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Climatic Regions of the World
as shown by vegetation

Arctic Circle
Tropic of Cancer
Equator
Tropic of Capricorn
Antarctic Circle

1 Tropical rain forest
2a Tropical jungle
2b Tropical dry forest and savanna
2c Tropical grassland and savanna
3 Desert, grass in parts
3a Desert sandy and stony
4 Grassland cold winters
4a Better grassland prairie
5 Tundra
6 High plateaus
7 Northern coniferous forest
8 Cool moist west coast
8a Cool moist farm lands
9 Small grain, potato, grass
10 Spring wheat
11 Corn winter wheat
12 Mediterranean climate
13 Cotton rice corn
14 Florida climate
15 Tropical upland coffee
High mountains
16 Ice caps

Irrigated areas

AUSTRALIA
PAPUA
NEW ZEALAND

E. Kaisz.

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NORTH AMERICA

ITS PEOPLE AND THE RESOURCES, DEVELOPMENT, AND PROSPECTS OF THE CONTINENT AS THE HOME OF MAN

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PREFACE

THE first edition of this book appeared in January, 1925, halfway through the "golden twenties." The world had just emerged from "The War to End All Wars." Germany was a republic. The League of Nations, despite the indifference of the American people and the covert opposition by certain European governments, was still a living hope.

America, believing it had helped to "abolish war," was setting out to "abolish poverty." Business was good. The stock market was behaving nicely. Our export trade was booming. Technological advance was proceeding rapidly. A good man could always find a job, except in coal and agriculture. Urban America seemed to be entering upon a "New Era," and thought itself to be the whole of the continent.

This new edition of *North America*, in which two of us have combined our efforts, has been written in a different psychological atmosphere. The two of us are sadder than we were in 1924, hopefully a bit wiser, but distressed by such catastrophes as the record Mississippi flood of 1927, the record Ohio flood of 1937, the record droughts of 1930, 1934, and 1936, and the record stock-market crash of 1929 — the crash which ushered in the longest business depression in American history. The millions who continue on relief bear witness to the fact that we have reached the end of an epoch — the end of the frontier of free land and free resources. Not only that, but we are compelled to live in a world whose tempo has changed.

In one sense we may say that the continent of North America has come of age. Like the young person whose body ceases to add inches in height, the continent has ceased to add new frontier communities. Except for some camps of miners, lumberjacks, and banana-growers, no important new settlements have been made in North America for a long time. The free land is taken; the frontier has ended.

When the first edition of this book was written, the rocket of business opportunity and growth was describing a sharply ascending curve across the statistical sky. That curve, rising, ever rising, had symbolized the United States for generations; it indicated increasing population, new communities, expanding business, increasing wealth. We called this ascending curve "progress" and boasted about its material measurements.

This edition of *North America* was written under a darker sky, a sky clouded by new and unhappy realization of definite and painful facts. The curve of the graph had flattened. Export trade had slumped. Immigration had almost stopped. The birth rate had fallen to a point where experts were talking about a stationary population within a short time. We had almost ceased to swarm as bees do in springtime when they start new colonies. And business ——? Also from 1934 to 1940 the National Resources Board (later called the National Resources Committee) had shocked all who read and considered its reports. These reports presented facts about the waste

of our matchless heritage, the foolish destruction of irreplaceable natural resources.

In view of these cold, hard facts, the conditions under which Americans must live henceforth have changed. The acute problem confronting this generation and the next is to bring about parallel changes in men's minds. Time is required for the national mind, accustomed for generations to think in terms of endless opportunity, to realize that "Go West, young man, go West" is no longer good advice, but merely a record of history, a record that causes a pang to millions of landless men when they hear that slogan of the past. They know all too well that all the good land was taken years ago.

When the sons could go West, take up good land, and grow up with the community, there was less need for youth to know about the geography of the continent. Today the young generation must face a new epoch — the epoch of the more intensive utilization of a continent that has already become bit by bit the possession of individuals or groups of individuals. What resources are at our hand, and how may we safeguard and develop them?

This book is an attempt to answer that question in the light of conditions prevailing in 1940.

J. RUSSELL SMITH
M. OGDEN PHILLIPS

April 15, 1940

PREFACE TO 1942 EDITION

This 1942 edition contains many changes and additions incorporating the results of the 1940 census of the United States.

These changes occur in the tables and footnotes in the text and also in a special appendix, Appendix B. All users of this book are especially urged to read the first paragraphs of Appendix B.

Where figures appear thus: *Metropole* (*48 : 58*) the first figure represents population in thousands in 1930, the second figure that for 1940.

J. RUSSELL SMITH
M. OGDEN PHILLIPS

October 1, 1941

ACKNOWLEDGMENTS

WITHOUT the co-operation of many people, the production of this book would not have been possible. Like a locomotive, a pocketknife, and most commodities of the present day, this book is a product in which the labors of an almost endless succession of people have made some contribution to the finished whole. In this host are the hundreds who have labored on surveys, maps, books, documents, and articles that gave us material from which we have attempted to erect a new structure.

As the manuscript leaves our hands we feel a sense of obligation to many who have personally favored us with their aid. Parts of the manuscript have been critically read by persons (named below) who are especially familiar with certain sections of North America. We definitely wish to absolve our friendly helpers from any responsibility for mistakes of fact or philosophy that may be found herein. For the valuable criticisms rendered by these authorities, we are deeply grateful:

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We must give expression to our sense of gratitude for the endless patience and ever ready kindness of many experts in the United States Department of Agriculture. The members of the scientific staffs of the Canadian Government have likewise favored us with their co-operation.

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We have traveled over much of the area encompassed by this book; we have not deemed it expedient to differentiate the observations of the senior and the junior author. We have combined our experiences, and the personal pronouns "I," "my," "me," which occur at times in the text, may refer to either author.

J. R. S.
M. O. P.

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NORTH AMERICA

Chapter 1. FREE LAND — PLENTY OF IT; FREE LAND — THE END OF IT

"WE will give you a farm. Uncle Sam has a farm for every one of us."

These were the words attributed to Abraham Lincoln, spoken at a political rally shortly before the Civil War. Lincoln had been rehearsing the Republican party's opposition to slavery. "But what are you going to do for me?" shouted a heckler. "I'm no Negro. I'm no slave. I'm a free white carpenter. What are you going to do for me?"

In a flash came the answer: "We will give you a farm. Uncle Sam has a farm for every one of us."

What a campaign promise! What a country — able to make the promise good! Pass a law and give away good land, to every man who asked — give enough for a farm. Give something for nothing at public expense. Surely that is a politician's concept of heaven!

Abundant resources! That is the most important key to American history for more than two hundred years before Abraham Lincoln became President and for many years thereafter. As a result of free-land legislation, good farms were given away in central North America for several decades after Lincoln's death, and the influence of that free land will be with us for many decades yet to come. It is the nature of folkways that they outlive the conditions that create them.

Singly or in groups men are ever searching for land, for a chance to live. To get possession of a bit of the earth's surface, men work and save. To acquire and own land, they will endure hunger, heat, and frost. They migrate. They commit the entire series of subterfuge, chicanery, and lies that they call diplomacy. They fight. They organize themselves into armies and go forth to conquer and dispossess.

Columbus's finding of America started the great European land hunt. After centuries of staying at home the Europeans set out to find what the world contained, especially for them. Settlement of distant lands began long before the years of exploration were completed. The grand golden act in this drama of land hunt and settlement was the gift of free homesteads by the governments of the United States and Canada in the half-century prior to the World War.

Since the time of Columbus vigorous peoples of Europe have planted themselves in the new lands of non-European continents from the Arctic to the Equator and then southward to where the Antarctic snows begin. No important land has been neglected. Europeans settled Iceland and Greenland, Newfoundland and New England, Virginia and Florida, the West Indies and the East Indies, Africa, Australia, and South America, Falkland and New Zealand.

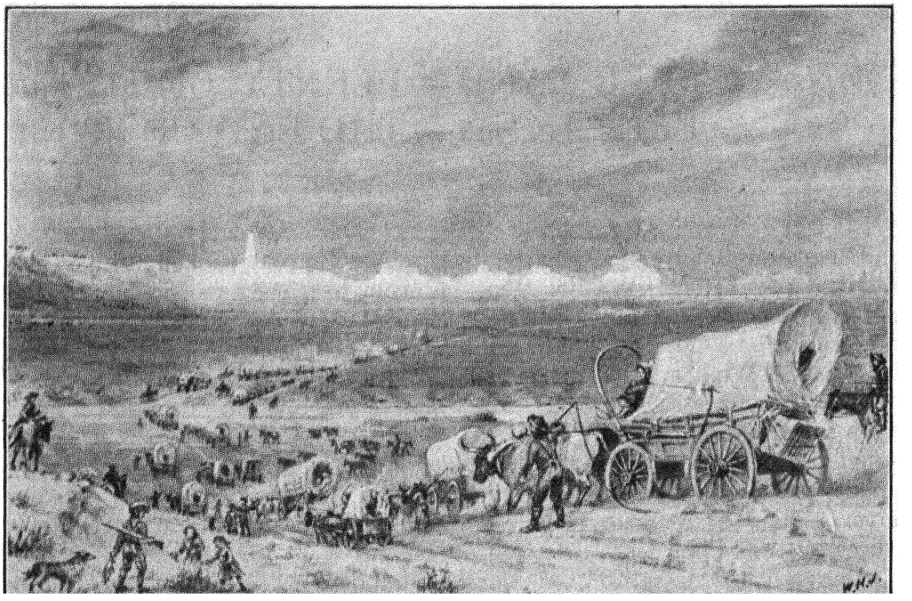

FIG. A. The first covered wagon.



FIG. B. The new covered wagon, 1930 edition — no place to go. (Courtesy Farm Security Adm.)

The earlier settlements in the West Indies and in many parts of South America were at first more promising than the feeble and smaller settlements of Massachusetts and Virginia. But the settlements in Massachusetts and Virginia survived, the people multiplied, and as a seed sends its roots deep into the earth, so these tiny settlements on the shores of the cool Atlantic sent their penetrating threads of white men back into the continent and on to the shores of the Pacific.

Today great cities smoke and roar in the interior of North America. But in Central America and South America large unexplored areas still exist — unexplored because the climate was so inhospitable to European stocks that the earlier settlements upon adjacent shores did not thrive and penetrate. The importance of geographic influences receives striking confirmation when we compare with these unsettled areas the density of population in

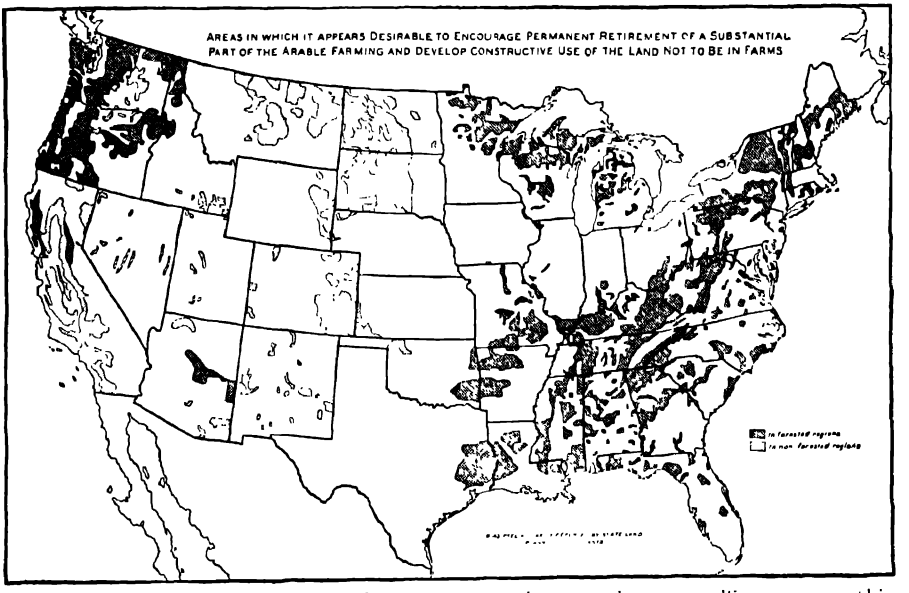

FIG. A. Little did Abraham Lincoln in 1860 anticipate such an appalling map as this. (Courtesy Nat'l Resources Board)

different parts of the United States and southern Canada. These alone of all the new lands have become populous and powerful in the European sense. But even Canada has at the north large areas almost or quite unexplored. South of the United States considerable areas are only partly explored and are completely lacking in settlement by European stocks. Why this great disparity? What factors have contributed to making some parts of the earth's surface so much better than the rest?

NORTH AMERICA AND THE WORLD
CLIMATE REGIONS

Near the Equator in all continents and archipelagoes is a wide band of wetness and heat -- tropical forests. The area is extensive in South America and Central Africa; it includes most of the East and West Indies and the eastern lowlands of Central America and Mexico.

In tropical forests the white man has been unable to maintain his numbers. The climate debilitates. New diseases are waiting to attack the European who goes there --- enough new diseases to lay him low and keep him low through the last four centuries.[1]

Poleward from the zone of tropic forests lie regions with a wet season and

[1] Before accepting a contract as agricultural adviser in Nigeria, Professor Forbes, of Tucson, Ariz., listed 63 diseases that might afflict him there.

a dry season — grasslands. South of the Equator are wide areas of grasslands in South America, South and East Africa, northern Australia. North of the Equator this type of climate covers much of India; in Africa, the wide Sudan; in South America, the Orinoco Valley; and little patches of the West Indies, western Central America, and western Mexico. In these tropical grasslands the proportion of white men to dark-skinned native stocks is insignificant.

Near the Tropics of Cancer and Capricorn are the trade-wind deserts — in the Southern Hemisphere the dry heart of Australia, the semiwastes of Kalahari and Argentina, the lifeless deserts of Chile and Peru.

North of the Equator the Sahara, or Great Desert, and its almost unbroken extensions reach across Africa, Arabia, far into India, and almost to the gates of Peiping. In North America this desert zone produces a land of cactus, scrub, and dune in much of northern and northwestern Mexico, in Arizona, Nevada, and a corner of California.

At the other extreme of temperature, toward the poles, Antarctica, as large as Europe, has no human inhabitant because it is a continent of icecaps. In Greenland 500,000 square miles of ice defy both man and beast.

Equatorward from these ice deserts lies the tundra, frozen for most of the year, but suddenly in the short summer transformed into a muddy, mossy, grassy, blooming land of flowers, where waterfowl and mosquitoes abound. Inland from the Arctic Ocean wide areas of tundra extend all the way across Eurasia and North America. Tundra also faces the Bering Sea in western Alaska. The Southern Hemisphere has so little land in this latitude that only a few acres of tundra have been found. This is relatively unimportant, however, because the tundra is a land of scanty population, and the white man appears there only as an explorer and temporary sojourner among Mongol and Indian nomads, hunters or reindeer-herders.

Equatorward from this climatic type are the world's largest forests, the taiga of Siberia, North Russia, Finland, Sweden. In North America this Great Northern Forest begins in Newfoundland and sweeps across the widest part of Canada and on into the Yukon Valley. Because this type of climate is too cold for farms, settled occupants are few.

Even this brief survey shows that the lands near the Equator are too hot to suit the European man; the lands near the poles are too cold for his crops.

Between these two realms of hot and cold is the precious mid-region of alternating frost and heat. These are the climates that suit the European — the climate of Spain and California; of France and Oregon; of Washington, British Columbia, and the British Isles; of the Cotton Belt of the United States and its duplicate in central China and southern Japan; the climate of the northeastern United States and its analogue in northern China, Korea, and Japan.

Alas for European man! Asiatic regions having these climates are overflowing with people. In the Southern Hemisphere, where continents are narrow and oceans are wide, there are only scraps of land with this group of climates — small New Zealand, an outer shell of eastern Australia, small corners of South Africa, a bit of eastern Argentina, southern Brazil and little

Uruguay, and a fraction of Chile between the Andes and the near-by sea. But in North America the region blessed with these climates widens until it is greater in extent than the total of the similar regions of the Southern Hemisphere. Its resources are richer, more varied; its climate is more dependable. For these reasons southern Canada, the United States, and the plateau regions of Mexico contain between three and four times as many people of pure European stock as are to be found in all the rest of the non-tropical world outside Europe and the U.S.S.R.

It was in the mid-region of North America, in the strip of cool land between the parallels of 26° and 55° N., that the white man found the real Eden of the Western Hemisphere. There, and there only, has he increased and prospered, threaded the continent with railroads, seized upon its resources, built great cities, and increased his numbers to multitudes. More than 100,000,000 live there; New World lands with full tropical climate have not one-twentieth this number of white men, although the Negro thrives there.

The distribution of climate and resources in North America favors the European races. The continent is somewhat triangular and is blessed in having its widest part — a large, fertile, well-watered area — in the cool latitudes, where alternating summer and winter furnish (1) the warm season that permits man to grow good crops, (2) the cold season that stimulates him to activity and creates the necessity of saving for winter use some of the goods he produces in summer, and (3) a climate that enables the white man to remain healthy.

GOOD FOR THE TRANSFER OF EUROPEAN CULTURE

It was not difficult to transfer Europeans and their culture to this mid-region of North America. The easy transfer of a culture requires three operations — the transfer of man, that of his animals, and that of the crops upon which both man and beast subsist.

The European colonists found the North American environment hospitable to their beasts of burden. Milk- and wool-producing animals survived and prospered in their new home. Settlers brought fowls with them; they found the turkey here.

In the new land the Europeans grew successfully every important European crop except the wine grape, which failed on the Atlantic Coast. In addition they found American corn, tobacco, and the potato — profoundly important additions to European agriculture.[2] The potato benefited both Europe and America, and corn and tobacco were of particular importance to the European colonists.

Corn, king of American crops today, was especially useful to the early settler. European small grains required a carefully tilled and finely prepared soil, but corn, in the Indian method of primitive agriculture, could be produced among stumps, rocks, and even among standing trees when they were deadened by ax or fire. Since wheat was planted in the autumn and

[2] The potato, a native of South America, went to Europe and thence to what was to be the United States, arriving while white men were yet few in that land.

harvested the following summer, the settler who arrived in November had to wait almost twenty months before he could eat that product. Corn, on the other hand, was ready for roasting by July or August, and the yield was usually double that of wheat. Unlike all other grains, ripe corn can wait on the stalk for delayed harvesting. In much of our country, at least a part of the crop will stand in perfect condition on the stalk or in the shock until spring. Meanwhile men might gather other crops or go upon hunting expeditions or be at war.

Corn is excellent food for man and beast; few other grains are used in so many ways. Green (immature) corn is a prized midsummer vegetable. The hunter could parch the whole grains of ripened corn before his campfire and subsist if hunting failed. After the grains were soaked in lye, the husk could be peeled off and the corn cracked between two stones, thus making hominy — the stand-by of the Indian's diet. There is no need to dwell upon the nutritive excellence of corn as meal, mush, and bread. The food habits of many peoples pay tribute to corn as a king of foods. Every farm animal eats it greedily, as do rats and mice, birds and poultry.

Bundles of cornstalks (fodder) make a warm, dry roof for a shed or shack, and can be eaten later by ruminant animals. Cornhusks furnished material for the mattress of the early settler's bed, and are still used, to some extent, for that purpose.

Colonial agriculture was greatly enriched by tobacco also. Though it is a robber crop that destroys the soil, tobacco gave the exploiting colonists something to export to the mother countries at a time when Europe needed almost no other American product except fur. It was nearly two centuries after tobacco met this export need that cotton came forward in the warm, moist Southland to revolutionize agriculture, trade, and politics, and to supply a staple that Europe lacked and could not produce.

A most important stimulant to the transfer of European culture was the absence in this inviting mid-region of North America of new diseases that might lay low the European colonist, his wife, or his child. It is difficult to appreciate fully what this relative immunity meant in the settlement of the continent. Records show that measles is one of the most destructive diseases when it attacks a race that has never before experienced it. When measles was first brought by white men to some of the Pacific islands, from 25 per cent to 40 and 50 per cent, of the people were destroyed. It may have been as fatal to many generations of white men at some remote time before selection by decimation gave relative immunity. When measles was new to the whites, there may have been five hundred or five thousand years during which population was reduced and humanity was at a low ebb. Only the destruction of those Caucasians to whom measles was fatal brought relief.

Though the white man got no deadly disease from the Indian, he brought new diseases (such as measles and smallpox) which killed the Indian.[3] These

[3] It is recorded that when white men entered the Columbia Valley they found many Indian villages empty, with clothes and trappings still in the tepees, and fish nets still swinging in the river. At first it was thought that the Indians had fled, but later it was found that they had been wiped out by smallpox, which they had contracted a few weeks before from a light case of varioloid in this same band of white men. Two years before the

two factors were of great importance in the rapid peopling of the continent by Europeans.

Thus the new settlers not only found a climate hospitable to themselves, their animals, and their crops, but also they found immunity from new diseases. Furthermore, four new important crops were added to their resources — corn, potatoes, tobacco, and, later, cotton.

A CLIMATE UPON WHICH THE FARMER-COLONIST COULD DEPEND

It is true that most of the earth is wasteland. Four-fifths of the earth's surface is either too dry, too wet, or too cold for abundant crops; too steep or rough for tillage; too unhealthful for man. Despite its many advantages as a home for the European races, we have seen that North America is not immune from the curse of wasteland. A large part, perhaps one-third, is too cold for dependable agriculture; another part, perhaps one-third, is too dry; another large part to the south is so hot as to impair the vigor of white men. One-half of the United States is, for one reason or another, unsuited to agriculture. Only 40 per cent seems destined to be productive to any high degree. Nevertheless, there is enough good land east of the 100th meridian to make North America a continent of unexampled opportunity and the United States the most favored nation under the sun.

A great advantage of the well-nigh matchless eastern mid-region of North America is its immunity from drought. Even in this century, as in many other centuries, drought-made famine has slain millions in India, China, and Russia.[4] The European peoples of North America have not experienced famine due to drought. Drought we have, and floods, but the affected areas are local. Thus while New Jersey burns, Virginia is sometimes too wet; the plenty of one locality can supply the shortage of another.[5]

Pilgrims came to Plymouth, Mass., a plague (contracted from European fishermen on the coast of Maine?) killed 95% of the Indians between Kennebec and Narragansett, and cleared out every member of the tribe of Indians living near Plymouth, Mass. The Pilgrims inherited the cornfields of the defunct tribe. Had it not been for the white man's diseases, it is quite possible that the Indian might have held the white man back a century or two; and if he had had some deadly new diseases to give the white man and none to receive from him, it is difficult to imagine just what the contest between the two peoples might have been, after the Indian got a start with European livestock and other cultural elements.

[4] The Book of Genesis records the troubles of the Israelites with the famines that drove the sons of Jacob to seek food in Egypt.

[5] The variableness of the American climate within small limits of time and space, and the local nature of our climatic troubles, are shown by the following reports:

Mr. H. K. Bryson, Commissioner of Agriculture for Tennessee, reported, June 1, 1916, that "the eastern part of the state suffered from a drought of unprecedented severity, for from four to six weeks [indicating local variations even within a part of a state] . . . while in the western portion a veritable deluge in some parts resulted in serious but not irreparable damage."

Mr. J. Warren Smith, Agricultural Meteorologist, in the *National Weather and Crop Bulletin*, May 3, 1921, reported a week which shows our climatic variability: "Frosts and freezing weather were general in the Northwest, with resulting damage to alfalfa, early truck and fruit; there was some frost damage in the central Lake region. It was too warm for truck in California, and the lack of moisture is being felt rather seriously in that State and in southern Arizona and New Mexico and western Texas; more rain is needed also

Further than this, drought east of the 100th meridian rarely if ever lasts an entire season. April and May may be dry, injuring hay but fattening wheat grains, and June and July wet, injuring wheat but making good corn and pasture. Therefore if the wheat crop and the hay crop are poor, the corn and the summer pasture may be good, and the farmer is saved. He may not make a cash profit, but his family does not starve. A serious crop shortage never menaced any large group of people in America until we reached western Kansas. There, long after the country was established as a Great Power, settlers were urged by politicians, railroad companies, and other land speculators to make farms in lands of little and uncertain rainfall. The settlers were unacquainted with these conditions and met disaster.[6]

In parts of India, China, Australia, and South America droughts sometimes continue for an entire season, or even two seasons, and blast crops over wide expanses. Often death or migration (when possible) follows.

COMPLETENESS OF RESOURCES

In addition to the advantages of food resources and good climate, settlers in America had unprecedented advantages in forest and mineral wealth. No other continent can rival North America in these respects.

That part of the continent included in the United States has long produced all the important minerals except tin and potash, and is now rapidly forging ahead as a producer of the latter. The early settler found iron, the indispensable metal, in many places along the eastern coast region. Near-by forests furnished plenty of charcoal with which to smelt it. Thus the settler was able to equip himself with the tools of iron and steel so necessary in the conquest of a great continent.

The United States has half the known coal of the world and large quantities of copper. It leads all other countries in the production of phosphate, the greatest raw material of commercial plant foods, and in iron ore, the greatest raw material for manufacturing. North America, so well provided in the simple days of the colonist, is also well provided in the complex days of the present, when life depends upon machinery, and machines depend upon coal, oil, and water, harnessed with iron and steel, copper, and cement. All these materials North America possesses (for a time at least) in quantities greater than any other continent.

Wherever the settler landed on the Atlantic Coast he was beneath or near the shade of trees. The forest reached almost without a break from Quebec to Florida and westward across the Alleghenies to a place the white man scarcely saw for two centuries. However, while this timber furnished innumerable aids and vital necessities for European farmers in a cold climate, it was really a serious bar to the rapid development of early settlements. The modern American farmer, and the city dweller, can scarcely comprehend

in the extreme Southeast. The moisture conditions were favorable in most other sections of the country, except that there was too much rain in some central districts. Farm work was delayed by cool weather and wet soil in most Central and Northwestern States throughout most of the week."

[6] See Chapter 24, "The Great Plains Ranch Region."

the degree of burdensome labor that the settler endured in felling the great trees of the primeval forests and rolling the heavy logs into piles to be burned. He then fought the roots with plow, mattock, and hoe, and afterward he fought the determined and upspringing shoots that threatened to overwhelm his corn. Cleared spaces remained encumbered with great stumps for a generation before he had a smooth green field such as he had left in Europe. Incredible and persistent toil were necessary to transform the great forest, the hunting-ground of the Indian, into the fields and farms of the agriculturist.

THE CULTURE OF THE AMERICAN INDIAN

Since North America had all these advantages, all these useful things, why did not the Indians develop a wide-reaching culture, with literary, artistic, and legal developments comparable to that of Greece, Rome, or sixteenth-century Europe? Was it because of racial inferiority of the Indian?

Before passing judgment we must consider some of the handicaps of the Indian and some of his capacities and achievements. Do we think that culture is measured by tons of steel, an engine, a motor, a self-propelling wagon, means of quick communication, a bathtub, a water closet, a sewer, a skyscraper, or paper with printing on it? If that is our measure of culture, we must consider the remains that still stand on the plateau of Anáhuac, the ruins in Yucatán and Peru, and remember that those astounding structures were wrought by men without the aid of wheel or the help of strong beasts of burden.

A complicated culture that includes books and reading is very new in the experience of man. It arrived for the most-favored groups only the day before yesterday — only in the last 1 or 2 per cent (or perhaps less) of the time that man has been man. The development of a culture is more nearly a geographic accident than a racial virtue.

Despite the resources of a great continent, the Indians in most parts of North America remained in relatively small culture groups for centuries after the Chinese, the Babylonians, the Egyptians, the Cretans, and the Greeks had made complex societies and codes of law, had acquired books, libraries, and temples. Those other peoples inherited aids which the Indians lacked. For them unknown benefactors had tamed and harnessed the beasts of the field. This was help of incalculable value to the early peoples of the Eastern Hemisphere. Perhaps the chief obstacle to cultural advance in North America was this — there were no domesticated animals to increase the feeble strength of man by drawing the plow and hauling crops and temple stone, none to enrich his food with meat and milk and his apparel with leather and wool. The North American continent was poor in tamable animals. It had no wild horses, no wild cattle or buffaloes, no pigs. The sheep of its mountains were long of limb and more wary and more fleet than deer. The nearest approach to cattle was the bison, an animal of mean disposition that still baffles the white man's attempts to domesticate him. His towering stiff neck is perhaps evidence of a spiritual quality as well as a physical characteristic.

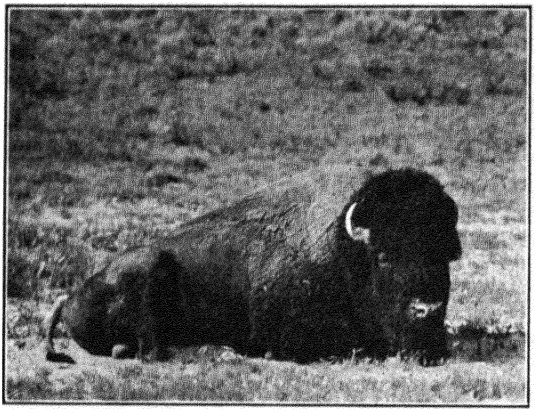

FIG. A. Perhaps the present wealth and power of the United States are due in large part to the perversity of a single beast. If the spirit that animates this mighty hulk were a little less independent, he might have been drawing plows and wagons thousands of years ago after the manner of his docile cousin the ox. If he had been thus willing to assist the impertinent biped man, it is more than possible that Babylon, Thebes, or Mohenjodaro might have risen on the banks of the Mississippi. And if soil destruction had gone on from that day to this one-quarter as rapidly as we are destroying it now, there would not have been enough of the United States left to support a first-class power. (Courtesy J. Wixon, U.S. Dept Interior)

The dog was the only domestic animal common among the Indians, and they used it as a sledge animal only in the more open regions. The alpaca and the vicuña, two sheeplike animals of the Andes, were tamed and used in that region by the Incas, but the limitations of those animals are such that the white man has not thought it worth while to use them in competition with his other beasts. The llama, the other domestic animal of the early Andean peoples, is still used as a pack animal, but only in the mountains, where its remarkable sureness of foot is important. Even more important is its ability to pick its food from roadside crannies.

Not only were the Indians denied the help of these animals as workers, as beasts of burden, as sources of milk, food, leather, and cloth, but they also missed the developing and humanizing qualities which the care of animals fosters in a people. The necessity of watching sheep, of milking cows, of storing winter food for animals, would almost surely have developed in the Indian techniques of industry and trade which are basic in European culture. Such work would have developed his staying power and would have forced him to acquire a surplus, both of which developments are essential in obtaining the leisure necessary for learning. Yet the Indians of the Southwest went far toward this without the Eurasian advantage of animal helpers.

The domestication of animals might well have resulted in an effect upon the Indian of the Darwinian law of the survival of the fittest. In the course of generations the man who could not or would not take care of animals could not be a successful farmer, and not being able to obtain a regular food supply for his children, would tend to become extinct, while those who acquired the work habit and industrial dependability would survive.

What was perhaps a fundamental difference, apparently racial but probably cultural, between the industrious white man and the lordly Indian of eastern North America was the ability to stand the pain of steady work, which is one of the bases of a dense population and a complicated culture. The American Indian has many splendid qualities — fine physique, dignity,

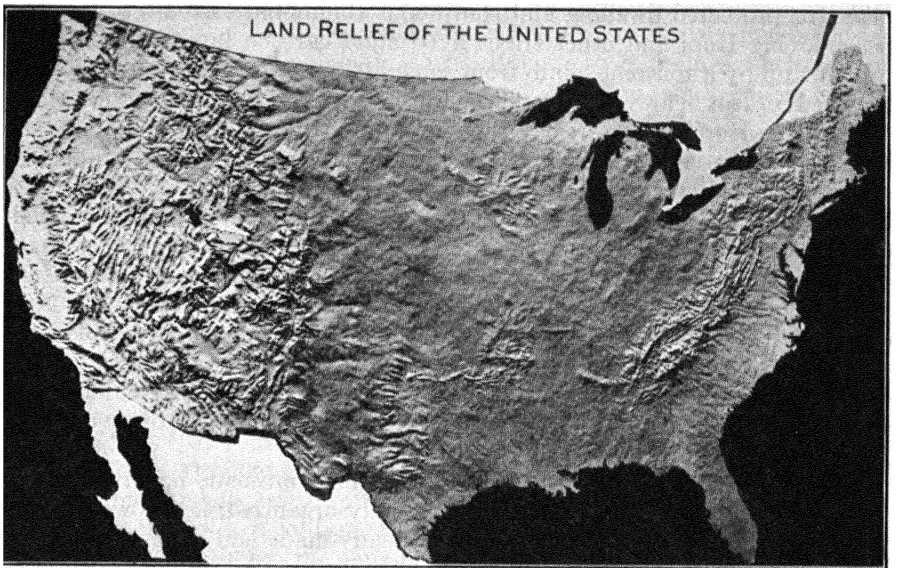

FIG. A. This map shows some of the reasons why so much of the white population of North America remained east of the Appalachians until steam came to our aid, and why the Indian found no safe nooks in the rich mid-region. (Courtesy U.S. Dept Agr.)

native veracity, and loyalty. Many of them have acquired enviable scholastic and athletic records in the schools of the white man. The Indian promptly caught the wild horses that ran away from the Spanish settlers, and was making rapid progress in utilizing them. Given time and an opportunity equal to that of the European races, the Indian might have duplicated (essentially) European achievements. But he did not have the necessary thousands of years. Just as he was making a start, along came the white man, strong in organization, equipment, and numbers, and brushed him aside.

But another obstacle deterred the American Indian. He found few safe nooks on the North American continent where the course of peaceful living could be undisturbed for many generations. Time, much time, generations of time, are necessary for the development of culture. Reasonable safety from attack is essential. Rome, you will recall, was built on seven hills. Standing in the near-by plain are towns that still occupy the entire crest of many of the sharp round hills, their perfect walls still surrounding them. They were easily defended through the ages. Greece developed its civilization on islands, or in nooks, such as Sparta and Athens, where there were mountains for protection, the effectiveness of which the defense of Thermopylae exemplifies.

In America the Indian made his greatest progress not in the parts of the country best suited for the production of food and supplies, but in parts less suited to subsistence — in the arid Southwest, where the chance of crop survival was small, but high mesas and almost inaccessible cliffs afforded a

place for protected dwelling and continuous communal existence. Here the peace-loving Hopi and other tribes lived amid earthen jars filled with corn brought up by a toilsome climb from some little irrigated patch in the valley hundreds of feet below. Corn and the water they secured from distant sources enabled the Hopi to hold at bay the marauding tribes of the open plain until their enemies gave up the attempt at conquest. Then the successful pacifist, on his high, safe rock, could continue to weave blankets, raise his children, and worship his gods with his long series of religious dramas. Tenochtitlan, the Aztec capital, on an island, and the Andean Plateau, situated between an empty sea and an almost empty tropic forest far below, each had natural protection better than that of Egypt.

Through the open Mississippi Valley and the everywhere accessible East, the tribes and war parties surged at will, and no tribe had a chance to work out its destiny.[7] The tribes were like those of Germany in Roman times. Germany was then the typical land of the barbarian, frequently overrun by migrant peoples who destroyed almost everything.

Despite his merits and the advantages of his continent, north of Mexico City the Indian was neither numerous, highly organized, nor powerful. He was not sufficiently developed to absorb, ready-made and almost overnight,[8] the culture of the European settlers, so the latter pushed him aside, took his land, and destroyed his society. The most coveted thing in the world was involved — land, good land, the opportunity for a home. The white man could not resist the temptation; he took the Indian's land, and vilified him.

Some historians excuse our treatment of the Indian by pointing out that the Romans would have enslaved or slaughtered him, whereas we did neither completely. (Attempts by Anglo-Saxons to enslave the Indian usually resulted in the Indian's death.) But the record of our association with the Indian, judged by standards of honor, is not one of which the white man can be proud.

Perhaps it is the attempt to clear a guilty conscience that has caused us to talk so much and write so much about "treachery," "cruelty," "scalping," "savagery," on the part of him whose land we took after he had welcomed our ancestors and treated them kindly.

Indian culture cannot be dismissed without giving heed to the *intellectual* achievements of the Aztecs, the Pre-Aztecs of the Mexican Plateau, the Mayas of Yucatán and Central America, and the peoples of the Andean Plateau. Their calendars and their knowledge of astronomy are very suggestive; also their architecture. To come nearer home, the federal system of the Indian nations of western New York State suggests that the Indian was not inferior in mental capacity.

The period of colonial history and the early years of American independence were marked by the struggle for the possession of the continent, not only

[7] This openness of the middle of the continent results in the great advantage of easy communication, now that we have machines, and a settled society gives man a chance to possess, produce, and trade.

[8] The speed and achievements of the Cherokee Indians of the southern Appalachians in taking on the ways of white men before we packed them off to Oklahoma would make an interesting sociological study.

between the white men and the Indian, but between the European nations. England and France fought for possession; England and Spain fought for it; the United States quarreled about it with France, with Spain, with England. Fortunately, these quarrels were settled by treaty or by purchase, sometimes extensive purchases, as when the United States bought Florida from Spain and the vast reaches, then called Louisiana, from France. Finally, as the Anglo-Saxon pushed on against the weak Mexican, the United States took another territory — by conquest, mollified by a small monetary payment.

THE LAND POLICY OF THE UNITED STATES AND CANADA

What did government do with its abundance of land? Generation after generation grew up in the eastern United States with the same idea that Lincoln had about the limitless abundance of land — "Uncle Sam has a farm for every one of us." And so he had. In 1827, just before the first railroad was built, the Secretary of the Treasury announced that five hundred years would be required to settle America. The prophecy would probably have been correct if man had continued having only the ax, the scythe, the freight wagon, the horse and ox, the canalboat and steamboat, of that day. About the time of the settlement of Oregon, United States Senator Benton of Missouri (1782–1858) saw that on the basis of land sales during the previous forty years it would take five hundred and twenty years to sell the land in the states and territories, and that it would "take about 2000 years more to complete the sales (of public land) to the head of the Mississippi valley and to the base of the Rocky mountains." [9] Like all others, the distinguished Senator could not anticipate the future, and the oncoming age of machinery. Note the relationship between the date of his statement and the appearance of the railroad.

Before 1800 the view of the United States Government regarding land was, in effect, that land was a source of public revenue. The revenue was to be derived by selling the land in great blocks to land companies that would parcel it out to individuals, who would in turn pay taxes. The Government also tried to sell homesteads at $2 an acre, with four years to pay for a 160-acre tract. During the period from 1800 to 1820 when this practice prevailed, the Government had the greatest difficulty in collecting the money, and by 1820 individual purchasers were in arrears to a total of $21,000,000. To meet this situation, the Government reduced the price to $1.25 an acre, payable in cash, for an 80-acre lot. This too was disregarded, and there followed that interesting phase of American history in which the "squatter" figures.

"Squatter rights" and "squatter sovereignty" were big questions in the Middle West in the latter part of the first half of the nineteenth century. The squatter was a person who came into empty territory that looked good to him, built a house, cleared the forest, fenced in a piece of land, and said that he owned the property. Why then should he endure such injustice as

[9] *Register of Debates in Congress*, 20th Cong., 1st sess., p. 610.

paying $1.25 an acre for his land? In the '40's it was stated that only one-third of the voters of Illinois had good titles to their land. Squatters' associations were formed, such as the Sun Prairie Wisconsin Squatters' Association, whose object was to keep out of the territory the man who was the legal purchaser.

There were two sides to the question as to the ownership of the land. Did it rightly belong to those who had gone to the wilderness, cut down trees, hauled away stones, plowed the ground, tilled the land, perhaps driven out the Indians? Or did the property legally belong to somebody else who wanted to get the benefit of the labor of others and who appeared a little later saying that he had paid $1.25 an acre for the land to a mysterious something called the Government, which had perhaps made some new rules since the arrival of the squatter? The squatters were so numerous, and their physical and voting strength so strong, that in many ways the squatter-sovereignty claim won out. This was expressed in law in Lincoln's homestead policy, which is actually a legalized form of squatter ownership. It gave land to anyone who would go and take it, live upon it for a time, and cultivate a part of it.

During the period of the Civil War the United States Government dispersed land in two ways: first, in fulfilling Lincoln's campaign promises by the National Homestead Act of 1862, it provided that almost any person could receive 160 acres of government land for the taking. Nothing was required of the applicant except to live on his claim a part of the time and to cultivate a small part of it for a short time. He could then receive title. The Government kindly surveyed the land and staked it off for him. Land offices scattered along the frontier took charge of these matters and transferred the land from government ownership to the new settler. In the decades that followed the Lincoln administration we in the United States got along so beautifully with giving land away that the Canadians took up the practice and added certain modern improvements, new high-speed devices. Not only did Canada give away the magnificent black acres of its prairie provinces, but it begged the Caucasian world to come and take them. In scores of journals in the United States and Europe, Canada advertised free lands for the taking. Land offices were opened in many cities of the United States and Europe, and Canadian government agents persuaded people to come to Canada and take up land, and showed them how it could be done most easily.

Second, during the Civil War the United States Government started giving away Western land wholesale to corporations that would agree to build railroads through it. The first railroad to the Pacific Coast, from Omaha to San Francisco, was partly financed by the Government. For every mile of railroad the company was given 6 square miles of land — every alternate square mile within 6 miles of the track. This wholesale method was used extensively to persuade capitalists to build railroads in unpeopled lands, on the theory that the railroads, needing traffic, would do their best to persuade settlers who needed land to come and take it. Within ten years after 1860 nearly 100,000,000 acres were thus disposed of; altogether the Government has given away 155,000,000 acres of land for this purpose.

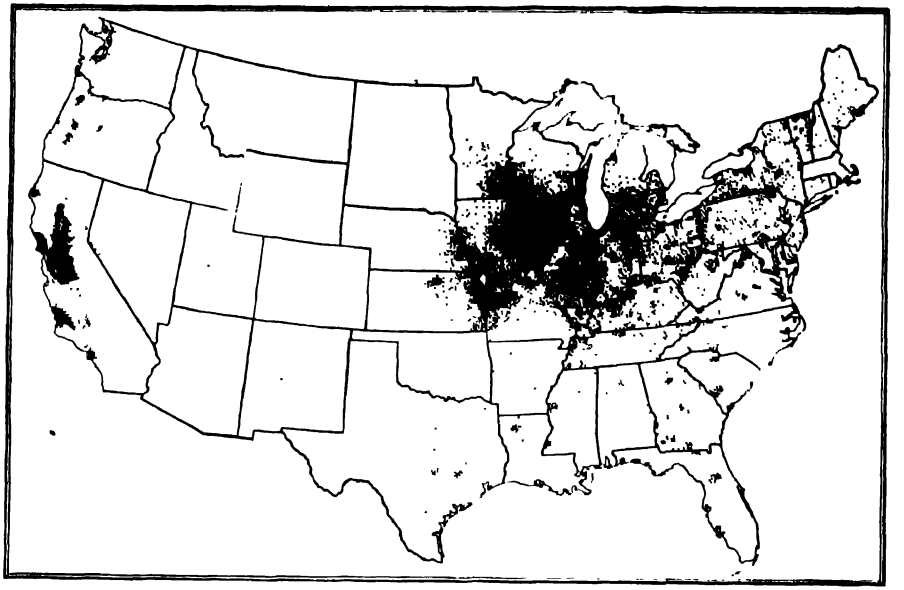

FIG. 15 A. Improved land 1860–70. One dot = 5000 acres.

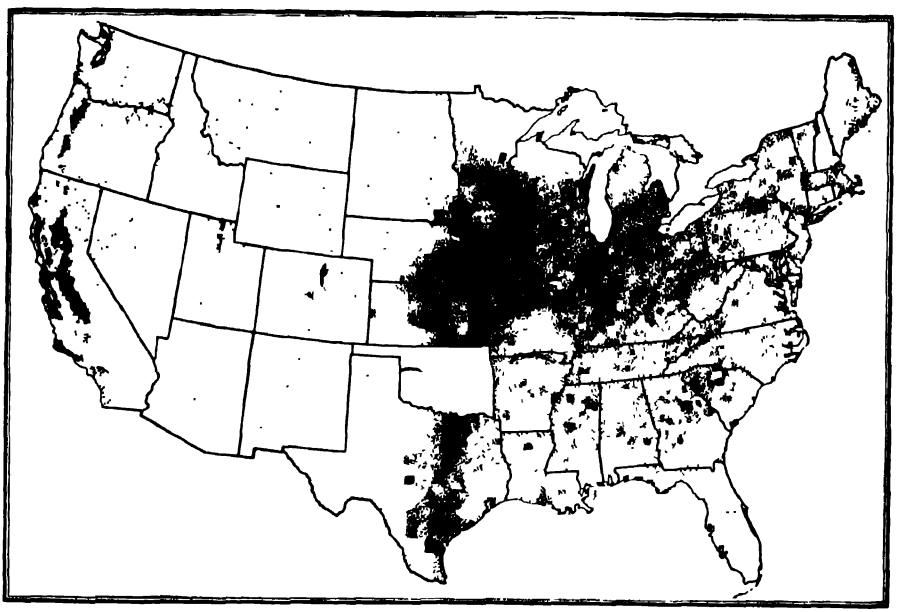

FIG. 15 B. Improved land 1870–80. One dot = 5000 acres.

These two maps show the golden age of migration. The land was free. It was good, very good, and new railroads took the settlers to the land. (Courtesy O. E. Baker, U.S. Dept Agr.)

THE FIRST COVERED WAGON

The famous advice of Horace Greeley, "Go West, young man, go West," was followed by Greeley's generation as it had been followed by previous generations. In the seventeenth, eighteenth, and nineteenth centuries the young man of Massachusetts, Pennsylvania, Virginia, or Carolina who did not find work on his father's farm had the choice of seeking a livelihood in city factory or city store, on the sea, or on Western land. If he went to the sea, the factory, or the store, he went because the opportunity there seemed better than chances in the West. But a multitude chose the land, and putting their young wives and their household goods into the covered wagon, they tied the cow on behind and joined the endless procession of settlers going out to the frontier, there to build the cabin, fell the forest, break the prairie, start the home. The equipment of a young couple -- wagon, tools, horses, cows, pigs, clothing, and bedding — was the product of several years of *surplus* regularly furnished by thrifty farm families working in a dependable climate. This process had begun in the 1630's when people from Plymouth, Massachusetts, went to settle in the Connecticut Valley. The movement continued westward without a break for more than two centuries. The era of the covered wagon made a romantic chapter in the winning, and the skinning, of a continent. Tracking the roadless prairie, bumping over stones and ruts, fording streams, the covered wagon carried its human cargo, full of hope and expectation, ever westward to grow up with the country. Throughout the nineteenth century the covered wagon symbolized developing America.

THE AGE OF MACHINERY ENTERS SUDDENLY

Suddenly, in the midst of a process carried on by age-old techniques, the Industrial Revolution placed in the hands of man a battery of new tools for land conquest -- new tools of giant strength. The first of these tools, the factory engine and its machines, increased man's power to make equipment with which to tame the wilderness. Then came the railroad to carry man and his new equipment into the frontier and to bring out the goods he produced there.

Beyond the Ohio Valley the unoccupied land was easy to tame. In the Eastern forests men had advanced slowly, fighting stumps and stones for generations; the middle of the continent was open prairie ready for the plow. And here was the new steel plow ready to turn the sod. Soon came barbed-wire fences to fence the treeless prairie, dynamite to blow up mountains, electricity in a hundred forms, and matches to set the world on fire. Then came the automobile and the truck and lastly the airplane to carry the explorer and the prospector to the farthest nook in the wilderness.

Under these new conditions the pioneer could advance as far in a decade as his ancestors had gone in a hundred years. Never before was such opportunity offered to the sons of men. There will never be another such opportunity, although the improvements in machines and in the ability to

handle materials increase. Within a single generation the relation of man to the surface of the United States and the peopled parts of Canada and many other countries was profoundly changed by the arrival of the automobile. Good surfaces on which to use the new machine now became necessary, and roads were built with great rapidity. Modern road-making machinery is powerful and efficient.

In the first decade of this century transport and travel over the highways of the United States were strictly local. A few miles of good road reached outward from the cities, but at a distance of but 15 or 20 miles from city limits all roads led to the railroad station. To the railroad station the people of the United States went in carriage, buggy, or farm wagon; the passenger train and the freight train did the rest. To travel from New York to Chicago by means other than the railroad was a romantic adventure. When the first automobile came, such journeys involved engineering exploits and surprising lengths of time two days, for example, were required for the journey from Chicago to Milwaukee, months for crossing the continent.

The shift from the Railway Era to the Automobile Era came quickly. Machines came in groups, the children of a basic invention. About this time came an invention whose significance is rarely appreciated. The invention of new metal alloys gave us high-speed steel, which enabled a machinist with his machine or machines to turn out five, ten, fifteen, or twenty times as much work as was possible a decade earlier. It was high-speed steel that gave us cheap automobiles and most of our cheap machines. This machinery brought the good roads that now connect every important city and almost every county seat with the surrounding country, and have made highway traffic by automobile and truck so swift and cheap that the American railroad corporations are threatened with financial annihilation through loss of earning power.

The era of machinery has also given us plumbing and heating devices. Clean hotels and clean tourist camps are now to be found in ten thousand places where they were nonexistent in the preautomobile era. Of even greater economic importance is the fact that transportation by truck permits production in remote places. Such a thing was undreamed-of in the days when old Dobbin and the locomotive owned all roads and were the sole aids to the frontiersman in settling the land and taking produce to market.

Never, before or since, did human beings get into an empire so rich and usable, and never did they treat one worse. It is difficult today to look back on the past and see it as those who then lived saw it. To us it seems reprehensible that farmers and lumbermen should have burned and ravaged as they did. But the farmer-settler needed to burn the forest to get a place for a field. Before commercial fertilizers became available, the soil was soon exhausted. It was then a logical procedure to abandon a clearing and clear more forest to make another field. It was a time of individual freedom, and a time of severe competition in agriculture. Only the best resources could pay their way to market. If one commercial lumberman cut a perfect stand of pine five hundred years old and let the forest burn behind him, his rivals did no better. The coal-miner, working the best rich seam close to

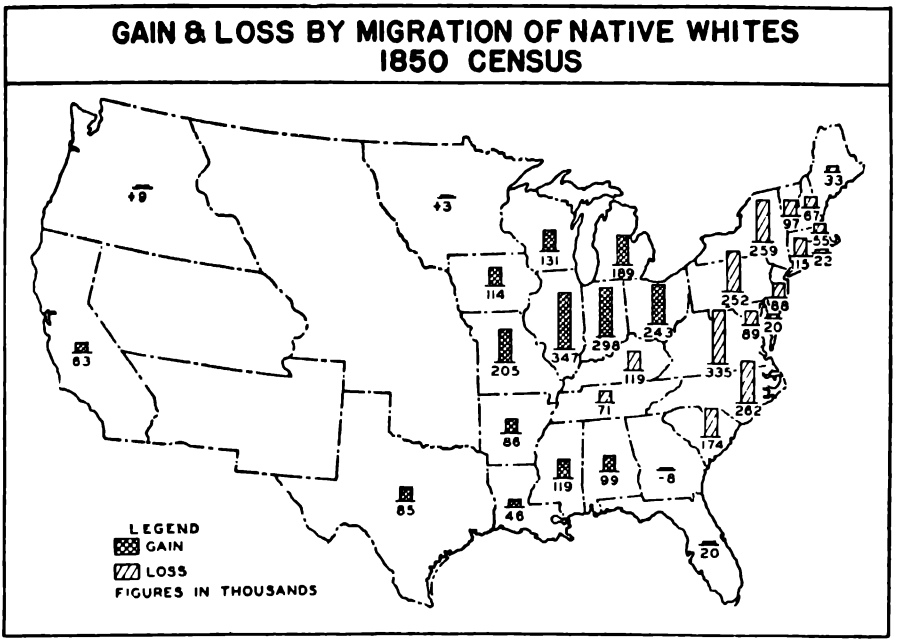

FIG. 18 A.

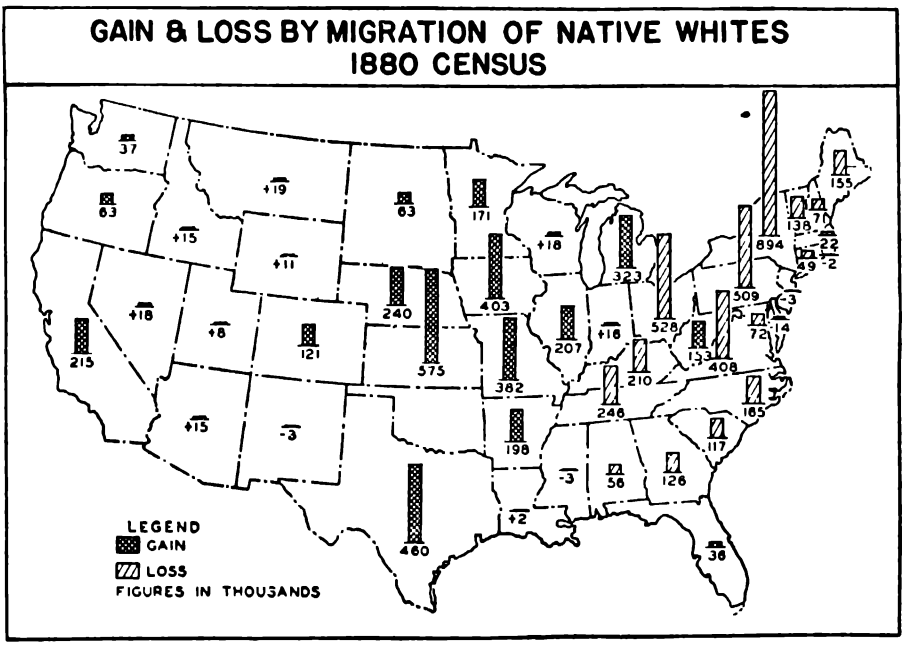

FIG. 18 B.

Internal migration in the United States enables us to follow the waves of 1920–30 the movement reverses. The mid-continent pours men back

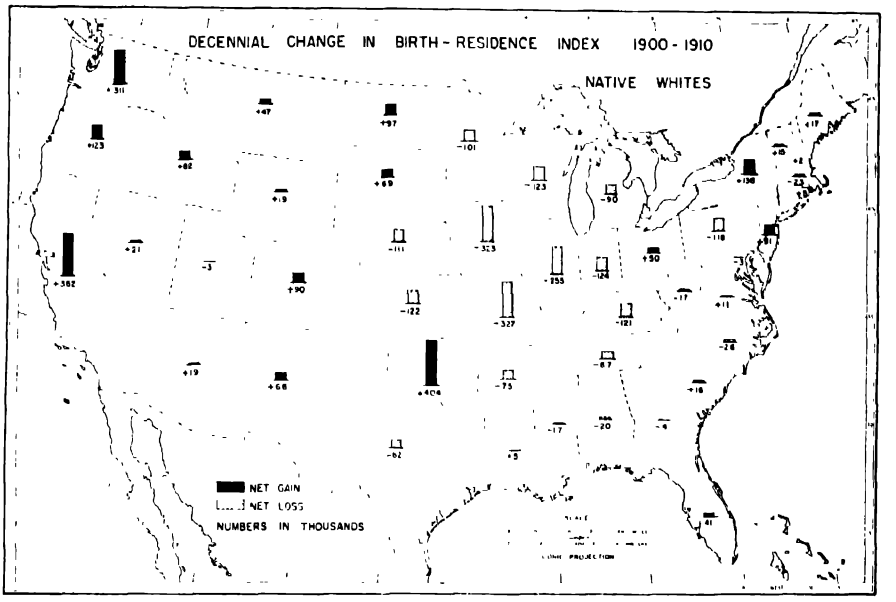

FIG. 19 A.

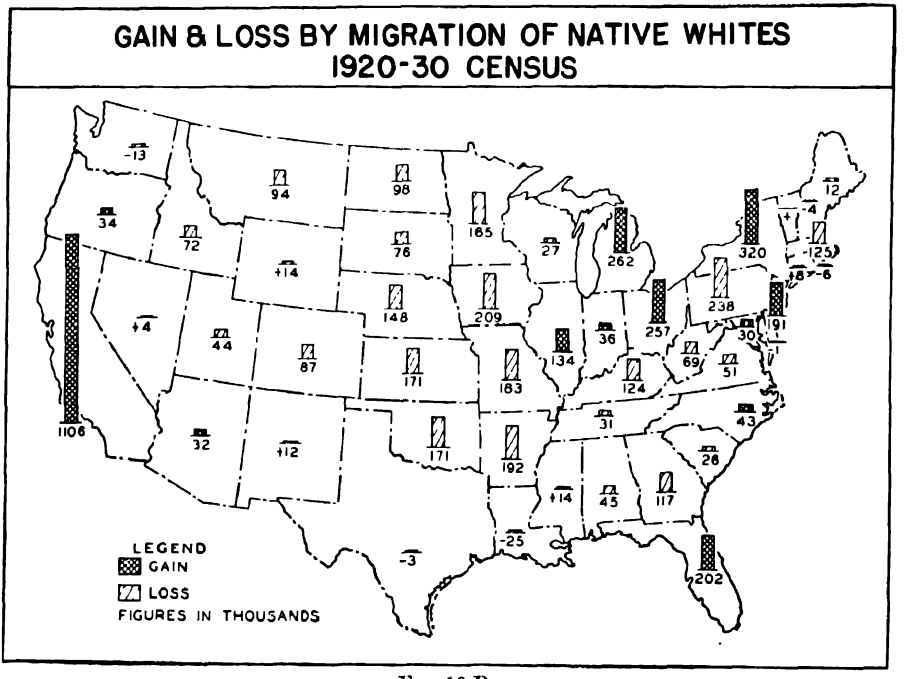

FIG. 19 B.

migration across the United States as Mr. Lincoln's policy worked. In to the industrial East and to the temperate corners of retirement.

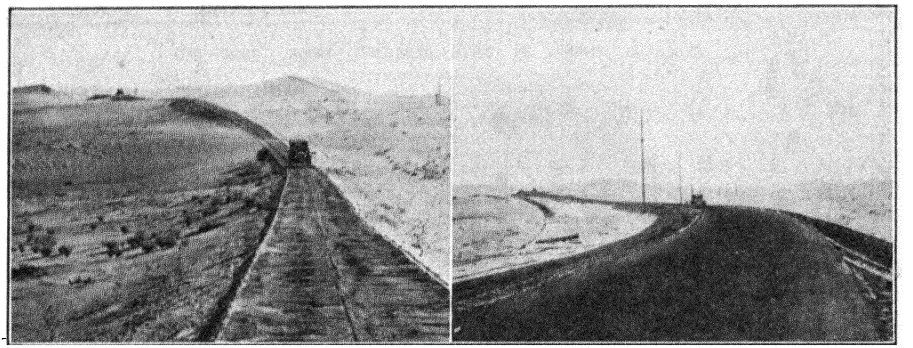

FIG. A. This pair of pictures from Imperial Valley, California, show us what thirty years have done to link up the isolated parts of the United States. (Courtesy Standard Oil Co. of Calif.)

the surface, made a price for coal that no coal-miner practicing conservation could meet. Thus were minerals and lumber wasted.[10]

We are indebted to Dean Davenport of the University of Illinois for the following motto. "Here's a fine animal," said the frontiersman, "let's kill it. Here's a big tree, let's cut it down. Here's a thick sod, let's plow it up. I'll skin this farm and go get another." This has been the practical motto of entire generations.

We have slashed and let it burn, deforested and let the soil wash away, degrassed and let it blow away. We have trampled the resources as dumb

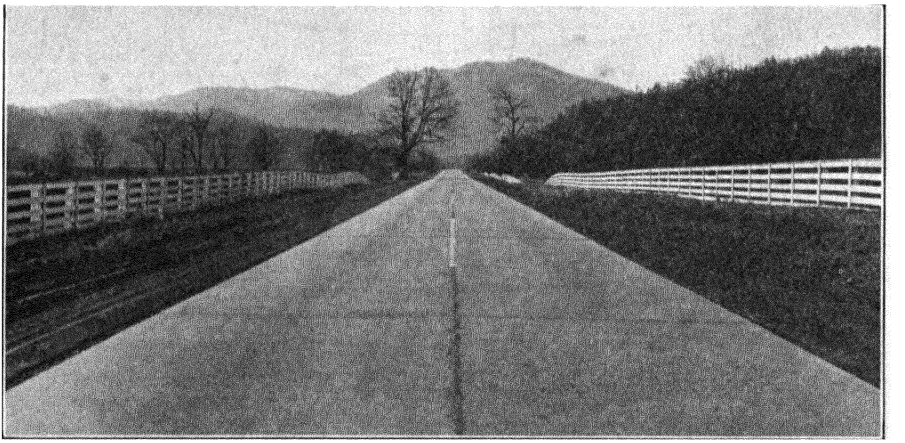

FIG. B. The automobile has made us build roads This Virginia highway of 1940 bears little resemblance to the ones on which hundreds of thousands went West. (Courtesy Farm Security Adm.)

[10] The case for agriculture is not quite so convincing. At all times and in nearly every county in the United States some farmers have applied intelligence to agriculture. Some have followed soil-saving and fertility-saving conservation devices and practices. Through the decades and the generations these farms have yielded more than the national average of standard crops, and they are still good farms.

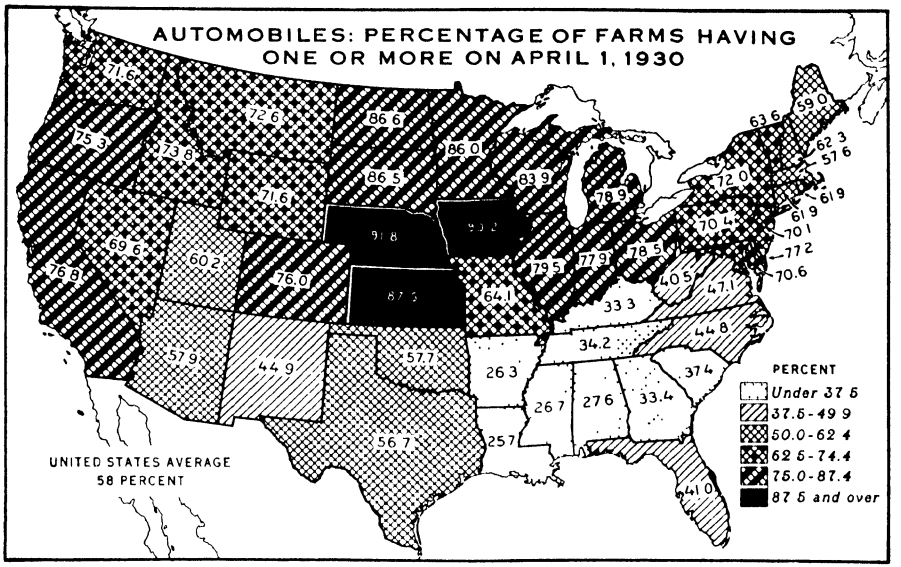

FIG. A. This map is partly a map of per capita wealth. (Courtesy U.S. Dept Agr.)

cattle trample their hay in mud as they eat. The speed of the sacking of the continent is dumfounding. Consider Oklahoma. For ages the Indian had roamed there; but he left the turf unbroken, the streams full of fish, the soil undisturbed by his corn patches. After centuries of occupation by the Indian the resources remained.

The land was open to settlement in two large blocks, in 1889 and 1892. Texas to the south of it, Kansas to the north, Arkansas to the east, had been occupied by white men decades before. Here in their midst was the new Indian Territory, a grand, wide stretch, millions of acres of rich prairie to be given away. To make it a fair race, much of the land was surveyed in advance but prospective settlers were kept out until twelve o'clock on a certain day. To keep them out, the United States Army spread itself along the boundary.[11] At twelve o'clock noon, the moment of entry, the opening was signaled by cannon. Like the pistol crack starting a foot race, it started the land-hungry Americans on their race with 160 acres as the prize. Many men still living participated.

But look! Before the fiftieth anniversary of the opening to settlement of Oklahoma Block No. 1, the state was held up by the Soil Conservation Service as one of the most tragic examples of destruction by erosion. The map of soil erosion shows Oklahoma to be in the very worst situation, and after only half a century.

The blight of Oklahoma signalizes the end of an epoch, and the transformation of the young Americans' opportunity.

[11] "Sooner" was a designation of reproach applied to those who managed to slip in before the gun. In many places "Sooner" now means any inhabitant of Oklahoma.



FIG. A. Evicted share-croppers of the 1930's. (Courtesy Farm Security Adm.)

THE ERA OF THE SECOND COVERED WAGON

The 1930's saw another "covered wagon" migration — this time over good roads, but without hope; American refugees were moving with no place to go. Tens of thousands of bankrupt families, fleeing from blasted communities, fleeing from drought, dust storms, grasshoppers, gullied lands, closed mines, gutted forests, traveling in the most amazing wrecks of automobiles and trucks, sought a place where the family might eke out some sort of hand-to-mouth existence. In some parts of the country the refugees are called "mice." Homeless, they travel from lettuce field to cabbage field to cherry orchard to peach orchard to orange orchard, doing the seasonal work when not on relief.[12] The "covered wagon" of the 1930's fled in despair; it did not migrate in hope. No free farms of government land awaited these people. The free-land epoch had ended — completely. As proof, on at least one state boundary stood men with guns, forbidding the bankrupts to enter, even though they were willing and able to work — cherubims and a flaming sword.[13] In the 1930's the United States Government was not giving away good farm land. Instead it was buying up what was called submarginal land and putting people off the land because they could not make a living there.[14]

[12] John Steinbeck's *Grapes of Wrath* (Viking Press, 1939) is good collateral reading for this chapter. An illuminating addition is Archibald MacLeish's poem *The Land of the Free* (Harcourt, Brace and Company, 1938), with its fine photographs of these homeless folk.

[13] "So he drove out the man; and he placed at the east of the garden of Eden Cherubims, and a flaming sword which turned every way." Gen. 3:24.

[14] "The main reasons for buying such marginal land out of production and keeping it out are social. Our main concern is to stop bad land from wasting human lives. A great many farms now being operated condemn the people there and their children to worse than peasant standards of living." — H. R. Tolley, Assistant Administrator, AAA, "The Problems of Long-Time Agricultural Adjustment," an address given during Farmers' Week, Ohio State University, Jan. 1, 1934.

"President Roosevelt transmitted to Representative Elliott of California today the

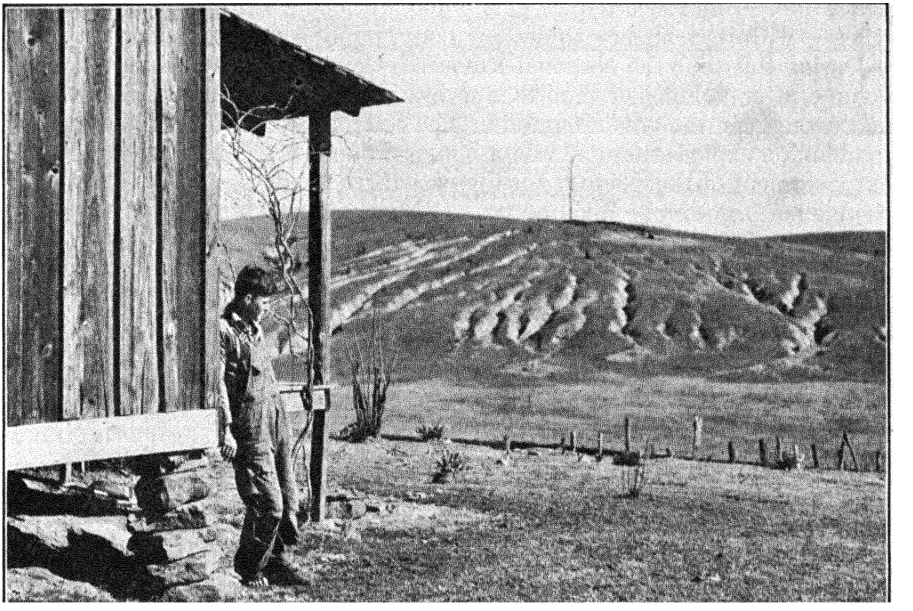

FIG. A. This young share-cropper was not in Lincoln's audience. (Courtesy Farm Security Adm.)

THE NEW ALTERNATIVES FOR FREE LAND

A rapid increase in farm tenancy accompanies the end of the chance to go get your own farm. Since the nation can no longer offer land, it offers education. The young man is now offered not free land in the West, but a night school or a trade school that he may become an artisan or a clerk; an engineering school that he may become a manufacturer or a builder; a school of commerce that he may engage in trade; a school of business administration that he may increase his business efficiency — provided he can

findings of a special committee recommending methods of dealing with California's migratory relief problem.

"He emphasized that the problem was not peculiar to California but was national in scope. No existing Federal agencies, the report asserted, could deal effectively with the problem and special legislation would be necessary to create a nation-wide program to deal with the situation.

"Suggested legislation:

"1. — The resettlements of migrants who are now in California and other States in areas where they could become self-supporting.

"2. — The return of migrants who are willing to go back to their States of origin and assisting them with public funds to re-establish themselves in their former environments.

"3. — The resettlement of other migrants in areas where suitable employment for them is most likely to be found.

"For broad national action, the President said at his conference, legislation would be required and that was something for Congress to decide." — "President Asks Aid for Migrants," *New York Times*, Mar. 29, 1939.

Fair words, but still the homeless wander.

find a job. But too often he gets a job without a future, or he gets cash relief — with its tendency to destroy body, mind, soul, and nation.

During this time the National Resources Committee in Washington issued volume after volume of reports, surveys which showed the wreckage man had wrought in the great Republic. The committee tried to persuade people to abandon exploitation and adopt conservation. Exploitation characterizes our treatment of this country for the past three hundred years. Can we now change and conserve? We'd better. Otherwise our future as a Great Power must be short.

FREE WOOD AND FREE MINERALS

Wood and minerals, which should be reckoned as a part of land abundance, awaited the settler and influenced profoundly the development of the country.

From Nova Scotia and Maine to Minnesota an endless forest offered its wealth for fuel, timber, and mast and fence materials. From Ontario to Florida, from New York to Illinois, from Cape Hatteras to western Missouri, there was wood and more wood — the stuff for floor, wall, roof, barn, fence, and hearth fire. All were to be had for the taking.

The United States alone had (and has) a wealth and variety of minerals not matched by those of any two countries combined — coal, iron, and oil; copper, lead, and zinc; phosphate; gold and silver; and also good and abundant water power. For all practical purposes wood and minerals have been given away almost as fully as farm land.

The free farm gave the individual a chance. The forest, the minerals, and the power sites gave opportunity to the corporation — mining company, oil company, lumber company, power company. Corporate opportunity and individual opportunity! Is it any wonder that industry throve, cities grew, and state was added unto state, province unto province, millions of men unto millions of men?

FREE LAND ALSO BUILDS THE CITY

Perhaps one helpful aspect of this free land has not been fully appreciated. We refer to the aid the frontier was to the old communities and to the cities, especially the cities of the eastern United States, eastern Canada, and Europe. The widespread unemployment that followed the panics of 1873 and 1893 and their consequent depressions caused tens of thousands to go West and take up land by homesteading. The graphs record percentages of increase in population and show that free land eased the problem of the young man in the older communities (page 25). The graphs show that generation after generation of young men went West.[15] The homesteader needed things that

[15] It has been pointed out (see Charles A. and Mary R. Beard, *America in Midpassage*, Macmillan, 1939, Vol. II, p. 552, and references given there) that the actual number of *industrial workers* who went to farms was small. This fact, however, is not of great significance. In that day farm families had three or four sons, and the surplus of them chose between going to a town or to the Western land. For the actual record of migration from state to state, see the maps in Carter Goodrich, *Migration and Economic Opportunity*, University of Pennsylvania Press, 1936.

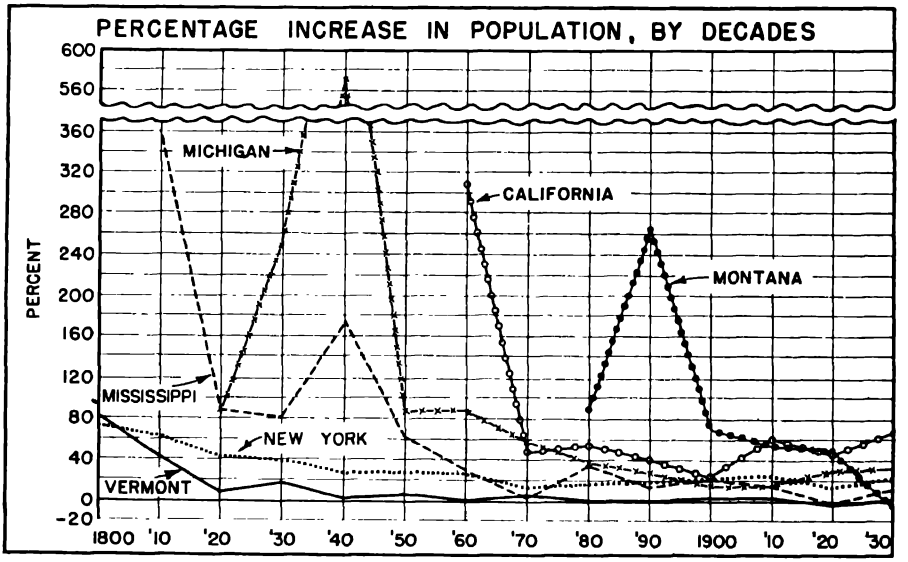

FIG. A. This graph shows that waves of population swung across the continent and down the decades. The population of Michigan increased nearly 600 per cent 1830-40, Montana 260 per cent 1880-90, and California did 60 per cent or better for two late census periods. The figures for Vermont and Mississippi suggest the other end of the story.

It should be remembered that the 60% increases in California in late censuses were on a base of large numbers. (U.S. Census)

were procurable in the place he had left but not in the place to which he went. He needed materials for a house. Lumber, brick, glass, nails, hardware, a stove, furniture, were needed. He must have a barn, at least two horses, a cow or two, some pigs, chickens, harness, plow, wagon, tools, perhaps a herd of cattle or sheep.

Periods of settlement after 1840 were accompanied by the building of railroads. Thousands of men worked to grade the right of way and to lay the track. They erected grain elevators and built stations. The new communities needed stores, blacksmith shops, banks, schools, churches.

The expansion of the frontier resulted in many a homesteader's placing orders for goods in the established centers — products that ranged from locomotives to needles, from mules to cottage organs. Not only did the young men who migrated take themselves out of the labor market of the East, and start the wheels of industry by the purchases of equipment goods, but they also started the wheels of finance. Most of the farms were mortgaged through investment agencies in the East. Railroads were built on bonds and stock subscriptions. There followed township bonds, school bonds, county bonds, municipal bonds, state bonds, provincial bonds — developments in which financial centers and stock exchanges rejoice.

Indeed an important function of a frontier lies in its being a place to which old established settlements can ship goods, most of which are paid for in bonds and mortgages. Whether or not the bonds and mortgages are ever

paid is another matter to be revealed later. The boom is a boom as long as the bonds are *thought* to be good.

During the period 1830–1921[16] two movements were going on together — swift frontier settlement and swift building of cities. Both were due to the mechanization of the Western world. The machines, made in Eastern towns, helped to develop the farm and the frontier; they also helped the farm to supply and build the town. Thus new cities, new farms, and new rural communities grew up together. At the same time the farms furnished surpluses to export to Europe, thereby helping build up European towns, which, in turn, were equipping Africa, Australia, and South America.

For three hundred years the Western world has been expanding, building new communities like the old ones. The economic system of the Western world was an effective frontier (expanding) technique. A vital question is, Can the system continue to live without frontiers? The indications are that it probably cannot.

THE FALSE FRONTIERS

One who has traveled in the Western part of the United States must have been impressed by the small, one-story stores whose big false fronts made them appear two stories high. After three centuries of genuine frontiers we entered the period of the frontiers of the false front. At the exact time when we had come almost to the end of free land and had normally reached the end of an epoch, we entered a period of industrial counterfeits that deceived us for a time.

First came the World War. Industry roared with activity. But instead of building houses for the young wife and child on a new farm in a frontier town, we built cantonments and made munitions to be shipped overseas. Instead of digging railway cuts in Alberta and through the Rocky Mountains, we dug trenches and graves in France. Although this was the frontier of destruction, the first *financial* and *industrial* results were similar to those of the genuine frontier — feverish industry and bonds to pay for it.

After the World War, Europe owed us billions in war debts. We had sent goods to Europeans during the war. Now Europe's turn had come to send goods to us. The debt could only be paid in goods; there was not enough gold in the world to pay it. But a serious difficulty existed; our factories were standardized and speeded up for wartime production. In addition, millions of returned soldiers needed work. Therefore the idea of European imports struck terror to American producers, and Congress took the ground that we did not want goods from anywhere, not even from creditors who owed us money. So we put up tariffs to keep out European goods. Such are the workings of scarcity economics, in which abundance is the major terror.

Soon after this came another marvel of madhouse (scarcity) economy. We would not let Europeans pay old debts, but we helped them to go more deeply in debt to us. To keep our factories busy, we kindly consented to continue selling on credit to peoples who already owed us billions and whose pay in goods (the only thing they had) we had refused to take.

[16] 1921 saw the end of the Montana land rush.

The period of the 1920's was the world's greatest credit orgy to date. The United States exported billions of dollars' worth of goods, and took in return pieces of paper which said that they were the bonds of foreign countries, of foreign corporations, of foreign cities (the names of which you have perhaps never heard). Existing factories boomed; new factories were built; skyscrapers and the stock market soared. Another false frontier had appeared.

In 1928 there began to creep through the financial world a suspicion that perhaps we had enough foreign bonds. Later experience proved that we had enough and to spare. The collapse showed that North America had been having a financial joy ride upon the basis of the frontier of wonderland, the frontier of pieces of paper. *Alice in Wonderland* is a serious and rational book on economics when its reasoning is compared to the financial policy of postwar United States in the period that has been called the "golden twenties." Really it wasn't even brass — only gilt (or guilt) and print. We Americans were unable to break off too suddenly from frontier finance, upon which we had subsisted for three centuries.

After we stopped lending in Europe — that is to say, exporting goods and receiving paper in return — we moved on quickly to another frontier, this time to the future — *installment buying*. Armies of salesmen canvassed the United States, persuading people to buy this refrigerator, that automobile, set of furniture, fur coat, etc. Buy in *this year* (1928) and pay out of the income of *next year* (1929).

Promissory notes of installment buyers were good stuff for financiers for a while. When 1929 came, the income of that year was insufficient to pay for the things purchased on installment in 1928 and also for the produce needed for the current year. We had been through the frontier of destruction (war), of wonderland (foreign bonds), and of the future (installment buying). What next? The stock-market crash of 1929.

Then came millions of our people on relief.

The next reviving wave of financial paper was not from Dakota or Alberta, England or Germany, Colombia or Peru, nor yet a mortgage on the new refrigerator. It was the promise of the United States Government — public debt. In the past, *bankruptcies have always been a part of recovery* from a panic — wiping out many of the securities with which we boomed. Next?

FREE LAND, HIGH WAGES, AND MACHINERY

The free land (abundant resources) of the frontier has marked American life in many ways, especially in making high wages.[17] For generations we have lived in the continuous presence of alternative opportunities. As recently as 1914 the newly arrived immigrant who swept the streets in New York still had the choice of going on to western Canada, there to receive, as a free homestead, 160 acres of rich level prairie. The Canadian Government

[17] The list of things to which high wages have been attributed would be amusing if it were not tragic — democracy, various political parties, free competition (as though we ever had it in the realm of manufactures), the protective tariff, the Anglo-Saxon race, etc., etc. Thus have we kidded our ego and overlooked the munificence of the Creator.

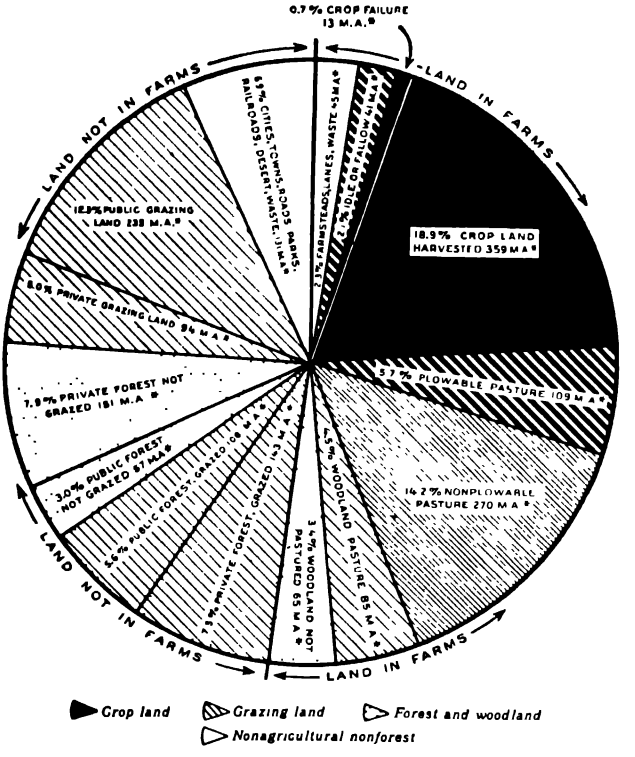

FIG. 28 A. This graph may show you that the United States is not quite so good as you may have thought. (Courtesy U.S. Dept Agr.)

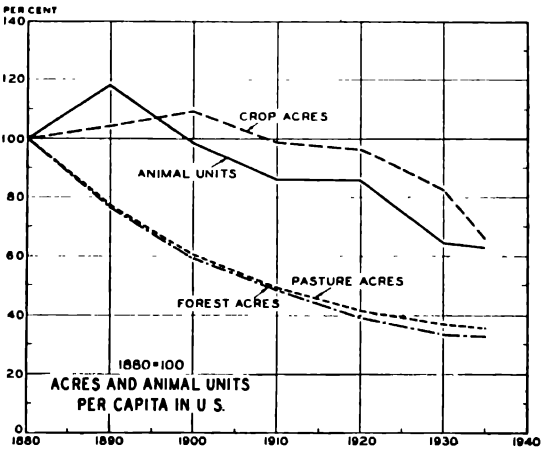

FIG. 28 B. If you seek causes for the rise of our feeble conservation movement, study this. An animal unit is 1 horse, or 1 cattle or 5 swine, or 7 sheep or 100 fowls. (Courtesy U.S. Dept Agr.)

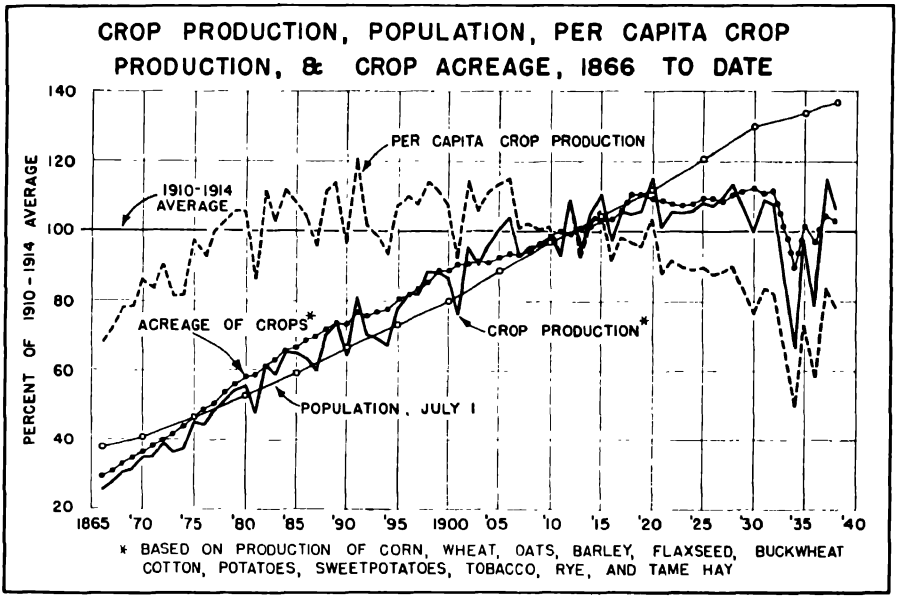

FIG. 29 A. The crossing of the curves. The trend of the curves is no longer upward like a rocket. This is a graph of profound significance. Note that production is not keeping up with population. This shows how lunatic is our unemployment. (Courtesy U.S. Dept Agr.)

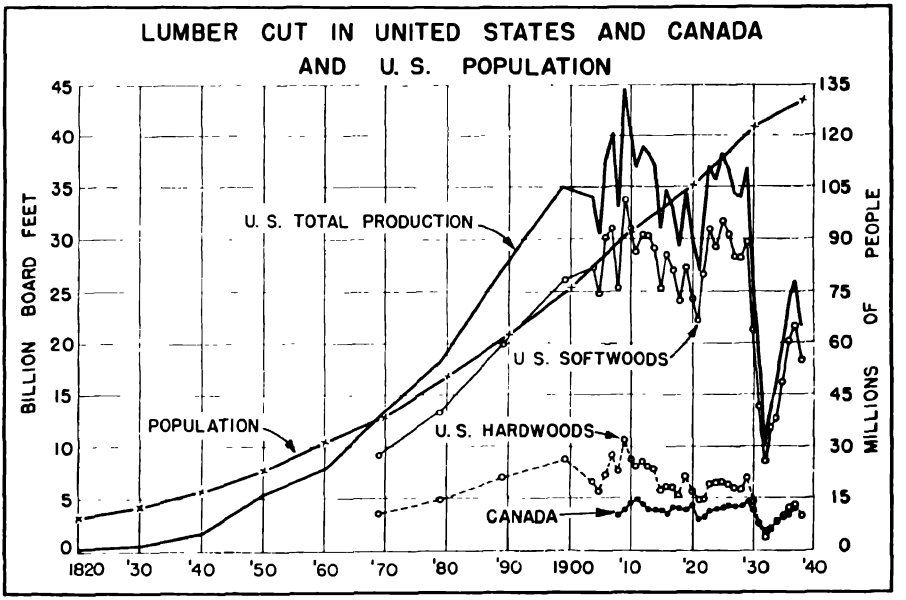

FIG. 29 B. Lumber also shows that the trends of the curve have changed. We reached the peak in 1929. Some day we will grow forests or go without as some Asiatics do. (Courtesy U.S. Dept Agr.)

begged him to come and take it. Wages in New York had to be high enough to tempt the immigrant to stay in the East. Free land kept wages up then as it had done for three hundred years. The collapse of American wages after the crash of 1929 (see hearings before code-making groups of NIRA, Washington, 1933), and the complete disappearance of wages for unemployed millions, are a not unnatural accompaniment of the ending of free frontiers – the finish of the *alternative opportunity*.

Where land is abundant, it is cheap and a little work is very productive. Where land is scarce, it is dearer and man must dig more to get the same amount of produce. This is by far the greatest factor that differentiates America from Europe or Asia as the home of man. It explains why the unskilled laborer in America before the World War received from $1.50 to $2 a day, while in Europe he received from 30 cents to $1, and in Japan and China from 10 to 25 cents. Despite a multitude of Fourth of July orations, these wage differences do not correspond to differences in the industrial competence of the individual or the race, nor do they result from being Anglo-Saxon or Nordic or Protestant or democratic or from a particular tariff policy. Differences in wages measure chiefly the different ratios of men to resources.

Abundance of land has had other results. Because wages were high we have developed machinery as no other nation has done. A man can afford to pay much more for machinery if the machine can replace labor at $1.50 or $3 or $5 a day, as in the United States, than he can afford to pay in Portugal, where it would replace labor at 40 cents to 80 cents a day.

Often, however, it was not a question of replacing labor. Many times, in many places, labor was nonexistent. It was then necessary either to make a machine that would do the work or to do without the produce.

One group of inventors was making machines for factory work – looms, woodworking machinery, metalworking machinery. Another band of creators of wealth was devising farm machinery. The cheap level land of the Midwest, so good for the operation of machinery, was a great impetus and aid to this. Some of the results of machinery on the farm are shown by the fact that in 1840 the cradle would cut, and the flail or the trampling of animals would thresh, a bushel of wheat for 18 cents, whereas some modern machinery does the same work for $3\frac{1}{2}$ cents. The scythe and the rake would make hay for $3 a ton, whereas the modern mowing machine and hay rake and hay tedder and loader will help man to do it for half that cost and give the worker a higher wage. But cash costs do not really cover the matter. The real point is that one man can produce so much more.

LAND, SLAVERY, AND IMMIGRATION

Other results of the abundance of land in the United States are found in slavery and immigration. The enterprising European colonist in America in 1630 stood upon the edge of a great continent with forests waiting to be felled and land waiting to be tilled. Perhaps he dreamed of industrial expansion to produce more for himself and for the markets of Europe. Being enterprising and intelligent, he pined for a labor force that he might use it.

But the laborers were few. His neighbors were busy with their own affairs, and were, like himself, pining for helpers. No hired man was to be had.

This vacuum was partly filled by indentured labor, a kind of temporary slavery conspicuous in colonial history. Penniless men in England who wished to come to America sometimes made a contract with ship companies — in exchange for free transportation they agreed to let the captain sell their services for a period of years to the highest bidder. The laws for the protection of indentured servants and for the protection of those who purchased their time were rather complicated and thorough in colonial days. But this supply of labor was inadequate, and so the slave ship came from Africa. Slave labor was a natural consequence of abundant resources and a scanty, energetic population. The emancipation of the slave did not lessen the need for labor or diminish the number of aliens; it merely shifted the source of supply and added variety. Before 1914 immigration at the rate of 1,000,000 a year in normal times was a result of the attraction of the cheap lands of America. The young man left Holland because there he would have to pay $700 for an acre of newly reclaimed sea bottom. He came to the United States, where land, not so good as that of Holland, but good land nevertheless, could be bought for from $40 to $100 per acre. Or he left Italy, where land rented at $25 an acre per year, and came to New England, where he could, and still can, buy fairly good land outright, sometimes with buildings on it, for $25 an acre. It is logical that this immigration to the United States should have produced its most acute results on the coasts of the Pacific Ocean, since it was a question of Oriental peoples and standards of living. China and Japan on one side and North America on the other side present startling contrasts in resources, and their peoples naturally asked: Why not move across? Why not go to North America to find room and opportunity? The prospect of almost limitless Oriental immigration caused us to exclude the Chinese and Japanese.

As the middle of this century approaches, no greater contrast exists anywhere on this earth than the contrast between the crowded fields of China and Japan and the wide and still almost empty plains of the American Pacific slope, where large and all but untilled ranches still call for settlers — but we will not let the Orientals come, and Americans will not buy them. America, land of opportunity, is looked upon by the yearning eyes of hundreds of millions of hungry Asiatics across the Pacific. So the future of America, like its past, will doubtless be influenced by the abundance of land.

Immigration problems are types, not isolated episodes. They result from land hunger, which arises where a relatively empty land faces a crowded land. Land hunger is inevitable, like gravitation, sex, and hunger for food. Its problems have rocked the past. They will rock the future.

Australia had a hot political fight about this matter. Should the few white people who owned big plantations in its tropical section be allowed to import colored coolie laborers, or should the land remain idle? Should Australia have big crops *now* and a black or mixed Australia *later*, or should it produce what could be produced now without black labor and have a white Australia later? The latter idea won — for the present. But empty Australia and

crowded, hungry Asia face each other across a narrowing sea, and Asia has a hundred times as many people as Australia.

A lower cost of living has been one of the many results of the abundance of land in America. This has probably made it possible for the masses of people in many parts of the country to be fed, clothed, and sheltered better and more easily than ever before. However, the actual incomes and living-conditions of millions of share-croppers, farm laborers, and unskilled laborers in towns and cities make much of our talk of high standards of living appear mere cant. This fact is largely due to an economic system which is unable to put its people to work, no matter how rich the continent may be. Reduced to the lowest terms it is this: I own some land. I am one of a small fraction of the people who own all the available land in the United States. The landless man cannot get land on which to work for himself. He cannot work for himself on my land or yours, nor can he (the unemployed) work for us on our own land.

The frontier has ended.

LAND'S END AND A NEW PSYCHOLOGY

We have come to the end of an epoch, an epoch from which we have inherited many problems — curses, we might almost call them. These curses are mental concepts — axioms, ideas of right and wrong, proprieties, "inherent" rights of the individual. As we struggle to begin a new era we are hampered, nay almost blocked, by the old psychology.[18] Before we can successfully rearrange the material basis of modern life we must clear our minds and spirits of some of the frontier psychology and the frontier emotions. This is necessary before we can conceive the patterns to be worked out in the new epoch.

[18] In Chapter V of *The Future of the Great Plains*, House Doc. No. 144, 75th Cong., 1st sess., this psychology is presented at length. Here are some of its subdivisions.

1. *Man conquers nature.*
2. *Old proved ways are best.*
3. *Our natural resources are inexhaustible.*
4. *Expanding markets will continue indefinitely.*
5. *Values will increase indefinitely.*
6. *A man may do as he pleases with his own property.*
7. *What is good for the individual economically is good for everybody.*
8. *Tenancy is a steppingstone to farm ownership.*
9. *The individual must make his own adjustments.*
10. *Free competition will adjust relations of individuals and groups of individuals.*

Many have held the assumption that when demand declines, prices go down until demand and supply balance satisfactorily for individuals and society. So much for a theory. The facts in a suggestive, nay almost typical, case are as follows: In 1933, after four years of depression, output of many kinds of machinery used by farmers was so definitely controlled that the price had declined but 6 %, although production had declined 80 %. In contrast to this, farm produce, really competitive, had declined but 6 % in quantity and 63 % in price. In the first case the price was controlled; in the second it was uncontrolled.

This suggests the basic problem of this age. We can produce, but we do not yet know how to distribute the produce among the people who have produced it. This problem focuses in three questions: 1. Who controls natural resources? 2. Who controls the opportunity to work? 3. Who controls the distribution of the produce? Concerning these things, attitudes and points of view must change and concepts of right and property must be altered. Pending these changes, we languish.

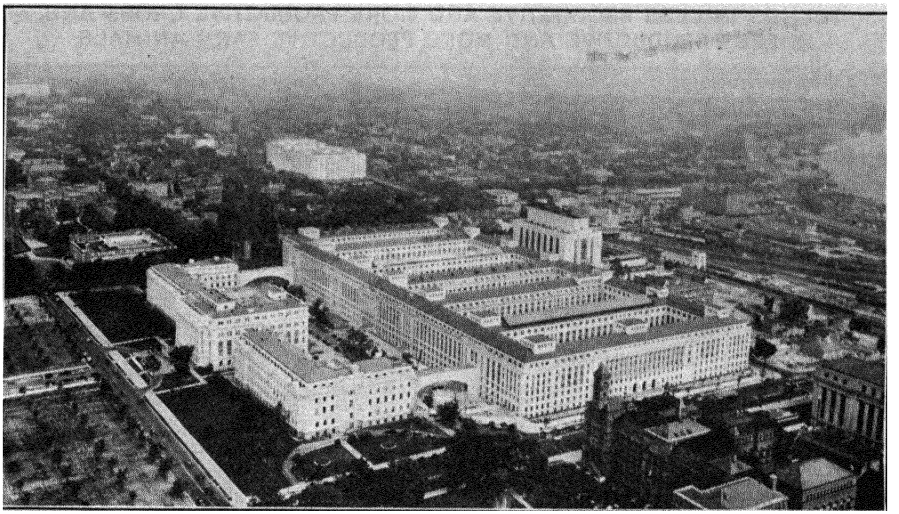

FIG. A. The new frontier of 1933 — government buildings; the new settlement of this frontier — government jobs. The frontier before this one was in the West, but this newest one was everywhere, in every county of our broad land.

This particular unit before us is the new building of the Department of Agriculture at Washington. It was opened to settlement not by everyone, as the farms had been, but chiefly by the friends of the then reigning political bosses, big and little. Its miles-long rows of cozy sustenance spaces had each a desk, a swivel chair, and a crop that ripened with great regularity and dependability — the fortnightly pay check. (Number of U.S.D.A. employees in this building, 8000; number in Washington, 12,000; total number in the United States, Nov. 30, 1939, 96,000.)

It was borrowed money and some say it will never be repaid, but like the rains of heaven it fell equally upon those who dwelt in the wings where they told us how to produce more and upon those who dwelt in the wings where they paid us for producing less, and upon those others who paid us to plow under and destroy the crops already grown — in this era of bewilderment in the wonderland more wonderful than that of Alice. And this is no impeachment of Henry Wallace, Secretary of Agriculture, or of any individual. It does refer to a system that we happened to have and to which we cling. (Courtesy U.S. Dept Agr.)

The ending of free land finds us a people bewildered, with a certain resemblance to that literary character who had ten thousand men and "marched his soldiers up the hill and marched them down again."

For example, we have a nation-wide organization for research and education which aims *to encourage and improve agricultural production.* At the same time we have another branch of that great army under the Secretary of Agriculture *paying people real money not to produce.*

This paying for scarcity is a type of a widespread effort to produce scarcity rather than abundance.[19] It is probably the root trouble with an economic system that maintains hunger in the midst of plenty and, by way of glutted markets, penalizes the producers of abundance.

[19] Tariffs, trusts, price agreements, restriction of output, labor-union rules, and the recent outbreak of state laws restricting trade are a part of the equipment for this great objective. The NRA codes of 1933–34 are a convincing exhibit. Still more convincing were the almost nation-wide requests for restriction of output when it came to making these codes.

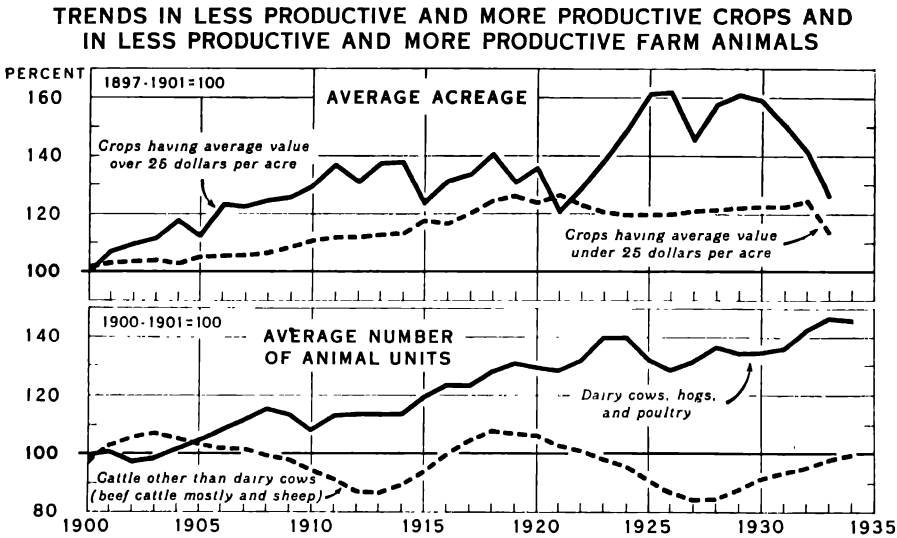

FIG. A. These graphs show why we can develop surpluses without increase of farms. (Courtesy U.S. Dept Agr.)

As we move from the past into the future, let us hope that the end of the land frontier will not cause us to lose the frontiersman's genius for solving problems.[20] The frontiersman's life was a continuous application of self-reliance and inventiveness. This has helped to give us our marvelous output of mechanical devices. No nation approaches ours in the number of inventions per man, although several nations are more highly educated. There is room for, and great need of, the application of the frontiersman's ingenuity to social change. Invention must be applied to the solution of *individual problems*, not only *by the individual* but *by groups* working in some kind of unity. America needs to school itself in group activity. Individualism does not fit us for group activity, but the American aptitude for invention should be a tremendous asset in this field.

As an example of group activity, thousands of men combine their efforts in a multitude of joint-stock corporations to produce a steel rail. But the groups working in consumers' co-operatives in Scotland, Sweden, and Finland have a different kind of organization. Theirs is pioneer work. Another kind of group organization is found in the hundreds who work together to get out a weather report, in other hundreds who deliver a letter. The Russian experiment at State Socialism is, of course, the most stupendous of all experiments.

[20] "To the frontier the American intellect owes its striking characteristics. That coarseness and strength, combined with acuteness and inquisitiveness; that practical, inventive turn of mind, quick to find expedients; that masterful grasp of material things, lacking in the artistic, but powerful to affect great ends; that restless, nervous energy; that dominant individualism, working for good and for evil, and withal that buoyancy and exuberance which comes with freedom — these are traits of the frontier, or traits called out elsewhere because of the existence of the frontier." — Frederick J. Turner, *The Frontier in American History*, Henry Holt and Company, 1921.

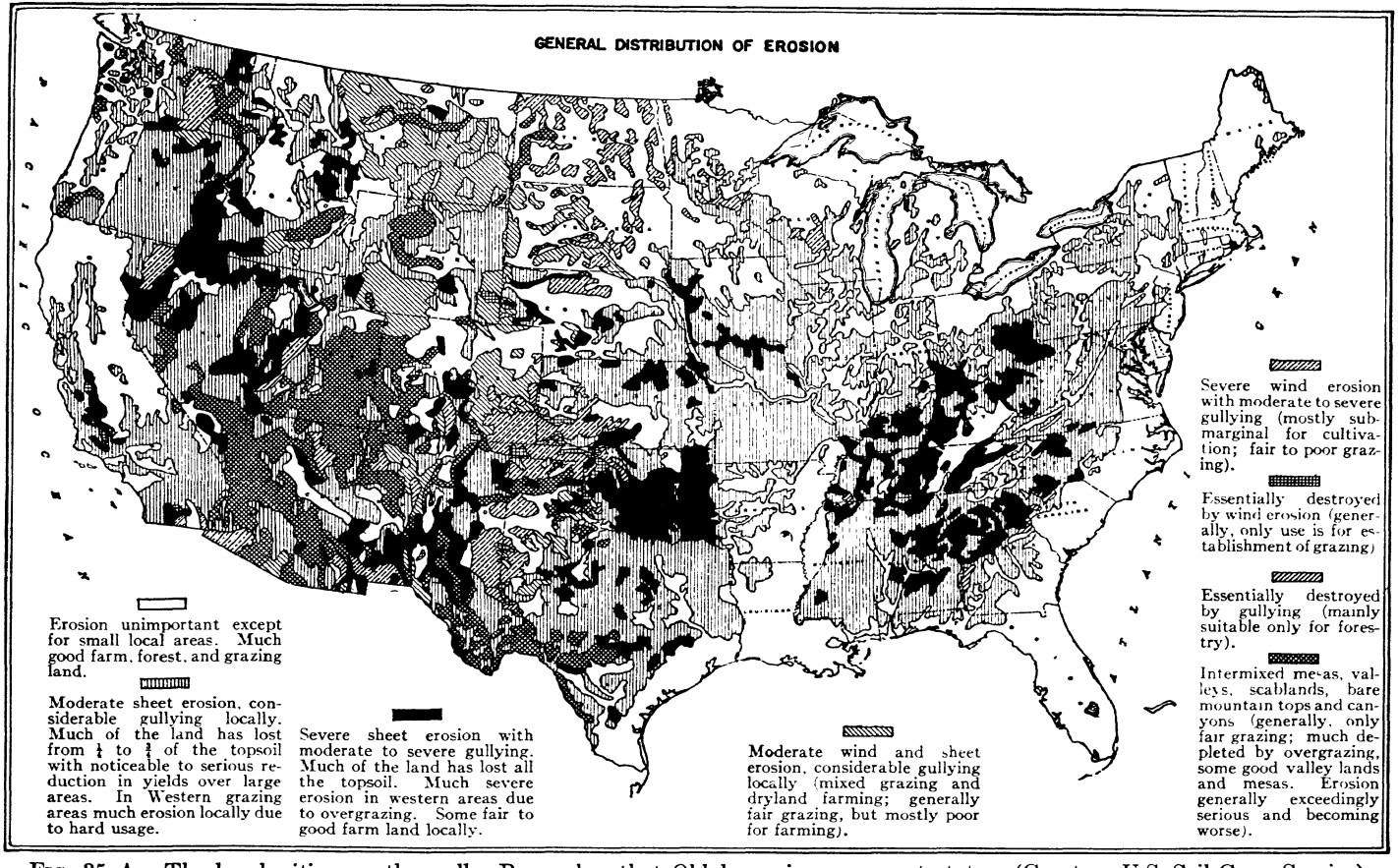

FIG. 35 A. The handwriting on the wall. Remember that Oklahoma is our newest state. (Courtesy U.S. Soil Cons. Service)

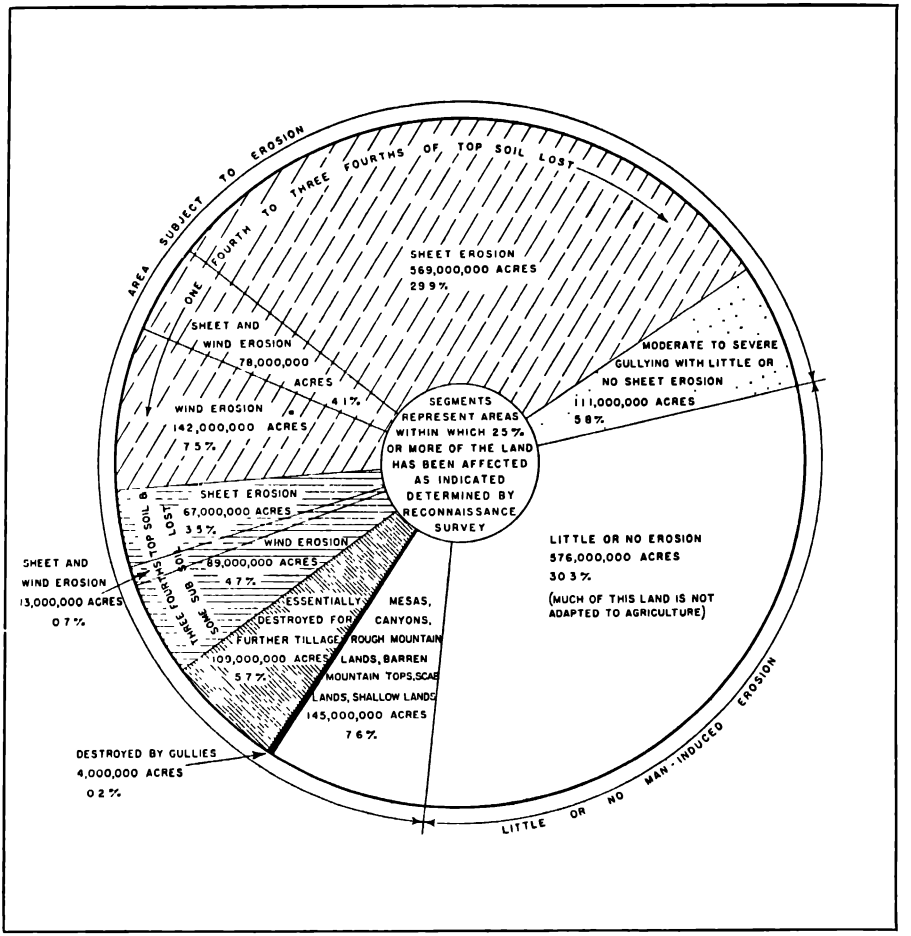

FIG. A. Extent of erosion in the United States. To see what this graph means, get the U.S. Department of Agriculture book of agricultural statistics and find total crop acreages in Japan or some European countries. (Courtesy U.S. Dept Agr.)

To see the difference between the old frontiersman and the new, consider Boulder Dam (page 597) or the Central California Water Authority work (pages 703-04) or the studies that are necessary before a farmer is safe to try his luck on the Great Plains.[21]

The studies and reports of the National Resources Committee all suggest plans for the efficient use of the resources of the country. Many of these plans require many persons to execute them. Today nearly every state has a state planning commission. Groups of states have group plans. For

[21] See *The Future of the Great Plains*, House Doc. No. 144, 75th Cong., 1st sess. The idea of Clarence K. Streit of Missouri and Montana and Geneva in his book *Union Now* (Harper & Brothers, 1939) is an interesting and suggestive example of invention in relation to group action on an international scale.

example, the New England Council is considered the capstone of New England planning, but it was reported that in 1939 there were 206 different planning organizations in the six small New England states. Mr. Victor Cutter, head of the New England Council, says (in a private letter) that about 50,000 New Englanders are now really cognizant of the concept of planning.

WHAT HAVE WE?

As we still struggle with the problems left over from the physical-frontier period that is behind us and with the new problems of the economic and social frontiers that are before us, we need a careful appraisal of our available material resources.

What have we? We have only natural resources. We have nothing else. Indeed, we have fewer material resources each day than we had the day before. We have no prospect of getting anything except that which comes out of the soil and earth of our country and the work of our people, or is secured by trading what we produce for things produced by other peoples.

As we stand bewildered at the end of the era of free land and frontiers, and begin again — a new era in which we must strive to conserve and operate — it is extremely important that we examine our country and its resources in great detail. Hence this book.

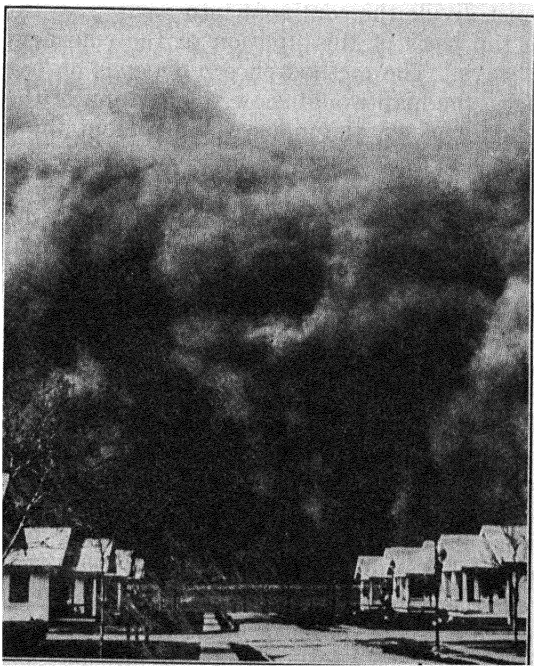

FIG. A. The frontier vomits, spewing earth and men over adjacent regions. Complete reversal! Welcome has changed to ejection. A dust storm on our newest frontier. (Courtesy Soil Cons. Service)

Chapter 2. THE COASTS OF NEWFOUNDLAND AND LABRADOR

THE HUMAN-USE REGION



IN attempting to describe North America as the home of man we straightway strike a problem. How shall we speak of the continent? The various parts of it differ from one another so greatly that there is almost nothing that can be said about the continent *as a whole*. Therefore it must be divided into parts. What parts? Countries? Look at the diversity of Mexico or the United States! Even our states are almost as bad. What can be said about the *whole* of California, of New York, or even of little Maryland with less than one six-hundredth of the area of North America? We must divide the continent into parts.

What shall be the basis of this division of the continent? It might be divided in many ways. The method chosen depends on our object.[1] If we were studying races, the map would show the location of the different races. If we were studying geology, the maps would present the areas of the different geological ages or formations. But this book presents and describes the continent as a land for human use. Therefore we shall divide the continent into economic, or human-use, regions. Each region possesses a distinctive unity of natural conditions, and an accompanying unity of industries. Sometimes there are important differences in economic activity within a region, but we shall see that these differences are not so great as the difference existing between the region as a whole and other regions.

For some regions the boundaries are sharp, as for example a mountain range. For others there is a transition area, such as that where climate sets bounds to the Cotton Belt or the Corn Belt.

The colored map in the back of the book shows the continent divided into economic regions — regions whose boundaries result from the work of the cosmic forces that make climate, surface, soil, mineral deposits, land, lake, and sea. The political units, such as Canada, Maryland, or California, have their present boundaries because of the whims of chance and the accidents of history. As a result they are composed of areas that differ greatly in the kind of use that men can and do make of them. To understand Maryland, Canada, or California as the home of man, it has long been the common practice to redivide the political units into regions each of which contains

[1] See J. Russell Smith, "The Elements of Geography and the Geographic Unit," *School and Society*, June 9, 1923, pp. 617–28.

all of its kind of land within the state or group of states, as for example the Great Valley of California, or the Coastal Plain of Maryland and Delaware. On this basis of common conditions throughout a region the results of man's efforts, occupation, home, and social organization tend to be alike over the whole of it.

A FISHING-COAST

The coasts of Newfoundland and Labrador are a good region with which to begin. Here we have a simple economic unit and one therefore that enables us most easily to see the method (see map of North America, inside back).

For generations the people of the coast of Newfoundland and Labrador have had one idea, one interest, and that was fish. Their lives were devoted to the sea and its produce. The sea is particularly rich in fish, and the land is particularly poor in the possibility of crops. Thus a natural specialization of activity centered the thought of a region upon fish.

An Arctic Current flows down the coasts of Labrador and Newfoundland. It is burdened in winter with pack ice frozen in the open sea. In summer it is burdened with millions of tons of Greenland ice cast into the sea by the great Arctic icecap. This icecap covers hundreds of thousands of square miles, flows slowly to the seacoast, and floats away to the southward — a chilly curse upon the sons of men.[2]

This current hugs the shore of Labrador and eastern Newfoundland and creeps around to the western Newfoundland shore through the Strait of Belle Isle, carrying its Arctic ice and cold into the Gulf of St. Lawrence. In May, 1923, both entrances to the Gulf of St. Lawrence were completely blocked for a time.

Ice water thus becomes the dominant fact of the shore environment — ice half the year and ice water all of the year. The chill wind arising from ice makes the coast treeless. Since these coasts are high, rough, and rocky, they have a peculiarly forbidding appearance. At the extreme south, on the little French island of St. Pierre, 19 miles from the coast of Newfoundland, one walks about in forests of evergreens that sprawl upon the ground less than knee-high. Thus they resemble tree growth at its extreme limit on high mountains. Sprinkled among the miniature and misshapen forests are laurels and goldenrod only 2 to 3 inches high, but full of blossom.

The coasts, particularly the coasts of Newfoundland, are often wrapped in fog, because the warm waters of the Gulf Stream mingle off its shores with the cold Arctic Current, making the ideal condition for fog — warm, moist air suddenly cooled. The fog, however, does not go far inland, at least in

[2] In April, 1912, the White Star liner *Titanic* struck an iceberg and sank, with a loss of 1517 lives. Since then steamship lanes on the North Atlantic route have been shifted 2° 30′ farther south during the warmer months, and since 1913 the United States Government has maintained an intermittent ice-patrol service. Two Coast Guard cutters are assigned to search the area south of 43° and to warn passing ships of the location of dangerous ice. Icebergs drift southward from the middle of March until the middle of July and are especially dangerous to shipping south of the Tail of the Grand Banks. Only one-ninth of an iceberg appears above the surface of the water; the patrol measured one berg which rose 248 feet above the water and extended 1690 feet in length, probably enough ice to fill every refrigerator in the United States for a year.

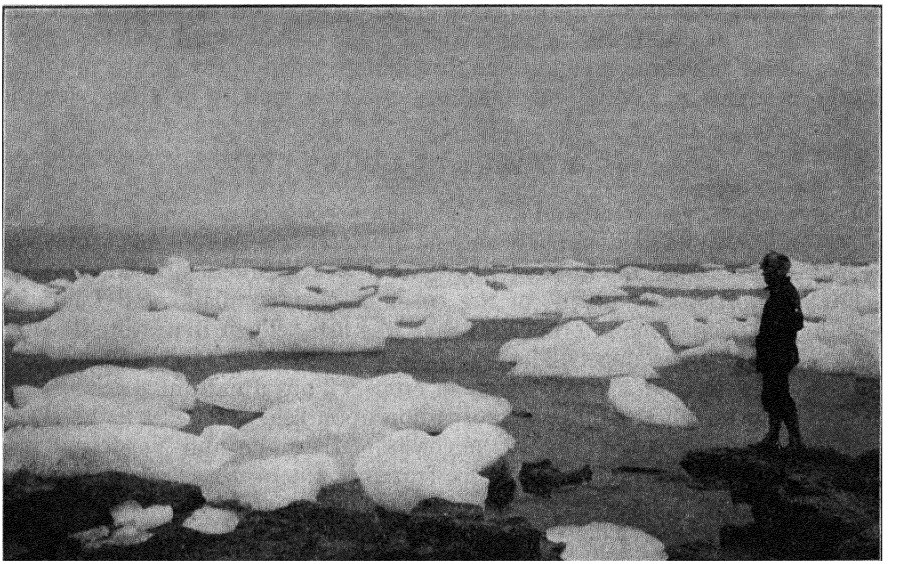

FIG. A. North shore of Newfoundland and the Strait of Belle Isle, June 30, 1933. Why don't they farm? (Photo by Fred C. Sears, who stands upon the rock.)

weather that would be otherwise clear, because the sun, shining on the land, warms it and melts the fog. Therefore a few miles from the shores of both Newfoundland and Labrador bright sunshine often smiles on the land while the shore and the sea are gray with fog.

Away from the chill waters, a few miles inland, the tree growth begins, and the interior of both Newfoundland and Labrador is forested but mainly unsettled. The region we are now studying is the narrow strip of treeless coast whose people look to the sea for their chief means of livelihood. The sea is particularly rich in this region, because edible fish are more abundant in cold waters than in warm, and can be caught more easily in shallow waters than in deep. The icebergs and floes keep the water cold, and wide shallows lie off the shores. The Grand Banks, lying about 100 miles southeast of Newfoundland, are one of the finest fishing-grounds in the world. They have an area about the size of Pennsylvania, with waters so shallow that fish can be taken from the bottom of the sea with lines and baited hooks. There are also fishing-banks in the Gulf of St. Lawrence. The fact that the coast of Newfoundland, like that of Labrador, has recently sunk several thousand feet means that it is a deeply indented fiord coast like that of Norway, which has had a similar history. The deep indentations make a multitude of good harbors for the shelter of fishing vessels. Naturally, therefore, fish mark the industry of these coasts and have dominated their history. A number of interesting treaties have been made concerning the fishing-rights along Newfoundland shores. France and the United States are as deeply interested there as are Great Britain and Canada.



FIG. A. This map of natural forest areas should be examined many times by one who reads this book. (Courtesy Baum's *Atlas of U.S.A. Electric Power Industry*)

EARLY DEPENDENCE ON FISH

Newfoundland was discovered by Cabot in 1497, and within a decade was regularly visited by the fishermen of Brittany (France) and Cornwall (England). Indeed Sir Wilfred Grenfell presents plentiful evidence of fishing there by Europeans *before* Columbus crossed the ocean blue in fourteen hundred ninety-two. In 1578, 400 ships frequented Newfoundland. In 1583, Sir Humphrey Gilbert, the explorer, stopped at St. Johns to fit out

his ships. He reported the place to be "very populous and much frequented." In 1600, 30,000 men [3] were there, a quarter of them British; the rest included French, Dutch, Portuguese, and other Europeans. These early fishermen described the island as unfit for human habitation. There were two reasons — the facts and their desires. They wanted to be undisturbed in their use of the harbors, coves, and fishing-grounds. Strange to say, this wealth of fish and fishing did two contradictory things. It caused this to be the first part of the North American continent put to use, and at the same time helped to delay and discourage permanent settlement.

For centuries Newfoundland was claimed in part by both England and France, yet both, through most of this period, discouraged its settlement. This was due to the desire to encourage their national development at home in two ways: first, to give employment to the French and British fishermen; second, to encourage their navies and mercantile marines. The repeated sailings across the rough Atlantic were rigid training for seamen.

An English settlement was finally made in 1623, but in 1650 there were only 350 families in 15 small settlements. It was not until a century later that the British encouraged settlement of the country. Today there are over 290,000 people in Newfoundland, which is a British Crown colony.[4]

At the present time France, like every other nation, possesses free fishing-rights on the Grand Banks, which are part of the open sea, but to aid its nationals, France, while relinquishing Canada, has managed in its treaties with Great Britain to retain not sovereignty, but a fishing-right, on much of the coast of Newfoundland. Here French fishermen (and also those from the United States, by a treaty of 1818) can land, camp for months, build sheds to dry fish and prepare them for the market; but they cannot make permanent settlements or fortifications. This is a fine distinction between economic and political empire. France also saved a fishing-port out of the wreckage of its North American empire — the two little islands of Miquelon and St. Pierre, off the south coast of Newfoundland. The wooden shoes, the good Norman French, the dogcarts, the shop windows and the goods displayed therein, all speak of France, the France of the past. The town of St. Pierre is a sad wreck, with only 1000 people where it once had 3000, all because the Newfoundlanders passed a law forbidding the catching of bait along the Newfoundland coast.[5] St. Pierre is a study in gray — gray rocks, gray houses, gray fog, lit up by windows full of bright flowers.

[3] Arthur S. White, "Newfoundland: A Study in Regional Geography," *Scottish Geographical Magazine*, March, 1914, pp. 113–28.

[4] After 1855 the people of Newfoundland enjoyed a degree of self-government about equal to that of the British Dominions. In 1933, however, the fiscal condition of the colony had become so poor that the mother country was forced to assume financial responsibility for the island, and the legislature and executive council were suspended until Newfoundland should again be self-supporting. Since 1933 the legislative and executive powers have been vested in the governor and a special commission of six members. The governor-in-commission is responsible to the Secretary of State for Dominion Affairs in London. "He who pays the piper ——!"

[5] Another local industry suffered from the whims of legislators abroad. During the era of American Prohibition rumrunners did a thriving business transporting French bootleg liquor from St. Pierre and Miquelon to the United States. With the repeal of the Eighteenth Amendment in 1933 the bootleg traffic ceased.

FISHING, PAST AND PRESENT

Political policy delayed settlement on the lands of Newfoundland, but this interference was less potent than the geographic conditions of the island. Even today it is well described as an empty shell with a fringe of shacks. There is a settlement on almost every fiord, because it is a natural harbor, and there is a system of 843 miles of railroad, mostly government-owned, connecting the capital, St. Johns (40,000 population), with most of the leading ports at the heads of the deeper fiords. There is also steamship service giving regular connection with Canada and the United States. It is, however, essentially true that a half-mile inland Newfoundland is a wilderness, full of mosquitoes and black flies, and still occupied by a few Indians and the caribou. Its area is 42,700 square miles, about equal to that of New York State, but the population of 290,000 (1935) is only one-fortieth that of New York.[6]

In spite of the fact that between 1921 and 1935 the number of Newfoundland fishermen declined from 65,000 to 36,000, fishing remains the principal occupation of the people, as the latest census data (1935) indicate: 36,000 fishermen, 4500 loggers, 4200 farmers, 2100 carpenters, 1400 salesmen, 1100 miners, and 7900 general and unskilled workers.[7]

Export statistics tell the sad story of a declining fishing industry and the shift of exports to the forest and the mine.

EXPORTS FROM NEWFOUNDLAND
(millions of dollars)

	1920–21	1935–36
Dried codfish	13.33	4.94
Salmon	. . .	.55
Canned lobsters	3.05	.29
Herring	.72	.29
Other fish	. . . .	.20
Sealskins	1.48	.26
Cod oil	.47	.46
Seal oil	.25	.13
Paper and pulp	4.89	13.95
Furs	. . . .	.26
Iron ore	.62	2.25
Zinc concentrates	. . .	1.96
Lead concentrates	. .	1.86
Limestone	.	.23

[6] The surface of Newfoundland would be unfortunate for the farmer even if the climate were favorable. The continental glacier that overrode the northern part of the North American continent in the recent (geological) past found Newfoundland a land of parallel mountain ranges from 1000 to 2000 feet high. Before the glacier came they were probably soil-covered and forest-clad. When the glacier was gone, large areas were scraped down to bare rock; others had a thin and rocky layer of soil; the valleys were often dumped full of debris, natural dams of earth and rocks which produce many lakes, swamps, and waterfalls. Even where the land is level the glacial stones make tillage practically impossible over most of the land, although here and there are fine spots in the valleys.

[7] The Newfoundland Information Bureau reports that in 1938 there were 30,000 persons

In the late 1930's thousands of fishermen were on the dole, idling in weather-beaten, odorous "ghost towns" that were once lively fishing villages. Idle along the coast were hundreds of fishing schooners. The cause was "technological unemployment," which had reared its ugly head in Newfoundland, as in so many other places. The machine had displaced the man; the huge, mechanized trawler with steam or Diesel engines had displaced many a little schooner. These great trawlers, which scoop up mechanically thousands of pounds of fish at one time, had so reduced fish prices that fishing by hand methods was no longer profitable.[8] Only trawlers, hauling in their catch in huge nets day after day, could show a profit, with the result that most of the small boats were driven out of business. Verily, Newfoundland is an island with a problem — several of them.

"I suppose you eat a lot of codfish," I remarked to a grand-looking Viking whose codfishing schooner I was visiting in the harbor of St. Anthony, Newfoundland. [In this book "I" may refer to either author. See Footnote 9.]

"Three times a day," he answered.

"Don't you get tired of it?"

"No indeed, it's the only fish you don't get tired of. I'd eat it in the night if you'd wake me up and cook it for me."

THE DANGERS OF CODFISHING AND SEALING

The opening of the codfishing season at St. Pierre is marked by the religious ceremony of blessing a dory. The boat is carried to the altar of the church by a solemn and reverent procession.

These coasts are no place for the timorous man. Catching cod in the old-fashioned way may well-nigh be called heroic work — if danger makes work heroic. Fishermen go to the banks in small schooners, each equipped with several rowboats called dories. In the front end of each dory stands a tub containing a line about 3000 feet long, called a trawl. To the trawl at intervals of 6 feet are fastened lines 2 feet long with baited hooks on the ends. The hooks are baited and the trawl is coiled in the tub while they are still on the schooner. Two men go out from the schooner in a dory containing the tub. They drop overboard one end of the trawl with anchors to hold it down and with floats to show the location of its end. They row away in the dory, paying out the line as they go, and afterward spend the day going back and forth along this trawl, pulling it up and passing it over the boat, to take the cod off the hooks and put on fresh bait. The cod are taken to the schooner, packed in ice, and taken back to the mainland to dry, a process which causes them to lose one-third of their weight and marks the shore with great rows of sheds upon which the fish are spread to dry in the sun. The commercial codfish weigh from a few pounds to an occasional size of 100 lbs. The meat

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employed in fishing and about 6000 in paper and pulp mills. There were 70,000 people on the dole.

[8] Furrow-faced old salts, who used to push out to sea, were vexed to watch lobster selling at ½ cent per lb., when it later was resold for $1 per lb. in tin cans. In 1938 cod and halibut brought only 2 cents to 6 cents per lb. in Newfoundland markets.

is one of the most easily prepared and will keep a long time if properly salted, smoked, or dried. Codfish has been called the "bread of the seas," and finds a ready market, especially among the crowded and needy Catholic populations of southern Europe. The prepared fish is of especial value in the tropics, where it keeps indefinitely, and has for centuries been a great staple of food and commerce.

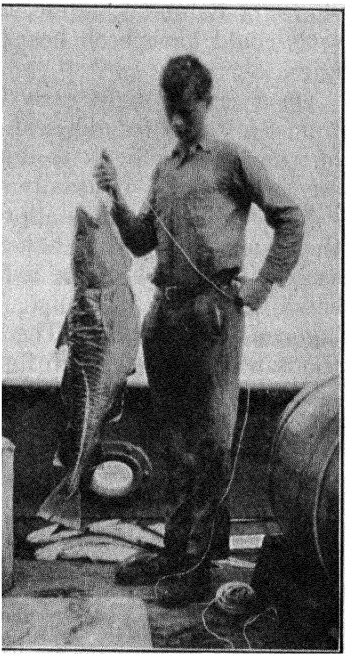

FIG. A. A 40-pound codfish and its captor, a son of Sir Wilfred Grenfell. (Photo by Fred C. Sears)

When one considers the great land opportunities the North American continent has offered these last four hundred years, it is difficult to see why men have kept on catching cod, unless it be some charm of the sea, some lure of danger. The task holds no gambler's chance of great riches; indeed the chances are all in favor of a poor catch and a risk of death by drowning, with the certainty of a cold, mean job the while. Therefore I wonder why men risk their lives in this place where the waters are freezing cold, the winds are raw, icebergs often float about, and the fog continually throws everyone into groping blindness on the rolling, tossing sea. To make the matter worse, this is the route of the transatlantic liners, which occasionally plow down the dories or the schooners in the fog. To cap the climax of terrors, it is the stormiest part of all the sea that is much traveled. The St. Lawrence Valley outlet is the great converging-point of the cyclonic storms that cross the North American continent, whether their point of origin be British Columbia, Texas, or the Bahamas.

Codfishers in their dories are continually getting lost in fogs and floating out to sea, or being driven off by sudden storms,[9] and it is no wonder that at some fishing-places Memorial Day is celebrated by throwing flowers into the sea, which is the last resting-place of so many fishermen.

The codfishing lasts from May until winter drives the fishers in. The seal season lengthens the fisherman's year by giving him a job from March until May.

SEALING

The Arctic seals come south with the current to give birth to their young on the ice floes along the northern shores of Newfoundland and the southern

[9] I know an old man who keeps a shop in a fishing town. His hands are mere stubs, all that remained when he was rescued with his hands frozen fast to the oars, after floating for four days in an open dory driven by a biting blizzard that froze his companion stiff.

Note: "I" and "me" in this book may refer to the senior author or to the junior author, as their experience has been combined.

shores of Labrador. Here, in February, over the miles of ice, 500,000 baby seals could have been heard thirty years ago giving their weird infantlike cries.

On a certain night early in March, the Newfoundland sealing fleet sails from St. Johns for the seal nurseries. This is an industrial event the like of which it is difficult to duplicate elsewhere. The whole city turns out to see the fleet off. It usually sails at midnight.

The sealing steamers approach the ice pack along the shore. The sealers then leave their boats at the edge of the ice, go to the floes, kill the bachelor seals with a blow of the gaff, and drag them to the edge of the ice, where small boats pick them up. The killer strips off the skin and a 2- to 4-inch layer of adhering fat. The good meat of the body is left to waste. Forty thousand is a good catch for a sealing steamer, and the sealers expect to be home by the tenth of May. The seals are not the fur seals. Their skins make the leather used in motorcycle seats and good handbags. Their fat is a material for soap, an illuminant for lighthouse lamps. There is danger in sealing, too, for occasionally a storm breaks suddenly upon the scattered sealers, breaking up the ice floes and driving the pieces out to sea, where drowning or freezing may be the drifting sealer's fate.[10]

WHALING AND THE FIGHT WITH NATURE

The Newfoundlanders do some whaling. This was a great industry before 1860, at which time petroleum, by furnishing an oil for the family lamp, broke the price of whale oil, which before had been practically the only illuminant superior to the tallow candle. There was at that time much concern in the world over the darkness that was promised by the impending extinction of the whale. In those days they caught the whale by harpoons thrown by a strong man in the bow of the boat — another perilous task. By 1880 the harpoon gun reduced whaling to an artillery operation, and for a short time the whale-fishing industry was larger than ever, but it soon declined, again melted by the cheapening rays of petroleum, gas, and electric light. The whale blubber furnishes oil, the cracklings that remain make fertilizer, and the baleen makes commercial whalebone, once used extensively in the manufacture of corsets.[11]

[10] The following news report describes the ever threatening tragedies of the sealer. "At least sixty-four members of the crew of the sealing steamer *Newfoundland* perished in a storm which caught them on the ice-floes near the Strait of Belle Isle last Tuesday. That number of bodies was recovered by other steamers in the fleet, which also picked up thirty-seven survivors, all suffering severely from frost bite. . . . The men lost were far from their vessels killing seals when the storm, with blinding snow, swooped down upon them. They were exposed forty-eight hours before assistance arrived, and in that time many succumbed. . . . When the blizzard came, the crews of the other vessels managed to regain their ships, but the floes on which the *Newfoundland's* men were working drifted away from the main body of ice and when darkness fell that night not one had returned. The ship's crew consisted of 150 men, of whom 120 were on the ice. Captain Wesley Kean, his officers, engineers, stokers and cooks remained aboard."

[11] With the substitution of steel springs for whalebone in most corset-making the demand for whalebone declined. It declined again when Dame Fashion decreed the use of elastic girdles instead of corsets.

Newfoundland seems to be a land of eternal warring and death. The furs from the interior have declined because of forest fires and too much hunting. The salmon of the rivers have declined because of the use of nets. The seals and whales declined because of excessive killing.[12] The 1911–13 average in the seal catch was 250,000; 1934–36, 154,000. The Indian has declined in numbers because the white man has destroyed his food. Even the white man's great commercial stand-bys of herring and cod are not so regular as they once were.

Another important Newfoundland fish is the lobster, for which there are 500 canneries scattered along the coast. Here some herring and halibut are caught; and here the salmon ascends the streams in springtime to spawn, affording sport to the tourist fisherman, although its commercial yield is insignificant compared with the great salmon catches along the coast of Pacific North America.

Suppose the fish supply failed.[13] Fish are really the result of a very delicate balance of nature. Little crustaceans as big as a pea or a grain of wheat or a mustard seed eat minute marine plants and animals called plankton. Codfish eat the small crustaceans. Anything that breaks any point of the series breaks the fishing industry. Man, of course, by continually catching the cod tends to do this himself. Occasionally nature itself causes some overwhelming destruction. One spring, ships passing out from the Atlantic Coast of the United States found the surface of the water a few miles from the shore covered with tens of millions of dead fish. This continued for hundreds of miles up and down the coast. They were tilefish, a good, edible species that lives in a rather narrow zone along the shores in water of a certain depth and within a certain range of temperature. Apparently there had been some change of temperature conditions that almost extinguished them, so that it took twenty years for them to approach plenty again. Then the United States Fish Commission had to teach the people that they were good to eat.

The only marine dependence of Newfoundland to which man can give aid in propagation is the lobster. We can and do raise young lobsters in ponds and liberate them to fatten at sea.

The basis of the fishing industry of Newfoundland and Labrador does not appear to be as sound as might be desired. It should be pointed out at once that the resources of the sea are little known. In the scientific sense they are almost unexplored. We should be able to get great resources of food, oil, fertilizer, leather, and other materials from the sea if land limitation and increasing need drive us to it. If that day should come, these coasts will rise in importance.

[12] In 1937, 7 steamers and 1300 men were employed in sealing, and only 113,000 seals were caught. Whaling has shifted almost entirely to the Antarctic regions, and in 1937 Newfoundlanders caught only 191 whales.

[13] Back in the 60's one or two years of very bad fishing resulted in the necessity of government doles to stave off famine. The case became a sociological classic because of the long-drawn-out difficulty in getting the people back to work. And now — eighty years later — perhaps Newfoundland and the United States will find that history repeats itself?

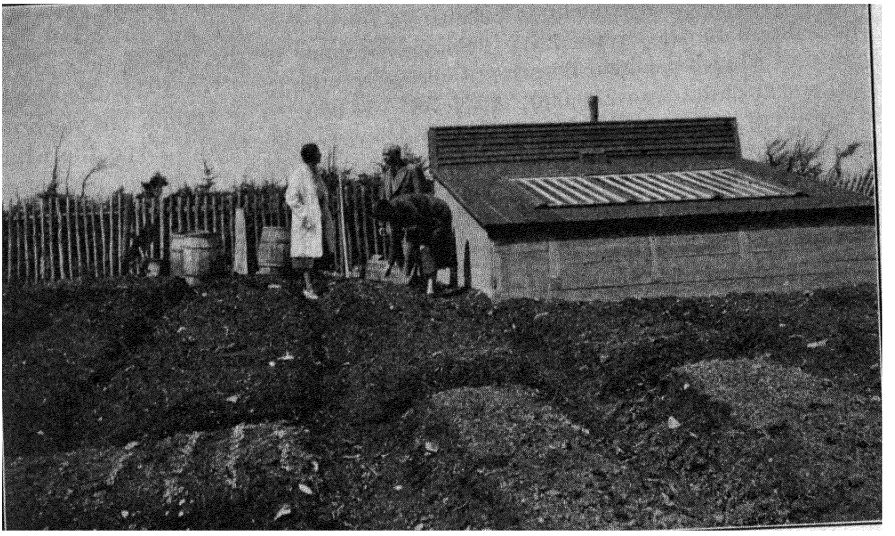

FIG. A. A garden near the Grenfell Hospital at St. Anthony in northern Newfoundland. Note the trenches 4 ft. apart for drainage. Dr. Grenfell is in the center. (Photo, Grenfell Mission)

AGRICULTURE AND FORESTRY

What are the other resources? Agriculture employs a small fraction of the workers, and its total product is worth only $3,400,000. The average Newfoundland fisherman does not even have a garden. This is partly professional pride. A fisherman is a *fisherman*. The chief crops of the few farmers are hay, potatoes (9 bushels per capita), cabbage, and turnips, all characteristic of the extreme Northern agriculture.[14] Oats are the only grain that can be grown, and the actual production is almost negligible, amounting to 20,000 bushels in 1938. There are on the island only 8000 hogs, 15,000 goats, 24,000 cattle, and 88,000 sheep — less proportionately than we have in the United States, where sheep are relatively unimportant.

It is true that agriculture might be greatly increased by the development of more quickly ripening varieties that will endure the colder climate, as well as by such an intensive use of the soil as prevails in Italy; but there is no present prospect of such development. This is submarginal agricultural land, and fishermen seem to hate the hoe.

The pulp mill is the most important new industry that has come to the Newfoundland coast in the last four centuries. It uses the product of the forested interior, which is another region.[15] Most of the Newfoundland interior that does not consist of lakes, bare rock, or peat bog is covered with

[14] Lord Baltimore, founder of Maryland, showed his wisdom when he removed his Newfoundland settlement to the much more hospitable shores of the Chesapeake.

[15] See Chapter 21, "The Great Northern Forest."

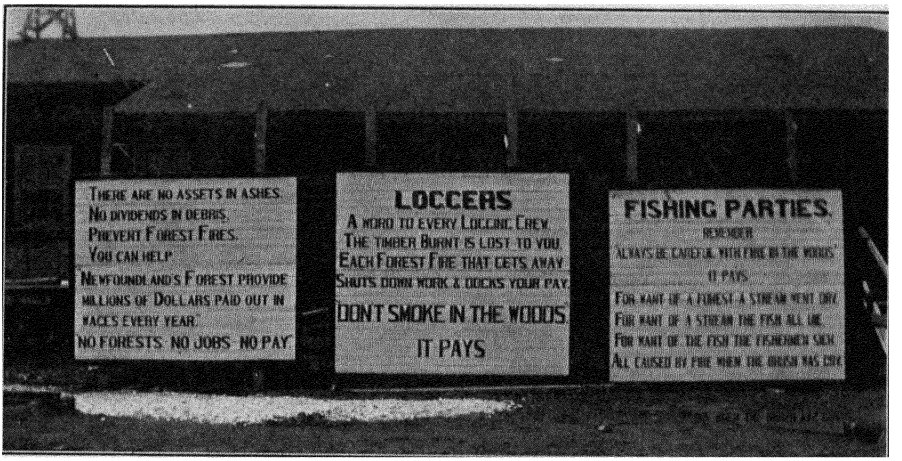

FIG. A. Signs beside the railway station at Corner Brook, Newfoundland. (Photo by A. W. Bently, International Power & Paper Co.)

black-spruce forests, the best of pulpwoods. The cool climate makes a slow-growing tree, but the damp summer checks forest fires somewhat, and the small trees can be used for making pulp. The deeply indented coast permits paper mills to be built close to or on harbors and close to the woodlands. The lake-fed rivers furnish abundant water power. Very little pulp has been exported in recent years, but the value of newsprint paper exports in 1936 was about twice the value of the products of the fishing industry. In 1938 there were two paper mills in operation, the larger one at Corner Brook being owned by Bowater's Newfoundland Pulp and Paper Mills, Ltd., with a capital investment of £5,000,000. In that year the pulp and paper industry employed about 6000 people (one-fifth the number employed in fishing) and produced 263,000 tons of paper. (The total Canadian output was over 4,300,000 tons.) Here is an industry that promises to be permanent as long as men want paper and the climate remains as it is. It is only necessary that the forests shall be kept in good production. That means keeping fires out of them.

MINERAL RESOURCES

The mineral resources of the island seem to be considerable, and promise an industry that will increase largely, especially in iron ore. The iron is mined on an island, Belle Isle, in Conception Bay on the east coast, which has a great deposit of iron ore estimated at 3,600,000,000 tons. From 800,000 to 1,000,000 tons of ore per year are mined. Most of it is smelted at Sydney, Nova Scotia, although conditions for its export to the American ports are excellent, and some is taken to Philadelphia. Some lead, zinc, copper, and pyrite ores are mined, and there are silver deposits on the east coast.



FIG. A. A wind-swept promontory in northern Newfoundland. J. Russell Smith holds up a branch of a completely creeping cedar tree that lay on top of a mat of moss. This cedar tree (a vine in form) extends from the right foot to a point beyond the left margin of the photograph. Note how the left foot has sunk into the moss. Within the area shown in this photograph there is also a birch tree creeping through the moss as though it were a sweet-potato vine. (Photo by Fred C. Sears)

LABRADOR

If Newfoundland may be called an icebox, then Labrador is a frigidaire; both are cold. The Arctic Current flows down the eastern coast of Labrador; and while it is possible for Newfoundland to receive a southwest wind from the not distant mainland, the west wind of Labrador must cross Hudson Bay, which is always ice-cold and so blocked with ice that only a few tramp steamers can profitably pass in and out of it even for a space of six weeks at the end of summer.

In summer thousands of Newfoundlanders fish for cod along the coast of Labrador. Sometimes they stay in one place all summer, and dry their fish there. These are called "Stationers," while those who sail up and down in their boats are called "Floaters." The permanent residents along the coast number less than 4000, and are known as "Liveyeres." There are a few hundred Eskimos, to whom white men, some of them missionaries, have carried tuberculosis, Christianity, and education, with the result that the

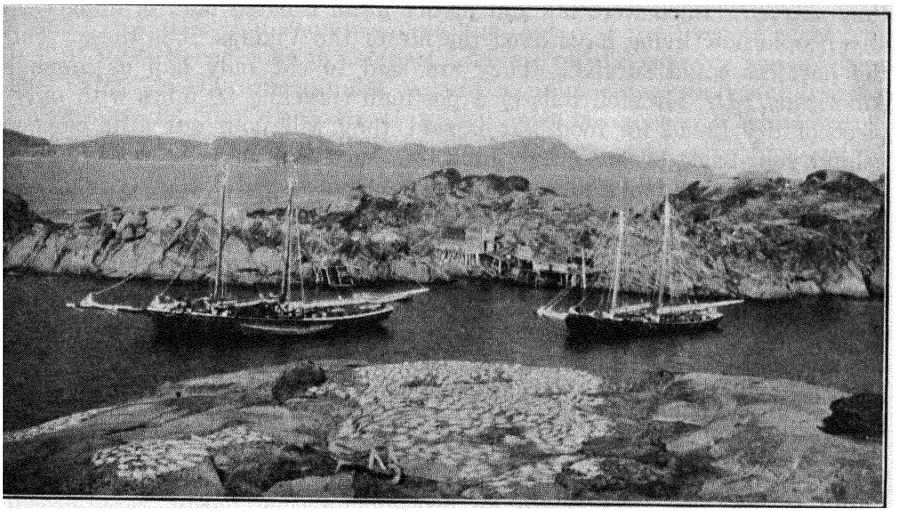

FIG. A. Labrador coast, glaciated and almost soilless. Schooners, fishermen's summer shacks, codfish drying on the rocks. (Photo by Fred C. Sears)

number of Eskimos is declining but their education is better than that of the codfisherman of British stock.[16]

The Caucasians had no missionary for a long time, but at last their turn came. It came when Labrador and the "Liveyere" were discovered by Dr. Wilfred Grenfell, a fisherman's missionary who had been converted by the American evangelist Dwight L. Moody. Grenfell sailed with the British North Sea fishing fleet, went with them to the Grand Banks, met the Newfoundlanders, became interested in them, went home with them, and found in their conditions the stimulus for a lifework of peculiar hardship, daring, and interest. He found the scattered Labradoreans facing all the difficulties of the Newfoundlanders, with a more forbidding soil, a climate so cold that gardens were almost unknown, and the people often perishing for the lack of vegetable food to break up the ravages of scurvy.

The Labrador fishermen lived on rocky bays, many of which were unmapped when Grenfell came, and in many cases the fiords were full of hidden, uncharted rocks. The people lived a hard life. They were so isolated, so scattered, so few, that their outside connections depended upon occasional trading-ships that came only once or twice a year. The arrival of the trading-ship was naturally a great day; but the native was compelled to sell to men who bought at low prices, and then he had to buy from these same men, who sold at dear prices.

The people were naturally poor. Cartridges were so expensive that the flintlock gun still prevailed. There was no doctor. If they fell ill, they got well or died. Broken bones healed without care. There was no judge, no court. If they caught a thief, they hanged him. If they were out of food,

[16] H. Hesketh Pritchard, F.R.G.S., *Through Trackless Labrador*, London, 1912, reviewed in the *Scottish Geographical Magazine*, May, 1912, pp. 265–68.

they starved. Such were life and justice in an isolated land of hunger. If any people now living have lived the life of the Vikings, it is these. Only the hardiest could survive. They are said to eat only half as much as Americans. Dr. Grenfell tells of a postman traveling 50 miles with only a piece of dry bread for food. It is said they will pour out gifts of cocoa behind your back, because they think that such stuff must be weakening.

Why did these deplorable conditions, so like those of the so-called barbarous peoples, continue into the twentieth century on the North American continent, on land controlled by England? Partly because no one knew about them, but more because it did not pay to establish regular lines of steamers to trade with these people and give them the industrial basis for the support of a good community. Grenfell, who took up the life of a missionary to Labrador, has made the land known. Contributions of money have come to build hospitals, to establish schools, to build churches. He has mapped the coast and helped to establish a steamship line which carries the fish to market and brings back goods for the co-operative stores. Grenfell is striving to free the people from their dependence on the one resource of fish.[17] This is done partly by introducing such hardy, rapid-growing vegetables as radishes, cabbage, lettuce, and potatoes, which can be grown in selected spots; but Grenfell's attempts to persuade them to eat them is a not-too-encouraging story.[18] For a time his great hope was the reindeer, but his experiment failed, for good reasons. The herd was too small, and it was preyed upon by fishermen's dogs and poachers. The half-starved Eskimo dog is a real terror. Grenfell's Jersey cows were protected by chicken wire, four sides and top, but the huskies made holes and killed them.

The remnants of Grenfell's herd of reindeer went to Anticosti Island in 1923, but the Labradorean of the future may look landward rather than seaward and become a reindeer farmer.[19] But that day is not yet, and when it comes it will need but few workers. Reindeer packing-plants may some day dot this coast. In 1939 a company reported plans to start reindeer-ranching on a grant of several million acres lying north of Hamilton Inlet.

THE INTERIOR OF LABRADOR

If you want to get your name on the map, the interior of Labrador offers an opportunity. It is the custom of geographers to name a river or a lake after the explorer who first comes out of the unknown with a good map of it. The map of the territory between Hudson Bay and the coast of Labrador shows blank areas in which states like Connecticut and Rhode Island could be placed almost at random and still remain well within the bounds of the uncharted land.[20] All you need to do is to land on either coast, go up some

[17] Unluckily for Labrador, Sir Wilfred Grenfell was born in 1865. Perhaps his work has inspired successors who will carry it on after he lays it down.

[18] Professor F. C. Sears of the Massachusetts Agricultural College has spent many summers with Sir Wilfred Grenfell as "secretary of agriculture to the coast of Labrador." He says he has had better success in teaching the people to *grow* vegetables than Grenfell has had in teaching them to *eat* vegetables.

[19] See Chapter 38, "The Arctic Pastures."

[20] Labrador has an area of 110,000 square miles. A long-standing dispute between

stream, cross the divide, and go down some other stream to some other body of water — a task that sounds simple but may cost the lives of those who attempt it, as it has done in the past. Living on the country has not been easy. This 110,000 square miles of land contains a few thousand Indians, mostly nomadic hunters, some of whom have never seen a white man.[21] Dr. Frank Speck of the University of Pennsylvania is authority for the statement that at least one tribe has always succeeded in running away when the white men have approached, although their camps have been found with water heated by dropping hot stones into bark vessels — a true survival of the Stone Age and of nonintercourse with the white man.

Roving bands of caribou may be met sometimes in thousands, and then again not at all for months, so that the problem of the explorer's food supply is a problem of transportation. If food and tackle are lost when his canoe overturns in the rapids, he probably starves as others have starved, for white men cannot catch fish, rabbits, or birds with bare hands and stones.

WATER POWER IN LABRADOR

Much of the interior of Labrador is a plateau nearly 2000 feet in elevation, dotted with lakes. These lakes provide a natural storage of water, give an even flow to streams, and make the coast rich in water power. Small dams at the outlets of large lakes in the wilderness can make the cheapest of water storage. In one fiord called Hamilton Inlet, in southern Labrador, a horse power of 2,000,000 is available. There has been talk of a great power plant for the utilization of the near-by limestone, with electric current and air to manufacture the nitrates that are so important in both chemical manufacture and the production of fertilizers. This suggests the possibility of an enduring industry; and there are in the interior of southern Labrador perhaps 30,000 square miles of timber, enough, with care, for a considerable paper manufacture, with plenty of water power to grind the pulp. This would only be a duplication of the well-established log-grinding industry on the north shore of the Gulf of St. Lawrence.

WORLD TRADE AND THE ONE-RESOURCE MAN

The Labradorean waterfall, which now produces only mist, foam, and noise, has the prospect of turning wheels and supporting a small town. A few decades hence, reindeer slaughterhouses may arise alongside power enterprises on this same coast, to which the reindeer might be driven from the ranges of the interior. All this means only a population of a few tens of thousands of people, with the investment of corresponding tens of millions of dollars. These people, like the present Labradoreans, will be heavy purchasers of imported goods.

Newfoundland and Canada over the ownership of Labrador was settled by the Privy Council at London in 1926, title to Labrador, with enlarged boundaries, being given to Newfoundland.

[21] Dr. Truman Michelson of the Smithsonian Institution, in the *Washington Star*, Sept. 30, 1923.

This possible emergence of the Labradorean fishermen from a hard condition of life, which on its physical side may properly be called barbarous, is interesting as a type of world condition. The man of the land of one resource has a hard life unless good transportation helps him to exchange his product *on a fair basis* for the multitude of things that he needs. Thus the fisherman of Newfoundland, with his good steamer connections, sells dried cod and buys from the Americans and the Europeans bread, meat, butter, sugar, fruit, fuel, clothing, lumber, and practically everything that can be named. *But he must have a good price for fish.* That is the rub on the one-product man. He is at the mercy of so many elements — those provided by nature and those made by man.

Man's relation to the world has profoundly changed with the coming of steam transportation. In 1820, when people emigrated from the eastern part of the United States, they had to look at land pretty much as did Caleb and Joshua when the Israelites sent them into Canaan to appraise the territory. Land for the emigrant of 1820 had to have a complete list of resources, lumber for houses and fuel, suitable conditions for tillage, a climate to permit the maturing of crops, water power to grind grain. Without all these, the agricultural community of 1820 could not hope to be comfortable. So the splendid grassy prairies of Iowa and Kansas lay empty except for roving Indians. Now one resource suffices. Fish or reindeer will do, or gold, or pulp for paper, or waterfalls to make nitrate. With this one thing *that can be got to market and sold,* the village store can have the products of every land; the home on the foggy shore can be comfortable, light, and warm; men can be well fed, well read, and civilized.[22]

As we study the North American continent, region by region, we must use a very different standard of measurement from that used by the geographer or the businessman of 1820. One resource now suffices, but we must examine that one resource carefully. Will it endure? Perhaps it is gold, which in two years makes a feverishly prosperous city of shacks — shacks that in five more years may have become roosts for owls, because when the gold is once gone, man goes too. Perhaps it is whales — whales that will be well-nigh exterminated, leaving the wharf of the whaler to rot, as was the case in Nantucket. Perhaps it is agriculture. Agriculture can, with care, endure through unending centuries, as has been the case for four thousand years in China. Also agriculture can be suicidal in a few decades, as is attested by hundreds of American townships. The narrower the list of one's resources, the more carefully must they be scrutinized.

[22] For example, see the section on Iceland in this book (page 749). The Falkland Islanders furnish another instance. This type of community seems to have had its heyday while the frontiers were opening up in the Machine Age. They have not done so well in the age of mass production and overproduction. They should rise again if we become smart enough and good enough to devise a reasonably effective means of distributing the produce of

Chapter 3. THE ST. LAWRENCE VALLEY

CHARACTER AND ORIGIN



THE shores of the lower St. Lawrence are high and bold, like those of Labrador and Newfoundland. In many places the sheer cliffs are hundreds of feet high, with a village nestled, here and there, at the mouth of a stream, busy with sawmills and fishing. Quebec marks the beginning of the lowland of the St. Lawrence Valley. The lowland came into being because its surface was composed of sandstones and shales which were softer than the hard, granitic rocks of the Laurentian upland to the north, and of the Adirondacks and the mountains of Upper New England and Lower Quebec to the south. The softer rocks weathered away faster and made the lowland in between the highlands. The valley is about 70 miles wide at Montreal, 20 miles at Quebec, and ends near the eastern end of Lake Ontario, where the old, hard rocks swing across the valley to connect with the Adirondacks. This harder formation remains to make the hills, and in the river it remains as the Thousand Islands which so beautify the St. Lawrence River at this point.

The northern edge of the St. Lawrence Valley is sharply bounded by the steep Laurentian hills. On the south it widens out to include the fertile Richelieu Valley and Lake Champlain. The neighboring Appalachian hills of a part of Vermont and Quebec form a rolling country where fertile valleys and low near-plains are covered with farms. The lower St. Lawrence River is really an arm of the sea, produced by the sinking of this region until the sea reaches far into the land. So great was this sinking that the Saguenay, a northern branch of the St. Lawrence, is in places 800 feet deep, and Montreal, the head of navigation, is 1000 miles from the ocean.

ACCESS AND SETTLEMENT

There are four gates to this St. Lawrence Valley: up the St. Lawrence River; down the St. Lawrence River; the Ottawa Valley outlet to Georgian Bay and Lake Huron; and the Lake Champlain outlet to the Hudson Valley. These four outlets focus at Montreal. Above Montreal in the St. Lawrence River are the Lachine Rapids, an obstacle to navigation. It was but natural that Montreal became an important transshipping-point and trading-post at an early date. Today this metropolis of the St. Lawrence Valley handles more commerce than all other Canadian ports combined and is Canada's largest city (pop. in 1931, 818,000).

The first settlement was made in 1608 at Quebec, which served as a gateway fortress. It was located on a high bluff at the first place where the river was narrow enough for guns from the fort to defend the region against the English ships of the eighteenth century. The city was besieged five times, and the power that commanded Quebec has always commanded Canada. Indeed, it was only by clever strategy that English troops under Wolfe were able to scale the heights of Quebec and defeat Montcalm on the Plains of Abraham. The site also offered the advantage of a certain amount of land for farms, especially on Orleans Island, the Beaupré coast, and the south shore.

The early days of the French colonist were hard. The forest was so thick that a man could clear only an acre and a half in a whole year. The climate was colder than any to which the Frenchman was accustomed. He could not bring his agriculture with him. He could not borrow corn from the Indians, as the New Englanders did, since corn would not ripen. For a long time Quebec was little more than a fur-trading post.

THE ISOLATION OF THE LOWER ST. LAWRENCE VALLEY

A twentieth-century curiosity is the peculiar provincialism that characterizes some settlements in the lower part of the valley, northeast of Quebec. The architecture is distinctly Norman. Barns with thatched roofs are common. The French that is spoken is much nearer the language of seventeenth-century Normandy and Picardy than that of present-day Paris. Colloquialisms in speech reveal the influence of the river, for the native "disembarks" from his horse and "moors" it to a tree. Until recently the habitants — (the rural French Canadians) were almost medieval in their superstitions, and they are still absolute in their religious faith. While the roads are not particularly rough, two-wheeled carts are still common, a relic of Norman days when a tax was levied on wheels. Until a few decades ago much of the lower St. Lawrence Valley was a land of isolation. Indeed, a modified feudalism existed, the land being held by seigneurs. When a seigneur rode by on his fine horse, the peasantry would remove their hats.

Why did isolation persist along the banks of the St. Lawrence River, which has long been one of the great arteries of world commerce? Even today the mammoth ocean liners and the little tramps that move up and down the river merely toot their whistles and pass on by. There are few harbors, the river is shallow near the shore, and only small river boats can land. Winter ice keeps all boats away for five or six months. Not until one reaches Narin's Falls, only 90 miles from Quebec, does one find a railroad along the north shore. On the south shore the railroads were built to connect Quebec with the Maritime provinces, and there is no line east of Matane. Beyond the end of the line to Quebec one enters the land of real winter desolation. Communities are buried in snow, and some of them get mail by airplane and dog team — and not too often. Furthermore, there is the isolation of a long cold winter, when highways are blocked, for this is a region of heavy snows.

"I should think life would be very dull there," remarked an American passenger on a St. Lawrence steamer.

"Oh, no, madame, not so, not so!" replied a fellow passenger, a French Canadian governess. "They have the consolations of their religion, and in summer, their husbands' farm work to do."

For years the farms were elongated and irregular in shape, and all of the early farms had some water frontage, a valuable point of contact with the outside world. Today rows of narrow farms can be seen along the roads that parallel the river, and, with growing population pressure, settlements have spread even up into the adjacent highlands. For three hundred years most crops were subsistence crops, and there was but little to sell. A money crop of cheese is a twentieth-century innovation. So is the pulp mill grinding logs that float down from the highland to the north. In summer many of the men are fishing. The St. Lawrence River is the heart, the highway, and the industrial site of the region.

AGRICULTURE

The St. Lawrence Valley is a land of the snowshoe, the ski, and the skate. The sleigh runs for months over the snow, which steadily grows deeper and deeper until February or March. It is primarily an agricultural region, with an agriculture that bears the stamp of the Northland. The short growing-season almost prohibits corn and restricts the list of crops, but there is time enough fortunately for the development of all the small grains — wheat, barley, rye, oats, and buckwheat. The climate is suitable for wheat and other winter grain, for despite the rigors of winter the young plants, beginning their growth in early autumn, are kept warm by the blanket of snow which covers this region regularly and on melting fills the soil with moisture. Despite this climatic aid, wheat-growing declined for years and has now practically ceased.

The farms here are small, and unfortunately much of the St. Lawrence lowland suffers from glacier-borne boulders and stones. Under such a severe handicap the region has suffered greatly from the competition of western Canadian wheatlands with their vast reaches of rich, treeless, level, smooth, cheap land.

Oats, spring-sown, are the chief grain crop, and the hay production is greater per capita than it is in the United States.

As wheat declined, there was an increase in the growth of root crops, such as potatoes, beets, turnips, and forage crops. Neither hay nor roots are exported to any extent. They are used as food for cattle, especially for the dairy cow, for with increased competition of Western grain, the farmers of the St. Lawrence Valley were compelled to intensify their agriculture by going into the dairy business.

THE PLACE OF THE COW

The milk cow is often a sign of intensification of agriculture, a process whereby the same number of people get a greater yield from a given amount

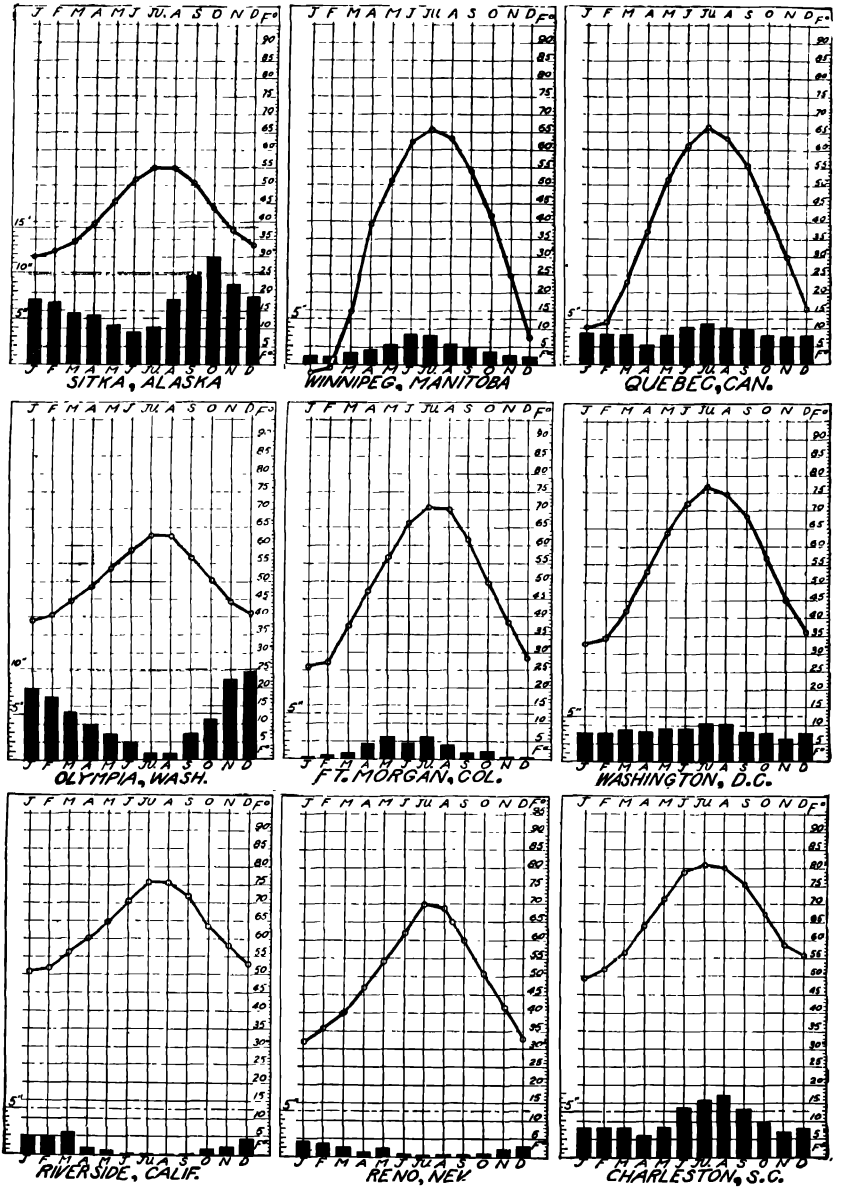

FIG. 58 A. These graphs (see Fig. 59 A), the best type of picture of a climate, show stations typical of regions. They are placed together for comparison, and merit careful study. Note the increasing rainfall, decreasing temperature, and low range of temperature in the Pacific Coast types: Riverside (Southern Calif.); Olympia (Puget Sound); Sitka (North Pacific Coast).

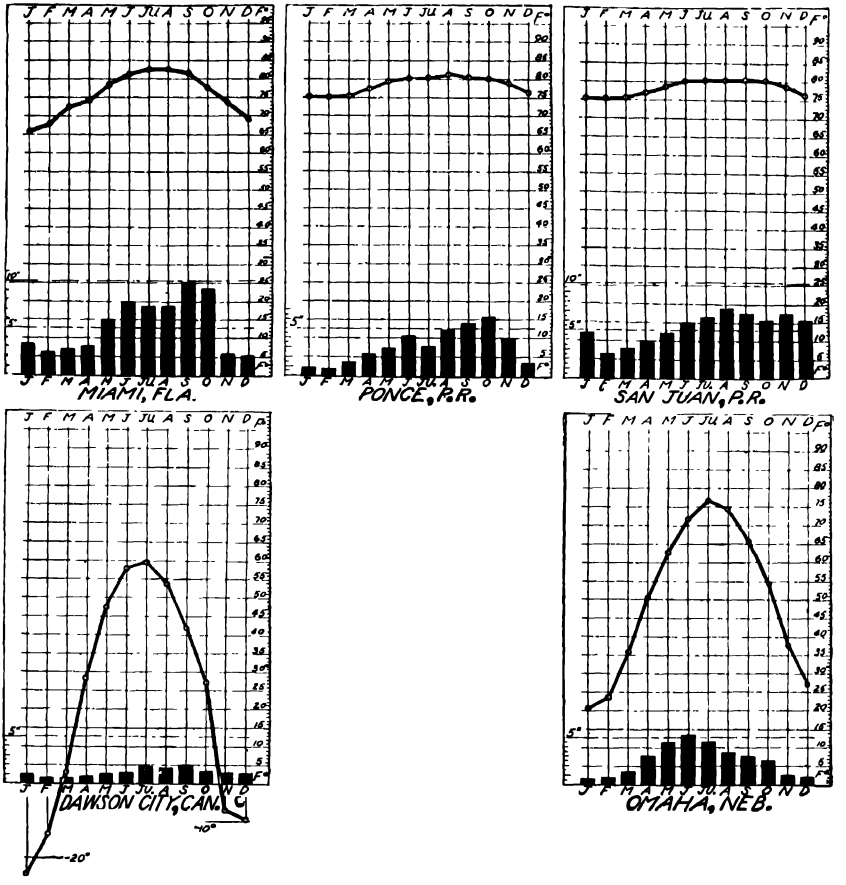

FIG. 59 A. See Fig. 58 A. In these graphs note that the temperatures are averages for each month. The comparison of range between extremes is thought-provoking. Unfortunately these graphs can show nothing of the variations that have been averaged.

Reno (Arid Intermountain Basin) shows same type of rainfall as Pacific Coast with greater range of temperature. Fort Morgan, Colorado (Great Plains), has still greater range with rainfall of entirely different type, the mid-continental.

Omaha (Corn Belt), Winnipeg (Spring Wheat), and Dawson (Yukon and Great Northern Forest) show variations of the same continental type. Comparison of Dawson and Sitka, not far apart in latitude, shows the extreme oceanic-continental contrasts.

Charleston (Cotton Belt), Washington (North Atlantic Coastal Plain — Northern Piedmont), and Quebec (St. Lawrence Valley) enable us to compare the east and west sides of the continent. Miami (Florida peninsula) shows how near south Florida is to the trade-wind type. San Juan, rainy trade, Ponce, rainy-dry trade types. Compare the temperature with Riverside, Omaha, or Dawson.

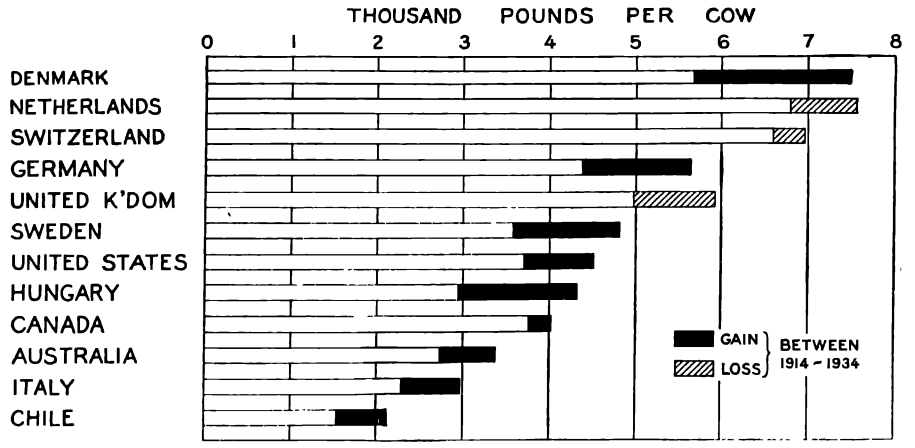

FIG. A. The cow's yield depends on her breed, her breeding, her feed, her owner, and the climate. Something appears to be lacking in Canada. (Courtesy U.S. Dept Agr.)

of land, although there may be no corresponding increase in product per person. Intensification of agriculture must finally reach a point where there is a decline in output per person but an increase in production per acre. Thus the acre that is in fair pasture would yield but 50 to 200 lbs. of edible meat per year. The same acre in oats, roots, and hay, all of which are fed to meat animals, would yield about 300 to 400 lbs. of edible meat per year. But give the forage to dairy cows and the amount of milk produced may be somewhere between 1000 and 2000 lbs., and a year-round job for the milkmaid. Hence dairying is more intense than meat production, meat production is more intense than grain-growing, and grain-growing is more intense than pasturage.

With the growth of urban centers and the improvement of transportation facilities, intensification has occurred within the dairy industry itself. The more perishable butter and milk have assumed greater importance, while the *proportion* of cheese has declined. In 1900 the Canadian production of cheese amounted to 221,000,000 lbs. as compared with 36,000,000 lbs. of creamery butter; in 1937 the ratio was 130,000,000 lbs. of cheese and 246,000,000 lbs. of creamery butter. In 1937 the consumption of cheese in Canada was less than $3\frac{1}{2}$ lbs. per capita, but butter consumption was $32\frac{3}{4}$ lbs., which helps to explain why the bulk of the cheese output is marketed overseas, whereas butter is consumed chiefly at home.

CO-OPERATION AND THE FARMER'S JOB

The perfect running of a farm requires a sort of intellectual and administrative Cyclops, a whole industrial organization. The farmer who has several crops and several kinds of livestock needs a vast amount of technical knowledge about each one. In addition, the farm often has enough buildings to be a little village. The farmer has an ever increasing number of machines

and engines which he must keep in repair. A farmer is his own purchasing agent, often his own salesman, and to know how his business is running he must be his own accountant. Furthermore, nearly every farmer must work on the land, or if there are helpers, he must plan and superintend their work. Verily the farmer should be a dozen men and a dozen scientists rolled into one. Now add to this burden the task of getting a foreign market, and you will see the basis of the new paternalism, government aid to agriculture, and also the basis of the new and rapid progress of co-operation in agriculture.

The natural outlet for the surplus of Canadian butter and cheese is the city markets of New York and New England, but from those they have been barred for many years by high American tariffs. Although reciprocal trade agreements in 1935 and 1938 reduced American duties on Canadian milk, cream, and Cheddar cheese,[1] sales to the American market are but a small portion of the Canadian export trade in dairy produce. In the latter part of the nineteenth century the Canadian was compelled to seek his market in Britain, wedging his way against the strong competition of the Dutch, Belgians, French, Swiss, and Danes, and, in later years, of the New Zealanders. The winning of the British cheese market is an interesting example of the success of associated activity where individual effort is helpless.

CAPTURING THE CHEESE MARKET

The Canadian Government sent experts to study the exact requirements of the British cheese markets. When the desired color, flavor, composition, and age of the cheese were known, schools were established to teach people how to make that kind of cheese, extension lecturers gathered farmers into groups and expounded cheese, cheese, cheese. Hundreds of co-operative creameries and cheese factories arose to handle the products of farmers' dairies. In 1937 there were in Canada 1023 cheese factories, 1312 creameries, and 264 factories producing both butter and cheese, the great majority of these establishments being located in Ontario and Quebec. The dominant role of these two provinces in the dairy industry is clearly revealed by the following table.

PRODUCTION OF DAIRY PRODUCTS, 1937

(millions of pounds)

	Ontario	*Quebec*	*Total Canada*
Factory cheese	93.3	29.8	128.4
Farm cheese	.1	.3	1.2
Creamery butter	81.2	74.1	246.4
Dairy butter	31.4	14.5	113.1
Miscellaneous factory products (condensed milk, etc.)	287.2	25.1	418.2
Milk otherwise used	2812.5	2108.9	6902.8

[1] The 1935 agreement reduced the duty on Cheddar cheese from 7 to 5 cents per lb. and the ad-valorem duty from 35 to 25 per cent. Canadian exports of cheese to the United

The farmers of Quebec and Ontario banded themselves into co-operative breeding associations and cow-testing associations to improve the quality and products of their cattle, and in six years' time the selected Canadian cow gave 4400 lbs. of milk per year instead of 3800. Lastly, and perhaps most important of all for the conquest of a market, the cheese was branded by the government inspector, who certified that its quality was up to standard, so that the buyer across the Atlantic could depend upon the quality of the cheese beneath that brand. The Canadian Government even keeps inspectors in Europe to see how the product arrives. In 1937 Canadian Cheddar cheese represented 25 per cent of the total cheese that entered the British market.

When it comes to the detail of selling, the Quebec farmer does not bother with it; the co-operative association with thousands of members has *one* bargain, *one* distributor.

THE CHAMPLAIN SECTION AND THE NORTH SLOPE OF THE ADIRONDACKS

The sections of Vermont and New York State that are in this region are as dependent on the pasture field and the dairy cow as are the neighboring sections of Quebec. The New York section, at the north base of the Adirondacks, is fairly dotted with cheese factories. Between 1905 and 1915 silos (using corn fodder — see next chapter) spread among the farmers here almost as rapidly as new styles in clothes. The Vermont section and the Champlain Valley, which has some rich limestone soil, make butter, and every day they ship fresh milk by train and motor truck to the great urban markets in the Boston and New York City areas. In ten years, 1909–19, the amount of Vermont milk sold increased 62 per cent. In some years Vermont has led all the states in the value of dairy products per capita.

There are but few towns and cities of importance in the American section of the St. Lawrence Valley.

The Aluminum Company of America operates a large reduction plant at Massena, New York, on the St. Lawrence River, where cheap electric power is available.[2] Ogdensburg, New York, has a paper mill utilizing pulpwood that is transported by river boats from the Gaspé Peninsula. Plattsburg, near the edge of the Adirondacks, is a great center for winter sports. Bur-

States increased from 475,000 lbs. in 1935 to 11,456,000 lbs. in 1936. The duty on cream was reduced from 56.6 cents to 35 cents per gallon on a quantity not to exceed 1,500,000 gallons, but less than one-seventh of this quota has actually entered the United States annually since then. The duty on whole milk was reduced from 6½ to 3¼ cents per gallon, subject to a quota of 3,000,000 gallons annually, which is equal to about 1 per cent of domestic consumption even in those regions where Canadian milk might compete. These duties were reduced further by the 1938 agreement. No reduction was made in the duty on butter.

[2] Here is an interesting example of the limitations sometimes placed by geography upon a great industry. The molten aluminum slowly pouring from the reduction pot at Massena may have journeyed more than 5000 miles to be manufactured into useful shapes for industry. The bauxite ore came from British and Dutch Guiana up the Mississippi River to East St. Louis, Ill., to be refined into alumina, a whitish powder. The alumina moved to Massena to be reduced to aluminum, which in turn is shipped to the company's plants at Fairfield, Conn., and Edgewater, N. J., for final fabrication.

lington, Vermont, has varied manufactures, including woolen goods, spools and bobbins, brush fibers, and maple-sugar utensils. Winooski, Vermont, on Lake Champlain, is known for the manufacture of wire window screens and doors.

MINING

One-half to three-fourths of the world's asbestos is mined each year [3] near the town of Thetford Mines about halfway between Quebec and the Vermont boundary. This industry, like several other Canadian industries, is largely owned and operated by American capitalists.

The mineral resources of the St. Lawrence Valley other than asbestos are not large. It has no coal, no oil, no gas, and no iron. Coal needed for domestic and industrial purposes is imported from two sources. It comes by boat from Nova Scotia, but the cost of transshipment from boat to rail generally limits the Nova Scotia coal to Montreal and other river points.[4] Inland it is usually cheaper to get coal by rail from the mines of Pennsylvania, Ohio, and West Virginia. During the 1930's the amount of coal imported from the United States averaged about 9,000,000 tons annually, which was about a third less than the average imports of the preceding decade.[5]

Coal is usually a vital resource to a manufacturing state, but the St. Lawrence Valley rivals Switzerland in being as nearly independent of coal as any place in the world. Into this lowland from the highlands on both sides streams of wood and of water power are pouring, literally pouring. Indeed Ottawa, the nation's capital, which uses hydroelectric power in its sawmills, pulp mills, and other wood-using plants, has often been called a "sawmill town."

WATER POWER

The lack of coal, oil, and gas in the St. Lawrence Valley is compensated by the abundance and accessibility of water power, which is a prime resource of the region. The high plateau beyond the high hills at the north wall of the valley means that streams must make a swift descent. The fact that the plateau was overridden by the continental glacier means a blessing in water power. This glacier pushed earth, rock, and hills around as a child plays with sand on the seashore. When the glacier retreated, no stream knew its own valley. Open valleys had become chains of lakes. Streams that had

[3] 1936 production: Canada, 273,300 metric tons; Soviet Russia, 125,100 metric tons; Southern Rhodesia, 51,100 metric tons. In 1937 the Canadian output increased to 372,000 metric tons.

[4] The movement of coal from Nova Scotia has been stimulated by subventions granted by the Dominion Government; 1,913,000 tons of coal were shipped to Quebec and eastern Ontario from the Maritime provinces under subsidized rates during 1937. This movement equaled one-fifth of the total coal imports from the United States.

[5] In 1936 6 tons of bituminous coal were shipped to Canada for every ton of anthracite. Since 1932 American anthracite coal has been subject to an import duty of 50 cents per ton; British anthracite enters free. American bituminous coal pays an import duty of 75 cents per ton; British soft coal pays only 35 cents a ton. These duties were not reduced by the 1938 Canadian-American trade agreement, but were secured against further increase. In spite of the tariff preference granted to British coal, American coal represents 90 per cent of Canada's total coal imports.

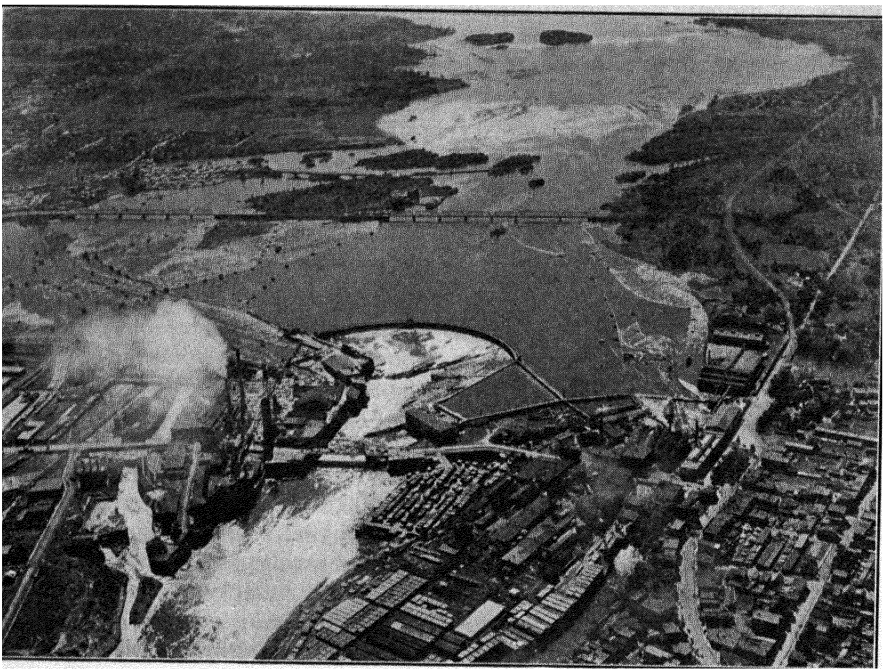

FIG. A. Ottawa, child of the river that turns its wheels and brings it wood. Power plant, sawmills, lumber piles, and log booms on both sides of the river. (Courtesy Royal Canadian Air Force)

gone in an orderly way down their own valleys found themselves tumbling over precipices in strange places. Niagara Falls is an example of this. The ancient valley of the St. Lawrence was filled up and the river turned across a high limestone cliff, hence the great fall, one of the wonders of the world both in scenery and in water power. Although not in this region, there are many falls of similar origin offering millions of horse power to the men who will harness them.

To make matters yet better for water power, the plateau lakes produced by the glaciers serve as natural storage to give the streams an even flow. A small dam at the outlet turns them into controlled reservoirs.

The turbine water wheel enables us to use great water powers. By this invention, twin of the electric motor in time of origin, a great amount of water can be brought to one small wheel; and when this is confined in pipes it can be brought from great heights, so that from 5000 to 50,000 horse power per unit is now easy and common.[6]

Electric transmission is the twin of the turbine in giving a manufacturing city access to the great water powers of distant places. In the days of 1850 the mill had to stand immediately beside the stream, with its wheels attached to the water wheel by shafts or belts. Now we bring power by wire 100

[6] In 1938 the largest units in operation were hydrogen-cooled turbine generators utilizing 200,000 h.p. per unit.

miles or 400 miles. Perhaps the time is not far distant when it may be brought 3000 miles.

In 1938, 98 per cent of all electricity generated for sale in Canada was produced by water power. The influence of technological improvements and a growing demand upon Canadian water-power development is revealed by the following data: 300,000 horse power in 1900, 1,000,000 in 1910, and over 8,000,000 in 1939. In this development the St. Lawrence Valley has played the leading role, for Quebec alone has nearly half of the present installations.

POTENTIAL AND DEVELOPED WATER POWER

(January 1, 1939)

	Potential power at ordinary six-month flow *	*Turbine installations*
Quebec	13,064,000 h.p.	4,031,063 h.p.
Ontario	6,940,000 h.p.	2,582,959 h.p.
Total Canada	33,617,000 h.p.	8,190,772 h.p.

* These data are for available 24-hour power at 80% efficiency. Available horse power at ordinary minimum flow is estimated as follows: Quebec, 8,459,000; Ontario, 5,330,000; and total Canada, 20,347,000.

No discussion of Canadian water-power development would be complete without mention of the successful ownership, production, and sale of electricity by the provincial government in Ontario. Since 1916 the Ontario Hydro-Electric Commission has built power plants, distributed its power, sold it to private companies, and regulated the rates charged by the private power companies. In 1938 over 65 per cent of the turbine installations in Ontario were operated by this commission, 21 per cent by privately owned central power stations, and the remainder by private industry. Operated on a sound business basis and making allowance for plant depreciation and obsolescence and for amortization of bonds, the commission has been able to sell its power at one-third of the rate charged by private power companies on the American side of the international boundary. In Quebec a more conservative government limits itself to the building of storage dams near the source of streams, from which all users can benefit, as, for example, the Grande Décharge Dam at Lake St. John at the head of the Saguenay River.

WOOD-PULP AND PAPER MANUFACTURING

It is a happy combination that Canada's great wood-pulp industry is a hog for power. Canada has the water power, and it still has the wood.[7] The pulp and paper industries combined have a greater capital investment, employ more men, pay more salaries and wages, and turn out products with a greater net value, than any other manufacturing industry in Canada.

[7] There is a skeleton in the economic closet. See the discussion of new pine pulp in the Cotton Belt, Chapter 14.

During the fiscal year 1937–38 newsprint paper was Canada's greatest export, exceeding even wheat, and wood pulp ranked eighth. In that year Canada shipped over 3,000,000 tons of newsprint paper, worth more than $120,000,000, two-thirds of which went to the United States.

In 1937 there were 74 mills in Canada with a total output of over 5,000,000 tons of wood pulp. About four-fifths of the output was produced by 47 mills that converted their pulp directly into paper. In Quebec, which surpasses all other provinces in the pulp and paper industries, most of the timber is cut for pulpwood. The forests in the St. Lawrence Valley today are of mixed softwoods and hardwoods, with some excellent stands of spruce, which is so desirable for the rayon industry. Most of the larger mills own or lease huge tracts of timberland, and some are practicing scientific forestry. A pulp mill cannot move about like a sawmill, for it has a huge capital investment in heavy machinery and must be near cheap power. A number of pulp and paper mills are located along the St. Lawrence River, where a branch stream can float logs down from the northern forest to the mill. Some mills are Canadian-owned, some are British-owned, but most of them are owned in New York.[8] Thus the United States has a double interest in the Canadian pulp and paper industries, first as a source of investment, and second as a source of supply. Since 1921 American wood-pulp imports have exceeded American production, and the great bulk of our pulp and paper imports comes from Canada. America is reaching maturity in forest history, while Canada is still young.

The advantage of cheap and abundant hydroelectric power permeates manufacturing throughout the St. Lawrence Valley. The smelting and refining of nonferrous metals, an important industry in recent years, consumes vast quantities of electric power. Large electrolytic reduction works, converting alumina into aluminum, are located at Shawinigan Falls and Arvida, Quebec.[9] In addition, there is a varied industry producing for Canadian markets shoes and leather goods, electrical apparatus and supplies, iron and steel products, rayon, cotton yarn and cloth, clothing, foodstuffs, and many other things.

Despite the advantages of the St. Lawrence Valley, its manufacturing and city population has not increased as rapidly as that of Connecticut, New York, Ohio, or Michigan. Quebec lags behind Ontario in manufacturing output.[10] Commercially, the St. Lawrence Valley is a land exporting dairy products and wood products.

THE ST. LAWRENCE PLAN

All the water powers in the St. Lawrence Valley, great as they are, seem small beside the stupendous plan for taming the river itself. This stream

[8] In 1937 total American investments in Canada amounted to $4,000,000,000; British investments, $2,700,000,000.

[9] The Arvida plant is the only one in North America where the manufacture of alumina and aluminum occurs in the same plant on a large scale.

[10] Gross value of manufactures in 1936: Total Canada, $3,000,000,000; Ontario, $1,500,000,000; Quebec, $900,000,000.

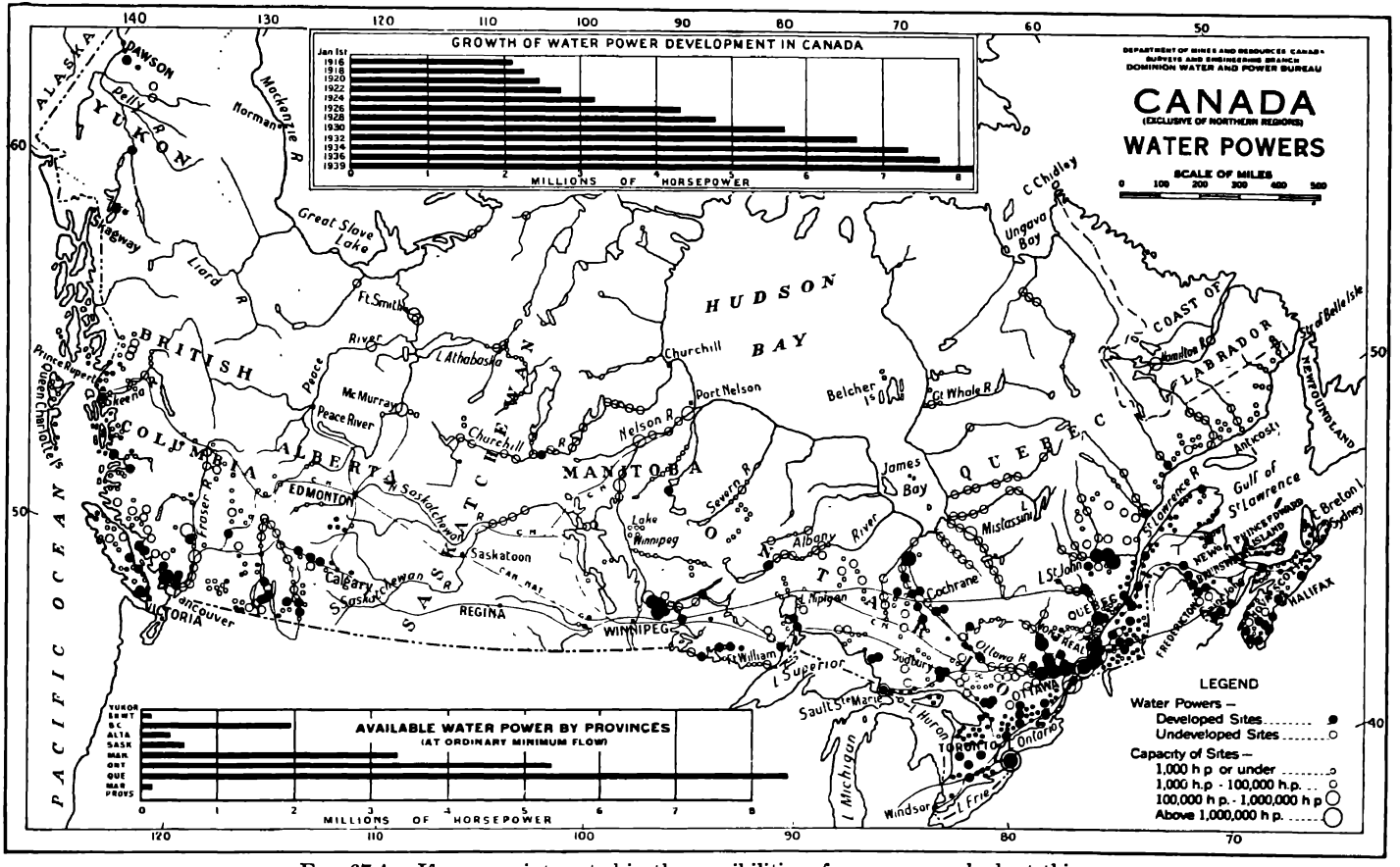

FIG. 67 A. If you are interested in the possibilities of permanence, look at this.

falls 222 feet between Lake Ontario and tidewater. For a long time this fall served only as an embarrassment to navigation, and 45 miles of canal have been built to get boats around the many rapids. The present canals, which are only 14 feet deep, handled over 9,000,000 tons of cargo in 1938.[11] Now that the age of cement dams, hydroelectric power, and great canal locks has arrived, there is a plan to create a deeper waterway in and around the river by building canals 27 feet deep, which shall be free of tolls, and two great dams with locks which will raise and lower ships from one level to another and at the same time develop 2,000,000 horse power of the 5,000,000 potential horse power that is available in this section of the river. The magnitude of this power project can be realized by comparing it with the power plants at Niagara Falls, which have an installed capacity of about 1,250,000 horse power.

The St. Lawrence is the king of water-power streams in respect to the evenness of flow, which fluctuates only 25 per cent [12] because of the natural reservoirs of the Great Lakes, 91,974 square miles in a total drainage basin of 565,000 square miles in which the rainfall is well distributed throughout the year. The Congo has vastly more *potential power*.

There have been many arguments advanced for and against the proposed St. Lawrence waterway and power project, which has been the subject of many reports and much debate. There are wide differences of opinion regarding the total cost of the project and the benefits to be derived therefrom.[13] Perhaps no man can tell whether or not the project is economically feasible. Treaties authorizing the project have thus far (1939) failed to secure the necessary two-thirds vote of approval from the United States Senate. Here is a good chance to see the fine hand of sectionalism. Some sections will benefit, some will not. Remember that in reading about it. Such plans usually require years of thought and years of study and sometimes years of debate before wheels begin to turn.[14]

THE PORT OF MONTREAL

Montreal, which ranks among the world's great ports, is Canada's prime commercial gateway. It has an admirable location, being situated 1000 miles from the eastern edge of the continent at the head of deep-water navigation on the St. Lawrence River. Steamship lines serving Montreal appeal to tourists who are prone to seasickness, since they can spend on the quiet St. Lawrence their first two days en route to Europe. Being farther north than and east of New York, Montreal is 300 miles nearer to Liverpool by the Great

[11] The Welland Canal, connecting Lake Erie and Lake Ontario, is 30 feet deep and handled 12,500,000 tons of cargo in 1938, including 86,000,000 bu. of wheat and 78,000,000 bu. of corn.

[12] The lakeless Potomac fluctuates 225-fold between highest and lowest.

[13] See R. Wyer, "Fact and Fallacy on the St. Lawrence," *Harvard Business Review*, April, 1935, pp. 344–52; and T. Ireland, *The Great Lakes - St. Lawrence Deep Waterway to the Sea*, G. P. Putnam's Sons, 1934.

[14] The first report recommending such a project was made by an international joint commission in 1921.



FIG. A. Looking downstream at a part of the harbor of Montreal. The breakwater at the right keeps ice out of the ship basin. See canalboats, coal piles, ocean steamer, grain elevators. From the left side of this basin boats enter the canal to go around the rapids. (Courtesy National Harbors Board, Montreal)

Circle route. Montreal has a large and productive hinterland. Its immediate hinterland is the St. Lawrence Valley; its tributary hinterland reaches westward to the wheat fields of Alberta. Good railway facilities provide cheap, quick, and easy access to the hinterland. When the proposed deep waterway is ultimately built, access to the hinterland via the Great Lakes will be even cheaper. Montreal has an adequate harbor and splendid terminal facilities. Nine miles of deep-draft wharves and piers can accommodate 100 large ocean steamers. Electric locomotives serve 70 miles of belt-line railroad. Four modern export elevators can store 15,162,000 bushels of grain and deliver it into ship holds at 500,000 bushels per hour, and at the same time canalboats and railway cars can be unloaded at the rate of 300,000 bushels per hour.

Ice, the curse of the Northland, is Montreal's great handicap. Fog in June is encountered 60 per cent of the time in the Gulf of St. Lawrence, which retards the speed of steamers; but it is ice in the river, beginning in the latter part of November and lasting for four or five months, that brings navigation to an absolute standstill. The ice handicap is partially revealed by the fact that 22 per cent of Canadian grain shipments leave for overseas markets by way of American ports. During the latter part of November insurance rates on hull and cargo rise sharply, because ice, fogs, and rocks have sent

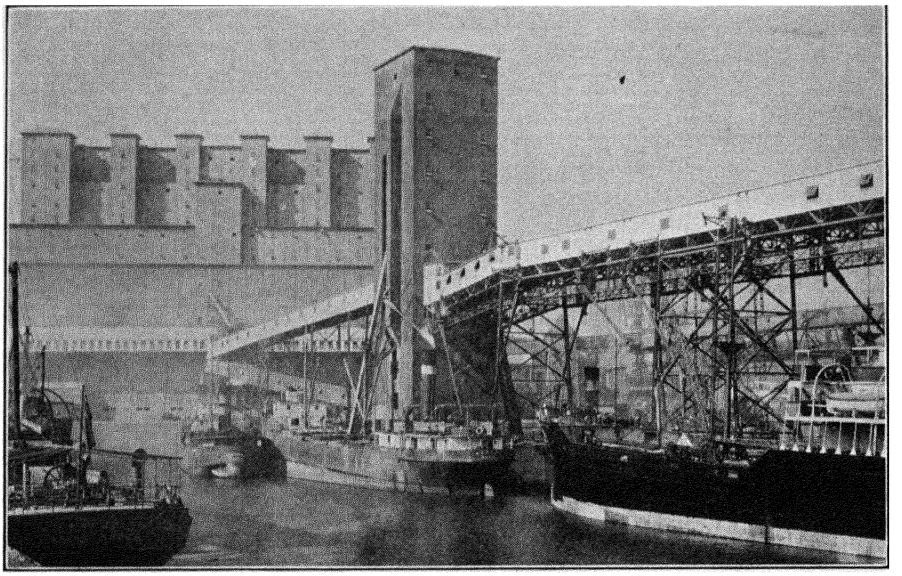

FIG. 70 A. Belt conveyors carry grain high overhead and drop it through pipes into the ships. At the right of the tower, grain is being elevated from a ship through the two slanting "posts" which contain bucket belt conveyors. (Canadian Pacific Railway)

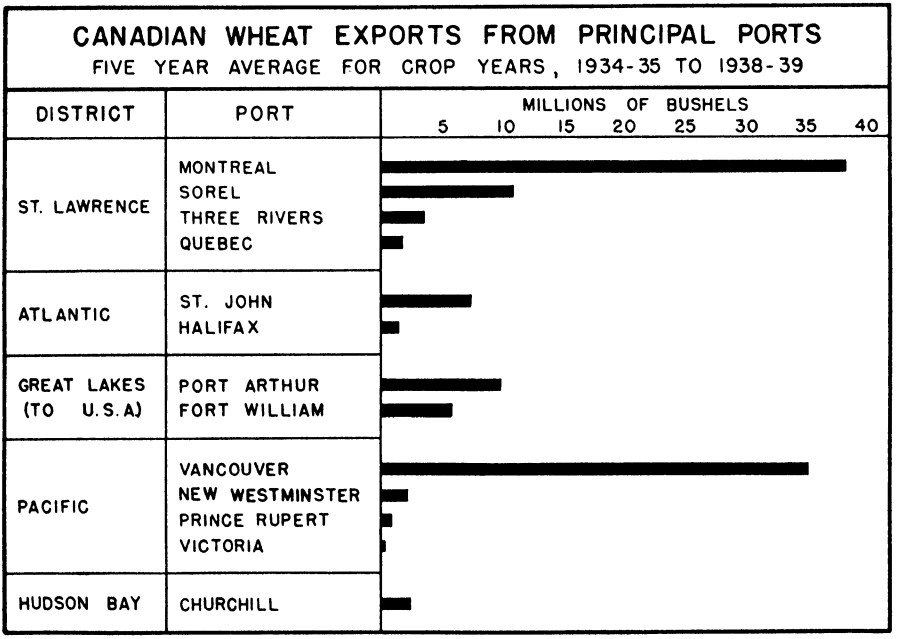

FIG. 70 B. Vancouver has recently risen as the great rival of Montreal. Churchill menaced and flunked. (Courtesy Bureau Statistics, Ottawa)

many a ship to a watery doom in the lower St. Lawrence area.

More than 2000 ocean-going vessels, aggregating over 7,000,000 net tons, call at Montreal during the course of a year. Montreal's exports greatly exceed its imports in volume, for they include many heavy and bulky commodities. Among the exports are large quantities of newsprint paper, wood pulp, mineral products, and dairy produce, but its great stock in trade is grain. (The ports of Three Rivers and Sorel also ship grain.) The seasonality of the grain movement calls for the assistance of irregular tramp steamers, which in recent years have handled about 40 per cent of the trade.

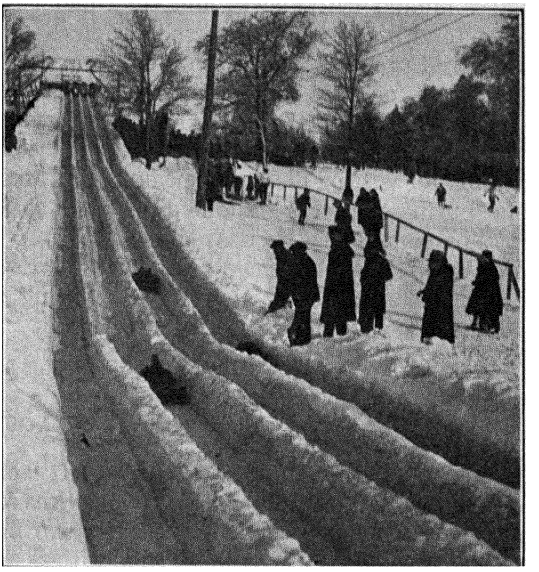

FIG. A. "Our Lady of the Snows" once more rejoices in her snow. Park in Montreal. (Courtesy Canadian Nat'l R.R.)

THE WINTER

In considering the future of this region, its long, cold winter looms up as a great handicap. Here is water power by the million horse power, adjacent forests by the hundreds of thousands of square miles, healthful climate, an industrious population of French Canadian laborers, and the great river for the highway — but a winter that shuts the highway half of the year, increases the cost of living, and makes the fighting of snow a positive cost factor.

Canada has had some interesting mental reactions to this winter and this snow. For decades the people built at Quebec, Winnipeg, and other

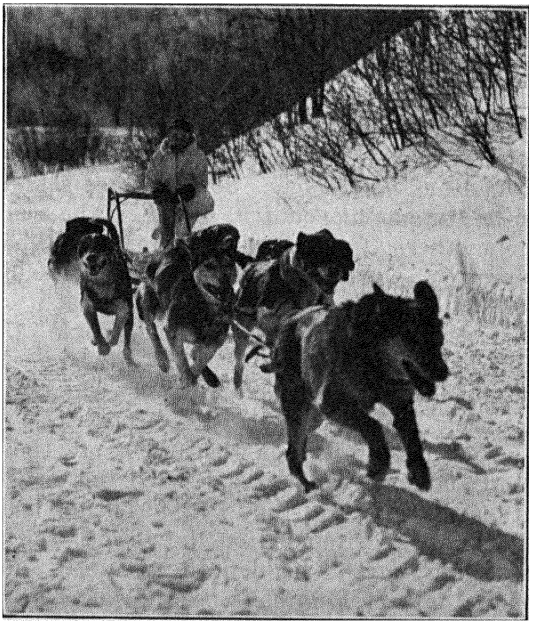

FIG. B. The Dog Derby has become a Canadian sporting event. (Courtesy Canadian Pacific R.R.)

places annual ice palaces, and they had coasting, skiing, and other winter sports and made much of them. Then came the desire for immigration, particularly European immigration, and the Canadians thought that when people heard only of piles of snow and ice palaces and saw pictures of them, they would not want to move to such a country.

About this time the Canadians were very much annoyed at Rudyard Kipling for writing his poem speaking of Canada as "Our Lady of the Snows." The business interests suddenly turned against the ice palace. For years it was abandoned. Then Americans took up the winter-sports idea. Adirondack resorts and American railroads advertised winter sports, picturing them in every possible way, and Canada, seeing what it was missing, turned to its ancient resource, the winter carnival. In 1937 visiting tourists spent $296,000,000 in Canada.

RACIAL FRICTION

This region has a human handicap. It lacks the human solidarity that its open surface and electric transmission wires should produce. Here, as among no other North American Caucasians, we find one of the common troubles of Europe — conflicting racial solidarities. Nearly four-fifths of the people of Ontario are British, while those of Quebec are probably more than four-fifths French, and the races are growing farther apart, thus proving the error of the French publicist De Tocqueville, who when he visited this region in 1830 said that the French were "the wreck of an old people lost in the flood of a new nation." They have not been lost in the flood. The government reports of the province of Quebec are published in French and in English. There are two sets of schools, French and English. The French language is being deliberately purified of its Anglicisms, and the community is becoming more and more French. The French Canadians are proud; they refer to themselves as *les Canadiens*, and to the rest of the people in Canada as *les Anglais*. Someone has said that while England may claim to be the parent country, France is the real mother and England only the stepmother. The old countries may say what they please; the mothers are forgotten. Quebec is a runaway child. It clings to French, but not to France. It is rather to its own individuality that it clings. The World War showed this clearly. In 1915, when the people of Ontario were enlisting by the hundreds of thousands to fight with the Allies in the European war, the people of Quebec did not enlist, not choosing to fight with either England or France. When Canada adopted conscription, Quebec resisted it hotly.

How does it happen that these are the only Europeans in all central North America who have resisted the melting-pot so thoroughly? It may at once be said that they were not in the melting-pot. They were set off by themselves, surrounded on three sides by Gulf of St. Lawrence ice and by the empty forested highlands to the north and to the south. Here the French of the days of 1763 have been let alone in their agricultural isolation. In many ways the eighteenth century still continues.

Farming is a conservative business. The French are a conservative people.

The habitant has the land hunger of the French peasant. He loves it, he sticks. His children stick. They divide the farm and keep on as their father did. As the river front is the desirable part of the river farm, the farms have been divided lengthwise until they are described (a bit figuratively) as having their width measured in feet and their depth in miles. The houses are on the river front, so that the south shore of the St. Lawrence seems like a village street. The civil unit is the municipality, but it is the parish that counts. Here the Church of Rome still holds its eighteenth-century place as the center and control of men's lives. In thought, in education, and in the press it still tells men where and how far to go. The people are still in the age of faith, simple faith; witness the pile of crutches at the shrine of Ste. Anne de Beaupré.[15] The mass is the great event of the week. Bad must be the weather to keep the farmer away.

A beautiful and charming novel, *Maria Chapdelaine* by Louis Hémon, gives of this life of hard labor and this background a sympathetic and understanding picture such as no geographer can hope to rival.

In winter the habitant celebrates. Sometimes he postpones other seasonal celebrations until the leisure of winter. He likes to celebrate. Betrothals, birthdays, and anniversaries are a time of merriment, joy, and high jinks.

The young people marry early. The Quebec couple usually christen their first child while still in their teens. French Canadian families are large — note the numerous brothers and sisters of the Dionne quintuplets. The birth rate in Quebec has declined materially in the last two decades, but it is still high, higher than that of any American state except Utah.

BIRTH RATE PER 1000

	Births		*Deaths*		*Gain*	
	1921	1937	1921	1937	1921	1937
Quebec	37.1	24.1	17.5	11.3	19.6	12.8
Ontario	25	16.6	14	10.4	11	6.2

In nearly every neighborhood you can hear a story of the widow with ten children who married the widower with twelve, or vice versa. The 80,000 French of the days of the Revolution have become 3,000,000, even though they have sent out many emigrants.

Many parts of New England are amazingly French. The Adirondack section of New York bristles with French names. At Tupper Lake, New York, in 1939 it seemed that the majority of people on the street spoke French.

The Quebec French are overcoming the Ontario English by force of numbers. When young Protestant MacGregor comes home from school using French words, the farm is put up for sale because of the fear of too much

[15] "I have spoken elsewhere of the effect of this isolation upon morals. The Church, aided by the encompassing hills, has brought to these people a peace of conscience and a moral sense which are sublime. Nowhere else have I seen such temperance and orderliness of life." — Roderick Peattie, "The Isolation of the Lower St. Lawrence Valley," *Geographical Review*, February, 1918, p. 116.

French association. Jacques Mercier buys it. Thus whole townships have passed from one race, one language, one religion, to the other, and old Protestant chapels stand in ruins by the roadside.

The misfortune of this is that the two groups keep up the friction and the separateness instead of mingling and rubbing along together as the members of the various churches do in England and the United States. Racial peace is not promoted by the fact that in Montreal nearly all the people are French, nearly all the big business is British. Financial domination is rarely appreciated by those dominated.

THE FUTURE

Perhaps the most significant thing about the industrial future of this region is the plan to export its greatest raw material — the power of the St. Lawrence — by wire to the United States. There is little doubt that the shores of the Hudson, of Long Island Sound, and of New England are better places for manufacturing towns than the icebound shores of the St. Lawrence if the materials are easily movable, and the St. Lawrence power seems destined to go to the better place now that wires can take it there so easily.

Chapter 4. THE NEW ENGLAND–CANADIAN MARITIME REGION

A HARD LAND



SOUTH of the St. Lawrence Valley is an area of highlands which is still chiefly uninhabited forest. South of the highlands is the New England-Canadian Maritime Region, comprising the lower lands (mostly below 600 feet elevation) of Nova Scotia, Prince Edward Island, New Brunswick, Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut, and extending from the suburbs of New York to the Gaspé Peninsula in the Gulf of St. Lawrence.

This is one of the most difficult regions in all North America to describe, because it has so many minor variations. Therefore we shall consider its major similarities and afterward we shall call attention to the small areas of local variation.

Before cities and machines made life easier this New England-Canadian Maritime Region was a land meant for hardy men. No others could survive and support families. It was a hard land — hard geologically, hard agriculturally, hard climatically. Most of its surface rests on rocks which are geologically old, and very hard. Upon these rocks thousands of streams have worked for millions of years, carving them into a land of rolling hills, whose elevation varies from sea level to 600 feet. There is no soft flat plain beside the sea. The land has been submerged so that the sea flowed back into the valleys. Along the rugged coast of Maine and the deeply indented coasts of Nova Scotia and New Brunswick, waves now beat upon the tops and sides of ancient hills, many of which now stand out as islands.

GLACIATION

The glacier added numberless variations which helped to make the land a hard place for the home of man, especially the farmer. The continental ice sheet advancing across hills and mountains wrenched off boulders and stones and strewed them over the lower lands. So varied are the results of glaciation that the meaning of the word is indefinite. The glacier made some parts of the region so rocky that they are hopeless for the plow. Elsewhere it scraped a few feet of soil from the tops of hills and left only bare rock. In other places streams rushed forward from the glacier and carried away all fine earth materials. Only stretches of coarse sand ("outwash plain") were left. Some of these areas absorb rain water so rapidly that the soil

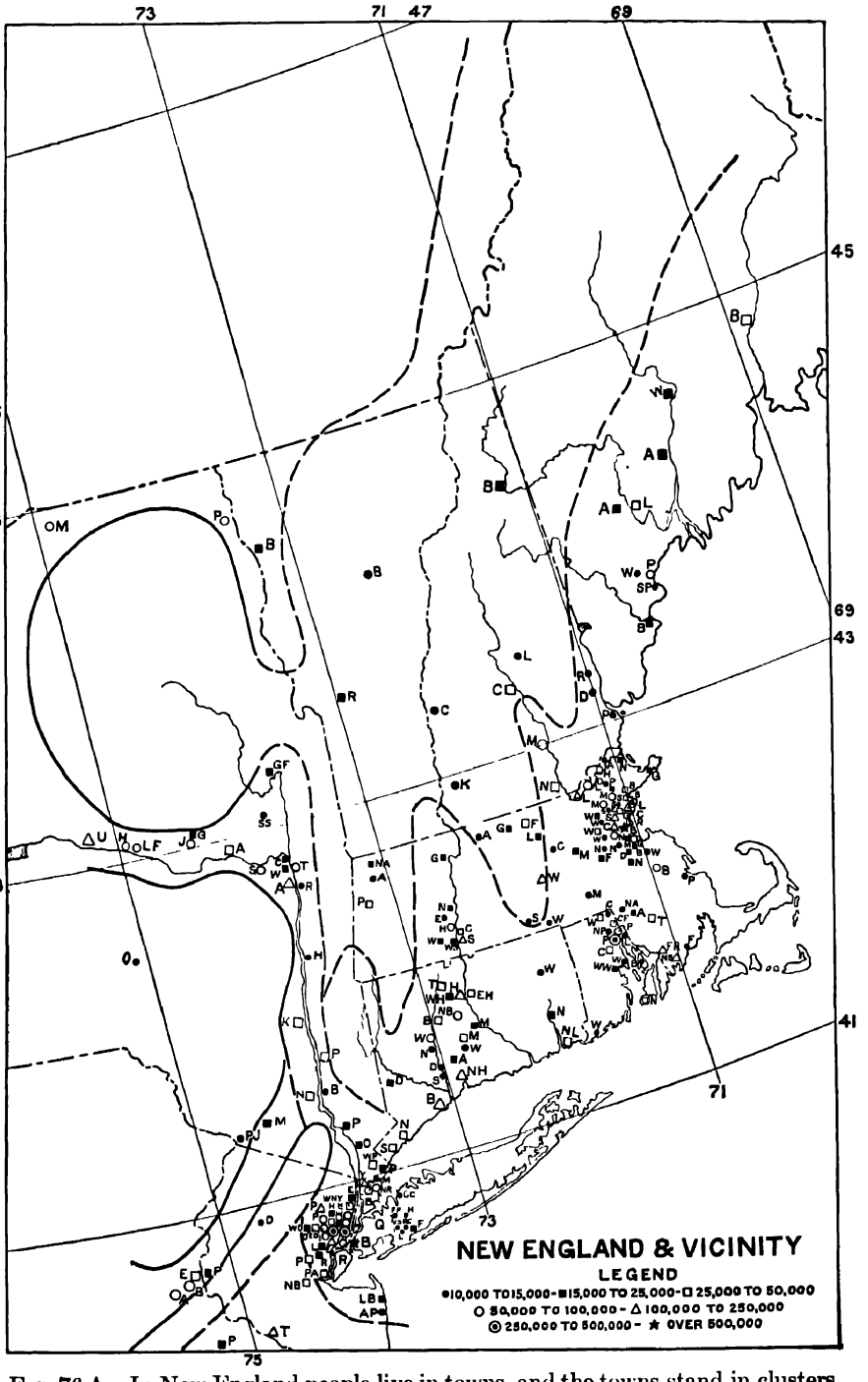

FIG. 76 A. In New England people live in towns, and the towns stand in clusters.

dries quickly and there is not sufficient moisture to make farming possible or even grass possible. The people who live near them sometimes call these tracts "deserts" or "barrens," for even trees refuse to grow. But the work of glaciers was not all bad. In some places they spread rich, glacial clays over the surface. Elsewhere they brought fresh, unleached soils from great depths and mixed this more fertile material with the original surface soil.

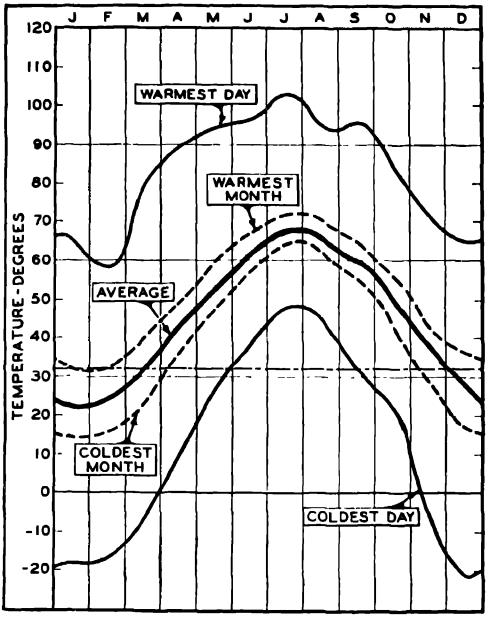

FIG. A. Temperatures Fahrenheit for Portland, Maine. (Courtesy U.S. Weather Bureau)

FOREST

It was hard for the settler to establish a home, because the land of this region was covered with forest. Spruce, pine, hemlock, oak, maple, and hickory came down and met the salt spray of the ocean. The forest sheltered the wolf and the Indian and stood where the settler wanted to make a field. It took years of labor to fell the trees, grub the bushes, pry out stumps, roll away stones, and make a farm. During the process men lost their reverence for the forest. In the time of Queen Elizabeth England was almost deforested, and generations of wood famine had caused the English settler to reverence trees when he first arrived in New England.

CLIMATE

The region was further handicapped by climate. The winters were long and cold. Frequent storms occurred, and often a deep mantle of snow covered the ground for three, four, or even five months. Perhaps the Californian was right who remarked that if the United States had been settled from the Pacific Coast, New England would not have been discovered yet.

THE PILGRIM FATHERS

But this region was settled, and by a variety of hardy stocks seeking homes: Puritan English in New England, Scottish and German in Nova Scotia, Irish and Church of England English in New Brunswick.

The Pilgrims, 102 in number, sailed from England on September 6, 1620, in a chartered vessel, the *Mayflower*, bound for the Delaware River area. It was not until November 11 that they sighted land at Cape Cod. They

anchored in Provincetown Harbor, and after five weeks of exploration they took their ship to Plymouth, a spot marked on Captain John Smith's map. Here a settlement was begun. The site had advantages: a piece of cleared land where the Indians had once grown corn before they were annihilated by the plague of 1617–18; a spring to provide fresh drinking-water; a hill upon which to build a blockhouse for defense; and plenty of wood at hand with which to build homes and feed the household fire.

Frontiersmen are not made in a day, and the rigors of life in ship and winter camp on this cold shore levied a heavy toll upon the first colonists, only 50 of them surviving the severe winter. The first settlers had no work beasts. They cultivated corn with hoes, Indian-fashion, and it was some time before they learned to take full advantage of the abundance of fish and wild game near by. With hard work they raised a small amount of corn in 1621, but the arrival of 35 more settlers without food supplies put the struggling colony on half-rations. When 65 more persons arrived in the spring of 1622, the situation became desperate. Their discouragement was extreme, and the letters they wrote in no wise praised the climate of the new land.

But the Puritans were a superior stock of people. They had enough independence to resist the regularism of their day and to maintain their own church. They had enough courage to seek freedom in a distant wilderness. The Puritans were of middle-class working stock, sufficiently accustomed to labor to enable them to stand the necessary toil of the hard new land. It is natural that such hardy stock later on should not flinch at the hazards of a seafaring life and should be able to subdue the forest as they moved westward to settle new commonwealths.

In the early days these courageous settlers had three possible means of subsistence. They could farm. They could fish. They could hunt. They did all three, but farming was the mainstay.

COLONIAL FARM LIFE

In what is now a territory of abandoned farms where city sportsmen hunt deer these settlers fought nature and tamed enough of the rough land to make thousands of the small self-sufficient farms of the domestic epoch.

To understand the life of this time, we should think of the early colonial farm as a self-sufficient unit where men produced goods for use rather than for exchange, and even when exchanged it was often by barter, money being almost a curiosity. The wheat and corn of the little fields made the family's hominy, porridge, and bread. The miller ground the grain for a share of it. The pig, sheep, and cow, with the game that the people might catch, furnished all the meat they had. A patch of flax made fiber for thread and for linen. Homespun wool, dyed with the stain of walnut hulls, fed the hand loom upon which was made the homespun cloth which illustrious men wore to the Continental Congress. The skins of the farm animals made the shoes. The woodlot fed the fire and furnished lumber for house, barn, and fence — when it was not of stone. At many a home forge the horse was shod and the wagon mended. Expenses for daily paper, telephone, and gasoline were

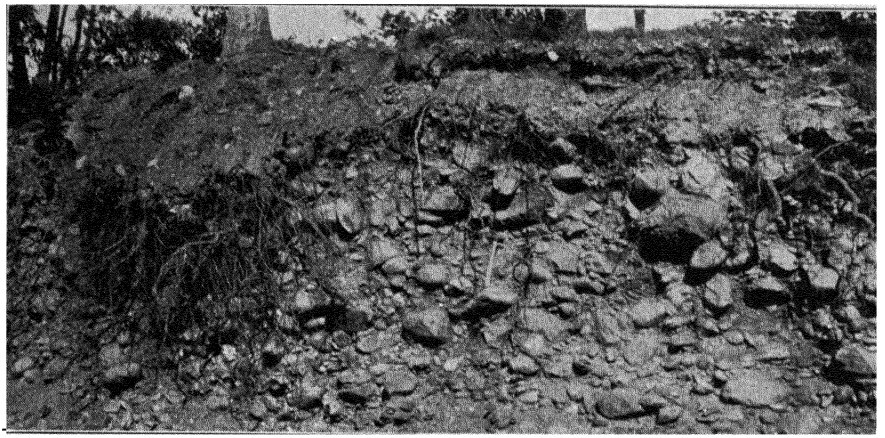

FIG. A. It is easy to see that this mass of earth material transported by glaciers is well drained and will yield crops of stones for generations. (Courtesy U.S. Geol. Survey)

undreamed-of. The family traveled on the plow horse when traveling was not done even more simply on foot, or in the fashion celebrated by Longfellow in the romance of John Alden and Priscilla.[1]

ENVIRONMENT AND POLITICAL EXPERIENCE

There was little immigration after 1640. The next hundred and fifty years were a period of the large family, of a rapidly increasing population, of a dense rural population in the lower areas of New England and Maritime Canada. The period has been justly celebrated as a precious time of preparation for political independence — whether formal like that in the United States, or informal like that in Canada. Their inability to migrate westward to large, new lands compelled the people of the Maritime district to live close to one another. The new colonies were neglected by the mother country. Consequently, in the course of several generations the people acquired the experience in self-government which eventually was crystallized in the American Constitution.

The English colonists were schooled in self-reliance by many teachers. As fishermen they had fought with storms on one of the worst oceans. As farmers they had fought nature to gain a piece of the earth on which to make a living. As interlopers in the red man's continent they had fought to the death the Indian (who had welcomed them), that they might take his land.[2] Then came quarrels among the new possessors — the colonizing powers of Europe. Then, as now, European quarrels reached across the Atlantic.

[1] A pamphleteer of 1786, a Massachusetts farmer, rehearsed these simple but manifold facts of the farm life at great length, and told how he lived comfortably by the expenditure of $10 a year, spent chiefly for metal, salt, and gunpowder, and how he had $150 of wheat money to save.

[2] This conquest is a shameful story. I should hate to defend the white man's end of it before the Creator of mankind — unless the ownership of good land is an offense meriting capital punishment.

France and England fought each other at rather frequent intervals, struggling for mastery both in Europe and in America, and the colonists took part in these backwoods campaigns.

THE STRUGGLE FOR MARITIME CANADA

The struggle between France and England for dominance in America made the eastern end of this region, the territory guarding the entrance of the St. Lawrence, very important. This river valley was then the only route from the Atlantic seaboard to the interior. Because the St. Lawrence Valley was the gateway to the continent it became the seat of the French empire in America. France was almost the dominating power in European affairs in the seventeenth and eighteenth centuries. So England, the upcoming rival, strove with France for the possession of this much-prized land. One of the great events in American history was the capture of Louisburg (1745) by New England colonists. This victory helped the American colonists to realize their destiny. If farmers and fishermen could capture a great fortress from the mighty French, could they not also stand erect and look England in the eye? This awakening of national consciousness fostered the sense of independence that early ripened into the Continental Congress and the Revolutionary War.

THE INVITATION OF THE SEA

It was but natural that the colonial New Englanders should turn to the sea to make a living. On the west the New Englander was confronted by a hostile wilderness, for the westward march of pioneers and covered wagons really did not get under way en masse until the nineteenth century. At home he was confronted with a thin and rocky soil and a long cold winter, both of which made farming difficult. Recurring generations of large families in a rough and meager land pushed the land hard in many places, as the many stone fences and the boulder-strewn little fields bear witness. There was no important agricultural commodity available for export. On the east was the sea, rich in fish. The heavily forested land upon which the New Englander lived provided material to make ships, and the indented coast line, with its many bays and estuaries, offered shelter for ships. The New Englander accepted nature's invitation to go to sea. Fishing, shipping and shipbuilding, and overseas trade became important industries.

FISHING

Save for the stormy climate, nature has conspired to make this a good place for fisheries.[3] The sunken coast, because it sank recently, is full of

[3] The Indian had made much use of the sea. Fish were so plentiful that it was a common Indian practice to place one under each hill of corn as fertilizer, a device copied by the colonists. Along the coast of Maine are heaps of oyster shells, 400 feet long, 30 feet high, said to be the largest in the world (*Literary Digest*, Oct. 6, 1923). These were left from Indian feasts — evidently oysters on the half-shell have long been popular.

bays. The rivers have wide estuaries. These places are good alike for catching fish and for sheltering ships. Maine falls little short of the full truth when it calls itself "hundred-harbored Maine."

Edible fish are more plentiful in cold waters than in warm. The cold winter afforded an unlimited supply of ice with which fish could be stored for a time. The cool summer permitted fish to be dried before they spoiled, which is impossible in warmer climates. Not only were the shores good for fishing, but off the shores were the fishing-banks, better (because nearer) for the Canadians than for the Yankees. East of Boston and south of Maine is Georges Bank. South of Nova Scotia is Sable Island Bank, and farther east are the Grand Banks.

EARLY SHIPBUILDING

While the abundance of fish in offshore waters beckoned the New Englander seaward, the forest back of him pushed. Hemmed in between the wilderness and the sea, many a colonist regarded the forest as a stupendous liability that meant a year's hard labor to clear a few acres of meager soil for farming. Soon, however, the forest became a prime asset, for it contained pine, tall, straight, and light, that could be used for masts and spars in shipbuilding, and tough oak for a ship's ribs and hull. Pine masts from the forests of Maine and New Hampshire provided New England with its first great export, for these great masts were highly appreciated in the timber-poor mother country, which only recently had become mistress of the seas.[4] The first cargo of ship masts was exported in 1634, and for over two centuries New England enjoyed a large and profitable trade in masts and ship timber.[5]

The men of New England used oak and pine to build their sturdy fishing vessels, and in time an important shipbuilding industry developed. It was in Gloucester in 1714 that Captain Andrew Robinson built the first schooner, a two-masted ship with fine lines and fore-and-aft rigging. This new ship, which was both fast and seaworthy, could be more easily navigated in our rivers and estuaries, where the wind would frequently draw up or down the channel, requiring a large amount of beating to windward in relatively short "tacks." In Yankee fashion it placed a premium on economy, for it required fewer hands to man the sails. While the sailors of Europe were climbing aloft on their square-rigged ships to take in sail at peril of life and limb, the Yankee stood on the deck and worked the ropes and pulleys which sent his sails up and down without waste of time and effort. The Yankee sailor tacked his ship into the teeth of the wind and outsailed ships of every design and every land.

THE RISE OF SEA TRADE

Sailing out to the Banks was a real sea voyage, on a very stormy sea. The vessels that could go to the Banks, fish for a week or two, and sail back could

[4] A road near Plymouth is still called "Mast Road."

[5] The unusual size of American masts required specially constructed mast ships of 400 or 500 tons, and occasionally 1000 tons, which held from 40 to 100 masts, with many yards and spars. These mast ships were the "liners" of colonial New England, bringing in passen-

go anywhere, and they did. Consequently the New Englander was soon engaging in trade.

It has often been said that Puritan commerce smelled of fish even more than Puritan theology smelled of brimstone. The New Englander took dried cod and salt herring to the Mediterranean and the West Indies. Since wheat would not grow in the West Indies, he took wheat flour and even biscuits; he took pine lumber and stuff from which barrels were made. The export of barrel staves was an important factor in the colonial trade, since many barrels were required to hold West Indian sugar, molasses, and rum, which, with other tropical produce, made a nucleus for the return cargo. These commodities were not only a welcome addition to the New England larder; their arrival planted the seed of future manufactures, for it was these ships which first brought to New England the cotton which became the parent of a major industry. The fishing schooner brought the molasses-born rum which made distilleries so important in the colonial epoch.

Fish were carried to the Mediterranean. Thence it was not far to the Guinea coast for a return cargo of Negroes. The New Englander brought most of the slaves to the South in the seventeenth century, and two centuries later his descendants spilled their blood freely to liberate the descendants of those slaves. For a time Boston and Newport were centers of the slave trade, and Newport was for a time the greatest slave market in America. A close relationship sprang up between the Newport traders and the Charleston, South Carolina, planters, which extended to a social intercourse between their families. It has lasted down to the present time; Newport is a favorite Northern resort for Southerners, and there are many connections between Newport and Charleston society.

THE ERA OF MARITIME PROSPERITY

The New England colonist, carrying his fish to market across the ocean, learned the ways of the sea and became acquainted with the people and the ports of Europe and the West Indies. Soon more daring voyages were undertaken. There was never a time when the urge to make fast ships was greater. War between England and France, or England and Spain, or England and Holland then meant, among other things, the privateer, and sometimes his half-brother, the *independent* pirate. Almost any ship was authorized to capture the ships of enemies. This was perhaps the golden age of piracy. Captain Kidd was neither a joke nor a myth; he was a daily menace. To distinguish between piracy and propriety was difficult, and many a New England fortune was made or started by the success of its citizens as privateers.

If you were a privateer, you needed a fast ship. Also you needed a fast ship if you were trying to escape from a privateer or a pirate. With such a premium on speed, many improvements were made in Yankee shipbuilding. The topsail schooner combined the good qualities of fore-and-aft and square

gers, troops, mail, and tea. See R. G. Albion, *Forests and Sea Power*, Harvard University Press, 1926, pp. 237–38.

rigging, its lower, top, and topgallant sails giving it greater speed than the ordinary schooner. Most of the "Baltimore clippers" of the latter part of the eighteenth century, the privateers of the Revolution and the War of 1812, and the packet ships that established the first line services across the North Atlantic were vessels of this type. In the construction of square-rigged vessels, the "American clipper" was the final achievement. These famous vessels, because of their streamlined hull design, were able to obtain a speed of 15 knots, weather permitting. It was during the clipper-ship era, 1845–60, that American shipping outsailed the British on every sea and won speed records alike in the China seas and the English Channel.[6] As the British turned to iron ships, driven by dependable steam, they beat the Americans, and American shipping declined.

Thus Yankee shipping and shipbuilding flourished from colonial times down to Civil War times. The United States not only had large supplies of timber but also able seamen, and naval architects with inventive minds. In 1775 a ship could not be built in England or on the Continent for less than $50 a ton; in America costs varied from $25 to $38 a ton. Indeed, at the outbreak of the Revolution one-third of the merchant ships under the British flag were products of American shipyards. For decades the men of Salem, Boston, Gloucester, and Marblehead loaded their ships with merchandise and sailed all seas, trading as they went and sometimes making a profit of several hundred per cent. The sailing ship laid wealth on Boston's doorstep; many a fine old coast-town mansion and many a Yankee fortune date from the "days of wooden ships and iron men."

THE RISE OF MANUFACTURES

New England is a great manufacturing region for several reasons. Perhaps one of the most potent reasons is the accident of an early start. The same urge that drove the New England farmer to sea in quest of fish caused him to seek a market for the handmade articles which the family could spare. As early as 1690 the wool produced by the New England weaver, fuller, and dyer was exported to England. This was soon forbidden by English law, for then, as it is now, abundance was the terror of the economic system. Then came the peddler — the man who went about among his neighbors seeking purchasers for his homemade goods.

THE PEDDLER

To sell his small surplus the farmer-artisan often became a peddler, or he let a neighbor with a more roving disposition take his goods and seek to sell

[6] The American clipper was given a bow with concave water lines, relatively great breadth at a point well aft of the bow, and a long overhanging stern. The schooner, because of its carrying capacity and its economy, survived the clipper, as the latter was driven from one line service after another by the more reliable steamer.

The first "American clipper" is generally held to be the *Ann McKim*, a three-masted ship of 493 tons with fine lines, low freeboard, and raking masts, built in Baltimore in 1832. Other authorities claim that the *Rainbow*, built in New York in 1845, was the first real American clipper.

them. In colonial times a man in Berlin, Connecticut, imported some sheets of tin from England. He hammered the tin into desirable shapes for cooking utensils, and taking a pack of the tinware upon his back, he set out to sell to his neighbors. This seems to have been the beginning of the famous Yankee peddling — a business which was favored by the long idle season of the New England farmer. The peddler carrying his wares upon his own or a horse's back, or in a cart or a sleigh, became a well-known figure over wide areas. First he sold only tinware, then such common necessities as cowbells, knives, platters, spoons, bolts, hinges, locks, and round metal balls to put upon the ends of the sharp horns of the ox. The making of these things tended to develop the skill of the local blacksmith and was perhaps responsible for the tribute of Longfellow's poem "The Village Blacksmith."

This peddler, far from home, with no reputation at stake and no expectation of developing a permanent connection with his customers, did not have a high reputation for honesty. The words "Yankee trick" originated from the peddler's mercantile practices. It was he who sometimes distributed basswood hams, white-oak cheeses, and wooden nutmegs. Connecticut is sometimes called the Nutmeg State, regardless of the fact that real nutmegs grow only in the torrid zone. But despite the occasional shrewdness, trickery, and immorality of this irresponsible pioneer of commerce, there seems to be little doubt that by making an outlet he helped to start manufacturing in New England.

SHIPS AND MANUFACTURING

There were peddlers not only on land but on the sea as well. A New England vessel sometimes took sugar to Newfoundland, bought fish, traded them for wine at Madeira or Portugal, traded wine for sugar in the West Indies, and repeated. Ships went out seeking markets, and the shipping industry contributed to manufactures in many ways.

The ships of Boston and Salem brought back many kinds of skins and hides from many distant places.[7] It was perhaps not entirely by accident that at Lynn, halfway between Boston and Salem, the shoemakers first applied division of labor to a job that for ages had been the work of a single artificer. Before the days of the large shoe factory much of the work was done in the homes. The sewing of uppers was turned over to the women of sailors' and fishermen's families, whose men were often away for weeks, months, and even (on whaling cruises) for years. There was scarcely a cottage along the shore between Boston and Gloucester where the womenfolk were not working for the shops of Lynn.

THE EPOCH OF WATER POWER

From this early hand manufacturing and trade there came to be a surplus of capital. This made New England ripe for the mill epoch. When the exciting news came across the Atlantic that machinery for spinning and weaving cotton had been invented in England, New England was ready.

[7] Read Richard Henry Dana, *Two Years before the Mast*, New York, 1840.



FIG. A. A boat to bring raw material and a water wheel to run the mill — a perfect location for an early start. Pawtucket, R.I., a cotton-mill center. (Courtesy C. F. W. Easton, Pawtucket, R.I.)

With mercantile sagacity, England prohibited by law the export of cotton-manufacturing machinery or drawings thereof,[8] but it could not prevent the export of ideas. So one day Samuel Slater, an English emigrant who had served an apprenticeship in one of Arkwright's factories at Belper, arrived in Providence, Rhode Island, with a head full of knowledge concerning cotton-manufacturing machinery. He soon found financial aid, and his mill, erected at Pawtucket, spun in 1790 the first machine-made cotton warp in America. By 1800 Slater's mill was surrounded by 29 others, erected and equipped with machinery by men whom Slater had taught. Ten years later there were 62 mills in New England and 25 more under construction. The first spinning

[8] In an attempt to guard the secrets of industrial growth, the following were prohibited by British law: the emigration of trained operatives (1765); the emigration of persons engaged in printing calico, linens, or muslins or engaged in textile manufacturing (1772); the exportation of textile machinery, plans, or models (1774); the exportation of any utensils used in the textile industry (1781); the emigration of workmen employed in iron and steel manufacture and the carrying out of tools (1785); the emigration of coal-miners (1789).

machines were driven by hand or animal power, but this practice was soon displaced by the widespread adoption of water power.

Thus began the first epoch of cotton-manufacturing in New England. Fortunes accumulated at sea started the cotton mills of Lowell and Lawrence in Massachusetts, of Biddeford and Saco in Maine, and of many other places. Wealthy shipowners and traders had the necessary capital. It was during the years 1807–15, marked by embargoes, nonintercourse, and war with England, that American manufacturing received its first great stimulus. With the exception of privateering, American commerce and shipping languished, and the investment of much New England capital for a time was diverted from shipping into manufacturing. During this period imports of foreign goods were reduced greatly, thereby stimulating the demand for American manufactures.

Water power has shaped New England's history and the distribution of its population much as a mold shapes hot metal which cools to its form. The entire region from western Connecticut to the tip of Gaspé is rich in water power that is unusually dependable. The rainfall is well distributed throughout the year. Many of its soils are porous, because of the glacier, and therefore they absorb much rain, which they hold in storage and let run out gradually through springs. The glacier left upland swamps and thousands of lakes, of which there are 180 within 25 miles of Boston. This combination of even flow and plentiful supply meant that the country miller was not so often subject to having his dams washed out and his raceways broken as was the miller in Maryland or Virginia and in other places below the glacial belt. The even flow of the stream meant only a short period of shutdown during the summer drought, and therefore a longer working year.

The glacier had sent the rivers into strange courses, providing waterfalls. New England's factories were built near falls and were therefore pretty well scattered, though they were kept in locations near harbors, with which the coasts were everywhere supplied.[9] It was natural, therefore, that Pawtucket should have been the first site of a power textile mill in New England, for its location on the Blackstone River is at a point where the large stream plunges over a ledge of rock, below which the river is navigable. As the waterfall sites near the seaboard became fully utilized, new factories, of necessity, were located farther upstream.[10]

THE INFLUENCE OF SCATTERED WATER POWER

Unlike the St. Lawrence Valley Region, the New England-Canadian Maritime Region has no place where a stream has power resources that are counted by hundreds of thousands of horse power. There are, instead, hundreds of small falls. For this reason the manufactures of New England became widely scattered in many small towns in the period between the

[9] Sixty-eight of the early settlements of New England were on or near these many harbors.

[10] Some of the first sites to be developed were outgrown at an early date. In 1813 the Boston Manufacturing Company erected a plant at Waltham on the Charles River; twelve years later the plant had outgrown its power resources there.

Revolution and the time of the Civil War. This point will be clear when we see, by contrast, the great human hive of New York. In 1930 Massachusetts alone had 30 cities having more than 25,000 people. In New England there were 55 such cities, but New York State, with more population by far than all New England, had but 23 such cities.

It is a surprise to see what small waterfalls served to start New England enterprises which eventually grew to great importance. It is said that at Southbridge, Massachusetts, on a branch of the Quinnebaug River, a man began to grind lenses and to make other optical instruments with the power of a stream so small that when it went dry in the summer he used a horse for power. Once he even paid a stalwart Negro 10 cents an hour to take the horse's place and furnish all the power he needed in his little mill.[11] Today on that very site is the great plant of the American Optical Company. This furnishes an excellent example of the growth of an industrial giant from a tiny industry which started beside a tiny brook. Most of these little mills have long since become picturesque ruins or have left scarcely discernible traces, but enough have survived to gather New England manufacturing into a host of little cities.

THE INFLUENCE OF AN EARLY START

An early start often develops an industry in a place that has a relatively poor location. Once established, the owner always faces a double dilemma — his plant is too big to move and too good to throw away. He can enlarge it, but he cannot move it. If sites for plants were chosen today, many of New England's inland manufacturing towns would be situated elsewhere, doubtless on some of the many navigable waters, with a power plant sending current over the hill by wire.

THE INFLUENCE OF THE CIVIL WAR ON MANUFACTURES

If names described the period, the Civil War would be correctly spoken of in New England history as the Second Revolution. It changed men's lives more than the Revolutionary War. The period of the war marked (but did not cause) two industrial deaths and many industrial births. The deaths were the passing of the wooden ship and the whaling industry. For decades whaling ships had sailed from New England and Canadian ports. The usual voyages lasted from one to three years, and the whalers went to every sea where whales were found. Nantucket and New Bedford, Massachusetts, were the greatest whaling-ports. New Bedford reached its peak of prosperity in 1857.[12] In 1859 a competitor was born when the first oil well was dug in western Pennsylvania, for kerosene proved to be a cheaper and

[11] R. M. Keir, "Some Responses to Environment in Massachusetts," *Bulletin of the Philadelphia Geographical Society*, October, 1917, pp. 1–18.

[12] In 1857 New Bedford interests controlled half of the entire American whaling industry. In that year there were 329 vessels in the New Bedford fleet, worth about $12,000,000, and employing about 10,000 seamen.

better oil for the family lamps throughout the world. As has already been noted, this sealed the doom of the whaling industry at the very time when scientists, economists, and shipowners were becoming alarmed at the prospect of the early extinction of whales. The declining demand for whale oil is revealed by the decline in price from over $1 a gallon in 1850 to about 35 cents at the close of the century. In 1871, 33 whaling vessels, including 22 vessels from New Bedford, worth over $1,000,000, were caught and lost in the ice pack north of Bering Strait. New Bedford's population declined between 1865 and 1870, but the old families, rich with whale money, shifted their interests from whales to cotton mills, for their city was well placed to take advantage of the third epoch of New England manufactures — that of dependence upon coal. This epoch had begun about 1840. Then auxiliary steam plants were built in places where one water-power site after another proved too small for the growing industry to which it had given birth. This change threw the advantage back again to the coast cities. New Bedford typifies this growth. In 1860 it had 22,000 people; in 1870, 21,000; in 1880, 27,000; in 1890, 41,000; in 1920, 121,000; in 1930, 113,000. Sixth largest among Massachusetts cities, New Bedford ranks third in the value of its manufactured products. In 1938 Bristol County, in which New Bedford is located, had 2,403,560 cotton spindles in place, more than any other county in the country. Its great cotton-textile industry, like those in many New England towns, has suffered from Southern competition, with the result that many mills have been closed down or abandoned. This loss has been only partially compensated by the development of the rayon industry, which in 1937 turned out over $14,000,000 worth of goods and employed more than 4300 workers. New Bedford's seaboard location is one of its industrial assets, for the coal that is used for power is imported cheaply by water, as are raw cotton, fuel oil, gasoline, and other bulky commodities. A deep-sea fishing fleet, boatbuilding, and the manufacture of marine equipment are the sole heritages of a great maritime past.

The growth of New Bedford is typical of the industrial revolution which the Civil War brought to New England. At that time, as today, although to a less degree, war was an economic struggle. Other things being anywhere near equal, victory went to the army that had the best supplies. The four years' struggle of that war sent to New England factories sums of money which previously would have been considered almost unbelievable. These huge sums were paid for the rifles, the cartridges, the bits, spurs, buckles, bayonets, blankets, uniforms, overcoats, socks, shoes, caps, tents, flags, and all of the other kinds of goods used and wasted by hundreds of thousands of men on the march, in camp, and on the battlefields. Immigrants rushed from Europe into the El Dorado of good wages. Boston gained 40 per cent between 1860 and 1870.

After the war the Northern states dominated the American Congress and saw to it that the protective tariffs gave most of the American market to the American (chiefly New England) mills. Maritime Canada, having no such huge market within its free-trade zone, has had a much smaller development of manufactures — a good example of the accidents of history.

THE INFLUENCE OF WESTERN LANDS

Then followed another of the accidents of history. After the reconstruction of war wastes, and between 1870 and 1900, the rush began to settle the western half of the Mississippi Valley. The Civil War had loosened men from their old places. The period before the war had equipped the eastern half of the country with railroads. We were then ready to equip the West. New inventions had made cheap steel. Plants that had manufactured war materials were ready to manufacture steel into farming equipment.

The prairies were level, treeless, most easy to settle. The stage was set for a postwar boom. It is doubtful if the history of the world elsewhere affords a parallel example of the speedy occupation of land. The Eastern states, particularly New England, scattered their sons and their grandsons over an inland empire. They can be trailed by town names as well as by family history. Portland, Maine, and Salem, Massachusetts, reappear in Portland and Salem, Oregon. There are twenty-seven Salems, twenty-five Manchesters, twenty-five Newports, twenty Plymouths, and nineteen Lexingtons in the United States, to the misery of postal clerks.

THE ERA OF ABANDONED FARMS

From the time that the *Mayflower* discharged its cargo of famous ancestors, and its unbelievable amounts of "genuine" antique furniture, until the present day, the average New England farmer has had a hard time making a living from the thin soil of his rocky little fields. As other economic opportunities developed, it was but natural that many farm people should seek more lucrative employment elsewhere. During the nineteenth century three powerful economic forces dealt heavy blows to New England agriculture and contributed to farm abandonment.

First may be mentioned the improvement of transportation facilities between East and West, which opened the floodgates through which poured upon Eastern markets a deluge of cheap Western grain and other farm products. The opening of the Erie Canal in 1825 reduced the time for making the trip from Buffalo to New York from twenty to eight days and cut the freight rate from $100 to about $5 a ton. The success of the Erie Canal ushered in an era of canal-building that lasted until about 1850. The phenomenal development of American railroads came in the latter half of the century, for the period prior to 1850 was largely one of pioneering and experimentation in railroad-building. In 1850 there were only 9000 miles of track, but by 1870 the mileage had doubled, and in 1880 it had reached a total of 93,000 miles. As independent lines were combined into great systems and as railway construction and equipment improved, rates declined, and the railroads became the prime movers of the nation's freight.

The settlement of the West and the cultivation of vast expanses of productive farm land constituted a second powerful force contributing to the troubles of the New England farmer. Tales of stoneless, level land, black with fertility, to be had for the taking lured many a farmer family westward.

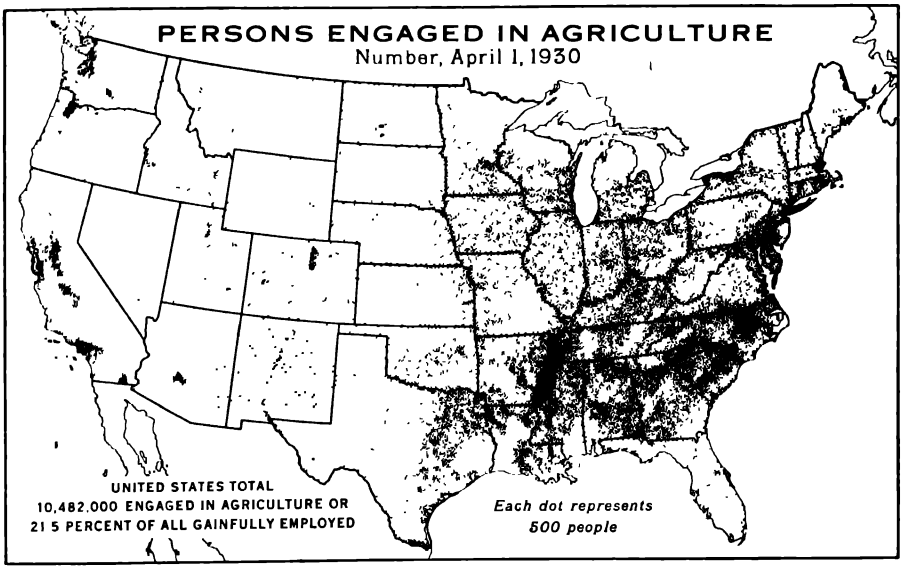

FIG. 90 A. Agriculture: South, 53%; North, 38%.

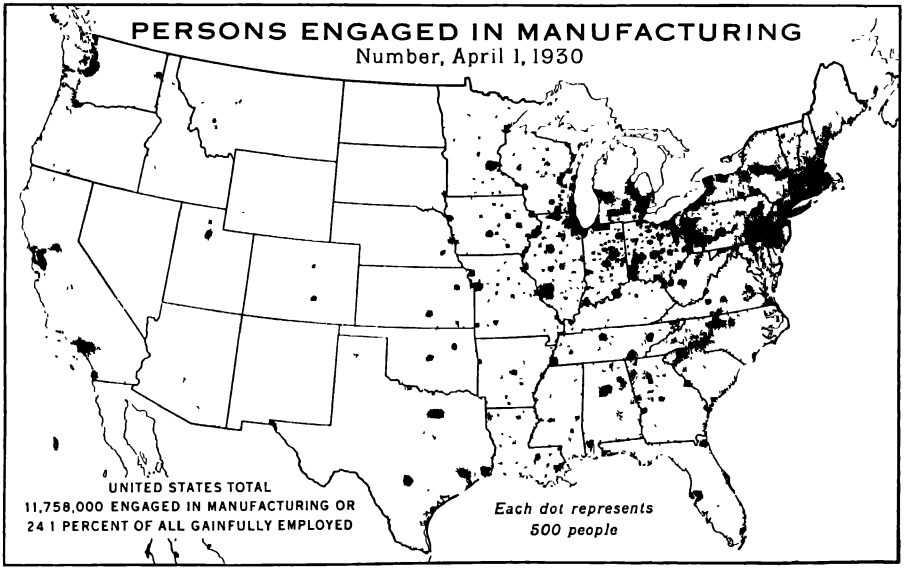

FIG. 90 B. In manufactures, South 19%, North 73%, and 11 Western states 7%. Note the contrast between Lower and Upper New England. (Courtesy U.S. Dept Agr.)

For the families that went West the railroads gave access to distant markets and made possible a type of farm that sold one or two commodities and bought everything else. For the families that remained on their high-cost New England farms, the railroads brought cutthroat competition. The virgin soils of the fertile West dumped upon Eastern city markets and Europe a flood of cheap produce. The American wheat crop more than doubled between 1860 and 1880. The price of wheat in England declined from 56 shillings a quarter in 1877 to 22 shillings in 1894.[13]

A third great force contributing to farm abandonment was the remarkable development of New England manufacturing. Thousands of farmers' sons and daughters, who had seen their parents struggle to make a living, yielded to the siren call of factory wages. Here in New England occurred the first great American movement from farm to city. The old family farm could not compete with the shorter hours of toil, the better pay, and other attractions that were offered by life in the city.

As a result of these great economic forces there followed an episode of industrial history probably without parallel. Thousands of families abandoned their farms. Sometimes abandoned farms characterized almost the whole of a community — the house with windows boarded up, sagging roof, rotting well sweep, weeds and hollyhocks growing wild in the yard, and the fields grown up to wild roses, brambles, bushes, and finally the young forest. The extent and the causes of this abandonment are shown by this table:

IMPROVED LAND BY GROUPS OF STATES EXPRESSED AS PERCENTAGES OF 1870

(1870 = 100%)

	1880	1890	1900	1910	1920 [14]
New England	109.6	89.5	67.8	60.5	51.0
East North Central	137.7	143.5	157.9	162.0	160.1
West North Central	260.5	448.8	577.0	698.8	729.0
West South Central	276.3	444.8	578.9	848.1	934.3

[13] Edward Cressy, *An Outline of Industrial History*, London, 1915.

[14] This table cannot be continued, because the Bureau of the Census have changed their minds about what we should know. The Bureau of Agricultural Economics, U.S. Dept Agr., reports as follows: "The Census has not obtained a figure for improved land since 1920. We have made an estimate for 1925, 1930, and 1935 approximating the 1920 figure, by adding the total crop land, the plowable pastures, and with an allowance of three acres per farm for the farmstead, with the following results:

IMPROVED LAND, ESTIMATE

Year	*Connecticut*		*Massachusetts*		*Rhode Island*	
	Total acres	*Per cent land area*	*Total acres*	*Per cent land area*	*Total acres*	*Per cent land area*
1925	709,061	23.0	872,881	17.0	121,335	17.8
1930	610,016	19.8	802,533	15.6	113,427	16.6
1935	749,022	24.3	861,621	11.7	116,517	17.1

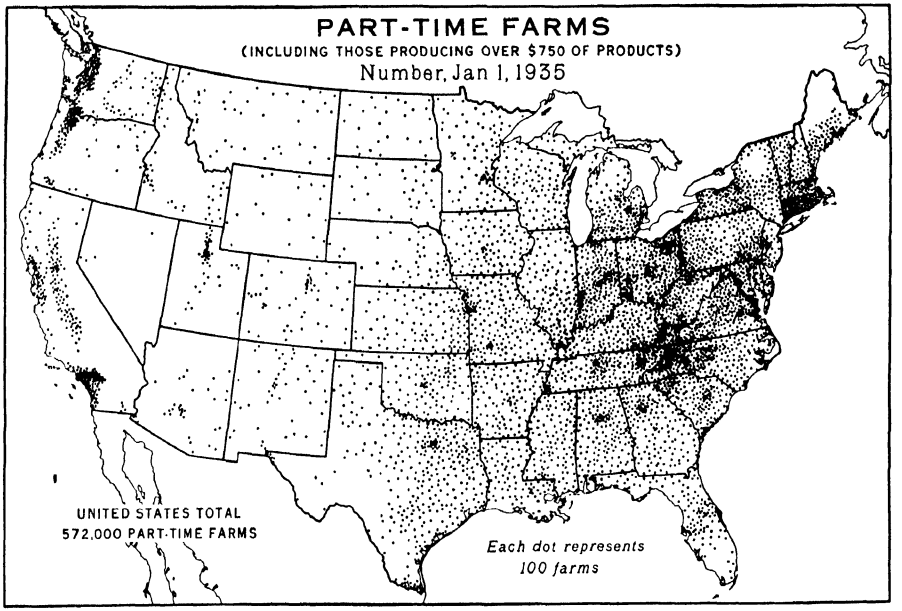

FIG. 92 A. Part-time farms — those in which the operator worked more than 150 days off the farm. Suburbanism stands out very plainly here. Also the poor little mountain farm. (Courtesy U.S. Dept Agr.)

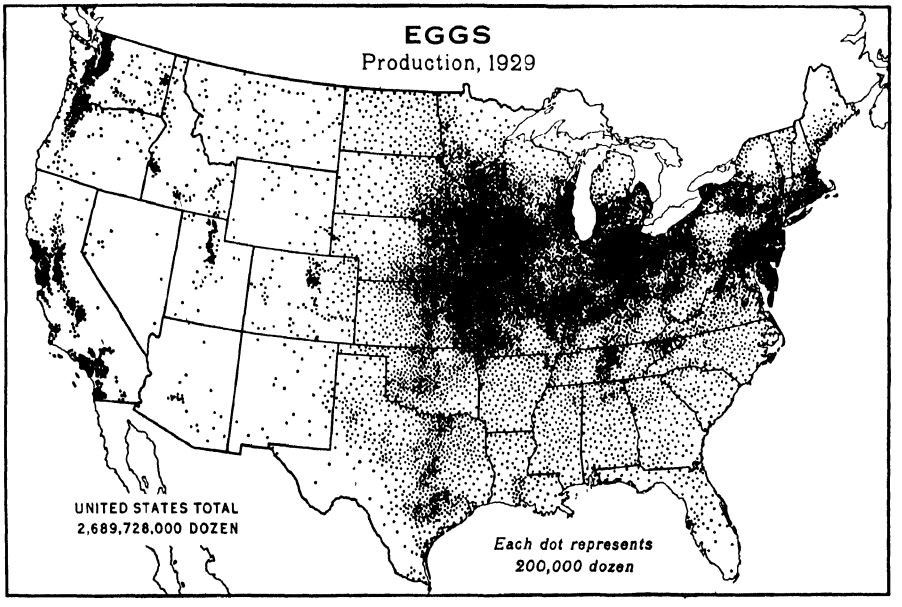

FIG. 92 B. The egg crop, far more valuable than gold and silver combined, is suburban to be near the Eastern market, or rural to be near the hen's food supply. (Courtesy U.S. Dept Agr.)

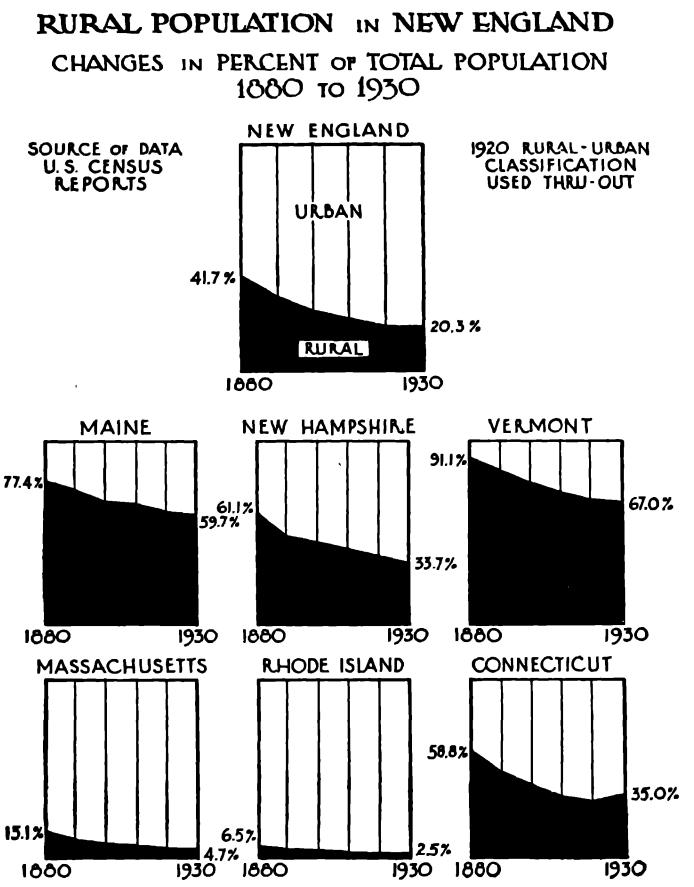

FIG. A. These graphs give one measure of the decline of farming and the rise of manufacturing. (Courtesy Nat'l Resources Board)

The figures for New England are deceptively large. The director of the Vermont Experiment Station told me in 1908 that about half of the so-called improved land of that state was then growing up in forest.

The 75 per cent loss in one seashore county of New Hampshire immediately adjacent to the many mills of that section is typical of the many counties where the factory offered its greatest opportunity to the farmer boy.

LAND UNDER CULTIVATION IN ROCKINGHAM COUNTY, NEW HAMPSHIRE

1870	235,605 acres	1900	102,058 acres
1880	223,544 acres	1910	113,573 acres
1890	179,402 acres	1920	86,336 acres

THE PRESENT — A LAND OF CITIES

In 1940, after the forces above enumerated had had a century to work out their results, we find a great contrast between the Canadian and American

ends of this region. The Canadian part is rural; the American part has become, one might almost say, a collection of cities. The boom period of the World War helped to make this condition still more acute, as every Allied army called on New England for munitions and supplies. The 1930 census indicates the predominance of manufacturing in New England, 43 per cent of the gainfully employed population being engaged in manufacturing.[15] Since these figures include rural Vermont, the importance of manufacture is still greater in the Maritime Region.

Fifty-six per cent of the people of the United States live in cities, 77 per cent of all New Englanders and 38 per cent of all those in the three Canadian Maritime provinces. Note the astonishing figures in Lower New England states, wholly or almost wholly within this region.

INCREASES IN POPULATION IN NEW ENGLAND SINCE 1910

	1910	1920	1930	1940 URBAN POPULATION		*Per cent increase of pop. in 30 years*
				Population	*Per cent urban*	
Massachusetts	3,366,416	3,852,356	4,249,614	4,316,721	89.4	28.2
Rhode Island	542,610	604,397	687,197	713,346	91.6	31.5
Connecticut	1,114,756	1,380,631	1,606,903	1,709,242	67.8	53.3
New Hampshire (Hillsborough, Merrimack, Rockingham counties)	231,595	239,780	250,067	263,740	66.0	13.8
New Hampshire (all counties except those above)	198,977	203,303	215,226	227,784	47.9	14.6
Maine	742,371	768,014	797,423	847,226	40.5	14.1
Vermont	355,956	352,428	359,611	359,231	34.3	0.9
Iowa	2,224,771	2,404,021	2,470,939	2,538,268	42.7	14.1
United States	91,972,266	105,710,620	122,775,046	131,669,275	56.5	43.2
	1901	1911	1921	1931		
New Brunswick	331,120	351,889	387,876	408,219	31.6	23.3
Nova Scotia	459,574	492,338	523,837	512,846	45.2	13.6
Prince Edward Island	103,259	93,728	88,615	88,038	23.2	− 14.7

So great is the urban population, so meager is agriculture, that someone has estimated that Connecticut produces each year only enough mutton to

[15] U.S. CENSUS OF 1930 — NEW ENGLAND WORKERS

Manufacturing and mechanical industries	1,478,958
Trade	438,956
Clerical occupations	346,194
Domestic and personal service	343,517
Transportation and communication	253,056
Professional service	252,268
Agriculture	212,619
Public service	76,971
Forestry and fishing	22,027
Extraction of minerals	6,601
Total persons occupied	3,431,167

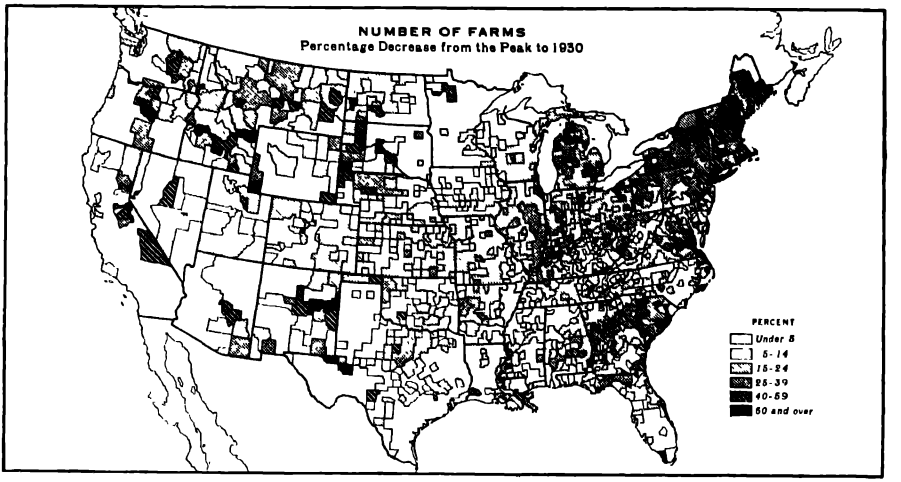

FIG. A. The migration maps (Fig. 18 A) will throw light on this. (Courtesy U.S. Dept Agr.)

meet the needs of its people for one day, only enough beef to meet their needs for eight days, and only enough potatoes to meet their needs for fourteen days. In Massachusetts the value of fish per capita in 1935 was $2.17; of farm crops, $5.90; of factory products, $472.11. The essentially urban character of the population is obvious. This urbanization is new, and it is perhaps a moot question if it can last. In 1790 New England had but 3 per cent of its people in cities, and the figure had only risen to 21 per cent in 1870.

BOSTON

Boston is well called "The Hub," for in New England "all roads lead to Boston." Three of the spokes were constructed in 1835: the Boston and Lowell R.R.; the Boston and Providence R.R.; and the Boston and Worcester R.R., which was extended to Albany in 1841. The Boston and Maine was organized in 1842, and seven years later Boston was connected by rail with New York City. Today a splendid railway, highway, and airway network focuses upon Boston, making it the great commercial gateway of New England.

In 1935, according to the state census, Boston had over 800,000 people within its municipal limits,[16] and the Boston Basin, a low plain surrounding the city, is dotted with towns, some of which are an unbroken continuation of Boston. Within a radius of 30 miles are 80 towns and cities that help to form the great Boston "metropolitan district," where live 2,385,000 people, more than a fourth of the population of all New England.[17] In size of popula-

[16] In 1930 Boston had a population of 781,000, according to the Federal census.

[17] 1935 census data: Cambridge, 118,000 people; Lynn, 101,000; Somerville, 101,000; Quincy, Newton, Medford, Malden, and Brookline, over 50,000 each; Everett, about 50,000; Salem, about 44,000.



FIG. A. Boston is our leading wool market. The importance of its port is attested by these bales of wool, all from Argentina. After many processes and many wage payments they will become suits and overcoats. (Courtesy Boston Chamber of Commerce)

tion this area is exceeded only by the metropolitan districts of New York, Chicago, Philadelphia, and Los Angeles. In per capita wealth and savings metropolitan Boston ranks first. Within this district are more than 5000 factories, employing about 254,000 workers, with an annual pay roll of about $254,000,000, and producing a wide variety of products worth over $1,200,000,000. No single industry dominates the Boston industrial area. The combined value of the output of its three leading industries (woolen and worsted goods, leather footwear, and printing and publishing) amounts to only one-fourth of the total value of its entire industrial output.[18]

Nature endowed Boston with one of the finest harbors along the Atlantic seaboard, yet Boston ranks only eighth among American ports in the total weight of cargo handled.[19] For decades the port of Boston has lagged behind its rivals, New York, Philadelphia, and Baltimore. A number of facts help to explain the slower growth of Boston's commerce. In the first place, Boston had no Erie Canal, which was a mighty factor contributing to the early supremacy of New York. Secondly, it had no through trunk-line railroad to bring vast amounts of Middle Western traffic to its doorstep, as did its rivals.[20] And, thirdly, railway and ocean freight rate differentials have favored New York, Philadelphia, and Baltimore at the expense of Boston.[21] As a result, Boston's hinterland is restricted to New England,[22] and this hinterland has mighty little of bulk and weight to export.[23] Boston's imports, including such commodities as wool, hides and skins, paper and

[18] In comparison, Detroit's automotive industry makes up 72% of the total value of the industrial output of its metropolitan area; Pittsburgh's steel, 43%; Los Angeles's petroleum-refining, 24%; and New York City's clothing, 19%.

[19] Boston is exceeded by New York, Houston, Philadelphia, Baltimore, Beaumont, Port Arthur, and Los Angeles.

[20] New York has long been served by the New York Central R.R., Philadelphia by the Pennsylvania, and Baltimore by the Baltimore & Ohio. The Pennsylvania and the B & O found it advisable to extend their lines to New York at an early date.

[21] Terminal costs and practices have also contributed to Boston's difficulties. The three railroads serving Boston act independently of each other in handling terminal freight, virtually dividing the water front into three separate ports. New England was settled by *individualists*, and here we see one of the many costs individualism inflicts upon us.

[22] An exception is the Canadian grain trade, a portion of which moves via Boston when the St. Lawrence is closed by ice.

[23] Manufactured goods do not usually occupy much space in comparison with staple commodities. The heaviest foreign export in recent years has been scrap iron.

pulp, sugar, bananas, coffee, and cacao, comprise 90 per cent of its foreign commerce. Its coastwise trade, which is three times as important as its foreign commerce, is also badly balanced; inbound traffic, including such items as crude oil, gasoline, coal, and cotton, is nine times as heavy as outbound traffic. The result is that ships come in full and leave hungry, and ocean rates for Boston are higher than they otherwise would be.

THREE INDUSTRIAL CIRCLES

Boston is the greatest wool market in the world, save London.[24] It is a great market for hides and skins, which ships bring from every continent. The city itself has varied industries, and it is surrounded by three circles of specialized industry. The inner circle is the leather circle. In it are included Peabody and other suburban cities that contain great tanneries. Next comes the circle of the shoe towns — Haverhill on the north, which boasts of being the greatest center in the world for the manufacture of women's shoes and slippers, and Brockton on the south, with a similar record for men's shoes.[25] Lynn, in the midst of the shoe region, is the rival of both Brockton and Haverhill. In recent years there has been a strong tendency for the shoe industry to migrate westward and for new factories to locate in such cities as St. Louis, Milwaukee, and Chicago in order to be nearer to the growing markets of the Middle West. Nevertheless, New England still produces over a third of the nation's shoes. Massachusetts leads the Union, and in 1938 its 294 factories produced nearly 77,000,000 pairs of leather boots, shoes, and slippers, or one-fourth of the total output of the United States. A development of recent years has been the growing manufacture of rubber footwear, 44 per cent of the nation's output being produced in the Boston metropolitan area.

Walking the streets of Lynn, one realizes what concentration an industry can have; the signs upon the places of business read Heels, Welts, Insoles, Uppers, Eyelets, Thread, etc., etc. It is an astonishing proof of the degree to which even a simple commodity like a shoe, so long made by one man, can be subdivided and become the work of scores of industries and thousands of people.

[24] In 1936 nearly 400,000,000 pounds of raw wool were received in Boston.

[25] VALUE OF BOOTS AND SHOES (OTHER THAN RUBBER) 1937

(millions of dollars)

1. Massachusetts	152.0
2. New York	125.8
3. Missouri	103.3
4. Illinois	65.4
5. New Hampshire	64.0
6. Ohio	49.4
7. Maine	42.6
8. Wisconsin	41.5
9. Pennsylvania	40.9
10. Tennessee	20.9

Four Massachusetts cities, Brockton, Lynn, Haverhill and Boston, together produced $143,000,000 worth of shoes in 1935.

Textiles make the third industrial circle around Boston. It reaches from New Bedford, Fall River, and Providence around to Lowell and Lawrence. Over half of New England's cotton manufactures (11.4 per cent of the nation's total) are produced in the Boston metropolitan and the Providence-Fall River-New Bedford areas.

Boston is often the center where business is transacted for factories located miles distant. Boston is the leading shoe and leather *marketing center* of the country, and within its shoe district are the offices of nearly 1000 different firms representing various branches of the industry. Nearly 20 per cent of Boston's total foreign trade, on the basis of value, consists of the importation of hides and skins and the exportation of leather and footwear. Boston is also the greatest Northern market for raw cotton. Textile mills and machinery plants 50, or even 100, miles away buy materials and sell the finished product in the Boston office, to which the material is never sent. Indeed material for export is sometimes made in Lawrence or New Bedford, sold through the Boston office, and exported by way of the export houses and the shipping lines of New York.

THE TEXTILE INDUSTRY

The products of the whirling spindle and the noisy clanking loom overshadow all other New England industries, and employ about one-fifth of all the factory hands of Lower New England. Ranks of looms reach across the wide floors of weaving rooms like rows of corn across the Central Plain, and the multitude of spindles tended by a single worker makes one think of perpetual motion and endless multiplication. The section between Portland, Maine, and New York City produces more than one-fourth (26.8 per cent, 1929) of the cotton manufactures, and over one-half (56.3 per cent, 1929) of the woolen goods, of the entire United States. This fact explains Boston's wool market. It also explains why the textile industry is the chief concern of the New England politician, who, after all, must reflect what the public wants. The textile industry even affects the curricula of the schools, as it doubtless should, for schools must strive to prepare young people for making a living as well as for being citizens.

Why is the textile industry so important here? Many factors have contributed to make it so, factors that have shifted in relative importance with the passage of time. The story of how the Industrial Revolution was first transplanted from old England to New England has already been told, and there is no denying the fact that the impetus of an early start has been a powerful and long-enduring advantage to the New England textile industry. The abundance of water power made easy the early use of power-driven machinery, although the time arrived when New England was forced to augment its power resources by importing coal.[26] Climate also played a role,

[26] For example, Fall River may be considered as the mature type of New England industrial town in that it was started with the water power furnished by the Little Fall River (1813). In fifty years this power supply was outgrown, and since 1865 production has been carried on chiefly by steam generated by imported coal.

as it did in Lancashire, for the moist New England climate facilitates the manufacture of textiles by keeping the thread from getting dry and brittle, and it also reduces the amount of electricity in the thread, which often makes the thread snarl and tangle. In this age of modern science humidifiers can fill the factory air with the exact amount of moisture needed, but the expense of operating such machinery is less in moist New England. From the very beginning the New England textile industry has been favored with an adequate supply of capital and a large and growing market. Railway rates have not been unfavorable to New England's domestic commerce, and its textiles have had easy access to markets throughout the country. Nearness to raw materials is no prerequisite for the manufacture of textiles, whether it be cotton, wool, silk, or rayon; indeed, it is cheaper to ship 100 bales of cotton from the fields of Dixie by either rail or water to a Northern market than to ship over an equal distance the finished goods that could be made from the raw cotton. New England, like old England, has long enjoyed a splendid supply of skilled labor, which gives it a definite though narrowing superiority in the production of high-grade fabrics.

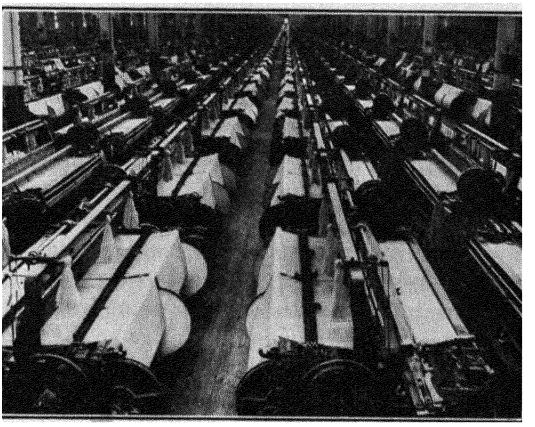

FIG. A. A 9-acre loom room, 4000 looms, Salem, Mass. The largest loom room in the world. Will it stay there? (Courtesy N.Y. & N.H. R.R.)

In spite of all these advantages, one great branch of its textile industry, cotton-manufacturing, has been seceding from New England. For decades New England had an abundant supply of cheap labor, but with the growth of labor unions, the enactment of social legislation, and the dwindling of immigration, this advantage has virtually melted away, causing a real crisis in its cotton-textile industry. The following statistics on active cotton spindles reveal the serious loss occasioned by the southward migration of the cotton-textile industry:

MILLIONS OF ACTIVE COTTON SPINDLES

	1900	1920	1930	1938
New England states	13.2	18.3	11.3	5.9
Cotton-growing states	4.4	15.2	18.6	18.1
Other states	1.9	2.0	1.3	.7
Total U.S.A.	19.5	35.5	31.2	24.7

THE WOOLEN INDUSTRY

In contrast with the migrations that have occurred in the shoe and the cotton-textile industries, the manufacture of woolen and worsted goods has remained firmly entrenched in New England. Lower New England manufactures over half the wool in the United States. Several reasons help to explain the concentration of the woolen and worsted industries in the northeastern section of the country, and in New England in particular. In the first place, these industries specialize much more in cloth that goes into wearing apparel than does the cotton-textile industry. Hence it is desirable for factories to be near the central point from which the mysterious force of style emanates, which means proximity to New York City. Secondly, the higher value of woolen and worsted goods makes it desirable to be near a market with large purchasing power, which is to be found in the large urban centers of the Northeast. Thirdly, the manufacture of woolens and worsteds, especially the finer fabrics, calls for skilled factory workers and for specialists in the chemical and physical laboratories. Finally, over half of the raw wool consumed in the United States is imported from such distant places as New Zealand, Australia, Argentina, and South Africa, so a location at or near the seaboard serves to eliminate or reduce the expense of a rail haul.

Within New England the wool and worsted mills are scattered over more territory than the cotton mills. The cotton fiber was not abundant until after the beginning of the nineteenth century, so cotton-spinning and cotton-weaving in the homes of New England were never widespread. When the cotton gin was invented, the industry developed not in the households of New England, but primarily as a mill and city industry, whereas every village and almost every farmhouse made woolen cloth, and when textile machinery came, little woolen mills started where the village industries were. Thus woolen mills were scattered all up and down the valleys in remote places where small water power would run a few machines, for example, in the Berkshire Hills country of western Massachusetts and the central upland around Worcester.

Despite this wide dissemination, the last sixty years have brought great concentration of wool manufacture in Lawrence, Massachusetts, which makes about one-eighth of the national production. Lawrence is dependent chiefly upon the water power from a series of three falls in the Merrimack River. This power resource attracted a man named Samuel Lawrence, who, with his partners, bought the falls in 1843. Four years later the first mill began to produce woolen, worsted, and cotton goods. This city now has the largest worsted mill in the world. The mills of one company in this one city turn out cloth so fast that the output would make a piece long enough to reach to England as quickly as an ocean steamer could get there. Providence and Woonsocket, Rhode Island, and Lowell and Holyoke, Massachusetts, are also important wool centers.

Holyoke, Massachusetts, is situated at a bend of the Connecticut River. As it curves around the city, the river falls 57 feet. This fall has been harnessed by a great dam, which feeds three levels of power canals, about 5 miles

in length. The water runs from the first canal through a number of mills, then drops into the second canal, and then into the third, for the second and third power utilization in the same town. This unique canal system was conceived in 1849, long before the days of electric transmission. Now the method would be to make a central plant that would furnish power for all of the mills. Holyoke's textile products include woolens and worsteds, silk, cotton, rayon, and alpaca, but it is from its great paper mills that it takes the name "The Paper City."

At Danbury, Connecticut, the fur from the rabbit skins of many lands is turned into felt hats, to the surprising extent of one-fourth of the total output of the United States. The hair of fur becomes felt by being beaten and rubbed until its tiny scales cling to each other.

THE BRASS AND HARDWARE INDUSTRIES

The brass and hardware industries are good examples of Yankee skill. Like the textiles, these industries are concentrated. Connecticut specializes in brass, making a large portion of the brass goods of the country. This is probably due to the peddlers of the early days, who soon got to carrying brassware as well as tinware. The industry is centered in a string of towns in the Naugatuck Valley, northwest of New Haven. From the brass industry developed the cheap clock, for which Connecticut has long been famous, and it has long ranked first in the production of watches, clocks, and parts thereof. This state also makes two-fifths of the needles, pins, hooks and eyes, and snap fasteners. Connecticut, Massachusetts, and New Hampshire make about half the nails of the country and a large portion of the tools. Over two-thirds of the firearms of the United States are made in Connecticut and in parts of Massachusetts adjacent to it — Bridgeport, New Haven, Hartford,[27] and Springfield, Massachusetts, being the great centers. The greatest center of hardware manufacture is the town of New Britain, which makes nearly one-tenth of the hardware of the country (1935), and before the World War celebrated its pre-eminence with the following statement in the paper of the local board of trade:

> This morning you probably arose from a comfortable night's sleep on a New Britain spring bed; you put on some attire furnished with New Britain buckles, some attire woven on New Britain looms; you visited a clothes-closet fitted out with New Britain hooks to which you gained access by unlocking a New Britain lock, turning a New Britain knob, then allowing the door to swing upon New Britain hinges. At breakfast you used New Britain cutlery, drank coffee from a New Britain percolator, read your mail brought you from a New Britain letter-box, slitting the envelope with a New Britain penknife. You walked through a hall built by New Britain tools and made solid with New Britain screws, opened a front door which was prevented from slamming by a New Britain doorcheck, and jumped into your New Britain automobile, or into a carriage drawn by horses with New Britain trimmings, to go to your office warmed by a New Britain register.

[27] The people of Hartford, Conn., have a queer combination of dealers in life and death — firearms and life-insurance companies. From the 45 insurance offices of this city $7,000,000,000 has been paid to policyholders and beneficiaries to date, and enough has been kept to support 18,000 employees and help to make the city rich.

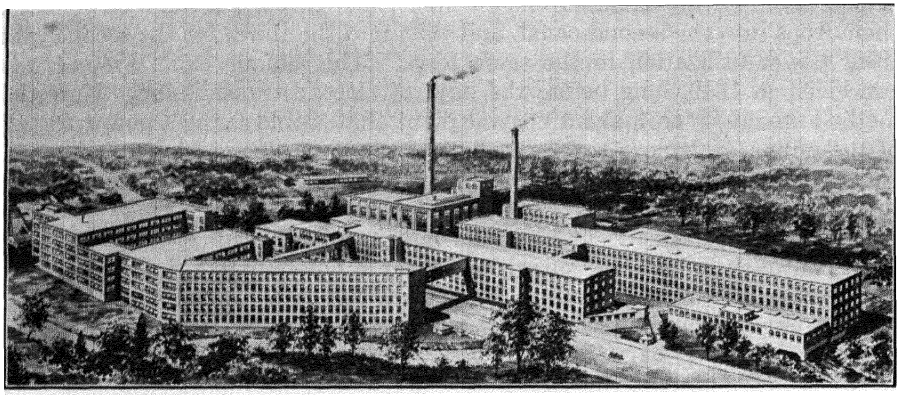

FIG. A. Yankee ingenuity is illustrated by the size of this plant, the Oakville Division of the Scovill Mfg. Co., Oakville, Conn. Here 900 people make common pins and safety pins, hooks and eyes, garter trimmings, snap fasteners, thumbtacks, and such gadgets according to demand. (Courtesy N.Y. & N.H. R.R.)

During the World War this town boasted that it furnished parts for airplane, battle tank, and submarine.

The peddler with his pack was a convenient means for the early distribution of jewelry, of which the Providence-Fall River-New Bedford area makes over one-third of the American output (1935). The variety ranges from the ten-cent-store brilliants to the best of plate and solid metal.

CAUSES OF INDUSTRIAL CONCENTRATION

Why have the industries of New England been gathered into special centers? Some cities, like Worcester and Boston, boast the great variety of their industries. In contrast to this, Fall River has 68 per cent of its workers engaged in making cotton, and New Bedford has about 80 per cent in textiles. In Brockton, 80 per cent, and in Lynn, about 20 per cent, make boots and shoes. In Waterbury, Connecticut, 53 per cent work on brass, bronze, and copper products.

The rough surface of New England has undoubtedly helped to produce the specialization of industry. Much of the country is hilly, and the towns are scattered along the streams because of the water power. In the early days hills made communication between towns difficult unless the towns were in the same valley. Valley specialization resulted, until today some New England valleys are almost one long-drawn-out settlement with a common industry, such as the brass industry of the Naugatuck Valley of Connecticut, the textile industry of the Merrimack Valley (Lowell and Lawrence, Massachusetts; Concord, Manchester, and Nashua, New Hampshire). Other examples of valley industry are the paper industry of the Androscoggin and Connecticut valleys.

Concentration has also come about because imitators have followed the lead of some successful pioneer. Often the son has followed the father, and other members of the family have taken up the business until all the mill-

owners of a town may be more or less related. There are cases of mills that have been in the same family since before 1840.[28]

The skilled labor of the established industrial center is a force tending to bring there other industries of the same kind. The skilled artisan is usually a permanent worker living in his home, and he expects to have his family with him. Such a man is hard to move, hence from the manufacturer's standpoint the greatest opportunity to obtain skilled labor is usually in an established center. The mechanical skill of the particular trades often goes from father to son. It may almost be said to be in the air. The knowledge of and the talk concerning the chief local industry make an intellectual background for the people, and they are apt to be a little more skillful than other workers. This is a reason why manufacturers who want to engage in the industry in question should and do go to an established center to start the new enterprise.

If the manufacturer wishes to establish an industry in a place where there is no trained labor force, he meets difficulties, as was shown by the experience attending the opening of one of the first shoe factories in St. Louis. Workers from New England were transported on special contracts to do the work, but they had to be paid more than twice the amount they had received in the great shoe factories of the home town in Massachusetts. It is thus plain that the many established manufacturing industries of New England may be said to have their roots driven deep into its rock-bound soil.

THE RESULTS OF CONCENTRATION

This concentration has a number of advantages. It is easier for the mill-owner who wishes to borrow money, because the financiers of the community know the condition of the industry and are able to estimate the risk. A banker would not be wise in lending much money to a man starting a new and untried industry in that locality. Also, buying the raw materials and selling the finished product are easier where there are many manufacturers. When machinery breaks down or needs repair, skilled mechanics who know how to do the work are at hand. The industry can divide and subdivide; for instance, one mill will spin, another weave, another finish, dye, or print. By-product industries rise, such as the glue industry around the fishing-wharves or those mills of many kinds that use the shorter fibers which are waste to other mills. Finally, legislation and the education of the town can favor the one dominant industry. Textile schools are common in textile centers.

Concentration also has its disadvantages.[29] When an industry becomes dull, the whole town is dull. A certain Massachusetts town lives from the pay roll of two cotton mills. In 1924 one of the mills was shut down. This was temporary industrial death. Every merchant in town was scared about the credit accounts he was building up with the people who had no work

[28] This fact is also advanced to help explain New England's textile decline. The grandson may inherit the *works* but not the genius or the energy or the necessity to exert himself.

[29] For a fuller discussion of the economics of concentration, see R. M. Keir, *Manufacturing*, Ronald Press, 1928.

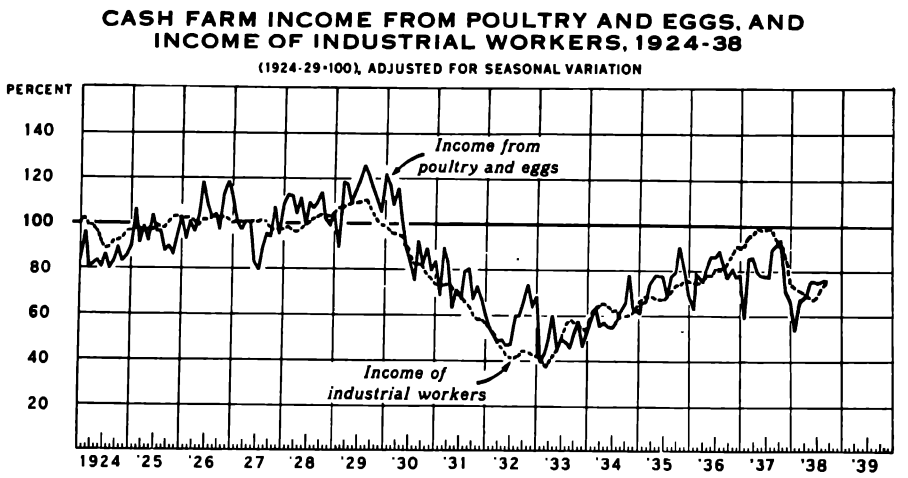

FIG. A. This shows how money keeps moving and how one group passes its prosperity on to another. (Courtesy U.S. Dept Agr.)

and hence no money. Everybody felt blue. Men loafed and grumbled, women worried, and children were getting less to eat than they had been getting. The salesman of the closed factory came back without orders again and yet again. Then one day he packed his suitcase for a long trip. The whole town turned out in procession with songs and prayers to see him off on the night train. It was like cheering the departure of a college football team, but was much more serious. The salesman wired back an order for upholstery for Ford cars. The mill whistle blew again. The Chautauqua Association renewed its contract, and there was again butter on the bread.

THE MANUFACTURE OF MACHINERY

Following textiles and shoes, the manufacture of machinery is the third industry in importance in Lower New England. This industry belongs in this region by a kind of economic right. It is a kind of parasite, a hanger-on, or a purveyor to the other manufacturing industries. For the textile, shoe, and other mills of New England many machines are needed. It costs a great deal more to ship the finished machines than to ship the raw materials used in making machinery — iron, copper, brass, tin, and wood. Therefore there is a natural tendency to make the machinery near the place where it is to be used.[30] Furthermore, there is a great advantage for repairs and replacement of factory machines when the machine-producing factory is near the

[30] Ohio ranks first in the production of rubber machinery because of the great tire industry of Akron; Connecticut ranks second, New Jersey third. Wisconsin leads in the manufacture of woodworking machinery, Illinois second, Ohio third. New York ranks first in canning machinery, Illinois second, California third. Missouri holds first place in manufacturing shoe machinery, with Massachusetts a close second. Alabama ranks first in cotton-gin production, Texas second, and Georgia third. (Figures from the *Biennial Census of Manufactures, 1935.*) Holyoke, Massachusetts, with dozens of water-power plants, was the natural place for the manufacture of the turbines for Niagara.

machine-using factory. Once machines are in operation, it may be the workers who discover defects and devise improvements. New England has been the center of the inventions that have built up machine design. Thus shoe machinery has been perfected until every process is now a machine operation.

The natural results of these advantages appear in New England's production of 52 per cent of the textile machinery of the United States (Massachusetts having over 38 per cent), even though much of it may be used in new textile plants in the South or the West. One usually finds upon textile machines the names of Worcester, Lowell, Hyde Park, or Whitinsville. The same facts explain the importance of Beverly and Boston in the manufacture of shoe machinery, and also the centralization in New England of the manufacture of paper machinery for use in the paper industries of the Upper New England forests.

THE TENDENCIES AND THE FUTURE OF NEW ENGLAND MANUFACTURING

Lower New England lives by trade. Its people live by selling manufactured produce which they make of imported raw materials in factories, many of which are driven by imported coal;[31] meanwhile the operatives eat imported food and live in houses built with imported wood and heated with imported fuel. The particular facts show a condition almost without parallel. The New Englander buys from other sections his fruit, cereal, sugar, tea and coffee, bread and butter, meat and cheese, cotton, leather, iron, indeed, every raw material he uses except a part of the wood and building-stone.[32] Not

[31] Here are three very thought-provoking columns of figures:

POTENTIAL AND DEVELOPED WATER POWER

	Potential power available		*Installed capacity h.p.*
	*maximum h.p.**	*minimum h.p.*	
Maine	806,000	524,000 †	593,000
New Hampshire	293,000	167,000 †	477,000
Vermont	193,000	115,000 †	274,000
Massachusetts	211,000	125,000 †	441,000
Rhode Island	13,000	5,000 †	28,000
Connecticut	125,000	52,000 †	191,000
New Brunswick	169,100	68,600 ††	133,300
Nova Scotia	128,300	20,800 ††	130,600
Prince Edward Island	5,300	3,000 ††	2,600

* Available 50 per cent of the time.
† Available 90 per cent of the time.
†† At ordinary minimum flow.

Source: U.S. Dept of Commerce, *Statistical Abstract of the United States, 1938*, 1939, p. 364; Canada, Dominion Bureau of Statistics, *Canada, 1939; The Official Handbook of Present Conditions and Recent Progress*, 1939, p. 66.

[32] He has within his rocky boundaries an abundant supply of marble tombstones and granite for the more pretentious monument.

even the United Kingdom is so dependent upon material from some other region.

The cost of freight is therefore an important factor in New England life, and it shows itself in the character of its industries The manufactured product must be of high value to stand the freight charges in and out. Therefore the freight cost must be small and the labor cost must be high. This means *skill*. Indeed, in no section of the United States is skill so conspicuously evident in every important industry. Think of the metal products of New England — rifle, skate, pocketknife, hardware. Consider the bar of silver which becomes the wedding gift of silver plate, and the yet more precious bullion that goes out as jewelry. Under the skillful processes of manufacture brass becomes the alarm clock that arouses the slumbering world to labor. Compare the bulk and weight of Pittsburgh's pig iron, sheet steel, rails, and skyscraper skeleton with all this fine produce of New England. A freight rate of $10 per ton on $50 worth of materials for skyscrapers is a very different thing from $20 per ton on rifles worth $2000 or more per ton.

SOUTHERN COMPETITION

Can New England keep on buying everything and at the same time increase in prosperity and human numbers? This is the Number One Economic Problem that confronts New England today. Will the migration in the shoe and cotton-textile industries be followed by other migrations? Will New England become a land of abandoned factories as it once became a land of abandoned shipyards, whaling wharves, and farms? Will New England capital and labor and brains be able to cope with the problem? The postwar events that have occurred in its cotton-textile industry are part and parcel of New England's fundamental economic problem. An examination of these events will help to give a better understanding of the problem as a whole.

The great depression in American business during the 1930's brought to a head a crisis that had been approaching for years in New England's cotton-textile industry. Since 1880 cotton mills have been increasing more rapidly between Richmond, Virginia, and Montgomery, Alabama, than they have between New York City and Augusta, Maine. In 1880 the active cotton spindles in New England outnumbered those in the cotton-growing states 16 to 1; in 1900 the ratio was 3 to 1; in 1910, $1\frac{1}{2}$ to 1; in 1920, $1\frac{1}{5}$ to 1; and in 1924 the ratio was 1 to 1. Since then the cotton-growing states have surpassed New England with a ratio of $1\frac{1}{2}$ to 1 in 1930 and 3 to 1 in 1938. The years 1923–24 were a sad landmark in New England's cotton-textile history. Since 1923 the number of active cotton spindles has declined sharply (18,000,000 in 1923, 11,000,000 in 1930, 6,000,000 in 1938). Since 1924 the South has held supremacy, and the number of active cotton spindles in the cotton-growing states has increased slightly (17,000,000 in 1924, 18,000,000 in 1938).

The events that occurred within a single decade, 1923–33, are almost incredible. Within this brief span of years the average number of wage-

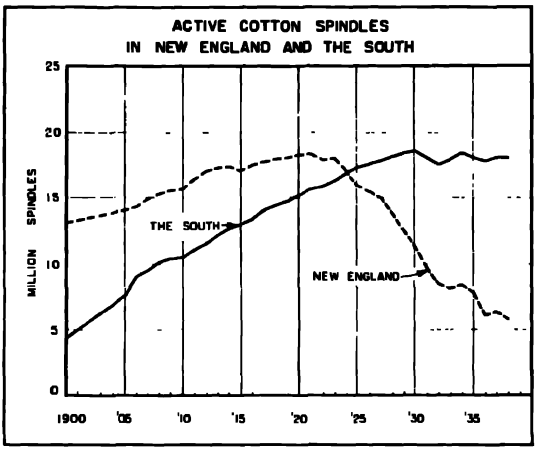

FIG. A. Here is something that keeps some New Englanders awake at night. (*U.S. Statistical Abstract*)

carners in New England's cotton-textile industry declined from about 209,000 to 92,000; the number of mills declined from 510 to 194; the number of active spindles from 18,000,000 to 8,000,000; and the number of bales of raw cotton consumed from 2,050,000 to 884,000. On the other hand, in the cotton-growing states the average number of wage-earners increased from about 238,000 to 271,000; the number of active spindles from 16,000,000 to 18,000,000; and the number of bales of cotton consumed from 4,248,000 to 5,087,000 — although the number of mills showed a slight decline from 772 in 1923 to 710 in 1933.[33] These data tell a sad tale indeed for New England, a story of unemployed workmen, idle and abandoned mills, a declining demand for raw cotton, and increasing competition from the South.

The chief explanation of these phenomena, so alarming for the North, is to be found in the longer hours and lower wages of the Southern cotton operative. The Southern textile-mill operators raised a howl of protest when a 40-hour week was established under the ill-fated NRA and a minimum weekly wage was set at $12 for Southern mills, only $1 less than the wage prescribed for the North. In many Southern factory towns there have been, and still are, no labor unions to contend with. Other factors that have caused many Northern companies to build new factories in the South, rather than enlarge the old factory in the North, are the lower land values, rents, and taxes to be found in and around the smaller Southern towns. Does this mean that the whole cotton-textile industry is to go South and that New England will lose its major industry? And will others follow, so that New England will have abandoned factory towns?[34] On the other hand, will

[33] The data for cotton-growing states include California, which had 4 cotton-textile mills in 1923 and 8 in 1933. The total average number of wage-earners does not include Arkansas and Missouri in 1923 nor Kentucky, Louisiana, Missouri, and Oklahoma in 1933, as the *Biennial Census of Manufactures* does not give individual data for these states.

[34] On Christmas morning, 1935, the *Manchester* (New Hampshire) *Union* announced the bankruptcy of the Amoskeag Manufacturing Company, which had employed 17,000 of Manchester's 76,000 people and operated 20,000 looms in 75 cotton mills extending for a mile on both sides of the Merrimack River. When a Federal court later ordered the vast properties to be sold at auction, many foresaw the doom of Manchester. The citizens pooled their resources, and within ten days a citizens' committee, organized by a hardware merchant, Mr. Arthur Moreau, bought the property for $5,000,000 and organized a new firm under the name of Manchester Amoskeag Industries, Inc. Within a short time 30 new industries were housed in the old cotton mills, a triumph on the part of citizens who were

the further development of labor unions in the South and the enactment of more Federal and state legislation protecting the workers slow up the southward migration of industries that exploit cheap labor, and perhaps give a new lease on life to New England mills? Will the people of the great Southland, which is so rich in natural resources, realize that low wages and long hours are at best a temporary and doubtful advantage, and that "human erosion," like soil erosion, does not pay? The answer to New England's fundamental economic problem depends upon people — human energy, human skill, and human laws. In mere physical materials New England is on an unstable economic basis.

If an industry is capable of being completely standardized and carried on by workers who do not have to use much energy or intelligence, New England probably cannot hold its own in competition with places where food and raw material, power and living-costs, are cheaper than its own. Cotton-textile machinery was the first manufacturing machinery made. The industry is fairly well standardized, but it is extremely suggestive that it is the coarser yarns and the coarser cloths that are being made in the South, while the finer products are being made in New England. The South is improving the quality of its output, however, and the final question is, Can the Southern worker become absolutely as efficient as the Northern worker? If so, the Northern worker may have to accept a lower standard of living because of the greater cost, or give up the competition with the South.

THE PLACE OF SKILL AND ENERGY

This brings us back to the real question of human energy and human efficiency. Men do not work with equal ease in all climates. New England workers are doing the things which require skill, like operating shoe machinery, and a large proportion of these skilled operatives are well educated. If climate makes men hustle and makes their minds work, it is quite likely that the New Englander can keep on for decades, generations, perhaps even for centuries, inventing things that others had not thought about and producing specialties that others cannot make — just yet.

If highly fabricated products are to be made, the disadvantages of New England are not so heavy as one at first might think. Take the disadvantage of the absence of coal — the great base of modern industrialism. A typical Fall River cotton mill, with a capital of $1,250,000, sold during twelve months cotton goods worth $1,341,000, and used coal costing $37,485, or 2.8 per cent of the value of the goods sold. Granted a handicap of 50 per cent on coal in comparison with the mill in Appalachia, it figures out that this fuel disadvantage for the factory was but 1.4 per cent of the value of the product.

The final question concerning the future of New England manufacturing is,

determined that Manchester should not become an abandoned factory town. The new plan, however, has been none too successful, for in September, 1938, only 1604 persons were employed. During 1937 the average monthly employment was 2662, or 30% of the 1934 employment in the old Amoskeag mills. The wage bill in 1937 was only $2,200,000, as compared with $6,400,000 in 1934.

Can its workers maintain superiorities of brain, energy, and manual skill sufficient to offset a handicap of 10 per cent or 15 per cent in comparison with Alabama or the Ohio Valley? Otherwise its workers may abandon its factories as they have abandoned its farms.

The researches of Mr. Ellsworth Huntington, who was born in Galesburg, Illinois, and is teaching at Yale, as to the influence of climate indicate that New England has a climate that makes human energy, more of it than other climates (see his *Civilization and Climate*, Yale University Press, 1915). Very suggestive indeed are the figures on the average number of days that a New England child attends school in a year and the per capita expenditures made by New England states on their public elementary and secondary schools.[35]

SUPERPOWER

Soon after the World War men began to talk about superpower. New England and Maritime Canada are likely to benefit by the cost reductions that result from the application of the so-called superpower plans. Superpower promises the connection of New England mills with power plants on the St. Lawrence, at Niagara Falls, and connection with plants near the coal-mine mouth in Pennsylvania and Nova Scotia.

If producers sought abundance rather than scarcity, superpower plans would make rapid strides. The knowledge has been in hand for years. The chief causes of delay have been and are conservatism and the fighting power of vested capital, some of which will suffer by the improvements.

THE MANUFACTURES OF MARITIME CANADA

New England and Maritime Canada are two parts of the same region, but there is a strong contrast between them. The Canadian part, quite the reverse of the American section, is poor in industrial development but by no means poor in materials for manufacturing. Maritime Canada has abundant and accessible coal and iron, the natural foundation stones for an industrial civilization. Yet, with the exception of a small steel industry at Sydney on Cape Breton Island, Nova Scotia, the Maritime provinces remain industrially the "land that was passed by." Within the provinces of Nova Scotia, New Brunswick, and Prince Edward Island live only one-tenth of the people of Canada. Within these provinces are produced manufactures that amount to only one-thirtieth of the total value of Canada's manufactured output. Geography and politics have militated against the development of manufacturing in this area. On the one hand, the Maritime provinces are poorly located to supply the Canadian market. On the other hand, they have long been barred by high American tariffs from their natural

[35] In 1936 the average number of days of attendance per pupil enrolled in public elementary and secondary schools was 156.5. In Mississippi the average attendance in schools for white children only was 111 days; in Alabama, 115 days; in North Carolina, 140 days; and in Negro schools the average was lower than in white schools. In New England the expenditure for the current expenses of public elementary and secondary schools per capita of enrollment was $85.37. In Mississippi it was $21.61; in Alabama, $24.17; and in North Carolina, $30.45.

market in the seaboard communities of the New England and Middle Atlantic states.[36]

Canada is a strangely divided nation, economically and commercially. It is chiefly three lobes of good land projecting out from the United States into the stony forests of the North. In the center, the wheat lands of Manitoba are a continuation of Dakota and Minnesota. To the eastward, across 900 miles of uninhabited forest, are the plains of Ontario, a continuation of Michigan and western New York. Other hundreds of miles of uninhabited wild land separate the farms and factories of the St. Lawrence Valley from the farms and the few factories near the Atlantic. Through most of their history, the Maritime provinces have been worse than an island, so far as access to the other parts of Canada is concerned. The St. Lawrence is frozen half the year, and during that season, until the building of the Intercolonial Railway in 1876, the only way to reach the rest of Canada was by traveling through the United States. The Intercolonial Railway, Canada's gesture of independence, makes such a long detour around the lands of Maine that it is but little used and is financially unprofitable. This railroad renders the same kind of national service as a warship or a fort -- it might be handy in war.

The result of these factors which discourage manufacture is shown in the well-nigh static population of the Maritime provinces. They are another New England without the factory towns. The largest city, Halifax, has less than one-twelfth the population of Boston. This is true despite the possession near by of a finer collection of resources for the manufacture of iron than can be found anywhere in Europe, Asia, or North America, save in the one district of Birmingham, Alabama. The iron and coal for Cape Breton are close together. Everywhere else something for iron manufacture must be carried a long distance. Pittsburgh smelts the ores of Lake Superior. England smelts the ores of Spain and Sweden. The island of Cape Breton has 200 square miles of coal on tidewater, with many of the deposits reaching far under the sea. On the cliffs not far from Sydney seventy seams of coal outcrop. Several are 5 or 6 feet thick and one is 9 feet thick, with only 2½ feet of shale separating it from the next lower seam. Some of these coals are good for steam, others for gas, others for coke. Large deposits of limestone are near for flux, and a short ocean voyage brings the excellent ores of Newfoundland, dug on tidewater, to the iron plants on tidewater at Sydney, which is already called the Pittsburgh of Canada and has a growing iron and steel industry. If we had in operation a free-trade arrangement with Canada,[37] this locality would furnish much of the iron and steel for the Atlantic seaboard, while the American plants on the Great Lakes would in turn supply central Canada. Cape Breton is a natural source for New England coal, and some is imported despite tariffs.

[36] The closest approach to free trade between Canada and the United States was achieved during the period of reciprocity, or the low-tariff era, in 1855–66. The recent trade-agreements program has lowered tariffs between the two countries on specific products, but it is a far cry from free trade.

[37] Among the Canadian products that were granted lower duties by the 1936 and 1938 trade agreements were spiegeleisen, ferromanganese, ferrosilicon, cast-iron fittings for cast-iron pipes, unprocessed iron castings, iron or steel chains, and woven wire cloth. The duty on Canadian coal was not lowered.

OTHER MINERAL RESOURCES

Aside from coal, this region has few mineral industries, although it has three minerals most favorably located on tidewater and good harbors. These three are gypsum, limestone, and building-stone. In Cape Breton there are millions of tons of gypsum that can be quarried and loaded upon seagoing vessels. At times it is exported to the United States.

The whole rocky coast from Boston northward can furnish limitless amounts of building-stone which can be loaded on ships with little effort. Rockport, Massachusetts, located on Sandy Bay, and Rockland, Maine, have doubtless got their names from good natural reasons. At both places building-stone is quarried almost at the ship's side, and Rockland has the advantage of limestone, which permits the shipment of burned lime by water to many other coast towns.

Except the coast of Cape Breton, the most salient feature of the mineral equipment of this region is its poverty, although deposits of oil shale in New Brunswick may, in some era of scarcer petroleum, give rise to an industry that far outranks anything now in the Maritime provinces. It is reported to be nearly twice as rich as the Scotch shale, which has already been worked at a profit. No other group of American states has so little mineral output as New England.

FISHERIES

The fishing industry in the New England-Canadian Maritime Region has much more nearly shared the fate of agriculture than that of manufacturing, although it has not actually declined. The New England fishermen catch between 4 and 6 pounds per capita for all the people of the United States, but the value is rarely as much as $3 per capita for the people of this region.[38] The Canadian part has the better fishing-resources, being nearer the Grand Banks. The number of persons engaged has increased somewhat during the last twenty years,[39] although the capital investment has decreased from $13,900,000 in 1920 to $10,600,000 in 1935. This is partially due to the fact that the fishermen of Maritime Canada have been slow to turn to "mechanical fishing," for in 1935 they owned only 3 steam trawlers among their fishing equipment.[40] As has been pointed out, the coming of the mechanized steam and Diesel trawlers, which virtually plow the ocean for fish, has sealed the doom of the fishing schooner, that great sailing vessel of the past.[41]

The coasts of Canada are among the richest lobster fisheries in the world, and the lobster canned in the many canneries along these shores is widely distributed throughout the world. Catching lobsters is a one-man job. In

[38] In 1929 it was $3.60 per capita; in 1935, $2.12.

[39] In 1920 there were 29,656 persons engaged in fishing in the three Maritime provinces; in 1931, 27,824; and in 1935, 34,260.

[40] The fishing equipment of the Maritime provinces in 1935 included 10,586 sailboats and rowboats and 10,246 gasoline and Diesel boats.

[41] The modern trawler is equipped with great funnel-shaped nets that drag along the ocean floor and scoop up vast quantities of fish. The fish are stored on ice during the trip to market.

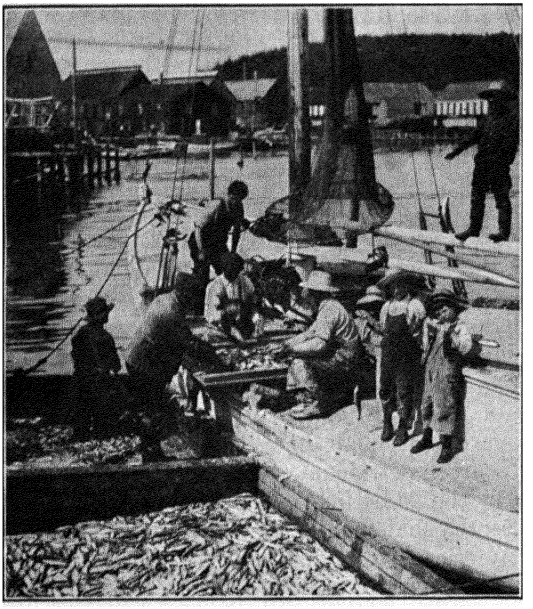

FIG. A. Sorting herring on the coast of New Brunswick. (Courtesy Canadian Pacific R.R.)

a rowboat or a gasoline launch the lobster fisherman visits the baited crates or lobster pots that he has set in the in-shore waters. He pulls up each crate to see if a lobster has crawled inside. Lobsters are almost in the class of domestic animals now that the eggs are artificially hatched and the young crustaceans are allowed to grow for some months in ponds on the shore before they are turned out into the sea to grow up and fatten. Overfishing on the New England coast, in violation of the law that requires small lobsters to be thrown back, has greatly reduced the catch.

Gloucester, which is known for its preparation of salted fish for distant markets, was once the most famous fishing-port in the United States. After the World War the combination of low prices and a fishing-trust produced hard times for the Gloucester man. In 1933 Gloucester had but 129 fishing vessels in place of its old-time fleet of 400. Today only a twelfth of the New England catch is landed at Gloucester.

New England ports receive about one-fourth of the nation's fish supply, and Boston claims to be the leading fishing-port of the Western Hemisphere. More than 400,000,000 lbs. of fish are landed annually in Boston, about one-fourth of which come from Canadian and Newfoundland waters. Another 150,000,000 lbs. are received at other New England ports, chiefly Gloucester, Portland, New Bedford, and Provincetown. Haddock, because of the filleting branch of the industry,[42] leads all other species and normally amounts to about half of the total catch, but large quantities of cod, mackerel, redfish,[43] hake, flounders, and pollock are landed throughout the year. A large "package trade" has developed in recent years as a result of improvements in marketing and transportation, and New England fish are sold even west of the Mississippi River.

[42] The process of filleting has made possible the more widespread distribution of fresh fish. It consists in cutting or stripping the meaty sides, or fillets, of the fish after it has been cleaned or scaled; the fillets are wrapped in a special vegetable parchment and packed in tin boxes, which, in turn, are packed in ice in a second container. An improvement in 1928 permitted the quick freezing of the fillets after they are cut and prepared; this actually preserves the normal condition and flavor of the fish and has greatly extended the market.

[43] The rosefish, or redfish, is a newcomer that has found popularity in Western markets. In 1936 an unusual catch of 100,000,000 lbs. was landed and sold.

Like agriculture, fishing is subject to the law of diminishing returns. Like the soil on the land, the fish in the sea can be subject to misuse that may lead to exhaustion, for there is a delicate balance between nature and reproduction that can be easily disturbed. The fish in the sea comprise a resource that is renewable and inexhaustible if used wisely by man. Here is a problem in scientific study and social control. The sea has great unused, untouched, almost unknown resources if we study them carefully and use them scientifically.[44] America as yet is too rich in resources to bother much with such things as scientific tree-cropping or scientific study of the sea. Proof of this statement lies in the figures of the annual fish consumption per capita — United States, 13 lbs.; Canada, 29 lbs.; Norway, 44 lbs.; Sweden, 52 lbs.; England and Wales, 35 lbs.; Japan, 55 lbs.

THE POPULATION OF NEW ENGLAND

New England is the land of a passing race. Newspapers often speak of Massachusetts and other New England states as though Yankees were their dominant human stock and Puritanism the dominant faith. Time was when this was true, but that day has passed. New England, especially southern New England, the region of manufactures, is the land of immigrants and sons of immigrants.

From the settlement of Plymouth until 1800, the population was almost pure British, chiefly English stock. During the first ten years after the settlement, 2500 British immigrants came. There was another large immigration after the Restoration of the monarchy in 1660. For two and a quarter centuries, during the period of poverty and struggle, the Yankees increased, beat down the forest, won the fields, sailed the seas, and went forth to populate Western commonwealths. Then came the era of manufactures, riches, and prosperity. The Puritans, although they had dominated New England and much of the United States during nearly all of its history, ceased to bring forth many sons and daughters, and have become a regretful though still potent minority in the land of the new immigrant.

THE ERA OF MODERN IMMIGRATION

Since 1850 great changes have come to the New England population. First, the emigration of the rural population to the towns and to the West; second, the new immigration from Europe. The prosperity of the manufactures of New England has made its towns a labor market. In the '30's and '40's the New England textile mills were "manned" by farmers' sons and daughters. Then the magnet of high wages drew in the foreigner, and the Irish and the French Canadian jostled the Yankee girl at the loom and the spinning machine. In three-quarters of a century before the World War the process made a new New England. Its population was increased by every wave of immigration from Europe, whether produced by prosperity here or by hard times there. One great influx of immigrants was due to the Irish famine of

[44] See J. Russell Smith, *The World's Food Resources*, Henry Holt and Company, 1919.

1846. The failure of the potato crops in that densely populated island, which then had 8,000,000 people and now has about 4,200,000 (Eire and Ulster, 1936), caused deaths by starvation and large and sudden emigration to the United States, of which New England received a large share. The high birth rate of French Canada and the lack of manufacturing development have made it an important source of emigration to New England, and after the general revival of prosperity in 1898, people drawn by the opportunities of the mill towns came by thousands and tens of thousands from southern and eastern Europe — Italians, Poles, Russians, Austrians.

The people have changed as much in racial composition as they have in distribution on the land. While the United States in 1930 had 11 per cent foreign-born, New England had 22 per cent foreign-born, and together with those who had one parent foreign-born had the surprising total of 60 per cent, in comparison to but 5 per cent in our Southern states. New England's population has been made over.

These figures, which are for all New England, do not fully cover the case, because the new immigrant has gone to the city, while the farm still continues to be the stronghold of the old stock.[45] The figures for Massachusetts and some of its cities show how completely the new arrivals have overwhelmed those whom they found in possession:

IMMIGRANTS IN MASSACHUSETTS CITIES, U.S. CENSUS, 1930

(population in thousands)

	Total	*Native white of native parents*	*Foreign-born*	*Chief foreign element*
Fall River	115	24	32	Canadian 8.9
Haverhill	49	20	11	Canadian 3.6
Holyoke	57	13	16	Canadian 5.3
Lawrence	85	14	29	Italian 6.5
Lowell	100	27	26	Canadian 10.1
New Bedford	113	22	37	Canadian 8.4
Boston	781	200	229	Canadian 44.2; Irish from the Free State 43.9
Massachusetts	4250	1430	1055	Canadian 288; Irish from the Free State 138.3; Italian 126.1; English 78.4; Polish 71.4; Russian 67.6; Swedish 36.8; Lithuanian, 25.2; Portuguese 24.8

EXIT THE PURITAN

A colleague in Harvard tells me that on a Sunday afternoon in spring one may hear on Boston Common "every language but English." There are places in New England towns where the stores have signs "English Spoken

[45] Maine, with a population of 797,400, has 100,300 foreign-born, and of these 36,900 are French Canadians from beyond the northern boundary and 36,800 are other Canadians.

Here." An investigator spent an hour in the city hall in Woonsocket, Rhode Island, during which time he heard no English except that which was addressed to him. The shop committee in a Peabody tannery in 1918 had the following rich variety: two Greeks, two Irish Americans, one Pole, one Portuguese, one Italian, one Turk, two of unidentified foreign nationality. In the list of sons of New Britain, Connecticut, who died overseas during the World War, the names beginning with S were as follows: Sarisky, Schade, Schleicher, Senf, Siomakevicz, Skorupa, Smith, Sokovich, Strohecher, Stunia, Sullivan, Sullivan.

The completeness of the passing of the Puritan in urban New England is well shown by the list of births and deaths recorded by the town clerk of a New England factory town in one month in 1915.[46]

It will take decades or generations for this transformation of stock to work out its final results, although many superficial results promptly appear. President Eliot of Harvard was merely observing the simplest fact when he remarked early in the twentieth century that Boston was a Roman Catholic city. It is estimated that the people are 80 or 90 per cent of this faith because of the combination of English Catholics, Irish Catholics, French Catholics from Canada, and Italian, Portuguese, and other Catholics from Europe. The editor of a Boston paper tells the new reporter from a distance to assume that every stranger to whom he speaks on the streets is a Catholic.

Early in the twentieth century the Boston School Board was composed of two of old Puritan stock, two Irish, one Hebrew. We wonder who ruled. The Irish representation on this board was unusually small. Politically, most New England cities are completely governed by the Irish, who seem

[46]

Births

A daughter, Ida, to Quintu and Amelia Perline
A daughter, Vittoria Luigia, to Antonio and Luigian Musante
A son, Albert Joseph, to John and Amelia Kottman
A daughter, Hilda M., to John and Elsie Balster
A daughter, Stanislawa, to Wlodslow and Mary Dietk
A daughter, Annie, to Joseph and Mary Groszek
A daughter, Helen, to Nikolay and Sophia Smey
A daughter, Sophie Justine, to John W. and Louise F. Kempt
A son, Joseph, to Redolf and Mary Govin
A daughter, Katie Mary, to Nicholas and Josepha Moriscato
A daughter, Victoria, to Mathew and Joanna Styfcka
A daughter, Eugeniusz Jo, to Volente and Mary Borcz
A daughter, Cecilia, to Peter and Anne Nasiadka

Deaths

D. Wilbur Simpson, aged 59
Sarah Anna Piper, aged 68
Frederick G. Losee, aged 67
Sara Janet Goodall, aged 27
Henry L. Wyant, aged 57
Raymond Blum, aged 1 month

In 1940 similar lists did not show such clear-cut separation of stocks. The death list was becoming mixed. Also, many of the foreign-born change their surnames and baptismal names, choosing more "American" names.

In 1910 the foreign-born of Connecticut, numbering 30% of the population, gave birth to 63% of the children. Exit the Puritan, enter the Italian, the Pole, the German, the Jew.

almost everywhere in the United States to have a genius for carrying elections. Boston is filled today with O'Brien and Fitzgerald and Murphy "Squares" named after the boys who fell overseas.

The ups and downs of the races were well described by Professor C. F. Johnson of Trinity College, who published a long poem in 1894 in the *Hartford Courant* at a time when the street railways were being constructed in Hartford.

> Under the slanting light of the yellow sun of October,
> Close by the side of the car track, a gang of Dagos were working . . .
>
> Then the thought came, why, these are the heirs of the Romans;
> These are the sons of the men who founded the empire of Caesar;
> These are they whose fathers carried the conquering eagles
> Over all Gaul and across the sea to Ultima Thule. . . .
>
> Yonder one pushing the shovel might be Julius Caesar —
> Lean, deep-eyed, broad-browed and bald, a man of a thousand;
> Further along stands the jolly Horatius Flaccus;
> Grim and grave, with rings in his ears, see Cato the censor.
>
> On the side of the street in proud and gloomy seclusion,
> Bossing the job, stood a Celt; the race enslaved by the legions,
> Sold in the markets of Rome to meet the expenses of Caesar.
> And as I loitered, the Celt cried out: "Warruk, ye Dagos!
> Fill up your shovel, Paythro, ye hathen! I'll dock yees a quarther!"
> This he said to the one who resembled the great imperator;
> Meekly the dignified Roman kept on patiently digging.
>
> Such are the changes and chances the centuries bring to the nations.
> Surely the ups and downs of the world are past calculation.
> "Possibly," thus I thought to myself, "the yoke of the Irish
> May in turn be lifted from us, in the tenth generation.
> Now the Celt is on top, but Time may bring his revenges,
> Turning the Fenian down, once more to be bossed by a Dago."

In vindication of this prophet, a Connecticut manufacturing town had an Italian mayor in 1923.

Government in some manufacturing cities of New England has at times, especially in recent decades, been sadly corrupt. It is easy, of course, for the outvoted Puritan to blame it all on the new immigrant, especially the Irish, but the population conditions of these cities make for boss rule. And who contributes to the boss? The groups are diverse; many of them do not understand the language, the country, or the system of government. The educational attainments of many of them are low, and they are the natural material upon which political bosses thrive.

Yankee stock still has a few entrenched positions. Directors of banks, business executives, and college presidents are not elected by popular vote. Hence New England finance is in the hands of the old stock. So are most of the industries. So also is the long list of colleges and universities. No part of our country is so dotted with these visible signs of the effort to learn. State universities, spread over the United States, have many New Englanders

on their faculties, but still hundreds of young people come each year from distant parts of the country to study in New England colleges.

The elementary schools of this part of New England are nationally famed for their excellence. Indeed, Boston might well be called the cradle of American education, for public instruction began in 1635 with the opening of the Boston Latin School, the first public school in America. A year later Harvard College was established. In 1644 the first school to be built and supported wholly by taxation was opened at Dedham, now a suburb of Boston. The first school law was passed in 1642, followed by another in 1647, which is frequently referred to as the "mother of all school laws." These are but a few of the pioneer contributions of the Puritans to American education.[47]

The modern Puritan is striving to hand on the torch of learning, to transfer the culture and traditions of New England to the sons of the immigrant down the street. Every small town provides free instruction to prepare the youth for any college; if it does not have a high school of its own, the town pays for tuition in some near-by town.

Nowhere else in the United States is the public library so much a part of the municipal and even village equipment. The Boston Public Library, one of the best in the country, is the pride of the city. Nowhere are there so many historical societies as in New England. Nowhere are historic monuments so jealously preserved. Critics may say that the successful Bostonian flies away to New York, and may call Boston the abandoned farm of literature (Oliver Herford), but the 1938–39 edition of *Who's Who in America* is highly suggestive of the continued vitality of New England. In the geographic classification, New York, the parasite of the nation, where thousands of New Englanders live, has $20\frac{1}{4}$ pages, Massachusetts has $7\frac{1}{8}$ pages, while such huge and weighty commonwealths as Pennsylvania, California,[48] and Illinois have 6 or 7 pages each. Evidently there are still live brains, energy, and ambition in Massachusetts.[49] Perhaps the climate gives men these qualities. Perhaps the Yankees can transfer to the new stocks all that is worth transferring. Perhaps, also, they cannot. The real danger seems to be that they will transfer too much by giving these people the ideas that will cause them also to die out as the Puritan is dying out.

THE DEATH OF BRAINS?

In recent decades education in America seems to have proved singularly fatal to the families of the highly educated. All recent statistical studies of

[47] And as to serene self-content, it is a moot question whether the most complete provincialism is to be found in Boston or in New York. An old lady in Boston received a visit from a niece in San Francisco. The niece grew rapturous in her description of the trip across the continent. "Oh, Aunt Mary," she said, "you ought to make a journey!"
"But," said Aunt Mary, "I'm here already."

[48] That venerable volume now includes movie stars.

[49] "An indication of the degree of interest which is to be found in science in a locality is brought out by my correspondence on nut tree questions. There are about three hundred names on the list. . . . I can find more enthusiastic correspondence on almost any scientific subject in a small New England town than in a whole Southern state or in an entire South American republic." — Robert T. Morris, *A Surgeon's Philosophy*, Doubleday, Page & Co., 1915, p. 242.

the birth rates of American college graduates show that their stock is melting away in New England and elsewhere in the United States about as fast as the Indian melted away before the white man's advance. Indeed, the alarming statistics show that on the average the graduate of Vassar is the mother of one-half of a daughter, and that the average Harvard graduate is the father of three-fourths of a son.[50] The graduates of other universities likewise fail to replace their numbers through their offspring. All available evidence shows that the rate of increase in the population of alien racial groups is fully twice as rapid as in the native stock. In 1930 those cities whose stock was chiefly American-born lacked by 38 per cent enough children to maintain their present populations.[51]

Dr. O. E. Baker has pointed out that farm tenants have about 10 per cent fewer children per family than farm laborers, that farm owner-operators have about 10 per cent fewer children than tenants, that unskilled laborers in the cities and towns have about 10 per cent fewer children than farm owner-operators, that skilled workers in the cities have nearly 20 per cent fewer children than unskilled laborers, that businessmen have more than 20 per cent fewer children than skilled workers, and that professional men have about 7 per cent fewer children per family than businessmen[52] — and further that births do not equal deaths in our large cities.

It seems plain that success, education, and urbanism in America have within a short time produced voluntary limitation of numbers among the educated, the well-to-do, and dwellers in large cities as a group. This tends to the rapid decline in numbers of the offspring of the group that now conducts our civilization. At present they are being replaced by the children of others, chiefly rural. While this family practice continues, does not our present attempt to educate everyone speed up the elimination of the capable? The breeders of plants and animals make startling changes in races by denying parenthood to specimens showing qualities that are not desired, and conversely. Does man differ in this respect from his biological cousins?

Arthur E. Morgan thinks that social need will create a new morality — the duty to reproduce — if you have talents.

Now that we have almost prohibited immigration, New England's greatest necessity is that the present population shall not eliminate itself as its past population has done. This necessity of maintaining human resources presses upon New England especially because of its scarcity of material resources and its high percentage of urban population. If the present population catches this form of Americanitis, who will take their places?

[50] F. R. Fairchild, E. S. Furniss, and N. S. Buck, *Elementary Economics*, Macmillan, 1939, Vol. II, p. 452.

[51] For significant studies of population trends, see W. S. Thompson, and P. K. Whelpton, *Recent Social Trends in the United States*, McGraw-Hill Co., 1933, Chap. 1; W. S. Thompson, *Population Problems*, McGraw-Hill Co., 1930; L. I. Dublin, ed., *Population Problems of the United States*, Houghton Mifflin Company, 1926; Lorimer and Osborn, *Dynamics of Population*, Macmillan & Co., 1934; and O. E. Baker, "Rural-Urban Migration and the National Welfare," *Annals of the Association of American Geographers*, June, 1933, pp. 59–126.

[52] O. E. Baker, "Relation of Population Trends to Commercial Agriculture, Especially to Production of Animal Products," an address before the American Society of Animal Production, Chicago, Nov. 29, 1935.

RURAL EMIGRATION AND CONSERVATISM

The rural population of New England, still largely of Yankee stock, has for several generations been subjected to the selection resulting from the emigration, generation after generation, of those who elect to go away to better themselves. These are usually the more restless, the more imaginative, the more progressive. The conservatives stay at home and become the parents of the next generation.

THE POPULATION OF MARITIME CANADA

Maritime Canada has been subjected to the same social forces that have influenced New England, except that of the development of the manufacturing city.

There are only 5 cities above 20,000 in the Canadian section, while there are 63 in the New England section. The Canadian city population is therefore comparatively small. This leaves a rural society much like that of New England. Maritime Canada has had a heavy migration to New England and to the Canadian West, and it displays plenty of conservatism.[53] In some localities the Puritan Sunday of Oliver Cromwell still prevails to the extent that trains do not run on that day.

These three Maritime provinces have less uniformity of rural population than the United States part of this region. This is because large blocs of immigrants came in a body. Most of the northern coast of New Brunswick is settled by the French, south-central Nova Scotia by the Germans, western Nova Scotia by the English, eastern Nova Scotia and eastern New Brunswick by the Scotch.

The Scotch went in such blocs to parts of Prince Edward Island that at one time a single county had 4000 people named MacDonald. Since the sole reason for a second name is to differentiate, the value of a second name disappears when everybody is named MacDonald. This difficulty of designation has been met in one case as follows. James MacDonald the banker was one of so many James MacDonalds that he was called "Banker Jimmie." His son John was one of the scores of John MacDonalds, so he was differentiated by being called "Banker Jimmie's John." Revering the family stock, this man named his son James, locally known as "Banker Jimmie's John's Jimmie."

The blocs of German and Scotch in Nova Scotia afford a puzzling contrast, the latter cherishing education, the former neglecting, almost scorning it.[54]

[53] The reception of the automobile shows this conservatism. Motor vehicles were prohibited altogether on Prince Edward Island from 1908 to 1913. After 1913, automobiles were permitted on the streets of Charlottetown and one other small town on three designated days per week. Finally in 1919 practically all restrictions were removed except prohibition from operating outside towns and cities during April, when roads are soft from spring. (U.S. Dept of Commerce, *Commerce Reports*, Apr. 24, 1922) Today passenger cars are permitted to drive throughout the year, but trucks having a weight of over 4000 lbs. are prohibited from operation during the spring period, when frost is coming out of the ground.

[54] "Pictou County is the center of the Scotch (farming) population, and this single county has supplied a list of college professors and college presidents that would do credit to a province. From this one county, nine men are now serving or recently have served as



FIG. A. This set of Maine farm buildings is a typical New England style — all in a string, making it easy to get to the barn in stormy weather. (Courtesy New England Council)

AGRICULTURE AND THE SUMMER VISITOR

The return of the pine tree has been the most conspicuous single change in the agriculture of all parts of this region. The pine returned when agriculture passed from the domestic epoch of the general farm to the commercial epoch of the specialized farm. In some places there have been interesting survivals of the old general farm system, and in other places even more interesting revivals of agriculture through the development of specialties. The survival of the general farm has usually been made possible through additional income derived from side industries, of which this region has three — fishing, lumbering, and the summer boarder and tourist.

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college presidents, and eighteen others as prominent college professors, not to mention educators of lesser standing. . . .

"In striking contrast to Pictou County with its Scotch population, devoted to higher education and producing in a generation or two twenty-seven college presidents and professors, is Lunenberg County on the Atlantic Coast, settled in 1752, mainly by German farmers from the Palatinate and Hanover. Of its 30,000 population, in 1891, 9000 could neither read nor write. They are an industrious, thrifty and fairly prosperous people but they are not making their sons into premiers or college presidents. The influence of the sea and of the fishing banks has made over a race of peasant farmers into the pre-eminent fishing population of Nova Scotia. And a people whose interests — created by their environment — seek occupation in fishing do not stress the intellectual side of life. It is a question which I ask and cannot answer: Suppose the same Scotch colonists who settled in Pictou County had, instead, settled in Lunenburg County, would they in that environment have produced the long line of illustrious men that they have produced in their present environment?" — R. H. Whitbank, University of Wisconsin, "A Geographical Study of Nova Scotia," *Bulletin of the American Geographical Society*, June, 1914, pp. 413–19.

In the old days the winter was the time for making wagons, tools, harness, shoes, and clothes. The farmhouse became a little winter factory. Now that this era has passed, some of the men go off to the woods for the season of wood-chopping. The women stay at home and take care of the stock, for which the New England building unit is conveniently arranged, namely, a string of sheds with the house at one end and the barn at the other. The buildings are connected, so that it is easy to go from the house to the barn without getting lost in the wild storms of winter. If the farm is near the shore (and Maine alone has 2500 miles of coast line), a spare day in the warm season can be used for fishing. The possible combination of fishing and farming is better shown by the surprising fact that there are seven shore fishermen in the Canadian provinces to one who goes in a schooner to the Banks.

The summer boarder and the summer tourist now far exceed both fish and forest as sources of income for the resident population. Men must live along the shore to get additional income by fishing. They must often go considerable distances to work in the forest. But to derive income from the summer tourist the farmer remains at home and develops whatever resources nature and his own industry provide. It is the tourist who does the traveling. He goes to the shore, to the inland farm, and also to the forest. This whole region has developed a keen sense of the value of the tourist and a knowledge of what interests and pleases him. The region has the attractions of beautiful landscape, climatic delight, the sports of hunting, fishing, and sailing, and a rich collection of historical associations and remains. All of these things are jealously preserved.

PLANNING FOR THE TOURIST (AND OTHER THINGS)

The migration of the cotton industry to the South has frightened New England into constructive activity. The business leaders have formed the New England Council (already noted), aiming to promote the general economic welfare of New England.

One of their early discoveries was that the tourist industry produced more than $200,000,000 income per year to New Englanders. If such income could result from spontaneous, chaotic, crisscross effort, why not organize and advertise? And so they passed the hat. The supposed beneficiaries were supposed to contribute. Some did, and some, being extra-thrifty Yankees, did not, although all profited. And so in a short time the next thing happened. Government stepped in. Government might almost be defined as a device to jack up slackers. Every New England state now contributes cash appropriations for the New England Council, a private organization, to spend in advertising New England. According to a recent estimate 1,200,000 automobiles from other states visited New England in a single year, carrying 3,400,000 visitors. Behold, New England discovers its greatest industry, and lays itself out to provide camps, trails, and almost every conceivable facility for the convenience and comfort of the traveler. There is a corresponding effort to beautify the country and make it attractive.

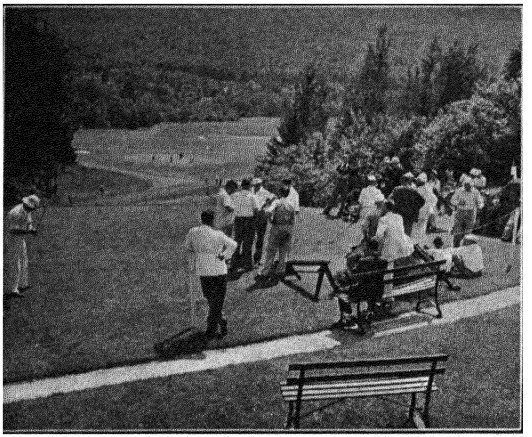


FIG. A. One of the many forms of recreation to which and with which New England invites us. (Courtesy New England Council)

In 1939, when it was reported that there were 206 different planning organizations in New England, many experts thought that the movement had just started.

A BEAUTIFUL LAND

Here one finds a variety of physical beauty. South of Boston, the coast is sandy, with soft landscape and with long waves rolling evenly upon the gentle beaches. North of Boston, even to the extreme of Gaspé, red and gray granite is piled in endless variety of form. Upon this stern and rocky coast waves dash high and break into surging foam. The scene changes endlessly with every rise and fall of the tide. To many who watch this for an hour or for a day, flat sandy coasts become insipid.

If the tourist goes inland, he finds hundreds, even thousands, of lakes and ponds. Does he love especially the glade, the field, the farm, the quaint homestead, the wood, the hill, or the almost untouched wilderness? He will find them all. The small proportion of cultivated land makes it easy to understand why the New England landscape is such a wilderness.[55]

CULTIVATED LAND IN THREE NEW ENGLAND STATES

	Per cent of land area in improved farm lands					*Per cent of area in crops other than hay, with acreage reports*	*Per cent of area in hay*
	Acres	1920	1910	1900	1890	1919	1919
Massachusetts	5,144,960	17.7	22.6	25.1	32.2	2.2	8.7
Rhode Island	682,880	19.5	26.1	27.4	40.2	2.2	6.9
Connecticut	3,084,800	22.7	32.0	34.5	44.7	3.9	1.1

Source: U.S. Bureau of the Census. That bureau does not give figures after 1925, but the Bureau of Agricultural Economics of the U.S. Dept of Agr. courteously furnishes the following estimates:

IMPROVED LAND

	Total acreage and per cent of land area					
	1925		1930		1935	
Massachusetts	872,881	17.0%	802,533	15.6%	861,621	11.7%
Connecticut	709,061	23.0	610,016	19.8	749,022	24.3
Rhode Island	121,335	17.8	113,427	16.6	116,517	17.1

[55] See explanatory note under the table.

The climate is cool. This is particularly true along the coast, for the cold waters come down from Labrador. When people swelter in Philadelphia, Chicago, or Albany, tourists and summer boarders may be sitting by the fire on the coast of Maine or Cape Breton, or wearing woolen sweaters as they climb over the wind-blown rocks.

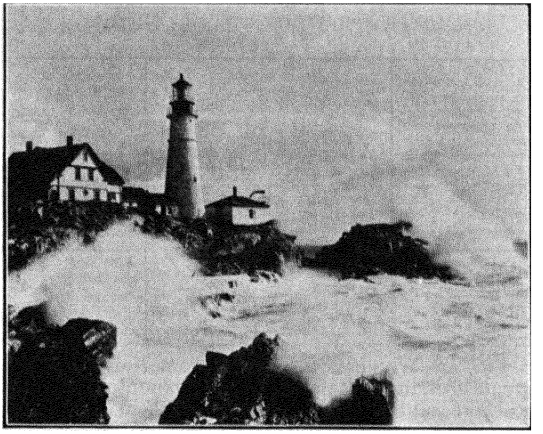


FIG. A. Portland Headlight. New England's rock-bound coast is full of harbors, charm, and danger. (Courtesy New England Council)

HUNTING AND FISHING

As bait for the vacationist the resources of fish and game are carefully preserved. As deer become scarce, long periods of prohibition of hunting are decreed. This has permitted the number of deer to increase until at times they become a nuisance. Every winter they walk into the suburbs of scores of cities, even Greenwich and Stamford, Connecticut, suburban to New York.

HISTORICAL ATTRACTIONS

The cultural and historical attractions for the visitor are utilized to a high degree of perfection. Nothing of historic value is allowed to go into needless decay or to be forgotten. The fact that Paul Revere rode past a house is considered to be an asset. A Revolutionary bullet hole is a piece of property preserved more jealously than heirlooms. So are the homes of those who have become distinguished. One is shown so many houses where Washington slept that one receives the impression that the father of his country must have been an inveterate traveler and a prodigious sleeper.[56]

FIG. B. Pleasure boats of every kind flock to the New England coast in summer. (Courtesy New England Council)

Millions of dollars are spent each year by tourists in Mari-

[56] A person with a sense of humor had a sign in his yard somewhat as follows: "This is the only house on the Lexington Pike in which Washington did not stay all night." And another: "Paul Revere would have passed this house if he had returned this way."

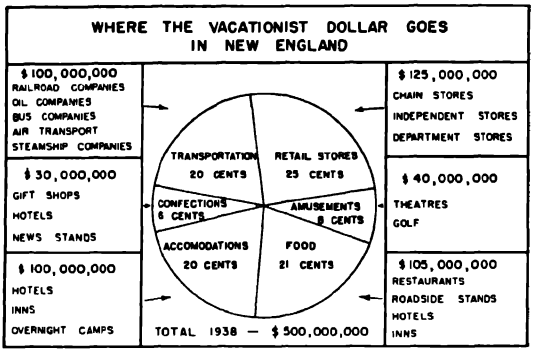


FIG. A. Who gets the money from New England's greatest industry? It sells lakes, mountains, forest, seashore, and snow, and still keeps them all. (Data from New England Council)

time New England and Canada.[57] Many a farm, from Connecticut to Cape Breton, would have to be abandoned if the family budget were not rounded out by the cash that results from the sale of service and home-grown produce in the highest of all retail markets — the home table. The hundreds of summer hotels and the thousands of summer cottages that line the shores are another important local market and source of employment. Thus does the New England-Canadian Maritime Region cash in its pleasant climate, beautiful countryside and landscape, sport, and historic places, and the desire to please the guest.

THE REVIVAL OF AGRICULTURE — DAIRYING

Fresh milk to supply the needs of millions of city dwellers has been the greatest single factor in the agricultural revival, especially in the New England part with its large population. Every day of the year specially equipped trains and motor trucks deliver milk from Upper New England to the factory towns. Fresh milk, being more perishable, cannot be carried so far as cream and butter. The influence of the transportation factor is shown by receipts in the Boston area. In 1936 Boston received 66.5 per cent of its milk from Vermont, 11.7 per cent from New Hampshire, 10.5 per cent from Maine, 6.1 per cent from Massachusetts, and only 5.2 per cent from the State of New York. On the other hand, its cream supply came from 14 different states, including one shipment from Canada; indeed, it came from such distant points as Hutchinson, Minnesota, Bloomer, Wisconsin, and Springfield, Missouri, although most of it traveled much shorter distances. Butter is an even better traveler than cream, and some of it even came from Texas; one-half of Boston's butter supply came from Minnesota and Illinois, with less than .02 per cent from New England.[58]

Everywhere this region has well-watered lands, and mostly there is good grass, two factors that favor summer dairying. In winter the dairy furnishes

[57] Most Chambers of Commerce have given up the pleasant pastime of estimating the value of the tourist trade to their respective communities and states, since there are so many imponderable factors that make such estimates nothing more than guesses. Among the "estimates" on the tourist trade are $12,000,000 for the Maritime provinces, $110,000,000 for Maine (1936), $75,000,000 for New Hampshire (1937), and $500,000,000 for New England as a whole (1938).

[58] In 1936 Boston received 81,791,752 lbs. of butter. Leading sources were approximately 22,000,000 lbs. from Minnesota, 21,000,000 from Illinois, 11,000,000 from Iowa, 4,000,000 each from North Dakota and Wisconsin, and 3,500,000 from Indiana.

more employment than any other form of agriculture; therefore it is peculiarly well fitted to this region where the winters are long and cold and prohibit outdoor farm work for such a large part of the year. One measure of the predominance of dairying in agriculture is shown by the importance of hay among the crop areas. Hay usually outranks all other crops combined.[59] This figure is partly deceptive, for the reason that much of the New England hay can scarcely be called a real crop and therefore an acreage record tends to overstate. For instance, when a farm is abandoned a neighbor often pays a small rental for the privilege of cutting hay on the old fields, and finally, as the crop gets smaller and smaller, he is sometimes allowed to cut it for nothing, because the owner, hoping to sell the land, prefers that the field should be mowed once a year; otherwise it would grow up in brambles and forest. As a result, the New England hay acreage is large, but the yield per acre is often low.

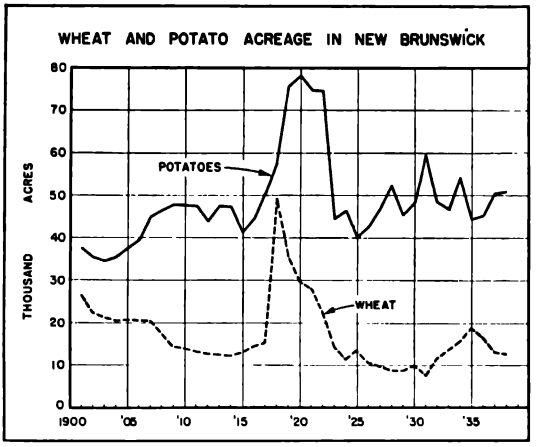


FIG. A. This region can grow wheat if the need should arise again, but the potato suits it even better. (Courtesy New Brunswick Dept Agr.)

THE REVIVAL OF AGRICULTURE — CANNED CORN

"Maine canned corn!" In scores of cities these are the words by which the grocer assures you that his canned corn is the best.[60] This superiority rests upon an interesting combination of climatic and economic factors. Southern Maine is dotted with canneries to which the ears of sugar corn are brought, and for every cannery there are many silos in which the husks and stalks of the corn are stored for the dairy cow's winter food. The climate is too cold to permit corn to mature fully. But weeks before corn is ripe there is a stage when the ears are right for canning and when the stalks and husks are at the period of maximum edibility for cows. At this stage the Maine farmers send the corn to the cannery and fill their silos.

The groceryman, though he may not know why, recommends Maine corn because it grows where the summers are cool. This causes the development of the corn to be slow, much slower than in the burning sun and hot winds of Illinois, where corn rushes speedily from blossom to roasting ear and

[59] Acreage harvested in New England (1937): tame hay, 3,109,000; wild hay, 45,000; potatoes, 234,000; corn, 199,000; oats, 189,000; tobacco, 23,000, barley, 9000; wheat, 4000.

[60] The test of quality is not only in the eating, but also in the price. The price per ton paid to Maine farmers for their sweet corn is about twice the average American price. New York corn commands the next best price, but Maine corn brings $6 to $7 per ton more.

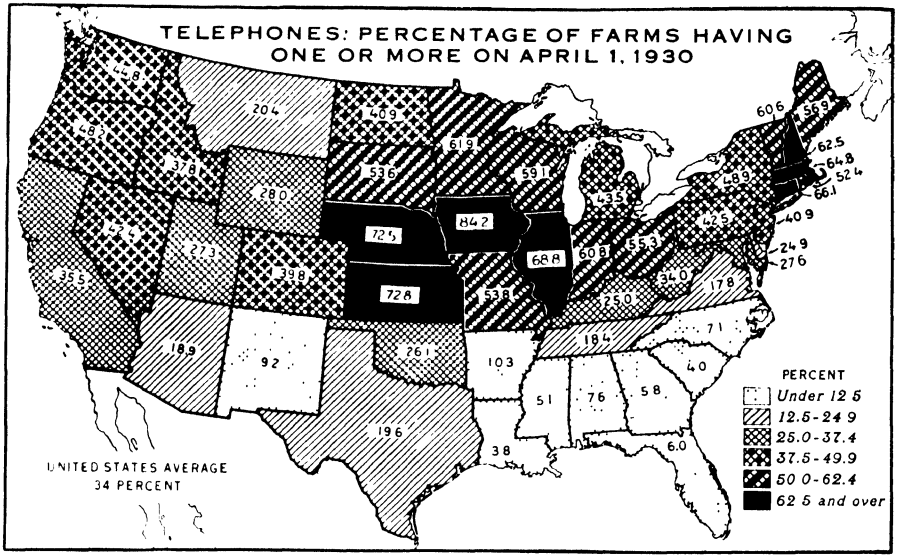


FIG. A. Here is a measure of the New England farmer's prosperity — if he hasn't abandoned his farm. (Courtesy U.S. Dept Agr.)

dry, ripened grain. In the fields of southern Maine, where it is 5° or 10° cooler than it is in Illinois, the corn lingers. If the weather is very cool, the grain develops scarcely at all after the roasting-ear stage, and therefore it remains for many days tender and juicy and in prime condition. Under Illinois sun and wind corn would stay for perhaps only two days in really prime condition for canning. The Maine competitor has a great advantage in having a longer period during which he can deliver a large crop of fine corn to the cannery. The service of the fodder in the dairy is another factor which aids the canning industry. Thus canned corn from Maine is really a kind of by-product of a dairy-farm district. It amounts to one-eighth of the national product.

THE AGRICULTURAL REVIVAL THROUGH SPECIALTIES

Although most of the area of this region is composed of old, hard rocks and thin, rocky soils, there are six areas which are exceptions, and each of these areas of soft rocks and soft soils has developed an interesting and suggestive agricultural specialty.

NOVA SCOTIA APPLES

The first of these soft spots is the Annapolis-Cornwallis Valley of Nova Scotia, which runs for nearly 100 miles parallel to the south shore of the Bay of Fundy and varies from about 3 to 10 miles in width. The element of softness is afforded by red sandstone much softer than the hard, gray

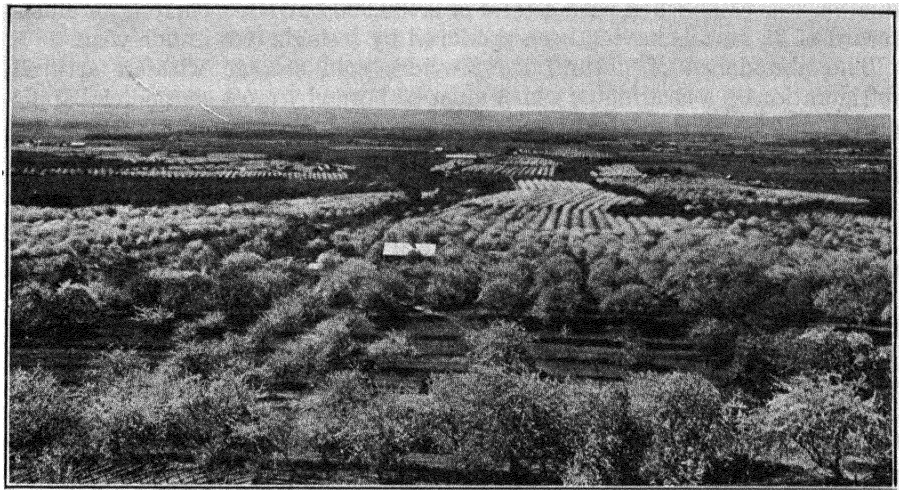


FIG. A. Annapolis Valley, Nova Scotia, in springtime shows the advantage that results from a soft-rock base rather than hard-rock base. The distant ridge that walls the valley is hard rock. (Courtesy Ottawa Dept Trade and Commerce)

granite which rises on the south side of the valley and makes the main backbone of Nova Scotia. The north wall of the valley is a long ridge of traprock which separates the valley from the Bay of Fundy. This traprock is hardened lava which pushed through the other rocks in ancient times and now stands up as a high hill because it is so hard that it wears away much more slowly than the softer sandstone between it and the hard granite.[61]

The advantages which apples enjoy in the Annapolis-Cornwallis Valley are due partly to climatic and partly to locational reasons. On both sides mountain ranges protect the valley from strong winds. The Bay of Fundy furnishes the protection afforded by a body of water which by its warmth in winter keeps away extremes of temperature. Annapolis is from 5° to 6° warmer on the average in winter than Halifax, on the other side of the same peninsula. Ice remains in the Bay of Fundy until late in spring, the resulting coolness of the water body delaying the growth of fruit buds until the danger of frost is over. By its warmth at the end of summer the water prevents autumn frosts, thus ensuring a long harvest period. This climatic factor locates many fruit districts beside lakes and seas.

The Bay of Fundy goes yet further in providing a satisfactory temperature control. The great danger from frost comes in the one or two still nights at the end of a cold wave. But the Bay of Fundy has the highest tides of the world, and the water rushes in and rushes out with such force that enough wind is produced to keep the nights from being deadly still.

Within this valley is grown nearly half of the commercial apple crop of all Canada. The great bulk of the apples of this valley is exported to Great Britain by way of the port of Halifax. In 1933 an all-time record for pro-

[61] This traprock is the same material as the Palisades of the Hudson opposite Manhattan Island, and is one of the best of road materials.

duction was established with a total of 2,438,000 barrels. There is an official record of 35 barrels having been produced by a single tree in one year.

The abundance of natural ice provides cold storage without artificial refrigeration — a cost factor which must be borne by most commercial apple-growing districts of the United States.

THE BAY OF FUNDY DIKED LANDS

The second geologic soft spot — it is the softest spot of all — is the reclaimed tidal flats along the Bay of Fundy. When the tide, which is from 40 to 50 feet high, goes out, it leaves bare expanses of mud flat.[62] Dikes have been built around the flats, and in the dikes there are automatic floodgates. These gates swing open at low tide and let the water out. They swing shut as the tide comes in, and most of the water is kept out. Since the bottoms of these flats or bays have been made from good land which washed down from the hills, mixed with shells and other animal remains, the soil is unusually rich, and it gives annually from $1\frac{1}{2}$ to 3 tons of hay per acre. If it shows signs of declining in fertility, the sea is allowed to flood it again for a short time and thus to restore it. Such land has sold for as much as $400 an acre and is now worth about $100. It is unfortunate that its area is not larger. This is the land that was settled by the Acadians and is commemorated by Longfellow's "Evangeline."

The Nova Scotia farmers on the Bay of Fundy like to talk about the excellence of their country as a bacon-producer. The great virtue of bacon is to have a streak of fat and a streak of lean. For this, they tell you with a twinkle of the eye, the Bay of Fundy has unusual resources. When the tide is low, wide areas of flats are exposed, and because the tide runs out so rapidly, fish are often left flopping about. At low tide the pigs range the flats eating fish and getting fat. The tide returns with such speed that the pigs must run for their lives, and the effort makes them lean — a streak of fat and a streak of lean.

PRINCE EDWARD ISLAND

This island, half as large as Connecticut, a province all by itself, is the largest of the soft spots of sandstone and shale formations in the whole New England-Canadian Maritime Region. In proportion to its area this is one of the finest pieces of agricultural land east of the Allegheny Mountains. The glaciers did not ruin it. They slid up out of the sea, bearing few stones with them to litter the earth. Nearly all of the island is arable, and about a third of it is under cultivation. The people, most of whom are Scotch, call it the "Garden of the Gulf," the "Emerald Isle of America," and many other complimentary names. The Maritime climate is thoroughly wholesome and approaches the northern limit of agriculture on the Atlantic Coast. It is too cool for corn and too damp for wheat to thrive at its best, although the Prince Edward Islander produces enough wheat for his own use. Oats for

[62] At low tide, wharves stand higher than a house above wide flats. At high tide steamers scurry in, hastily unload, and flee before they strand upon the flats.

the dairy cow exceed all other grains, and hay for the dairy cow exceeds all grains in area. Turnips and forage beets are grown. Thus do the crops tell the story of a main industry — forage crops and dairies.

Prince Edward Island has great value as an index of the pressure of men upon land in America. This index shows us that the continent is yet far from full. Notwithstanding the advantages of climate and arability and excellent resources for fishing, there is a steady decline of population.[63] Farming is still chiefly of the general type, although the very high production of from 80 to 100 bushels of potatoes per capita almost amounts to a specialty. About 500,000 bushels of seed potatoes are exported, chiefly to the United States and Cuba, where the hardy stock from a cooler clime is duly appreciated. There are factories for making potato starch.[64]

But the really significant things about Prince Edward Island are its declining agricultural population in the midst of excellent resources which are rather remote from good markets, and its one great contribution to the new agriculture — the development of fox-farming.

FOX-FARMING

The silver fox, denizen of the subarctic areas of North America, sometimes has a black child with a silver-tipped tail and scattered silver hairs. The trappers occasionally caught a wild one. This sport among fur-bearing animals has appealed to fur-wearing people to such a degree that these rare pelts have brought as much as $2600 in the market. In twenty years preceding 1914 the supply of this fur had declined one-half; the price had advanced threefold. A couple of shrewd Prince Edward Islanders succeeded in catching enough silver-black foxes to start breeding them. Some of the offspring were black. The story goes that the canny Scots, to keep the new industry a secret, had their farm on a rocky, forested island. They visited the island ostensibly to examine the lobster pots with which they had dotted its shores. But one winter the sound froze, and a fox happened to get out of the enclosure and ran across the ice to the mainland. Hounds trailed it back to the den, the owners of the hounds followed, the secret was out, and a fox-farming furor arose. Then the pioneers proceeded to make a fortune selling their foxes for breeding purposes for more than their weight in gold. If a fox skin sells for $1000, as it sometimes does; if a mother gives birth to seven offspring at a time, as she often does; and if she lives for years, as she may do — then the business looks good, so good, indeed, that from 1910 to 1914 a tremendous boom was on. Silver-black fox pups of the best Prince Edward Island stock sold at from $12,000 to $18,000 a pair, and there was at least one sale of a pair of mature foxes of proved fecundity for $35,000. As animals for breeding brought such prices that no one could afford to kill them, they bred foxes

[63] Population: 1901, 103,259; 1931, 88,038.

[64] Manufacture of starch is a seasonal industry, since the raw material cannot be preserved indefinitely. It is also very sensitive to price; it cannot operate when the price of potatoes is high. Between 1928 and 1936 these factories operated only during the seasons of 1928–29, 1930–31, and 1934–35. The chief market for Canadian potato starch is for sizing purposes in textile mills.

and sold them. In 1915 the Silver Fox Breeders Association of Prince Edward Island was incorporated for the purpose of classifying, registering, and marking silver-black foxes, after the fashion of other livestock breeders' associations. Within a year a larger proportion of silver foxes was recorded than any other variety of livestock eligible for registration.[65] In 1934 the income of Prince Edward Island from foxes amounted to $1,712,000, or $8.66 per capita.

FOX-FARMING

1935	*Number of farms*	*Value of land and buildings*	*Value of fur-bearing animals*	*Value of pelts produced, 1934–35*
Prince Edward Island	771	$ 885,000	$1,192,000	$ 653,000
Nova Scotia	853	315,000	557,000	651,000
New Brunswick	983	508,000	949,000	765,000
Quebec	2,408	1,173,000	1,911,000	1,915,000
Ontario	1,029	1,322,000	1,848,000	2,219,000
Manitoba	400	700,000	913,000	1,185,000
Saskatchewan	308	414,000	546,000	1,263,000
Alberta	463	906,000	1,085,000	1,475,000
British Columbia	272	356,000	374,000	809,000
Yukon Territory	8	12,000	6,000	230,000
Total	7,495	$6,591,000	$9,383,000	$11,165,000*

* In addition, the value of pelts in the Northwest Territory was $1,679,000.

The industry spread even to British Columbia and the Yukon. In 1936 it is estimated that there were more than 151,000 silver foxes on fox farms, and that the 163,000 pelts sold had brought $30 each. In 1936 there were in Canada 7,057 fox farms, 912 mink farms, and 173 farms for the production of raccoon, marten, fisher, etc., the land and buildings being worth $7,097,000 and the animals, $9,838,000. In the United States there are more than 4000 fox farms scattered from Maine to California, and even as far south as Oklahoma and Virginia.

As the number of these animals increases, the value of their fur will go down and down until an equilibrium is reached, subject to *the fluctuations of style*. The high prices of the early days were a novelty which could not last long. This fox-farming is typical of fur industries which should be developed in cooler parts of North America. Why should we have domesticated so few animals? There is an appealing combination of economic qualities in the muskrat (not a rat at all). This rodent breeds as does the rabbit, about three litters per season. As in the rabbit, the meat is edible, and like the rabbit muskrats are vegetarians and can live comfortably on the food that suits sheep or cattle. Moreover, they build their own houses. Therefore, as a new variety of cattle of the North they appear to have the maximum possible efficiency. One might wish that muskrats might become the rage. The area from Cape Breton to British Columbia and from the Chesapeake

[65] *Scientific American*, Dec. 16, 1916, p. 543.

to Hudson Bay has thousands of lakes, swamps, and streams where the animals are at home. Indeed, swampland in Maryland and Delaware is regularly rented for this purpose, at a valuation based upon the price of muskrat skins and the catch of muskrats which the lessee is expected to make.

AROOSTOOK POTATOES

The fourth geologic soft spot in this region is in the Aroostook Valley in the northeastern corner of Maine, where there is an island of fertile, sandy loam soils surrounded on all sides by hard and inhospitable granites. The climate is too cold for corn, but admirably suited to potatoes. The cool, moist, cloudy weather of upper Maine is apparently close to the ideal for potatoes.[66]

The potato does best in the moist climate where the warmest month is 65° F. Northern New England has approximately these conditions. Witness the national average potato yield for ten years (1927–36) of 110 bushels, with 68 bushels for Texas, 261 for Maine. For the exceptionally good crop year of 1934 it was 324 bushels in Maine, a figure that approaches the good yields of northwestern Europe. The uncertainty of potato-growing is shown by the low yield of 160 bushels per acre in Maine in 1922.

The distance from market is such that the crop did not pay the first settlers. In 1874 a New Hampshire starch-manufacturer happened to come there and saw the opportunity for the potato-starch industry. If six tons of raw potatoes are cut in small pieces and soaked in water, a ton of starch will settle in the water. It is easier to send 1 ton to market than 6, especially as the dry starch is not subject to injury from frost or decay. In 1935 Maine produced almost all of the potato starch in the country, 25 starch factories operating in Aroostook County alone. This county grows more potatoes than all the rest of the state.

In 1893 there came rail connection through Bangor with the American railroad system, and the shipment of seed potatoes. A solid train of refrigerator cars, the Aroostook daily potato special, rushing southward through the spruce-tree landscape, is an impressive winter scene.

Maine seed potatoes, chiefly from Aroostook County, are now in demand by the potato-growers from Massachusetts and Long Island to Florida and Texas, and are even exported to Argentina. The plants from the Northern-grown seed are more vigorous and mature more quickly than the seed of the Southern-grown potato. Every year a fresh supply is seeded from the original source of vigor. Thus the commercial hold and the increasing prosperity of the Aroostook potato-growers is easily seen. The potato farmers, with their crop of 35,000,000 to 45,000,000 bushels per year, commonly have a three-year crop rotation, potatoes one year, oats the second, hay the third, then potatoes again. The oats and the hay serve as feed for the animals and may be called supply crops in contrast to the potato, which is a money crop — an excellent example of the development of an agricultural specialty.

[66] Experiments have recently shown that potatoes do better in partial shade than in the full sunshine of such a climate as that of Louisiana.

Of late the tractor has replaced many of the horses, and on some farms there are no draft animals.

THE CONNECTICUT VALLEY

Red sandstones, much used at one time for building brownstone mansions, are much softer than granite rocks. Therefore the sandstones wear away faster. This faster wearing-away of soft rock made the Connecticut Valley of western Massachusetts and northern Connecticut a wide-open lowland surrounded by higher lands of harder rock. The continental glacier choked up the mouth of the Connecticut and turned this lowland into a lake, and then filled the lake with river deposits. Later, as the river cut its way out it meandered back and forth, cutting the old lake deposits into a series of terraces at different elevations, and each with a different soil. These are the most level land in New England. The early settlers called them "fields," and on them are all the towns of the valley — Springfield, Westfield, Pittsfield, etc. Some of these terrace soils are excellent for growing truck, and the 2000 to 3000 acres of onions that are grown in the Massachusetts part of the valley make that state the seventh or eighth onion-growing state in the Union.

Some of these soils, however, have special value for tobacco — the most particular of all crop plants with regard to its soil. On some of these terraces tobacco of excellent quality can be grown, but that grown upon the present flood plain of the river itself is almost worthless.

The tobacco industry of the Connecticut Valley was started a century ago. In 1937 tobacco covered about 17,000 acres of land in Connecticut and 6000 acres in Massachusetts. About the year 1900 experiments in growing tobacco under the shade of cheesecloth screens resulted in a leaf of unusual qualities. It was free from insect injury and hail injury. The uniform temperature and moisture gave a leaf of uniform quality and great toughness of fiber suitable for cigar manufacture, but the changed climate beneath the tent screens required a different variety of tobacco. After experimentation, the Cuban tobacco was found to be the best. It sometimes sells for from five to ten times as much per pound as the tobacco grown in the open. The expense of planting posts and stretching laths covered with cheesecloth is so great that this industry is now carried on chiefly by corporations. In 1934 Hartford County, Connecticut, was exceeded in the value of its tobacco output by only three other counties in the United States.[67]

THE LEDA CLAYS

Portland, Maine, is the center of yet another oasis of good land, the sixth and last of the soft spots. It stretches in a narrow belt for 15 or 20 miles up and down the coast from Portland, and is called the Leda Clays. The chance traveler is struck by the excellence of the farms as he rides into this

[67] Value of output (1934): Johnson County, N.C., $5,976,000; Wilson County, N.C., $5,865,000; Nash County, N.C., $5,578,000; Hartford County, Conn., $4,681,000. (Figures from the U.S. Dept Agr.)

clay belt. Its origin is unusual. It was deposited on the bottom of the sea, a fact which permitted the fine particles of clay to become mixed with shells of sea animals, producing a limy clay, which is very rich and easy to cultivate — an area of good general farms.

BLUEBERRIES

Extreme eastern Maine has what might be called a subindustry in blueberries. They grow in what is sometimes known as the eastern spruce region.

A very large proportion of Washington and Hancock Counties, extending northward to the upper St. Croix, consists of granite. This particular granite is a hopelessly sterile and acidic rock, and in that part of Maine almost entirely denuded by glaciation, so much so that from the lower Penobscot eastward many areas are strewn with boulders often the size of a barn. — Letter from M. L. Fernald.

This was originally covered with spruce forest, most of which has gone by ax and fire, and many areas of old fields and old forest are alike given over to blueberries, which thrive in acid soils. The crop is cared for by having large bushes cut and the berry bushes burned every third year. The bushes are burned with torches while shallow snow protects the leaf mold. The season after the burning produces a big growth of new bushes, the next year, a big crop of berries. The following crop is not so big, then the fire ends the cycle. The berries are picked in large quantities and canned, and the crop is worth $1,000,000 a year. There are 15 canneries in Washington County. This industry is especially suited to "suitcase" farming — absentee owners who come for a season. Many blueberries are also marketed fresh.

TRUCK CROPS

The markets of the many cities make a local demand for truck and garden crops. Between 1895 and 1905 there was a rapid development of greenhouses near Boston for the growth of market crops. Then the greenhouses declined, because the express-train service from Florida improved so much that it became cheaper to bring the products of distant sunshine from Florida than to make a climate in New England with fires. This limits New England trucking to the season when their produce is ready for fresh local consumption. Most of the market gardening is in the hands of newly arrived foreigners, especially Poles and Italians. Near Boston some of them have lengthened their growing-season a little by building fences to keep the north wind off their fields.

CAN SCIENCE BRING BACK NEW ENGLAND AGRICULTURE?

The soft spots and market gardens comprise but a small fraction of the total area of this region. What about the rest of the land that was once in cultivation? During the depression beginning in 1929 there was a distinct "back-to-the-land" movement and an increase of rural population, but it

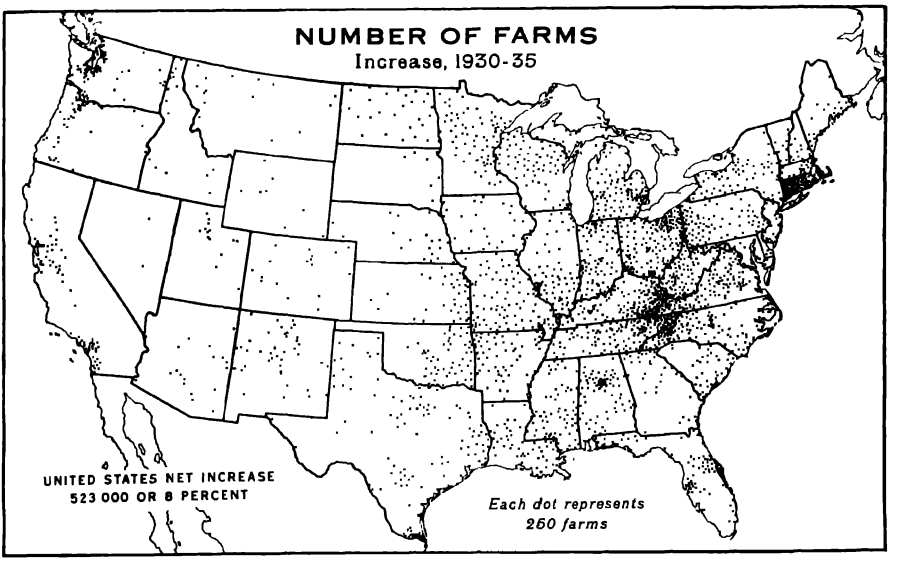


FIG. A. The farms of desperation reverse a long-time trend — for a time at least. Their location shows them to be largely part-time, near-town, or self-sufficing farms on poor land. Be not deceived by this fact of increase. (Courtesy U.S. Dept Agr.)

would have been better to call it a back-to-the-roof movement, as people were more nearly seeking shelter of an old house in time of storm than seeking a bona-fide business. It was really a measure of the breakdown of our system of distribution.

The future of agriculture promises to be very different from its past, for this is an age of machinery and of science, and agriculture is perhaps the most scientific of our industries. As has been noted, agriculture is a much more scientific industry than manufacturing. The ordinary factory uses one or two or at most a small number of sciences, and it can have a specialist to attend to them. Thus it has a dyer or a chemist or a metallurgist or an engineer or two. The average farm requires the application of two or three times as many sciences as the average factory, and the farm cannot employ any specialists at all. Take the complicated problems of soil management and fertilization. How would you fertilize a peach tree, an apple tree, a wheat crop, a corn crop, a pasture, a hay crop? For each of these questions there is a different answer. What should a pig eat to produce pork most economically; what, in a particular set of feed prices, should a calf eat to grow well and economically; what should a cow eat to make milk most economically; what should a horse eat to work most efficiently? Good cow feed will sometimes kill a horse. The cow turns up her nose at pig feed. The answers to these particular questions are strictly scientific, and they are answered with varying degrees of error. Suppose the American cows waste through inefficient feeding 5 cents each every day for eight months in the year. Just a little waste like that rolls up to more than $12 for each of

21,000,000 cows, enough money to pay the total budget of all the first-class universities in the United States!

To find the right answer for these scientific questions requires careful study and experiment. The farmer is usually unable to do this. Even if he had the necessary time and money, he could not escape from the caprices of nature which vary the conditions and make experimentation very difficult. Many of the agricultural experiments take years to reach a conclusion. For example, the Agricultural Experiment Station of Arizona has started on a twenty-four-year series of experiments with date palms. Experiments in bovine nutrition require a kind of incubator-refrigerator arrangement large enough to hold a cow and measure all the heat she gives off, and all her intake and excrement must be measured and analyzed. Even if the farmer can carry on these experiments, he is often unable to profit by them. He might spend $10,000 on an experiment worth $100 a year to him and as much to each of another thousand farmers, but he cannot get the money from them to help him pay for the experiment.

SCIENCE IN THE FACTORY, AND AGRICULTURAL EXPERIMENTS

How different is the factory, where almost every condition can be definitely controlled! Most of the experiments can be performed in a day or a week or a month. Then before the year is out the factory can be profiting by the results; and in a decade, while the farmer is still conducting his experiment, the factory-owner may have become a millionaire. Recognizing these facts, we have created elaborate governmental machinery for the promotion of agricultural science and teaching for the benefit of all the people of the United States. We have the national Department of Agriculture at Washington, with many bureaus (see the annual report of the Secretary). We have in every state one or more agricultural experiment stations,[68] to devise and try out things which may be of value to that state and other states. An example of this kind of work is the experimentation carried on in Connecticut to determine the food requirements of animals when growing, at rest, fattening, or producing milk. The results are valuable to every state and every country in the world.

To carry the knowledge yet further, we have created the college of agriculture, the agricultural high school, and finally the county farm bureau, with more than 6000 county agents and their assistants in the United States who are meeting the farmers face to face and helping them to work out their problems.[69]

Machinery is another thing that has been and is changing agriculture in

[68] Some of them unfortunately are sadly inefficient because of conservatism, politics, red-tape rigidity, timidity, and plain boneheadedness.

[69] The teaching service of this organization suffered greatly in the late 1930's, because the agents were bogged down with administrative work, largely paying farmers not to produce — the so-called Agricultural Adjustment Service, and soil conservation. On the other hand, they are *paying* the farmer to farm well, and this may be the most effective teaching of all.

the United States with startling speed during the first half of this decade 1935–45, and it promises to continue. "Maud Muller on a summer's day, raking meadows sweet with hay," has indeed become a poetic vision, a highly imaginary creature far from standard American farming. A rubber-tired tractor tirelessly draws a clicking mowing machine around the field, followed in due time by a side-delivery rake that rolls the hay up so that it will dry perfectly. Then the tractor comes around again pulling the pickup baler, a machine that drops off bales of hay for the truck to carry away to the barn or town. And so we might go on through almost the whole list of American farm crops.

What does science and machinery have to say for the future of agriculture in New England? Much modern machinery has small chance, although tractor-drawn disks can now tear up for reseeding pasture lands which were erstwhile thought to be too rough for any tool. This can increase pasture to some extent. The greatest hope for extension of crops in New England lies in the application of science to a new type of agriculture — tree-crop agriculture. The newer knowledge of horticulture reveals that apples and many other tree crops can, if properly fertilized, be grown in much of the United States without plowing the ground.

TREE CROPS — A NEW AGRICULTURE

This success suggests the possibility of using other tree crops in place of cultivated annual crops. New England has much fertile soil that is difficult, often impossible, to till with the plow. The great need of the New England-Canadian Maritime Region, and also of many other parts of the world, is for agriculture that does not depend on tillage, but is able to grow as a shade tree grows, without benefit of plowshare.

In agriculture we have been surprisingly uninventive. Until the beginning of this century little had been done to domesticate new animals or plants since the prehistoric primitive agriculturalist (woman), seeking quick returns, planted annuals and developed the cereals from the grass family. She could not wait for trees to grow and bear fruit. But tree crops could and should be made a part of agriculture, because the yield is so great in proportion to the expense or effort.

We may search far to find a better nut than the American black walnut, which grows over much of this region. If we should find a better nut, it would probably be the native shagbark. The butternut, the hazelnut, the beechnut, and a number of other wild, fruiting trees are natives of this region, and even hardy strains of the Chinese chestnut, the pecan, and the English (Persian) walnut thrive in southern New England.

During the first two decades of the twentieth century the technique of grafting nut trees has been perfected. It is now easy, and this century should see millions of trees grafted with twigs from the best stock that can be found. Already the patient pioneers have found rare specimen trees of black walnut, shagbark, hickory, Indiana pecan, and other hardy northern trees which produce large crops of nuts whose kernels come out of the shells in halves

like the kernel of the English walnut. Propagation from parent trees has begun in widely scattered locations.[70] This opens a wide vista of new crops through further plant *domestication*, plant *introduction*, and plant-*breeding*.[71] These three processes are to botany what the steam engine in 1800 was to mechanics.

One of the menaces to fruit and other tree crops is the destruction of buds by the late spring frosts. But if planted on hillsides, orchards may escape being frozen when frosts kill the fruit buds in the valley. This is explained as follows: Cold air, being heavy, runs down the slope and settles on the valley floor. The valley may become full of air that has a temperature of 30° while the temperature of the air on the slope is 34° or 36°.[72] Everywhere that frost comes, hillsides, as compared with valley floors, have an advantage for the fruit industry.

Thus the clayey and even the rocky hills of New England are suitable places for the production of apples and many other crops that grow on trees.

Black-walnut and hickory-nut meats are now very high-priced foods. This may induce the New England farmer to grow nut trees in the rough brushland or hilly pasture. Trees and grass grow well together. If cows do not need all of the grass, sheep-ranching might be developed, but the New England sheep ranch requires the utter annihilation of the old system of small farming. A dozen farms must be combined to furnish upland pastures and valley lowlands for the intensive cultivation of crops for winter feed, replacing gullied hillside and abandoned farm. I have seen such farms on the rough lands of Spain, Portugal, the Apennines, Sicily, and the Atlas of Algeria.

The transformation of the untillable lands of the New England-Canadian Maritime Region into the tree-crop type of agriculture is a problem rather for the future than the present. Here and there a farmer will plant a few trees each year and protect them from animals. In a decade or two his farm will grow more valuable. The next generation will inherit a productive legacy and perhaps will plant trees enthusiastically. This type of agriculture continues to yield crops for generations, perhaps for centuries. There are numerous examples in Mediterranean countries, but tree crops must remain relatively unimportant until they grow food for animals — the chief job of the American farmer.

FORESTRY

Forestry is the immediate call for large-scale action in this region. The United States Forest Service says that three-fourths of New England is fit only for forestry, and that the New England forests are now only one-fourth effective.

[70] Persons wishing further information should write to George L. Slate, Secretary, Northern Nut Growers Association, Agricultural Experiment Station, Geneva, N.Y.

[71] This idea is expanded and illustrated at length in J. Russell Smith, *Tree Crops*, Harcourt, Brace and Company, 1929.

[72] For a case so pronounced as to kill the buds on lower limbs only, see F. D. Young and C. C. Cate, "Damaging Temperatures and Orchard Heatings in the Rogue River Valley, Oregon," *Monthly Weather Review*, Washington, D.C., December, 1923, pp. 617–39.

Nature is not waiting for man to begin the task of reforestation. Nature is always busy in the effort to restore most of the area to its original condition of forest. The immediate problem in the utilization of this land is to help nature and then to protect the forest from fire and pest. In Nova Scotia and many other places natural pine forests have been destroyed by fire, which has so injured the soil that the less-desirable spruce has taken the place of the pine.

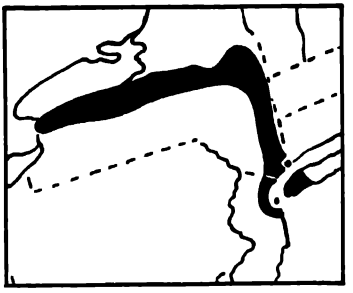
Those who would plant trees in New England complain justly of a stupid system of taxation that immediately puts a burden on the young tree rather than waiting to put the burden on the finished log. The cumulative effect of compound interest on taxes paid on timber trees at planting-time works out to appalling results.

Perhaps the immunity from taxation that inheres to public lands helps to explain the rapid increase in town forests. They have suddenly become the style in New England, and are spreading to other parts of the United States. Also many million acres of New England land have been classified as for future purchase by state or nation.

The beauty of the forests as an attraction to the tourist and the desolation of a burn as a repellent to him are causing a rapid increase in the importance of the conservation concept in this part of the world.

Chapter 5. THE ERIE CANAL BELT — NEW YORK TO BUFFALO

NEW YORK CITY — ITS CROWDS



THE *New York Times* of January 11, 1940, published a report of a trial in a magistrate's court. Here is the essence of the story as far as we are concerned.

Some might have called this incident "the sardine's revenge. . . .

It happened at 8:30 o'clock yesterday morning during the height of the rush hour on the downtown platform of the I.R.T. subway station at Grand Central Terminal. Matthew Walsh, platform guard, was "packing 'em in" in a fashion so well known to subway-riders.

"I just couldn't stand it any more," the banker said in Yorkville Court. "For four years I've been going through this same thing. . . .

"I was on the fringe of the crowd this morning and this fellow" — he indicated Walsh — "got behind me and began pushing. He pushed and pushed and got me half way through the door. Then the door started to close on me. It hit me on the shoulder while he was still pushing.

"I turned around in the crowd and faced him, and I hit him in the face." . . .

"Judge," he said to Magistrate Abeles, "I know I did wrong, but I've been taking this packing into subway trains like a sardine in a can for four years, and it finally got me down."

That is New York — the inhuman pressure of crowds. The story above is suggestive of its cultural effect.

New York City is a giant product of transportation. This is so because nowhere else in the world is there such a supreme focus of routes by sea and land. New York, being the gateway and the market of the North American continent, and having one of the finest harbors in the world, has become the world's most important port.

From the top of one of the high buildings in lower Manhattan, the details of commercial life spread out before the eye like an animated map. Manhattan is an island 13 miles long and a mile or two wide. To the west lies the Hudson (here called the North River). Its broad stream flows southward to the widening bay and the yet wider sea. You look down upon innumerable piers and docks, some of which are 1000 feet long. Across the river in New Jersey at Hoboken and other points are more huge piers. Northward the river is navigable through the highlands toward the rich interior. To the south and east of Manhattan is the East River, lined on both sides with



FIG. A. Rockefeller Center, the most gigantic office-building enterprise ever undertaken, seventy-story building, not fully occupied. (Courtesy Rockefeller Center, Inc.)

docks and wharves, threaded by ferries, dug under with tunnels, and overhung with bridges which connect New York with Brooklyn, Manhattan's first overflow and its present rival in population, with Queens, and with the Bronx. Looking to the northeast, you see the Harlem River dotted with boats.

Here is the world's busiest harbor, teeming with ships of every description — squat ferryboats shuttling back and forth across the river; wide floats carrying freight trains from pier to pier; Long Island Sound boats; Hudson River boats; coast steamers from Norfolk, New Orleans, and Boston; sleek white steamers from the tropics; giant superliners of the North Atlantic, those floating hotels which must depart in a spectacular manner at midnight; oil tankers; ore-carriers; tramp steamers, rusty with the salt spray of the Seven Seas; occasionally some relict of the dying days of sail; and everywhere dirty little tugboats skillfully weaving their way in and out of the congested traffic. The little tugs, puffing with great labor, are assisting the huge liners in and out of the harbor. They are pulling barges of coal, barges of oil, barges of lumber, barges of grain, barges of everything, it seems. They are busy doing the odd jobs of the harbor.

New York is a commercial gold mine, with the kind of lure that California had in '49. This rich, exacting, gold mine of business opportunity is the magnet that draws many of the able, the ambitious, the adventurous, and helps to empty the farmhouses of New England, of the South, and even of the West.

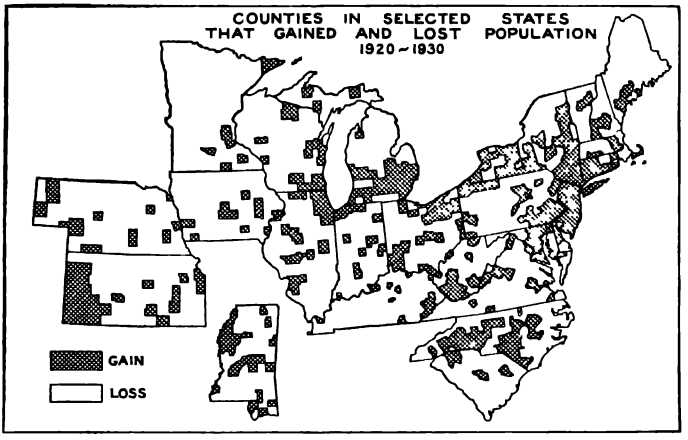


FIG. A. This map of movement in the "golden twenties" will bear much thought. It shows migration from farm to town. We have no map to show this depression wave back to the farm. (Adapted from Carter Goodrich and others, *Migration and Economic Opportunity*.)

So many people have come here to do business that the lower part of Manhattan Island has become terribly crowded. More space must be found. Where? Someone invented the elevator, and buildings, instead of spreading out, shot up into the air and became higher and higher. The steel skyscraper piled men upon the land and condensed business upon this spot as never before in the history of the world. It aids business by letting so many people be near each other. New York now has 35 buildings that exceed 500 feet in height, and, looking down upon them all is the Empire State Building with its 102 stories, 1248 feet tall.[1] There are elevators which stop at every floor, and other elevators which give express service. "No Stop to the 20th Floor" is a common sign. In several buildings two elevators are needed to reach the top; the first goes to the thirtieth or fortieth floor, where you change cars and take the second elevator, which takes you on up to the top.

Some of the skyscrapers are beautiful buildings. Twenty-three of these cathedrals of commerce are taller than the Pyramids of Egypt, the Capitol, the Washington Monument, or the Tower of London. When you look down at the street from the top of such a building, the people appear to be as tiny as ants; like ants they come streaming out of the ground (subway entrances); like ants they press forward with a kind of relentless, unheeding speed, for there is so much that one may do in this many-storied metropolis if one moves fast enough; one can see more people if only one hustles more.

Fifteen thousand persons pour out of a single building into the streets, many of which are narrow because once they were lanes left between the cabins of the Dutch fur-traders of 1640 or 1650. So great are human numbers that if all the people got into the street at the same time they would fill it in some sections two layers deep.

[1] Second tallest is the Chrysler Building, 77 stories, 1046 feet in height.

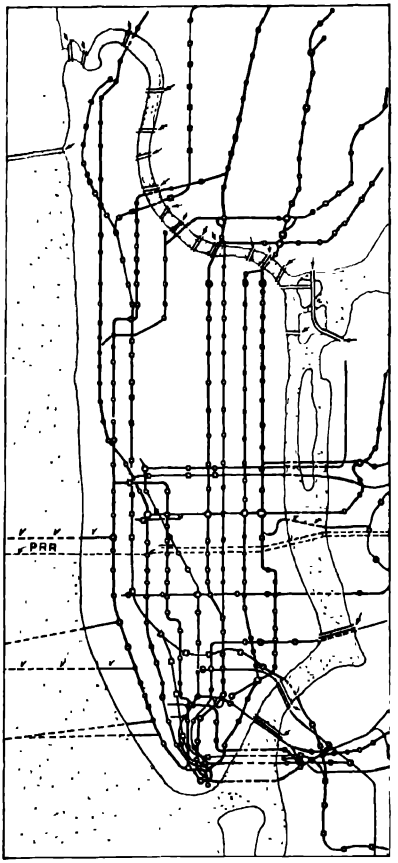


FIG. A. Map of Manhattan Island showing subways, tunnels, and bridges that cost hundreds of millions of dollars — a part of the cost of crowding and island location. Broken line under river — tunnel. If it has VV, it is for highway traffic. Solid line across river — bridge.

This mass of humanity quickly overcrowded the surface cars. Then elevated railroads were built on available north-south streets to lower Manhattan, and trains roared and rattled past the second- and third-story windows and even on tracks built over the tops of houses. Soon they too became unable to carry the people. But passengers must be carried, so subways were dug underground, and through them heavily laden trains rumbled and roared. In the most congested districts the subway has four tracks, with express trains and locals. The second subway soon followed the first, and the third followed the second, and still the crowds cannot be handled without much waiting and crowding and jamming. In 1938 the subways alone carried over 1,300,000,000 passengers. Tunnels have been dug under the rivers, bridges have been built over them, and ferryboats ply back and forth upon them in order to connect insular Manhattan with adjacent boroughs and with New Jersey. Ever expanding bus lines augment all other facilities. The streets are choked with automobiles, and it is often quicker to walk the few blocks between the Pennsylvania and Grand Central railway stations than to take a taxi and set out in the heavy traffic. Nothing seems to bring any noticeable relief, for every new facility brings more people to share the matchless business opportunities in this huge and most crowded of human hives.[2] The mere fact of numbers of people thus makes it the best possible place for many kinds of business. Every day in normal business periods several hundred people come to the city to live, and, like the proverbial snowball, Greater New York gets bigger and bigger.

[2] NEW YORK

Jazz, rattle, bang, crash, asphalt and cobblestones,
Roar of the Subway — clangor of the El,
Battering the brainpan — shattering the consciousness,
Some call it living, but I call it hell.

— Baron Ireland, in the *Saturday Evening Post*, copyright, 1922, by the Curtis Publishing Co.

New York's insularity has been modified in recent years by a burst of bridge- and tunnel-building. Two new bridges were thrown across the East River from Manhattan to Brooklyn, and one from Manhattan to Queens. Upper Manhattan got the wonderful George Washington Bridge across to New Jersey. The city got its share during the spree of government-aided building with which the Federal Government tried to buy out the depression of the '30's. A great Triboro Bridge was built connecting Manhattan, the Bronx, and Queens. Lower Manhattan got the Holland Tunnel or tunnels, for there are really two, eastbound and westbound. Each has two tracks, a truck track and an automobile track, with policemen to keep motorists straight and rescue squads to whisk disabled vehicles promptly to the other end of the tunnel. In mid-town New York the Lincoln Tunnel, now partially completed, will duplicate the Holland Tunnel in services. New subways have also been built, with tunnels to Long Island and New Jersey. All this ease of getting vehicles and people into Manhattan tends to make street traffic conditions in the lower part of the city even worse than before. Witness the attempt in 1939 to keep interstate busses from coming to the island.

THE MOHAWK DEPRESSION AND THE ERIE CANAL

For decades New York has overshadowed all cities on the North American continent. Many forces have contributed to its greatness, and among them is the fact that New York for over a century has been the only seaport served by an effective canal route to the Great Lakes.[3]

The riches of the central region of the continent were known to the leaders of the Revolutionary period; to find a means of tapping its commerce was the dream of commercial prophets from the Revolution to 1830. Every important seaboard city had a plan, all unsuccessful except that of New York. Its triumph was made easy because the Mohawk Valley provided the only break in the highlands, which otherwise continue without interruption from the St. Lawrence Valley to the Gulf Slope.[4]

Before the Erie Canal was built the cost to haul wheat in the farmer's wagon over bad roads for a distance of 300 miles ate up the value of wheat. To haul corn 100 miles ate up the value of corn. At one time sea salt from the Atlantic Coast cost $35 a ton in Pittsburgh. In April, 1822, corn brought

[3] Rollin G. Albion, in *The Rise of the New York Port (1815–1860)*, Charles Scribner's Sons, 1939, shows that in the decade 1815–25, before the opening of the Erie Canal, the port of New York had already surpassed those of Philadelphia and Boston. After the War of 1812 it was selected by the British as the place to "dump" their manufactures. In 1818 the first transatlantic packet line *sailing on schedule* began service from New York. Similar lines to the South soon gave the United States leadership in cotton exports. Then the Erie Canal brought flour and grain exports and started the avalanche toward New York.

[4] In its final form the Erie Canal, now named the New York State Barge Canal, rises from sea level on the Hudson to an elevation of 420 feet; then it goes down to 370 feet at Syracuse; and up to 564 feet at Lockport, entering the Niagara River at Tonawanda. The channel of the canal is 12 feet deep; it has a minimum surface width of 123 feet and a minimum bottom width of 75 feet. The Barge Canal and its branches total 525 miles of canal and 382 miles of canalized river and lake. The state maintains the waterway, as it does highways, and a few terminals. The canal does no carrying, establishes no rates. No companies do a package business, and only large corporations can afford to own and operate a fleet of modern barges to carry their own cargoes.

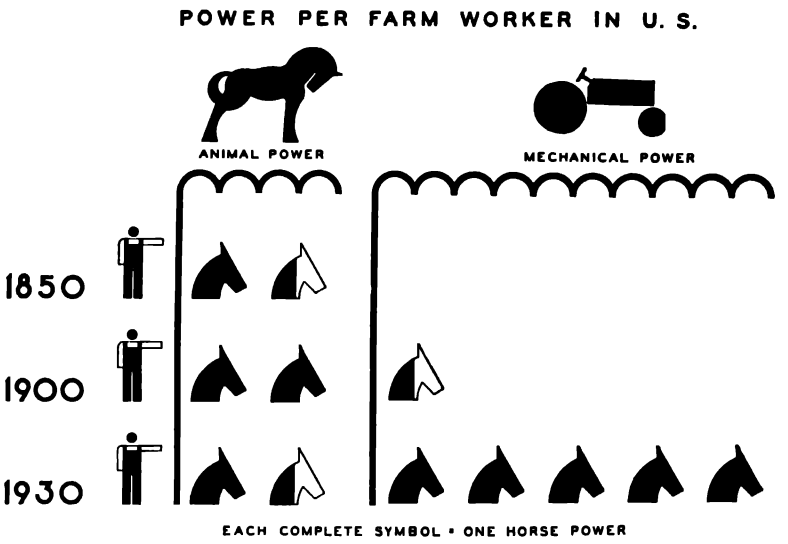


FIG. A. How does this graph help to explain the flow of population from farm to city and the consequent growth of giant cities? (Courtesy Nat'l Resources Board)

8 cents a bushel in Cincinnati and 80 cents in Philadelphia. There is a record of one boatload of flour taken from western Pennsylvania down the Ohio and the Mississippi and around to Philadelphia. At that time, commercially speaking, the middle of the continent did not exist save for the fur-trader.

When the Erie Canal was opened in 1825, the freight rate from Buffalo to New York dropped from $100 to $5 a ton, and the freight time dropped from 20 days to 8. The traffic of the lake region poured into New York Harbor. Instantly the Great Lakes became a part of New York's hinterland. An enthusiastic era of canal-building ensued. Horse-drawn barges were soon running on easily built canals between Lake Erie and the Ohio River and between Lake Michigan and the Mississippi, thus promoting trade between New York and the Middle West via the Great Lakes and the Erie Canal. Prior to 1850 the nation's railroads had not yet been consolidated into through lines or great systems; many of the first railroads in the Middle West merely served as feeders to the inland waterways that finally focused on New York, thus adding more area to New York's vast and swiftly widening hinterland. In New York State canals were built to connect the Erie Canal with Lake Champlain and Lake Ontario. Night and day the Erie Canal resounded to the yells of boatmen urging the mules which tugged the boats at 4 miles an hour along the busy waterway, and within a decade the original cost of the canal, $7,000,000, was repaid through the receipt of tolls.[5]

New York grew amazingly. The cities along the Erie Canal also began to grow. The first railroads in New York State, attracted by the towns, followed

[5] In 1826 more than 19,000 boats and rafts passed West Troy, New York.

the Hudson River and the Erie Canal from town to town, and furnished more speedy communication. For hauling heavy freight the railroads had to meet the comparatively low rates of the canalboats except when the canal was closed by ice. This influenced the railroads that later went more directly from Buffalo to New York; from Chicago to Philadelphia and Baltimore, and even to Norfolk. Even the railroads of Canada which carried freight from the Lake Basin to New England ports had to keep their freight rates low. The Erie Canal did New York City great service by carrying freight at low cost, even greater service by drawing railroads to the port, and further service by making the railroads carry freight at reasonable rates.

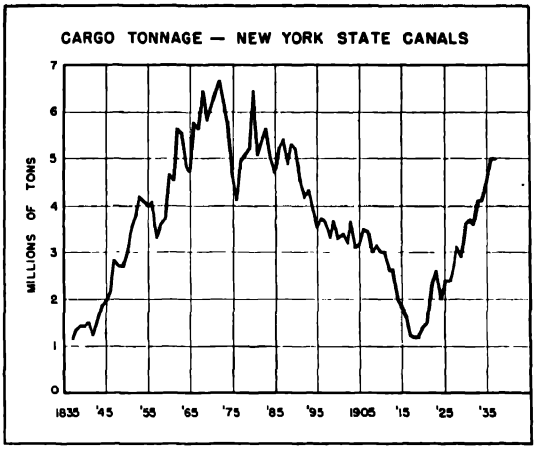


FIG. A. As late as 1870 rail and canal traffic in New York State were about equal, but by 1900 the ratio was 20 to 1 in favor of the railroads. In spite of modern improvements and a prime location, the New York State Barge Canal today is a white elephant — but its past still serves the present. (From *Statistical Abstract of the United States*)

Being the greatest port of export, New York naturally attracted the most important steamship lines. The canal and the railroads made ships come, and more ships made more railroads come. The Pennsylvania R.R. was built to bring traffic to Philadelphia and the Baltimore & Ohio to carry traffic to Baltimore, but both found it profitable to extend their lines to New York, for this valuable connection with the world's greatest port stimulated their through traffic from the Middle West and gained for them a share of the import trade.

All these things made New York the gateway to the heart of North America. The Erie Canal started this, and it was not until after 1870 that canal traffic in New York State was surpassed by that of the railroads. Since then the railroads, and more recently the motor trucks, have made an ever increasing contribution to the commercial greatness of New York.

We call the region the Erie Canal Belt because of the predominating influence of the Hudson-Mohawk Depression and the waterway in creating the long line of cities that has New York at one end and Buffalo at the other. This line of cities is almost uninterrupted, and it extends from the ocean, the highway of the world, to the Great Lakes, the highway of the interior of the continent.

In the final analysis, it was nature that created the Erie Canal route. The Hudson Valley is a drowned valley, and, owing to the submergence of the land, the tide extends to Troy. Between the hard crystalline rocks of the Adirondacks and the Catskills is an area of weak limestone rocks, easily

subject to erosion, and hence the Mohawk Depression. It was a mere accident of history that the canal came before the railroads, and built the line of cities. Thus man has used the great highway laid down by nature, and it has been the prime cause in creating a clear-cut region.

FOREIGN TRADE

A central position on the coast early made New York the focus of the coasting trade. On one side was New England with its manufacturing and fishing. On the other side was the agricultural South. In 1825, when the canal was opened, 4000 coasting vessels and 1400 foreign vessels entered New York Harbor. The Civil War clinched its hold upon the trade of the Middle States. The Mississippi and the Southern ports were closed for four years, during which time the railroads were consolidated and trade was thoroughly established on East-West lines. The South served New Orleans a sorry blow by secession. Between 1860 and 1870 New York's share of United States exports varied from 34 per cent to 60 per cent.

New York today is the world's premier port, for it serves the commerce of the richest of all the continents. A few of the many factors that account for its supremacy may be mentioned briefly. New York has a splendid location in the midst of a densely populated and wealthy industrial and commercial area along our northeastern seaboard facing Europe, which still is our best customer and a leading source of imports (see Figs. 957 A–B). Behind New York, therefore, is an immediate hinterland that is both a great market and an important producer of goods. The size, and productivity, and purchasing power of this tributary hinterland are without an equal, for a large portion of the interior of the continent focuses commercially upon New York. To this peerless hinterland it has long had cheap and easy access, with remarkable transportation facilities that gave it a decisive advantage over rival ports at an early date. To the outside world, it has the largest number of regular steamship services of any port in North America. The drowned valley of the Hudson gives it a deep and commodious harbor that is scoured out twice daily by the tide. With its 360 miles of improved water front and its 40-foot channel depth, New York Harbor is one of the world's best.[6]

During the last fifteen years about half of all of our imports and about a third of our exports, on the basis of value, have moved through the port of New York. The greater pre-eminence of New York in the import trade is due largely to the character of the commodities (see Figs. 956 A–B) and to the type of transportation service needed.[7]

[6] In one respect New York is deficient, namely, the lack of co-ordination of terminal facilities, often resulting in traffic congestion and delay at the water front. The length of the water front is by no means an index of a port's efficiency, belt-line switching facilities sometimes being far more important. There are a number of European ports which appear like mere holes in the mud in comparison with New York but which handle three times as much cargo per linear foot of wharfage. Hence New York's slogan, "Biggest in the World," does not mean so much.

[7] Twelve leading exports (1938): automobiles and parts, raw cotton, leaf tobacco, crude petroleum, gasoline, electrical machinery, metalworking machinery, corn, wheat, farm machinery, refined copper, and lubricating oil. These comprised 48% of the total value of

About 40 per cent of the American import trade consists of finished manufactures and semimanufactures, which because of their high value and small bulk require speed and regularity in transport and are moved in parcel lots by liners. Another 30 per cent of the import trade consists of raw materials, and these, for the most part, are of sufficient value in proportion to bulk to require regular steamship service. New York, with its liner services to so many parts of the world, with its good location in respect to domestic markets, and with its excellent distribution facilities for goods upon arrival, makes an ideal port of entry.

On the other hand, approximately 50 per cent of our exports consists of finished manufactures, and another 15 per cent, of semimanufactures. Many American manufacturers prefer to export their goods via New York because of the frequency and regularity of liner service available there. Less than a third of our exports consists of raw materials and crude foodstuffs (e.g., grain, cotton, lumber, phosphate), which are low in value in proportion to bulk. These staple commodities naturally seek the nearest port of exit in order to reduce the expense of land transportation. With them there is no great premium on speed, and they are likely to move by slow cargo liner or by tramp.[8]

In view of the long-run trend for exports of raw materials and crude foodstuffs to decrease in relative importance and for manufactures to increase, New York's share of the export trade may increase. On the other hand, it may not increase if other ports develop more extensive liner service.

MANUFACTURES IN NEW YORK

Commerce was the scaffold, the framework, that started the city and held it up while a yet greater structure of manufacturing and local business was built upon the framework. It is interesting to see how one thing brings in another. All through the nineteenth century we were importers of fine goods from Europe, especially fine clothing and equipment. The goods landed in New York. Therefore merchants from everywhere went to New York wholesale houses and New York became the greatest wholesale market in the country. If a local manufacturer tried to rival the popular European styles, he too took his goods to the New York wholesale house. Hence the clothing industry naturally grew up in New York beside the wholesale houses. This proximity is a great advantage; clothing can be manufactured and displayed to better advantage and can reach the purchaser more quickly if the salesroom is on the first floor and the workshop is on the fifth or tenth floor of the same building, or just around the corner, as is now so often the case.

American exports. Twelve leading imports: coffee, cane sugar, crude rubber, newsprint paper, raw silk, wood pulp, distilled liquors, tin bars and pigs, furs, copper ores and concentrates, leaf tobacco, rawhides and skins. These comprised 46% of the total value of our imports.

[8] For an account of the desertion of many commodities from tramp to liner service and for an analysis of the transportation requirements of American exports and imports, see *Report of United States Maritime Commission on Tramp Shipping Service*, House Doc. 520, 75th Cong., 3d sess., 1938.

THE CLOTHING INDUSTRY

Immigration aided the growth of the clothing industry. The ships that carried exports and imports brought human imports too. Hundreds of thousands of immigrants arrived annually.[9] Practically all of them entered by way of New York, and many of them, especially those from central and southern Europe, remained there. New York acquired the greatest non-agricultural labor supply in the country.

The clothing industry can endure the crowded conditions of a great city, because small space is needed. About 1910 a private survey was made of New York industries, and it was found that in one block in lower Broadway about 40,000 people were working at the clothing industry, housed in buildings 10 or 12 stories high. The workers often sat as close together as students sit in school. For many decades New York City has had the advantage of an abundant supply of cheap labor; it has long been the style center of the United States; and the city itself is a great market lying in the midst of a densely populated area with millions of people to be clothed. This combination of factors has given New York more than half the clothing manufacture of the United States.[10] Since 1930 the great stream of immigrants has been reduced by law to a mere trickle. The decrease in the supply of cheap labor, vigorous activity by labor unions, and wages and hours legislation have

[9] Peak years were 1905, 1906, 1907, 1910, 1913, and 1914, years in which more than 1,000,000 immigrants arrived. Since 1900 the record has been as follows: 1900–04, a total of 3,300,000; 1905–09, 4,900,000; 1910–14, 5,200,000; 1915–19, 1,200,000; 1920–24, 2,800,000; 1925–29, 1,500,000; 1930–34, 400,000 (figures from *Statistical Abstract of the United States*, 1938, p. 97).

[10] VALUE OF CLOTHING MANUFACTURES, 1935

(millions of dollars)

Rank	*Industrial area*	*Total*	*Men's*	*Women's*
1	New York	$1,229	$ 334	$ 895
2	Chicago	123	57	65
3	Philadelphia	123	82	41
4	Baltimore	58	48	10
5	Boston	53	30	23
6	Los Angeles	39	11	28
7	St. Louis	37	22	15
8	Cleveland	37	24	13
9	Cincinnati	32	29	2
10	Rochester	22	22	0
11	San Francisco	19	9	10
	All other areas	534	368	168
		$2,306	$1,036	$1,270

Note: The above data include (1) men's furnishing goods, (2) men's cotton collars, nightwear, shirts, and work clothing, (3) men's, youths' and boys' clothing, (4) women's misses, and children's apparel. Because of the nature of the census classifications, these data are not complete, but they do give a reasonably accurate concept of the value of clothing manufacture. Source: *Biennial Census of Manufactures, 1935*, 1938.

resulted in rising costs for New York's clothing manufacturers — and a higher standard of living for the clothing workers.

The division of labor as applied to the clothing industry has gone so far that dozens now work on a single suit of clothes. An uneducated, non-English-speaking foreigner can quickly learn to do one of the simple processes in clothing manufacture.

The cigar industry, like clothing, is one that requires but little factory space and is therefore well suited to crowded city conditions. It is important in New York.

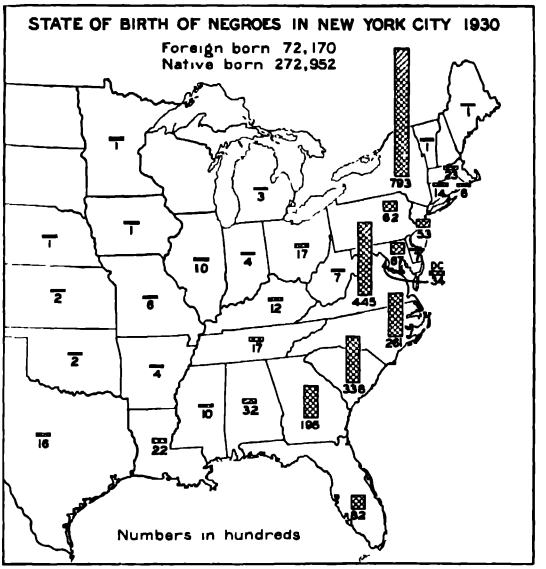


FIG. A. The New York jobs are a magnet that draws men of every color. (After Thornthwaite)

A FINANCIAL CENTER

Finance is the handmaid of commerce and industry, and it follows in their footsteps. The phenomenal growth of trade that followed the opening of the Erie Canal called for the services of bankers, brokers, insurance men, and a host of middlemen, and it was not long before New York outstripped its rivals as a financial center. Growing trade and shipping yielded an increasing surplus of capital funds. New York bankers had to deal with bankers overseas, whither its exports went; they dealt with bankers in the interior, whence many of its exports originated and whither many of its imports went. Foreign banks maintained balances with their correspondent banks in New York, and "country" banks throughout the United States sent their idle funds to New York to be loaned out to brokers and others on short-time loans. If the "country" banks wanted to invest some money in stocks or bonds, New York was the place to buy them. Although Chicago, St. Louis, and other large cities offered some competition, the bank reserves of the country became pyramided in New York. Before the establishment of the Federal Reserve System a stock-market crash or a few big business failures in New York might easily throw the nation into a financial panic. Even since the decentralization of bank reserves under the Federal Reserve System, the Federal Reserve Bank of New York towers above the other eleven Federal Reserve banks in power and influence.

During the World War, 1914–18, the United States became a creditor nation, and New York's financial power spread to the four corners of the earth. Foreign governments and business enterprises turned to New York

for capital funds, since New York banking houses could sell their bonds and stocks without difficulty. In the booming 1920's New York surpassed London in the volume of its new loans to foreign countries, but the Londoners remark upon how very many of these loans proved worthless.

Many firms in distant countries deal through New York. A company which owns a railroad in Ecuador has men in a New York office who make bargains for steel rails shipped from Pittsburgh, for ties shipped from Oregon, for cement shipped from eastern Pennsylvania. The Standard Oil Company, whose offices are on lower Broadway — though not a barrel of oil is produced within 200 miles — is buying oil in a dozen distant states and many foreign nations, refining it in half a dozen distant cities, and running steamers all over the world, but most of the stock is owned in New York, and most of the larger business is transacted on Broadway. This concentration of finance has made Wall Street, a little strip of land 30 feet wide by less than half a mile long, one of the best-known streets in the world.

New York is the transaction center, the bargain center, the greatest market place in the United States, not only for many commodities but also for capital funds. On the Cotton Exchange brokers buy and sell cotton that they never see, and likewise brokers do business on the Coffee Exchange, the Cacao Exchange, and other organized markets. On the New York Stock Exchange (founded 1792) as many as 16,000,000 shares have changed hands in a single day. It is apparent that New York is the supreme focus of supply and demand for capital funds as well as for many commodities. Hence the multitude of transactions in New York may be said to have a dominant influence upon the price of many commodities, upon the price of most securities, and upon the price of money (the interest rate).

So much has become centralized in New York that it has the same predominance in printing and publishing as in finance and trade. Many of the books published in New York are actually printed in small towns in New England, New Jersey, and Pennsylvania, where the cost of living is cheaper than in New York. This publishing is another example of a *transaction center*.

A TRAVEL CENTER

With the people going to New York on business trips and those going to and from Europe, the city has become the greatest travel center of the continent. Merchants from everywhere go to New York to make the rounds of the wholesale and manufacturing sample agencies. With so many visitors to be cared for, people have sometimes had to go to Newark or even to Philadelphia to find a place to sleep. Tens of thousands of people in New York make a living by working in the hotels, restaurants, and theaters that cater to the traveling multitude. Some of the hotels have an employee for every guest. Servitors of travelers are numerous enough to make a city far larger than was New York in the day when it was the capital of the United States.

To see plays — many of which never leave New York — tens of thousands visit the metropolis each winter. Hundreds of actors and actresses entertain



FIG. A. Lower Manhattan. The most astounding group of buildings ever built. Docks, freight sheds, the S.S. *Queen Mary*, river steamers, tugs, Brooklyn in the background. (Courtesy Cunard Line)

the audiences. The theaters and the moving-picture houses could seat over 1,500,000 persons at a time in 1935.

It is often surprising to find what a small proportion of the workers in a city are actually engaged in the dominant industry and what a large proportion are engaged in taking care of the rest. The butcher, the baker, the candlestick-maker — the people engaged in serving the city — are more numerous in New York than in any other city, because of the difficulties of living in crowded New York. Thousands, for example, have been busy for years building subways; other thousands are busy operating them. New York is in constant process of being rebuilt. Thousands are at work tearing down and putting up buildings, enlarging subways, repairing streets. This kind of activity adds enormously to the number of people who are busy taking care of the rest and feeding them and adding to the cost of living.

New York has become so large that it is itself a major market. Scores of factories are required to keep its millions supplied with each particular kind of food, furniture, and clothing.

THE PEOPLE OF NEW YORK CITY

The population of New York City is richer in its variety than any other similar group in the world. Its people represent every race and tongue and culture. If you wish to eat foreign food or study the idiom of a foreign

language, you need not go to Europe — visit Little Italy, Little Germany, Little Slovakia, Little Lithuania, or some of the other scores of foreign centers of New York. In 1923 the National Council of the Protestant Episcopal Church made a study of the foreign-born groups in the congested portions of New York City and published a map locating 24 Polish centers, 23 Italian centers, 18 Greek centers, 13 Czech centers, 10 Magyar centers, 8 Russian centers, 8 Armenian centers, 6 Yugoslav centers, 2 Syrian centers, 2 Rumanian centers. The United States Census classified the people of New York City as follows:

POPULATION OF NEW YORK CITY, 1930

Native white, native parentage	1,505,000
Native white, foreign or mixed parentage	2,789,000
Foreign-born white	343,000
Negro and other races	2,293,000
Total	6,930,000

Those of foreign birth were of many nations.[11]

In 1920 New York had more Irish than Dublin, more Italians than Rome, and it turned out to be the Promised Land, for it had more Jews than Jerusalem had even in the most glorious days of King Solomon. Irish immigration was the first to come in large numbers, and the Irish have become so thoroughly Americanized that they no longer live in centers but are scattered throughout the whole body, a fact which suggests that in their case the American melting-pot has been effective. Their number in the city is attested by a list of over 5000 Murphys in the city directory. Their influence in the city government has been the same as it is in Boston. In 1924 the ruler of New York, Boss Murphy, chief of Tammany Hall,[12] died, leaving an estate of $400,000. At this time Mr. Ryan was secretary of Tammany Hall, Mr. McCooey was boss of Brooklyn, and the leading candidates for successor to Mr. Murphy were Surrogate Foley and Judge Olvany. This dominance by the Irish is perhaps temporary. Americanization seems to bring others to the top. In 1924 the most dangerous rival of Tammany Hall for leadership in New York politics was Mr. Fiorello LaGuardia. He is of Italian descent, and had been a major in the American army that fought in Europe and a member of Congress. In 1933, running on a Fusionist ticket, he was elected mayor, and he was re-elected in 1937.

[11]

Russian	442,000	Germans	238,000
Italians	440,000	Irish	221,000
Poles	238,000	Austrians	127,000

Approximate numbers of foreign-born of other nationalities as follows: English, 78,000; Hungarians, 60,000; Rumanians, 47,000; Canadians, 40,000; Scotch, 39,000; Norwegians, 38,000; Swedes, 37,000; Czechoslovaks, 35,000; Greeks, 27,000; French, 24,000; Turks, 15,000; Lithuanians, 15,000; Central Americans and South Americans, 14,000; Spaniards, 14,000; Finns, 13,000; West Indians, 13,000; Danes, 11,000; Swiss, 10,000; Jews and Syrians, 9000; Chinese, 8000; Yugoslavs, 6000; Dutch, 5000; Japanese, 2000; Welsh, 2000.

[12] This political organization, nearly one and a half centuries old, controlled the Democratic party prior to the New Deal, and in its periods of success completely governed New York by naming mayors, councilmen, judges, school directors, policemen, very much as the dominant political organization does in nearly every other city of importance in the United States.

The city is filled with people of tough and vigorous stock, for it is more often the stronger who migrate. Most of its people are the children and grandchildren of immigrants from Europe, or from the American farm. About one-half of the native-born children in New York City have one or both parents of foreign origin.[13] The New York public school system, like that of Boston, is striving to transform the immigrant child into an American citizen. There is much effort to train him for economic independence through vocational guidance and vocational training. But alas! in the 1930's the young and ambitious product of the schools waited by hundreds of thousands for jobs. (See Chapter 1.)

The climate is wholesome, and, considering the crowded conditions under which people live, the health of this population is good. The nearness to the sea usually tempers summer heat. On a hot summer day one can see over 1,000,000 human beings swarming on the beach at Coney Island.

Opposed to these advantages is the increasing density of New York's population per square mile since 1865, but this has happened when our knowledge of preventive medicine was increasing rapidly, and its discoveries were being applied by a vigorous health department. This has helped to bring about great improvement in the control of communicable diseases.[14]

THE SISTER CITIES WEST OF THE HUDSON

In a geographical and an economic sense the cities west of the lower Hudson are as much a part of New York as are the cities beyond the East River.[15] Like New York itself, they have grown up as a result of the traffic focus. Immediately across from lower Manhattan is one city with three governments and three names, Hoboken, Jersey City, Bayonne. To the westward across the marshes is Newark, reached by barges and therefore industrially and commercially part of New York Harbor. To the south of Newark is Elizabeth, claiming the production of half of the sewing machines of the United States. The manufactures of most of these New Jersey cities are extremely varied; for example, Elizabeth lists 216 different industries, varying all the

[13] If one should say that three generations on this continent are required to make a person truly American, then the inhabitants of the United States today are less truly American than were the generations that lived here between 1770 and 1830.

[14] Infant mortality in New York City declined from 200 per 1000 live births in 1880 to 48 in 1935. Between 1876–85 and 1926–35 the average death rate due to pulmonary tuberculosis declined from 368 per 100,000 to 62; typhoid fever, from 29.5 to 1; diphtheria, from 171 to 4.5; and scarlet fever, from 88 to 1.1.

[15] POPULATION IN THOUSANDS, 1930 AND 1940 (U.S. CENSUS)

	1930	*1940*		*1930*	*1940*		*1930*	*1940*
Newark	442	430	Hoboken	59	50	North Bergen	41	40
Jersey City	317	301	Union City	59	56	Bloomfield	38	42
Paterson	139	140	Irvington	56	55	Orange	35	36
Elizabeth	115	110	Clifton	47	49	New Brunswick	35	33
Bayonne	89	79	Perth Amboy	44	41	*Total*	1725	1570
East Orange	68	69	Kearny	41	39			

Trenton, Camden, Atlantic City, and New Brunswick are the only New Jersey cities with more than 35,000 people not included in this list.

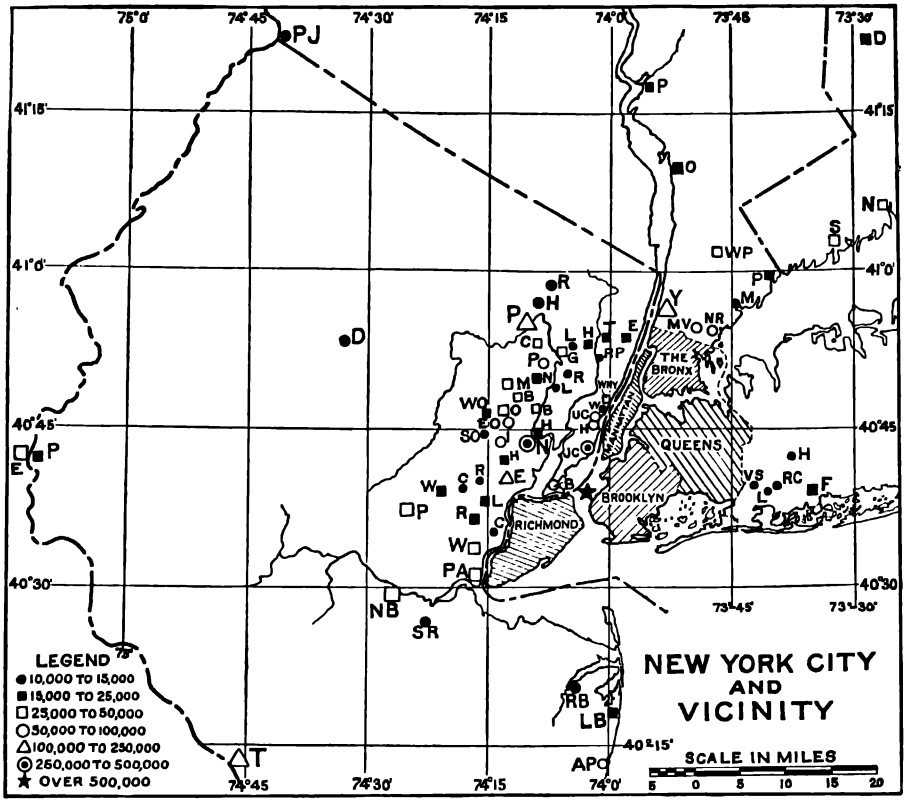


FIG. A. A cluster of cities, and then country, country, country — a clustered archipelago of cities in a rural sea — almost a sea of forest.

way from razor blades to heavy machinery hoists and printing presses. A little to the north of Newark is Passaic, with important wool-manufacturing, and still farther north, where the Passaic River tumbles 70 feet over the terminal moraine and makes a lot of water power, is the city of Paterson, which has long been known as the "silk city," for over one-seventh of the country's silk looms are to be found in its mills.[16]

BUFFALO

Buffalo stands at the western end of this human-use region as the counterpart of New York, although only one-twelfth as large. New York commands the Seven Seas; Buffalo commands the eastern end of the Great Lakes. The

[16] Comparatively little of Paterson's output is pure silk, as mixtures of cotton, wool, and rayon are used to bring the finished materials within the range of the average consumer's purse. Changes in style, such as the short-dress fashion, at times have dealt heavy blows to Paterson's industry. Paterson's textile industry is more than a century old, and so are its strikes. In 1835 some 2000 workers in 20 mills struck for a 60-hour working week and succeeded in having the working day reduced from 13 to 11½ hours.

heavy lake traffic indicates the variety and abundance of the products and raw materials of the interior. Thus Buffalo sends hemlock to New York and gets mahogany in return. It sends grain and gets spices; flour and gets sugar; limestone and gets diamonds; hides and gets imported cloth; steel products and gets jewelry.

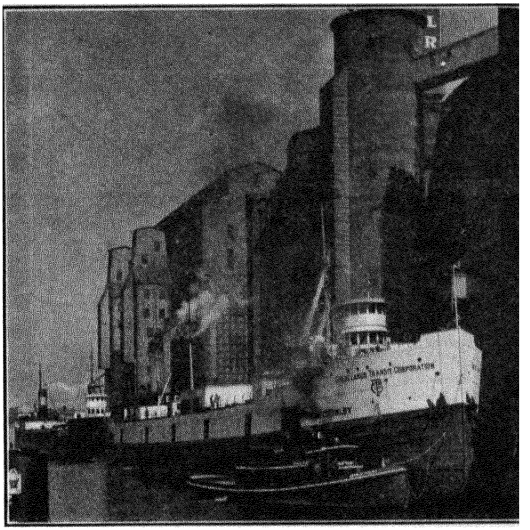


FIG. A. The funnel function of Buffalo. The device immediately to the left of the pilothouse on the big boat is an endless-chain elevator to take wheat up from the hold of the boat. Gravity takes it down. (Courtesy Buffalo Chamber of Commerce)

Through most of its career Buffalo has been a funnel pouring wheat, corn, oats, and other produce from lake steamers to canalboats and railway cars bound for New York. About 20,000,000 tons of cargo (chiefly grain, iron ore, and limestone) move across its docks each year, and it ranks first among all lake ports in the value of tonnage handled. Not only has Buffalo served for decades as a great transshipping-point in the stream of East-West traffic, but it is also the greatest gateway to Canada; more than a fourth of all Canadian-American commerce is recorded by its customhouse. In recent years some of the barge traffic, such as the barges of the Ford Motor Company of Detroit, have been routed via the Welland Canal and Lake Ontario into the Oswego branch of the Barge Canal system instead of entering the canal at Buffalo.

In recent decades Buffalo has risen rapidly in manufactures, for which its resources are great, and its industries are varied.[17] In 1937, Erie County, in which Buffalo is located, had a manufactured output worth $857,000,000.[18]

[17] Population changes of cities in different sections of this region are very suggestive.

ERIE CANAL BELT CITIES OVER 25,000 — PER CENT CHANGE, 1920–30; 1930–40

(Figures from the U.S. Census; 1st figure 1920–30)

New York	23.3%	7.6%
Cities of Northern New Jersey	17.8	−3.1
Buffalo	13.1	0.5

Hudson River Group			*Canal Group*		
Newburgh	3.0%	1.9%	Schenectady	7.9%	−8.5%
Poughkeepsie	15.1	0.5	Amsterdam	3.9	−4.3
Kingston	5.2	1.8	Rome	22.8	5.8
Albany	12.4	2.5	Syracuse	21.9	−1.6
Troy	1.1	−3.4	Rochester	10.9	−1.0
Yonkers	34.4	5.9	Utica	8.1	−1.2

[18] The value of manufacturers in the Buffalo-Niagara industrial area was $1,078,000,000 in 1937.

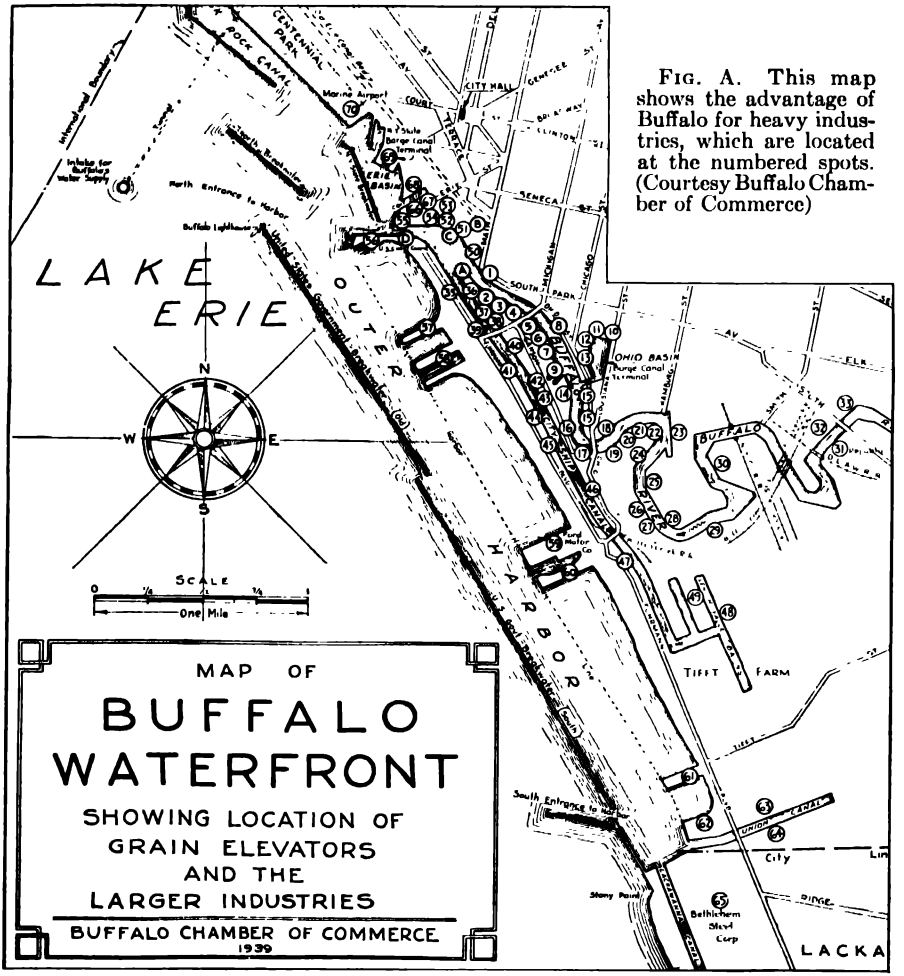


FIG. A. This map shows the advantage of Buffalo for heavy industries, which are located at the numbered spots. (Courtesy Buffalo Chamber of Commerce)

Buffalo's manufactured product reflects the character of its commercial location. With its steamers reaching all the shores of the Great Lakes, lying near the Canadian forests and near the mines of Minnesota and Pennsylvania, Buffalo has a great advantage for the assembling of bulky raw materials — grain, lumber, coal, limestone, and iron ore. It has in addition the unrivaled power resources of Niagara.[19]

Before the invention of the turbine, Niagara Falls was little more than a spectacle, a world wonder.[20] In 1881 the first hydroelectric plant was es-

[19] As has been noted, the Hydro-Electric Power Commission of Ontario sells power in that province at a low price — the subject of endless argument and propaganda on the American side, where people pay more.

[20] It is said that the first to utilize the power of the falls was Chabert Honcaire, who in 1757 built a short and narrow loop canal to deliver water to a wooden overshot wheel in

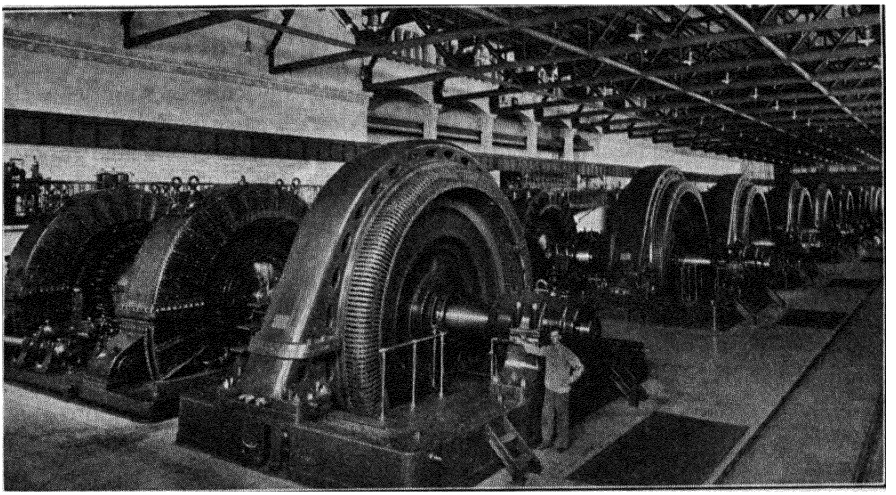


FIG. A. Power. Ontario Power Plant, Niagara Falls. Back of the man's head is a shaft. Attached to it are an electric generator, 11,100 horse power or 7500 kilowatts, and two water turbines, 11,700 horse power. The water in the riveted scroll cases leaps upon the surprisingly small turbine with a velocity born of the pressure at the bottom of a vertical column (penstock) 180 feet high — the effective head. Note the row of generators. (Courtesy Hydro-Electric Power Comm'n, Ontario)

tablished, and in 1896 the first transmission lines began to deliver power to Buffalo. Mighty Niagara unquestionably is one of the finest water-power sites in the world, for it has the combined advantages of a large and uniform flow, a high head of water,[21] and a large and growing market near by. Electric power from the falls is now distributed by high-tension lines over an area of 30,000 square miles, the total installed capacity of Canadian and American power plants amounting to 1,551,450 horse power.[22]

Buffalo is on the main spring-wheat route (from Duluth) to the sea. This fact, abundant water power, cheap water transportation, and nearness to great urban markets have combined to make it the leading flour-milling center of the world, with an annual output of about 10,000,000 barrels. Its 29 grain elevators have a storage capacity of over 50,000,000 bushels, and about half of all the grain carried down the Great Lakes is delivered to these elevators.

Buffalo is rapidly developing into an important steel center. A very significant episode in the industrial life of this region was the transfer some years ago of the Lackawanna Steel Company's operations to Buffalo from Scranton. At Buffalo lake boats deliver iron ore and limestone alongside the blast

his sawmill. See Edward D. Adams, *Niagara Power; History of the Niagara Falls Power Company, 1866–1918*, Niagara Falls Power Company, 1927, p. 41.

[21] Most of the power is obtained from a head of about 200 feet, although the difference between levels of Lake Erie and Lake Ontario is 327 feet. The Queenston-Chippewa plant on the Canadian side utilizes a head of 305 feet.

[22] In order to preserve the scenic grandeur of the falls, an international treaty of 1910 limits the diversion of water by Canada to 36,000 second-feet and by the United States to 20,000 second-feet. If the entire flow were utilized, about 6,000,000 horse power could be generated.

furnaces; cheap coal and coke move up by rail from Pennsylvania; and rail, boat, and truck connections with near-by industrial markets facilitate the delivery of the finished products. Indeed, the Buffalo-Pittsburgh-Chicago triangle, with its heavy industry, is fast becoming the Ruhr of America.

Other important industries in the Buffalo-Niagara area include aluminum reduction (a hog for electric energy), the manufacture of chemicals, rubber, and ferroalloys, and also meat-packing. Patently, the environmental assets of location and water power mean much to Buffalo.

THE INTERVENING CITIES

The transport advantages of the waterways from New York to Buffalo have caused that route to become a string of towns.[23] From New York to Buffalo via Albany is 400 miles. On that route are 71 towns having more than 2500 people, 37 having more than 10,000, and 15 having more than 25,000.

These cities have advantages of power and transportation that favor manufacturing. The coal fields of Pennsylvania are accessible to all of them. Water power is easily accessible, especially from the Mohawk River and Adirondack streams. The Buffalo-Rochester section now receives power from turbines at Niagara. Railroad service is excellent. Everywhere the Barge Canal waterway is an actual or potential factor of raw-material supply and carriage to market.

These cities are much like those of New England in their dependence upon imported food and raw materials and upon exported produce. They have superior advantages in transportation and in their greater proximity to fuel

[23] POPULATION IN THOUSANDS (U.S. CENSUS)

	1930	*1940*		*1930*	*1940*		*1930*	*1940*
Yonkers	135	143	Schenectady	96	88	Auburn	37	36
Hastings-on-the-Hudson	7	7	Amsterdam	35	33	Seneca Falls	6	6
Dobbs Ferry	6	6	Gloversville	23	23	Ithaca	21	20
Irvington	3	3	Johnstown	11	11	Waterloo	4	4
Tarrytown	7	7	Canajoharie	3	3	Geneva	16	16
Nyack	5	5	Fort Plain	3	3	Watkins Glen	3	3
Ossining	15	16	Dolgeville	3	3	Lyons	4	4
Peekskill	17	17	Little Falls	11	10	Newark	8	10
Highland Falls	3	4	Mohawk	3	3	Palmyra	3	3
Newburgh	31	32	Ilion	10	9	Fairport	5	5
Beacon	12	13	Herkimer	10	10	East Rochester	7	7
Poughkeepsie	40	40	Frankfort	4	4	Rochester	328	325
Kingston	28	29	Utica	102	101	Brockport	4	4
Saugerties	4	4	New York Mills	4	4	Albion	5	5
Catskill	5	5	Whitesboro	3	4	Medina	6	6
Hudson	12	12	Yorkville	3	3	Lockport	23	24
Rensselaer	11	11	Rome	32	34	North Tonawanda	19	20
Albany	127	131	Oneida	11	10	Tonawanda	13	13
Watervliet	16	16	Canastota	4	4	Niagara Falls	75	78
Troy	73	70	East Syracuse	5	5	Buffalo	573	576
Green Island	4	4	Syracuse	209	206	Kenmore	16	19
Cohoes	23	22	Solvay	8	8	Lackawanna	24	24
Waterford	3	3	Fulton	12	13		2,416	2,434
Scotia	7	8	Oswego	23	22			
			Baldwinsville	4	4			

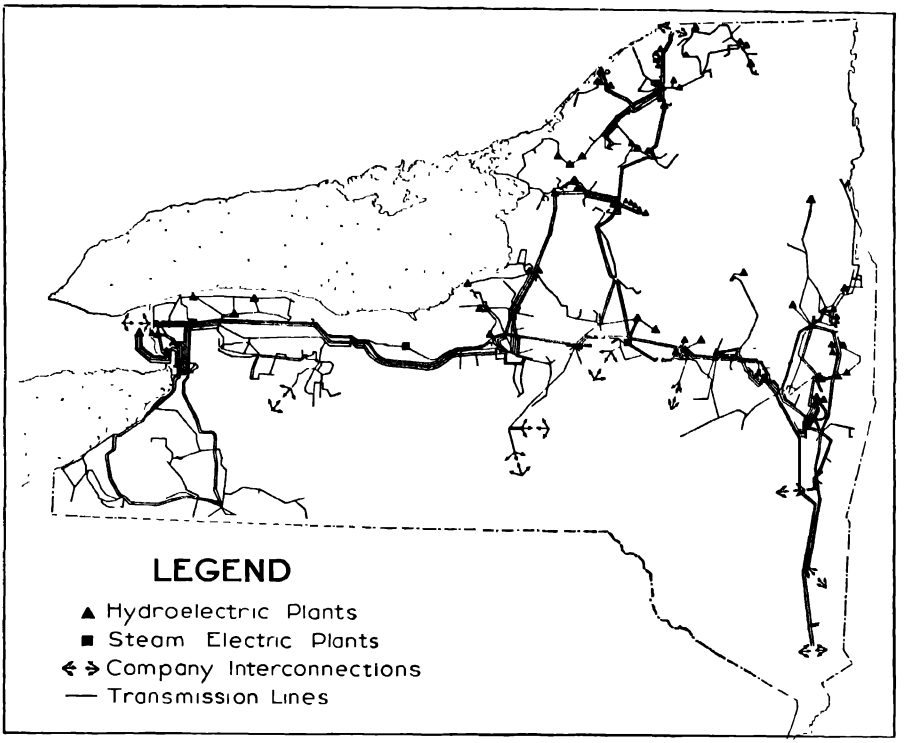


FIG. A. Generation stations and transmission lines of one company, the Niagara-Hudson. Observe the directions in which it can lend or borrow power. (Courtesy Niagara-Hudson Co.)

and the center of population. The market advantage is well illustrated by Albany. Within 200 miles there are 30,000,000 people. The city is at the crossroads of the routes between New England and the West, and between New York and Montreal, with the Champlain Canal giving barge traffic through to the St. Lawrence. But, after all, every other city between New York and Buffalo has almost as good transport and market facilities as Albany.

Undoubtedly Albany's excellent location helps to explain the varied character of its industries and their relation to densely peopled communities. Its factories produce embossed blocks and dominoes; composition billiard balls; electric car-heaters; door-operators and stokers; toilet paper and paper towels; paper boxes; sheet-metal specialties; college caps and gowns; papermakers' felts and blankets; car wheels; automobile accessories; clay products; plate glass; food products; cigars and tobacco; iron and brass foundry products; gas meters; shirts and children's dresses; chemical products; store fixtures; barn equipment; baseballs; and many other articles.

The cities of the Hudson Valley have developed a number of manufacturing specialties which illustrate the force of accident, that great and unpredictable

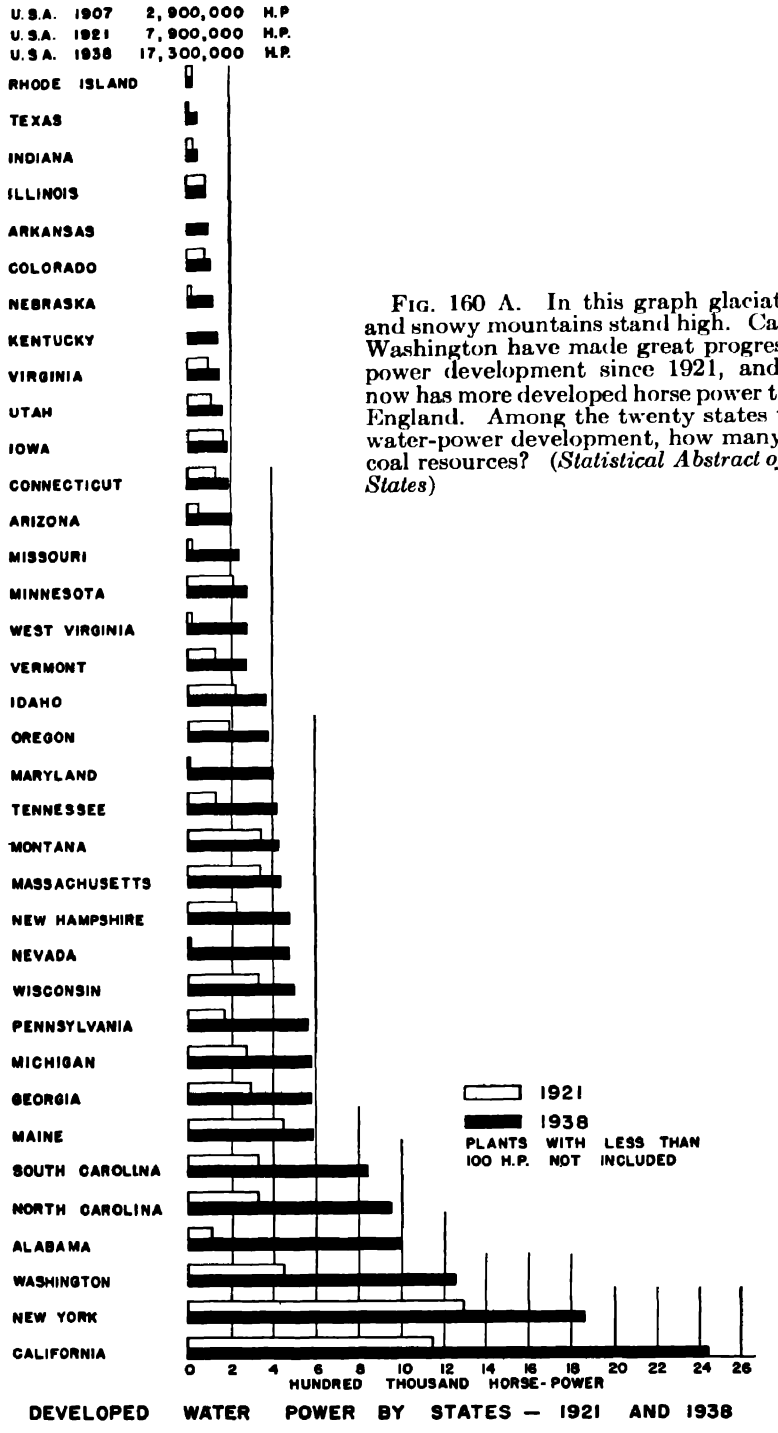


FIG. 160 A. In this graph glaciated uplands and snowy mountains stand high. California and Washington have made great progress in water-power development since 1921, and California now has more developed horse power than all New England. Among the twenty states that lead in water-power development, how many are rich in coal resources? (*Statistical Abstract of the United States*)

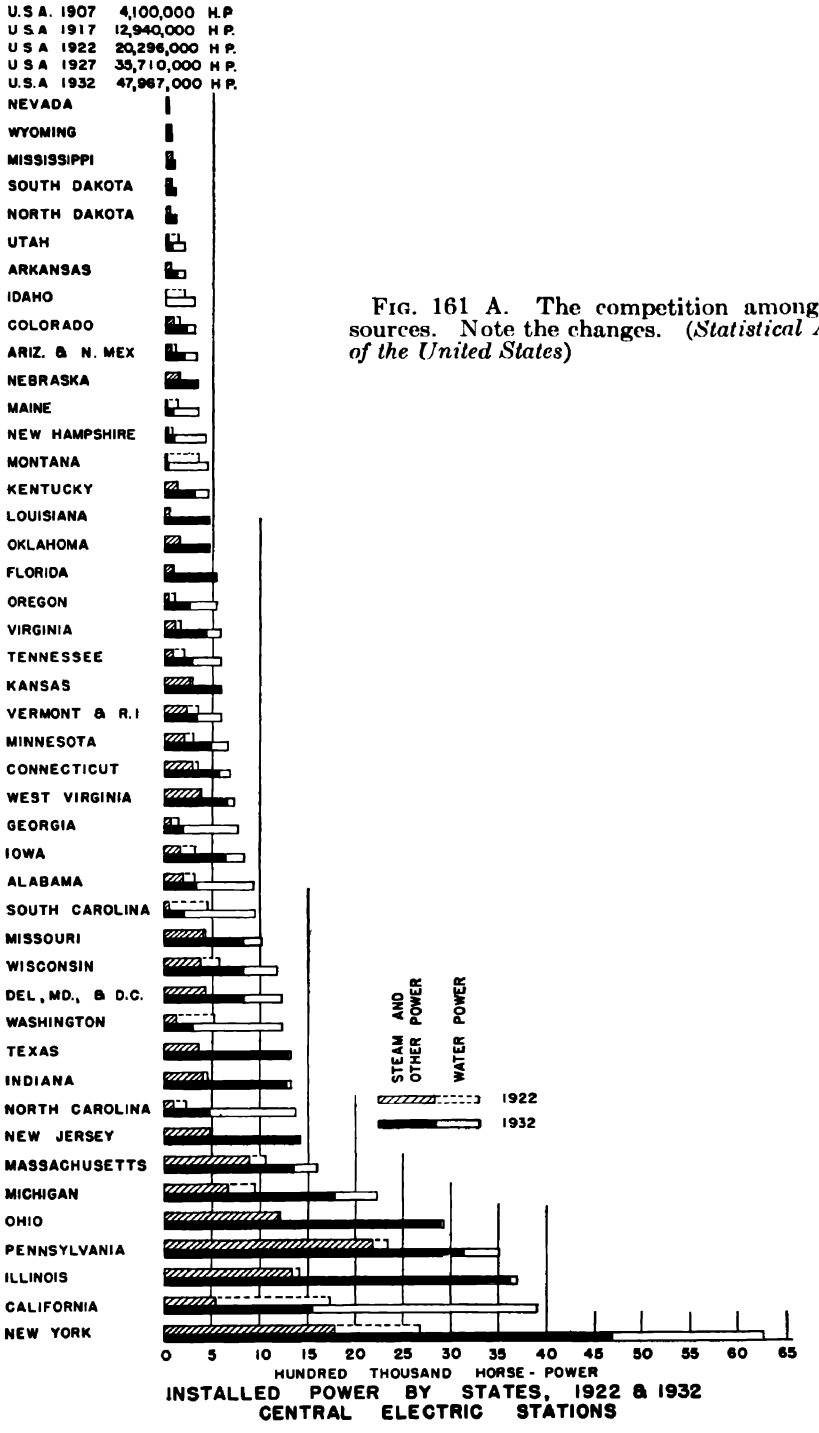


FIG. 161 A. The competition among power sources. Note the changes. (*Statistical Abstract of the United States*)

factor in the location of manufactures. The Mohawk Valley towns have a great industry in knit goods, apparently because in 1832 an Albany merchant happened to operate in Cohoes the first knitting machines ever driven by mechanical power. The same industry spread to other towns of the valley, Little Falls, Rome, and Utica. One-third of Utica's workers are engaged in knitting industries, which indicates a high degree of concentration. In 1878 the city of Rome had a white elephant on its hands, a large unused rolling mill. It had been made to roll the strap iron once used by the railroads. Steel rails made it useless. After much search it was turned into a copper mill. Some brasswork was added, and now the copper industry of Rome employs approximately 5000 men and produces $40,000,000 worth of produce annually, with products ranging from teakettles to copper cloth.

The city of Troy shows another specialization; two-fifths of its workers are busy making shirts and collars, of which the city produces a disproportionally large part of the American product.[24] Why? The answer again seems to be found in an accident of history. About 1829 a tired housewife, Mrs. Hannah Montague, conceived the idea that detachable collars would reduce the work of washing and ironing so many shirts for her fastidious husband. He agreed to wear the collar which she designed, the neighbors copied her pattern, a retired clergyman in the dry-goods business began to make and sell them in his store, Mr. Montague himself started up a full-fledged collar factory, and thus Troy's great collar, cuff, and shirt industry was born. In 1852 the sewing machine started the real boom in the manufacture of collars and cuffs.

Fulton County, in which Gloversville and Johnstown are located, produces over half of the leather gloves and mittens in the United States. This concentration had its humble origin in pioneer days, when Indian-tanned deerskin was used to line the palm of crudely fashioned woodsman's mittens. In 1760 a group of highly trained glovemakers from Scotland settled in the county, bringing with them needles and patterns from their native Perthshire. They transformed the woodsman's mitten into an elaborately tanned and finely made glove, which resulted in an enduring industry, for years conducted in the homes of the workers. The gloves and mittens are now made on motor-driven sewing machines in factories.

Schenectady, one of the early Dutch settlements and in precanal days a prosperous station on the trade route to the West, has developed great concentration of its activities, and of late has acquired fame through the manufacture of machinery. Ninety per cent of its factory workers are in the great plant of the General Electric Company or in the American Locomotive Works. For the electric plant the location is especially good. The multitude of industries in New England and the Erie Canal Belt demand machinery, and for its distribution few places could be better located than Schenectady, with its through lines of railway connecting New York and New England with the West.

[24] Troy claims national leadership in the manufacture of men's detachable collars, valves, iron water gates, fire hydrants, engineering and surveying instruments, sandpaper, and emery cloth.

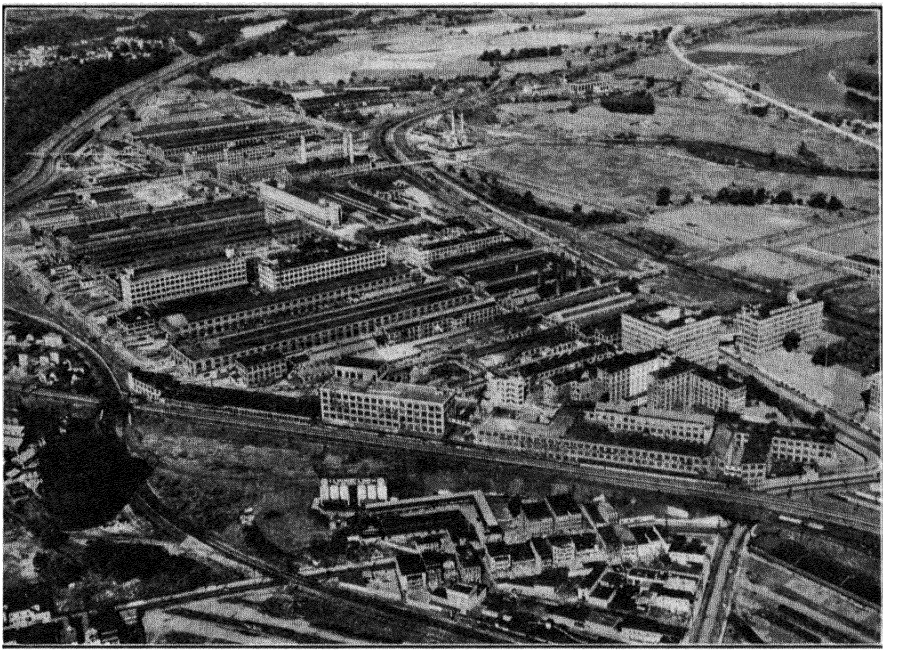


FIG. A. The Schenectady works of the General Electric Co. have plenty of room to spread and lay railroad tracks in convenient places. (Courtesy General Electric Co.)

Poughkeepsie has several machine shops that send machinery all over the world, and the town of Ilion, 10 miles west of Utica, does the same with the Remington typewriter.

Rochester has a site marked by nature for a city. Here the Genesee River tumbles 205 feet over the face of the same escarpment that makes Niagara Falls. This water power early served to make Rochester an important flour-milling center. The Erie Canal was a handy means of bringing the wheat and taking the flour on to market. A canal connecting the Erie Canal with the Allegheny and the headwaters of the Ohio at Olean early gave supplies of timber, oil, grain, and hemlock bark. The bark started a tanning industry in Rochester; perhaps that is why the shoe industry developed there. Rochester is also known for the manufacture of men's clothing.

Rochester makes a third of the optical goods of the United States and is also well known for leadership in the manufacture of photographic apparatus and photographic materials.[25] This is an industry which undoubtedly requires skillful workers, but its great concentration is probably due to the control of patents by a company that happened to develop there, and the company was developed by a business genius, George Eastman. The city is conspicuous for the intelligent attention it is giving to industrial problems.

[25] Rochester claims that it leads the world in production of cameras, photograph supplies, optical goods, check-protectors, thermometers, filing devices and office systems, enameled steel tanks, soda-fountain fruits and syrups.

It bought 13 miles of the old Erie Canal right of way and converted it into a four-track interurban and freight-switching subway.

Syracuse is unique among the cities of this whole region in having an important industry that depends upon local raw material. A large part, perhaps half, of the soda in the United States is produced in the Syracuse area. The raw materials for this product are coal, limestone, and common salt. A stratum of salt underlies considerable areas near the city. It raises interesting speculations concerning the geologic past to remember that these deposits of rock salt can be made only by the drying up of the impounded arms of the sea, or of salt lakes, in a desert climate.

The other important mineral industries of this region are the brick and building-stone production of the Hudson Valley. Brickmaking is an industry having a great physical restriction of area. Clay for making brick is found in many places, but because bricks are heavy to transport and are of low value, they must be manufactured from clay that happens to be close to the market for brick. In the Hudson Valley good glacial clays furnish raw material, and the cheap barge furnishes the vehicle to the market. Scores of brickworks and stone quarries line the riverbanks. In the Hudson Valley there is necessity for much building and rebuilding, and that explains the importance of the brick industry here. The Erie Canal Belt is a long string of cities, and a modern city is never finished.

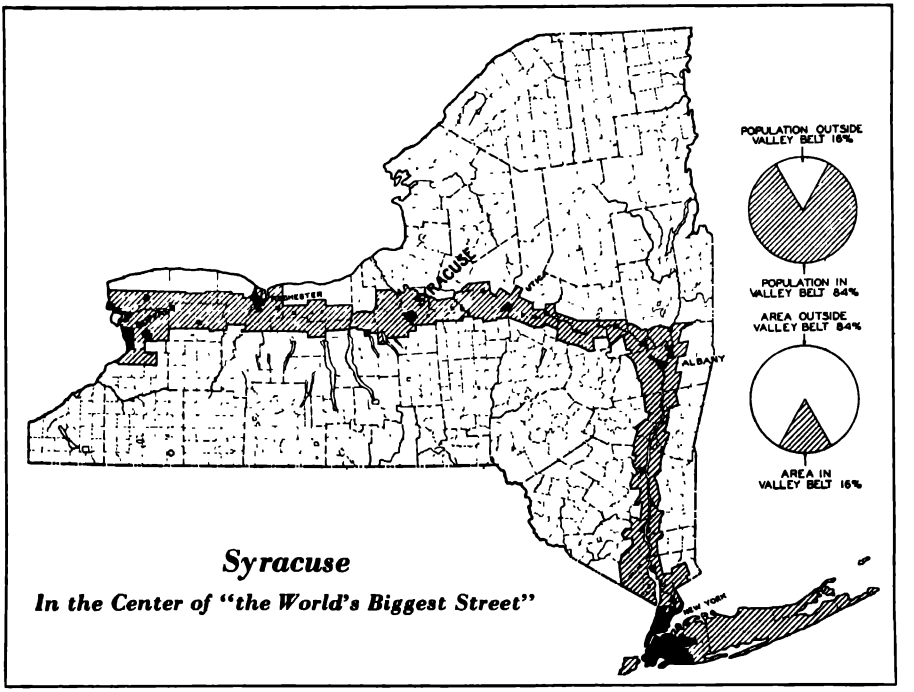


FIG. A. Thus does Syracuse emphasize a geographic factor. (Courtesy Syracuse Chamber of Commerce)

AGRICULTURE

The agriculture of the Hudson and Mohawk valleys is so much like that of Lower New England that it need not be discussed here. That of the territory west of the Mohawk is influenced by nearness to the Great Lakes rather than by nearness to the Erie Canal, and will therefore be discussed in Chapter 23, "The Lower Lake Region," of which agriculturally it is certainly a part.

THE FUTURE OF THE ERIE CANAL BELT REGION

From the western tip of Long Island all the way to Buffalo the almost unbroken line of towns and cities promises continued growth — if the population of the country grows. The Erie Canal Belt is distinctly an urban belt, for fully 70 per cent of the people of New York State live within 10 miles of the waterway. In the counties that adjoin the waterway there is much unused rural land. For the time being, such land lies beyond the margin of urban utilization, and it is not worth while to erect factories or suburban homes upon it or to use it for other urban purposes. If the soil is good, it may be put into dairy farms, market gardens, or some form of intensive cultivation, as is frequently done. If the soil is poor or just fair, it promises to have continued neglect unless the rapidly increasing style for community forests takes it in. The price of mediocre land (or its rental) precludes its use for farming. Here, indeed, is an indication of the continuing richness of North America; we do not have to use all of the available land.

There are many hundreds of acres of undrained (from the farming standpoint) and entirely unused marshland between New York and Newark. This land is very fertile and if reclaimed by diking much less expensive than that of the Netherlands, would make truck land of great value. Barges could carry the produce in a few hours from the field to the wharves on Manhattan. But it lies unused; the factory and the skyscraper are magnets which draw men from the land near by while trainloads of produce from farms a thousand miles away rush across this haven of mosquitoes and muskrats. This is but a type example. In and around every urban center in the United States one can find similar areas of unused land. In northwestern Europe or in the Far East, where the pressure of population upon all available resources is much greater than in the United States, such land was long ago put to use. Our day of intensive use is yet to come!

In predicting continued growth for the cities of this region, some consideration should be given to the canal that created the cities. To enlarge and improve the old Erie Canal, together with its Oswego and Champlain branches, cost the State of New York $168,000,000, including the construction of 66 freight terminals and 2 grain elevators. No tolls are charged, and the annual cost of operation is about $1,000,000. Before its reopening in 1918, canal enthusiasts predicted that 20,000,000 tons of freight would be handled annually. Instead, traffic on the Erie division of the Barge Canal system has grown slowly from 1,400,000 tons in 1919 to 4,200,000 tons in 1937. The

following data show the importance of westbound petroleum and eastbound grain among the commodities that are carried.[26]

TRAFFIC ON THE ERIE DIVISION, NEW YORK STATE CANALS

(millions of short tons)

Yearly average or year	*Total*	*Petroleum*	*Grain*	*Sand, gravel, stone*
1921–25	1.5	.2	.6	.3
1926–30	2.4	.4	.9	.3
1931–35	3.5	1.2	.9	.1
1936	4.2	1.9	.6	.1
1937	4.2	2.1	.3	.2

Why should the chief inland waterway success of the nineteenth century be such a white elephant today? The broad answer to this economic conundrum is that times have changed. To build and operate a fleet of modern motor barges, costing $100,000 to $250,000 each, and to meet the cost of interest, insurance, and depreciation during the four or five months of ice when there is no revenue from the investment, is quite a different thing from operating the small, mule-towed, wooden boats of fifty years ago. The Standard Oil Company, the Ford Motor Company, and the big grain and quarrying interests can afford to do so, but John Jones, average citizen, cannot. Furthermore, John Jones cannot take a package down to the canal freight station, as he does to the post office or the railroad freight station, for *along the canal there is no public freight service.* Even if he could, John Jones is not inclined to do so, for the American public is speed-minded.[27] Always there is the cost of transshipment to reckon with, that economic stumbling-block to transportation since time immemorial! Today the rail-

[26] PRINCIPAL COMMODITIES CARRIED, NEW YORK STATE BARGE CANAL, 1935

(in short tons)

Grain			
Wheat	593,828	Pig iron	65,041
Corn	178,057	Molasses	55,603
Oats	32,708	Iron and steel articles	48,770
Rye	32,090	Implements, vehicles, and parts	36,543
Barley	30,140	Cement and lime	32,199
Flour	53,981	Flaxseed	31,417
Petroleum and its products	1,805,797	Lumber	51,587
Sand, gravel, and stone	77,676	Crude rubber	43,419
Chemicals, drugs, etc.	274,863	Salt	35,065
Sugar	195,036	Iron ore	38,052
Fertilizers	166,725	Other ores	36,365
Scrap iron	98,469	Sulphur	182,491
		Total	4,489,172

Source: U.S. War Department, *Report of the Chief of Engineers, U.S. Army, 1936,* Pt. II.

[27] During and after the World War the Federal Government operated a fleet of 95 modern barges, costing about $4,500,000. The experiment was a financial failure.

roads and the motor trucks are hauling the nation's freight; the truck, with its greater mobility, calls for, carries, and delivers the goods. Not until the continent is filled with more people than it has today, or until there is a need for more economy and less speed in carrying goods, will the canal cease to be a relic of the horse-and-buggy age.

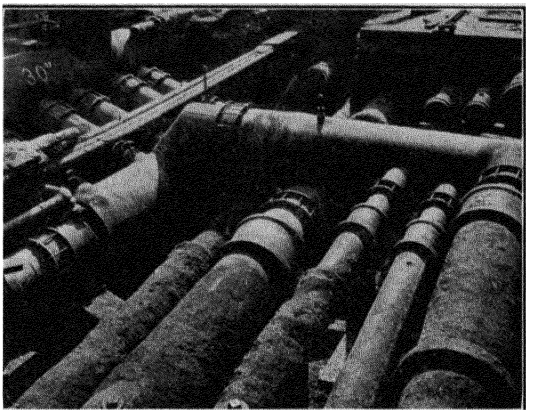


FIG. A. Why is life in New York expensive? Look at the internal organs of a street in condition of autopsy — water, gas, electricity, telephone, sewage, and perhaps below it all a subway or two. (Courtesy Consolidated Gas Co.)

But what has it saved the people as a rate-controller? The railroads near it had to meet its rates in the early decades of its existence. Then railroads that never go near the canal had to do the same. Thus the railroad that goes direct from Chicago to New York is like the one that goes direct from Buffalo to New York in that it must make rates that recognize those of the canal. Thus it comes to pass that the Chicago-New York freight rates are lower than the Chicago-Philadelphia rates even on the Pennsylvania R.R., which carries the freight *through* Philadelphia on the way to New York. Perhaps the old ditch is dead, but it set a rate pattern, and its ghost still walks and works.

THE CITY PROBLEM

New York is a perfect illustration of the social-problem cycle. In 1831 the railroad began. Men used it in their business to make dividends. It has been well said that the railroads decided where there should be villages, what villages should become towns, what towns should become cities, what cities should become markets, and what markets should become metropolises. We are still debating about the proper theory by which the railroads shall be operated. It is only since 1870 that the public has even claimed the right to control the roads in the interests of the public welfare, and there is no agreement as to whether they shall be operated by private corporations or by the Government. In more than a century we have not solved this problem.

The great city faces an extensive array of knotty problems. Take the problem of water as an example. In the autumn of 1923 the people in many northern New Jersey towns prayed in their churches for rain. Thirty thousand factory workers had temporarily lost their jobs because there was no water in the mains.

New York City has appealed many times to the engineer and the moneylender; it has borrowed hundreds of millions for waterworks. It began its large enterprises in 1842 with a great reservoir on the east side of the Hudson,



FIG. A. A thirty-two story apartment hotel at 320 East 42nd Street. On the 14th floor a space 12 by 32 feet plus bathroom, closet, and entrance hall rents for $990 per year in 1940. (Courtesy Fred F. French Co., Inc.)

the Croton Reservoir. In 1917 came a reservoir on the south slope of the Catskills, but water shortage soon threatened again, and an 18-mile tunnel, the Shandakan, the longest tunnel in the world, was dug to carry water under the mountains from a creek on the north slope of the Catskills to reservoirs on the south slope. There it connects with the aqueduct system that carries the water at great expense under the Hudson to connect with the older Croton system. While still celebrating the opening of the Shandakan tunnel people were talking of an Adirondack water supply. The Catskill system alone cost $185,000,000. In 1939 New York City consumed about 1,000,000,000 gallons of water *daily!* Here we see one of the weaknesses of democracy. You can waste all the water in New York that your negligence permits. No administration has dared to sell water by meter, although it is thought that this would cut water demands enormously and solve the water question for decades to come. Instead of doing that, New York is now busy spending more millions to bring water by tunnel from the upper Delaware — by 1942, so it hopes.

The water problem is one of the simplest of the troubles produced by New York's increasing millions. Crowding — its cost, and its results — is the greatest menace. Where people crowd to one place their presence makes high land-values, and then the high land-values crowd them still more. So important is the site value where people throng that a corner building may be worth $50,000 for stores uptown on one of the main up-and-down avenues of the city, whereas a building of identical structure in the center of the same block may be worth only $35,000. The newsstand service will give some idea of the human swarm that surges in and out of the subway entrances. The station at 116th Street and Broadway, a residence and university station, has a newsstand on the station platform underground (one attendant), one at the street entrance in the middle of the street (two attendants), one on each sidewalk, one of them with two attendants. These six people are all busy selling papers and magazines to the throngs who jostle down to jam themselves into the cars which take them to the business part of the city.

"New York will be a nice place when they get it finished," remarked a man observing the tearing-down and building-up that continually goes on

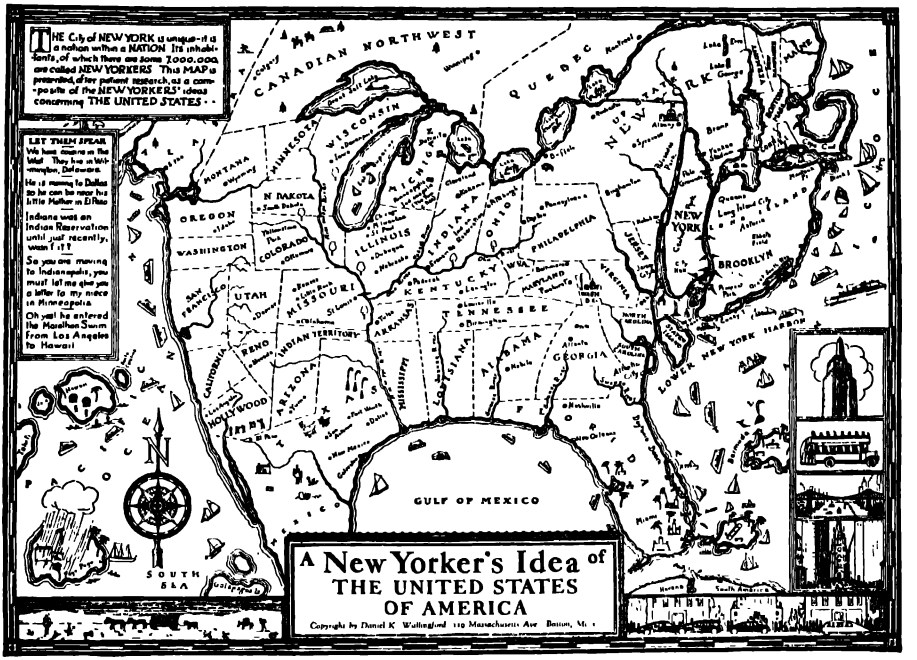


FIG. A. The New Yorker is often criticized for his insularity. It is very real, and perhaps it is stiffer in the skyscraper than in the backwoods. Mr. Wallingford of Boston shows it thus.

as population and land values increase. For example, a plot of land at 103rd Street, just west of Broadway, 100 by 160 feet, had on it 8 solid stone houses, 20 feet wide and 4 stories high, built quite as substantially as the medieval houses of European towns which are still good. These structures were torn down in 1924 to be replaced by a 13-story apartment house, which will hold from 50 to 100 families where 8 once lived. Such a structure in the choice residence district of Seventy-fifth Street and Park Avenue has a value of $1,000,000. Its 225 rooms are divided into 3- and 4-room apartments, and the average annual rent was $825 per room in the "golden twenties," but it was only half that in the "depression thirties." Apartments and skyscrapers, made possible by the elevators and the subway, create more congestion. It was recently estimated that 223,000 vehicles and 2,850,000 people enter Manhattan Island south of Fifty-ninth Street during twenty-four hours of a typical business day. The street traffic is so dense that the New Yorker is almost denied the pleasure of driving his own automobile, unless he delights in delay, danger, maneuvering in a jam, and hunting for a place to park.[28]

One Fourth of July a few years ago some pleasure-seekers made an early start for a day on the New Jersey coast. They reached the ferries at lower New York at 7:30 and sat in the summer sun until 10:30 before they could

[28] About 1000 persons are killed annually in street accidents, a rather remarkable record considering the heavy traffic and how the New Yorker loves to jay-walk, and does it.

get their turn at the ferryboat. Others, avoiding ferries, crossed by bridge to Long Island, but the roads from the East River bridge to the seacoast on the south shore of Long Island were solid with cars — two unbroken funeral-like processions, one going north, the other south, without room to turn out, except in emergency.

These conditions have led to the construction of vehicular tunnels and bridges that make it easier now to get in and out of New York. Also an expensive elevated highway along the river front of the West Side, connecting directly with a highway on the level, has made it possible to get out of the city toward the north without traffic complications. A similar elevated highway for the East Side is now under construction. But in the lower part of Manhattan one is wise never to take a taxi if there is a subway within reach.

At ordinary times the vehicular traffic is so thick at the corner of Fifth Avenue and Forty-second Street that 4 policemen are regularly on duty at this one corner, and sometimes there are 7. When one considers the cost of these officers and the cost of delay in street traffic, it is easy to understand the estimate that street congestion costs $1,000,000 a day in New York and adjacent cities.[29] In 1916 Ellsworth Huntington estimated that with tunnels, ferries, and bridges, the people of New York were spending $10 per person per year in traffic cost because Manhattan was an island, and that Manhattan rents were increased by $100 per family per year because of the resulting inability to travel easily.

All this pressure of human numbers on a body of land, complicated by the restrictions of an island, give us the high land-values, and the consequent crowding which makes New York the most crowded city in the world. Each of 4 square miles has 250,000 people on it, for there are hundreds of thousands who cannot commute to the country and must live more nearly landless than men have ever lived before.

For number of human beings per cubic foot there is one block in Harlem that has no rival. Within an area of 150,000 square feet, bounded by Seventh and Lenox avenues and 142nd and 143rd streets, are 3824 residents. With the exception of three Chinese laundrymen, and a few white women who have married Negroes, the population consists entirely of Negroes. The density of population is about 1100 persons per acre. If all of the people in the United States were packed like this into New York, only half of the city's area would be occupied, and a couple of boroughs would still be left for parking-space.[30]

This crowding is a great business advantage to the financier, the merchant, the publisher, to men of many, many callings who need to see people. To the mere worker it is quite otherwise. It may give him a job, but the wage is not proportionately high and there are many disadvantages for which there is and can be no compensation. New York is not a good place for the poor.

In and out the door of the East Side apartment house 15 or 20 or 25, and sometimes many more, families pass to climb the stairs to their apartments.

[29] Ellsworth Huntington, "The Water Barriers of New York City," *Geographical Review*, September, 1916, pp. 167–83. Doubtless the figure is much larger now.

[30] A. J. Liebling, "A Reporter at Large — City Block," *New Yorker*, Nov. 27, 1937, pp. 47–58.

The *New York Herald Tribune* (October 18, 1923) reported 2,000,000 people living in tenements that had been outlawed but could not be replaced. If a dilapidated building paid the landlord more than a new one would, the old one continued in service. Slum clearance in big New York is now under way, but it is a slow, difficult, and expensive process. Vast sums of Federal money have been spent to alleviate the evil conditions reported in the "golden twenties." But this is only a beginning, and New York has much to learn about effective slum clearance that will really help the poor. Slum conditions are the fruit of a system, and, though the nation staggers, people struggle to preserve the system.

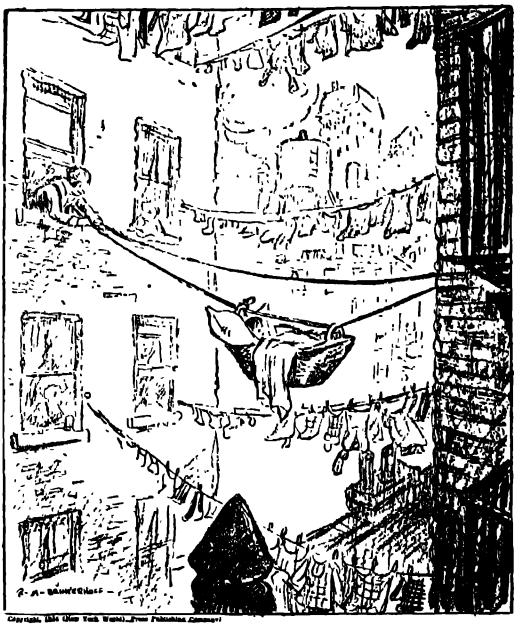


FIG. A. Going to visit Grandma — as a cartoonist sees it. The aerial clothes line is literally standard, and the crowding is about as bad as any in the world. (Courtesy *New York World*)

For many years, hundreds of thousands of New York children had no place to play but the street, where they dodged pedestrians, pushcarts, wagons, and automobiles. They had no chance at the earth, no place to dig, no grass to play upon, no country in which to walk, no baseball diamond. They were denied even the boy's spiritual birthright — the companionship of a dog. Their life was quite as far from nature as that of the animals in the zoo. Despite many public playgrounds, this is still the lot of thousands of boys in the big city, although much has been done to improve conditions.[31] During the 1930's, when the United States Government was contributing lavishly to public improvments throughout the country, New York City was fortunate in having as Commissioner of Parks Robert Moses, a remarkably energetic and efficient public servant. Under his direction many new parks and other facilities for recreation have been provided. Progress has been made, but it is only a beginning. The problem still remains as to how we can provide

[31] "It is doubtful if any city does so much in the direction of welfare work as New York for its poorer citizens. Free sterilized milk for the children, free clinics of all sorts, free classes where mothers are taught to properly care for their children, evening classes for men, day nurseries and places where babies may be kept under competent care while their mothers go to work, free illustrated lectures for everybody. Lectures on preventable diseases and a hundred and one other aids are constantly at the service of these helpless persons. The famous Henry Street Settlement House is here; its methods and practices are copied in every city in the Union, and it is only one of the many such similar institutions all over the city." — H. C. Brown, *Valentine's City of New York*, E. P. Dutton & Co., 1920, p. 164.

decent living-conditions for the great bulk of the population in a large and rapidly growing city.[32]

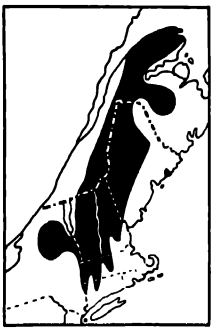
When we consider the damage to health that results from this crowding, it is appalling to think that anybody is planning for continued increase of numbers in New York. The great need of humanity and of New York is for a larger rationalism, which would distribute factory workers over the land so that they can live near their work yet in the presence of green grass and fresh air. It would be of untold benefit if factory workers and their families could have access to earth, with room enough to dig. To have a garden, and a place to play, is the right of every man.

The amount of unused land, some of it cheap land, around New York — and every big city — is truly amazing. Physically, there is room for expansion. Constructive imagination and a social-minded point of view are needed, for everything else is already in the hands of man. England, much further along in social evolution than we are, has made much greater progress in scientific city-building than we have.[33] If we would only learn to take care of our people as well as we care for our cattle and our machinery!

[32] Anyone interested in this problem should read Lewis Mumford, *The Culture of Cities*, Harcourt, Brace and Company, 1938.

[33] For an account of the scientific city, see J. Russell Smith, *The World's Food Resources*, Henry Holt and Company, 1919, Chap. 27.

Chapter 6. THE NORTHEASTERN HIGHLANDS



THE Northeastern Highlands lie between the St. Lawrence Valley on the north and the New England-Canadian Maritime Region and the Mohawk Valley on the south. They include the Adirondacks of New York; a quarter of Massachusetts;[1] a small piece of western Connecticut; most of Vermont; all of New Hampshire except the southeastern corner; more than half of Maine; about a third of New Brunswick; and that part of Quebec which lies to the south of the St. Lawrence Lowlands. They include the large Gaspé Peninsula, which reaches north of Maine and New Brunswick far into the Gulf of St. Lawrence. Although this region includes part of six American states and two Canadian provinces and covers more than 100,000 square miles of area, most of its area has uniformity of resources and pronounced contrasts with its neighbors.

The Northeastern Highlands are a glaciated upland from 600 to 2000 feet in height, peaks rising to over 6000 in the White Mountains; to over 5000 in the Adirondacks; to over 3500 in the Notre Dame Range of Eastern Quebec. The mountains and hills and the areas of boulder, swamp, and lake leave little land that is fit for the plow save in Vermont.

The upland differs from Lower New England in having no harbors, few cities, and a scattered population — large areas have almost none. Unlike Lower New England, it depends chiefly upon the production of raw materials for export. For manufactures it depends chiefly upon its own raw materials.

Being a plateau, the upland is cool, and air drainage which prevents frosts does not apply to plateaus, so summer frosts are common through much of the Northeastern Highlands. Since it is in the path of most of the winter storms, and cold enough to make snow rather than rain, its snowfall is far heavier than that of the Massachusetts coast. It is even heavier than that of the Laurentian Plateau beyond the St. Lawrence, or even the Arctic regions. A combination of factors makes agriculture difficult, and permits forests to grow. Therefore in this region the great dependence is upon forest products. This always means a land of small and scattered population. Piscataquis County, Maine, has 3770 square miles (four-fifths as large as Connecticut) with a population of 4.8 persons per square mile (Connecticut, 333.4 persons per square mile), which has declined in recent decades. Two counties in

[1] People in Berkshire County, Mass., where county pride exceeds state pride, have a saying that "the best thing about Berkshire County is the chain of mountains to the east which shuts it off from the rest of the state." This chain of mountains, the southern tip of the Northeastern Highlands, makes the Housatonic Valley tributary to New York, and most of the many summer residents are from that city.

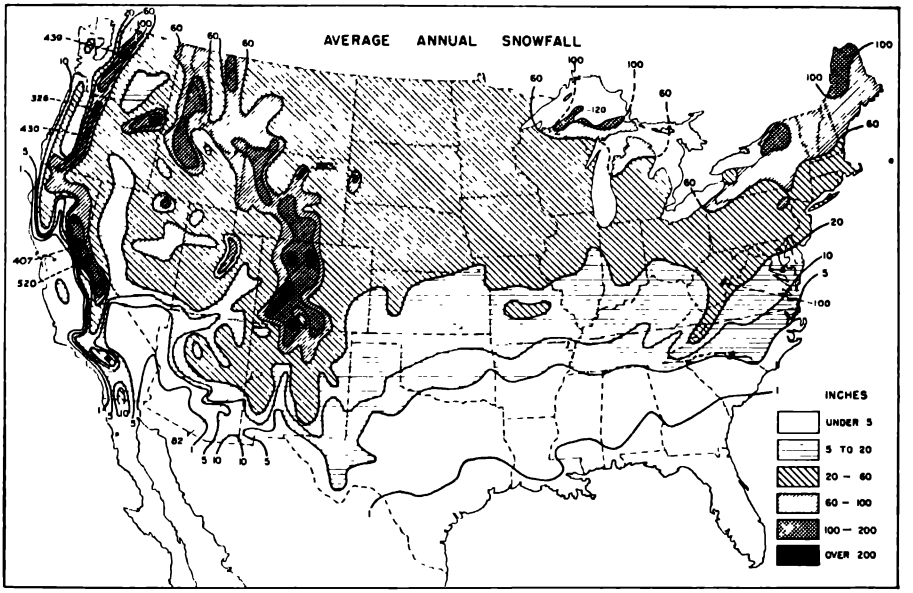


FIG. A. In most parts of the U. S. A. this is almost a map of mountains. Compare it with the pocket map and the rainfall map. (Courtesy U.S. Weather Bureau)

northern New Hampshire comprise two-fifths of the state, with but one-sixth of the people. Hamilton County, New York, in the center of the Adirondacks, is nearly as large as Delaware, has 2.3 people per square mile, and has steadily declined in population since 1900, having lost 21 per cent of its inhabitants in thirty years.

FORESTS

Forests have been and will continue to be the chief resource of most of this region. For more than two centuries each autumn has seen bands of lumberjacks going into the pine and spruce forests of this upland to build log cabins in which to spend the winter, while with ax and saw they felled the surrounding forest. With them were teamsters, and recently tractor-operators and truck-drivers, who drag the logs over the snow to the banks of the streams. There they wait until the spring freshet produced by melting snows carries the logs downstream.

The picturesque and dangerous log drive is largely a thing of the past. First the lumbermen took the virgin pine (grand timber), then spruce and second-growth pine; now they take largely the short stuff for the pulp mill.

In the winter of 1936, 10,000,000 board-feet of maple and birch were cut in the upper Connecticut Valley, requiring the services of 450 men, 200 horses, and 65 motor trucks. After being cut by the local mills, the wood was shipped by rail to the retail yards in Boston and New York and to the furniture factories at Gardner, Massachusetts. During this season about 50,000 cords

of spruce and balsam were also cut in this area, employing 300 men, 110 horses, and 50 trucks. The wood was shipped by rail chiefly to pulp mills in northern New York. Before the advent of the railroad and the motor truck the effectiveness of the moderate and dependable spring freshet made easy the exploitation of these forests. Hence the virgin forest is practically gone, and the lumber output is well instanced by the sharp decline in New York State (partly Adirondacks and partly Allegheny Plateau).[2] The New York Commissioner of Forestry declared in 1924:

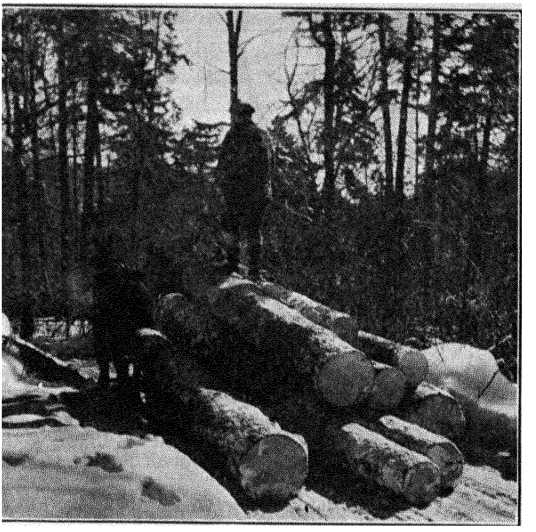


FIG. A. Logging in the Green Mountain National Forest, Vermont. Here logging is wisely supervised. (Courtesy Muir, U.S. Forest Service)

We are using lumber in the State twenty times as fast as we are growing it, and are spending vast sums of money every year to import lumber from distant points that would not have to be spent if all the land suited to raising forests were producing crops. We have upward of four million acres of idle forest in the State. This means that we have an area three times the size of Delaware that is non-productive, and it is a serious economic menace.

It is nonproductive because of fire.

The situation in New York differs but little from that of the rest of the region. After a few fires have killed the young growth and have destroyed the humus and leaf mold, there remain no seed trees of good species, and the miserable aspen tree takes the earth where once stood the noble pine. For these reasons the United States Forest Service reports that while three-fourths of New England, including nearly all of this region, is fit only for forests, the forests are now only one-fourth effective.

[2] NEW YORK STATE — LUMBER PRODUCTION

	Rank	*Millions board-feet*
1870	3	1,310,000
1880	4	1,184,000
1890	6	910,000
1899	17	875,000
1910	23	506,000
1920	23	410,000
1930	28	110,000
1936	30	97,000

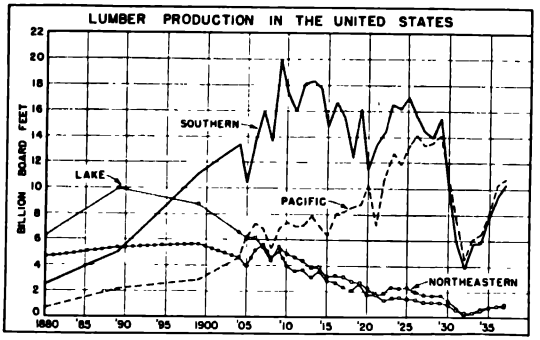


FIG. A. Regional forest history is usually divided into three epochs: (1) wanton exploitation, (2) increasing imports, (3) need of reforestation and much talk and some work concerning conservation. The Northeastern and Lake states are just beginning the third epoch. (Data from U.S. Forest Service)

The total remaining stand of available timber in this whole region is insignificant; even Vermont imports some lumber. It is high time indeed for an era of tree-planting and scientific forestry; but it is unfortunate that the beginning has been so insignificant. The United States Forest Service reports that during the years 1920–29 on an average 26,000,000 acres of forest were destroyed in the United States each year by fire, representing an average annual loss of over $37,000,000. In the single year 1931, 52,000,000 acres were burned, with a loss of $67,000,000, but fortunately this heavy toll has showed some decline in recent years.[3] These figures are merely the direct loss caused by the burning of merchantable timber. No man can tell the total amount of indirect damage caused by the loss of seedlings and immature growth, the ravages by insects after trees have been partially burned or scorched, the replacement after a fire of desirable species by poorer ones, the destruction of wild life, the increase in soil erosion and deterioration, and the greater variation in stream flow with such aftereffects as bigger and more frequent floods, silting of dams and river channels, etc. While fire destroys at the rate of *millions* of acres (25,000,000 to 50,000,000) annually, man replants at the rate of *thousands* of acres (130,000 to 150,000). Meanwhile, the timber famine looms.

FORESTRY

There is double necessity for scientific forestry to begin in this region, because such a large proportion of the timber now cut is for the pulp mills which are scattered along the margins of the region from the Gaspé Peninsula to the western Adirondacks. This double necessity arises from the absolute scarcity of pulpwood and from the great cost and difficulty to be encountered if a mill is moved to a new site. As has been noted, the paper mill is so expensive that the necessity of moving produces a much greater hardship than it does upon the owner of the sawmill, who can easily pick up most of his equipment and depart to other timber tracts, leaving the old site to wait for the destruction by fire, which can wipe out in an hour the growth of half a century. The paper-manufacturer can use small wood, so he cares much

[3] Damage in 1935, 30,300,000 acres, $32,600,000; in 1936, 43,200,000 acres, $54,100,000; in 1937, 21,900,000 acres, $20,700,000 (figures from the U.S. Bureau of Forestry). To state this loss in dollars does not cover it much better than would be the use of dollars as a measure of the value of loss of human babies.

more for a cutover forest than the sawmill man does. A paper company built a railroad through the forest to Millinocket, Maine, and there, near a fine waterfall, erected a plant which cost millions of dollars. The company also built a town for their workmen. To keep the mill supplied with pulpwood, the forests, which are owned by the company, are systematically managed so that they may yield pulpwood for an indefinite time.[4]

THE OSCILLATIONS OF AGRICULTURE

Most of this region has never had any agriculture, but the lower sections in Vermont and New Hampshire were occupied by the New England farmer in the period of his greatest activity. In New Hampshire the amount of land in farms has declined from 3,600,000 acres in 1870 to 1,900,000 acres in 1930. On a morning's walk near Bellows Falls on the Connecticut River you could once count 30 houses of which 29 had been abandoned within twenty years. In a certain school district there were 60 children in 1870, while not a family was in residence in 1918. These people had been living on small farms which produced a part of the family support, the rest being obtained from work in the forest in winter. When the timber of the region was exhausted, the land alone could not yield a living by commercial agriculture, and emigration was inevitable.[5] The forest proceeds with quiet persistence to claim the land as it awaits an agricultural reconstruction, with farming that will fit the land. Or it waits for fire, or, let us hope, for fire protection.

On the slopes of the White Mountains at an elevation of 2000 feet there once was a type of farming suggestive of nice adjustment to local conditions, a type which may some day return if the population of the North American continent should double or treble. This farming at the highest limit of New England agriculture was distinctly the northern type, depending primarily upon grass for summer pasture and winter hay, eked out by a crop of oats. Each year the farmer had a cow or two to sell, and the money he received, by the rigid custom of the neighborhood, was put in the bank. The person who did not save his cow money was almost an outcast. The cash income for family support came from potatoes which were ground by

[4] This company now owns three plants located at Millinocket, East Millinocket, and Madison, with an aggregate capacity of 1000 tons of pulp per day. It owns outright 1,500,000 acres of forest land and has part ownership in an additional 500,000 acres. Prior to 1920 it operated on a sustained-yield basis. At that time insect infestation made salvage the controlling factor in the extent and location of timber to be cut. In recent years conditions within the industry and interregional competition in raw materials have made it uncertain whether the sustained-yield basis could be justified, since Maine may not be able to compete in the long run with other pulp-producing regions. So well are forest conditions known that the company feels that a reliable working plan on a sustained-yield basis could be put into practice again at any time.

[5] The National Resources Board, *Supplementary Report of the Land Planning Committee*, Pt. VII, says that 50,000 more farms should be abandoned in New England and Middle Atlantic states, and we do not controvert this claim (see last chapter). Many a New England back-country farm yields a poor living by way of small sales, outside odd jobs, or part-time jobs, and a lot of colonial self-sufficiency (insufficiency). These people are economic cousins of the Southern mountaineer, but much more thrifty by instinct and cultural heritage, and therefore make a better living.

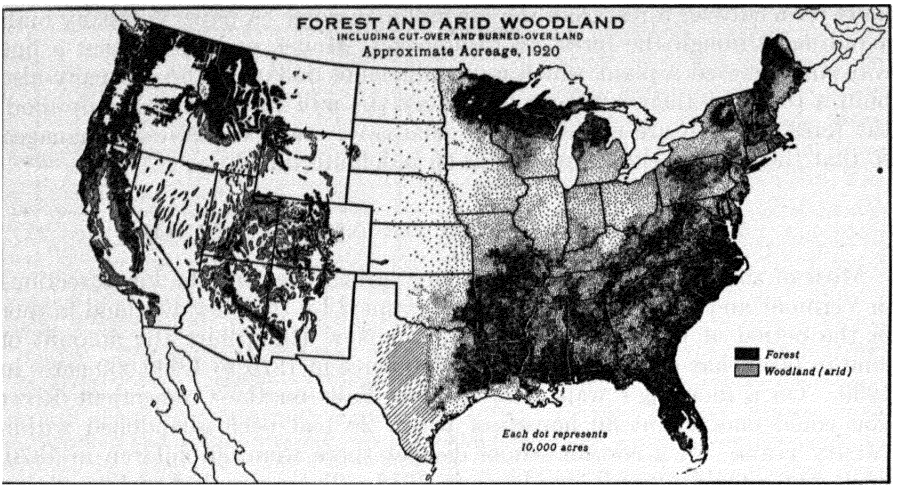


FIG. 178 A

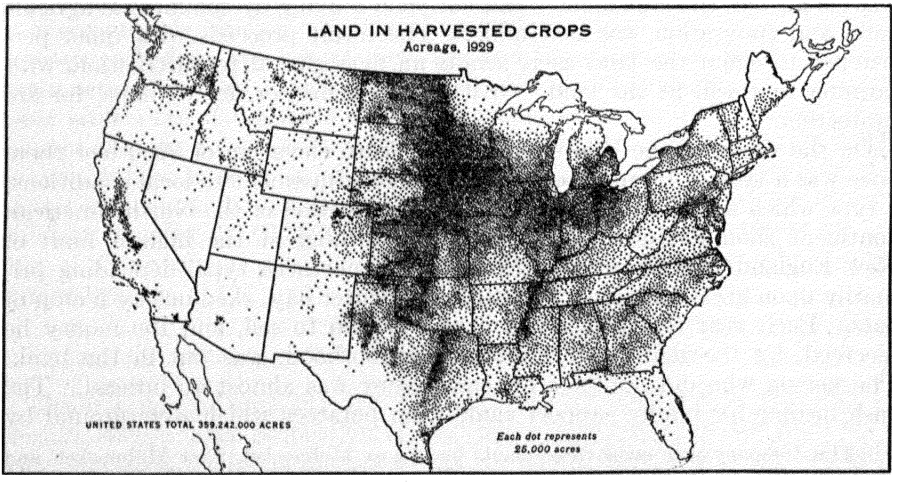


FIG. 178 B

Together, these two pictures tell the story of the Northeastern Highlands with its one spot of farm land — Vermont. Only about one-third of our woodland now contains saw timber. Nearly two-thirds of the cropped land is in a triangle with corners at southern Texas, northwestern North Dakota, and western Pennsylvania. It comprises but one-fourth of the area of the country.

"Commercial forest land is land capable of producing timber of commercial quantity and quality, and available for timber growing in the sense that because of high altitude, rough topography or surface, or poor soil it is not suitable for cultivation." (Letter to J. R. S. from R. D. Garver, Acting Chief, Division of Forest Economics, Forest Service, U.S. Dept Agr., Jan. 24, 1940)

water power at the country mill, and sold as starch. Competition of Western meat hurt the price of cows, Aroostook potatoes hurt the price of starch, so the blueberries, spruces, pines, and lesser trees got the farms. In 1830, when we were on a lower economic level, the potato was an important stock feed in New England, as it now is in central Europe.

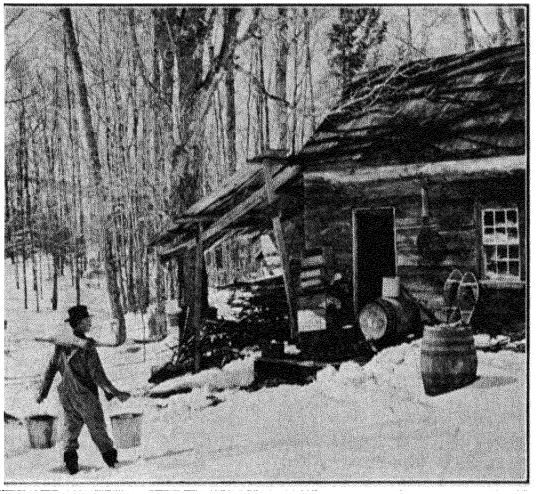


FIG. A. Carrying maple sap to a New Hampshire sugar camp. An industry we learned from the Indian. (Courtesy New England Council)

The agriculture of the Vermont upland has survived better than that of Maine or New Hampshire. Vermont has better valleys than its sister states, much of the cleared land is richer, and the grass is better. Corn is grown on some of the land and is utilized by means of the silo. Root crops must be used at the higher elevations. The city markets to the south give a good price for milk, and express trains carry the produce of the Green Mountain pastures of Vermont to Boston, as they carry Adirondack produce to New York. Vermont, with a small urban population and an important dairy industry, is the only state except Wisconsin east of the Mississippi having more bovines than humans, and the Vermont bovine ratio is the higher. Since 1930 low prices for milk have revived the cry for more self-sufficiency on each farm.

Maple sugar is an important crop of this region. The sugar-maple tree grows wild everywhere. The sap from which the best sugar is made flows in the very early spring before the last snow has left the ground. During these periods of bright sunshine and frosty nights the sap seems to flow up and down the tree each day, and produces much more sugar than is produced in southern lands, where spring is warmer.

Vermont maple syrup (some of which comes from other states) has long been famous to the wheat-cake connoisseurs throughout the nation. In Quebec are to be found schools of maple-sugarmaking. Thus maple sugar and maple syrup are cash crops for the farmers of the Northeastern Highlands.[6] In this industry we see an example of native tree-crop agriculture already in full operation, and capable of much extension.[7]

[6] In recent years the combined production of Quebec, New Brunswick, Maine, New Hampshire, Vermont, Massachusetts, and New York has been about 8,000,000 to 12,000,000 lbs. of maple sugar and 3,000,000 to 4,000,000 gallons of maple syrup annually. On September 21, 1938, a severe hurricane did great damage to the sugar maples of Vermont and other New England states. The unofficial estimate of the loss to New England timberland owners was placed at 5,000,000,000 board-feet.

[7] We acquired this industry from the Indian. The Algonquins were called "Tree Eaters." Maple sugar with powdered corn was a favorite hunting-ration.



FIG. A. A nice day on a Vermont porch. Oh, yes, the Yankees are industrious, but in this, the Machine Age, loafing is perhaps the greatest single consumer of wakeful hours in the United States — even among the Yankees. (Courtesy Farm Security Adm.)

However, the numerous other sources of sugar, the low yield per tree,[8] the heavy labor involved in gathering and boiling the sap, make it one of the least productive of all the tree crops. Also the trees are scattered, and personal skill is required for sugarmaking. These facts would all seem to indicate that the maple-sugar industry will remain in the hands of the individual instead of passing to the corporation.

In upland Vermont, free from cities, the rural Yankee still survives. Concerning this interesting type of man Bernard De Voto says: [9]

. . . there are more Yankees left in Vermont than anywhere else. They make the State a natural preserve for a way of life too much abandoned elsewhere.

Its philosophy, that life is an endless struggle against evil and necessarily a losing one, exactly agrees with the experience of a people who settled on a thin, boulder-sown soil in a ferocious climate, where mere survival was success, where visible and insuperable limits were set to achievement, where almost all the aims and social myths of the westward-bound American were obviously impossible. Its virtues had to be self-reliance, independence, fending for oneself, thrift, courage, solvency, pride of workmanship, craft. It produced a society accommodated to those individual virtues. . . .

And in the loft of the Coolidge barn, staring at the plowshares of five generations

[8] There is reason to suppose that a test would reveal some trees that were severalfold more productive than others. These might be propagated and the sugar output increased without additional labor, and then there is tree-breeding.

[9] Bernard A. De Voto, "How to Live among the Vermonters," *Harper's Magazine*, August, 1936, pp. 333–36.

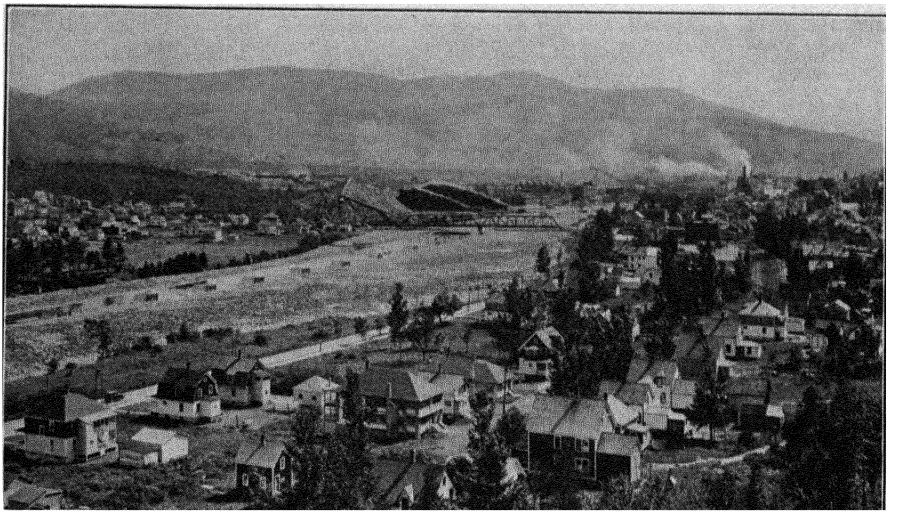


FIG. A. Berlin, New Hampshire. Paper mills, pulpwood piles, and the Androscoggin River full of wood. White Mountain National Forest in the background. (Courtesy E. S. Shipp, U.S. Forest Service)

ago, the flat-irons and axe-heads and broken grindstones and miscellaneous salvage of many years, he asked helplessly, "Don't these people ever throw anything away?"

They do not, and that is something to remember when you take up your summer residence in the loveliest of New England States. . . .

If your car runs off the road and a couple of farm hands spend half of the afternoon helping you get it back on again, be satisfied not to offer them remuneration. Your courtesy may be a little rusty, since you come from infidel parts; but theirs is not.

And now Mr. De Voto, in describing an all too widely known Yankee characteristic, gives us a rare gem of diplomatic statement.

They will not fleece him as a foreigner (this being neither Cape Cod nor the coast of Maine), but if he shows a gullibility that in a native would endanger his survival, social restraints that would operate against its exploitation will be withheld.

MANUFACTURES

Pulp mills are the chief manufacturing enterprise of this region. The finer use of wood is shown by the manufacture of pipe organs at Brattleboro, Vermont.

This region has a really distinctive industry which seems to be linked with New England exactness and thrift. It is said that a farmer named Fairbanks, weary of being cheated by his neighbors, built himself a set of scales about 1830 so that he might know the actual facts concerning his business transactions. Then he made some scales for other people. Because Fairbanks refused to be cheated, the largest scale factory in the country is located at St. Johnsbury, Vermont. A later rival in the near-by town of Rutland makes another

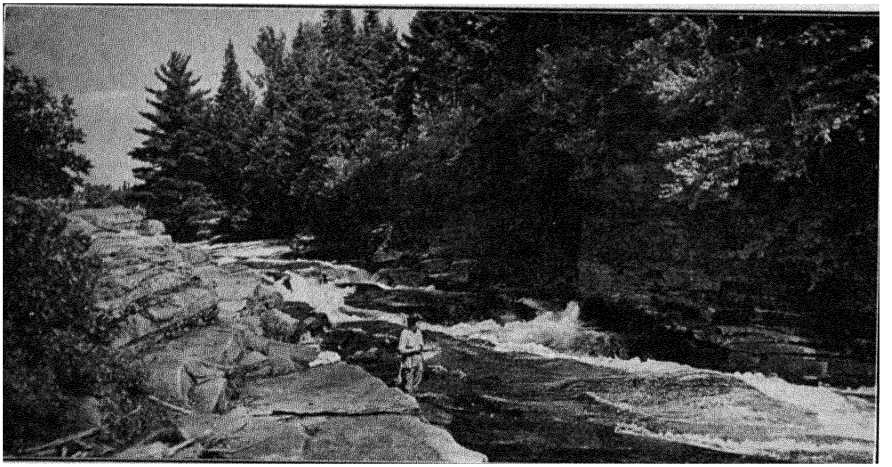


FIG. A. Hoping for trout and resting her nerves. Amonoosuc River, Bretton Woods, N.H. (Courtesy New England Council)

famous brand of scales. At Rutland utensils to be used in making maple sugar are manufactured — an interesting example of an industry producing equipment for a local industry.

MINERAL INDUSTRIES

The mineral resources of this region are like those of Lower New England, meager except for deposits of marble and granite. In the neighborhood of West Rutland are excellent and easily accessible deposits of hard marble. The machinery necessary for this industry is manufactured in the neighborhood. The characteristic scene is one of deep holes, high derricks, and piles of marble chips. Down in the great holes drills are busy cutting out blocks of marble, which are dressed at West Rutland and Proctor. Vermont furnishes one-fourth of the marble of the United States, and distributes it over wide areas. This is an industry which is declining in relative importance, because marble deposits are widely scattered over the United States. Vermont has a relative disadvantage, because it is not easy to send the heavy, bulky marble long distances. But the energy and skill of its people in organizing the sale and distribution of its product have so offset the handicap of transportation that Vermont sends marble hundreds of miles and sells it almost on top of deposits which might be quarried if only Yankees were there to do it. The same conditions apply to its extensive shipments of slate (one-fourth of the United States supply) and granite, which are produced in the neighborhood of the marble. A Vermont company operates marble quarries in Colorado.

THE VACATION INDUSTRY

As the summer boarder is important in Lower New England, so is he important in the Northeastern Highlands. Along the lakes and mountains of

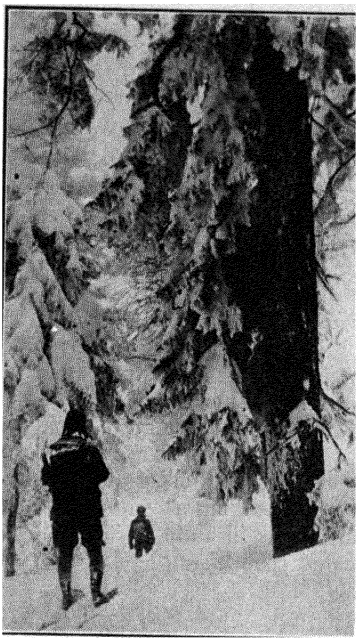


FIG. A. All the week in a city office, then the snow train and this vacation that is a real workout.

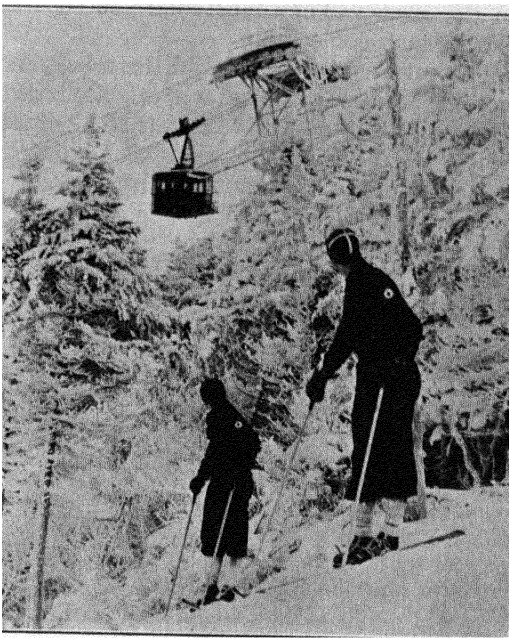


FIG. B. It's great fun to ski downhill, but the resort operator finds business is better if the skiers can ride up.

(Courtesy New England Council)

the Adirondacks, New Hampshire, and Maine are numerous summer hotels, summer camps, summer homes, and cabins where tourist, fisherman, camper, and other vacationists seek respite from the heat and the strain of city life. Mountain, forest, and stream combine to give a variety of attractions to the man from the cleared land and the paved street. The White Mountains of New Hampshire bristle with summer hotels, and so do the Adirondacks to a lesser extent. At great expense good roads have been put through much uninhabited land, and they are used in summer. In July, 1939, Dr. O. P. Starkey of the University of Pennsylvania met cars from 25 states in one hour on a highway in the deep woods of northwestern Maine.

The people of the Northeastern Highlands make great efforts to save the deer to attract the tourist, even to the point of making deer a pest to the farmer, whose garden and fruit trees they devour. Here vacations can have the touch of real wildness. For example, prior to 1924 the Gaspé Peninsula had been crossed only about twice by educated white men (*Geographical Review*, April, 1924). This involved canoeing up to the limit on one stream, carrying equipment through a forest and over a mountain, and coming down another stream. In 1928 came the highway, the magnificent Perrón Boulevard, encircling the peninsula. In its wake the isolation of the interior is melting fast; the people on the north and south coasts of Gaspé have a newly found community of interest, for the tourist with money to spend is arriving

on the scene. They must unite to separate it from him — pleasantly, so that he may come again.

The entrance of the ski and the toboggan into American life and the rapid increase of interest in winter sports are beginning to make these Northeastern Highlands a center of winter travel. Special ski trains leave Boston and New York for the mountain areas. Now that it ceases to be a hardship, we are beginning to see beauty in the snow.[10]

Pictures of Dartmouth College winter sports in numerous Sunday supplements have helped to deluge this, the chief educational institution of the region, with an avalanche of students from all over the United States. Winter there is one long carnival.

Sledding is considered a rather puerile sport in this vicinity. Favor is given to skiing, snowshoeing and tobogganing in the order mentioned. Snow is our cheapest and most prevalent commodity. Yesterday we had a storm which filled our paths and roads waist-deep with snow. Consequently snowshoes and skis are not only a sporting proposition but actually a household necessity. Children here in Hanover learn to ski during the first winter after they learn to walk. Recently at our great Winter Carnival a six-year-old kid went over our breath-taking ski-jump, a stunt which often the most experienced and hardy adult skiers hesitate to tackle. So for real sport, come up, leave your sled and get upon a pair of skis. — Letter from Professor Malcolm Keir of Dartmouth College.

THE FUTURE OF THE NORTHEASTERN HIGHLANDS

The future of this region seems plain. If we ever come to regard ourselves as custodians of our continent rather than its destroyers, this upland will have careful forestry,[11] systematic resort development, and agriculture in selected spots on the lower levels. We may expect forest products to be much more carefully saved and manufactured into lumber, wood products, and paper. Perhaps it may even take the extreme form of printed paper, and the paper-mill town will also become a printing-center for the great publishing houses of the metropolitan cities. Many books "published" in New York and Boston are printed in New Hampshire on paper made in New England. The agriculture will be much like that of Lower New England, which has already been adequately described. The pastures and climate are especially suited to sheep. At one time Vermont merino sheep were so

[10] "The extraordinary colors that one gets in snow. The shadows, the light shining through white birch trees, and the reflection of sky colors all give a constant variety to the colors in the snow itself. Our snow is nearly every color in the rainbow except white and the dirty brown slush of the cities." — Malcolm Keir in a private letter.

[11] Good forestry will be necessary if these Northern lands with their slow-growing trees are going to keep up with the new pulp industry of the South. Fortunately there are great possibilities of improvement, although the foresters have been peculiarly immune to the well-known facts of plant-breeding. A chemical engineer, Ralph McKee has hybridized poplars, producing varieties that grow much faster than any natural varieties and propagate much more easily (see J. Russell Smith, *Tree Crops*, Fig. 24).

The importance of tree cover for New England lands and its relation to water power were well shown in March, 1936, when normal sunshine had melted the snow off open fields while it was still 12 inches deep in the forests. The resultant slow melting would normally cause much of the water to get into the ground, the rest of it to flow more slowly into streams and lakes.

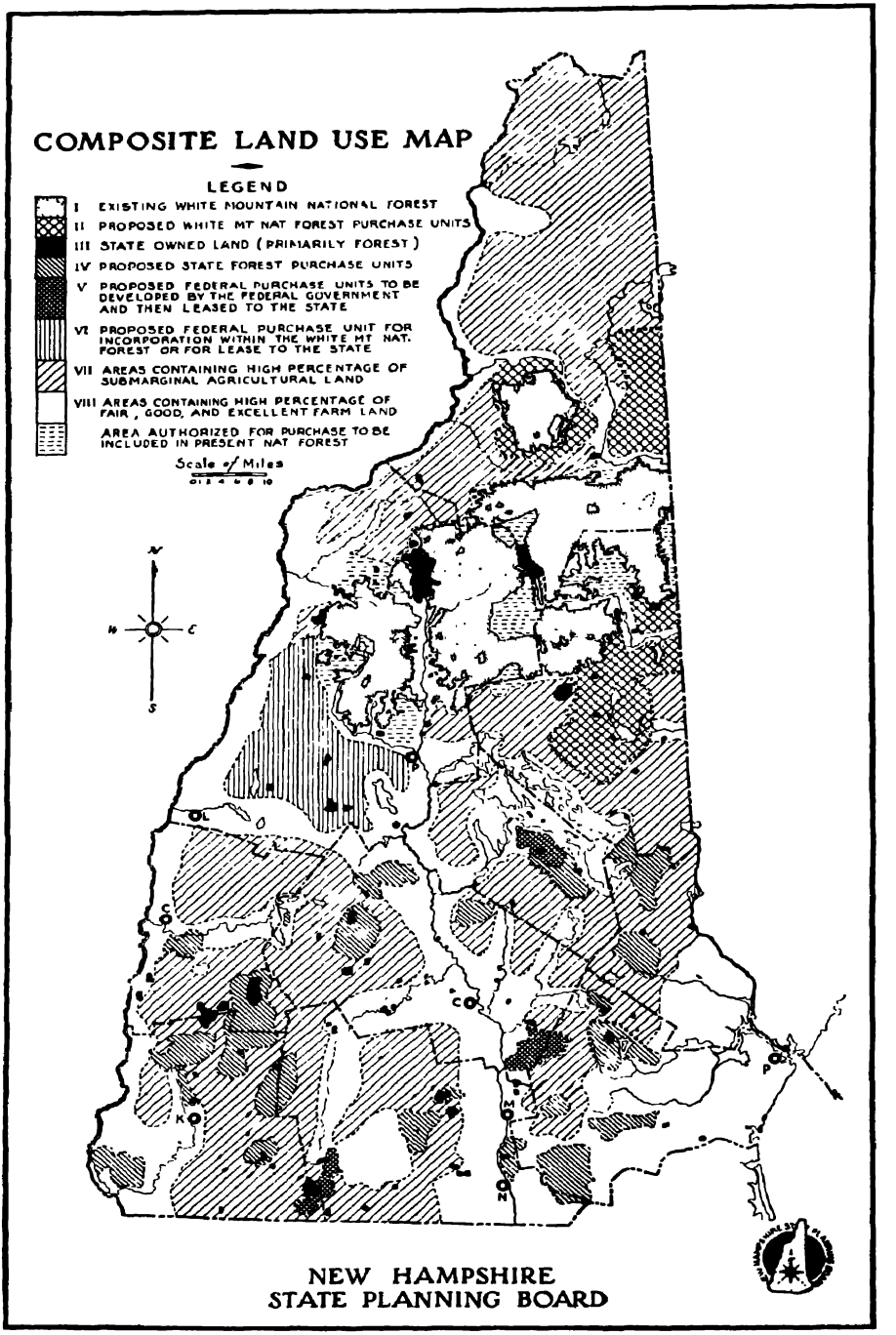


FIG. 185 A. Study this map, and it will tell you much. A map is the most telling page man has yet devised.

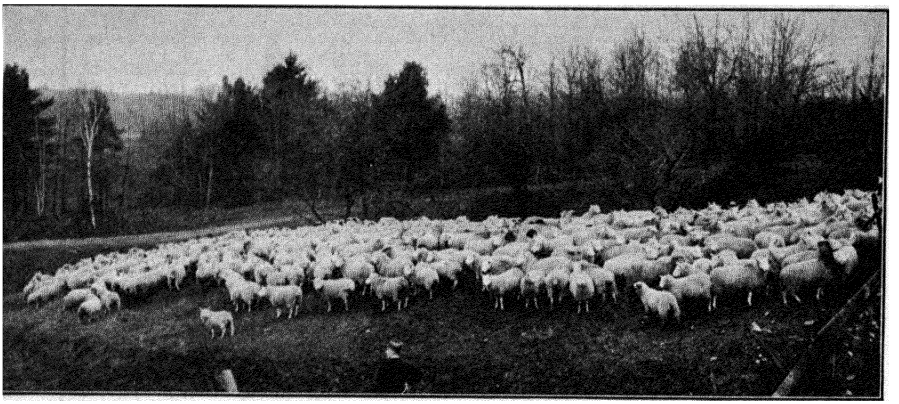


FIG. A. Beautiful Cheviot sheep pasturing an abandoned farm in Maine. (Courtesy Maine Development Board)

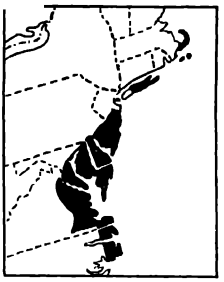
famed that they were exported to Australia for breeding purposes, although Shropshires now predominate. The excellence of this country for sheep is a continual surprise to the sheep-ranchers of the Western plains. The ancient joke that sheep's noses had to be sharpened in Vermont so that they could reach in between the rocks to get the grass is not without significance both as to the character of the country and as to the adaptation of the sheep to it. Although the land of the Northeastern Highlands can carry many more sheep than it now does, sheep production for the last fifteen years has been fairly stationary, increasing or decreasing a little with the rise and fall of the market price.

Vermont hills would resound again to the bleating of sheep if the price of mutton and wool should rise a little. If demand should rise, there is much new agriculture waiting to be used (see page 136) here in this land of snowy winter, rocky pasture, and good grass.

The real promise of new quick big money for this region is the rising tourist business. Already it is New England's leading industry. In 1938, the New England Council estimated its income at $500,000,000, and they actually talk about expecting $1,000,000,000 by 1945. The Northeastern Highlands will get their share of this — on a per capita basis more than their share.

Many a highlander of New York, Vermont, New Hampshire, and Maine, and even in faraway Gaspé, will gain much through the systematic exploitation of the visiting leisure class. Acres of water and miles of beautiful vistas have a definite cash value — indeed, in many cases, a far greater productivity than acres of rock-ribbed soil. Years ago Senator Moses of New Hampshire said that an acre of lake was as productive of income as an acre of land.

Chapter 7. THE NORTH ATLANTIC COASTAL PLAIN



IN the upper part of Manhattan Island much blasting of solid rock is necessary to get cellar space for a new building. In the lower end of Manhattan, to get a solid foundation the builder spends thousands of dollars sinking piles or burying great masses of concrete in the sand, gravel, and clay. This marks the difference between Connecticut and Long Island, between Philadelphia and Camden, between geologically old land and geologically new land. The softer, newer land is called the Atlantic Coastal Plain. Coastal plains are made of sand, clay, and gravel that have been so recently washed down from higher land that the material has not had time to turn into rock except for small bits cemented by iron or lime.

COASTAL PLAINS OF THE EASTERN AND SOUTHERN UNITED STATES

The line separating the older formations from the coastal-plain formations of the eastern and southern United States runs from New York to Philadelphia, Baltimore, Richmond (Virginia), Raleigh (North Carolina), Columbia (South Carolina), Macon (Georgia), and swings around to the mouth of the Ohio, passes Little Rock (Arkansas), and crosses Texas into Mexico. Not long ago, geologically speaking, the streams flowing into the sea spread on the bottom of the Atlantic sands, clays, silts, and gravels, which make up the surface of the Coastal Plain, 341,000 square miles in extent, 11 per cent of the United States.

As is the case with most shores, the Atlantic coast line has alternately risen and fallen. The present sea margin, as in New Jersey, is about midway between the edge of the old continent at Philadelphia and the edge of the continental land mass, which is marked by a great precipice several thousand feet deep at the edge of the so-called continental shelf, which extends the gentle slope of the Coastal Plain as a platform 50 miles out to sea. The evidences of advancing and receding sea are found in the presence of recent marine fossils on land and in the plainly marked canyons which soundings prove that the Hudson, the Delaware, and other streams have cut in the continental shelf. In its last movement most of this coast sank a few dozen feet, which let the sea flow back into the valleys of the rivers, turning them into shallow arms of the sea — Chesapeake Bay, Delaware Bay, New York Bay, Hudson River, Long Island Sound. This moderate sinking of the coast

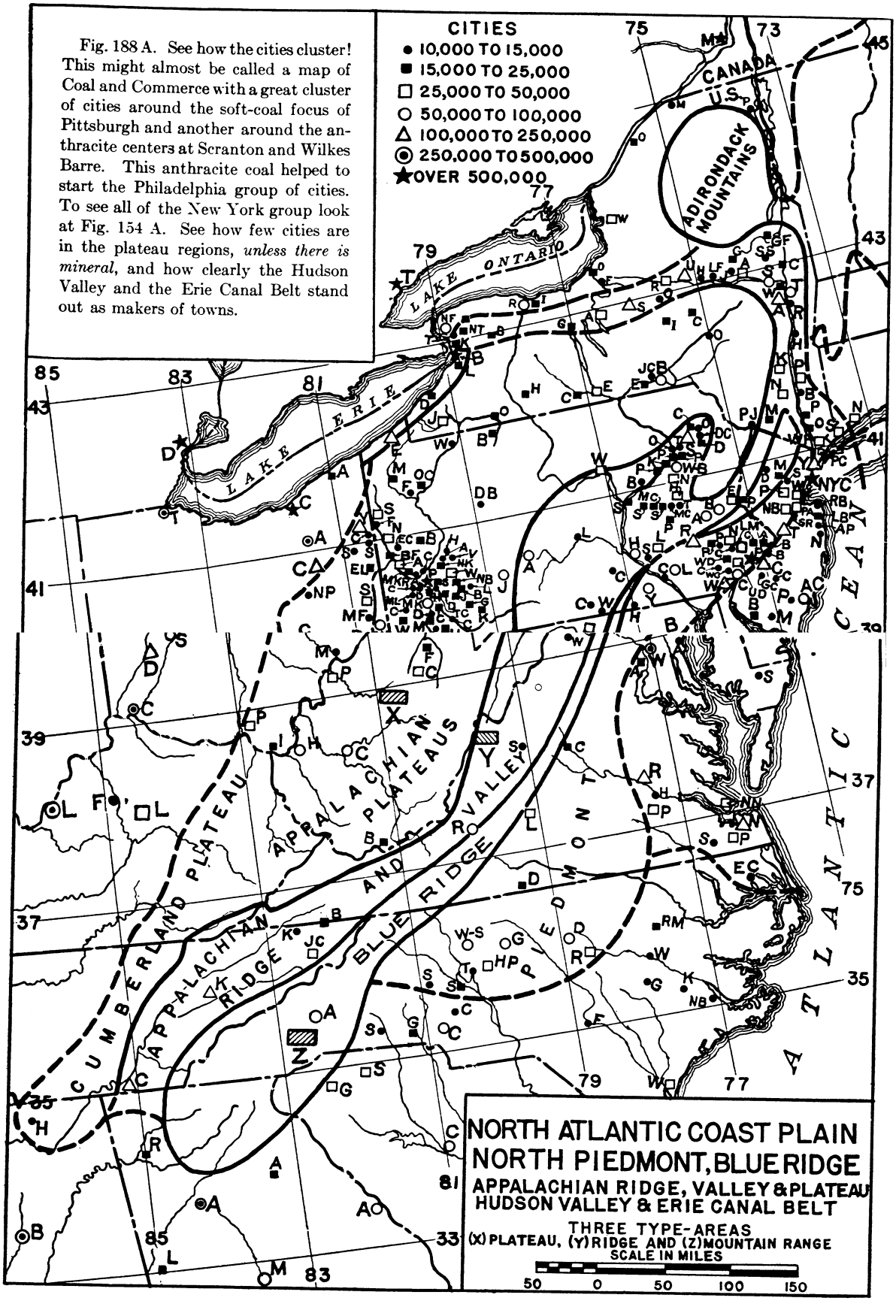


Fig. 188 A. See how the cities cluster! This might almost be called a map of Coal and Commerce with a great cluster of cities around the soft-coal focus of Pittsburgh and another around the anthracite centers at Scranton and Wilkes Barre. This anthracite coal helped to start the Philadelphia group of cities. To see all of the New York group look at Fig. 154 A. See how few cities are in the plateau regions, *unless there is mineral*, and how clearly the Hudson Valley and the Erie Canal Belt stand out as makers of towns.

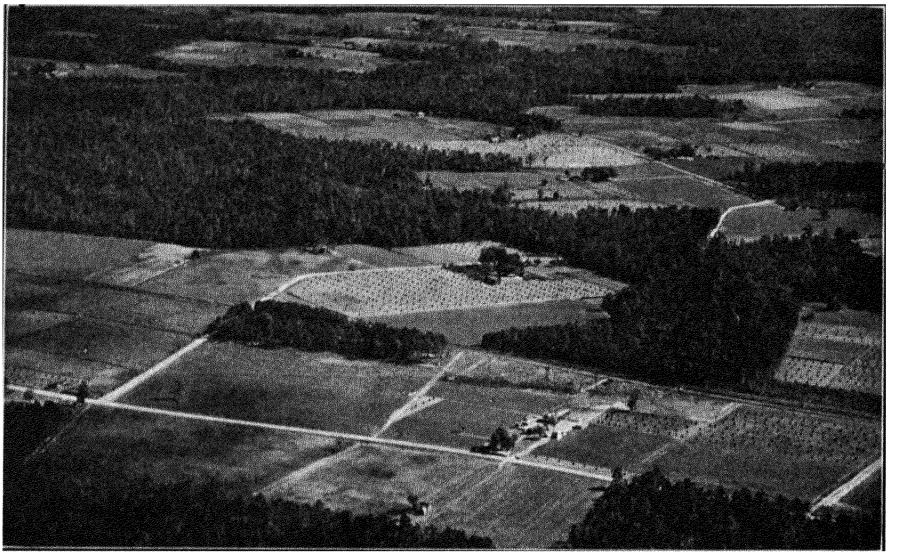


FIG. A. Tidewater Virginia, typical of much Coastal Plain landscape. (Courtesy Virginia State Conservation Commission)

makes the best harbors if the stream is large. Otherwise over most of its length the coast offers no good harbors, because the waves always tend to pile up a strip of sand called a barrier beach. This is well typified by the conditions on the New Jersey coast, where the resorts, such as Atlantic City, stand upon the narrow sand beach which encloses the characteristic tidal lagoon behind it. At intervals shallow inlets in the barrier beach are kept open by the continuous inflowing and outflowing of the tides. The lagoons are excellent harbors for small boats.

From the mouth of the Hudson to the mouth of the Rio Grande, and on into Mexico, the shore is nearly everywhere a barrier beach, fringed with lagoons and with bedrock deeply buried. The Coastal Plain widens as it goes southward. It includes the Florida peninsula, most of Alabama, all of Mississippi and Louisiana, corners of Tennessee, Kentucky, Missouri, a substantial slice of Arkansas, and a large territory in Texas. Its land boundary is always the line between the old hard rocks and the recent sands, clays, and gravels brought down by the streams. This boundary is most clearly marked on the rivers by rapids or falls, or by series of them where the stream crosses the easternmost ledges of solid rock, which wears away but slowly. Having passed the rocks, the rivers have been able to cut deep, wide channels in the soft Coastal Plain strata to the east. On the land the transition is usually a zone a few miles wide with no sharp line visible.

As far south as Richmond, the streams are tidal estuaries up to the falls, and navigable sometimes even for ocean-going boats. Immediately above these falls the streams are difficult even for canoes. This Fall Line, with its

double charm of falls for power and industry and head of navigation for commerce, is the natural location for the largest cities in the area between the mountain and the sea. This fact is proved by the locations of Trenton, Philadelphia, Baltimore, Washington, Richmond, Raleigh, Columbia, Augusta, Macon, and Columbus (Georgia), and even Austin (Texas). South of Richmond the Fall Line is from 100 to 200 feet above sea level, the streams are not navigable, and the Fall Line cities are not so large as those farther north.

The Coastal Plain has soils of great variety.[1] The movements of the water that placed these deposits were sometimes swift, carrying away everything but the contour sand and gravel. In other places the less swift current left finer sand, and in yet other places it left clay, or nearly pure clay. Sometimes there was deposited an abundance of shell, giving a high lime content, and again fossil beds (marl) were formed. So rich in plant food were the marl beds that they were quarried for fertilizer in the early days of artificial fertilizers. In other places the lagoon behind the barrier beach has been filled by a mixture of humus from river mud, animal and plant remains, and sand from the barrier beach. This makes soil of the finest kind. In many places, especially in the South, the sea retreating across the plain left its legacy of ancient beaches, which made the land surface very sandy. There are also areas of upland marshes, characteristic of level land having abundant rainfall.

Upon the whole, the process whereby the soils of the Coastal Plain were made tended to take out the soluble elements, which contain plant foods, and left too much sand, which is always of low fertility. To make it even worse for farming, parts of the plain have a layer of hardpan near the surface — the soil scientists' mark of an *old* soil. It is not unnatural that parts of the Coastal Plain remain unsettled — despite the fact that it is so level, soft, and stoneless that plowing is very easy, and roads could run in any direction.[2] There are whole counties without a natural stone large enough to be of use in killing a snake, yet many gravel banks make excellent road material.

Throughout its length, the Atlantic and Gulf Coastal Plain has the curse of level lands with good rainfall. In many places the water stands on the land until it becomes stagnant and raises a crop of mosquitoes — one of the

[1] This variety increases one of the many difficulties of the farmer. It is really a difficult task to know just what crops will grow on certain soils, and how the soil should be treated. Hence the importance of soil surveys, one of the important uncompleted works of the United States Department of Agriculture. One of the first surveys found this significant situation: Two communities in Maryland were on the same soil. One was prosperous, had good schools, good roads, good churches; the other was unprosperous, with poor roads, poor buildings, and despairing people. Why this difference? One group had made a better adjustment to its environment. One community grew the series of crops for which the soil was good, namely, truck. The other was trying to grow grains, for which the soil was not good. The application of this lesson is nation-wide, as is the work of the soil survey.

[2] I have walked through the woods, 17 miles in a straight line, parallel to and a few miles north of the railroad connecting Philadelphia and Atlantic City, without seeing a human habitation or even a field or a good saw log. This is a part of a 3000-square-mile area of forest, or would-be forest, gutted by ax and fire. Settlers do not want it.

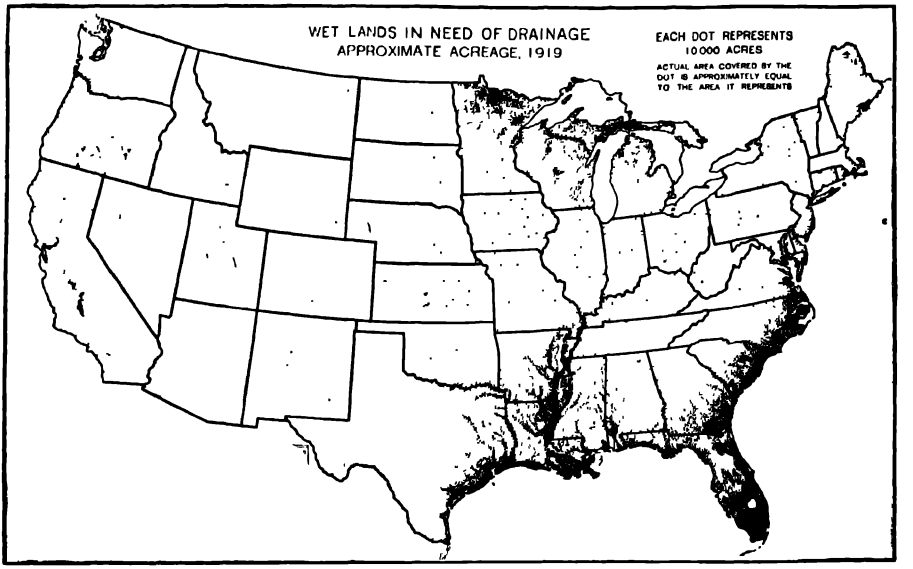


FIG. 192 A

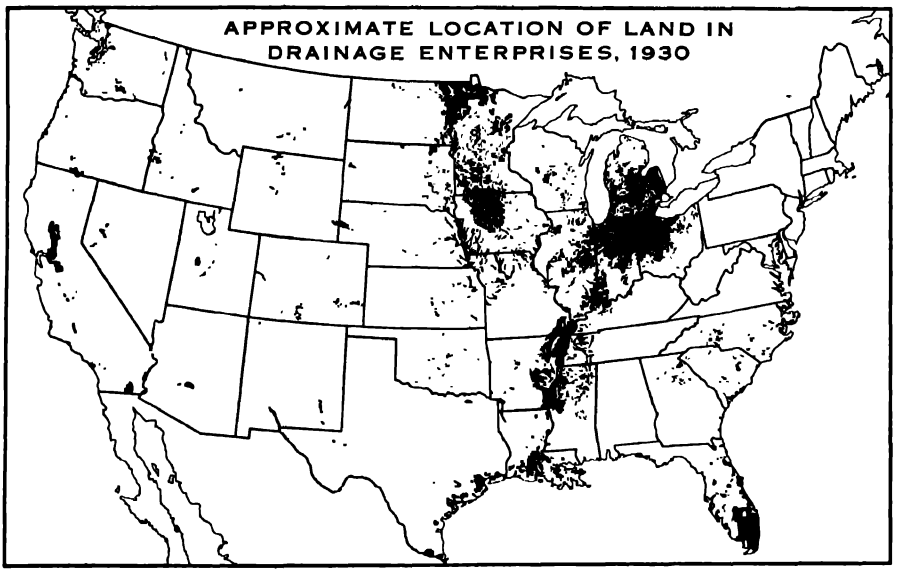


FIG. 192 B

The wet lands of the Atlantic Coast are a great land reserve if we should need it. They are much easier to drain than those of the Netherlands, and would produce more.

The Mississippi muds are Dutch in difficulty.

Most of our drained land in the North is merely flat and receives less rain and less overflow than the Southern swamps and marshes.

Figure 192 B shows 88,000,000 acres, of which 66,000,000 were "fit to raise a normal crop." In ten years the amount of improved land in these enterprises had increased from 44,000,000 to 63,000,000 acres. The Coastal Plain cuts a very different figure on these two maps. (Courtesy U.S. Dept Agr.)

great handicaps of the entire region. Here has occurred the great battle of America vs. Malaria.[3]

On the other hand, this vast expanse of level land is blessed with certain advantages. Cultivation of the level, sandy soil is easy. The low relief offers no obstacle to railway and highway construction.[4] Towns and cities are not crowded, the principal ones being situated on the inner and outer borders with the advantage of Fall Line or seaboard location, and within the Coastal Plain the distribution of population is widespread.

THE BOUNDS AND CHARACTER OF THE NORTH ATLANTIC COASTAL PLAIN

If the boundaries of regions were based on geology or soils alone, we should have one region running from Veracruz, Mexico, around the shores of the Gulf of Mexico and the Atlantic Coast up to the mouth of the Hudson, and including Long Island and Cape Cod. All of it is coastal plain having similarity of soils, but nature has spread dissimilarities of climate over these similarities of soil. It is so nearly a desert near the mouth of the Rio Grande that agriculture must wait upon irrigation. Lower Mississippi is wet, with a long, hot summer, so wet that agriculture must often wait upon drainage of the land, especially where the soils are of Mississippi River mud. In the Florida part of the plain they pick oranges and bathe in the sea when on Long Island there is skating and Cape Cod may be icebound. These differences of climate cause the Coastal Plain to fall naturally into several regions; one of these, the North Atlantic Coastal Plain, is the part under consideration here. The North Atlantic Coastal Plain has its southern boundary at the place where cotton becomes an important crop. This line marks the northern boundary of the Cotton Belt.

The North Atlantic Coastal Plain is not a land of cities, because there are no great mines, as in Pennsylvania, and no important waterfalls, as in Massachusetts. Because it is level, no place has distinct superiority, so there are no great commercial foci, such as that at New York. Norfolk is the nearest approach to a commanding commercial location. The Coastal Plain, therefore, remains a land most of whose people are farmers. The sandy soils were not well suited to the needs of the colonial settler, because they were not good for grass or wheat. The early settler wanted pasture and hay as well as wheat and corn. Hence much of the Coastal Plain has never been cleared and settled, and, as in New England, some of its settled areas have been abandoned. Only in recent decades have some of these old abandoned lands been rejuvenated by the application of commercial fertilizer.

[3] Probably the largest and most highly organized campaign against the mosquito at the present time is being conducted in New York City. Within the limits of this metropolis are to be found 22,000 acres of mosquito-breeding salt marshes, nearly twice the area of Manhattan Island. Since 1933 several thousand men, as many as 7500 at one time, have been employed by the CWA, FERA, or WPA in the work of drainage.

[4] Deep rivers and estuaries cutting far back into the Coastal Plain offer the chief obstacle to railway and highway construction; hence transportation routes parallel to the coast find necessary the use of ferryboats, long bridges, or even circuitous routing.

THE TRUCKING INDUSTRY

It is fortunate that although the sandy soils of the Coastal Plain and elsewhere are unsuited to grass, they are admirably suited to the production of watery products — melons, tomatoes, and nearly all of the truck crops. The sweet potato reaches its perfection in soil so sandy and so poor that it would bring despair and bankruptcy to the growers of wheat and corn. Indeed a heavy rich soil produces inferior sweet potatoes. The Coastal Plain is therefore an admirable region for truck farming, and some years ago there was an agricultural revival that promises permanence. The changes which caused the revival were: first, the application of lime and chemicals (commercial fertilizer) to soils of low natural fertility, thereby making them highly productive; second, the establishment of express-train and motor-truck services which carry truck crops to Northern markets for several weeks or months before the local supply is ready; third, and most important, the development of the canning industry and the increased demand for canned goods. If a crop is canned, its *period of consumption* is prolonged a whole year, or even two years or more, and its *area of consumption* embraces almost a world.

The truck industry tends to develop in centers, because different types of soil suit different crops and because centralization has advantages to the grower both in production and in marketing. If scores or hundreds of farmers around a certain town are growing strawberries or cantaloupes, there is a personal stimulus in keeping up with the procession, and personal aid through the spread of knowledge and technique. Every laborer in the community knows how to help. The merchants in the town keep every possible supply needed. In marketing it is easy for producers to take the advantages of co-operation and of carload shipment with its faster service and lower freight rate. It is easy to fill a car where the produce of many growers can be brought to one station, whereas it would often be impossible to ship in carload lots if producers were scattered. Once a center is established, another advantage often appears: The buyers come to buy from the growers and can ship full carloads to points where there is a good market.

Farmers' co-operative associations are a potent reason for the existence and development of this centralized production. The product is graded and packed according to association rules, and a standard package is then put on the market. Confidence is created, and people buy almost without looking. One organization has arisen to handle cranberries, another for potatoes, another for cauliflower, and so on. Each of these organizations came into being because conditions were hard for the individual farmer. Farmers, acting separately, would consult current price reports to see which market gave the highest terms. Every one would send his produce to that market; this would oversupply and so glut the market and sometimes cause the goods to sell for less than the freight cost. At the same time some other equally accessible markets would be bare. This, unfortunately, is an experience which all independent truckgrowers who ship by rail have met many times in a decade. When an association has been formed among

farmers, its chief purpose is to sell all the cauliflowers, or potatoes, or whatever it may have, through one sales agency, which can watch the markets of the whole country and distribute supplies to cities and towns where they are needed, thus avoiding the glutting of any market. This assures a better supply to the city and a better price to the farmer. The keystone of this operation, however, is the guaranteed standard package. A basket of cauliflower with the Long Island Association brand is so well known in many markets that its contents do not need to be examined. The tag tells the story. So does the "Eatmore" brand of the New England Cranberry Sales Company, or the label of the Eastern Shore of Virginia Produce Association, and the label of many others.[5] Naturally, the localities whose farmers have reached this degree of efficiency are sections of unusual prosperity.

This development of trucking-centers throughout the Coastal Plain gives great diversity of production in different sections. At one place the whole town and countryside revolves around potatoes as definitely as the Labradorean settlement does around codfish. At another place, perhaps only a few stations away, the people may buy even the potatoes they eat, while they grow strawberries or cantaloupes or even cucumbers by the trainload. Near the cities greater diversity is produced, because the grower has the advantage of being able to haul a succession of products to the near-by market in his own wagon or truck.

The North Atlantic Coastal Plain is divided by rivers and bays into six natural subdivisions: Southeastern Massachusetts; Long Island; New Jersey; the Eastern Shore, or the peninsula between Delaware Bay and Chesapeake Bay; the Western Shore, or the tidewater lands of Maryland and Virginia west of the Chesapeake; and the Norfolk district.

SOUTHEASTERN MASSACHUSETTS AND ITS CRANBERRIES

Southeastern Massachusetts, including Cape Cod, has a sandy, gravelly surface, made partly by glaciers. In this area the glacier stopped for a long time, and the melting waters rushed away from its front, strewing sand and gravel all over the plains to the south and leaving rather steep slopes to the north. The islands of Nantucket, Martha's Vineyard, and Block Island have a similar origin. As the ice melted it left pockets, which have been ponds and swamps in the midst of the sands. Most of the area between Buzzards Bay and Cape Cod Bay, including the three islands mentioned above, is scrubby bush or forest land without much good timber.

This unpromising-looking land is producing an agricultural specialty, cranberries. The surrounding water gives protection from spring and fall frosts. The marshes are the natural home of the cranberry. To help keep down

[5] An inspector of this association stopped his Ford, sprang to the platform of a railway station, ripped the burlap from one barrel of a shipment of outgoing potatoes, rolled them out on the platform, and looked them over with a merciless eye. That barrel had on it the Red Star of quality, and it was the inspector's job to maintain that quality. A bystander remarked. "With some o' these here potato-growers the fear of the inspector is greater than the fear of the Lord."

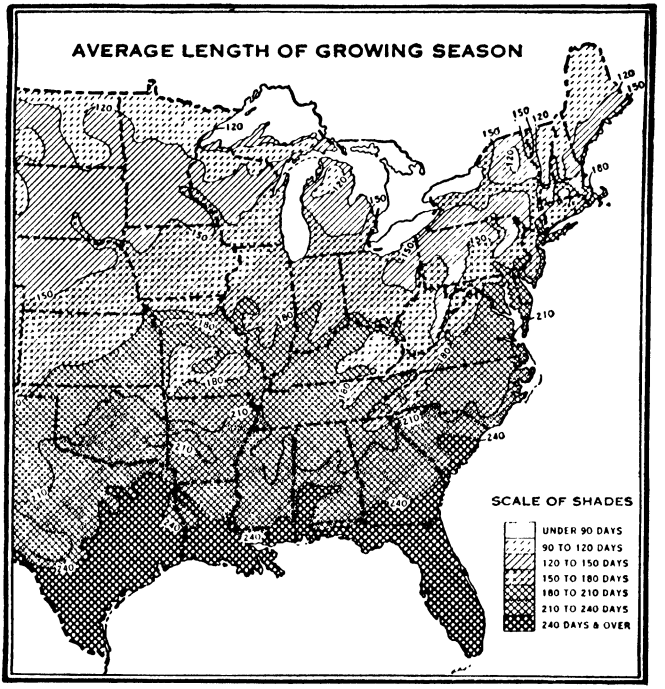


FIG. A. The longer growing-season permits double cropping and the rapid growth of forest trees. (Courtesy U.S. Dept Agr.)

weeds in the cranberry bogs, and to keep the berries out of the mud, it is customary to put a layer of sand over the top of the muck. This is usually done in winter, when sand can be hauled over frozen ground or ice. Weeds are kept down still further by temporary flooding. Dikes and other devices are built to control the water to be used for that purpose.

The growers are organized into a co-operative association which might almost be called a trust, and which spends several hundred thousand dollars a year in creating a demand for cranberries by advertising. The industry has spread westward across Cape Cod Bay to the drier lands of Plymouth County, where the industry is conducted on a large scale. This little corner of Massachusetts leads the world with a cranberry output worth over $5,000,000 annually, much more than half of the American crop.

LONG ISLAND

Long Island gives us our last glimpse for a time of the work of the continental glacier. Two terminal moraines extend practically the whole length of the island. It is their bulk which gives the two projecting ends to the eastern part of the island. Throughout their length these moraines are marked by the characteristic irregular hills and sinks (or kettle holes) which,



FIG. A. This map shows well the northward march of the seasons, the way both seedtime and harvest swing up the coast — a vital factor in the truck industry. (Courtesy U.S. Dept Agr.)

in the sandy soil, can rarely hold enough water to become lakes. The moraines are a mass of boulders and stones which seem strangely out of place as they lie upon the soft sands of the island. The surface is mostly composed of the sand and gravel washed into its present position (outwash plains) by the outrushing glacial waters.

Considerable areas are of almost pure sand marked by uninhabited wild barrens covered with a poor growth of pitch pines and scrub oak. Wild deer still live here, although this uninhabited region is almost within the sound of the great metropolis at the mouth of the Hudson.

The western third of the island is covered by part of Greater New York — Brooklyn (estimated, 1939, pop. 2,830,000) and its suburbs, and the Borough of Queens (pop., 1930, 1,100,000) — and by market gardens intensively cultivated by immigrants, chiefly Italians and Poles. The suburbs, like a slowly rising tide, are gradually spreading eastward.

In the central third of the island, sand plains and wilderness predominated until recent years, when parts of this area have been cleared for residences and market gardens. On the eastern third the soil is better, and there one finds an intensive agriculture — potatoes, cauliflowers, sweet corn, cabbages, tomatoes, and other garden vegetables. At one time this locality produced almost all the national supply of cabbage seed — a natural development of

a specialty in a region where much attention has been given to the crop. This vegetable industry in sandy soil of low natural fertility has been made possible by the recent great increase in the use of commercial fertilizer, which permits sandy soils, when abundantly fed, to yield heavily of garden crops.[7]

The autumn frost immunity of the marine climate on the narrow west end of the island gives the farmers there a monopoly in selling fresh produce late in October after the mainland crops are frozen.

THE NEW JERSEY SECTION

The contrast between agriculture on the clay lands to the west of Philadelphia and the sandy lands to the east of it shows clearly how soils can differentiate regions. There is practically no trucking on the Pennsylvania clay lands; instead, there are dairy farms.

Late in the nineteenth century many of the farmers on the sandy loams east of Philadelphia were also chiefly dependent upon the sale of milk, but the dairy business has now almost entirely disappeared. In its place enormous quantities of fruits and vegetables are grown to meet the demands of the 2,000,000 people in and around Philadelphia. About 1910 one lone milk-shipper continued to send his cans of milk to one of these stations, and his driver was quite unhappy because the men who shipped vegetables mooed like a cow when he came to the station. The good roads leading to Philadelphia are thronged with trucks loaded with vegetables. Fifteen hundred vehicles have crossed the Delaware in a single day, and many others go to Camden to leave their product at the canning factories that operate there to handle the surplus that cannot be immediately consumed.

The possibilities of the truck industry, aided by fertilizers and plenty of land in large tracts, are typified by the history of a particular piece of sandy upland about 12 miles east of Philadelphia. A man born in 1800 cleared the land and tried to grow grains. His son, born in 1830, allowed it to grow up to pines and forest because it did not pay to raise wheat, corn, or hay. The grandson, born in 1865, again cleared the land, and planted it to truck. His first crop was watermelons, and he raised 1000 of them on an acre of land and sold the crop for more than $100. He planted an orchard of peaches and apples along with the watermelons, and the melons and wood (resulting from the clearing) paid all the costs down to the end of the first year. The next year other truck crops made income in the young orchard.

The greatest single feature of the New Jersey section of this plain is an area of 3000 square miles of pine forest in the southeastern section. Here and there are settlements, often miles apart. The traveler wending his way through pines in New Jersey will suddenly come to a wide green opening as

[6] For some years the leading center of production has been in Skagit and King counties along Puget Sound. Cabbage seed, because of its small bulk in proportion to value, can stand the long haul across the continent to market.

[7] The intensity of Long Island agriculture in 1930 is well shown in Suffolk County by average expenditures of $42.51 per cultivated acre per year for labor and $37.59 for fertilizer. Compare this to the figures for the great world staple of wheat, with a gross value of $5 to $15 per acre.

flat as a floor, as smooth as a lawn, and as large as a small farm. It is a cranberry bog, one of many in this vicinity. New Jersey is second to Massachusetts as a producer of cranberries.[8]



FIG. A. Picking cranberries in a New Jersey bog — a seasonal job. Migrant workers do the picking. (Courtesy Rothstein, Farm Security Adm.)

The cranberry industry brings hundreds of transient laborers to the pines in the early autumn. The workers are Italians, Poles, and other foreign-born persons. They spend the winter in the cities and the summer in going from place to place picking berries and vegetables. They begin with strawberries in late May, and proceed to peas, beans, tomatoes, peaches, summer apples, pears, and finally to cranberries. They then return to the city until spring comes again. On some of the truck and fruit farms are rows of shacks, each of which is occupied, for a time, by a family of berry-pickers. At Hammonton, a railroad junction in the pines of southern Jersey, there is a great concentration of raspberries, blackberries, and dewberries, while a few miles away at Glassboro are hundreds of acres of apples.

This region affords a good illustration of a distinction that needs to be made between American and European agriculture. Most of us think of intensive agriculture, especially the growing of garden crops, as farming that involves a lot of backbreaking labor which results in a high yield per acre. It must be admitted that we do have this type of "European" agriculture in some parts of America, in our sugar-beet fields out West and in some of our market gardens. On the other hand, we sometimes achieve high yields per acre through the use of machinery in cultivation. As an example of this type of agriculture, a single farmer living 10 miles from Philadelphia recently

[8] PRODUCTION OF CRANBERRIES
(barrels)

	1924–26 *average*	1928–32 *average*	1937	1938
Massachusetts	395,000	407,800	565,000	300,000
New Jersey	180,000	117,200	175,000	70,000
Wisconsin	49,000	49,200	115,000	64,000

Source: U.S. Dept Agr., *Agricultural Statistics*, 1939.

operated 11 truck farms, which he managed by telephone and automobile. He made full use of machinery, chemicals, and legumes.[10] For one year he reported the following astonishing yields per acre:

YIELD PER ACRE ON ONE FARM

Corn, 80 to 100 bushels
Hay, 3 tons
String beans, 175 bushels
White potatoes, 250 bushels
Sweet potatoes, 300 bushels [11]

Fundamentally, agriculture is intensive if the total amount of energy and fertility applied to each unit of land is large.[12] The energy, of course, may be human energy, animal energy, or machine energy. In Europe, and especially in the Far East, it is human energy that is devoted assiduously to the cultivation of small patches.[13] In this country, we have developed large-scale, mechanized, chemically fertilized, intensive agriculture. Mechanized farming results in a large output per man, and it may (as in the example above) result in a large output per acre.

THE EASTERN SHORE

The lowland peninsula between the Chesapeake Bay and Delaware Bay, known throughout Delaware, Maryland, and Virginia as the Eastern Shore, is like the corresponding western shore of the Chesapeake and the tidewater territory of Virginia in being unusually favored in past decades, because the far-reaching arms of the Chesapeake make water transportation possible over a large area, of which the great focus is Baltimore.[14] Steamers come from many places in the interior of Delaware, such as Seaford, 35 miles inland, and from Fredericksburg and Richmond in Virginia. For a long while there was no other transportation service for this area. Ten counties located in the long peninsulas of eastern Virginia never had a mile of railroad, chiefly because the streams are so numerous and the boats were so satisfactory.[15] Every farmer lives within a few miles of a boat landing. Many farms have a private boat landing, and it is not uncommon for a man to own his boat. This was even more common in colonial times. Shaler has pointed out that these self-contained plantations prevented the development of town life in Virginia and Maryland and hindered the building of roads.

[9] An even better example is potato production in Aroostook County, Maine.

[10] The economist would say that large amounts of "capital" (machinery and fertilizer) are being used. Short on labor (it is relatively costly), we in America use it sparingly. Long on "capital," we use it freely. Richly endowed by nature, we spend our "land" with a lavish hand.

[11] In the part of Virginia east of the Chesapeake a corporation starting in 1920 has got possession of 10,000 acres of land; it grows and cans a variety of vegetable crops, including 40% of the canned lima beans of the United States.

[12] See Erich W. Zimmermann, *World Resources and Industries*, Harper & Brothers, 1933, pp. 97–98.

[13] See Franklin H. King, *Farmers of Forty Centuries*, Harcourt, Brace and Company, 1927.

[14] It is a sacrifice of social efficiency that this peninsula, now divided among three states, could not be one state with uniform interests.

[15] The population of these ten counties has been declining steadily, as is the case with so many rural counties in the United States.

On the Eastern Shore the swifter railroad gave the boats a heavy blow, and the still swifter truck has well-nigh killed them both. Many a boat landing is dead; many a boat has stopped. The truck can be more quickly loaded, and it goes three times as fast as the boat. A set of roads to the wharves has been abandoned. Another set to the railway stations is now but little used. Communities have been faced about. Here are some facts from the upper Potomac valley that show what trucks can do. Trains carry peaches from the eastern panhandle of West Virginia to New York in two nights and a day. The truck does it in one night.

In southern Delaware and the adjacent part of Maryland, one sees fields of tomatoes, peas, beans, potatoes, cabbage, melons, strawberries, and at almost every railroad station is the canning factory.

Baltimore is probably the greatest single canning center in the country. Steamboats afford a cheap and easy way of gathering the produce from widely scattered localities to the west. In times of dearth the boats even go through the Chesapeake and Delaware Canal to Delaware Bay, ascend the rivers of western New Jersey, and take the peas and tomatoes to the factories in Baltimore.

The two Virginia counties at the extreme end of the Eastern Shore are the seat of the Produce Association previously mentioned. In some parts the sands are of low fertility, but this happens to be exactly the type of soil required for the sweet potato, whose quality is ruined by soil of high fertility. The farmers have a most unusual system. A part of each farm is in pine trees, whose needles are gathered up and thrown into the barnyard to be trampled by the horses, mules, and cattle. In the spring the mass is spread upon the fields where white potatoes are planted. The next year, after the crop has partially exhausted the soil, sweet potatoes are planted, the next year white potatoes, and so on indefinitely.[16] White potatoes are sent from here to many parts of the United States in their season, which is limited to a short period from late in May to early July.

THE WESTERN SHORE AND THE NORFOLK DISTRICT

In colonial times the western shore of the Chesapeake in both Maryland and Virginia depended greatly upon the tobacco crop, and upon the labor of the Negro slave. It will be recalled that tobacco probably saved the Jamestown colony from failure, because it was the only thing that could be produced to sell in Europe.[17] So important was it in colonial times that tobacco served as money for over a century, even the minister receiving his

[16] In peak years, about 90,000 acres were planted in Irish potatoes, but glutted markets in recent years reduced this to about 40,000 acres. The abandoned Irish-potato acreage has been taken up largely with tomatoes, snap beans, lima beans, and some cabbage and strawberries. There has also occurred an increase in the number of hogs and cattle raised, and some farmers are beginning to ship milk to Philadelphia.

[17] N. S. Shaler said that the demand for tobacco in Europe laid the foundation for American commerce. It made Virginia prosperous, a leader in the Revolutionary War and in national affairs. But — tobacco fixed slavery on America and cotton extended it. And what this soil-robbing cultivated crop did do to the land!

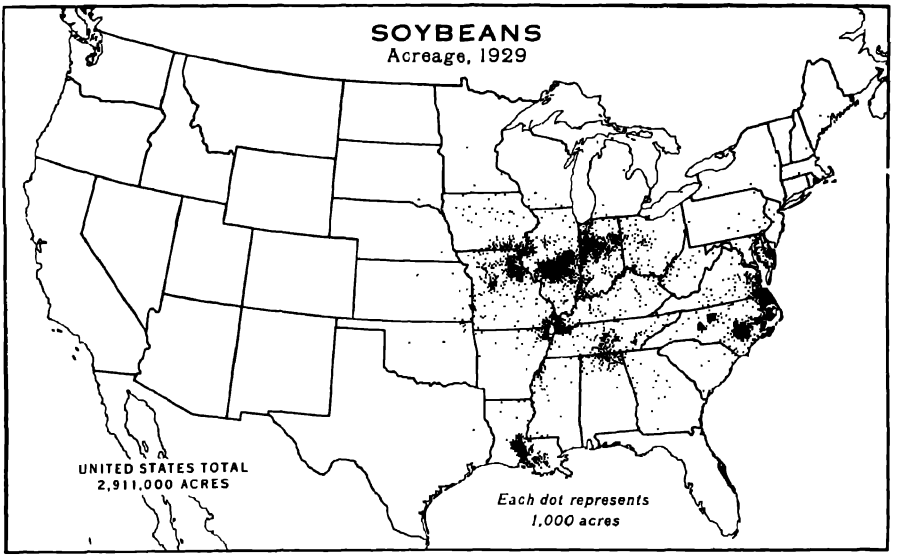


FIG. A. Here is a promising new crop that catches nitrogen from the air, furnishes one of the four perfect proteins for man, and shows ability to live in a wide range of soil and climate. (Courtesy U.S. Dept Agr.)

salary in tobacco.[18] The commercial prominence of this crop helped to impoverish the territory where it was grown, because tobacco is one of the worst soil-robbers known to agriculture. Land upon which tobacco has been grown for a time usually becomes exhausted.

The emancipation of the Negro interfered with the tobacco industry. A great deal of hand labor is required to care for the microscopic little plant, to hoe it, to pick off the worms that eat holes in its leaves, to pick off the buds to prevent blooming, to break off the young shoots so that only a single stalk will remain, and finally to strip the leaves from the stalk and prepare them for market. The slave women and children were an adequate labor supply while slavery lasted. Soil exhaustion, emancipation, and the decline in the price of corn, due to the opening of the West, are the chief explanation of the surprising fact that some counties in the western Chesapeake

[18] Witness the interesting Virginia statutes of 1662, in which tobacco seems to have been a great aid to godliness as well as family discipline. "Every person who refuses to have his child baptised by a lawful minister shall be amerced 2,000 lbs. of tobacco; half to the parish, half to the informer. . . . In actions of slander occasioned by a man's wife, after judgment passed for damages, the woman shall be punished by ducking, and if the slander be such as the damage shall be adjudged at above 500 lbs. of tobacco, then the woman shall have a ducking for every 500 lbs. of tobacco judged against her husband, if he refuses to pay the tobacco. . . . Enacted that the Lord's Day be kept holy, and no journeys be made on that day, unless upon necessity. And all persons inhabiting in this country having no lawful excuse, shall every Sunday resort to the parish church or chapel, and there abide orderly during the common prayer, preaching, and divine service, upon the penalty of being fined 50 lbs. of tobacco by the county court." Cited by G. T. Surface, "Geography of Virginia," *Bulletin of the Philadelphia Geographical Society*, Vol. V, 1907, pp. 1–60.

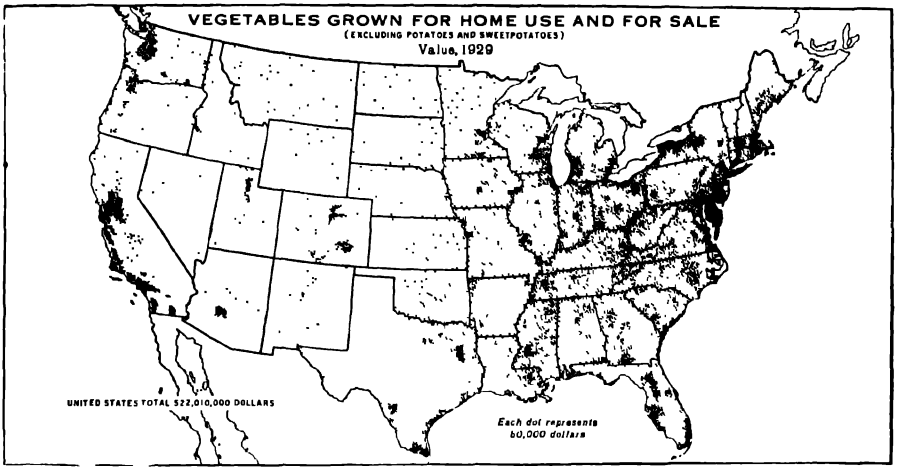


FIG. A. This vegetable crop map shows these things: places with special advantages for vegetable-growing, the influence of near-by city markets, and areas of self-sufficient farms like southern Appalachia. (Courtesy U.S. Dept Agr.)

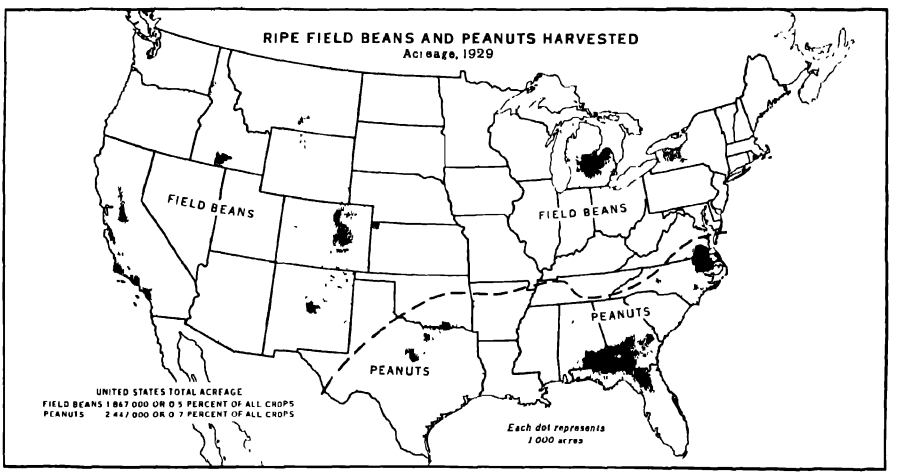


FIG. B. The peanut — a welcome immigrant from Africa. The ones we eat as nuts come from Virginia and North Carolina. The smaller "Spanish" variety from the Cotton Belt makes butter, oil, and pig feed. (Courtesy U.S. Dept Agr.)

Basin, including the site of historic Jamestown, had only about half as many people in 1920 as were there in 1820.

The emigration has been so great that many communities have not enough energetic people left to maintain satisfactory community life. Many old fields are grown up in pines. The land is cheap, easily worked, and awaiting the scientific farmer. Around the Norfolk district is a veritable agricultural boom, with high land-values based upon facilities for marketing truck crops, for which the harbor and location of Norfolk offer unusual advantages. In

12 hours the boat from Norfolk reaches Baltimore; in 20 hours, Philadelphia and New York; and in 36 hours, Boston. These facts explain the enormous concentration of truckgrowing in the immediate vicinity of Norfolk, where the soils are admirably suited to it.

Tributary also to Norfolk, and a few miles back of the truck center, is one of the greatest peanut centers in the United States.[19] This nut was introduced to the people of the North when the army returned from the Civil War. Since then there has been a great increase in consumption of peanuts, and several counties on both sides of the Virginia boundary back of Norfolk have almost their sole commercial dependence upon this crop, many farms selling nothing else. The remarkable food value of this leguminous plant, combined with its adaptability to sandy soils of low fertility, mark it as one of the greatest crops of the future.[20] Not only is it richer than meat in protein, the tissue-making food, but it is also rich in both carbohydrates and fat, two essentials of nutrition. A bushel of peanuts weighing 33 lbs. (hulls included) will produce nearly a gallon of edible oil when crushed, and 16 lbs. of cake, a stock food high in protein and especially suitable for dairy cows and growing animals. The uncooked peanut keeps in perfect condition for an indefinite time, and an acre of land can easily produce more than 1000 lbs. of nuts.

THE AGRICULTURAL FUTURE

What will be the agricultural future of this region? Unfortunately, or fortunately, according to the point of view, there is a demand for only a fraction of the truck this region can grow. In fact, a tenth or less of the area of good truck land in the United States suffices to supply at the present time all the commercial needs of the nation. The chief reason why the region has remained unsettled is that every time the farmer has tried to extend the truck area, glutted markets have discouraged him and stopped the spread of the industry. Production can increase only as demand increases.[21] Thus far the people have strangely ignored the opportunity to develop an agriculture which would produce staples for which there is a steady demand and a reasonably steady price — namely, animal industries.

It has been demonstrated time after time in every county of this region that an application of phosphorus and lime and a little potash to the sandy soils of the Coastal Plain will make them produce splendid crops of legumes

[19] The Virginia peanut crop is worth about $5,000,000 annually, most of it being produced in Nansemond County around Norfolk and Suffolk. Thus the humble peanut, once associated with circus elephants, the baseball game, and the pushcart man on the corner, has become a world staple and a real factor in American food production. Peanut butter, peanut oil, peanut candy, and peanut meal are sold extensively today.

[20] See the table of Food Values, p. 207.

[21] Innumerable examples might be presented showing that fine crops of vegetables have been grown but could not be sold even when the farmer took them to market in his own wagon. The sale of California tomatoes, wrapped in paper, at 25 cents per lb. in Broadway stores in early autumn, when they were bringing 75 cents per half-bushel in Washington and could still be harvested in many Coastal Plain locations, indicates the need of better market organization for Coastal Plain produce. American food-marketing shows many ridiculous crisscrossings of movement, and maldistribution of supply.

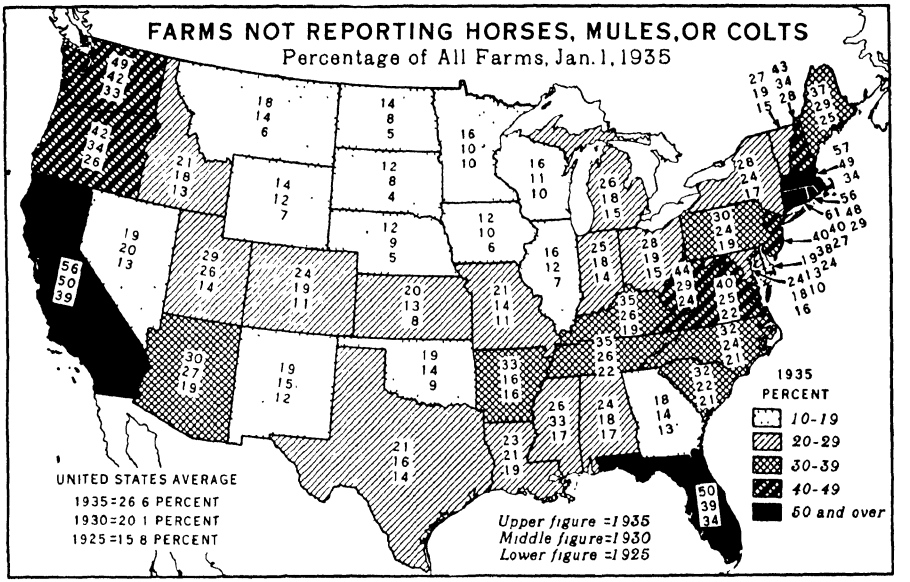


FIG. 205 A

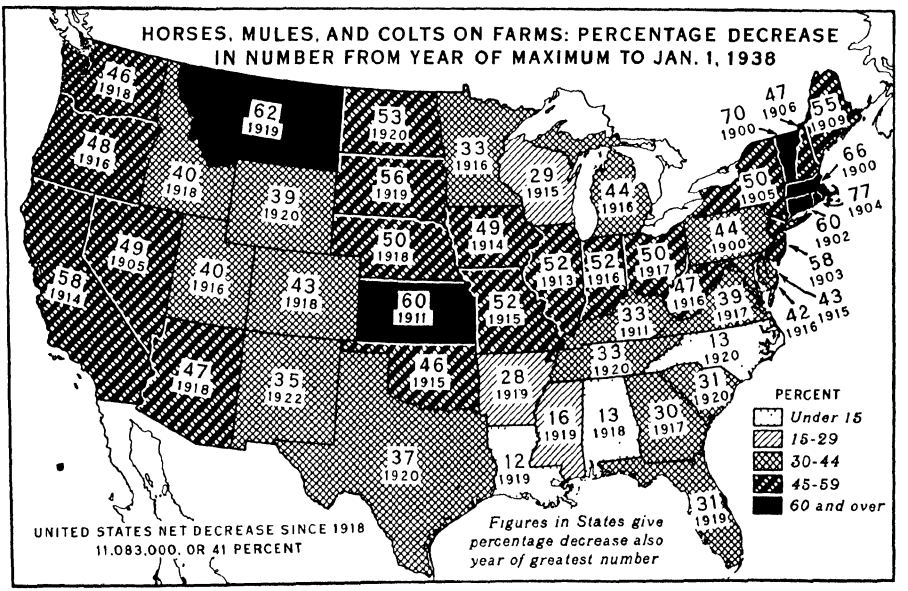


FIG. 205 B

Horselessness is one of the conspicuous characteristics of American agriculture, and the Coastal Plain and New England are not behind in this change. The Coastal Plain is fitted for it as well as any section of the world.

But for the automobile and the tractor we would have had several million more horses on Jan. 1, 1938, instead of 10,100,000 less. Without petroleum it would probably pay to feed the grain to the iron horse instead of Dobbin, Jack, and Jim. (Courtesy U.S. Dept Agr.)

such as clover, alfalfa, vetch, peas (several varieties), beans (several varieties), and corn.

Once the sandy soil is filled with vegetable material and a little commercial fertilizer is applied, it yields splendid crops of corn. In some localities 15 crops in succession have been grown by the following method: At the last cultivation of the corn a legume, usually crimson clover, is sown. This plant, which is a native of North Europe, grows in the autumn and early spring, blooms in April, and furnishes a great mat of vegetation which, to enrich the corn crop, is plowed under before the corn is planted in late May or early June. As far north as Trenton, New Jersey, two crops a year are regularly grown on this sandy soil by progressive farmers. One combination is peas, to be picked for market or canning by June 1, followed by corn, in which a legume such as vetch, crimson clover, or cowpeas is sowed to gather nitrogen for the next season's crop. Another two-crop combination is early peas and tomatoes, with crimson clover planted among the tomatoes to live through the winter and enrich the land, or to be cut for hay at the beginning of the next season.

The need of this region is for another discovery of the land, and why it has not been discovered by more people is difficult to understand, especially now that good farm land is worth $200 in the Corn Belt and can still be had for a fraction of that in the Coastal Plain.[22] Interesting examples of this discovery are furnished by a very successful alfalfa farm run by a California man near Fredericksburg, Virginia, and the great success of a colony of Scandinavians who, tired of the cold winters of Dakota, settled near the site of the original Jamestown and soon turned the old pine fields into productive stock farms.

Dairying takes almost nothing from the soil if butter is the export, because the manure of the animal returns all the phosphorus, potash, and nitrogen to the earth, and butter, which is chiefly carbon, is taken freely from the air by plants that help to make the cow's feed. Thus the sandy soils of the Coastal Plain, like the sandy soils of Denmark, might yield annually vast quantities of milk and butter, but this, being an advanced stage of agriculture, would not be the first stage of the animal industry.

A more natural beginning would be the production of meat, and in this industry the most promising line of development would be that of pasturing pigs. Pigs could be allowed to harvest a succession of crops — perhaps winter grain with vetches and clovers, cowpeas, soybeans, and even corn.[23] There is more than a suggestion of this in the widely known Smithfield hams. They are produced in the peanut section near Norfolk, and especial flavors claimed for them because the pigs fatten in part on peanuts, which they gather for themselves by rooting them out of the sandy soil.

The sandy soil, always dry enough to plow, smooth and nearly as level

[22] The value of farm land, of course, is subject to the vicissitudes of the business cycle. In 1920 the average value per acre of land and buildings in Iowa was $227.09; in 1925, $148.87; in 1930, $124.18. In Northumberland County, Virginia, the value was $46.59 in 1920; $46.82 in 1925; $50.60 in 1930; and in Westmoreland County, in 1920, $42.07; in 1925, $39.72; and in 1930, $46.62.

[23] See the story of Georgia hog production, p. 313.

as a floor, offers admirable opportunities for tractor plowing and permits the use of the most complicated machinery. This land, needing only a little care, and almost proof against erosion because of its physical features and the absorbing power of sand, invites man to the extreme of cultivation. It is one of the richest unused resources of America. One of the great drawbacks is doubtless the mosquito — product of the abundant marshlands. Marshes could, with profit, be drained.[34]

The table of food values per acre of various crops, especially vegetables, shows the great potential service of this region as a producer of vegetable food if need for it arises and chemicals hold out.

FOOD VALUES OF CROP AND LIVESTOCK PRODUCTS *
(per acre)

Food Products	*Yield per acre*		*Calories per pound*	*Pounds protein per acre*	*Calories per acre*	*Acres to equal one acre of corn in calories*
	Bushels and tons	*Pounds*				
Sugar beets	12 T.	.	.	0	5,565,000	.56
Sugar cane	20 T.	. .	.	0	8,750,000	.36
Corn	35	5,960	1,594	147.0	3,124,240	1.00
Sweet potatoes	110	†5,940	480	53.5	2,851,200	1.10
Onions	300	. . .	. . .	189	2,565,000	1.22
Irish potatoes	100	6,000	318	66.0	1,908,000	1.64
Rye	20	1,200	1,506	118.8	1,807,200	1.73
Wheat	20	1,200	1,490	110.4	1,788,000	1.75
Cabbage	9 T.	.	. . .	214	1,760,000	1.77
Rice, unpolished	40	1,154	1,460	55.4	1,684,840	1.85
Rice, polished		1,086	1,456	50.0	1,581,216	1.98
Soybeans	16	960	1,598	294.7	1,534,000	2.04
Tomatoes	7 T.	.	. . .	100	1,330,000	2.35
Peanuts	34	524	2,416	126.2	1,265,018	2.47
Oats	35	‡ 784	1,600	89.4	1,254,400	2.49
Beans	14	840	1,337	157.9	1,123,080	2.78
Cowpeas	10	600	1,421	116.4	852,600	3.66
Dairy products						
Milk	. .	2,190	325	72.3	711,750	4.39
Cheese	.	219	1,950	56.7	427,050	7.32
Meat	*Live pounds*	*Dressed pounds*				
Pork	350	273	2,465	22.7	672,945	4.64
Beef	216	124	1,040	18.5	130,000	24.00
Poultry crop						
Meat and eggs	66 lbs. and 111 eggs			27.5	149,000	21.00

* From W. J. Spillman. U.S. Dept Agr. In connection with this table keep in mind the fact that 1,400,000 calories are ample food for an adult workman for a year.
† 54 pounds per bushel ‡ Hulled kernels

[34] The Government is beginning to do it a little in some places as emergency work. Will the political employees keep it up, and do it well?

POPULATION

It should be noted that in the southern part of this region about one-third of the people are Negroes to whom the spasmodic labor of the truck farm is more welcome than the continuous labor of dairying. Such culture traits are hard to break. In some sections August is an almost continuous picnic. Watermelons, roasting ears (corn), beans, and many other vegetables are ripe; so is fried chicken. The air is warm, the demand for fuel and clothes is light. Why work — unless you are a capitalist, or think you can get an automobile and join in the national sport? The remainder of the population is chiefly native white.

FORESTS

The proportion of the Coastal Plain in forest is larger than that in improved land, but the good timber has all been cut once or twice, and unfortunately large areas are repeatedly burned. It is a land well suited to the short-leaf or old field pine, a timber tree of so much value that lands exhausted and abandoned have, in fifty years, produced pine trees large enough for saw logs. In many such forests the furrows left from the tillage of the last crop of corn can still be seen. With the coming of pulp mills utilizing the Herty process, the conversion of this second-growth pine land from a liability into an asset seems imminent. One of these mills is in operation at Franklin, Virginia, west and a little south of Norfolk.

The schooner, reaching into nearly all parts of the Coastal Plain from ocean lagoon or inland bay, was the great vehicle that aided in the early exploitation of the forests.

FISHERIES

Fisheries have been important in the economic life of this region, especially so on Cape Cod, Nantucket, and Martha's Vineyard. It was from Nantucket that one of the great whaling fleets sailed in the days when the oil lamp furnished illumination. No other part of this region has had such dependence upon fish.

The offshore fisheries of mackerel and bluefish are of some importance, but the shad and herring (really the alewife), which come in from the sea to spawn in bay and stream, are more important. The herring has done much to make the cost of living low in this region. In the spring, herring enter the streams in such quantities that they can be caught by thousands. For generations it was the custom for people on many parts of the Atlantic slope to salt down a year's supply of herring. About $5 per 1000 fish has long been a common price. When the Negro field hand came to do a day's work he often brought a salt herring and cold corn bread for the midday meal — not particularly appetizing food, but explanatory of a low cost of living. The use of the herring as a food staple has declined greatly since 1910.

The oyster industry in the partially enclosed waters of Long Island Sound, Delaware Bay, and Chesapeake Bay now furnishes the main salt-water income of this region. The dredging of natural beds has resulted in their serious

depletion. The oyster, helplessly fast in its shell, lays eggs which float through the water and hatch in the drifting current, where the young oyster swims for a time and finally makes fast to some firm substance, and there must die after living for a time on what fate brings. It cannot live in the mud, but clean sand or gravel is ideal. By putting down shells and brush, men make artificial resting-places and artificial oyster beds. If the full resources of this industry were utilized, the output of these three bays would be many times its present product.

As oysters can easily be stolen from the oyster beds, there have been many disputes between Virginia and Maryland oystermen. Both states maintain "navies" to protect the oyster property of their citizens.

Clams are also of some importance.

MANUFACTURING AND TRADE

The Coastal Plain is strangely lacking in local raw materials for manufacturing. It has no coal, oil, gas, or water power to use in fabricating imported raw materials. It is true that it could have obtained coal more easily than New England, but it lacked the established centers of manufacture, such as those created by New England's water power.

The manufacture of glass is the only industry within the North Atlantic Coastal Plain, except canning, that is based upon a local raw material. The unlimited supply of white sand in southern New Jersey has long been used by the glass factories at Bridgeton, Salem, and Millville. In the early days charcoal was used to melt the sand. With the exhaustion of the supply of charcoal, the industry was forced to shift to the use of producer gas obtained from Pennsylvania coal. Today the New Jersey glass factories use fuel oil, which is delivered cheaply by tankers to Delaware River points. Nearness to large urban markets and specialization in quality products, such as laboratory glass, have enabled the local industry to survive, though years ago most of the glass industry moved westward to Pittsburgh and the Middle West in order to be near the supply of natural gas. In recent years New Jersey has had an output of glass worth about one-fifth of that of Pennsylvania, the leading state in glass production.

BALTIMORE AND NORFOLK

The North Atlantic Coastal Plain is not a land teeming with cities, for Norfolk is the only large city (pop. 130,000) that lies distinctly within the region.[25] Economically, the city of Baltimore (pop. 805,000) is primarily a product of the plain and the sea, and will be considered here. Philadelphia, Richmond, and other Fall Line cities are more dependent upon the Piedmont and the continental interior, and they will be discussed in the following chapter.

Baltimore is a major commercial and industrial center, the product of over

[25] Jersey City and Newark and the other satellite cities of New York City were presented in Chapter 5, "The Erie Canal Belt."

two centuries of steady growth. It is the most southerly of the large northeastern cities, while to the south of it there is no other city approaching its size save Washington (487,000), until New Orleans (459,000) is reached. Partly because of its size and partly because of the excellent steamboat service to the Chesapeake territory, Baltimore early developed an important distributing trade. For many years the country merchants not only of Maryland, but also of West Virginia and Virginia and even points farther south, have depended upon Baltimore as a source of supply. Thus Baltimore, somewhat like New York, plays the role of a distributing center for consumption goods, such as clothing, foodstuffs, and other necessities of everyday life.

Baltimore's early growth, like that of New York, was built upon a foundation of commerce. In colonial times its vessels carried tobacco to England and were very active in the West Indian trade, taking corn, flour, biscuits, beans, hams, and barrel staves to the islands and returning with the customary cargo of sugar and rum. Later came the famous schooner-rigged "Baltimore clippers," which were the fastest ships of their time. During the War of 1812, when the city was blockaded by the British, Baltimore is reputed to have sent out more privateers than any other port. For decades it had an important export trade in flour, the keeping qualities of the "strong" flour made from Piedmont winter wheat finding particular favor in the tropical markets of the West Indies and Brazil.

Baltimore has an interior location on Chesapeake Bay, which makes it nearer to the productive Middle West than its rival ports to the north. On the other hand, it is about 250 miles farther from Liverpool than New York, and it takes twelve hours for the average steamer to make the 180-mile run down the bay to the open sea. For the most part, its steamship services to Europe are slow, and many Southern products, such as apples and tobacco, are often exported by way of New York.

The industrial development of Baltimore naturally has changed the character of its commerce from that of a century ago. Today its imports outweigh its exports 5 to 1, which is due to its large imports of iron ore from Chile and Cuba, manganese from Brazil, India, and the Gold Coast, and pyrites from Spain, all of which go to feed its steel industry. Petroleum from the Gulf and the Caribbean area, raw sugar and molasses from Cuba, nitrate and copper from Chile, potash from Germany, and wood pulp from Scandinavia are among its chief imports. Its exports consist chiefly of coal, grain and flour, and iron and steel products. Its coastwise trade is heavier than its foreign commerce, and its receipts of petroleum, phosphate, lumber, and other goods greatly outweigh its shipments of coal, iron and steel, and miscellaneous manufactures.

In the development of manufacturing, the lack of local raw materials has been largely overbalanced by the advantages of a good general location, of coal that is cheaply hauled by rail from the mines in West Virginia, western Maryland, and western Pennsylvania, and hydroelectric power from the Conowingo plant on the Susquehanna River. At Sparrows Point, just outside of Baltimore, a huge steel plant of the Bethlehem Steel Company depends on iron ore imported in the company's ships from the company's mines in

Cuba and Chile. The steel industry here, which started in 1887, now employs more labor and has an output of higher value than any other industry in the Baltimore area.

In 1929 Baltimore was the chief copper-smelting center in the world, refining about 20 per cent of the world's copper.[26] The copper is shipped to Baltimore in concentrated form as blister copper or copper matte, which permits the long haul from such distant points as New Mexico, Utah, and Chile. Large fertilizer-mixing plants are located in Baltimore, and the ingredients (nitrate, phosphate, and potash) are brought in from distant sources. The demands of its outstanding canning industry have resulted in an important manufacture of tin cans. Its clothing industry, with an output worth more than $60,000,000, has long been important. The city is also significant as a publishing center. Being the terminus of the Baltimore & Ohio R.R., it has shops for repairing and building cars. Meat-packing is one of its oldest industries, dating back to the time when cattle and hogs were brought through the Cumberland Gap and up through the Great Valley to Baltimore. The manufacture of aircraft is a new industry that is growing rapidly. It is clear that a seaboard location and a good market mean much to Baltimore.

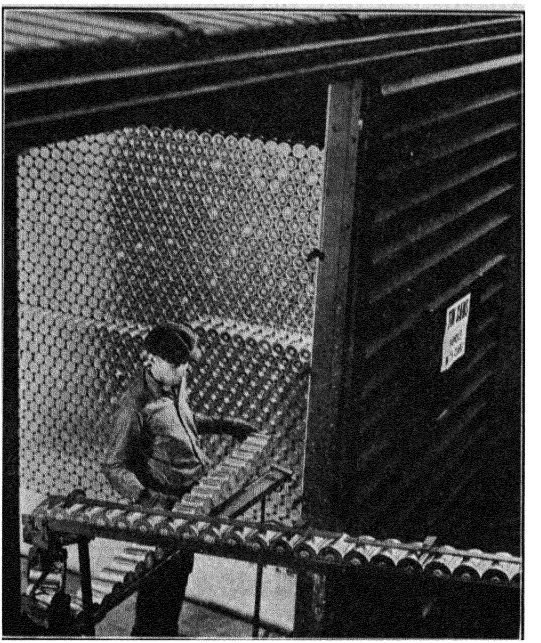


FIG. A. Mass production of food. A bulk carload of cans. Lifted off by the armful, they start upon their mechanical way. (Courtesy Baltimore Ass'n of Commerce)

Near the mouth of the Chesapeake Bay is the city of Norfolk (pop. 130,000), seaboard gateway for the states of Virginia, West Virginia, and North Carolina. The cities of Portsmouth (46,000) and Newport News (34,000), just across the narrow arms of the bay, bear the same relation to Norfolk that Jersey City and Newark do to New York. The sunken coast at the mouth of the James makes Hampton Roads a splendid harbor, indeed the finest between New York and Rio, capable of sheltering all the ships of the world with room to spare. Three railroads — the Norfolk & Western, the Chesapeake & Ohio, and the Virginian — bring coal almost by gravity from the coal fields of Virginia and West Virginia, and give access to Pittsburgh, Cincinnati, and Chicago. Stretching southward are the Southern Railway, the

[26] P. Blood, "Factors in the Economic Development of Baltimore, Maryland," *Economic Geography*, April, 1937, p. 208.

Atlantic Coastline, the Seaboard Air Line, and the Norfolk & Southern R.R. These roads can forward their produce either by water or by car ferry across the mouth of the Chesapeake to the Pennsylvania R.R. going up the peninsula to Philadelphia and the North. Along the water front are to be found good terminal facilities, including an efficient belt-line railroad, modern coal piers with a capacity of 200,000 tons daily, grain elevators that can hold 1,000,000 bushels, and adequate warehouses for general freight. Through the ports of Hampton Roads move more than 20,000,000 tons of cargo annually, the outbound traffic exceeding the inbound traffic 6 to 1. Coal is the principal outbound cargo, amounting to 18,900,000 tons in 1937.[27] About 67 per cent of the leaf-tobacco exports of the country move through Hampton Roads. Other exports include lumber, raw cotton and cotton linters, pulp, and miscellaneous manufactures. Imports include Egyptian cotton, jute, and tobacco.

The United States Navy is Norfolk's leading industry, the Naval Base and Navy Yard representing an investment of over $50,000,000.[28] Newport News has one of the largest shipbuilding yards in the country. A large seafood industry centers in Norfolk and Portsmouth, which market about $2,000,000 worth of oysters annually. A Ford assembling plant, for both local and foreign distribution, has a capacity of 100,000 cars a year.

When one compares Norfolk with New England cities, the cost of living appears to be less, because it is nearer to food supplies and coal and because it has a milder climate. Thus the reason for its recent growth appears to be plain. The real puzzle is, why is Norfolk not larger? Perhaps the answer may be suggested by some of the following facts. Unlike New York, it had no Erie Canal to give it a commercial leadership. Unlike Philadelphia, it had no Pennsylvania R.R. to give it the most direct rail connection with Chicago and the heart of the country. Unlike Boston, its immediate hinterland was not sprinkled with water powers to tempt early manufacturers. Also unlike Boston, it was not settled by the Puritan, with his high appreciation of thrift, and a frosty climate making him scratch or starve. Unlike Philadelphia, it and its territory were not settled by thrifty, industrious Quakers and Germans. Unlike all of them, it had a great and ready export — tobacco, a farm crop, which gave continued sustenance to the English-country-gentleman concept of its Cavalier colonists. The English country gentleman is a countryman, not a townsman or a manufacturer, and he is willing to let someone else do his trading for him. Therefore his is not yet a land of cities.

SEASHORE RESORTS

On or near the beaches of the North Atlantic Coastal Plain are the summer homes of thousands of families. There is the prospect of this area's becoming the home of many thousands more. Nearly all of the coast, from Cape

[27] Of the total dumpings in 1937, 961,000 tons were export cargoes, 839,000 tons were bunkers, and 17,107,000 tons were coastwise shipments.

[28] The Navy pay roll in Norfolk and Portsmouth in 1938 amounted to about $12,000,000; the total pay roll of industrial establishments, about $20,000,000. Trenton, N.J., a river port, population 123,000 in 1930, had an industrial pay roll of $17,000,000 in 1937.



FIG. A. Boardwalk, beach, and recreation pier at Atlantic City, N.J., a city that lives by the vacation industry and has been saddened by the automobile that takes people everywhere. One railroad to Atlantic City has been pulled up. (Courtesy Atlantic City Convention Bureau)

Hatteras to Sandy Hook, is excellent for bathing. From the mouth of the Chesapeake to Atlantic City the coast is everywhere backed by a bay, the Chesapeake or the Delaware, which makes it impossible for railroads to run without long detours from the interior to the coast. To Atlantic City, however, there is a straight, uninterrupted railway line from Pittsburgh via Philadelphia to the sea. Here enterprising capitalists built railroads, so that fast trains could take the people to Atlantic City, which became the largest resort in the world. The experiment paid. Visitors come by thousands, by tens of thousands. The city claims to be able to shelter 500,000 overnight guests. The permanent population of Atlantic City is 66,000; it is estimated that it receives 10,000,000 to 13,000,000 visitors yearly. The average daily population in the month of August varies from 100,000 to 300,000. Atlantic City has also succeeded in developing the business of entertaining others into a year-round industry. About 30 to 40 per cent of the visitors come during the months of June, July, and August, the remainder being fairly evenly scattered throughout the year.

The hotels, of metropolitan sumptuousness, have all the solidity of reinforced concrete despite the fact that they rest upon sand.[29] The boardwalk which extends for miles up and down the Atlantic City beach front is a kind of national parade ground.

The Jersey coast, from Sandy Hook at one end to Cape May at the other,

[29] They also rested, less securely, upon financial sand. Most of the grand ones, built in the "golden twenties," have gone through bankruptcy. The *hotels* remain; most of the *investment* has vanished, along with so much other pretty printing of the "New Era."

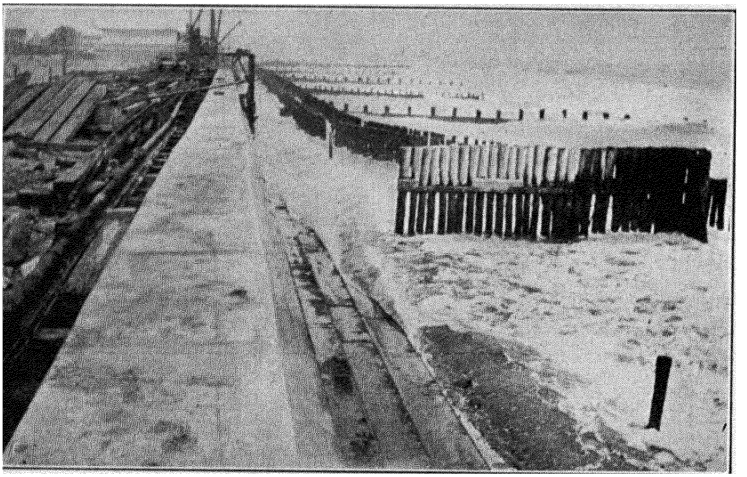


FIG. A. The conflict. The physiographers have explained the interesting process by which nature is forever moving the barrier beaches. Man wants them for building sites. Which will win — finally? Building the sea wall. This last device nearly bankrupted the little town of Longport, N.J., where the sea had swallowed a boardwalk, many houses, and acres of land. (Courtesy Lewis M. Haupt)

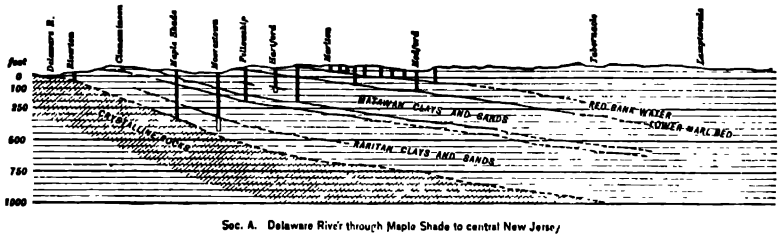
is dotted with smaller resort cities. The promise of 1910 that it would be an almost unbroken line of cottages or cities has been dimmed by the automobile, which carries the vacationer on — and on — and on — to lands of *varied* beauty and historic interest.

Virginia Beach is the largest coast resort between Atlantic City and Palm Beach. Being adjacent to Norfolk, it is a transport focus for Southern areas as Atlantic City is for the North, but its vicinity lacks such places as New York, Philadelphia, Pittsburgh, and the Corn Belt.

THE FUTURE OF THE COASTAL PLAIN

For many years the population of the world has been separating itself into manufacturing regions and raw-material-producing regions — witness the cities and the abandoned farms of our Northeastern states. Few parts of the world rival the North Atlantic Coastal Plain as a site for the scientific creation of manufacturing cities — cities which shall be healthful and efficient for both machines and men, for dividends and for living.

Within a short time we have seen the United States Steel Corporation conceive and create Gary, a city which suddenly spread over the sand dunes at the south end of Lake Michigan. Similarly the Lackawanna Steel Company made a new suburb of Buffalo where a lake-front site offered better advantages for making steel than did Scranton or any other inland city. Suppose the same or slightly greater constructive imagination should start out to make a manufacturing city or a string of manufacturing cities that would house many industries instead of one. Where should a city be located to be a good place both for the worker and for the owner? It should be, indeed it must



Sec. A. Delaware River through Maple Shade to central New Jersey

FIG. A. Layers of porous sand alternating with layers of tight clay are ideal for the formation of artesian wells, which furnish cheap and excellent water supply for the cities on the New Jersey Coastal Plain and shore. (Courtesy U.S. Geol. Survey)

be, in a healthful climate, a climate that makes energy rather than a climate of ease. Certainly some part of this region has a climate of achievement. Ellsworth Huntington says that it is the northern part, and history seems to agree with him, although Captain John Smith, after wide exploration on the Atlantic Coast, said of the southern part, "Heaven and Earth never agreed better to frame a place for man's Habitation."

The ideal manufacturing city should have a climate which stimulates men to achievement, and the city should be located in a place of easy access. In this respect, the whole of the North Atlantic Coastal Plain is richly endowed. The estuaries of the Chesapeake have water front enough to afford ideal transportation for cities housing millions of operatives. If it should be desired to make the cities at the northern rather than the southern end of this region, it would be a simple matter to make ship canals that would connect with New York Harbor, reach across New Jersey to Trenton or the Delaware, or down the coast to Cape May. Along such a coastwise waterway, factory towns on the inside of the lagoons would be swept each hot day of summer by the cool sea breezes. While Philadelphia and Baltimore sweltered, these cities would be comfortable, and barges running back and forth between the Delaware and New York Bay would give the transport advantages of New York. Upon the level sand plain railroads and highways could be built at a minimum of cost and could go in all directions with the maximum of freedom. The productivity of the plain promises abundant fruits and vegetables, and the nearness of the sea brings fish. The underlying strata are full of artesian water and could doubtless supply water to many cities, as they now do to Atlantic City and every other town of importance on this coast. Superpower lines can serve the entire region with electricity from mine-mouth plants, and coal haulage is short.

All this requires no new invention, merely the application in times of peace of that great imagination and a small part of the forceful energy that we use in times of war. The same constructive imagination could drain all the swamps, drive out the mosquito, and make the Coastal Plain an entirely different kind of place. It is by no means an unmixed blessing that this continent was settled by individualists. United, we stand. Divided, the mosquitoes and many other troubles eat us up one by one.

Chapter 8. THE NORTHERN PIEDMONT



FROM the Hudson River southward a belt of hilly or rolling clay land resting on hard rock lies between the Coastal Plain and the Blue Ridge Mountains. The meaning of the word Piedmont is "the foot of the mountain." The soils of the Piedmont differ from those of the plain, because they are residual; that is, they are made of such parts of the rock that lies beneath them as remain after exposure to weather, animals, and plants. As these rocks are often granite and gneiss, the resulting soils are usually rather heavy, composed largely of clay, and in the main of good fertility. In this respect, the soil is a pronounced contrast to the soil of the Coastal Plain. The Piedmont is separated from the Coastal Plain by the Fall Line, which is often a transition zone a few miles in width.

The western limit of the Piedmont throughout most of its distance is very plainly marked by the steeply rising eastern slope of the Blue Ridge Mountains. In the Carolinas the mountain widens out into a plateau. Through Maryland and much of Virginia the boundary is a clear-cut ridge. In Pennsylvania it is not so clearly marked, because the ridge happens to be absent for a short distance in the southern part of the state, but the geological and soil formations and the general type of country continue through Pennsylvania and New Jersey to the suburbs of New York. The Piedmont belt is about 50 miles wide in Maryland, but increases in width to 125 miles in North Carolina. The total area is about 80,000 square miles.[1]

The elevation of the Piedmont is from 300 to 500 feet on the east and from 500 to 1200 feet at the foot of the mountain. Originally it seems to have been worn down by the streams to a plain whose surface was uniform, but in comparatively recent times the mass was raised somewhat, and consequently the streams have cut valleys which increase in depth as they go from west to east. Thus a road that follows the Blue Ridge near the foot of the mountains goes across an almost level plain, while a parallel road 10 or 15 miles to the eastward would have to descend at frequent intervals into the rather steep-sided valleys of streams that have cut 50 or even 200 feet below the general level of the hilltops. The southern part of the Piedmont has the long warm summer that permits the growth of cotton. This part of the Piedmont area will be considered as a part of the Cotton Belt, and the present chapter will discuss that part of the Piedmont which is north of the Cotton Belt.

New Jersey	2,500	North Carolina	20,000
Pennsylvania	5,000	South Carolina	12,000
Maryland	2,500	Georgia	18,000
Virginia	18,000	Alabama	5,000

Nelson County, near Charlottesville, has the largest deposit of the mineral rutile in the United States. It is the source of titanium used as an alloy in steel and also in ceramics.

AGRICULTURE

The Northern Piedmont, lacking minerals of importance, except lime and building-stone, with scant water power and having no harbors save on its eastern edge, is of necessity primarily an agricultural region. It falls naturally into three divisions because of the different types of agriculture in each: (1) the tobacco section in the south; (2) the apple and livestock section in the northern half of Virginia; (3) the general farming and dairy section in the north.

THE TOBACCO SECTION

Tobacco dominates the agriculture of this region in northern North Carolina and southern Virginia up to and slightly beyond the James River. Since 1925 North Carolina has ranked first in the production of leaf tobacco. The tobacco territory is a disheartening sight to the traveler who is accustomed to well-kept fields and a neat countryside. The first impression is that everyone has recently moved away except a few who cultivate a patch of corn and tobacco here and there. This is so because of the system of cultivation. The man who may own 100 acres of land will derive all of his money from 3 to 8 acres of tobacco. This, with a patch of corn for his work animal or animals, comprises his entire cultivated area. After a few crops, the land is so impoverished and gullied that it is allowed to "rest." During its vacation, the land grows up to blackberries and other bushes until finally the young forest may re-establish itself. The impression of abandonment is well founded. Most of the land has been temporarily abandoned to await the time when it will be subjected to another series of robber crops and gullying. In those areas where tobacco is grown almost exclusively, one finds many earmarks of poverty — poverty of soil, poverty of money, and poverty of health and home life.

Some years ago the Virginia State Agricultural service endeavored to establish "Independence Week" — a time for the preaching of the doctrine of varied crops, pigs, chickens, cows, sheep, clover, peas, and good gardens, and less dependence on canned goods and the country store.[2] Tobacco, however, is the great cash crop of this section, and each year the Piedmont farmers sell their tobacco at such auction centers as Wilson and Winston-Salem [3] in North Carolina and South Boston and Danville in Virginia. Tobacco, the raw material of this section, dominates the manufacture of nearly every important near-by town. The big tobacco companies operate factories

[2] George Washington, a good Virginia farmer, began a system of crop rotation by growing grains, grass, and root crops in rotation with tobacco at a time when many tobacco-planters in Virginia were abandoning their worn-out soils and considering the necessity of migrating to new lands in the West.

[3] An average of more than 2000 tobacco-growers and their families visit Winston-Salem every day of the tobacco-market season, September to February. During the 1937–38 season about $11,703,000 was paid in cash on this market to tobacco-growers.

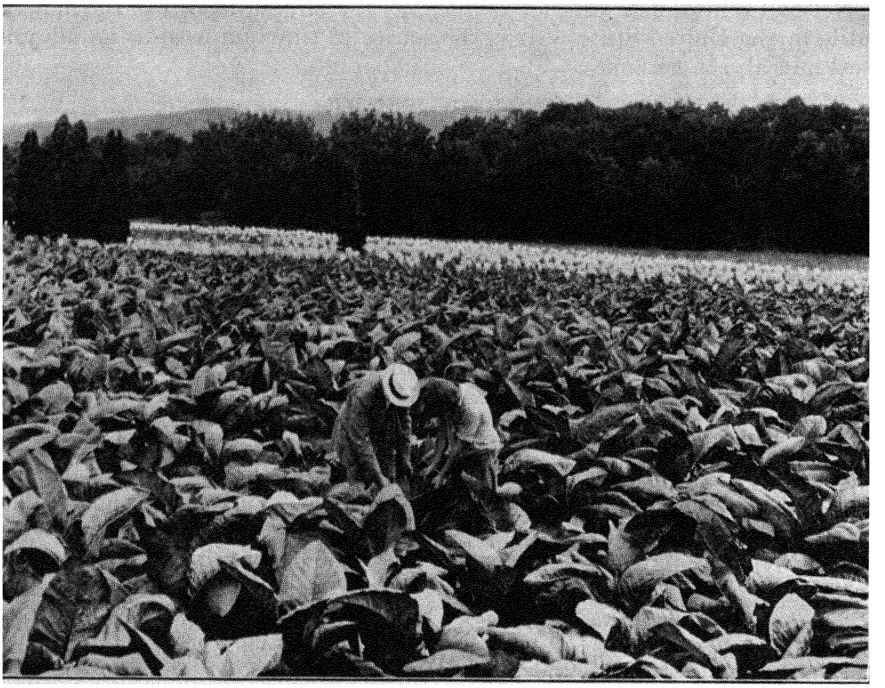


FIG. A. A county agent examining tobacco. Experimental plot. Lancaster Co., Pa. Note the bagged blossoms, a breeding experiment. (Courtesy U.S. Dept Agr. Extension Service)

in Winston-Salem, Durham, and Richmond.[4] These towns produce half of the tobacco manufactures of the United States.

THE APPLE AND LIVESTOCK SECTION

The northern edge of the tobacco belt merges gradually into one of the well-known apple sections of the United States. It reaches from the James River northward to the Rappahannock. Over sixty years ago, farmers began to plant apple orchards in the small, moist, fertile valleys (called coves) immediately at the foot of the mountain ridges. These orchards succeeded. Then many others were planted, until now it is said that one may walk for 7 miles along the foot of the Blue Ridge Mountain in Albemarle County and pass directly from one apple orchard to the next. The varieties grown

[4] In 1937 over 173,000,000,000 cigarettes were manufactured in the United States, over half of which were made in North Carolina, chiefly in Winston-Salem and Durham. Verily, this is the Kingdom of Tobacco. In Durham the name of Duke is almighty, Duke tobacco factories, Duke Power Company, Duke Hotel, and Duke University (endowment, over $30,000,000). On the university campus is a prominent statue of Duke, the patron of learning (with a cigar in his hand). Inside the chapel are recumbent statues of three more Dukes. Years ago, agape with astonishment, I paced the length of a warehouse which was, as I recall it, 948 feet long and filled with hogsheads of curing tobacco. Parallel with this was a college. Appropriately between the two stood a bronze statue of the tobacco magnate.

are chiefly the Winesap and the Albemarle Pippin, many of which are exported to Europe.[5]

There is no reason why this particular locality should have an advantage over other parts of the Piedmont or other parts of the United States, except the fact that the apple industry has long been established here.

Owing to the large yield of orchard crops, it is very unusual for the trees to cover a large proportion of the area in any territory. This is particularly true of the apples in the Piedmont. Nearly all of them are along the western edge. The rest of this region is a land of beautiful rolling hills, and the main crops are corn, hay, pasture, and wheat. This is almost the southern limit for wheat, because farther south wheat is injured by fungus and decay due to warm, damp weather in early summer.

That most excellent pasture grass known as bluegrass covers fields wherein fat cattle and fine horses feed. For a long time this part of Virginia was famous for its horses, but the business has diminished since the automobile came. Before the World War the United States War Department bought a large farm across the ridge, near Front Royal, and established there a base for the supply of cavalry remounts. They even bought breeding stallions for the use of farmers, so that the good quality of all the horses may be continued. Jumping horses for the fox hunt are still produced here.

In this locality it is probable that the English-country-gentleman type of society of 1640 has survived more fully than even in England itself. The Cavalier type which fled before Cromwell's persecutions settled back there in the hilly country somewhat removed from the arteries of travel, and therefore the agricultural basis which is necessary for its survival has been less disturbed than in England. The people still ride to hounds, delight in outdoor life and horse shows, and maintain a social consciousness which tends toward the exclusion of men who are not landowners. Since 1900 the fox-hunting avocation has been strengthened by the process of infiltration and selection — persons of wealth from New York and elsewhere have bought estates, established kennels and stables, and nurtured foxes.

THE GENERAL FARMING AND DAIRY SECTION

In the middle of Loudoun, the most northern county of the Virginia Piedmont, is a sharp line between North and South. It is not a climatic line, but a social and industrial line. The southern end of the county is Cavalier, aristocratic, fox-hunting, traditionally of the Democratic party. During the Civil War it recruited the famous Colonel Mosby's guerilla regiment. The northern end of the county was settled not from the Chesapeake, but from the north by Pennsylvania Quakers and Germans who migrated southward in their wagons during the last half of the eighteenth century. These people were and are willing to work with their hands, were and are democratic in

[5] It is commonly believed that the trade was established about 1840 by the Minister to America from Great Britain. He was a plantation-owner in Albermarle County, and he presented some Albermarle Pippins to Queen Victoria. The Queen liked the pippins, and they became popular.

their social outlook, were opposed to slavery, and at the time of the Civil War were with the party of liberation. This end of the county raised a volunteer regiment to defend the Union.

These Northern types of people, with the Swedes who settled along the lower Delaware, and the Dutch who settled along the Hudson, comprise the population of the Piedmont from the Potomac to the Hudson. Their farms are small, from 50 to 100 acres, while the farms of the country-squire sections from Loudoun County southward tend to be large, from 200 to 500 acres or even more. The small farms yield more per acre and are well tilled. In the sections inhabited by these willing-to-work people, the landscapes are dotted with large, well-built barns indicative of thrift.

THE PASSING OF THE COUNTRYSIDE

Like most of the United States that was settled by 1800, this region has experienced a swift economic transformation (including degenerations) during the past century. The case can be illustrated by citing the history of Hillsboro, a village in Loudoun County, Virginia, near where the senior author was born. In the decade before the Civil War the leading citizen was the owner of the flour mill. Each morning his six-horse team with jingling bells drove out of town, taking a load of flour to Harpers Ferry for shipment on the Baltimore & Ohio R.R. or the Chesapeake & Ohio Canal. At the other end of the village was the woolen mill, and four miles downstream another mill made broadcloth.

Hillsboro also had a sawmill to turn the local oak, chestnut, poplar, and walnut into lumber. Many woodsmen could rive shingles from oak and chestnut. The local artisans could build good houses.[6] A tanyard made leather. One or two shoemakers made shoes. A saddler made harness and saddles, two tailors made clothes, a cabinetmaker made good furniture, an undertaker made coffins. Various seamstresses went from house to house making the better clothes for women, and making a local newspaper almost unnecessary.

The blacksmith and the wheelwright, with a connecting door between their shops, a standard rural unit, made plows, harrows, wagons, and almost every farm tool. A few miles away an ingenious pioneering countryman had a little foundry making cast-iron plows. A few miles in another direction a local pottery made pots, crocks, and jars. The farms produced wool for fabric, wheat and corn for bread, also pork, beef, mutton, chickens, ducks, turkeys, eggs, milk and butter, a great variety of garden stuff, apples, peaches, cherries, and other fruits. Altogether we see here a nearly complete neighborhood self-sufficiency and very small need for import — only salt, pepper, glass, iron, and such luxuries as chinaware, silk, miscellaneous ornaments, bric-a-brac, and fineries. Income from wheat and animals gave the thrifty a chance to accumulate. Situations essentially similar to this could be found in a thousand neighborhoods, from the Gulf of St. Lawrence to the Cotton Belt, from the Atlantic to the Ohio River, and in some places beyond it.

[6] The mother of the Wright brothers, aeronautic pioneers, was born here.

Also the present plight of Hillsboro and its county are typical of most of these same regions. The manufacturing city grew up, the country craftsman faded away. There are not now in Hillsboro or its whole county as many people as there were in 1800. There has not for years been made in it a tanned skin, a pair of shoes, a suit of clothes, a suite of furniture, or even a coffin. Many blacksmith shops have closed, and *nothing is manufactured* except a little flour. Even most of the wheat goes out unground. The Hillsboro mill has become a filling-station, and the county has been reduced to being a producer of raw products — milk, meat, wheat, a little wool, some eggs and poultry. And there endeth the story for 1940.

The hamlets and villages are dwindling. Two or three towns are growing — and the countryman who does not have an automobile is stranded. He cannot loaf and get a bit of gossip at the near-by mill, the tanyard, the shoe shop, the wheelwright's, because there are none of these any more. The unsociable mail-carrier leaves the mail-order catalogue and goes upon his way. Sociability also has become centralized — if there is any.

Throughout the entire belt, from the Potomac to the Hudson, wheat is today a money crop grown on almost every farm. Corn is an even more universal dependence, but is chiefly used to feed the livestock, which is the chief agricultural output of the region. In districts less accessible to the towns, farmers are fattening cattle or swine, and occasionally they keep sheep or sell horses. But the presence of large cities — Washington, Baltimore, Philadelphia, New York — tends to make a heavy demand for dairy products, and the map of the location of creameries and dairy cows shows this influence very plainly.

In 1916 the United States Department of Agriculture published a study of farming operations on 378 farms in Chester County, Pennsylvania, a well-cared-for part of the Piedmont near Philadelphia. These farms, whose rolling pastures are carpets of turf, averaged 90 acres in size,[7] and derived 44 per cent of their income from dairy products and cattle; 14 per cent from hay sent to the city and sold at high prices to feed city horses (less now); 8 per cent from wheat; 8 per cent from poultry and eggs; 9 per cent from potatoes. (Another study in 1931 showed that the income from milk had increased to 77 per cent.)

In the earlier survey the tendency of the future was indicated by the fact that on the smaller farms of the Chester County district the portion of income derived from poultry and eggs, an intensive kind of agriculture, was much larger than upon the average of the farms. It was found that the shipment of butter had declined six-sevenths between 1890 and 1915, and it has since all but disappeared, because of increase in the demand for fresh milk from the growing city population near by. Truck was (and still is) insignificant — an interesting fact when one considers the great production of truck on farms that are equally distant from Philadelphia, but situated upon the sandy soils

[7] Such was the size of tracts sold by Penn to his Quaker comrades in the 1680's. It was all they needed with the tools and domestic system they had. In 1862, after railroads, reapers, and *commercial* farms had entered the public consciousness, Congress set the size of a farm at 160 acres, and now the new agricultural machinery is causing farm size to increase apace.

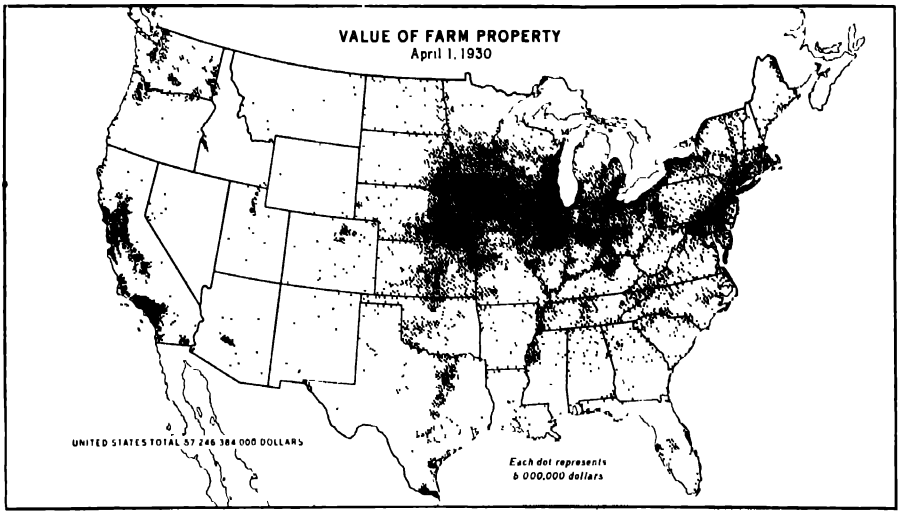


FIG. 223 A

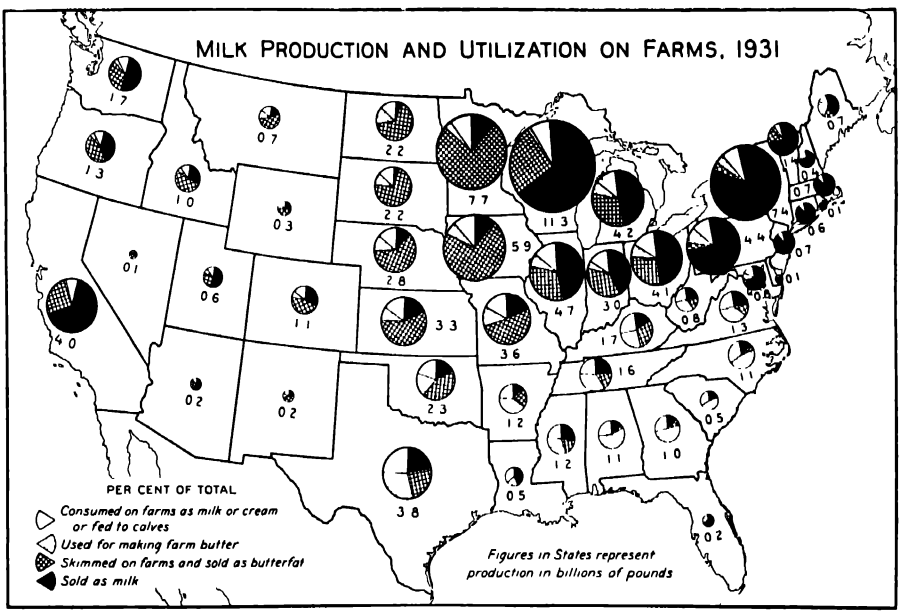


FIG. 223 B

The gullied and unfenced tobacco fields and the curing barn do not make value as do the fenced pastures, the herds, and the big dairy barns of the milk-producer.

The milk map shows the influence of the large urban population which takes fresh milk. West of the Mississippi the farmer skims it on the farm, and his cream (butterfat) may go 100 miles or more to a creamery. (Courtesy U.S. Dept Agr.)

of the Coastal Plain to the eastward. Chester, where these studies were made, is not very far from typical of the Piedmont north of the Potomac.

These Chester County farms are fairly typical of all that part of the Piedmont that lies in Upper Maryland, Pennsylvania, and New Jersey. The small well-tilled farms respond to the steadily increasing demand of the city population for dairy products. Agriculture becomes intensified to meet urban need.[8] This is particularly true in the Pennsylvania districts where a large proportion of the people have German blood. The Pennsylvania German seems to be essentially conservative. He has not emigrated so much as the other Eastern stocks. Therefore he has stayed upon the land and developed an agriculture so intensive that eastern Pennsylvania is very conspicuous in the maps of agricultural production.

PENNSYLVANIA GERMANS

This intensive agriculture by the farmer of German stock is best seen on the plain near Lancaster. In the hands of these diligent farmers a belt of limestone rock and soils has become a fat land. It is like Europe, with European land values, European yields, European appearances except for the fences and the huge barns, of which nearly every farm has two — one barn for the forage and the livestock and one for tobacco. This carefully tilled tobacco section contrasts strangely in appearance with that of southern Virginia and North Carolina.

The Lancaster County tobacco-growers have a systematic four-year crop rotation — wheat, clover, corn, and for the fourth year potatoes and tobacco. The farmer sells the wheat. He feeds the straw, clover, corn, fodder, and some bought grains to cattle which he sells for beef. Great quantities of manure are a by-product of stock-raising, and this serves to maintain the fertility of these farms, which have sale values from $200 to $300 an acre (sometimes more),[9] and a tobacco yield of 1400 lbs. per acre, while the yield is only 600 lbs. in North Carolina.

[8] An example of intensified agriculture: about half of the 30,000,000 lbs. of mushrooms grown in the United States are produced in mushroom houses, mostly on farms in Chester County, Pa. — a beautiful case of concentration with all the trimmings including canneries to dispose of surpluses.

[9] It should be remembered that these values are based upon a small tract of land, from 50 to 100 acres, with almost a small village of good buildings. In June, 1939, I observed the following: On a stone road 1½ miles from Lincoln Highway and about 5 miles from Coatesville, 340 acres of upland, not as rolling as many good farms, a big old square stone house, looking like a French château, another satisfactory house, and small frame barn, two sizable barns near the main house, the whole thing for sale at $8000, and no takers. The factory here had cleaned the countryside and made a high wage.

Not more than 3 miles from this land was better-lying valley land selling for $300 per acre. Into this valley the Amish and the Mennonites have swarmed. A Mennonite doesn't think much of going to town. He was born into a philosophy that takes care of land. He wants to build a permanent good house with a permanent good barn, and he almost worships the manure pile. He won't move to a new neighborhood if he can help it. He will buy a farm on the edge of an Amish settlement but he won't go 3 miles away over the hill. They are paying $200 or $300 an acre for land. I suspect a zoning of land-sale price somewhat as follows: (1) urban, high price; (2) suburban, high price; (3) just beyond suburban, very low price. The influence of a near-by city makes high wages for which there is no compensating advantage in the price of staple crops, even milk. Poor neighborhood organi-

CITIES

The Northern Piedmont is a region having no reason to possess large cities, except along the Fall Line margin. No spot has any great advantage over any other locality. In its 500 miles of length there are but 8 towns which have more than 20,000 people.[10] In the north, Lancaster and York, both on main lines of the Pennsylvania R.R. and centers of rich farming localities, have developed machine shops, textile mills, and rather diverse manufactures. Charlottesville, situated at the crossing of the main line of the Southern R.R. going south and the Chesapeake & Ohio R.R. going west, is the center of the Piedmont apple belt and the site of democratic Thomas Jefferson's aristocratic University of Virginia.[11] Nevertheless, it is only a small town of 15,000 people, indicative of the limitations of the Piedmont as a place for cities. Lynchburg is entirely in the Piedmont. It was at one time the terminus of the James River Canal and the Lynchburg-Knoxville turnpike, and became an important distributing center in the prerailroad days. Lynchburg's leading industry today is shoe-manufacturing. At Winston-Salem and Durham tobacco-manufacturing is of paramount importance. The population of Winston-Salem increased by 232 per cent between 1910 and 1930, and in 1937 the value of its manufactured products exceeded that of many larger cities, such as Richmond, Louisville, Atlanta, and New Orleans, largely owing to the increased consumption of cigarettes by the people of America.[12]

Farther south, the power wire, that great decentralizer of industry, has brought one or more textile mills to every town of any size and to many villages. The building of mills in the open country has made new villages and towns. The Piedmont section of North Carolina, and to a lesser extent of South Carolina, may almost be said to have had a manufacturing boom. The share-cropper's big family and the mountaineer's big family furnished labor. Streams from the mountains are fed by heavy rainfall of even distribution throughout the year. This furnishes good water power. Many hydroelectric units have been built. This whole region is wired, and stand-by steam plants are supplied with coal from the near-by plateau. The mountains furnish wood, the Piedmont itself furnishes cotton and tobacco. Here is the natural setting for the three leading industries: cotton textiles, furniture, and to-

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zation, country or town; (4) still farther from center — truly agricultural. Wages lower than 3, and land value higher. People know that they are in the country. That farm with the big barn mentioned above would have been snapped up in a day in many a neighborhood 200 miles from Philadelphia.

This discussion refers to the farm that hires labor and not to the one-family farm.

[10]

Population (in thousands)	*1930*	*1940*	*Population* (in thousands)	*1930*	*1940*
Lancaster, Pa.	60	61	Durham, N.C.	52	60
York, Pa.	55	57	Winston-Salem, N.C.	75	80
Lynchburg, Va.	41	45	Greensboro, N.C.	54	59
Danville, Va.	22	33	High Point, N.C.	37	38

[11] No student speaks to another student unless he has first been properly introduced.

[12] Value of manufactures (1937): Winston-Salem, $344,000,000; Richmond, $338,000,000; Louisville, $294,000,000; Durham, $160,000,000; Atlanta, $153,000,000; New Orleans, $127,000,000. Between 1920 and 1930 the population of Winston-Salem increased by 56%. In addition to tobacco manufactures, the industrial output of the city includes textiles, underwear, blankets, air-conditioning machinery, and tin foil.

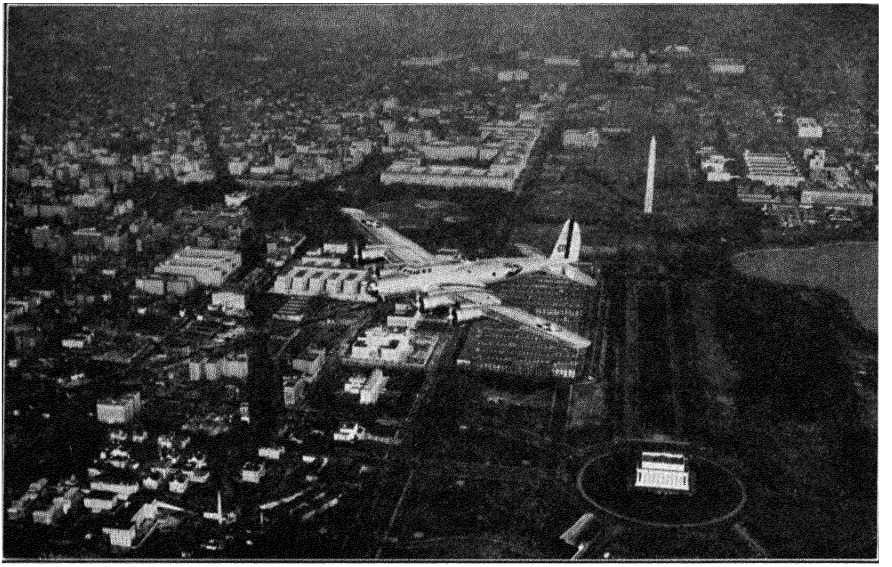


FIG. A. Washington, D.C. The Mall with the Capitol, the Washington Monument, and the Lincoln Memorial in a line. Masses of government buildings on each side of the Capitol and the monument; also between the Lincoln Memorial and the White House, which is left center to the left of four baseball diamonds. (Courtesy U.S. Army Air Corps)

bacco manufactures. High Point, Greensboro, Durham, and Winston-Salem are the larger towns in what may be called an industrial area.

At the edge of the Piedmont are tidewater harbors and waterfalls. These are factors which cause cities to grow, and here on the boundary of the Coastal Plain and the Piedmont are Richmond (183,000), Washington (489,000), Baltimore (805,000), Wilmington (107,000), Chester (59,000), Philadelphia (1,951,000), Trenton (123,000).

Richmond is at the edge of the great tobacco belt, and its leading industry is the manufacture of tobacco. It has boats that run to Norfolk, and two major railroads that give access to the Appalachian coal fields, three that stretch into the South; and it is not far distant from the iron furnaces of the Great Valley. Richmond, being on the Fall Line, has water power and therefore the possibilities of varied manufacture, as is evidenced by the manufacture of paper and paper products, printing and publishing, and the manufacture of iron and steel products and machinery. The city also has locomotive works and woodworking industries.

Washington, D.C., is a city unique perhaps among the cities of the entire world because of its almost complete lack of any industrial basis. Its sole reason for being is political. When the early Congresses of the United States could not agree on any important city for the national capital, they compromised (as the result of a dinner bargain, it is said) by planning a new city in the marshy woods along the Potomac near the home of President George Washington, for whom the new city was named. Washington has a firm basis

for growth, because this nation is rapidly increasing its governmental activities. Every day a greater number of things are being done by government. A single law, the first Soldiers' Bonus Bill, gave work to 4100 additional government employees, most of whom live in Washington. The World War increased the number of government employees in Washington alone from 38,000 in 1917 to 111,000 in 1918. The New Deal brought them in greater numbers than ever before. The city and its suburbs had the keenest housing shortage and the biggest building boom in the United States. It almost surpassed Detroit as the "boom town" of the country.

Two thousand four hundred daily newspapers have correspondents in Washington, and 50,000 words of "news" go out daily during the busy season.

Persons who are interested in political affairs like to live in Washington in order that they may be near the center of governmental activity. The proximity of the city to the South is indicated by the fact that 27 per cent of its population is Negro.

Washington is unique among cities of its size in having been planned carefully before it was built. General Washington had Major L'Enfant of the French Army draw up the scheme of right-angled streets, diagonal avenues, and abundant breathing-spaces, all of which make the city comfortable, and distinctly the most beautiful city in America. No capital in the world can compare with Washington in the size, cost, or architectural beauty of its government buildings.

Baltimore was discussed with the Coastal Plain, but Philadelphia seems to partake more of the inland than of the Coastal Plain and is presented with the Piedmont. It is a great manufacturing city with more than 3,000,000 people, if we include its industrial suburbs, which may properly take in the thriving city of Chester (59,000), 10 miles to the south, Camden (119,000), across the Delaware, and other towns near by. Within 100 miles of Philadelphia live 17,000,000 people, a greater number than are to be found within an equal radius of any American city.[13] In 1937 the 5537 industrial establishments in Philadelphia employed about 293,000 workers, paid out about $396,000,000 in wages, and produced goods worth over $1,500,000,000.[14]

There is no single predominating reason that explains the origin and development of this great city. It is true, however, that it has a number of advantages — it has a deep channel for ocean-going vessels; it has two rivers that give good and ample water front; it is situated at the Falls of the Schuylkill, which made water power of much relative value in the early days. Today three-fourths of the primary horse power used by the city's industries is

[13] Philadelphia's slogan, "Do Business Where Business Is Done," is backed with statistics to show that its industrial employment exceeds (1937) that of any one of 37 states; industrial pay rolls, 39 states; value of output, 39 states; retail sales, 35 states; wholesale sales, 37 states; and service-store receipts, 38 states.

Philadelphia and New York have a mild case of rivalry. The most active part of it, however, is the New Yorker's delight in calling Philadelphia "slow." Perhaps it was this jibe which caused a Philadelphia multimillionaire to put in his will the following provision: "I give and bequeath —— per month to my wife so long as she may live, provided she lives in the United States. For the purposes of this will residence in New York or its environs is not to be considered as residence in the United States."

[14] In 1839 Philadelphia's manufacturing industries employed about 15,000 wage earners and produced goods worth nearly $20,000,000.

electric power, a part of which comes from the great Conowingo Dam on the Susquehanna River.[15] The anthracite-coal fields are only 80 miles away, and Philadelphia early built a canal and a railroad up the Schuylkill Valley to tap these coal fields; therefore Philadelphia was one of the first cities to have a good fuel supply. This same Schuylkill Valley was, until 1870, an important center of iron manufacture, furnishing a basic raw material. The city was settled by thrifty and industrious Quakers and Germans, who also settled the surrounding territories, where for two centuries they have tilled the soil and have furnished an abundant food supply.[16] This democratic willingness to work is important. New England has it, and it extends down the coast as far as Baltimore. South of Baltimore the work habit is not nearly so prevalent.

The results of its combined advantages make Philadelphia a city of varied manufacture. Of all the many types of manufacturing to be found in the United States, four out of five are found in Philadelphia. Philadelphia's leading industries include the manufacture of textiles, amounting to about one-fifth of the total value of its industrial output; the processing of foodstuffs; petroleum-refining; printing and publishing; and the manufacture of chemicals, machinery, shoes and leather, nonferrous metals, and iron and steel.[17] The largest locomotive plant in the world moved from the city to roomier space a few miles down the river. Philadelphia leads all American cities in sugar-refining and cigar manufacture, and a great shipyard stands just across the river in Camden.

The Delaware River has two great advantages for shipbuilding. It is ice-free almost every day of winter, and it is near the machine shops, the steel mills, and the capital and trained labor of the North. It was therefore natural that in the great shipbuilding rush of the World War the supreme effort should have been centered in the Hog Island Yard, just below Philadelphia. This was by far the largest shipyard ever built. But it was a governmental war activity, for whose product there was no demand in peace. So this shipyard became a scrap heap almost before it was finished — merely another

[15] In addition, there are three carboelectric plants in the city and four more near by. In 1935 the combined installed capacity of the Philadelphia Electric Company's steam and hydroelectric plants was 1,125,000 kilowatts, including the 252,000 k.w. capacity of the Conowingo plant. Another source of energy is petroleum, which Philadelphia gets cheaply by pipe line from Pennsylvania and mid-continental fields and by tanker from the Gulf and the Caribbean area.

[16] Philadelphia's population is less foreign than that of cities farther north.

POPULATION OF PHILADELPHIA, 1930

(U.S. Census)

Native white of native parents	741,000
Foreign-born white	369,000
Native white of foreign parents	464,000
Native white of mixed parents	155,000
Negro	220,000
Total	1,949,000

[17] Philadelphia is a close rival of Los Angeles in petroleum-refining, and claims to be first in the production of knit goods, paper, carpets and rugs, clay products, steam and other packing, plumbers' supplies, lace goods, processed waste, files, cardboard, and upholstery material.

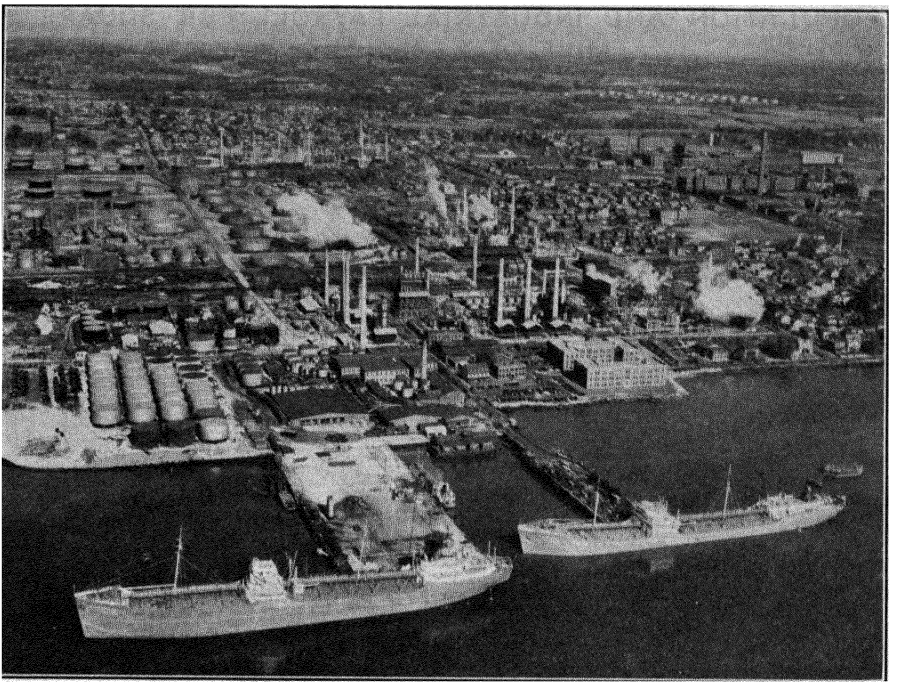


FIG. A. Heavy industries along the Delaware, a great industrial waterway. Oil-refinery at Marcus Hook, some 15 miles downstream from Philadelphia. (Courtesy Sun Oil Co.)

offering to the great god War. Camden, which boasts of soup, battleships, phonographs, and many other products, is economically a part of Philadelphia, as much as Newark is of New York. So is Chester, 10 miles down the Delaware.

Wilmington, Delaware (pop. 106,000), has advantages similar to those of Philadelphia and is rising in importance as a manufacturing center for machinery, cars, and vulcanized fiber. But it is better known as the headquarters of the manufacturers of munitions, dynamite, and an endless list of chemicals and allied Dupont Company products. This western shore of the navigable Delaware River and Delaware Bay between Philadelphia and the sea is almost a perfect location for heavy industries, and they are congregating there.

In the Pennsylvania section of the Piedmont and the Great Valley there are many small manufacturing towns. Their influence shows up clearly in Fig. 230 A.

Trenton, New Jersey, at the head of steamboat navigation, one-time terminus of canals to coal fields and New York Harbor, has many manufactures, but especially pottery, including the specialized forms used by plumbers and electricians.

Numerous suburbs of New York are located on the Piedmont hills, but they are pre-eminently dependent upon the commerce of New York Harbor and have been discussed in a preceding chapter.

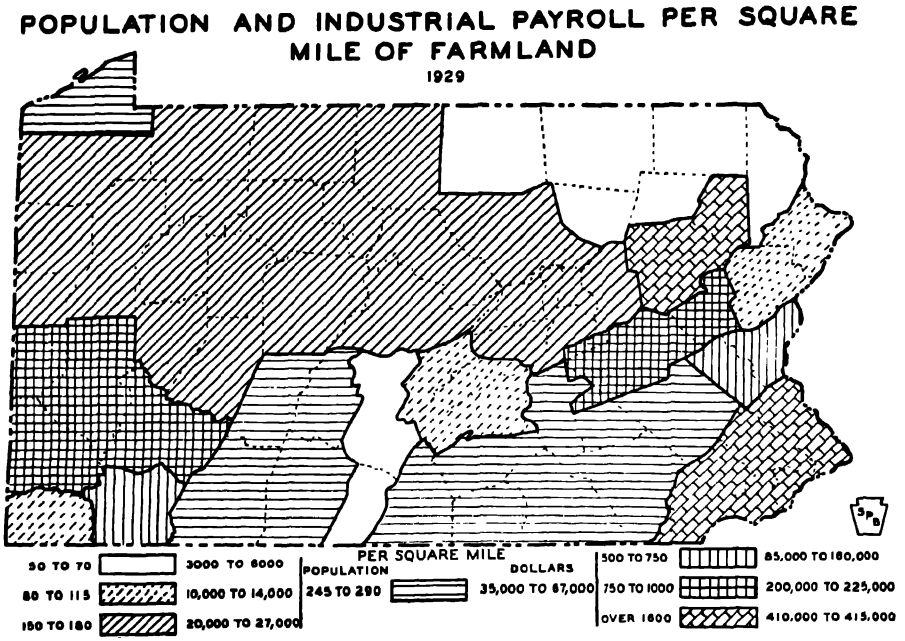


FIG. A. The very high industrial income of the Piedmont and Great Valley sections of Pennsylvania shows the influence of many towns and small cities scattered over the area between the Susquehanna and Delaware rivers. (Courtesy U.S. Dept Agr.)

THE FUTURE OF THE PIEDMONT

Plainly this region must continue as a land of agriculture. But to prevent deterioration there must be a readjustment of agricultural methods, or soil erosion will reduce much of it to the condition of a second-class forest. If one compares the rate at which soil is formed with the rate at which the earth is gullied and carried away from a plowed field during a thunderstorm anywhere in the southeastern part of the United States, it becomes plain that the Piedmont farmer must readjust his farming to suit his land. Agricultural readjustments are very slow, and hitherto the Piedmont has suffered greatly from soil erosion because men have kept the level-land type of agriculture on rapidly eroding hills.[18] The 378 Chester County, Pennsylvania farms examined by the United States Department of Agriculture (page 222, this chapter) showed that only 70 per cent of their land is arable, and many parts of the Northern Piedmont are more hilly than Chester County. Therefore if it is to retain the beauty of its landscape and the fertility of its soil, only the more level parts must be intensively cultivated; the steeper parts must be left in pasture or in trees. Its fertile soil and good rainfall make it admirable for the development of a tree-crop agriculture in places where now the plow

[18] The transporting power of water increases 64-fold with doubling of its velocity.

and the gully are making ruin with alarming speed.[19] The wholesome climate of the Piedmont, the absence of swamps, mosquitoes, and malaria which curse parts of the Coastal Plain, make it an attractive place for the homes of men.

Since nearly all of this Northern Piedmont area is sloping, rolling, hilly, or even steep, the continued cultivation of corn on much of its area must inevitably result in ruin. Summer rain is usually the torrential downpour of the thunderstorm. The corn cultivation has prepared the ground perfectly for erosion, and the hard rock base cannot make soil as fast as even occasional cultivation of corn causes it to wash away. Hence many a hillside has already been well-nigh ruined, often put to permanent (poor) pasture, sometimes actually abandoned.

The farther south one goes, the worse is the erosion, partly because the increasing heat of summer does not encourage turf.[20] The small livestock production leaves more of the ground in corn and tobacco, crops that require bare ground and tillage and are thus prime makers of erosion.

Fortunately agricultural science holds out a ray of hope. One of the best dairymen in the United States is keeping nearly 150 dairy cattle on 350 acres of land in central Loudoun County, Virginia, without the growing of corn. His silos are stuffed with grass silage. His mows are filled with alfalfa hay. His grain feed comes from home-grown barley and the Middle West. Some of the level West can grow grain without eroding.

His neighbor, a young Cornell agricultural graduate operating four farms, avers that he is never going to grow another crop of corn.[21] In May his silos will be filled with 8 or 10 tons to the acre of a succulent and nutritious wheat and vetch combination, leaving the ground free for a summer crop of soybeans, which can also go into the silo and be out of the way for October seeding of the next crop of wheat and vetch, or rye, which if cut in April has the richness of nitrogen that puts it in the class with alfalfa. For grain he grows barley, which lends itself well to mass production by tractor, disk, seeder, reaper, or combine; also, it is nearly as productive as corn, and in the age of machinery less expensive to grow and far less conducive to erosion. Moreover, it can be grown over the contour drains now being promoted by the United States Conservation Service.

The value of the land in the southern part of the Piedmont, namely, the cotton and tobacco belts, is very low, partly because of leaching, partly because of the damaged condition of the soil, and partly because of the continuance of unscientific agriculture. In the Northern Piedmont farm lands have an unduly low sale value, because of competition with cheap Western produce and because so many of the young men have gone to work in the

[19] I have measured the silt in June gully water from a Virginia cornfield. Upon evaporation a 5-inch cup of it yielded one-half inch of the richest soil in the field. Careful study of crop yield on the hillsides and level land of almost any hilly farm anywhere will show great and significant differences in yield.

[20] We need to appreciate more fully the importance of turf as a factor in national survival. Where does turf grow? Where can it grow?

[21] Fifty years ago each of these four farms was occupied by a family that might have sent a son to Congress, or to any profession. Now with power machinery one such family manages the four farms, and three of the solid old houses are occupied by farm hands. This too is a type of widespread happenings.

cities. As a result, both before and since the World War and the depression of the 1930's, Piedmont farms in many localities have been for sale at prices sometimes less than the cost of the buildings.

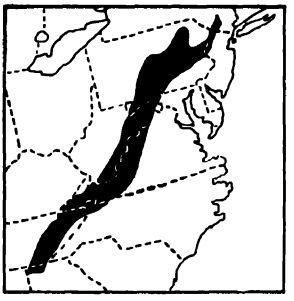
This is undoubtedly a region where the best type of rural community life should and could be developed. There is a neighborhood 15 miles north of Washington, in Montgomery County, Maryland, that has been studied by the United States Department of Agriculture as an example of a good community having a satisfactory rural organization.

Why is it a model community? It is not because the soil is better than elsewhere, or because it has superior opportunities for markets. The soil was originally rather poor, and in 1840 was in the same state of ruin as much as the tobacco belt is today. There was something else that entered into the spirit of the neighborhood and made it something that commanded the interest of the Government of the United States. The place was settled by a group of thrifty Quakers, with a few college graduates, who settled down to be good farmers and to develop a good community. They built stone roads, established good schools, and were among the first to install rural telephones. One of the women's clubs is the oldest in the United States, and there are now several other women's clubs, four farmers' clubs, and various musical and other social organizations.

The people there can enjoy suitable contacts without having to go to the cities to get them. What this neighborhood has done can be done anywhere in the Piedmont. It is just a question of the application of intelligence, and the chief task for intelligence today is to adjust life to one's swiftly changing environment.

The good living-conditions of its small towns should give the Northern Piedmont many more small manufacturing towns (from 2000 to 10,000 pop.) in the coming era of the universal distribution of electric energy. There are some such towns in the Pennsylvania parts of this region.

Chapter 9. THE APPALACHIAN RIDGE AND VALLEY REGION



THE Appalachian uplands lying between the Piedmont and the Ohio Valley are divided by nature into three parts. On the west is the vast Allegheny-Cumberland Plateau, formed of nearly horizontal strata, with many streams cutting back into the plateau from all directions. Between the horizontal rocks of the plateau and the Blue Ridge is a belt of limestones and shales and sandstones that was once subjected to intensive folding. At the eastern edge of the folded strata, adjoining the Piedmont, are the Blue Ridge Mountains and the Great Smokies. The western part of this folded belt is marked by linear ridges, and in places is quite rugged. But in the eastern part there are larger areas of relatively soft limestone, which streams have attacked with such success that a wide valley has been formed. For many generations this valley has been called the Great Valley.

THE GREAT APPALACHIAN VALLEY

The Great Valley is a remarkably long corridor that extends all the way from the St. Lawrence to central Alabama. The geologist and the physiographer maintain that the Champlain and Hudson lowlands are a part of this Appalachian Valley, but the geographer shows that man cannot use these two parts of the valley in the same way. Access and use make a different economic or geographic region of the part south of the Hudson. In its southern extremity, climate converts the valley into a land of cotton.

This Great Valley includes parts of 8 states (New Jersey, Pennsylvania, Maryland, West Virginia, Virginia, Tennessee, Georgia, and Alabama), but the total area is only about 20,000 square miles, because in all its 1000 miles of length, the valley rarely exceeds 25 miles in width and often is narrower. While it is properly spoken of as one valley, the Great Valley has different local names, because it is drained by a number of streams — Delaware, Lehigh, Susquehanna, Potomac, Shenandoah, James, Roanoke, New, Holston, Tennessee, and Coosa. In northeastern Pennsylvania it is known as the Lehigh Valley; near the Susquehanna, as the Lebanon and Cumberland valleys; and in northern Virginia, as the Shenandoah Valley, made famous in part by the Civil War. The whole of the Virginia section is spoken of in that state as the "Valley of Virginia," although it is a part of 5 drainages, of which one, the New, goes to the Ohio. Except for the small area in

southeastern Pennsylvania where the Blue Ridge disappears (Fig. 188), the valley is plainly walled in on both sides by sharply rising ridges. In some places, especially south of the Shenandoah, the valley floor is split by ridges which run parallel with the enclosing mountains. At the divides between the various rivers that drain it, the Shenandoah, the James, the Roanoke, the New, and the Tennessee, the Great Valley rises to nearly 2000 feet, but the ascent is always gentle, and the passage from one river basin to another is so easy that in most cases it takes an observant traveler to notice it.

A GREAT HIGHWAY

Limestone caused the creation of this great natural corridor, and limestone is the key to the history and the human use of the region. In early times, when the Indians held the plains of western New York, the valley was the only break in the Appalachians open to the English settlers with their wagons, and it was therefore the highway across the mountains. This explains the fact that Kentucky and not Ohio was the first state west of the Alleghenies. The migrating settlers from Pennsylvania, Maryland, and Virginia, and even from North Carolina, drove their wagons down the Great Valley to the boundary of Tennessee. There, at the extreme western corner of Virginia, a break in the western wall called the Cumberland Gap gave access to the headwaters of the streams flowing toward the Ohio. Through this passage Daniel Boone and other settlers of Kentucky entered this unknown region of wonders, dangers, plentiful game, and fertile soil.

It is estimated that more than 300,000 people passed through the Great Valley and the Cumberland Gap between 1775 and 1800 on their way to settle the West.[1] Back through this same gap later on came the droves of horses, cattle, and hogs walking to the Eastern markets. There were so many hogs that the road was known locally as the "Kaintuck hawg road." Because of its access to the North, the valley as far south as the headwaters of the James was settled by people from Pennsylvania. Most of them were Germans, but some were Quakers; many were Scotch-Irish, the people who settled all central Pennsylvania. On the Piedmont, more difficult to traverse, these people got only a short distance south of the Potomac. The Pennsylvania settlers of the northernmost corners of the Virginia Piedmont came in by way of the Harpers Ferry Gap from the Great Valley, and also directly over the Piedmont of Maryland.

The service of the Great Valley as a highway came sharply to the fore during the days of the Civil War. As the armies of the North and the South strove to menace or to protect Richmond and Washington, they found the Coastal Plain chopped by tidal estuaries and the Piedmont hilly and bad traveling for the army wagons, but the Great Valley offered opportunity to travel in a straight line over almost level country where the stone roads were better than

[1] R. D. Salisbury, H. H. Barrows, and W. S. Tower, *Elements of Geography*, Henry Holt and Company, 1912, p. 360. This figures out at something like 12,000 people a year, or 2000 per month during the open months, or 15 or 20 wagons a day. It must indeed have produced a sensation of endless moving for those who lived on that road to see a wagon go by every half-hour for six months of every year, each with its family of settlers from the little-known East going into the less-known West.

those of any other part of the United States. These geographic factors made the Great Valley the chief avenue for the rapid advance of large bodies of soldiers from both North and South. In 1862 and again in 1863, the two great invasions of the North were by way of this valley; that of 1862 was checked at Antietam, in the edge of the Great Valley in Maryland. In 1863 the Southern scouts reached the Susquehanna, and the main army was checked at Gettysburg, a few miles outside the limits of the valley in southern Pennsylvania, at a place where the Blue Ridge almost fades away, and made easy the turn toward Washington.[2] Armies between Washington and Richmond were constantly exposed to the danger of a flank movement up or down the valley, and more than once were compelled by this cause to retreat. The importance of the topography of the Great Valley during the war is graphically told in the record of the Great Valley town of Winchester, Virginia, 8 miles from the boundary between the Confederacy and the Union (after the creation of West Virginia). This town changed hands seventy-two times during the four years. It was a few miles south of Winchester that the battle of Cedar Creek occurred, celebrated in verse because of Sheridan's ride. Sheridan had been sent to the valley with a large army because, even in the weakened condition of 1864, the Confederacy had been able to alarm the North, and almost able to take Washington by sending the daring raid of General Early through the valley into Maryland and Pennsylvania while Grant's army was hammering Lee before Richmond.

In recent years the Great Valley has become one of the great tourist routes of eastern America. Limestone is the best material for making good stone roads, and in the days before concrete and macadam were common, the best automobile highway from New York to Savannah and Florida was by way of the Great Valley from New Jersey to Chattanooga, Tennessee. The beauty of the country, with its fertile fields, well-kept farms, big barns, productive orchards, and ever present mountains, makes it a delightful territory for the touring automobilist. Many are the attractions that intrigue the traveler to stop and look — historical markers in great abundance, limestone caverns: Luray, Shenandoah, Massanutten, Endless, and Grand (each advertised as biggest or best in some respect); and the Natural Bridge, a "miracle in stone," which geologists say is merely a cave roof that has not yet fallen in.[3] To the casual observer, it would seem that the valley has become a region of innkeepers, for, as on all popular routes, a plethora of tourist-home signs bids the tourist to pause and rest.

In one respect the Great Valley is not a major highway. No main-line railroad traverses the entire length of the valley, for it extends northeast-southwest, and the main lines run east and west or north and south, and they seek big cities, which the Great Valley does not have. In Tennessee and southern Virginia, however, the most direct railway service from New York to New Orleans follows a section of the valley.

[2] The Northern army was victorious partly because of its position on a low ridge which the Southern army had to attack. Note the military influence of the ridge.

[3] Other geologists believe that there was once a waterfall over the arch that now forms the bridge. Weak strata behind the arch later gave way, the water seeping through below the hard rock of the arch and the river eventually boring a tunnel below.

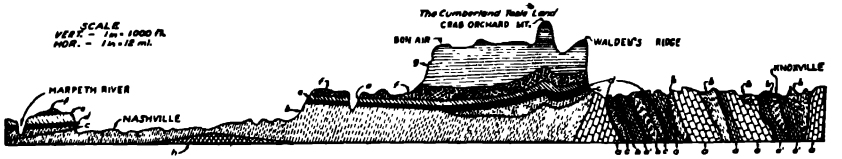


FIG. A. This is a very important little illustration. It is a cross section showing the rock formation from the Great Smoky Mountains across the Great Valley of Tennessee to Nashville and beyond. Look up this section on the pocket map. Find the Cumberland Plateau with its horizontal rocks. Find the Nashville Basin, eastern and western Highland Rim. Find the eastern edge of the Cumberland Plateau. See how the rocks in the valley have been folded. In how many places can you find the limestone formation *b*? That shows how the Great Valley has streaks of limestone soils and streaks of shale or poorer clay soils (see footnote on this page). The black layer *d* shows how the coal measures of the plateau reappear in western Kentucky and in Illinois, Indiana, and Ohio. (Courtesy Tennessee Dept Agr.)

AGRICULTURE

As is usually the case with soils made of decomposed limestone, that of the Great Valley from end to end is justly famed for its fertility.[4] This fertility enabled it to compete successfully with the cheap lands of the West in the latter part of the nineteenth century, although it was the only section in the East that was able to do so. Here the epoch of abandoned farms, so common in many other parts of the East, has not come. The valley has not had the same decline of land values, and as one stands on the top of the Blue Ridge and takes a panoramic view of the Piedmont to the east and the Great Valley to the west, the contrast in the appearance of the country is marked. The Great Valley in its broader sections is conspicuous by its wheatfields and the almost complete absence of forests, while the Piedmont is conspicuous by its woodlands, pastures, and smaller proportion of wheat.

The limestone soil of the Great Valley is excellent for wheat, corn, clover, and bluegrass, which north of Georgia and Alabama are the chief crops of the valley, leading to an export of grain, cattle, and dairy produce. In its better parts it is a prosperous land, with tilled fields, neat fence rows, well-painted houses, and big barns. The section of the Great Valley near the Virginia-Tennessee boundary is much intersected by sharp ridges, and the portion of arable land is small, but, as is the case everywhere throughout the valley, the limestone soil produces splendid pastures, which are here devoted largely to cattle and sheep. The animals, however, are not prepared for market here, but are shipped off as "stockers" to finish their preparation in localities where a greater proportion of arable land gives crops of grain and hay.

In its southern part, the part in Alabama and Georgia, the climate of the Great Valley is warm enough to permit the growth of cotton. (The agriculture of this part of the valley is presented in Chapter 13, "The Cotton Belt.")

The limestone is not without its disadvantages. It weathers unevenly, and the fertile fields are often surprisingly obstructed with outcropping knolls or

[4] It is not universally composed of limestone, for shale formations of much lower fertility occasionally cover the valley floor and give sharp contrasts of fertility and poverty of soil, crops, and farm buildings.

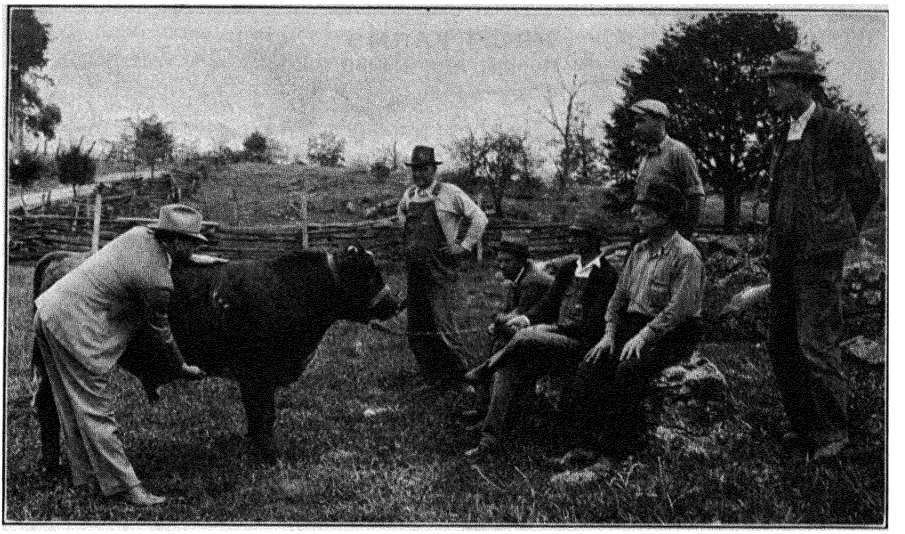


FIG. A. An agricultural extension expert and a beef-cattle demonstration on a Virginia mountain pasture 100 years old — a proper use for steep land. (Courtesy Virginia Polytechnic Institute)

long rows of projecting stones left from a harder stratum. These stone patches are usually dotted with trees and matted with bluegrass. The valley farmer has developed much ingenuity in working modern machines around stones. The solubility of limestone means that here, as in nearly all other limestone localities, the country is underlaid with a series of caves and underground passages which carry the water away from the surface, so that in comparison with the near-by Piedmont it is strangely devoid of springs and streams. The water table is not so near the surface, so that the farmers and also the towns often suffer from water shortage.[5] Cisterns, supplied by rain water from building roofs, are a common part of the farmstead equipment.

An agricultural specialty of the lower Shenandoah Valley is apple-growing, which has been developed extensively around Winchester and Martinsburg. The apple industry here was largely the result of historical accident. About the time of the Civil War a certain farmer planted an apple orchard of 20 acres on the slope of the Applepie Ridge. His neighbors laughed at him, and at times he himself thought that perhaps he was, as they said, a fool. Nearly twenty years later he sold a crop of apples for $6000. Two years later he did it again. A few of his neighbors began to plant orchards. They prospered, and like ripples in a pond of water the planting of apple orchards spread until by 1900 the third circle of converts was beginning to make good profits, and hundreds of acres of apple orchards were being planted. Today this locality has several million apple trees, which are a gorgeous sight at the time of the

[5] The rainfall is slightly less than in the Piedmont, because of the enclosing mountain walls: Frederick, alt. 275, Piedmont, 40 in.; Hagerstown, alt. 560, Great Valley, 36 in. It is 32 in. 40 miles southwest of Hagerstown in enclosed valleys.

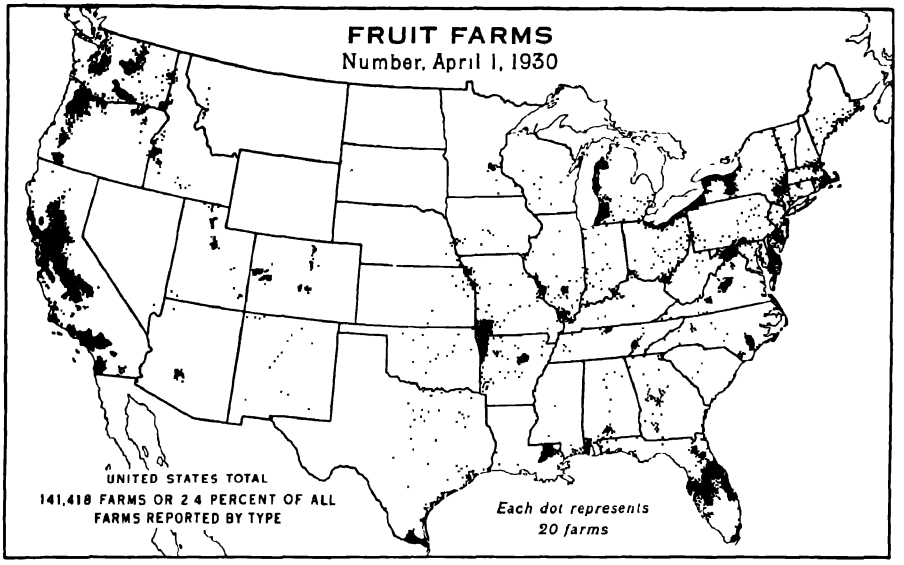


FIG. 238 A. This map shows commercial specialization. (Courtesy U.S. Dept Agr.)

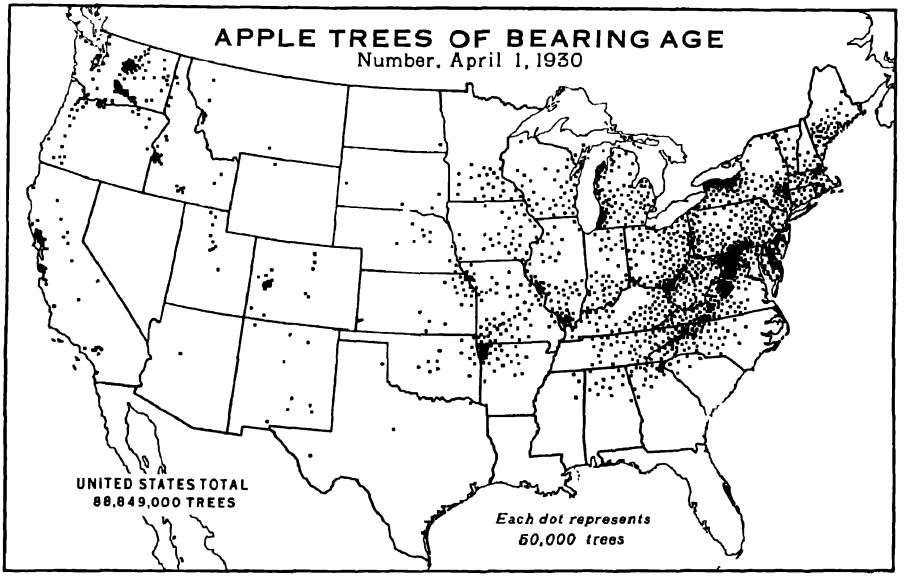


FIG. 238 B. All important apple sections east of the Rockies are near water or on hills or ridges. (Courtesy U.S. Dept Agr.)

annual Apple Blossom Festival. In 1938 one man, H. F. Byrd, planted a block of 1000 acres of apple trees. Shenandoah Valley apples are shipped in large quantities to England and to France as well as to domestic markets.[6]

MINING AND MANUFACTURING

The mining and the manufacturing of the Great Valley reveal the influence of the underlying limestone. Scattered throughout the valley are limestone quarries, which provide agricultural lime and material for cement plants, iron furnaces, and highway construction. At Strasburg, Virginia, and Martinsburg, West Virginia, are limestone quarries that ship trainloads of limestone to Pittsburgh for fluxes in the iron and steel industry. Their limestone is preferred at Pittsburgh, since it is from 95 to 98 per cent pure, whereas other limestone is only from 80 to 90 per cent pure. In some places, as in Knoxville, Tennessee, the limestone has been altered by pressure and changed into marble, which today is quarried, and shipped for considerable distances. Harrisonburg, Virginia, boasts of its black marble, so fine that it was used in the new Supreme Court Building in Washington.

The Great Valley has long been the leading cement-manufacturing region in the United States. Cement is made of limestone and shale, burned, ground, and intimately mixed. The native rocks, the valley limestone and the closely associated shale formations, provide these two raw materials for cement in almost every county for the whole of the valley. Coal of the near-by Appalachian Plateau or of the valley itself, as in Alabama, furnishes the necessary fuel. Nearness to New York, Philadelphia, and Scranton, abundant labor, and access to anthracite coal combine to make the Lehigh Valley towns in eastern Pennsylvania — especially Allentown, Easton, and Phillipsburg — the leading center of cement production.

In the cement district of Pennsylvania there are also important slate quarries producing three-fifths of the product in the United States, chiefly between Slatington and Bangor, where an intensely worked deposit is the largest slate quarry in the world.

It is well known that iron, coal, and limestone are the main ingredients in modern iron and steel production. Furthermore, it may be noted that limestone aided in the formation of the iron-ore deposits that are scattered throughout the valley formations from Alabama to Lake Champlain. When a stream of water with a little iron in solution flows across limestone, it dissolves enough limestone to cause the water to precipitate the iron as ore. Thus limestone and iron ore are associated throughout the world, and the Lehigh and Schuylkill valley sections of the Great Valley were early centers of modern iron manufacture in the United States. At the present time iron is made in this valley at Harrisburg, Bethlehem, and Lebanon, Pennsylvania; at Roanoke, Virginia; in one place in eastern Tennessee; and especially in Birmingham, Alabama.

[6] The interdependence of peoples is well shown by the financial calamity that befell Winchester and its vicinity because Europe, which had been taking about 60% of the crop, could buy so few apples in the autumn of 1939, owing to the European war.

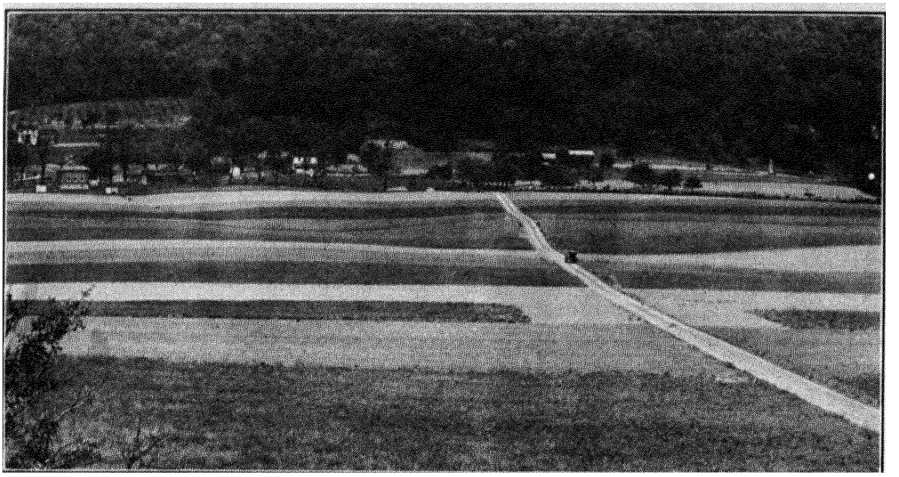


FIG. A. Appalachian Ridge; Great Valley farm, strip cropping, foothill orchard — Pennsylvania. (Courtesy Pennsylvania State College)

An important industrial development in recent years has been the rapid growth of the rayon industry in the Virginia and Tennessee section of the Great Valley, with plants at Front Royal, Waynesboro, Roanoke, Bristol, Johnson City, and other cities. Among the factors favoring the rise of the rayon industry in this section are the abundance of clean water for industrial use, sewage-disposal outlets, cheap coal from the near-by Appalachian Plateau, local supplies of such heavy chemicals as sulphuric acid and carbon bisulphide, and adequate railway facilities for transporting the finished goods to the market. Nearness to raw materials is unimportant, for this item is but a small portion of total costs. The viscose (the principal process) utilizes wood pulp that comes all the way by rail from the spruce forests of eastern Canada, although other processes depend largely upon cotton linters. Labor costs sometimes comprise from 40 to 50 per cent of total production costs, and the abundance of cheap labor is probably the deciding factor that has lured the industry southward.

A huge viscose plant with a capacity for 6000 workers was built in 1938–39 at the small city of Front Royal, Virginia, a place entirely inadequate to supply the labor for such an enterprise. This difficulty was expected to be overcome by the systematic operation of bus lines on the good roads that radiate throughout the valley. Thus workers can live in the country and commute daily to their jobs in a small city. This scattering of large industry to the small towns and of the industrial workers to the countryside is suggestive. It appears to be good. How far will it go? Certainly it is bothering the farmers to match factory wages and hours, but one of the great needs of the United States is higher wages. Perhaps factory wages will reduce agriculture in the Great Valley to the suburban basis (see page 244).

For manufacturing resources and opportunities towns and cities are much

alike throughout the valley. All have about the same access to raw materials, fuel, transportation, labor supply, and market. The industries are primarily cement, iron and steel, machinery, and wood manufactures, with increasing attention to textiles, chiefly rayon, cotton, and silk. With the exception of Birmingham, no Great Valley city thus far has gained enough superiority over any other to produce great leadership in size. The valley is long and narrow, with a tendency to have a string of towns near its center, each of which is a kind of local commercial capital of a fertile district but is not able to command a large territory. Where a plateau stream crosses the valley, giving access on the east to the Piedmont and the ocean and on the west to the Appalachians, we find a crossing of the ways, with some advantage of access, and consequently a town larger than its neighbors.[7]

While Birmingham is physically a part of the Great Valley, economically it belongs more to the Cotton Belt, and will be discussed in a later chapter.

THE TVA

The greatest single development in recent years concerns the southern part of the Great Valley. Beginning near Knoxville and extending downstream is the gigantic undertaking by the Tennessee Valley Authority. This great social experiment aims at the comprehensive development of an entire watershed, the Tennessee River Basin, which covers 40,600 square miles in 7 states — Virginia, North Carolina, Georgia, Alabama, Mississippi, Tennessee, and Kentucky.

In setting up the TVA, it was the belief of Congress that the diverse natural conditions existing in the Tennessee Valley would make it an ideal proving-ground for land-resource and water-resource planning. It was hoped that experience gained here might some day be applied to similar projects in other parts of the country and thereby lead to a wise national program of soil and water control. Another factor Congress considered was the enormous number of unemployed people who had swarmed back into the area from Midwestern cities after the 1929 debacle.

The manufacturing aspects of the TVA hinge upon a series of integrated dams, which will convert destructive water into a willing servant.[8] Storage of water and control of stream flow will serve a triple purpose. First, the project will make possible the maintenance of a 9-foot channel for navigation over a 648-mile waterway between Knoxville and the Ohio River at Paducah, Kentucky. Second, it will reduce the flood hazard following periods of heavy rainfall. And third, it will permit the generation of hydroelectric power. If a substantial portion of the 4,000,000 potential horse power available in the Tennessee Valley is harnessed and sold at low cost, this should be a great

[7] With a railroad map one can easily see the location factors: in Bethlehem, 58:58 (thousands population 1930:40); Harrisburg, 80:84; Hagerstown, 31:32; Martinsburg, 15:15; Staunton, 12:13; Roanoke, 69:69; Chattanooga, 120:128.

[8] The Norris Dam on the Clinch River impounds 3,400,000 acre-feet of water at capacity, which makes a lake with a shore line of 585 miles. The other principal dams are the Fowler Bend Dam on the Hiwassee River, the Chickamauga Dam above Chattanooga on the Tennessee, and the Guntersville, Wilson, and Pickwick Landing Dams farther down the Tennessee River.

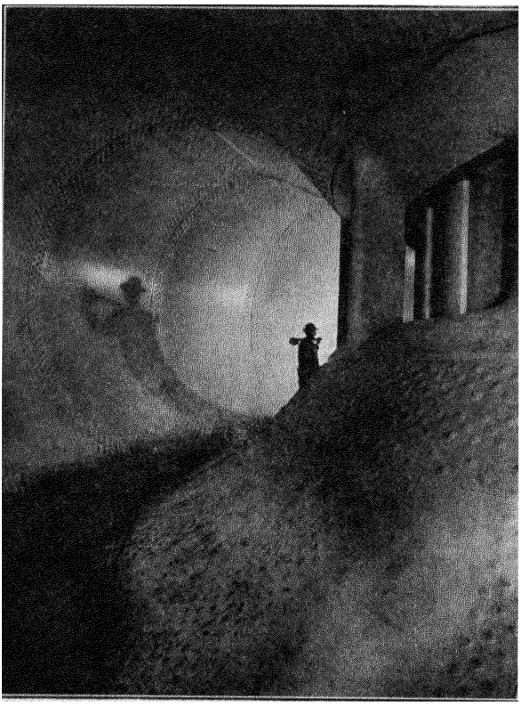


FIG. A. The interior of a scroll case at Norris Dam, TVA, that carries the water from the penstock to a 36,000-horse power turbine water wheel. The water spurts through the openings at the right and strikes the blades of the wheel, which is at the right out of sight. The scroll case reaches clear around the wheel so that water can spurt against every blade of the wheel all the time. (Courtesy TVA)

boon to both manufacturers and farmers throughout the valley. In 1930 less than 3 per cent of the farm homes in Tennessee, Mississippi, Alabama, and Georgia were electrified.

The task of subduing running water extends far back of the concrete dams erected by the Federal Government. Back on the hillsides man has been practicing the agriculture of hoe and plow, playing his part in the usual American sequence of land destruction, — forest, plow, field, and desert.[9] Uncontrolled, this situation simply means the loss of millions of tons of fertile topsoil, which in time would silt up the reservoirs built by the Government, hampering navigation, flood control, and the generation of electric power. Hence the Government has wisely instigated a vast program of erosion control.

It came none too soon, for TVA surveys of the cleared area above Norris Dam showed that 60 per cent of the cleared land had already been ruined by erosion, although the white man had been there less than a century and a half. This was double ruin — ruin of farm, ruin of reservoir.

The Government is promulgating such measures as contour plowing, terracing, the use of winter cover crops, fertilization, and the reforestation of the steeper slopes, for by such devices water can be made to "walk" downhill instead of running destructively. To do these things calls for capital funds often beyond the purse of the farmer who has run down his land, hence government aid is necessary. If vegetation is to grow once more upon eroded hillsides, plant food must be supplied. The soils of the area contain sufficient

[9] Land destruction was accomplished in a different way in the Ducktown, Tennessee, copper-mining area. Fumes from smelting by early methods killed every living green thing in an area of 50 square miles. Erosion and economic desert were the results. It is still impossible to cross the country on horseback, because many of the gullies are from 10 to 20 feet deep. But now, as a result of erosion control, nature's protective cover is gradually returning to parts of the area.



FIG. A. The Machine Age comes to the rescue of wasting land. A power-driven grading machine making terraces to carry water away harmlessly. It would go destructively if it followed the slope across plowed land. (Courtesy U.S. Soil Cons. Service)

potassium; nitrogen can be supplied through leguminous crops; and the Government is stimulating the production of phosphates from the rocks of central Tennessee in the form of triple superphosphate manufactured at Muscle Shoals.[10]

Thus there exists a natural circle of cause and effect. To obtain electric power, navigation, and flood control means dams and reservoirs. To keep reservoirs deep and effective means erosion control, which calls for plant food. And the plant food can be manufactured with electric power generated at the dams and reservoirs. To the industrialist in the Tennessee Valley all this means benefits from cheap electric power and transportation. To the farmer it means the advantages of rural electrification and a healthier farm economy, with freedom from one-crop bondage. And to the average citizen of the lowlands it means much less worry about damage or loss of life from future floods.

THE FUTURE OF THE GREAT VALLEY

The future of the Great Valley seems to be plainly marked in the continuation of its present. Everywhere it is a region of beautiful landscape, healthful climate, fertile soil, with abundant supplies of the raw materials that mark its present industries. It is being supplied with electric power, and the power wire, whether it comes from a carboelectric or a hydroelectric plant, is a great decentralizer of industry. The valley seems to be plainly destined for a con-

[10] The government nitrate plants, built during the World War, are obsolete.

tinued growth in manufacture, one which will dot it from end to end with a succession of small cities. These will have the great advantage of not becoming metropolises in size, and for that reason will have better opportunities to get food, raw material, and space to live. It is a beautiful land. Everywhere the refreshing mountains are in sight, beckoning man to climb and enjoy panoramas of charming landscapes. This increasing city population in many units will intensify the agriculture by giving a home market.

THE APPALACHIAN RIDGE COUNTRY

West of the Great Valley, and extending from east-central Tennessee almost to the Delaware River, is a district like the Great Valley in geologic origin but different in that it is such a succession of ridges and valleys that its surface has much more of ridge than it has of valley. In this ridge country the rock layers have been so much folded that in the territory west of Harrisburg, Pennsylvania, geologists have come to the conclusion that 81 miles have been compressed into 66, showing eleven principal folds and many more ridges. In bygone millenniums, this area was worn down by the streams almost to a flat plain with its surface near the tops of the present ridges. Then the whole area was raised. This gave the streams a chance to wear it down again, and they cut the present valleys where the rocks are soft and left the hard rocks, chiefly sandstones and conglomerates; these make the present ridges. Irregularities in folding made the hard layers produce parallel ridges, zigzag ridges, and ridges that surround canoe-shaped valleys. One such valley, that of the Kishicoquillas Creek, is 53 miles by 4 miles, with only one outlet, which is near Lewisburg, Pennsylvania. Particular ridges of this Appalachian Ridge district are usually from 25 to 50 miles long, although there is one that has been traced for more than 300 miles.

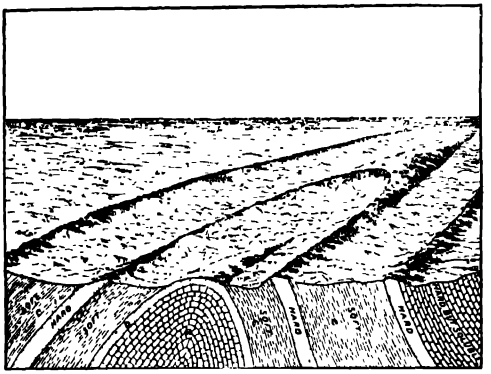


FIG. A

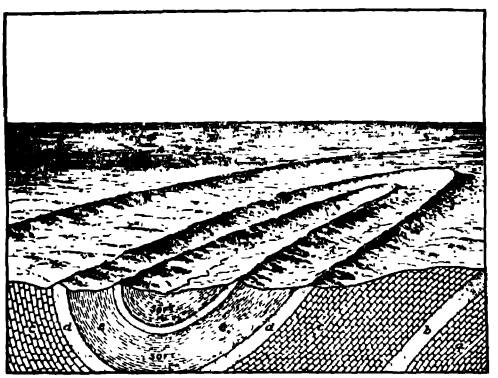


FIG. B

These pictures show how the rocks were folded and then wore away at different speeds to make the "folded Appalachians," the Appalachian Ridge and Valley Region of this book. Note two canoe-shaped valleys. (Courtesy U.S. Geol. Survey)

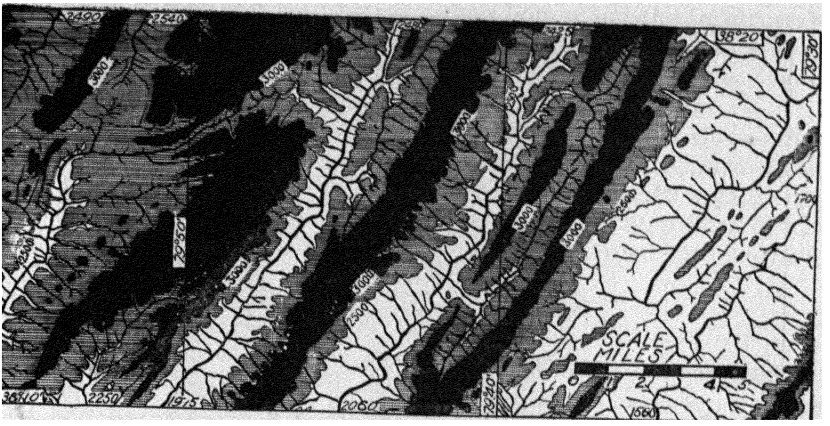


FIG. A. A section of Appalachian Ridge and Valley. Black areas are above 3000 feet; white, below 2500 feet. For location see *y* in Virginia on the map on page 189. (Courtesy U.S. Geol. Survey)

This mass of ridges and valleys has a sharp western boundary at the place where the folding of the rocks stopped, and the beginning of the horizontal formation makes the eastern edge of the Appalachian Plateau. This is one of the most clearly marked plateau fronts to be found anywhere, and is known for hundreds of miles as the Allegheny Front, a steep incline with an ascent of 1000 or 1500 feet from the east. At the top, the nearly level plateau reaches far to the westward.

The chief streams of the region had their locations before the last great uplift started them to cutting out their present valleys. Therefore they flowed across both hard and soft rocks. Some streams have been able to saw their way through the layers of hard rock that remain as mountains, producing such well-known features as the Delaware Water Gap, the gap at Harpers Ferry, West Virginia, and many other gaps, often called wind gaps, in which streams no longer flow. All the smaller streams now run lengthwise of the smaller valleys, giving a trellis effect to the map of the rivers (Fig. 245 A). The district as a whole is therefore a gigantic corrugation, a collection of long narrow ridges and long narrow valleys sharply separated from the neighboring valleys by steep, sharp-topped ridges which often run past county after county without a break. A colored county map shows how uniformly these ridges have become the boundaries of counties in central Pennsylvania.

TRANSPORTATION

Transport is most difficult. The narrow valleys support a few people, but not enough to build or maintain good roads. The winding stream that drains the valley often swings from side to side, so that the main valley road must cross and recross. A few years ago there were 27 such crossings in 30 miles in one valley, and all the crossings were fords which became uncrossable after rain. The cost of 27 good bridges on that stream would have bankrupted all the people in this little valley. The people in hundreds of localities have from

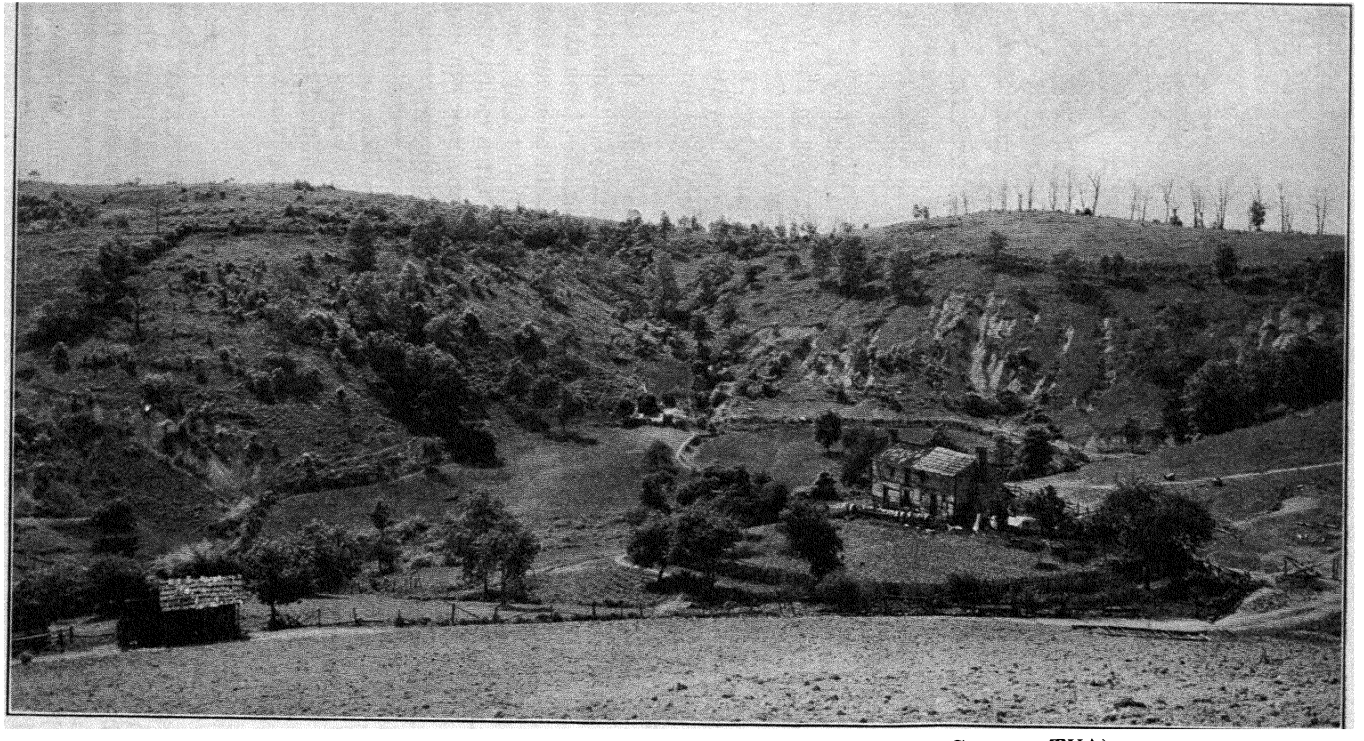


FIG. 246 A. A Ridge and Valley farm in process of ruin. (Courtesy TVA)

5 to 40 miles of such dirt road between their homes and the freight station. For evident reasons most of this ridge and valley country is without railroads except for the main lines which, at great expense, have been built as through lines to reach the plateau or the West.

Fortunately for man, the master streams that cross the whole series of ridges, Susquehanna, Potomac, James, New, and Kanawha, have made it possible for the railroads to get through the ridges in the narrow gaps. Often the track is close to the stream on one side, and cliffs of jagged rock overhang it on the other side. In one section a double-track railroad has one track on each side of the river.

AGRICULTURE

Agriculturally, the Appalachian Ridge Country is the poverty half of the region, the Great Valley to the east being a Garden of Eden in comparison. In the Appalachian Ridge Country the valleys are often so narrow as to be almost V-shaped gorges. There the farmer must wrestle with the slopes of shale hills, or at best find but a small field or two on the valley floor.

All these difficulties of soil and surface seem to be almost a conspiracy of nature against the farmer with his plow and reaper. This is not a land of the big red barn, as is the Great Valley. The soils, usually shale, usually hilly, and of but medium fertility, have in many cases been made very unproductive for grain and grass by unscientific cropping and by washing. As a result almost whole townships are for sale at a few dollars an acre. With these rather dispiriting conditions, many localities have suffered because most of their people capable of leadership have gone to Eastern cities or Western farms or plateau mines. When their natural leaders are gone, neighborhoods stagnate.

Farming is the chief support of the people, and it is upon the whole in a rather decadent condition. Because of the complete absence of cities in most of this area there is no near-by market for hay and milk, as in the Great Valley.[11] General farming, scarcely much more than subsistence farming, is the general rule — some wheat, some corn, some cattle, occasionally some hogs, with a small amount of dairying. Satisfactory dairying requires a scientific agriculture and more dairy cattle than are possessed by most localities in this rather ill-developed region.

In some places there are fortunate exceptions to the general rule. Here limestone formations appear, the valleys widen, and they are rich, like small sections of the Great Valley. A few of them widen out into fertile areas locally famed for their rich farms and prosperity. Thus in southwestern Virginia such a limestone pocket, known as Burkes Garden, is regarded as one of the natural curiosities of the state.[12] In Bedford County, Pennsylvania,

[11] Aside from the anthracite-coal towns, the only cities in this region are Cumberland, Md., Altoona and Williamsport, Pa. They are all close to the Allegheny Front and chiefly dependent upon the pay roll of repair shops on through-line railroads.

[12] This little valley, 5 by 6 miles, has the same limestone formation as the best of the Great Valley. Its splendid bluegrass pastures, like those of other such Appalachian valleys, fatten cattle without a grain ration. "Raising export cattle is about the only industry. It is hard to say what this land is worth, as it is not sold. The only way to get it is to inherit it or marry it, and it is hard for an outsider to do either." — Letter from R. J. Holden, Virginia Polytechnic Institute, Blacksburg.

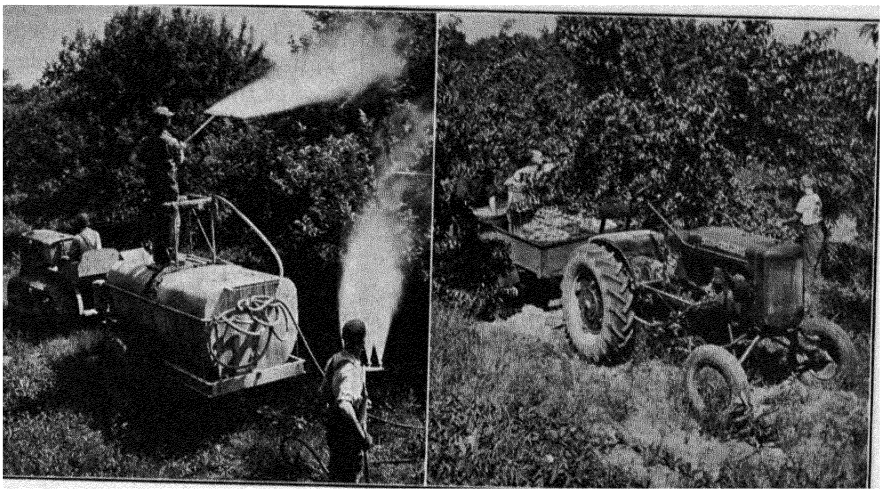


FIG. A. At the left, a cornfield in Appalachia — "the kind of cornfield the mule falls out of." After four or five crops, the topsoil is all washed away. (Courtesy TVA)

another limestone valley occupied by thrifty Quakers, known as Friends Cove, offers a marked contrast to the poverty of some adjacent shale formations of steeper slope, low productivity, soil erosion, and farm abandonment — a feature which in some localities makes the Appalachian Ridge Country a close rival to parts of New England.

The fruit industry is the principal type of commercial farming in the Appalachian Ridge Country, and it enjoys certain distinctive advantages. First, the succession of ridges rising several hundred feet above the near-by valleys affords excellent air drainage (Fig. 245 A). This explains why the peach crops in farmers' orchards on some of these ridges have come with unfailing regularity at times when there has been a great scarcity of peaches because of the general destruction by the cold waves which kill the crops of commercial orchards in less protected locations.[13] Second, the shale soil merging into the rotten, deeply fissured rock is excellent for both peaches and apples; and further, this land sells at much lower prices than orchard land in the Great Valley, western New York, and the Pacific Northwest. Third, the local population offers an adequate labor supply for the spasmodic work of orcharding. And finally, with the gradual spread of the highway network, the motor truck is making more of this section available to the market. Thus far, however, the chief development has been near the Potomac River, where the

[13] Mr. H. W. Miller, operating large orchards on ridges near the Potomac, reports frequent frost damage at 1500 feet, the bottom of his orchards, occasional freezes at the top 2800 feet, and frost immunity between.



FIGS. A and B. The Machine Age comes to the orchard. These two pictures illustrate the horseless fruit industry. Tractor and truck have sent the horse into history on many fruit farms. (Courtesy Allis-Chalmers)

Baltimore & Ohio and the Western Maryland R.R. (as well as trucks) give through service to the East and the Middle West.[14]

On the other hand, there is no reason to expect that orchards will occupy even a large proportion of the soil suited for this purpose. At present the industry is overdone. The reason is not far to seek. The good fruit ridges are so much more extensive than the market for their product that overproduction is the ogre of the peach-grower and the apple-grower. When all the peach districts have a good crop, the price is so low that few make money. Thus a certain fruit farm in the Appalachians shipped a car of Belle of Georgia peaches in the scant year of 1916, and received a check for $1015, while the year before a car of the same fruit from the same orchard did not bring enough money to pay the freight and the commission, leaving the farm with the whole cost of growing, picking, packing, hauling to the station, as an additional dead loss. Unfortunately such happenings are very common — witness the apple crops of 1937 and 1939.

It is a shame that this land of beautiful ridges cannot be put to uses that suit it rather than to uses that gut it. The Swiss example shows us what it may become when we have adjusted our industries to our resources. This land is naturally more productive than that of Switzerland. The climate is warm enough for corn — king of crops. Switzerland has well-tilled valleys, slopes with terraced orchards and vineyards, upland pastures producing cheese from cows and goats, and finally forests that hold the rough land soils and yield wood as regularly as any other crop yields harvest.

While there is no market for great extension of peach- and apple-growing, there is a larger market for meat, and a tree-crop agriculture might be de-

[14] Effective time to New York — by truck, one night; by rail, two nights and a day. No wonder the railroads weep and wail.

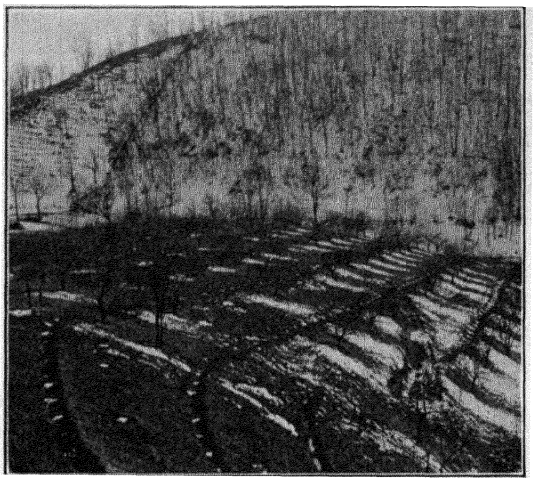


FIG. A. The first objective of agriculture should be farming that fits the land. Mr. Kelley, experimenter, made a plow with a huge shovel. At intervals he lifted it from the furrow. The earth in front of the shovel remains as a dam in the furrow. It holds the rain water, irrigates his orchard - no erosion. Suggestive of a future tree-crop agriculture of wide extent. (Courtesy Charles Kelley, Bristol, Va.)

veloped to furnish food for hogs and poultry.[15] The frost immunity of these shale ridges makes this country peculiarly suitable for tree crops subject to injury by spring frost.

Yet when one considers the steepness, the rocks, and the isolation of so much of the Appalachian Ridge Country, it is apparent that most of the surface is, and should be, in forest. It is unfortunate that much of the forest on privately owned lands is a ruin because of repeated fires. Many fires are deliberately but mysteriously started to burn the young trees so that huckleberries may grow — huckleberry deserts, they should be called. Since huckleberries come best after a fire, every two or three years the fires are expected with the regularity of the returning seasons. Since huckleberries here are public property and waste by millions of gallons, the landless starter of fires gets all the berries he wants for himself and his children (especially the children) to pick. Meanwhile the timber famine looms. Repentance for our foolish policy with forest lands is now showing up — governmental forests appear. By process of tax delinquency the states are getting back the gutted remnants of forests they should never have relinquished. The Federal Government is buying similar lands for national forests and national parks. This promises well for the future, for it seems to be true that even in a democracy governments can care for forest better than individuals can.

ANTHRACITE COAL

Near the place where the ridges merge into the plateau, in the extreme northern end of the Appalachian Ridge and Valley Country, is a concentrated raw material of national importance — Pennsylvania anthracite coal. In certain down-bending strata, the processes of erosion have not yet reached some 480 square miles of anthracite coal, which is but a remnant of a vast

[15] The nutritious mulberry ripens its fruit for ten weeks in summer, and is considered by many Carolina farmers to be as valuable as corn, acre for acre. The persimmon is equally valuable in the autumn. Acorns, beechnuts, and hickory nuts are mast — the natural food of swine in their primeval home and in colonial America.

amount that has long since gone down to the sea.[16] It is expensive to mine, because the bending of the strata has made the coal layers bent and crooked. The great demand from the heavy populations of the Eastern states has built up a great mining industry in the valleys of the upper Schuylkill and the eastern branch of the Susquehanna. Here we have a collection of cities: Scranton, Wilkes-Barre, Plymouth, Pittston, Pottsville, Shamokin, Hazelton, Mahanoy City, and numerous small towns whose sole cause for being is anthracite coal. The total population depending in one way or another upon these deposits is at least 1,000,000 people, many of whom were late arrivals from the Old World. This locality seems to have been one of the great magnets to attract the newly arrived immigrant. In the middle of the nineteenth century the coal was dug by Welsh and Irish miners, especially Welsh. Then came Irish, then Italians, and later east-European Slavs, so that the language spoken in the anthracite region is a mixture like that of central Europe, where the late empire of Austria-Hungary had eleven languages officially recognized.

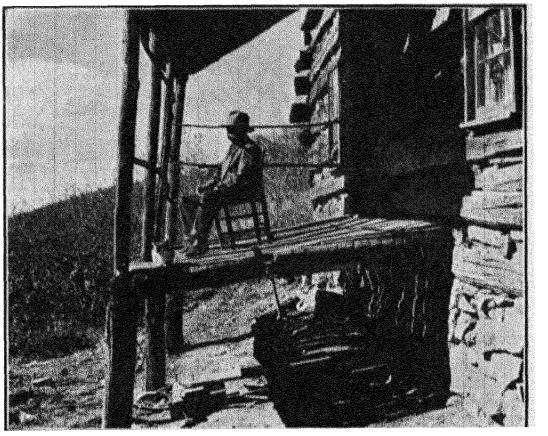


FIG. A. "Sometimes I sets and thinks, and sometimes I jes' sets." The man and the home are gone, and the place is now Shenandoah National Park. (Courtesy Farm Security Adm.)

The 50,000,000 or 60,000,000 tons of freight that come out of these mines each year make the anthracite district a traffic magnet to which seven railroads have been built to carry the precious smokeless house fuel to its scattered market.

Much labor is needed to separate this coal from the slate and prepare it for use. This is done in buildings called breakers, huge structures, tall, gaunt, and black, and rising from a blackened landscape.

A journey through the anthracite-coal district brings forcibly to the mind the name of "robber industry" which Europeans have applied to mining. It destroys, and can neither preserve nor restore. We see this in the great black banks of culm (mine refuse) that encumber the surface of the earth, in the holes which follow the cessation of mining, and in the falling-in of mine roofs. The practice of selling mineral rights separate from the land surface has caused parts of cities to be undermined, to the peril of the buildings above. The earth suddenly opens, and in falls your cellar, your house, your church, your locomotive, your cow, your child, even the bodies of your dead in the cemetery.

[16] The very compactness of this area aided a few big corporations to gain control of the hard-coal industry; likewise, it has made it easy for union organization.

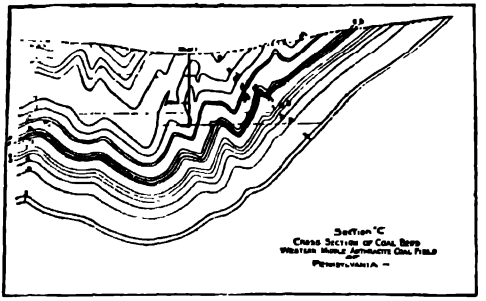


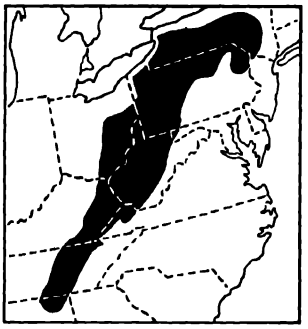
FIG. A. The bent and sloping strata surrounding the coal show why anthracite coal is expensive to mine. Some mines in the mountains of Pennsylvania go below sea level. Erosion has carried much good coal away. (Courtesy Pennsylvania Geol. Survey)

It is estimated that 800,000,000 tons of good coal underlie the town of Pottsville. The Arabs build their villages *outside* of the date-palm oasis.

A group of secondary industries followed the development of mines. Cars, wire cable, and machinery used in the mines are made near by. But the most conspicuous industry aboveground is the textile industry, especially silk. This industry gives work to the women of the families whose male members are engaged in the heavier industries. This complementary relationship of the textile mill and the machine shop and the mine has made Pennsylvania important in rayon and silk manufacturing.

The future of the anthracite town is an interesting puzzle. The mines must be worked out in a few generations. According to some estimates it will be one hundred and fifty years at the *present* rate of production. The most accessible mines were opened first, and the increasing cost of mining the anthracite is causing the output to decline in competition with oil and the cheaper and much more abundant bituminous coal. New devices for the smokeless burning of bituminous coal are aiding in making hard times in the land of anthracite. In the future, the people in the anthracite region must develop other industries or move away. But there is great staying power in established industry, and it should be remembered that these cities are as well placed as many New England cities for manufacturing imported materials.

Chapter 10. THE APPALACHIAN PLATEAU AND UPPER OHIO VALLEY



IF you happen to climb to the top of a high hill in the Appalachian Plateau section of Pennsylvania, West Virginia, or Kentucky, you will see all the way around the horizon many more hills about the same height as the one that you are on. You may also have noticed that the rock strata in the cuts beside the roadway lie upon each other horizontally, almost like the leaves of a book or a table.

Close examination of these rocks will cause you to recognize some of the same strata which had been tipped at all angles in the Appalachian Ridge Country to the east. The folding of the strata in the ridge country helped to make the ridges. The same strata in the plateau were lifted up en masse and tipped a little to the westward, which caused most of the streams to flow in that direction. The new river is an astonishing example of that stream direction.

The plateau hilltops are of the same elevation because they are remnants of the same layer that has remained as the streams carved their valleys, making a *dissected plateau.* Sometimes this dissection of the plateau has made a sharp valley and a steep hill with a sharp top, a landscape difficult for travel and useless for the plow. In other places there may be considerable areas of upland very hard to reach. These undissected parts are largest in Tennessee and North Georgia. Some are large enough to support agricultural communities.

The eastern boundary of the region is formed by the Allegheny Front, which might be called a mountain with one side, extending from Tennessee to Pennsylvania, and includes the steep eastern wall of the Catskills in New York. The western boundary is less definite, because the plateau slopes gently westward and finally merges into the lake plain and the hills of the Ohio Valley.

THE NORTHERN PART OF THE PLATEAU

That part of the plateau which is in New York State and the northeastern part of Pennsylvania is more extensively eroded and lower in elevation than the southern part. Therefore the surface is composed of rolling hills which are no steeper than parts of the Northern Piedmont and, like them, are used for general farming and dairying. This area has been glaciated; it has many small lakes, and certain places have been visited by the glacial curse of stone,

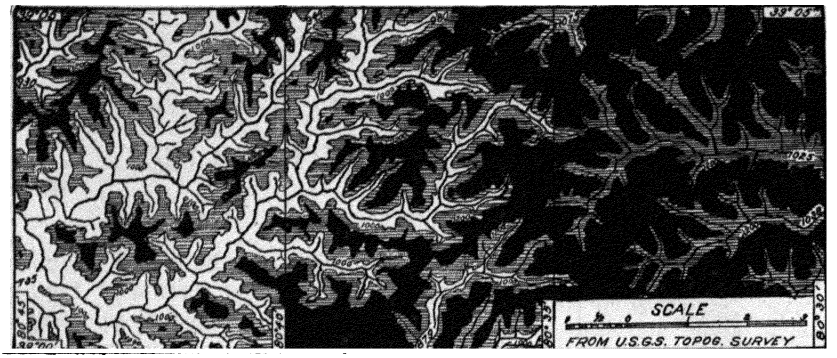


FIG. A. A part of the Appalachian Plateau in West Virginia (see X, Fig. 189). The layers of rock are nearly horizontal. This lets the streams cut their valleys in almost any direction. It is called the dissected plateau. The white area is below 1000 feet, the black, above 1200 feet. All the hilltops have about the same elevation, and the sky line seems to be flat.

See how different is the stream pattern in the area Y, shown in detail in Fig. 189. In that area the rocks are tipped up so that the streams cut long valleys in the areas of softer rocks. This leaves the hard rocks to stand up as ridges. This is called differential erosion, and it has made thousands of valleys and thousands of hills and mountains. The ridges in Fig. 245 have tops that are nearly horizontal.

A detailed map on page 276 shows how the rocks that have no regularity of form or position wear away into mountains that have no regularity of pattern or height. The mountaintops in Fig. 276 are very irregular in height.

though not so extensively as New England. Like New England, its chief dependence is on the pasture, the hayfield, the silo, and the dairy cow.[1]

Express trains carrying only milk run from the New York part of the plateau to the great city markets. The map of creameries and cheese factories shows a surprising number of these plants. Butter declined in 1929–34, but cheese held its own. A rough country which has much pasture but little tilled land is admirably suited to the cheese industry. Milk and butter dealers require a regular supply throughout the year, but cheese, because it keeps well, can be made in the summer season while the cows are at pasture, and stored for future use. It is interesting to find this development of the plateau industry here; it is a response to environment like the extensive cheese industries of certain mountain districts of Europe, such as Switzerland.

About half of the nation's supply of buckwheat is grown in the northern part of the plateau. This crop is peculiarly suited to a cool climate and rough or poor land. It has great ability to feed, which means that it can make a crop on poor soil. Buckwheat grows so quickly that it can be planted after a late May or June frost has killed the corn of an earlier planting, and still mature.

This Northern Appalachian Plateau is crossed by three New York-to-Buffalo trunk-line railroads — the Lehigh Valley, the Delaware, Lackawanna & Western, and the Erie. These roads carry anthracite coal and the com-

[1] We see a resemblance to New England in 18 contiguous abandoned farms in northeastern Pennsylvania in 1921. This fact helps to bear out New York State's reported loss of 4% of the farming population in one year (1920) of exceptionally prosperous city wages. It also suggests why the farm-management experts at Cornell say that more of the farms should be abandoned. The National Resources Board concurs in this (see Fig. 3 A, and map, *National Resources Board Report*, Dec. 1, 1934, p. 16).

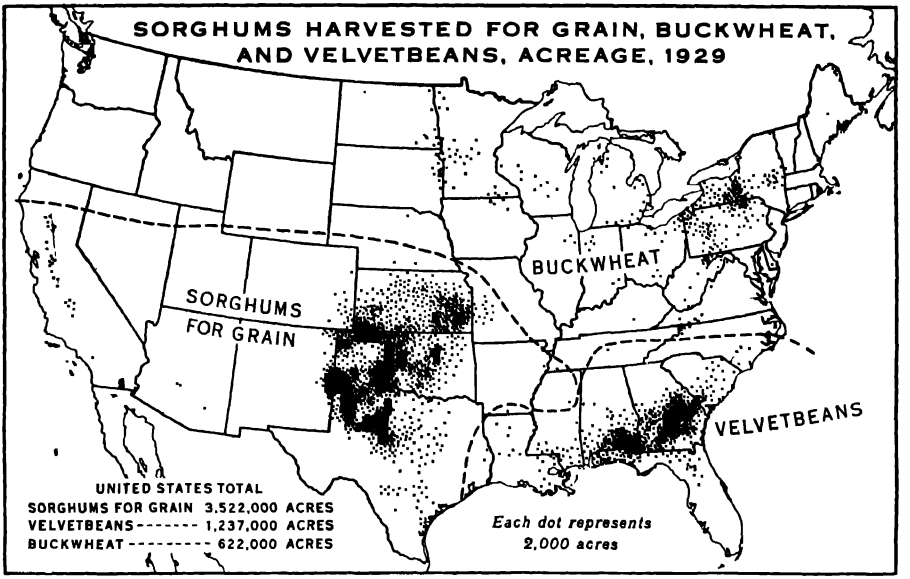


FIG. 255 A. Buckwheat resembles a goat in being able to stand hard conditions; therefore it is a plateau crop. (Courtesy U.S. Dept Agr.)

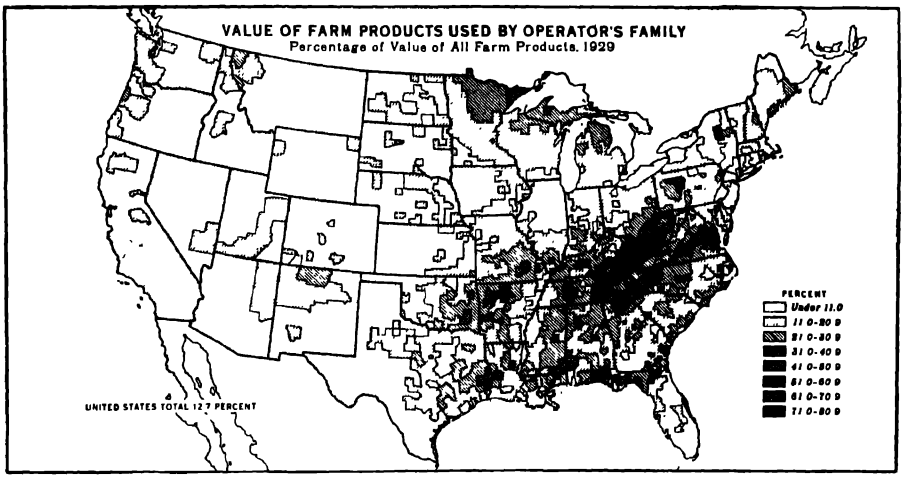


FIG. 255 B. On subsistence farms most of the crops are used by the family during the year. On commercial farms the larger part of the produce is sold. This is one measure of the low income which unfortunately characterizes these Southern mountains. Note also the Ozarks. (Courtesy U.S. Dept Agr.)

merce of the two leading cities, Elmira (pop. 47,000) and Binghamton (pop. 77,000). Elmira is known for its manufacture of typewriters and fire-fighting apparatus.[2] Within the metropolitan area of the "Triple Cities" — Binghamton, Endicott, and Johnson City — live about 130,000 people, three-fourths of the workers being employed in the factories of the Endicott-Johnson Shoe Company. In this great shoe-manufacturing community, plant specialization, task specialization, and an industrial democracy conducive to good employer-employee relationships have been perfected to a high degree.[3] Binghamton is also known for its camera and photographic supplies, in the manufacture of which it ranks second only to Rochester.

THE CENTRAL AND SOUTHERN SECTION

In north-central Pennsylvania one sees the sharp-valley and pointed-ridge type of landscape. The rough land has remained uncleared. On one 44-mile trail between the Pennsylvania towns of Bradford and Kane there were but two houses in 1920. In this section of cutover and burned forest the only recent industrial change worthy of mention is the effort of state and nation to care for the young forest, which, after being gutted, has passed back to government ownership.

This dissected plateau of sharp valleys and steep hills extends southward through West Virginia, Kentucky, and Tennessee. In Tennessee the streams have not eaten their way into all of the plateau and therefore part remains as a tableland, although it is flanked and shut off by many miles of sharp valleys. This steep land of Southern Appalachia is heavily peopled considering its resources and life conditions. South of central West Virginia isolation is the great dominating factor of much of the mountain country. This isolation is both internal and external, an isolation promoted by rugged topography, the absence of navigable streams, and the lack of even ordinary roads. Valley is separated from valley, and the story is told of funeral services being held for a man twelve years after he died, that being the first opportunity of bringing his kinsfolk together. Many a mountaineer family has never seen a railroad. Here one finds true subsistence farming, and pioneer customs that date back to the first frontier. The isolation of many generations has given the people a distinctive character.

As everyone knows, the Southern Highlanders are an interesting people. It is not easy to establish definitely the lines of their ancestry, but the follow-

[2] Elmira is also known as the "Glider Capital of America," for each summer the National Soaring Contest is held there, attracting skilled gliders from this country and abroad.

[3] The original factory was located in Johnson City in 1890. In 1936 22 shoe factories belonging to the company produced about 37,000,000 pairs of shoes; 6 tanneries processed about 60,000 hides weekly; and 2 rubber plants turned out 425,000 pairs of rubber soles and 650,000 pairs of rubber heels a week. One factory specializes in infants' and first-step shoes; another, in misses' and children's shoes; another, in the production of athletic and rubber footwear. So minute and so efficient is the division of labor within a factory that the average output per worker is 18 pairs a day. The company's welfare program is very comprehensive, including assistance to workers in building attractive homes, company hospitals, health clinics, recreation fields, a country club, a dance pavilion, a casino, old-age pensions, insurance plans, etc. The average annual wage of workers in 1935 was about $1350.

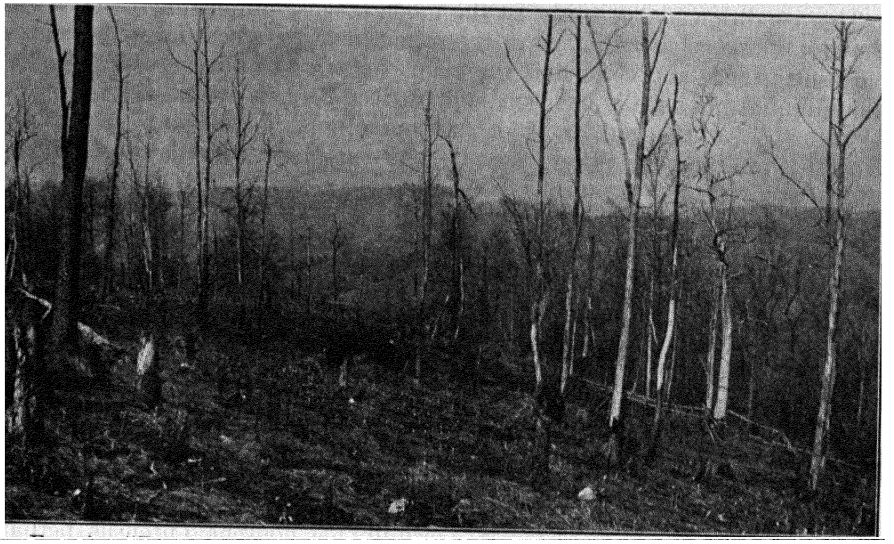


FIG. A. "Deadenin'" a new field. This still goes on in communities where wood cannot be transported. (Courtesy U.S. Forest Service)

ing opinion of Mr. Cecil J. Sharp, the English folk-song specialist, is quoted by Mr. John C. Campbell.[4]

Perhaps Mr. Sharp's designation "Anglo-Celtic" may be a name under which can unite the contending forces that have arrayed themselves as supporters on the one hand of the claim to Scotch-Irish blood, and on the other to Anglo-Saxon lineage — meaning thereby pure English. Without doubt these two elements are the strongest in the mountain population, though the Highland people are not different from the Lowland Southerners in this respect. The Scotch-Irish strain is strongest in some mountain sections; the English in others.

When these people emigrated to this continent, many of them landed at Philadelphia and later pushed their way along the Cumberland Valley into Maryland, then up the valley of the Shenandoah and into southwestern Virginia. Then they pressed beyond the Cumberland Gap and gradually took possession of much of Southern Appalachia. As Bishop Burleson well puts it:

Most of them broke through the barrier of the mountains and founded new commonwealths in Kentucky and Tennessee. But some stopped in the mountains. A horse died, a cart broke down, a young couple could not leave the little grave of their only child; fatigue, illness, the lure of the mountains — now it was one thing and now another; but when the host had passed, there were scattered dwellings being reared among the great hills, and a few hundreds — progenitors of many thousands — had begun a course of life which was to continue unchanged for generations. They came in poor . . . and they are today the poorest people in America. As in all races, there are different grades among them, ranging from the fairly well-to-do farmers along the river valleys to the squatters in the cabins on the high mountains, where the cultivated land is often so steep that the harvested crops can only be brought down in sleds.

[4] *The Southern Highlander and His Homeland*, Russell Sage Foundation, 1921.

This condition makes trade, in the modern sense, impossible.[5] Therefore the mountaineer has remained in the primitive stage where farming yields a bare subsistence and condemns the people to a life of poverty. The poorer mountain farmer usually has woodland, a steep field or two fenced with rails, a cabin to live in, a gun, an ax, a homemade plow, a rude wagon, or, if the ground is too steep for wheels, a sled. The usual farm animals consist of one or two oxen, a cow, some pigs and sheep that run in the forest. If the family is more prosperous, it may have a horse or two.

In this environment there is no chance to sell a few bushels of corn, but corn made into whisky is a source of income. Therefore the United States internal-revenue tax on whisky threw the mountaineers of western Pennsylvania into armed rebellion in George Washington's first administration. They fled from the United States Army, but they kept on distilling, and have waged ceaseless guerilla warfare against the revenue officers.[6] The mountaineer receives a great ovation from the neighbors when he returns from the penitentiary after serving time for shooting a "revenooer." During the long, dry years of Prohibition (1920–33) there was a considerable boom in the illegal moonshining and bootlegging business.

The mountaineer woman often has pitifully few household utensils, perhaps no stove; she may even yet be using the spinning-wheel, for if you have nothing to sell you cannot buy, and therefore you must make what you have or else do without.[7] Actual figures from Brasstown, North Carolina, and other places showed that in the 1930's the better families of several sections had less than $100 cash per year. Much of our American standard-of-living talk is *cant*, veriest cant.

This is a land of fried pork, fried squirrel, and cornecakes or corn pone and beans. Corn is the mainstay. It is the chief crop, almost the only crop, of thousands of these mountain farms.

For the most part, pre-Revolutionary ideas remain where the mode of life is pre-Revolutionary. In most places books and newspapers have killed out

[5] The following direction for a journey shows the importance of streams in travel and transport. "From the 'college' go down Greasy six miles to the mouth of Rockhouse; go up Rockhouse and take the right fork over the mountain; across Wolf and Coon to the headwaters of Cutshin; down Cutshin, fording three times; up Flacky, across a right rough little hill to the head of Owl's Nest; down Owl's Nest to Middle Fork, and up Middle Fork a piece to a deep ford; ford the river, and you are at the place you are aiming at." — John C. Campbell, *op. cit.*, p. 36.

The fact that roads are so often in or along the streams is a great bar to travel. Any rain may keep the children home from school by flooding the roads.

[6] In Knoxville, Tenn., Revenuer Sam McKinney, after raiding nine Cocke County stills, received a tearful letter: "In rades made last two weeks you got our forth licker, one forth our pots and barls. So plees let us alone awhile til we get good start again. We want work. Wer ashamed to beg. Wer afrade to steel. We can't starve. So plees let Cocke and Cosby rest 10 days til we get started again." — *Time*, July 10, 1939, p. 68.

[7] For vivid and accurate pictures of geography and people of the mountains, see the novels of John Fox, Jr. — *Bluegrass and Rhododendron*, Charles Scribner's Sons, 1901, *The Trail of the Lonesome Pine*, Charles Scribner's Sons, 1908, and others. Other interesting sources are: Horace Kephart, *Our Southern Highlanders*, Macmillan Company, 1913; John C. Campbell, *op. cit.* — the work of a sane and sympathetic missionary; Mary Verhoeff, *The Kentucky Mountains, Transportation and Commerce 1750 to 1911*, John P. Morton & Co., Louisville, 1911 — a mine of information; E. C. Semple, "The Anglo-Saxons of the Kentucky Mountains: A Study in Anthropogeography," *Geographical Journal*, June, 1901, pp. 588–623 — excellent, and still true for a few places.

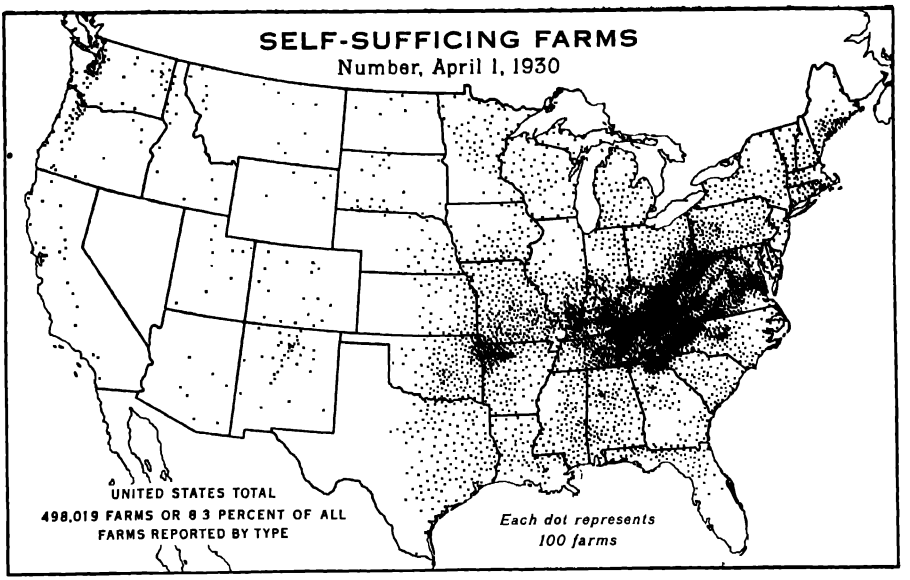


FIG. 259 A. Compare the mountain farm, the Maine potato farm, the western Kansas wheat farm, and the Florida or California orange farm. (Courtesy U.S. Dept Agr.)

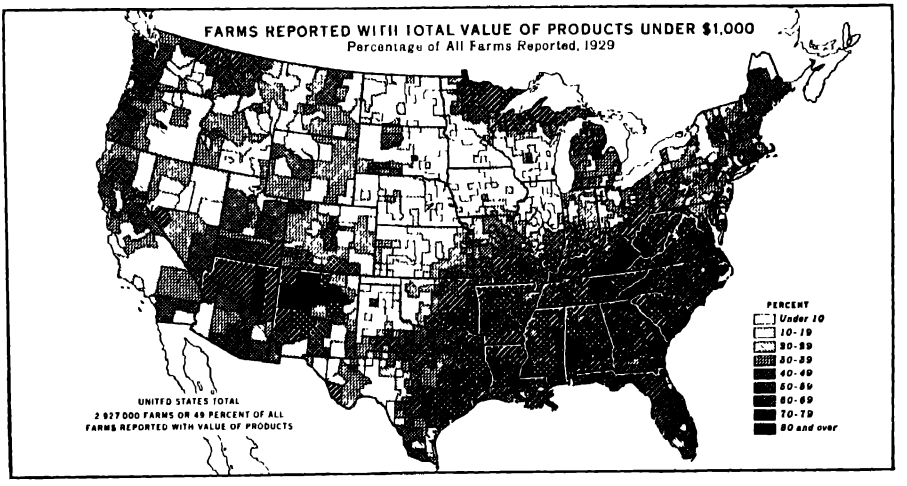


FIG. 259 B. This map would make a good examination question for those studying this book. (Courtesy U.S. Dept Agr.)

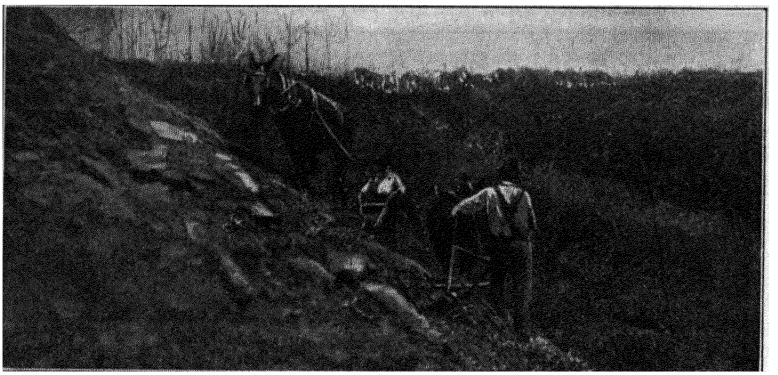


FIG. A. If you live in a one-crop country, and that crop is corn, and you must grow it on hillsides like this, poverty is explained — and also "corn licker" and a century of strife with the revenue officer. (Courtesy Olive D. Campbell)

the age-old practice of singing ballads, but the collectors of this form of folklore have made in Southern Appalachia a rich collection of Elizabethan song. Shakespearean language, long in disuse in England and in the Atlantic Coastal Plain where these people once lived, survives in Appalachia. So many customs of the past live in the present time that the people have been well called "our contemporary ancestors."

The private rifle is still used to settle personal difficulties, and family feuds, with plenty of killing, still survive.[8]

As a supreme example of the influence of isolation on ideas consider the following: In the fall of 1922 a schoolteacher was dismissed in the heart of this region for teaching that the world was round. It was proved to be "agin Scripture." The school board upheld the teacher, but some of the mountain families took their children out of school. The young man had to go. Nor should one forget the Tennessee law against the teaching of evolution, and the Scopes trial of 1925, for this is a land where a man's a man, and not a monkey.

Illiteracy is high in the Southern Highlands, but illiteracy does not prove anything about one's brain capacity. We were all recently illiterate, and

[8] To get the spirit of the feudist, reread Scott's "Lady of the Lake," and remember that many of the Allegheny Plateau people are Scotch. The following story shows the feudist — at his best and his worst: In the first few years of this century one of the many old feuds of the Kentucky mountains broke out afresh more than 40 miles from the nearest railroad station. Within a year 100 men had been shot. About this time one of the young men, named Burns, had managed to go away and get six months of schooling and then, despite lack of preparation, a year in Dennison University. He went back home, called together at an appointed place 20 men of his clan and 20 men of the other clan. They met armed to the teeth, young Burns standing between them. A wrong gesture or tone might have caused the death of a dozen men on the spot. But there was no shooting — instead, Burns persuaded them to start a school. Twenty years later the school had 1200 acres of land and was in a prosperous community. Feud fighting there has stayed down because education has put it down, and all because of the enthusiasm and energy of one man working with a neighborhood of brave high-spirited people — honorable after their own code. It is a great and inspiring story as Burns told it on the lecture platform in the 1920's. — Information from Paul M. Pearson

furthermore, gentlemen are born, not made with print. Friends of the mountaineer state it thus:

> It is the fatal fallacy of a public-schooled world that literacy is counted the earmark of civilization. The keenest intelligence, the sweetest behavior, the most high-born distinction of manner are gifts of the gods to those who can neither read nor write. A dear mountaineer friend once said: "We-uns that caint read or write have a heap of time to think, and that's the reason we know more than you-all." [9]

If the time ever comes when the requirements for citizenship are based on intelligence rather than information, perhaps these people will make a better showing than the multitude in cities who have just enough education to read cheap dailies.[10]

The missionary spirit of other parts of the United States (chiefly the North) is sending nearly $1,000,000 a year to the Southern Highlands in the attempt to give the people an opportunity for education.[11]

Some of the schools, particularly the older schools and those of the type called church schools, might, without much exaggeration, be cited to prove lunacy, or at least the profound limitations of the so-called educated person. One such school was founded shortly after the Civil War by alumnae of a certain illustrious New England institution. It taught a straight classical course, and in forty years sent not a single graduate back to the mountains. It is just too bad that these well-meaning Yankee teachers could not have read Herbert Spencer's essay on education. The concept of fitting a man to live in his environment guides most of the more recent schools.

For example, a school at Madison, Tennessee (near Nashville), teaches mountain girls elementary education and cooking, dietetics, and the elements of home nursing. In connection with the school is a sanitarium. The boys earn their way by working on the farm, learn farming, the care of milk goats, and cheesemaking and buttermaking. These young people often take goats back to the mountain and start local schools similar to the school at Madison. Berea College at Berea, Kentucky, founded in 1855, is doing much on the college level.[12]

At Pine Mountain Settlement School in Harlan County, Kentucky, the fireside industry of weaving has been revived.

> Every blanket copied from some old pattern is a hand-made product. The wool is sheared, washed, carded, and spun by hand, and colored by our children according to ancient recipes, from bark and roots which our forestry boys have gathered by forestry regulations. Our brown from walnut, our hickory yellow, the soft pink of

[9] Ethel de Long, "The Far Side of Pine Mountain," *Survey*, Mar. 3, 1917, pp. 627–30.

[10] Roland H. Harper, *Distribution of Illiteracy in Alabama in 1920*, author, University, Ala., 1939.

[11] In 1917 the senior author met the late Cecil J. Sharp, director of the Stratford-upon-Avon School of Folk Lore and Folk Dancing. He was at Knoxville, Tennessee, just back from the mountains, joyful over a book full of new ballads, copied down as people had sung them to him. "These missionaries with their schools!" he exclaimed indignantly. "I'd like to build a wall about these mountains and let the mountain people alone. The only *distinctive culture in America is here.* The people *live.* They sustain themselves on the *meanest* food. They are not interested in eating but they have time to sing ballads."

[12] "What a contrast between the eager, penniless, self-help students there and the ones who lie in the lap of luxury and come to your classes and mine." — Private letter

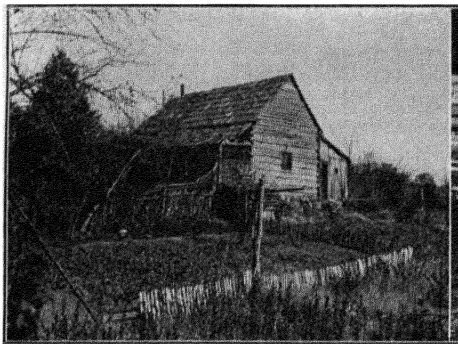


FIG. A. Home in the Land of Do Without. The logs are hand-hewn, the shingles hand-riven, so is the fence. On such a farm there may be no wagon. (Courtesy TVA)

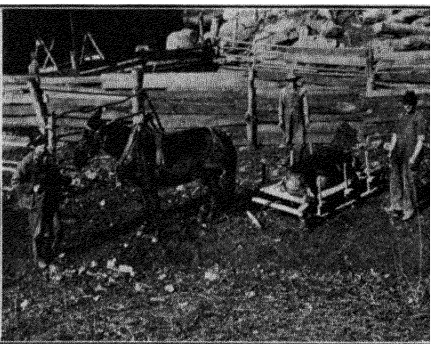


FIG. B. "Hawg-killin" is a very important festival event, especially on the farm that has no wagon. (Courtesy TVA)

"spruce pine" and many others have come out with a fair degree of success. The story of the search for the famous blue of the Kentucky Mountain coverlet is a complete one in itself, and must wait for more space in another issue of the *Notes*.[13]

Within the last two or three decades the isolation and provincialism of these Southern Highland people has been gradually disappearing. The coming of Uncle Sam's postman with rural free delivery, the World War draft that drew

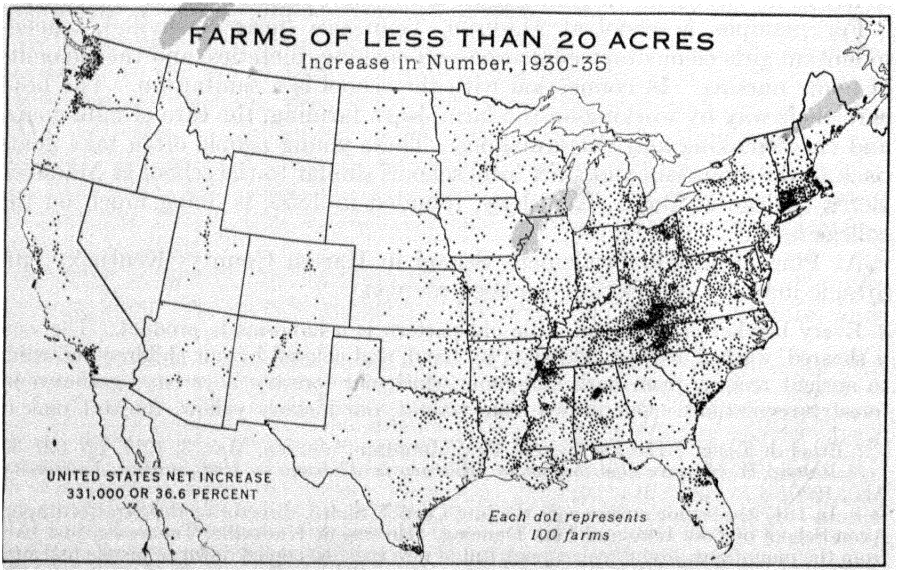


FIG. C. This map might well be labeled "Victims of the Depression." (Courtesy U.S. Dept Agr.)

[13] Quoted from *Notes from the Pine Mountain Settlement School* — a leaflet containing many interesting facts of contemporary life which can be secured by addressing the school at Pine Mountain, Harlan County, Ky.

many a mountaineer marksman into a "civilized" world, the penetration of the mountain country by profit-seeking lumber and mining companies needing labor, the gradual increase of public highways and public schools — these have served to bring about a change, but the statements here are still true of far too many people. While the islands of isolation in the Southern Highlands are gradually shrinking, even now one does not have to trudge so many miles from the beaten paths of civilization, as we know it, to discover economic and social conditions almost as they were a century ago.

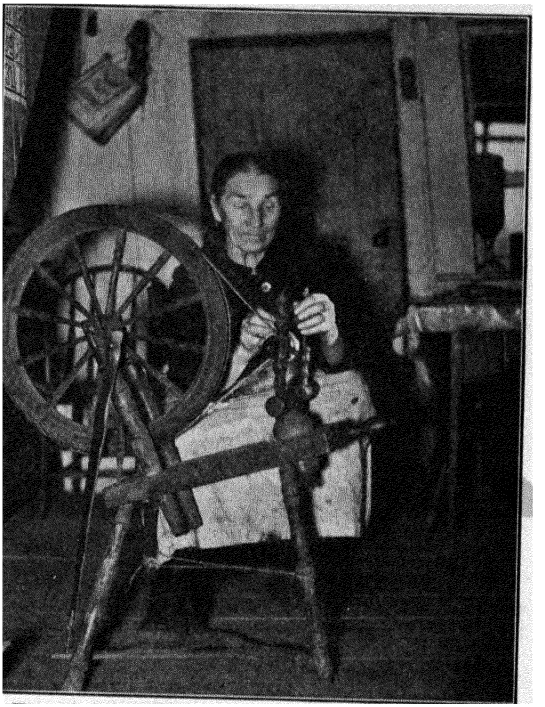


FIG. A. An Appalachian mountain woman. If you have nothing to sell, you must make, beg, or do without, and the Appalachian mountaineer, though poor, is no beggar. (Courtesy Farm Security Adm.)

Since the first edition of this book was written (1925) a missionary friend of mine was taken to see an old bedridden man. The missionary's companions told the old man of the progress the visiting lady was making at learning to card and spin wool.

"I didn't s'pose ther was ary woman in the whole world didn't know how to kyard 'n' spin."

Now unscramble the cultural and industrial implications of *that* remark.

FUEL AND POWER

The Allegheny Plateau should have been called the Plateau of Vulcan. In no other place has nature made such variety and wealth of fuel. On the hills are (or were) fine forests; on the hillside are outcrops of coal; the rocks when pierced released natural gas and petroleum. Here indeed is the basis for a rich materialism; here is the potential power house of the richest nation in the world.

Coal underlies most of the plateau from Alabama almost to the northern edge of Pennsylvania. Pennsylvania alone has nearly 15,000 square miles of bituminous-coal land, and that is less than half of this Appalachian coal field. The oil field extends diagonally down the Allegheny Valley and on past Pittsburgh into West Virginia and Kentucky. Oil was found in the Allegheny Valley in 1859, and that was the beginning of the world's petroleum industry.

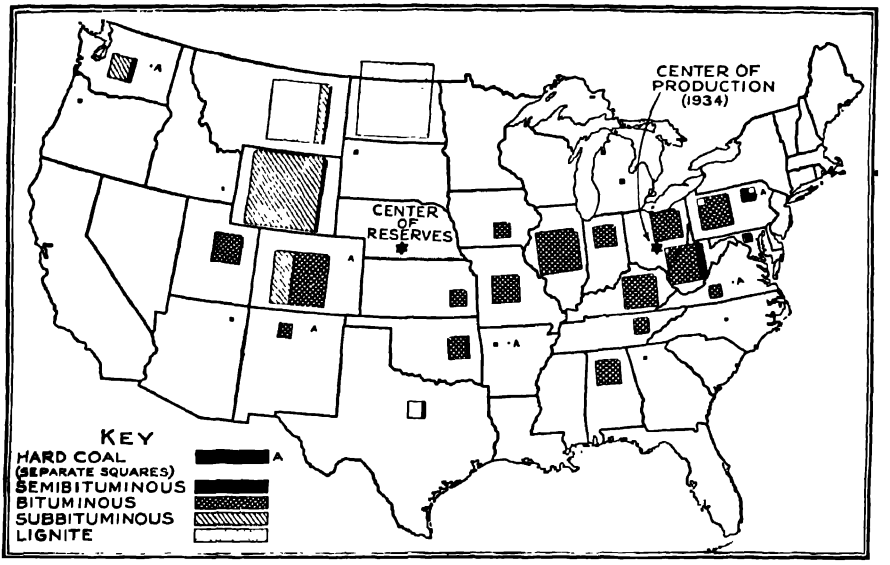


FIG. A. The location, kind, and relative amounts of our coal reserves. Note where they *are* and where they *are not*. The small white areas at the corners of the rectangles represent the proportion already used. (Courtesy Nat'l Resources Board)

Unfortunately an oil deposit is only a temporary resource; Pennsylvania, once the leader of the oil-producing states, has long since been surpassed. Oil fields where men feverishly made their millions are now scenes of desolation and decay. Gas wells that once hissed forth their millions of cubic feet per day have breathed their last and no longer deliver that most usable of all fuels.[14]

At present the southwestern extension of the field in West Virginia is productive of both oil and gas, which are piped to near-by cities and to points as far away as Baltimore. The combination of oil, gas, and cheap coal gave western Pennsylvania an era of cheap fuel, an era that will neither return nor be duplicated elsewhere. We of the United States have indeed been a fortunate people — if natural riches be the measure of good fortune; especially fortunate that our resources run in three dimensions — length, breadth, and *depth*. Appalachian fossil fuels have played a mighty role in the economic development of the United States.

The coal in this Appalachian field is very easy to mine, because the seams are nearly horizontal, and over much of the area they are above the stream

[14] "The discovery of gas in and about McKeesport in September, 1919, started one of the largest gas booms in the country, some wells totaling as high as fifty million cubic feet per day. Nearly a thousand wells were sunk; so many, in fact, that the valuable gas pool, underlying this city and environs, was drained in a year's time, there being but a few paying producers at the present time." — Letter, McKeesport Chamber of Commerce, Nov. 16, 1920. We can appreciate this gift of the gods better after figuring on these facts — 1,000,000 B.T.U. (British Thermal Units) = 1000 cu. ft. of natural gas = 6.94 gallons of petroleum = 83.3 lbs. of coal = 1600 cu. ft. of coal gas = 6849 cu. ft. of producer gas from bituminous coal.

levels and therefore outcrop in the hillsides.[15] In many places the mine car runs horizontally into the side of a hill, and when loaded it runs out and down to the railroad or even to a boat at the foot of the hill. The famous Pittsburgh coal seam is reached by going upgrade by railroad in any direction from Pittsburgh.

Mining has had the earliest and greatest development adjacent to the headwaters of the Ohio River for two reasons: nearness to the great centers of population, and geologic and transport accessibility. The Ohio River and its tributaries in carving the valleys have made the best of natural highways to the coal fields, and they also provide a means of transportation for many miles within them. The Ohio River, which gave early access and early development to this coal field, still carries coal to ports on the river as distant as New Orleans.

Traffic on the Ohio and the Mississippi cannot compare with such swollen arteries of commerce as the Rhine and the Yangtze Kiang. The American shipping public turns to the railroad and the motor truck to haul its freight. As freight traffic increases and congestion appears, we may turn again to our inland waterways for the economical transportation of a much larger portion of our heavy and bulky commodities.[16]

IRON

Not far from Pittsburgh there is a layer of coal that is known as Connellsville coal. It is the best coking coal in America, perhaps in the world, and especially when used in the old-fashioned beehive oven, which was the only device used in this country before 1900. The unusual excellence of this coke for making iron gave Pittsburgh an advantage at that time over all other

[15] DAILY PRODUCTION OF COAL PER MAN UNDERGROUND
(tons)

	U.S.A.[a]	*Nova Scotia*	*United Kingdom*	*Ruhr Valley*	*Belgium*	*Japan*[c]
1901	3.37	2.74	1.50	1.22[b]	0.84	0.73
1929	5.42	2.55	1.48	1.71	0.93	0.70
1933	5.37	2.79	1.62	2.38	1.00	0.88[d]

a. Bituminous coal only. *b.* 1901 data for Prussia. *c.* Includes all workers, underground and surface. *d.* 1932 data.

[16] The heavy industries of this plateau produce an amount of freight which is almost inconceivable. A maximum cotton crop of 18,000,000 bales, 500 lbs. to the bale, weighs less than 5,000,000 tons, a figure that is less than half of the coal and iron-ore trade of the small lake port of Ashtabula in the year 1907. The greatest wheat crop ever grown in the United States was less than 35,000,000 tons, while eight times that much bituminous coal is mined in the Allegheny Plateau each year. In years of good business, the total railroad tonnage of the Pittsburgh district alone varies from about 160,000,000 to 175,000,000 tons annually. In this we see a reason why there is a demand for the improvement of our rivers and waterways, including one from the upper Ohio to Lake Erie. Some of the steel companies have gone back to the river to move their materials. In 1926 the Pittsburgh district shipped 40,000,000 tons of freight by river and 174,000,000 tons by rail; in 1929, 34,000,000 tons by river and 162,000,000 tons by rail; and in 1933, 17,000,000 tons by river and 69,000,000 tons by rail.

iron centers, and since there were limestone and iron ores near by, it is easy to see why this city became the greatest iron-manufacturing city in the world.

Pittsburgh is now losing its advantage over other places. A new method of making coke in by-product ovens makes good coke out of many kinds of coal. As a result Johnstown (pop. 67,000), in the plateau east of Pittsburgh, now makes good coke and good iron. Pittsburgh's exclusive advantage also waned when it was found (1884) that it was cheaper, even in Pittsburgh, to make iron from the very rich iron ores from the western end of Lake Superior than it was to use the poorer local ores. These Lake Superior ores are now almost exclusively used for making iron in western Pennsylvania and eastern Ohio. Almost any place between Pittsburgh, Buffalo, and Chicago where the coke of Appalachia or Illinois and the ore of Lake Superior can be brought together is now about as good for making iron as is Pittsburgh itself. Youngstown, Ohio, is said to be a slightly better spot. The Lake Shore points are better, because one less handling of the ore is required.[17] As early as 1907 the town of Ashtabula on the shores of Lake Erie, halfway between Erie and Cleveland, received 8,500,000 tons of iron ore and shipped back 3,000,000 tons of coal to the Upper Lake ports. The iron and steel industry in the Ohio towns on or near Lake Erie has grown much faster since 1904 than that of Pittsburgh. In twenty-five years, 1904–29, the value of iron and steel products of Pittsburgh increased by only 24 per cent, while that of Ohio more than quadrupled in value. Blast furnaces are increasing in importance in McKeesport and Sharon, Pennsylvania, Youngstown, Ohio, and especially in the cities on the shore of Lake Erie. Fewer workers, smaller pay rolls, empty houses, characterize Newcastle and Johnstown, Pennsylvania, and other small cities of iron and steel in this region. Why? A new continuous-process type of rolling mill has been introduced, one needing fewer workers than the type in use a decade ago. The building of the plant sent orders to machine-building plants, but those were in some other city. The iron and steel industry in various forms is also to be found in the Ohio River towns of Wheeling, West Virginia (pop. 62,000), and Ironton (17,000) and Portsmouth, Ohio (43,000).

The traffic conditions of the Pittsburgh district furnish a modern example of a permanent geographic fact. The plateau is a barrier. From central Pennsylvania southward all natural routes of travel, all railroad lines, are in the bottoms of sharp valleys. Here then must be the assembling-points for materials and the natural location for towns, and they are very cramped locations.

Pittsburgh, like almost every other plateau town, is in a gulch, or rather in a junction of gulches. Where the Pennsylvania R.R. enters the city, a blank retaining wall as high as a six-story building keeps the shale rock from falling on the tracks. At the top of this wall is a street, and beyond the street is

[17] No longer is it true that it takes 2 tons of coal to smelt 1 ton of iron ore, for technological improvements have reduced the ratio to about 1 to 1. The old saying that "iron moves toward coal for manufacture" still holds true, not because of any saving in transportation charges on iron ore but because the coal supplies are located near the great industrial markets of America. In general, it is a movement of iron ore toward the market. The recent tendency to locate blast furnaces and steel plants at the Lower Lake ports will be discussed in a later chapter.

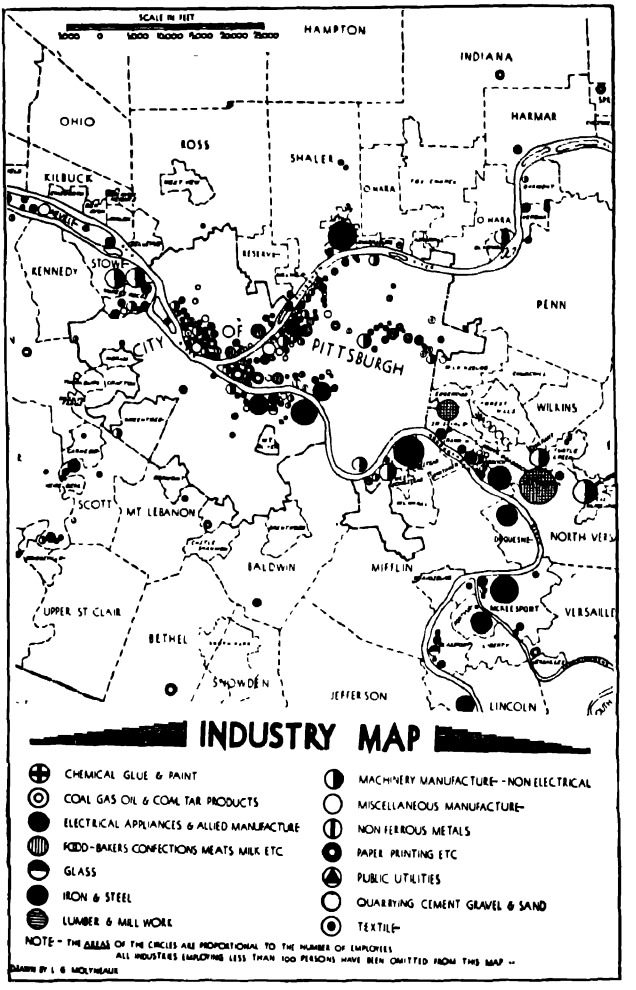


FIG. A. This map shows how the sharp valley topography jams heavy industry into narrow valleys ready for soaking when floods come. (Courtesy Pittsburgh Comm'n for Industrial Expansion)

another retaining wall. At the top is the upper city, to which elevators and inclined planes carry people from the lower city. This is typical of plateau townsites.

Now look at the freight situation. The railroads *must* follow streams. Since all stream-bank locations were already pre-empted by tracks and buildings, a newcomer, the Wabash R.R., tried to get into Pittsburgh without coming in along the stream. The attempt cost $35,000,000, and failed because cost prohibited its completion.

The map shows that the north and south branches of the Ohio River bring all railroad routes in western Pennsylvania through Pittsburgh, which has

often been choked with freight in periods of industrial prosperity; and building more tracks means terrible expense. Thus do the sharp valleys of the plateau harass alike the cabin mountaineer and the master of millions and machinery.

PITTSBURGH

Many are the factors that have contributed to the industrial growth of Pittsburgh. In pioneer days Pittsburgh, first called Fort Duquesne and later Fort Pitt, held a strategic position of great military and commercial importance because of its location at the junction head of the Ohio River. In early times it became a transshipping-point between the traffic that came across Pennsylvania by wagon and the river traffic on the Ohio. During the canal era Pittsburgh grew slowly, for it had no canal to connect it with the seaboard, as did Buffalo. It was the railroad, together with the discovery of the Bessemer and open-hearth processes, that proved to be the Open Sesame to industrial progress and enabled Pittsburgh to exploit its inherent advantages on a large scale. As a consequence, local deposits of iron, near-by Connellsville coke, railway facilities and water competition that kept railway rates low, cheap access by rail and water to the rich and easily worked deposits of iron ore at the head of Lake Superior, nearness to the great industrial markets of the country, and, not least, the formation in 1901 of that great industrial giant, the United States Steel Corporation — these have combined to make Pittsburgh the steel capital of North America. In particular, it should be emphasized that Pittsburgh lies at the very doorstep of the large industrial markets of America, near the heavy industries that must have large amounts of steel and coal, a factor of no small importance.

Pittsburgh and the mill towns in the various valleys within 30 miles contain about 2,000,000 people. Industrially this is a land of fire. Study the Pittsburgh district and you will have a mental picture of miles of coal cars, of burning coke ovens, smoke, dust, sweat, black hillsides, collieries, mine-conveyors, railroad tracks, blackened steel plants, flaming furnaces, white-hot metal pouring, red-hot metal cooling, heavy rolls pressing red-hot plates with a roaring noise, shears cutting the plates into pieces, giant cranes lifting and dropping them with a clang. Highly perfected machinery replacing man's labor adds to the impression that here is a kind of mechanical volcano, if not indeed an inferno. When one rides on the train at night past the fires of countless coke ovens, the region seems truly a land of fire.

Pittsburgh is an important center for the manufacture of electrical and other machinery. This was a very natural step in the development of a city which must use so much heavy machinery in its industrial plants and distribute it also to many near-by mines. The riches of fuel in this district have made Pittsburgh the leading center for the manufacture of glass. To make glass, sand is melted by fuel, preferably gas, of which, for a time, there is an unlimited supply.[18] The great Aluminum Company of America, with head-

[18] In the golden age of gushing gas people often let their gas grates as well as the house and street lights burn night and day, because they thought it cheaper than turning the gas off.

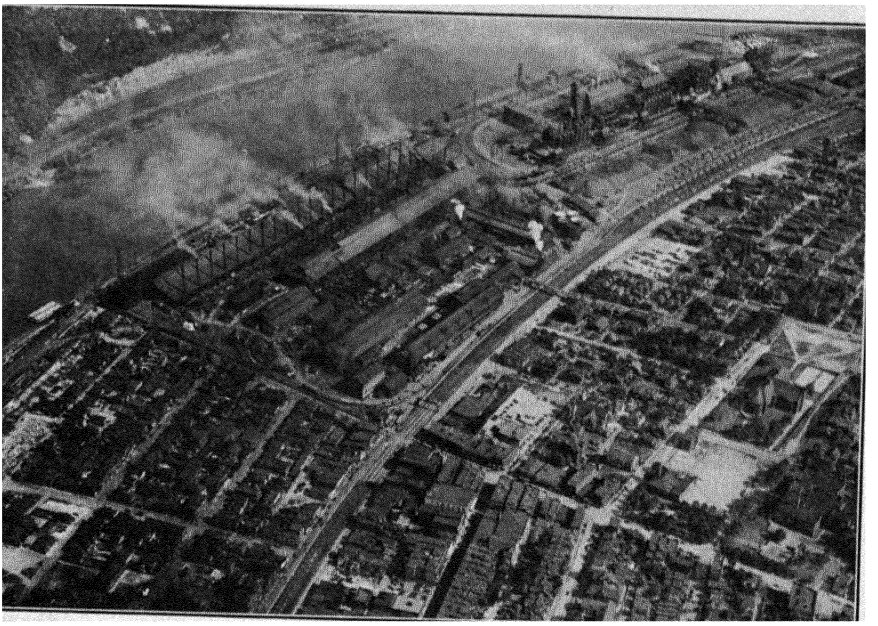


FIG. A. One section of a crowded narrow valley near Pittsburgh. Note the cliffs on the far side of the river. At the right, a long row of blast furnaces, a huge ore pile, and the cranes that traverse its length. At the left, the fabricating plant, some barges on the river. This is the kind of town where one finds "the old man." (Courtesy V. L. Hubbard, pres't, Meadow Gold Dairies, Inc.)

quarters at Pittsburgh, operates at New Kensington, only 15 miles northeast of the city, one of its plants for the fabrication of aluminum.[19]

Charleston, West Virgina (pop. 60,000), and near-by towns in the Kanawha Valley have a rapidly growing chemical industry, with such products as ammonium sulphide, synthetic methanol, calcium carbide, caustic soda, hydrocarbons, and various alloys. Two glass plants are also located there.

The textile industry, chiefly silk and rayon, is coming into a number of plateau cities where the men are busy working in iron, steel, and coal. The importance of Appalachian coal, petroleum, and natural gas is obvious.

THE MINE AND THE MINER

Mines can be opened with ease anywhere in this region along hundreds of miles of railroad. Farmers can open a "snowbird" mine and load their wagons in the wintertime. This has made for great competition among soft-coal producers. There are more mines than we need.[20] If there is a free hand,

[19] The raw material in the form of aluminum pigs is shipped to New Kensington from the company's reduction works at Niagara Falls and Massena, N.Y., Alcoa, Tenn., and Badin, N.C.

[20] During the World War they were opened by the score. Since that time, there has been no need for hundreds of the mines and hundreds of thousands of the miners of 1918. A chaos of competition followed, with deplorable economic conditions. What can an unemployed miner do in a gulch in the plateau?

the distributors of cars for the railroads can decide which company shall get the cars. Here is a great temptation to favoritism, perhaps to graft. The charge has often been made in the recent past that railroad officials have made great fortunes by this means. One of the simplest ways to get rich quickly was to buy distant coal lands cheaply, build a railroad to them, and open a mine with the absolute certainty of getting cars to carry coal. The Interstate Commerce Commission has attempted to end this favoritism. Has it succeeded? We have too much respect for the powers of interlocking directorates, subsidiary corporations, and other friendly devices by which insiders can extract money from stockholder or public.

The coal industry has worked southward from Pittsburgh through West Virginia, Kentucky, and Tennessee. Its development in the Cumberland Plateau has been rapid.[21] The coal was there, the men were there, and there was no union.

The date of the coming of the railroad and the opening of the coal mine is the date of greatest possible change in these mountain communities. When a community changes from a land of cabins to a mining town, the change is sudden and violent.

Digging coal and making iron in the Appalachian Plateau often results in making communities that are far from the American ideal. This combination of resources and environment forces us to see the raw edge of our industrial system. The opportunity for acquiring wealth often tests ideals. A farseeing man of great intelligence bought 60,000 acres of hilly, inaccessible, untillable land in the central part of the Allegheny Plateau. It was all underlaid with coal, but as there was no railroad near, and almost no population, he got it for $1 an acre. In a short time the railroad came, and the land was then worth $50 an acre. But if he holds it until the coal is mined at a low royalty of 10 cents a ton, the 450,000,000 tons of coal will yield $45,000,000.

If this coal is mined, it will probably be done by a corporation, as with most of the other coal-mining enterprises. The absentee and invisible corporation sends its men into the green and peaceful wilderness, where they build little houses for 200 or 300 workers, put up a power house to pump and ventilate the mine and to run the electric cars, erect a barn for the mine mules, and get everything ready for the arrival of the superintendent and the mine bosses, the timekeepers and the foremen.

The typical mining community, therefore, usually consists of a few superintendents who have some education and several hundred employees who are able to dig coal but who do not need any education at all. In many cases these miners know little of the English language and practically nothing at all of American customs and ideals. They live in the company's houses, buy at the company's store, and have a little city of their own in the wilderness. Some coal-mining districts have Negro labor. Most of the mining towns in the Allegheny Plateau are peopled by immigrants from Europe (from 15 to 25 per cent in western Pennsylvania). Towns in the Cumberland Plateau are often filled with mountaineers who have come from the isolation of their

[21] The Ford enterprises own 125,000 acres of coal lands in Kentucky — said to be the largest landholdings of any kind in the South.

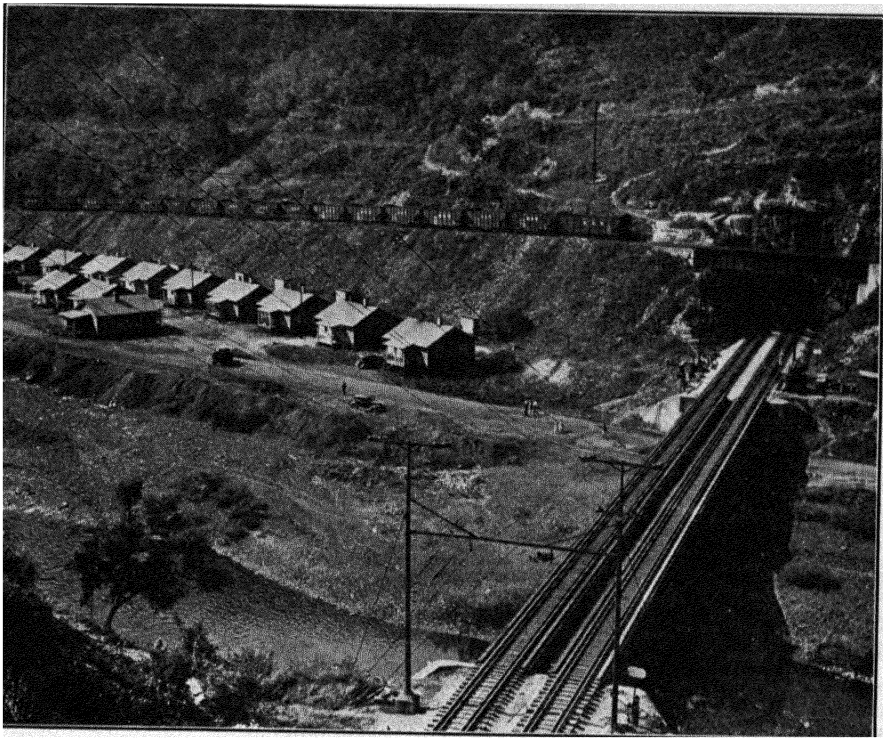


FIG. A. One West Virginia mountain valley after the revolution — industrial revolution. Coal. The valley is just wide enough for a road, a row of company houses and privies, and a railroad dug into the bank. It's all owned by absentees — one of the serious problems of our democracy. This valley is a tough place for democracy and for railroad-building. (Courtesy Post, Farm Security Adm.)

mountain farms to experience the crowded conditions of a mining town where the valley is so narrow that the houses must be perched up on the side of the hill like bleacher seats around an athletic field. It is not difficult to see why the individualistic, independent, feudist mountaineer with the point of view of the mountain cannot become at once a public-spirited townsman.[22]

A community composed of mining towns planted in the wilderness where there are a few farms and no other industries lacks the variety needed for a good community. It also lacks that middle class of independent property-owning citizens which has long been the pride and hope of Anglo-Saxon democracy in both Britain and America. Lacking the conditions of democracy, it shows the result in undemocratic government. In Pennsylvania,

[22] In a typical coal-mining town of this sort an intelligent mining engineer finds great difficulty in educating his children, because no one cares much about schools, and public schools, unfortunately, have to reflect public sentiment. When a typhoid epidemic breaks out, it results in needless deaths, because the enforcement of the rules of public sanitation by a board of health again demands public sentiment and knowledge of sanitation. When a mountaineer shoots someone, only the immediate family of the victim follows his coffin to the grave. Others stay away lest their presence might offend the one who did the shooting.

where this condition is oldest, we find that the maintenance of peace is not left in the control of township or county.[23] There is, instead, the State Constabulary.

THE FUTURE OF THE APPALACHIAN PLATEAU

Plainly the future here is primarily coal. Despite the enormous production of the present, the output may be greater in the future.[24] The Connellsville coking-coal seam is relatively exhausted, but it may be said that we have scarcely begun to use the great resources in the Appalachian Plateau.[25] As the public conscience improves, each decade should make the mining town a better place in which to live. Some of the newer towns show great improvement in physical excellence.

In the age of superpower and transmission from mine-mouth plants, this coal field seems destined to be the power house for nearly half of the American people. But this does not mean the development of the plateau. The mine-mouth power plant will tend to prevent city-building in the plateau, because it will be so easy to wire the power out to better town locations — Atlantic Coast, Lake Shore, or the banks of the Ohio.

Coal-mining can occupy but a small acreage at a time. All of the plateau was forest, much of it is now forest, and most of it should remain forest. So much lumber has been taken from the northern part that localities which in 1890 or 1900 shipped trainloads of lumber now buy lumber by the carload. After the lumberman came the fire, and after the fire came the huckleberry desert (page 250). The state is taking for taxes such burned-over lands as have been abandoned by their owners. Occasionally some tracts are bought by the state, which is making vigorous efforts to protect them from fire. Some have to be replanted, so complete has been the tree destruction. The West Virginia, Kentucky, and Tennessee parts of the plateau, being less accessible by rail and farther from markets, have not been lumbered so completely and are now the seat of a great hardwood lumber industry. The United States Government is steadily acquiring forests in Appalachia.[26] No wiser thing can be done for future economic welfare, for the timber famine approaches.

Forest studies in Tennessee show that chestnut, one of our most rapid-growing trees, adds 7 cords of wood per acre in the second decade, and 25 in the fifth.[27] Meanwhile it is necessary that fire should be kept out during this

[23] In some Pennsylvania coal and steel towns, if you ask a man in the street, "Where is the old man?" he will at once direct you to the superintendent of the company that dominates the town. Who controls the police? The old man. Who controls the school board? The old man. Feudalism is an institution of varied form.

[24] Our per capita coal consumption increased as follows: 1829–79, from 0 to 1 ton; 1879–99, from 1 to 3 tons; 1899–1919, from 3 to 6 tons. Since then it has declined to 4.8 tons in 1929 and to about 3.3 tons in 1937.

[25] We lose about 35% of our coal in mining, 20% being waste that could be avoided. In England not more than 15% is lost in mining; in Germany, France, and Belgium, not more than 10%.

[26] On June 30, 1937, there were 425,000 acres of national-forest land in Pennsylvania, 874,000 acres in West Virginia, 386,000 acres in Kentucky, 521,000 acres in Tennessee, 887,000 acres in North Carolina, and 1,229,000 acres in Virginia.

[27] This species has been practically annihilated in the eastern United States by an imported blight, but the significance of this wood-production record stands.

half-century — a convincing proof that eternal vigilance (against fire) is the price of timber.

THE UPPER OHIO VALLEY

Pittsburgh is Pittsburgh because it is in the plateau, with its fuel, and at the head of the Ohio Valley, with its boats and barges.

Millions of tons of coal come down by barge even to Pittsburgh. Points on down the river get it almost as cheaply as does the smoky metropolis. Therefore the cities of the Upper Ohio Valley — on the West Virginia side, Wheeling, Moundsville, Parkersburg, and Charleston (on the navigable Kanawha or Big Sandy); and on the Ohio side, Steubenville, Marietta, Ironton, and Portsmouth — may in a sense be considered as outposts of Pittsburgh, little Pittsburghs, if you will.

Wheeling describes itself by saying, "Coal, oil, gas, power, and Ohio River equal Wheeling," and so it is well described. The town boasts of its tin plate, pipe, sheet metal, expanded metal, corrugated metal, steel stamping, rolling-mill machinery, stoves, clay tiles, chinaware, cut glass, glass jars; and varying numbers from this same list can be found in all the other Ohio River towns mentioned above.

From one dusty, smoky town to the next, railroads follow the river and barges float upon its muddy but useful bosom.

The easiest route from the Upper Ohio Valley to the Great Lakes is by way of the valley of the Beaver River, which enters the Ohio at its northernmost point and affords an easy grade to the Lake Erie Plain. Here again are extensions of Pittsburgh — the steel mills of Newcastle and Sharon, Pennsylvania, those of Youngstown, Niles, and Warren, Ohio. Indeed, some claim that this Beaver-Mahoning Valley is really the cheapest place in America to make steel. The plants here are of great size and of the most modern construction.

FARMING IN THE UPPER OHIO VALLEY

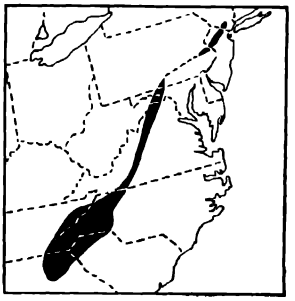
To understand this area, we should remember that it is composed of Appalachian Plateau rock strata at a lower elevation — low, dissected plateau. For the farmer it is mostly a despair of hills. Therefore it has very properly gone to grass — to sheep, indeed.

Ohio is surpassed in the number of its sheep by few states.[28] Most of the Ohio sheep are on the Ohio Valley hills. This area, including near-by parts of West Virginia and Pennsylvania, has a large number of sheep per square mile. This is the only part of the United States east of the Great Plains where we find many merino sheep, the wrinkly specialists of wool production. Even in the Pennsylvania part of this area the snowfalls of winter are so light and of such short duration that many farmers keep their sheep at pasture the year round, with a haystack or two handy to carry them through periods of deepest snow. Sheep will dig through moderate snows to get the dead winter grass, as is the case in many of the sheep sections of the Scottish Highlands.

[28] Number of sheep and lambs, Jan. 1, 1938 (in millions): total U.S.A., 46.8; Texas, 9.1; California, 3.5; Wyoming, 3.4; Montana, 2.7; Utah, 2.3; New Mexico, 2.3; Ohio, 2.2.

The hills of southern Ohio and adjacent West Virginia support a considerable apple industry. Experiments conducted by the Ohio Experiment Station showed that old orchards, so starved by corn and erosion that trees which would not grow an inch in a year or bear any crops, would make good growth and good crops if given a few pounds of nitrate of soda per tree. Most of these orchards are unplowed, and therefore an excellent adaptation of crop to slanting environment.

Chapter 11. THE BLUE RIDGE AND THE GREAT SMOKY MOUNTAINS



BETWEEN the Great Valley and the Piedmont is a long, narrow strip of the Blue Ridge which, except for a short distance in Pennsylvania, is continuous from the Hudson to southern Virginia, where it widens into an upland mountainous country, embracing several thousand square miles of western Carolina, eastern Tennessee, and small corners of South Carolina and Georgia.

The Blue Ridge is much like the other parts of the Appalachian Ridge already described. The Great Smoky Mountains, often called the Unakas, resemble the Appalachian Plateau more than they resemble the ridges, except that instead of being made of nearly horizontal strata they are just a mass of rounded mountains with some rather wide valleys between. Although the valleys are not quite so narrow and sharp as in the Cumberland Plateau, travel has been difficult.

The soils are better here than the soils in either the Appalachian Ridges or the Appalachian Plateaus. The rainfall is heavy and therefore nature has covered the south with fine forests. When cleared, the Unakas may often be covered with grass, especially with Kentucky bluegrass.

Within the mountain region one finds on the more-favored slopes and in the little pockets of arable land a few fruit trees and some grazing, but in general subsistence farming prevails. The settled parts of this region, as in the Appalachian Plateau, have suffered terribly from soil erosion, because man has attempted to use level-land agriculture upon its steep hills.[1] When plowed for corn, the earth of the steep slopes is soon eroded, and then abandoned for a fresh field.

I asked county agents in a number of counties in the hill country of North Carolina the following question: "What is your estimate of number of cultivated crops secured on steep land after clearing and before abandonment of cultivation?" The answers from ten counties were as follows: "5; 20; 12; 10; 5 to 10; 10 or 12; 10 or more; 12; 5, extremely variable; and 10." Ten tilled crops, and ruin has arrived!

These Southern Appalachians reach 4000 feet on the plateaus and higher valleys, and 5000 and 6000 feet on the higher peaks. This elevation produces a country of great beauty, of surprisingly low temperature in winter,[2] and

[1] L. C. Glenn, *Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin*, U.S. Geol. Survey, *Professional Paper* 72, 1911.

[2] This elevation really extends the climate of New York into North Carolina. It also extends the forest of hemlock and spruce. The influence of small elevation in Appalachia

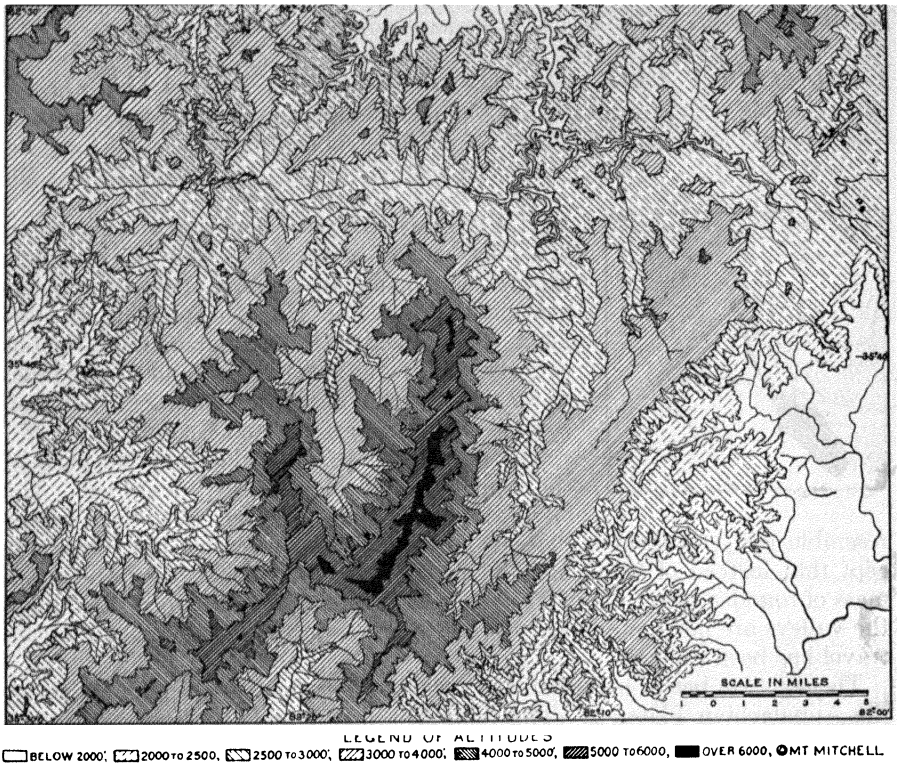


FIG. A. This detailed map of a part of North Carolina shows that the continuation of the Blue Ridge is no longer a ridge but a mass of mountains. Note carefully the elevations of different areas. (Courtesy U.S. Geol. Survey)

delightful coolness in summer — a combination of advantages which makes it a natural pleasure ground and summer resort for the people of the hot Southland, by which it is surrounded on three sides. Asheville, in the beautiful "Land of the Sky," is the best-known resort center.

The greatest thing that has happened within this region has been the establishment of two national parks by the Federal Government. In Virginia is the Shenandoah National Park (area 282 square miles), with its beautiful Skyline Drive which extends for 100 miles along the crest of the Blue Ridge Mountains. Between Knoxville and Asheville is the Great Smoky Mountains National Park (area 643 square miles), which has sixteen mountain peaks of slightly over 6000 feet. Of the 27 national parks in 1939, only 6 were east of the Mississippi. It is true that these two beautiful national parks in

on winter weather is surprising. On March 11, 1924, I saw 25 inches of snow (temperature 31° F.) fall on the Blue Ridge, altitude 1300 feet, 50 miles from Washington. Washington got about 5 inches of slush. Two days later the White House grounds were green and the Blue Ridge was still knee-deep with snow, and horseback the only means of travel. On Nov. 6, 1939, snow was 8 in. deep at 1350 ft. There was none 3 miles away at 600 ft. Almost every winter storm that comes up the Atlantic Coast deluges Appalachia with snow.

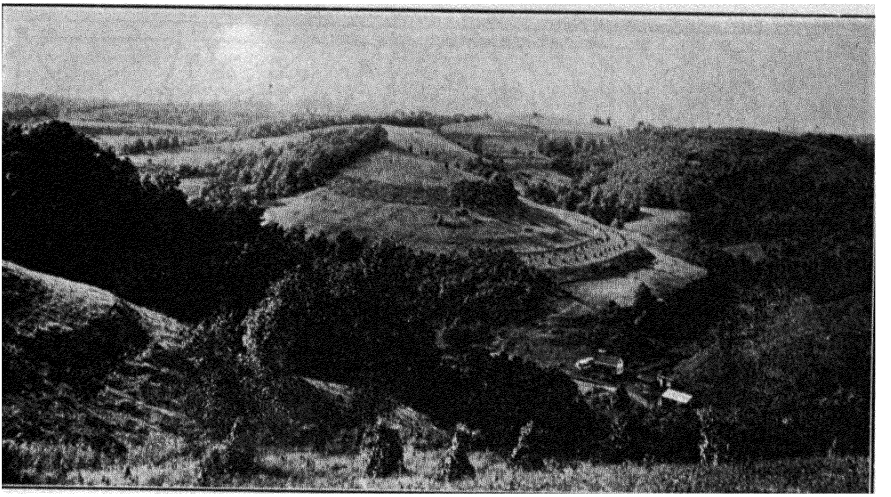


FIG. 277 A. The farm of the man who loves his land and keeps it. Top center, corn. Below it, grass bank and strip of woods. Next, hayfield. Lower, two rows of corn shocks. Below that, grass-bank terrace to hold soil, then soybeans used for hay. In shadow, pasture. The grass-bank terraces were made in the process of cultivation. The grass on the bank stopped the earth that was being moved by water, gravity, and tools. (Courtesy U.S. Dept Agr.)

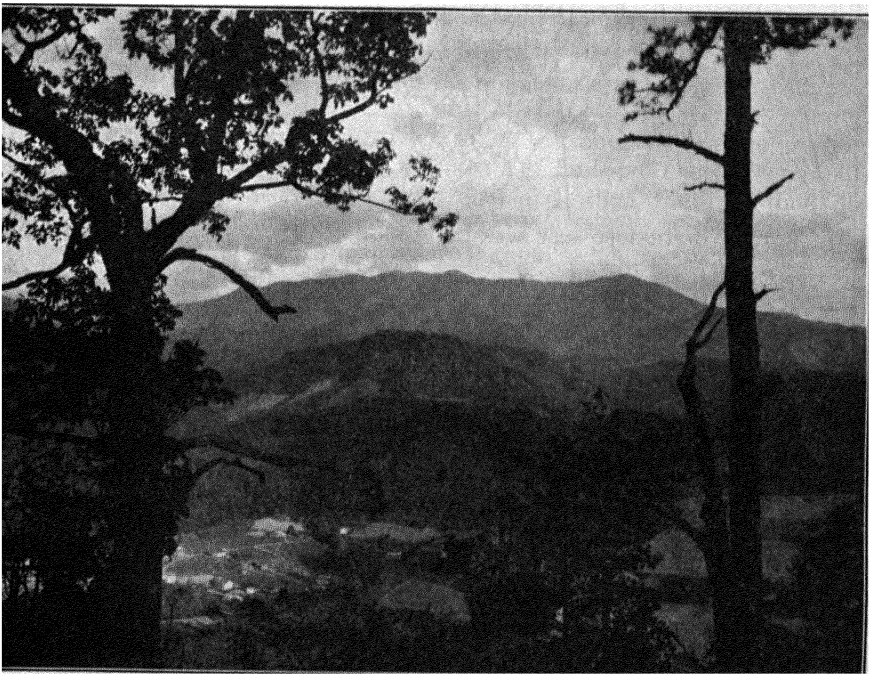


FIG. 277 B. Mt. Le Conte in the Great Smokies, from a point near Gatlinburg. Cove farms and steep fields are typical. (Courtesy Nat'l Park Service)

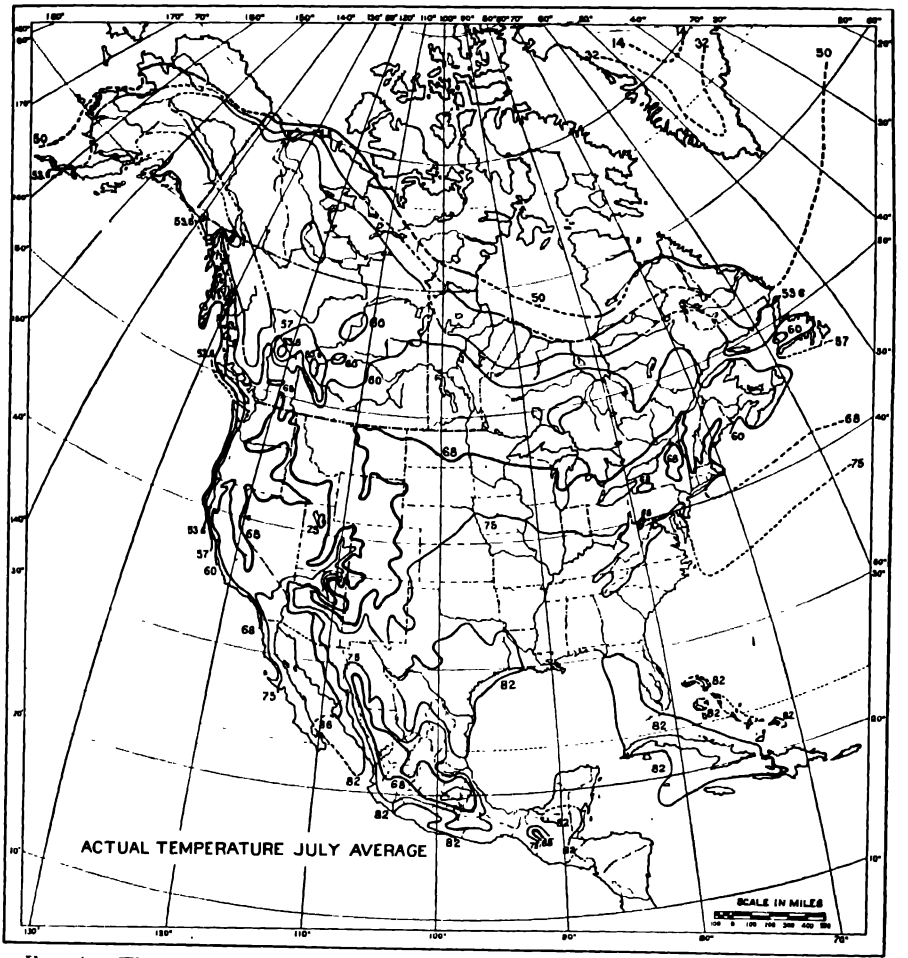
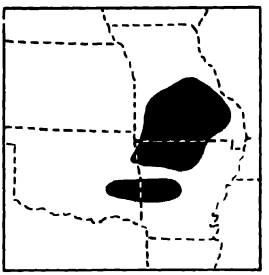


FIG. A. This map has surprises for you. Find all the locations having 68° F. temperature. Compare the Atlantic and Pacific coasts, also northern Georgia and New Jersey. Is Mexico a tropical country? The small area near Mexico City has a July temperature of 61°. (Courtesy Köppen-Geiger, *Handbuch der Klimatologie*, Vol. II, Pt. J, *Nord Amerika*)

Virginia and in Tennessee and North Carolina lack the forbidding and exotic grandeur of many Western parks, but they have one special virtue: they are easily accessible to millions of the American people.[3]

[3] In 1916, when the National Park Service was organized, about 350,000 people visited the national parks. In 1938 there were more than 7,000,000 visitors.

Chapter 12. THE OZARK–OUACHITA UPLANDS



ONE per cent sounds like an insignificant figure, but when the cosmic forces lifted up a low dome now called the Ozark Plateau about half a mile, less than 1 per cent of the width of the bulge or dome, its results in the course of time made a very different landscape, very different possibilities of land use, and finally, a different culture among men.

This bulge or very low dome, less than 2000 feet high, in the generally horizontal rocks of the Mississippi Valley, raised a limestone formation in which streams have been able to cut valleys until they have worn away the limestone entirely over most of its extent. This has not happened in the western part of the Ozarks, where the limestone layer still makes up the level upland surface into which valleys have been cut. In the center and toward the east the upland is worn away until only long shreds of limestone remain as ridges, with valleys between.

This shredded plateau of the west is surrounded on the north, east, and south by a rough, hilly country with valleys more than 1000 feet deep. This land is difficult of access and merges off in all directions into low hills that sink gradually into the surrounding plains.

The parts of the Ozark Uplands from which the limestone surface has been worn are covered with many small fragments of flint and chert.[1] Originally the chert was embedded in the limestone, and when the limestone dissolved, the hard insoluble chert remained. The Ozarks, with nearly horizontal strata, resemble the Appalachian Plateau, while the folded structure of the Appalachian Ridge and Valley section reappears in the Ouachita, Arbuckle, and Wichita mountains.

The Ouachita Mountains constitute the southern part of the region, covering an area 60 by 225 miles westward from Little Rock, Arkansas. These ridges are mostly composed of sandstone, and miles of it are fine enough and sufficiently uniform in quality to be made into whetstone. This industry, however, has been injured by the more abrasive product of the electric furnace.

ANOTHER SURVIVING FRONTIER

We treat the Ozarks and the Ouachitas here because of the great resemblance that their surface, industries, and culture bear to those of Southern Appalachia.

The whole region has good rainfall, was originally forested, and its outer

[1] In one section, called the St. Francis Mountains, the underlying granite protrudes. It is to be found in all parts at less than 2500 feet under the surface.

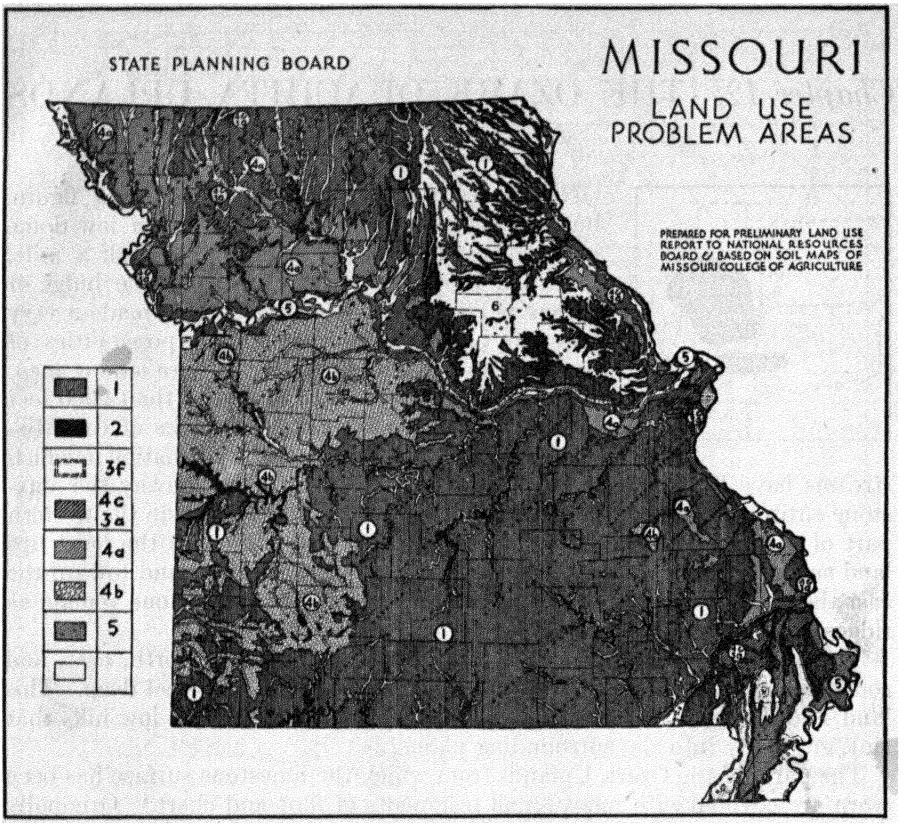


FIG. A. Behold the most fundamental American achievement in this figure and the next. 1. Generally marginal or submarginal for crop production. 2. Land proposed to be flooded by projected water-power developments. 3f. Drainage districts in serious financial distress. 4c, 3a. Severe erosion necessitating changed cropping system and larger farms. 4a. Severe erosion necessitating changed cropping only. 4b. Same as 4a, but erosion less severe. 5. Farming areas needing additional drainage. 6. No major land-use problem. *Note:* Preliminary survey, subject to change with additional information. (Courtesy Missouri State Planning Board)

hills were the site of the first permanent white settlement west of the Mississippi River.[2] The open prairie grew better crops of grain, but the wooded hilly country furnished logs for house, wood for fire, mast for pig, small areas of lowlands for field, opportunity for hunting and fishing — good land for the frontiersmen of the scattered cabins. Later the westward-moving American could take his choice: move to the open prairies and become rich at hard labor, or move to the Ozark woods and live more easily and simply by oc-

[2] The average annual rainfall in the Ozark Plateau increases from about 36 in. at Jefferson City, Mo., to about 55 in. in the Boston Mountains, with 20 to 30 in. falling during the growing-season. The average length of the growing-season varies from about 165 to 210 days. The average annual rainfall in the Ouachita Mountains is about 50 in., of which approximately 30 in. occur during the growing-season. The average length of the growing-season in most of the agricultural land varies from 210 to 220 days.



FIG. 281 A. This map of the depth of soil in Missouri shows the changes in depth of surface soil, the immediate surface layer being of uniform color and containing the most humus since the beginning of cultivation.

	Were	Are
Loess soils of northwestern Mo.	15–18 in.	8–12 in.
Rolling prairies of northeastern Mo.	10–14	8–12
Glacial soils, north-central and northeastern Mo.	——	3–8
Ozark border	8–14	4–8

These figures make clear the Missouri Planning Board recommendation that most of the Missouri Ozark area should be put into forest or extensive grazing. This would employ but a small fraction of the people who now live there, and largely by soil-destroying processes. The board found less than one-fourth of the state suitable for closer settlement by persons growing fruit, truck, dairy, and cotton crops.

The Arkansas section of the Ozarks and the Ouachitas has not been similarly surveyed, but there is no reason to expect those lands to be superior to those of the Missouri section.

casional labor. One type of frontiersman likes freedom. He prefers occasional labor to a steady job. He prefers joy to property. Therefore he is not so capitalistic as the builders of cities and the owners of big, painted barns.[3] Great wealth and degrading poverty are seldom found here. There is plenty of poverty such as that into which Abraham Lincoln was born, but it is not degrading poverty. The farther the frontiersman of 1790 or 1820 got into the Ozarks, the more difficult it became for him to get away, so here, as in Appalachia, we have a surviving but dwindling frontier.[4]

Corn is the chief crop, grown alike on rich lowland, level upland, and steep hillside. No other grain yields so much or is so suitable as food for man, horse, cow, pig. Unfenced land is public range where anyone may turn out his horses, cattle, or pigs to pick their living. The man of the Ozarks is primarily a farmer whose small farm is unspecialized and whose sustenance is derived chiefly from corn, range-fed cattle, and mast-fed pigs.[5] In the odd season he hunts for the roots of ginseng and golden seal, and furs. Coonskins have been accepted for taxes even in the twentieth century.

The maintenance of productivity is a major problem in the cultivation of the soils of the Ouachita Mountains and the southern part of the Ozark Plateau, for here the soils have been formed chiefly from sandstone and shale. In the northern part of the Ozark Plateau the soils, of limestone and shale origin, are more productive. Long ago the better level land was put under

[3] C. L. Edson, in the chapter "Arkansas, a Native Proletariat," *These United States*, ed. by Ernest Gruening, Boni & Liveright, 1923, Ser. 1, p. 361, says of these people: "They have not, in all their philosophy, any complaint against anything. They are the only white tribe among us that habitually fiddles and sings." A humorous book called *The Arkansas Traveler*, once much read in parts of the United States, tells a not uncharacteristic episode. In passing a miserable shanty one day the author, looking through the open door, saw the owner sitting in the midst of streams of water that poured through a leaky roof. "Why don't you fix your roof?" called the stranger. "Can't. It's rainin'," came the answer. The next day as the traveler returned the philosophic native still sat, although the sun was shining. "Why don't you fix your roof?" he asked again. "No use," came the answer. "Tain't a-rainin'." This story was published in the first edition of this book. One slightly indignant lady wrote the senior author saying that that story was a joke, and he should have had sense enough to know it.

The noncapitalistic attitude of some of these good-natured people is perhaps well characterized by an experience of a veracious traveler known to us. After spending many days in this country, the monotonous diet of corn bread and fried pork palled on his taste, and one day he inquired of the woman who was serving him his dinner why they did not keep some chickens and have eggs and chickens to eat. "Wall," said the woman, "he [meaning her husband] did bring some hens home once, and we cooked one of 'em, and, stranger, don't you know, they was sech pow'ful good cookin' we jes' fell to and cooked 'em all up."

[4] Disputes are still settled by the private rifle in remote parts of the Ozark country just as they are in Appalachia. On Mar. 19, 1932, the United Press carried a story in the daily papers about the shooting near Asa, Mo., of one Zeb Fleetwood, a direct descendant of the first of the Fleetwood clan that had come to the Ozarks to settle in 1815. In 1820 the killing of a Fleetwood by an Allsup marked the beginning of a feud between the families that has lasted to the present day. In the course of a century more than 200 persons lost their lives in this family feud.

[5] "In many cases these hogs are turned into the woods and run there in large numbers. They are earmarked in order to be able to identify the hogs of the different owners. Usually no feed is given these hogs except a small amount of corn, which is fed them when the owner or man in charge goes into the woods and calls them up in order to check up on the number which he has. Usually the practice of calling the hogs up and feeding them some grain is followed, this being done about once a week in order that the hogs may not become too wild so that they may be caught when ready for market." — Letter, March, 1923, from T. Ray Reid, secretary, Agriculture Extension Service for the State of Arkansas.

the plow. Most of the rugged Boston Mountain section of the Ozark Plateau is not in farms, and 500,000 acres are now in national forest. Likewise, a large portion of the rugged land of the Ouachita Mountains is not in farms, and national forest now occupies 1,000,000 acres of this area. Eventually we learn that our rough, stony, steep land should be in pasture or in forest.[6]

During the winter season many an Ozark farmer works on the land of some lumber company, or on his own land, cutting and hauling railway ties, mine props, and other forest products. It is this winter employment that often provides him with his chief source of cash income. The forest industries of the Ozarks are based dominantly on hardwoods; those of the Ouachitas, on pine. These industries include sawmills, cooperage plants, handle mills, and various other enterprises.[7]

MODERNIZATION

Transportation has always been a difficult problem here, as it is in every dissected plateau and mountain region. In some cases the road skirts along the backbone of plateau remnants, and the farms, and sometimes the houses, are down in the valleys, with a climb to get to the road. In other cases the road must go along the valley and face the problem of mud and flood.

For many decades the map of the railway net of the United States showed a big blank place in the Ozarks. It was too rough for railroad-building except at heavy expense, too steep to be good farms, and because of steepness and low fertility the small percentage of the area under cultivation offered few freight possibilities. Two-thirds of Arkansas is still in forests. For a long time Yellville had a horse-drawn stagecoach line 65 miles long to reach the railroad.

After a time the railroads began to build branch lines. In the first decades of this century the rural mail-carrier began to establish connection with the outside world, and the World War draft gave to thousands of Ozark sons their first glimpse of the lands beyond the hills.

Then came the automobile, the truck, the bus, and the good through highways cutting across the Ozarks and causing the abandonment of a number of short branch-line railroads. These, combined with the city business boom of the "golden twenties," started the stream of emigration from the little farms — selective emigration, of course.

Dairying has been the chief industrial change on the farms. In area, national forests are the chief change in land use. It is so plain that forestry is the proper use for much of this land that the Federal Government has already secured 3,400,000 acres, nearly one-tenth of the State of Arkansas.

Transportation cannot change the character of this land, and the life on the farm of small income has to be primitive. Therefore, while parts of the

[6] For recent studies, see University of Arkansas, College of Agriculture, *Geographic Distribution of Arkansas Crops and Livestock, Bulletin* 367, November, 1938; and University of Arkansas Extension Service, *Types of Farming in Arkansas, Extension Circular* 351, June, 1936.

[7] See Arkansas Forestry Commission, *Wooden Riches — Arkansas Forest Facts, Bulletin* 10, Dec. 10, 1938.

Ozarks have come out of the isolated frontier class, many parts of it, though not many miles from a good highway, are still essentially an isolated frontier where primitive living must continue until an improvement in purchasing power permits its change.

FRUIT

Small areas in northwestern Arkansas, near Fayetteville and Bentonville, and adjacent parts of Missouri are engaged in the commercial production of apples, strawberries, grapes, and other fruit. This production is located on the level upland remnants of the plateau, and is not at all typical of the Ozark country in general. As in so many places, there is often more fruit land than market demand. The particular fruit sections have excellent frost drainage and are developing efficient production and marketing organizations. A certain market advantage arises from the fact that apples will not grow well farther south or for several hundred miles to the west.

MINERALS

Joplin (pop. 33,000), in the southwestern corner of Missouri, calls itself the gateway of the Ozarks and has long been the center of an important zinc-mining region. Ozark zinc-mining has been carried on very wastefully in the past.[8] The fact that zinc production in Missouri has declined from 129,000 tons in 1910 to 10,000 tons in 1938 is again suggestive of exploitation. The northeastern Ozarks have large quantities of low-grade lead ore, which caused Missouri to produce about one-third of the American supply of that metal in 1938. Manganese is mined near Batesville, Arkansas, and the St. Francis Mountain district contains the leading barite-producing area of the United States. The tripoli deposits of southwestern Missouri and the adjacent part of Oklahoma are among the largest worked in the country. In the extreme northeastern part of the Missouri Ozarks local sand deposits have given rise to glass-manufacturing.

At best these mineral deposits will occupy but a small proportion of the people and a small proportion of the area for a short period of time. The main Ozark problem is one of rural organization and the establishment of a permanent agriculture, for this land has no prospect of becoming a land of cities. Springfield, Missouri (pop. 58,000), a distributing center in the best part of the limestone upland, is the largest city.

IT MIGHT HAPPEN HERE

If the land were put to its optimum use, the future of the Ozark-Ouachita Uplands would be written largely in terms of scientific forestry, tree-crop agriculture, intensive machine agriculture of good spots (see page 230), and

[8] The deposits were often leased to small operators who had to pay 20% or 25% royalty. Since they wished to make a profit, they took only the best and left the rest. From one-third to two-thirds was wasted. See C. R. Van Hise, *Conservation of Natural Resources in the United States*, Macmillan Company, 1910, pp. 84–85.

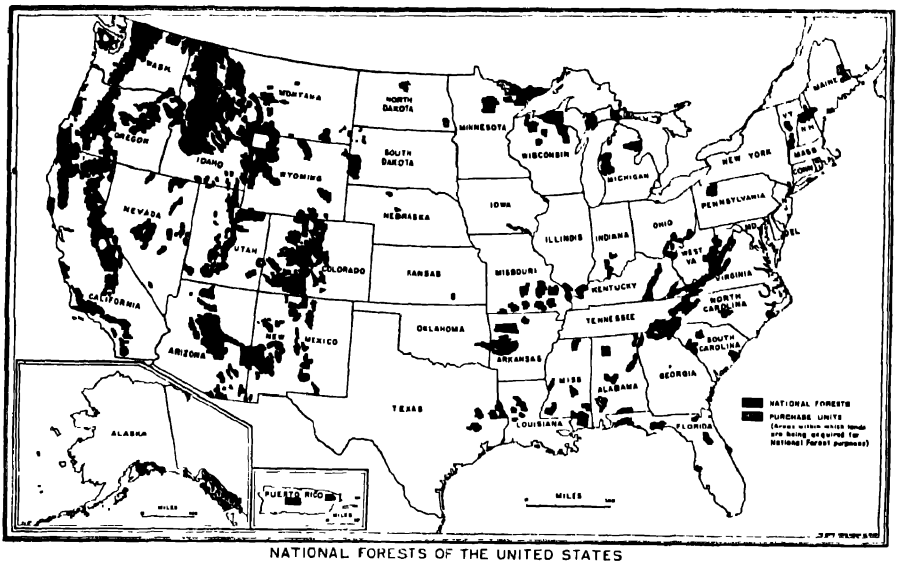


FIG. A. National forests of the United States as of Nov. 15, 1939. The striking thing here is the rapid advance to the eastward into private lands, which now must be bought. Hindsight is so much better than foresight! (Courtesy U.S. Forest Service)

exploitation of scenic resources.[9] At Hot Springs, Arkansas, in the Ouachita Mountains is the Hot Springs National Park, which for years has been an important health and recreation center.[10] With the construction of better highways, tourists are coming in increasing numbers to visit the White River country and other spots that have been developed for recreation. In this respect we see a resemblance to the Great Smoky Mountains, although the altitude is much less.

Unfortunately, the development of tree crops and scientific forestry, except in national forests, awaits the future, although the rugged topography of this upland area makes nature's invitation to grow trees for food and trees for wood particularly strong.

What *might* happen here is shown by what *did* happen in one little corner of southeastern Arkansas. Instead of being a ghost town in a land of stumps,

[9] In November, 1937, the Missouri State Planning Board reported: "Under the various Federal submarginal land programs, the area of Missouri State Parks has approximately doubled within the last three years. . . . The largest acquisition during this period is the Lake of the Ozarks Recreation Area with more than 16,000 acres. In addition to the State Park areas the Federal Government is acquiring within the state eight tracts of national forests, totaling approximately three million acres. These are all located in the Ozark Highland region on land unsuitable for agricultural use, and in addition to their utilitarian value in timber resources, water and soil conservation and erosion control, they will provide, in accordance with the policy of the Forest Service, a considerable opportunity for recreation." — *Missouri Planning Digest*, November, 1937.

[10] The park contains 47 hot springs that vary in temperature from 95° to 147° F. It is said that De Soto visited these springs in 1541. In 1832 the United States Government wisely preserved them from monopoly by creating the Hot Springs Reservation, which in 1921 was made by Act of Congress the Hot Springs National Park.

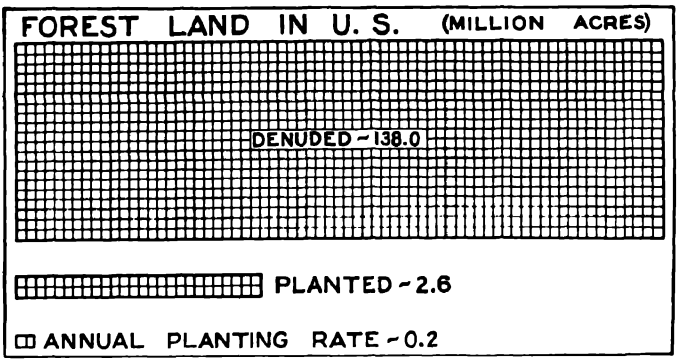


FIG. A. The denuded land is burned so often that most of it is not producing lumber. What will this mean to you if it keeps up until you are 60 years old? This is one of our greatest crimes against posterity. If this land could be let alone (no fire), it would in time become forest. Planting speeds the process. (Facts from U.S. Dept Agr.)

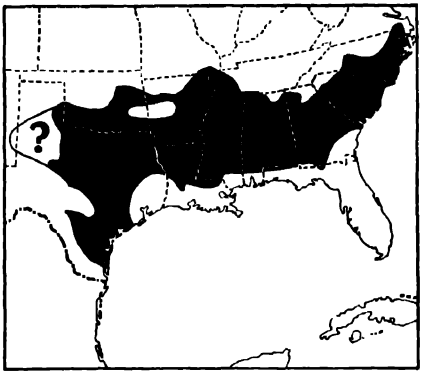
the little town of Crossett on the Ouachita River lowlands (Cotton Belt) is a lively community based upon a permanent business of cutting and replanting trees. In the 400,000 acres controlled by the wise men of Crossett, the philosophy of "cut out and get out" has never prevailed. No slash is left lying around to propagate forest fires, Instead, the cutover land is carefully cleared and replanted. Because the seedlings are spaced properly, twelve-year old trees are as large as forty-year old trees in other areas where the timber is crowded together. At the mill in Crossett there is no waste-pit fire perpetually burning, the usual tribute to the great God of Waste. Small pieces are used by the local box factory. The smallest sticks are sold to toy-makers. Rough slabs from next to the bark and short, broken stuff are turned into berry crates. Narrow strips are converted into ironing-boards. In the wood distillery scraps of waste are turned into charcoal, and saps, oils, and acids are recovered and sold. Crossett contracts stipulate that on every sale of flooring, 10 per cent of short pieces shall be included. Virtually nothing is left of a tree, for everything is used or sold.

What has happened at Crossett might well happen in the Ozark-Ouachita Uplands and throughout the South. Must we await the era of still higher prices, when "unlimited" supply, forest-butchering, and forest cremation are a thing of the past? [11]

The climate of the well-drained, breezy Ozark hills is too good for *men* to be wasted on wood. There should be farms that grow annual crops on trees instead of the one crop of wood from the dead body of the tree; for example, a few million acres of honey locust for the national sugar and cow-feed crop.

[11] "Now, with our lesson learned 'the hard way,' we find that we have approximately 22,000,000 acres, or two-thirds of the land area of the State, on which trees are at present the most important crop. If the lessons of the past mean anything, the greater part of the present forest land will find its best use in the future in the continuous production of timber and other forest products." — Arkansas Forestry Commission, *Wooden Riches — Arkansas Forest Facts*, pp. 7–8. The commission knows "the lesson," but do the people of Arkansas?

Chapter 13. THE COTTON BELT: I. ENVIRONMENT AND AGRICULTURE



ONE single commodity binds together one-sixth of the United States into a single human-use region appropriately called the Cotton Belt. Within this region cotton is king, since for over a century it has been the economic lifeblood of the people.[1] There are many crops grown in the Cotton Belt, but each year about half of the crop land is normally planted in cotton.[2] For millions of farmers the production of cotton is the chief and almost only source of income, and for millions of others the transportation, manufacture, export, and financing of cotton are of paramount importance.[3] For more than a century the economics, politics, and social structure of the South have been dominated by cotton.[4] So important is this great staple commodity that the prosperity of the Cotton Belt virtually rises and falls with the price of cotton. In the economy of the nation, cotton ranks high, since for many years it has been America's greatest cash crop.[5] For over one hundred and twenty-five years, with very few exceptions, raw cotton ranked first among American exports.[6] Hence it is quite appropriate that the limits of cotton-growing should be taken as the boundaries of one of the most important human-use regions on the continent of North America. The Cotton Belt has a great wealth of natural resources and an increasing variety of industry, and the fact that cotton has reigned supreme for so many decades, reflects the importance of climate, a mighty molder of the region's economic history.

[1] Not even the Civil War, the boll weevil, or the New Deal could depose the monarch from his throne.

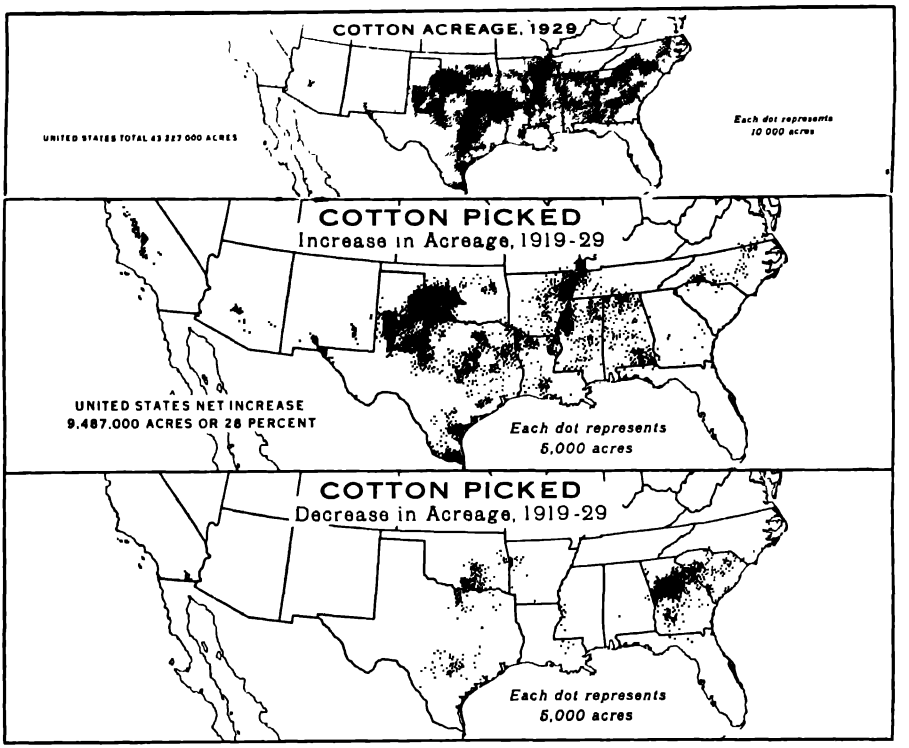
[2] In 1924, 51% of the total land in crops (combined states of North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, and Arkansas) was planted in cotton; in 1929, about 52%; and in 1934 (a year of crop restriction), only 28%.

[3] This statement remains true since 1932, as the chief income from cotton planters comes from growing cotton and from not growing it (cash-benefit payments from the Government).

[4] For a discussion of the effect of agriculture upon the Southern attitude toward the tariff, see M. Ogden Phillips, "The Tariff and the South," *South Atlantic Quarterly*, October, 1933, pp. 375-86.

[5] For years the total value of the corn crop has been greater than the value of cotton, but four-fifths of the corn crop is fed to animals on the farm and is not sold directly for cash. The value of the cotton crop (fiber and seed) is greater than that of wheat or hay.

[6] Value of chief exports in 1938 in millions of dollars: automobiles, parts, etc., 270; unmanufactured cotton, 229; leaf tobacco, 155; crude petroleum, 112; gasoline, 104; electrical machinery, 102; metalworking machinery, 97.



FIGS. A, B, C. It appears that the Cotton Belt has moved. Some counties in Georgia have lost half of their farms. Why? See the gully in Fig. 297 B, and boll weevils. (Courtesy U.S. Dept Agr.)

BOUNDS AND CLIMATE OF THE COTTON BELT

The cotton plant is not very particular as to soils, but it requires a long growing-season with summer rain. Therefore in most places climate sets the bounds of the Cotton Belt. Its eastern boundary is the Atlantic. The northern boundary is set by length of season.[7] Cotton can succeed only where there are at least two hundred frostless days in the growing-season. The western boundary is also fixed by climate, the line of too little rainfall. At the south again the boundary is a climate line, this time a wet one. The Gulf Coast is so thoroughly drenched with summer rain that tillage is almost impossible, and in Florida the autumn rains beat off the cotton before it can all be picked. A dry autumn for harvest is part of the ideal cotton climate — less than 10 inches of autumn rain.

The eastern part of the Cotton Belt has a humid summer. The western part, the part that is north of Mexico rather than north of the Gulf, has at times hot southwest winds, dry and very hot.

[7] Little cotton is grown north of the line of 77° F. average summer temperature. The boundary tends to move north, owing to the improvements of early-maturing varieties of cotton.

SLAVERY AND THE PLANTATION SYSTEM

The agricultural start of the Cotton Belt was quite the opposite of that of New England. Instead of the small general farm, supporting the family by a group of complementary crops, as was the rule in New England, the South started on the plantation system of selling one or two things and buying many others. In colonial times, rice, indigo, and tobacco were the money crops. There was no extensive settlement far from the seacoast until cotton became commercially important. Then the supreme commercial importance of cotton enabled it to support a brilliant civilization by the plantation system — slavery, and the sale of cotton. Some corn was produced for food for mule and slave.

In this period of slavery the abundant land of the South permitted cotton prosperity to be based upon a most wasteful system of land exploitation. It was merely the primitive agriculture of the African forest made strong by the ax and devilishly destructive through erosion induced by the plow. In winter the slaves chopped down forests and burned the trees to clear fresh fields for cotton. In summer they tilled the crop, men plowing, women hoeing. In the autumn men, women, and children picked it. When continuous cropping and gullying with cotton and corn impoverished the soil and made the yields low, the field was abandoned to grow up again in woods, and fresh clearings gave new land for the soil-robbing system.[8] Thus settlement rolled westward from the Atlantic to central Texas.

Men of mark from old Missouri,
Men of daring from Kentucky,
Tennessee, Louisiana,
Men of many states and races,
Bringing wives and children with them,
Followed up the wooded valleys,
Spread across the rolling prairies,
Raising homes and reaping harvests.

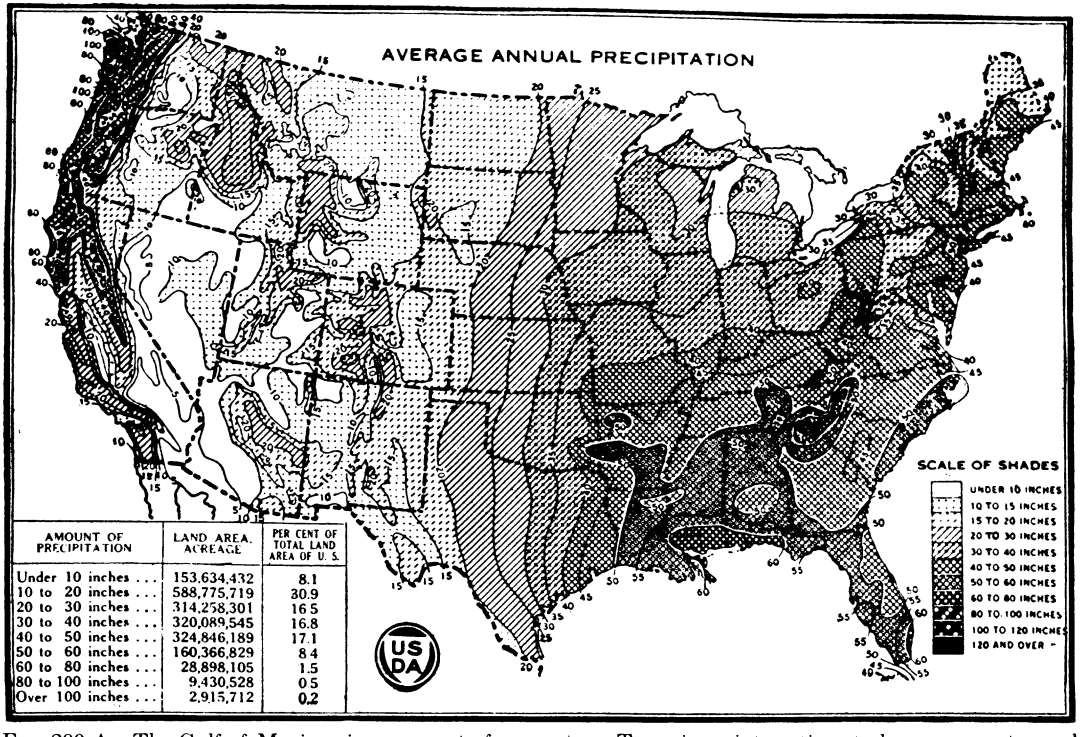
– From "Texas," Henry van Dyke

This plantation system of the white manager, the Negro worker, and the ruthless exploitation of land has received two shocks — one from the Civil War, one from the boll weevil. The boll-weevil shock was the greater, furnishing strong evidence of the power of the insect as man's rival for the dominance of the earth.[9]

[8] From the top of the State University buildings at Athens in the hilly country of North Georgia, one sees varied landscape of field and woods spread out in all directions. But professors at the university told me that every bit of the woods of which I saw so much has at some time been cotton field.

[9] "Man imagines himself to be the dominant power on the earth. He is nothing of the sort. The true lords of the universe are the insects. While it is true that man has invented and perfected so many destructive agencies that he has attained to a predominance over the most fierce and powerful mammals and the most deadly reptiles, it is also true that in face of an attack of insects he and all his works are set at naught." — James Buckland, "Value of Birds to Man," *Annual Report of the Board of Regents of the Smithsonian Institution*, 1913, p. 439.

If Mr. Buckland had been illustrating his point from the Cotton Belt, he might have



AMOUNT OF PRECIPITATION	LAND AREA, ACREAGE	PER CENT OF TOTAL LAND AREA OF U. S.
Under 10 inches . . .	153,634,432	8.1
10 to 20 inches . . .	588,775,719	30.9
20 to 30 inches . . .	314,258,301	16.5
30 to 40 inches . . .	320,089,545	16.8
40 to 50 inches . . .	324,846,189	17.1
50 to 60 inches . . .	160,366,829	8.4
60 to 80 inches . . .	28,898,105	1.5
80 to 100 inches . . .	9,430,528	0.5
Over 100 inches . . .	2,915,712	0.2

FIG. 290 A. The Gulf of Mexico gives us most of our water. Texas is an interesting study — swamp to sand dune. (Courtesy U.S. Dept Agr.)

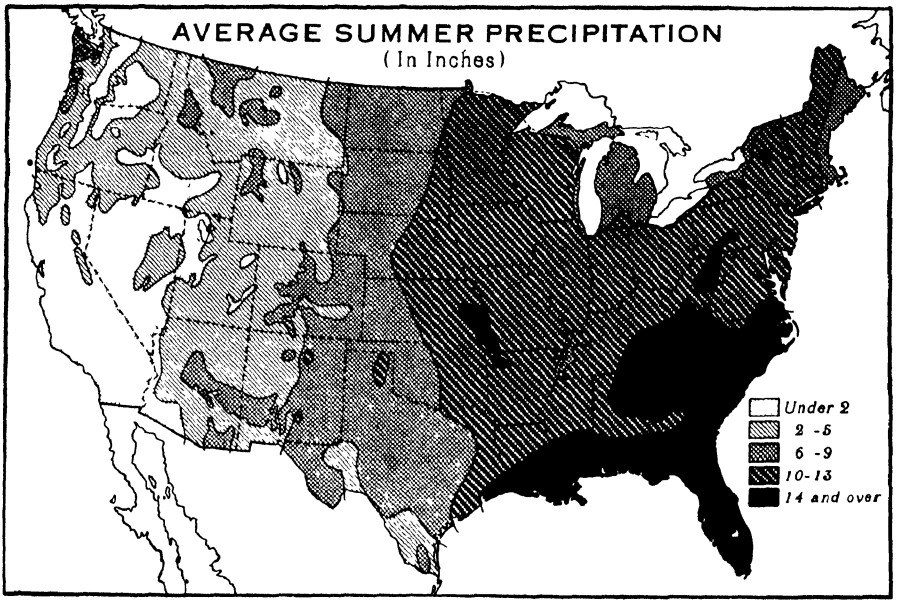


FIG. 291 A

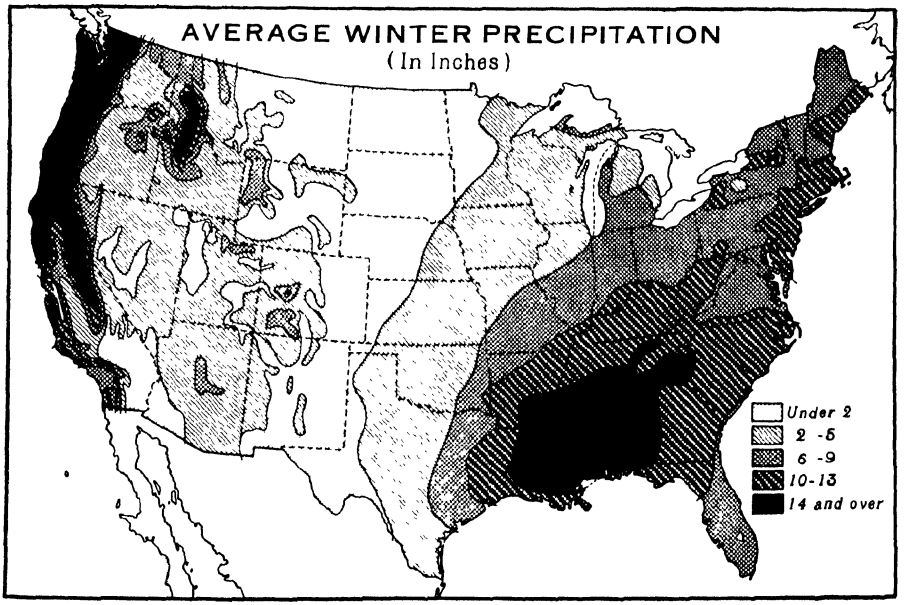


FIG. 291 B

One who would understand the United States as the home of man may ponder long on these maps. (Courtesy U.S. Dept Agr.)

THE CIVIL WAR AND THE TENANT SYSTEM

Those who think that revolution comes by legislation should compare the Southern agricultural system before the war of 1861–65 and after it to see how much easier it is to change names and statutes than to change economic fact. Before the war the plantation of 1000 acres had its owner, a white foreman or two, and many families of Negroes, who lived in cabins near the mansion. The Negroes worked the master's fields, drove his mules, and picked the cotton. After the war they were free Negroes, but most of them did not move away. They usually lived in the same cabin, drove the same mule, which belonged to the same white man, grew cotton in the same fields. In the autumn the men, women, and children picked cotton as before the war, but this time as tenants receiving a share of the crop, thereby being, in a certain sense — a very limited sense — their own bosses. There are various ways of being bosses; one of them is financial.

The independence of the new freedom was more nominal than real. It was greatly limited by the financial situation. The former slave was not used to saving money. Carefree joyousness and hearty laughter are much more common with him than with the thrifty Yankee. After the week of Christmas celebration, the great holiday of slavery which survived emancipation, the Negro was usually penniless.[10] He lived through the winter and spring and early summer on what he borrowed from the owner of the plantation or a local storekeeper or some other capitalist. If he did not keep on working, he could not keep on buying cornmeal, overalls, tobacco, bacon, and molasses. The white man, of course, advanced as little as he could, and in turn the Negro worked as little as he could. If the cotton sold for enough to pay back what the Negroes had borrowed, all concerned felt they had completed a lucky episode, and they were ready to start all over again for the winter of borrowing and the summer of work.

Cotton is still king of the countryside. If the price is good, the Negro has a joyous winter, or at least a good autumn and Christmas, and the planter's daughter goes to college with a trunk full of new clothes. If cotton slumps, the girl often has to leave college.

The common tenant's unit is one mule and the land that he can cultivate with a one-horse plow, hence the term "one-horse farm." This system has naturally tended to make a race of supervisors of the white population, es-

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pointed to the following: (1) mosquito, bearer of misery and malaria, which has done so much to keep the white man out of important sections and to keep down his numbers in others; (2) cattle tick, which held the cattle industry at bay and almost reduced it to naught until this generation discovered the potency of cattle dipping; (3) hookworm, the extent of whose ravages in keeping man down has only recently been discovered; (4) boll weevil. Before the World War it was estimated that insects did $700,000,000 worth of damage each year in the United States, of which $300,000,000 was done by the boll weevil. The figure would be much larger now. Therefore, in a zoologic sense, the Bureau of Entomology (for the study of insects) in the Department of Agriculture might be considered our real war department, and it is probable that larger appropriations for it would be highly profitable if they could be spent by men of scientific imagination. If bureaucratic paralysis (a very common affliction) got the bureaucrats, the appropriations would not be so profitable.

[10] Full carloads of bulk apples move freely from Virginia into the Cotton Belt as long as cotton-picking continues, with the free flow of wages. Then stop cotton — and stop apples!

pecially as the unskilled and uneducated Negro needs a great deal of supervision.

The attitude of the two races toward each other is shown by the following stories:

A Northerner from the two-horse plow or three-horse plow country, seeing a Negro on a Southern plantation creeping across the field with a one-mule plow, asked the white man why he did not give the man a two-mule team. "What!" he exclaimed. "Let that lazy nigger waste *two* mules' time?"

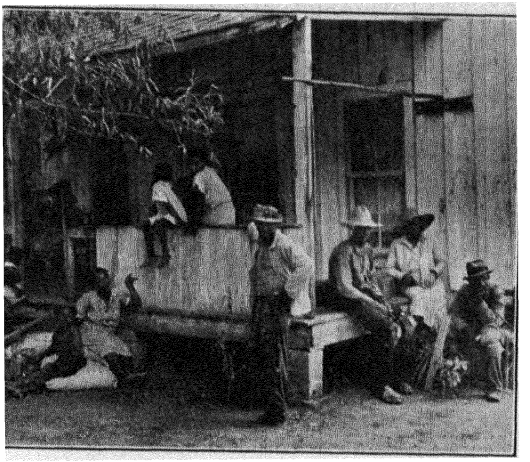


FIG. A. Waiting for the call to pick cotton. (Courtesy Farm Security Adm.)

"Marse Jeems," asked an old Negro of a leading citizen, "what wuz you-all white folks havin' dat meetin' about terday up thaiah at de cohthouse?" "We're gettin' up a plan, Jim, to try and get some more white people to come and settle in this country." "Good Lordy, Marse Jeems, don't you do it! Please don't do it. Why, Marse Jeems, don't you know that us poh niggahs has got jest all we kin do now ter suppoht de white folks dat's heah already?"

This one-crop and mortgage system led to a great commerce. The Northern farm furnished the mule and often the hay that it ate and the bacon and lard for the Negro's frying-pan. Mills and factories in the North and in Europe



FIG. B. Chopping cotton. We have small prospect of getting a machine that will take weeds and surplus little plants out of the row. (Courtesy Farm Security Adm.)

furnished thousands of commodities sold in the stores throughout the broad Cotton Belt.

The razorback hog was part of this system. Here, as in Appalachia (see Chapter 10), unfenced land was public property. The hog was turned out to root for itself, and generations of self-support made it long of leg, flat of side, sharp of back (razorback), and very long and strong of snout — the implement by which it rooted up much of its living. Acorns, hickory nuts, walnuts, pecans, and roots are still an important element of hog nourishment in many sections of the Cotton Belt.

A New Jersey pork-breeder who years ago showed beautiful, round well-bred porkers in a Cotton State fair saw with amazement the premium put upon the razorback. He could not understand it at first. "You see, Mistah, them hawgs of yourn may be all right fer up Nawth where you come from, but they ain't wuth five cents apiece heah. Youah hawgs ain't got no speed. Hawgs must have *speed*. Down heah, if a hawg can't beat a niggah to the swamp he ain't wuth havin', for you won't have him long."

The period following the Civil War saw less clearing of Cotton Belt forest for fresh fields than the period before the war, although the process still continues to this day. There are two major reasons why less land is being cleared for cotton: the declining supply of fresh land, and the use of commercial fertilizer, which permits land naturally exhausted to continue production for a time.[11] Therefore fertilizer has speeded up destruction by erosion. The South, with its robber agriculture, is the part of the country which requires the greatest amount of fertilizer.

The one-crop system was destructive of land through lack of proper rotation and great soil erosion, but it continued because of the commercial superiority of cotton and the ease with which it could be mortgaged. But finally from Washington, from the state agricultural college, and from other sources, came eulogies on the excellence of the country for diversified agriculture. The whole South rang with the din of sermons exhorting the farmers to grow many crops. When it came to a consideration of the Negro tenant, no one wanted to mortgage his prospective crop of pigs. It was too easy for them to "run away." If his crop were hay or beans or oats, the rain might ruin it. Indeed, nothing was so easy to mortgage as cotton, because it was easy to grow, easy to keep, nothing could eat it (a point of very great importance), and it had to be taken to the ginnery before it could be sold (another point of great importance).[12] The tenant-farmer system has long been an impediment to crop diversification in the Cotton Belt. It remained for the boll weevil, and later the New Deal, to achieve some results.

[11] Under the Agricultural Adjustment Act of 1933, the Soil Conservation and Domestic Allotment Act of 1936, and the Agricultural Adjustment Act of 1938, not only has cotton acreage been reduced but the cultivation of marginal land and the clearance of new land for cotton have been discouraged. Another reason why less land is being cleared for cotton is that farmers are beginning to realize the value of their woodlots.

[12] A leading citizen of North Carolina used to declare: "I wish it was harder to grow cotton. Then there would be some money in it. As it is now, any fool nigger with a bull yearlin' can make cotton." The bull yearling was a one-year-old ox, often used in place of the mule to draw the plow and the cultivator. The boll weevil certainly answered this prayer.

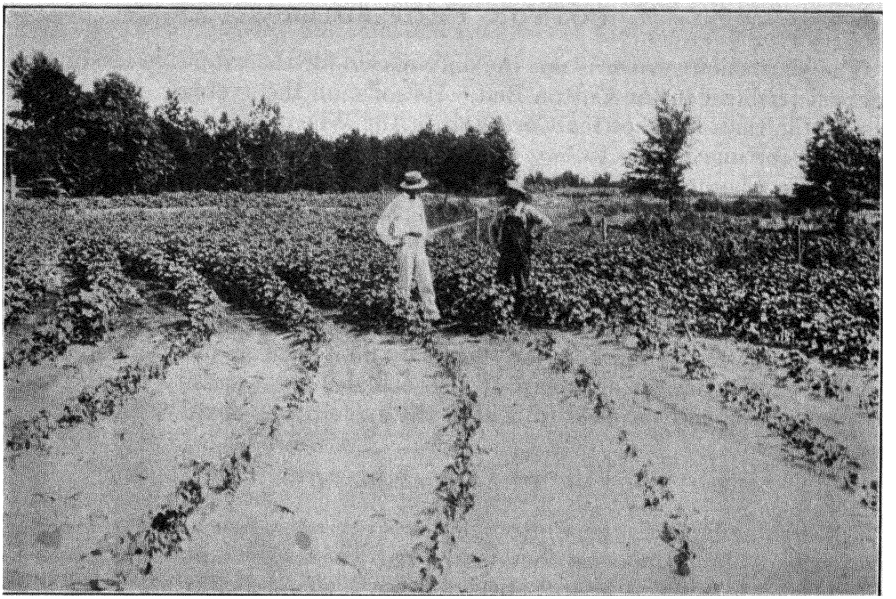


FIG. 295 A. An experiment in cotton fertilization. Both lots of cotton had 200 lbs. superphosphate and 25 lbs. muriate of potash per acre. One had 100 lbs. Chilean nitrate of soda. A shortage of a minor plant food, even microscopic quantities of boron, may almost ruin a crop. (Courtesy Chilean Nitrate Educat'l Bureau)

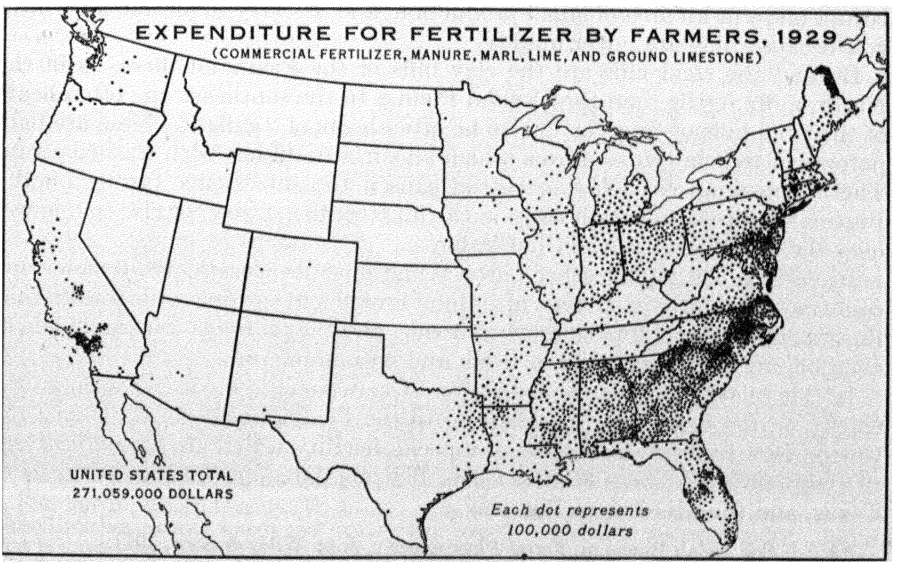


FIG. 295 B. Commercial fertilizers are almost as revolutionary to American agriculture in humid climates as steam has been to manufacturing. (Courtesy U.S. Dept Agr.)

COTTON BELT SOILS

The plantation system is not the only reason for the extensive use of commercial fertilizer in the Cotton Belt. Its soils, on the average, are naturally less fertile than those of the Corn Belt or the Wheat Belt to the north of it. This misfortune is due to two reasons: first, the Coastal Plain origin, explained in Chapter 7, and second, leaching. Iowa has 30 inches of rain, and its soil is frozen all winter, so that no water can get into it. It is evident that the soil of the Cotton Belt, because it receives an annual rainfall of from 50 to 60 inches, and because there is no deep freezing of the earth,[13] suffers much more from leaching than does Iowa. This climatic factor, which tends to reduce fertility in all lands of warm climate and heavy rainfall, explains the distinctly lower fertility content shown by many soil analyses made by the United States Bureau of Soils. It also explains the necessity for the rapid shifting of cotton from field to field in the exploitive system.

THE COASTAL PLAIN AND THE PIEDMONT

An area as large as the Cotton Belt has a great variety of soils. Nearly everywhere along the coast there is the barrier beach, and behind it the enclosed lagoon, often with large areas of sandy lowlands, called flatwoods, near the coast. Much of it is so poor that it is called pine barrens, and so flat as to be swampy after heavy rains.

Farther inland are better areas of sandy loams, good for cotton. Back in the Carolinas and Georgia, the sandy loams are flanked by a row of sand hills, from 5 to 30 miles wide and of low fertility. They appeared on the early cotton maps as an area of small production, and are very favorable for winter golf because they are never muddy.

Beyond the sand hills are the clay hills of the Piedmont, here, as in the North, more fertile than the Coastal Plain. In the southeast one often hears of the "red hills of Georgia"; also he often hears of "galls." These are bare patches of red clay subsoil from which all surface soil has been washed away. The commercial excellence of cotton caused the subsistence farmer on the Piedmont to turn to cotton early in the nineteenth century, or else to migrate over the Alleghenies to the Ohio Valley.

In eastern Texas and other parts of the infertile Coastal Plain sand-pine country so few farmers arrived after lumbermen had cut down the forests that there were not enough to support railroads, and the railroads were abandoned, even before the competition of truck and automobile.

In this relatively undeveloped region of varied soils, cotton has been grown chiefly on the best soils. In addition to the Piedmont clays and loams, the Cotton Belt has three soil areas of especial fertility which are famed for their rich agriculture. These are the Black Belt of Alabama, the Black Prairie of Texas, and the Mississippi Bottoms.

[13] See Isaiah Bowman, *Forest Physiography*, John Wiley & Sons, 1911.

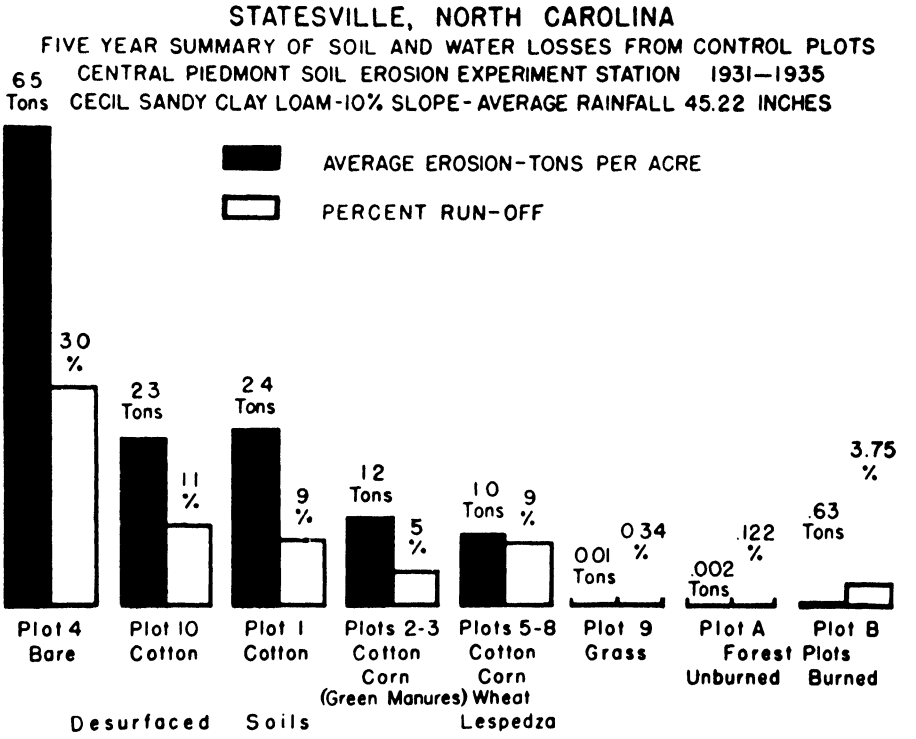


FIG. 297 A. The Cotton Belt man must keep plant cover or perish. (Courtesy U.S. Soil Cons. Service)

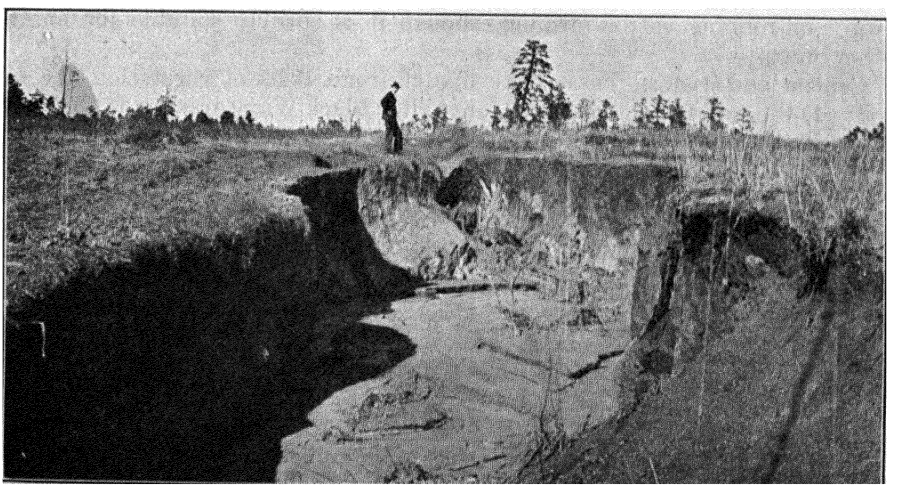


FIG. 297 B. South Carolina Piedmont. One of the finest soils in America erodes thus—topsoil washes easily; tough red clay subsoil resists and cuts a V-shaped gully. Below that is soil horizon C, third-layer coarse granular material that moves easily. The trickling water cuts caves in horizon C and the subsoil and topsoil drop in by the wagonload.

The national defense is soil conservation, not cannon. A few more generations of gullies, and there will be nothing to defend and none to defend it. (Photo J. Russell Smith)

THE BLACK BELT OF ALABAMA

The Black Belt of Alabama is a layer of soft chalky limestone, which outcrops in a great curve through central Alabama (Fig. 288 A). Erosion reveals the chalk which nature has covered with earth and blackened the earth with the remains of the rank vegetation which the lime encouraged. This limestone is one of the rich soil areas of the world. For many years it yielded crops of corn and cotton without the necessity of rest. This is ideal for the slave or the tenant system. The natural result was a large production of cotton before the boll weevil, and of livestock since. Three-fourths of the population on this good renting land is black, and in slave days the proportion was higher.

THE BLACK PRAIRIE OF TEXAS

As one goes westward through the sandy forested plain of eastern Texas, he passes suddenly out of forests into a treeless plain whose fine-textured black soil is made from weathered limestone. It is the Black Land Prairie of Texas, formed by the same geologic formation as the Black Belt of Alabama. This area of fine farm-land, often spoken of as "Black Waxy," because it is so sticky when wet, lies in a long belt from northeast to southwest from the Ouachita Mountains to Austin and beyond.

The great fertility of the Black Waxy causes it to be extensively used for cotton. Some of it is said to have made good crops of cotton for seventy-five years in succession. As is usually the case with rich lands where good salable crops can grow, it is high-priced, and most of it has passed into the hands of tenants and supports a landlord class. It has been too much devoted to one-crop, soil-robbing cotton-farming, though it is entirely suitable for many other crops.

Central and eastern Texas have five clear-cut belts of vegetation due to soil: (1) the eastern sand and pine forest; (2) Black Waxy grassland; (3) west of the Black Land Prairie, a long narrow strip of sandy soil bearing forest, the "Eastern Cross Timbers"; (4) west of that, another limestone prairie, the "Grand Prairie"; and (5) west of that, another sand formation bearing forest — the "Western Cross Timbers."

The lime formations were naturally grass-covered because they make a close-textured soil, good for grass, which is the great enemy of trees. The sand does not make such good grass and absorbs more water, and hence is forest-covered.

The same general conditions prevail on the Grand Prairie as on the Black Waxy, but the former is hillier and dryer, and not so extensively cultivated. The northern part of the Grand Prairie is called the Fort Worth Prairie; the southern part is known as the Lampasas Cut Plain. In this part the nearly horizontal strata of limestone have been eroded into a series of valleys and divides, the divide in many cases being composed of perfectly bare limestone rock flanked by shallow soils which tend to restrict cultivation to the small valleys between.

These two prairies, 30,000 square miles in extent, and divided up into a

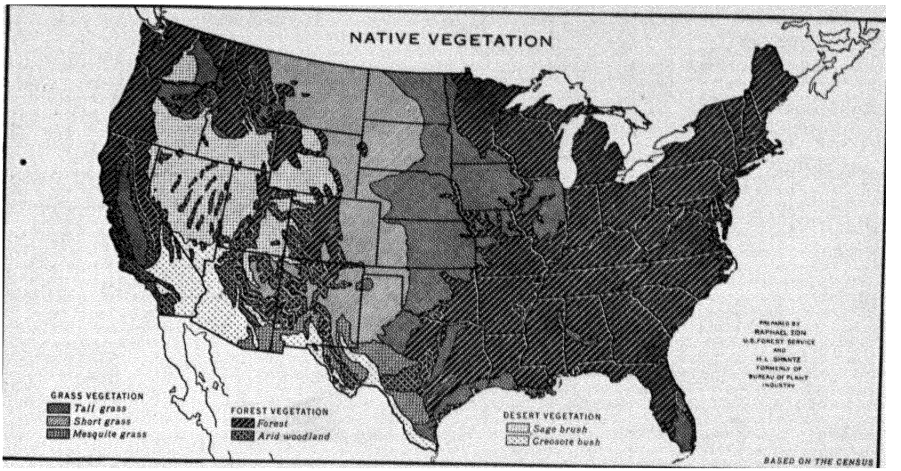


FIG. A. This map needs to be examined in connection with the rainfall maps. (Courtesy U.S. Dept Agr.)

number of smaller areas with local names, are the chief center of cotton-growing in Texas. They are the center of its densest rural population, of its highest land values, of its greatest prosperity. To surrounding territories they are as the Bluegrass of Kentucky, the Valley of Virginia, or the Black Belt of Alabama are to their surrounding districts.

This prairie region of agricultural riches has naturally become the seat of most of the cities of the interior of Texas — Dallas, Fort Worth, Austin, Waco, Paris, the natural trade centers of the fertile plains.[14]

The Black Prairie of Texas was not settled much until after 1865. Therefore it differs from the Black Belt of Alabama in having fewer Negroes. They comprise about one-fourth of the population and one-sixth of the tenants, but the total proportion of tenants is very high.[15] Tenant and landlord questions arising from this prairie have often dominated the politics of Texas.

[14] From Austin southward the boundary of the Black Waxy is a line, sometimes a cliff of limestone rocks, the Balcones Escarpment, a great fault that stands up almost like a mountain front, and runs for a long distance through Texas. It is the front of the Edwards Plateau. This escarpment divides Travis County, Tex., with Austin in the center, into two parts. One is Black Waxy, which looks like the prairies of Illinois — all cultivated, having good farm buildings and worth from $40 to $100 an acre. The other half of the country is dissected plateau. The people have little patches of cleared land in the valleys. Their cattle run in the woods. They make their money by hauling wood to Austin if they are near by, or charcoal if the distance is greater. Many of these people are from Southern Appalachia, and they live and think much as the more isolated Appalachian mountaineers live — another of the innumerable examples the world affords of the influences of environment upon life, society, and thought. It is easy here to overwork environment. Who went to this environment? We must consider social type and personal type. One of the "laws" of agricultural economics says that economically inefficient men (social type? personal type?) tend to gravitate to poor land, and vice versa. There are many of these poor-land poor-culture islands in the United States. They need studying.

[15] Tenancy in 1935: Kaufman County, 75%; Ellis County, 68%; Navarro County, 72%; Washington County, 60%.

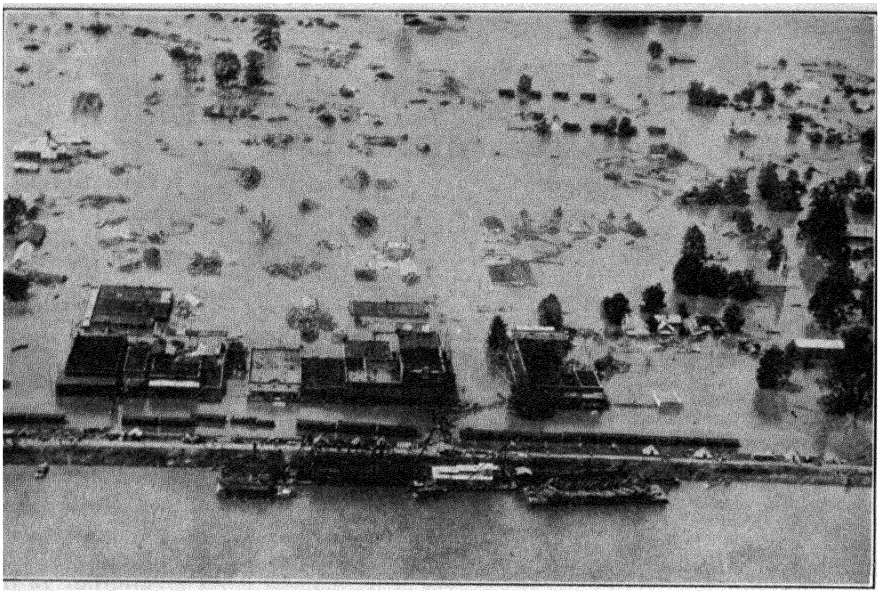


FIG. A. The Father of Waters is also the father of much misery. See levee, freight cars on railroad track, tents of flood refugees, and the almost submerged homes of men. (Courtesy U.S. Weather Bureau)

THE MISSISSIPPI FLOOD PLAIN

The Mississippi, carrying mud at the estimated rate of thirty-three carloads per minute, has built up thousands of square miles of land between the mouth of the Ohio and the Gulf of Mexico. An area of about 29,000 square miles is still so low that the river has in recent years overflowed it. When the river in flood rises above its banks, almost the whole lowland becomes a lake, and as the current flows from the deep, swift channel into the quiet backwaters of the lake, the velocity of the water is checked. This has caused the stream to drop much of its burden of mud and sand. This builds the bank (natural levee) higher near the stream than at any other part of the flood plain. Such is the nature of rivers.

The immediate banks of the Mississippi are usually built up 10 or 15 feet higher than the swamp 2 or 3 miles back. This is naturally the most valuable land for plantations. The soil is often drained by ditches which run at right angles to the river. The ditches carry water back to the edge of the swamp, which to this day covers most of the area of the Mississippi flood plain. The marvelous richness of its alluvial soil has not yet tempted man to undertake the necessary drainage in any large, comprehensive way. The land still belongs to muskrats, frogs, and mosquitoes. They have a saying in Arkansas that the little frogs in the swamps pipe in their shrill voices, "Quinine, quinine, quinine!" while the big bullfrog with his deep bass voice chimes in, "Double the dose! Double the dose!"



FIG. 301 A. Taken Apr. 7, 1936. The Mississippi in flood makes three cutoffs, gives a demonstration in physiographic process, and shows us some of the things that man must face when he sets out to tame the Father of Waters. (Published by authority of the Mississippi River Comm'n)

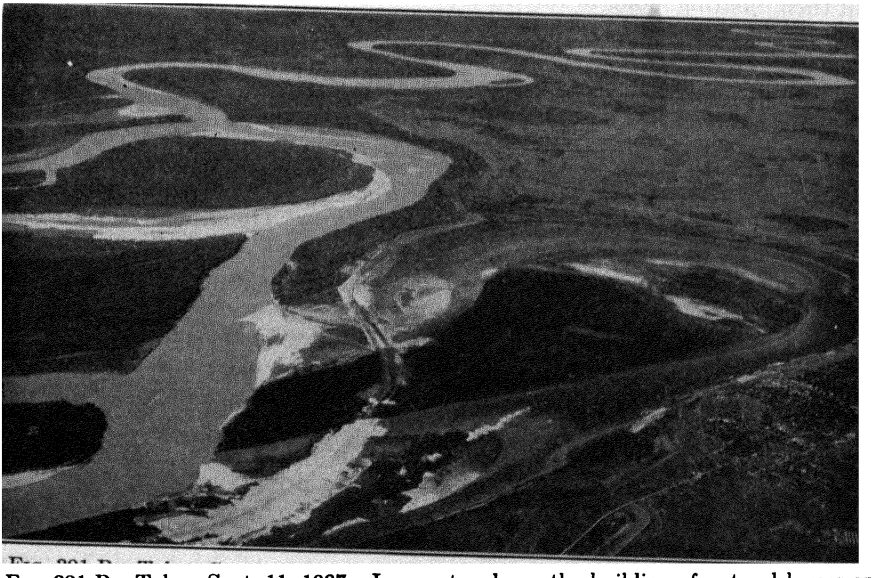


FIG. 301 B. Taken Sept. 11, 1937. Low water shows the building of natural levees as they fill up old oxbows and turn them into lakes. Observe the fate of Greenville, Miss., (lower right) which for years had great expense because the cutting river tried to eat it up, and partially succeeded. (Published by authority of the Mississippi River Comm'n)

The value of the plantations on the Mississippi flood plain led, many years ago, to the building of artificial banks or levees to hold the river within its banks. There are now nearly 2000 miles of these structures. They have cost over $350,000,000, and are sometimes spoken of as "$25-a-yard protection."

In times of flood the water rises 25 feet above the level of the plain outside the levee. The river steamboat is then the highest thing in the landscape. Sometimes floods break through this artificial levee, and water flows out through the ever widening gap, until often it covers hundreds, even thousands, of square miles. At these tragic times boat service has to be organized to rescue the dwellers on the flood plain. The War Department often loans tents, and the people camp for months on the levee, the only land visible in miles of muddy water.

The most extensive reclamation of the Mississippi Bottom Lands has occurred north of the Red River in northeastern Louisiana, northwestern Mississippi, and eastern Arkansas. These lands are richer even than the Black Belt, and can stand much continuous cropping of cotton or corn. From 60 per cent to 75 per cent of the population is Negro. The organization of the plantation is much like that of a coal mine. The absentee owner is represented by a superintendent, a foreman, a bookkeeper, and a storekeeper. The labor is done by dozens or scores of Negro tenants or share-croppers — a poor basis for a democracy.[16]

Early in this century the rising price of land in the Middle West caused the beginning of a more ambitious plan of swamp reclamation, which closely resembles that of Holland. A steam dredge floating on a barge cuts a canal, and then, floating along in the canal it has cut, lifts the earth up and with it builds a levee beside the canal. The dredge goes around the bounds of a tract of several thousand acres, leaving the canal on the inside of the dike to serve as a master drainage canal. Since the elevation of some of this land is less than 5 feet above the far-distant Gulf, the drainage of the enclosed land can only be accomplished by pumping, for which the fuel cost is usually less than $1 per acre per year. Several of these reclaimed units were built before the World War by Northern capitalists, who sold the land at comparatively low prices to people from the North Central states. On at least one of the reclaimed units there was not a single Northerner left in a few years. The possibilities of rich production were there in the black soil, but man does not live by crops alone. The constant humidity, the steady, wilting heat of summer, the mosquitoes, the monotony of life in a little frame house set on posts and without a cellar — all this lacked the charm of the old home in the land of frosty winters, in a place where you could get into an automobile and ride in any direction.

The coming of the boll weevil, which injured the cotton crop, has caused much land along the Mississippi to go out of cultivation, because wet lands make the cotton late in blooming and therefore more exposed to the hordes of weevils, which increase through the summer.

This Mississippi flood plain offers an interesting dare to man. Can we use

[16] The cotton-reduction plans of the United States Government resulted in the eviction of many share-croppers.

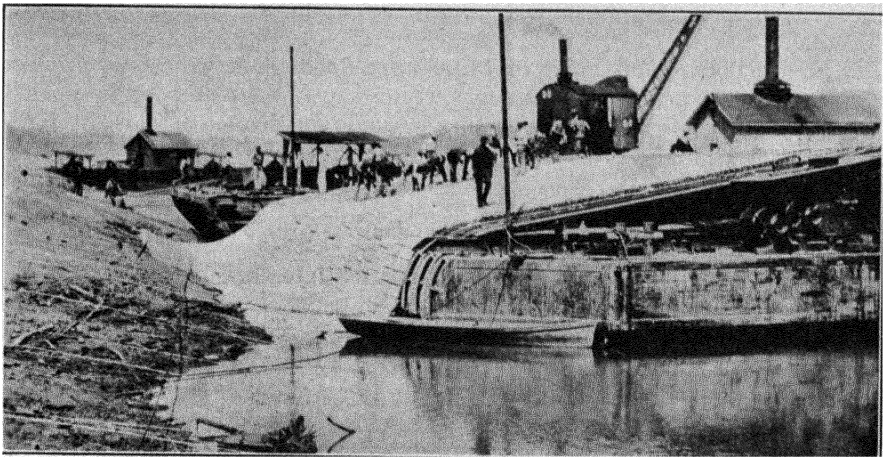


FIG. A. Controlling the Mississippi would be much simpler if building levees finished them. But the river twists around and cuts them out. Against this cosmic process man must forever fight, at present chiefly with revetments of brush, asphalt, or concrete. Here they are laying articulated concrete revetment. (Published by authority of the Mississippi River Comm'n)

all its wonderful soil to the best advantage? To do so will require a more wholesale attack than has yet been attempted. There are three enemies — the mosquitoes, the flood, and soil exhaustion. We need to go after them in the same way that an army goes after an entrenched enemy — with a solid battle line and an unbroken front. This is especially necessary in order to get rid of the malaria, which can be controlled only if constructive imagination is applied to hard work.[17]

The flood has not yet been captured. It has only been brought to a truce, and even that is occasionally violated. It is the habit of meandering streams to cut the outside of their curves. Thus the river is always eating at its levees. Sometimes the river is 100 feet deep 10 feet from the bank — a good illustration of levee difficulties.

The method of dividing the flood plain into a number of individual diked areas and pumping out the water is most promising for ultimate success. To maintain soil fertility some provision is needed for the introduction of river water, which brings the blessing of an annual or occasional coating of mud. It is river-borne mud which has for so long maintained fertility on the flood plain of the Nile.[18] Arthur E. Morgan, an expert drainage engineer, says that

[17] "Expensive as these measures may be, they are economic, for the cost of malaria is even greater, the annual loss to the South being estimated at approximately half billion dollars." — L. L. Williams, Sr., surgeon in charge of the Malaria Investigation, U. S. Public Health Service, 1937. See Frederick L. Hoffman, *A Plea and a Plan for the Eradication of Malaria throughout the Western Hemisphere*, Prudential Press, Newark, N. J., 1917.

[18] Parts of the Miami Basin in Ohio, subject to an almost regular winter flooding, have maintained a record of 75 bu. of corn per acre for fifty-six consecutive years.

The building of the Nile Dam at Assuan promptly caused a reduction of productivity in some of the land below it, because it held the flood which previously covered the land, fertilized it, and kept it fertile from the days of Pharaoh to those of Edward VII.

this is technically feasible. It requires large-scale organization to make it effective.

If the 25,000 square miles of Mississippi flood plain were brought into permanent cultivation and annually fertilized by the stream, it could easily support 1000 people to the square mile, or about one-fifth of the present population of the United States.[19]

SOIL EROSION

The rolling and hilly parts of the Cotton Belt have suffered more from soil erosion than any other part of the United States.[20] The heavy rain and the open winter conspire to this end, and man has assisted almost miraculously with his grassless, humusless agriculture, the two chief crops of which are cotton and corn. Both of these crops require that all other vegetation shall be killed, and earth loosened by the cultivator is in 100 per cent readiness for removal by the next rain — and that rain is likely to be a thundershower, the most erosive of all rains. The commercial value of cotton in the past has cursed the future. It made the bare field. It made the one-crop system. It made the mortgage system. It made the tenant system, and the tenant, being human like the rest of us, let the fields waste away and let the homelands of the future wash down with every shower to choke the rivers and spoil the navigation of the present and the future.

For decades reports of ruin have come out of the hill section — thousands of square miles of ruin. Some counties were reported one-third worn-out before 1850. Worst of all is the plight of the loess lands east of the Mississippi. This layer of rich, wind-blown soil, half as wide as the State of Mississippi, reaching nearly all the way from the Ohio to the Gulf, is a kind of thin veneer lying on top of Coastal Plain sands.[21] It is extremely rich, and erodes very easily.

"The washing away of the surface soil . . . diminished the production of the higher lands, which were then (at the time of the Civil War) commonly 'turned out' and left without cultivation or care of any kind. The crusted surface shed the rain water into the old furrows, and the latter were quickly deepened and widened into gullies — 'red washes.' . . .

"As the evil progressed, large areas of uplands were denuded completely of their loam or culture stratum, leaving nothing but bare, arid sand, wholly useless for cultivation, while the valleys were little better, the native vegetation having been destroyed and only hardy weeds finding nourishment on the sandy surface.

[19] And their food could be a well-balanced vegetable diet with a little flesh food — a more wholesome diet than millions in the South now get. See Victor G. Heiser, *You're the Doctor*. F. H. King, in *Farmers of Forty Centuries*, reports similar land at the mouth of the Yangtze Kiang to be supporting over 3000 people per square mile, without the aid of much machinery, and the art of nutrition is so advanced in China that these 3000 to the Yangtze square mile are almost certainly nourished better than 30 to the square mile in many parts of our South.

[20] A wide hill section was thus described: "Cut 'n burnt, cut 'n burnt, cut 'n burnt — and gullies where it's cultivated. Po' cotton, po' cawn, and po' people."

[21] For its origin see H. H. Bennett, *The Soils and Agriculture of the Southern States*, Macmillan Company, 1921.

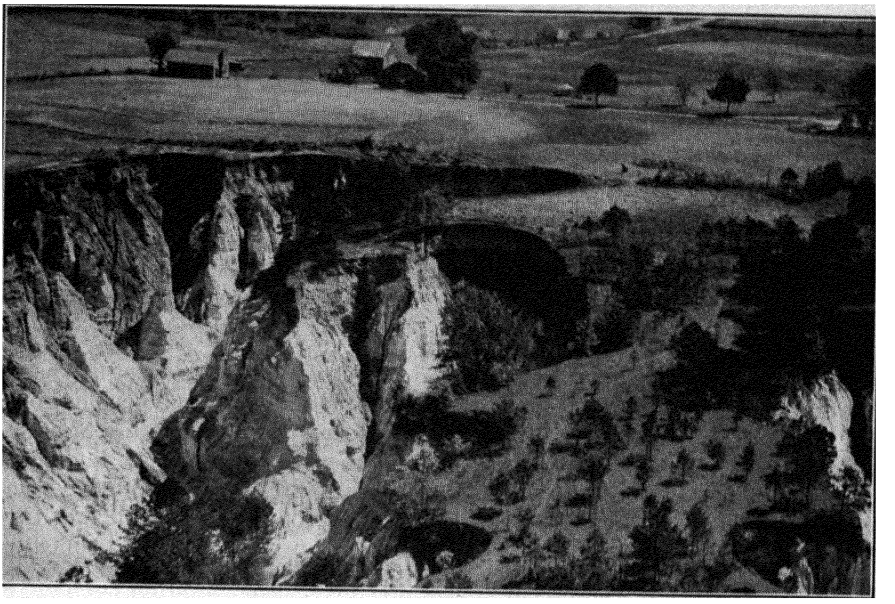


FIG. 305 A. One of Hilgard's gullies that is eating up a Georgia county. They are 50 to 200 feet deep. Sometimes 1 acre of hill land will thus ruin 5 acres of lowland. (Courtesy U.S. Soil Cons. Service)

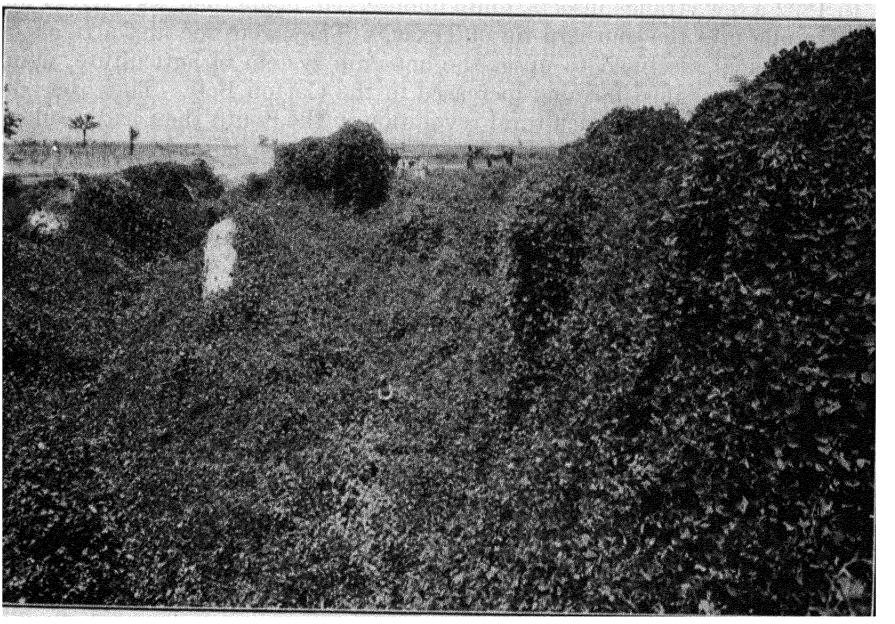


FIG. 305 B. In 13 years, one unaided plant of the creeping kudzu vine did this to a gully in good South Carolina Piedmont soil. The gully has filled up 5 feet. Note the two men (one in center). Mr. Detweiler of the U.S. Soil Conservation Service says that soil-erosion control is more nearly a vegetation problem than an engineering problem. See the Dept Agr. U.S.D.A. bulletin on kudzu. (Courtesy U.S. Soil Cons. Service)

"In this manner whole sections, and in some portions of the state [Mississippi] whole townships of the best class of uplands, have been transformed into sandy wastes, hardly reclaimable by ordinary means, and wholly changing the industrial conditions of entire counties, whose county-seats even in some instances had to be changed, the old town and site having by the same destructive agencies, literally 'gone down-hill.' "

Specific names have been given to the erosional features of this district; a "break" is the head of a small retrogressive ravine; a "gulf" is a large break with precipitous walls of great depth and breadth, commonly being one hundred or one hundred and fifty feet deep; a "gut" is merely a road-cut deepened by storm-wash and the effects of passing travel.[22]

In this way we have already destroyed the homelands fit for the sustenance of millions. We need an enlarged definition for treason. Some people should not be allowed to sing "My Country." They are destroying it too rapidly.

The quoted passage above makes clear the statement of an intelligent Southerner that it would be a boon to the nation if this land could become worth $100 an acre, so that people could not afford to destroy it and then move on and buy more for $10 or $20 or $30 per acre, to be in its turn destroyed.

THE BOLL WEEVIL AND ITS REVOLUTION

In 1892 a few strange insects, quite unobserved, made their way across the Rio Grande into the southern tip of Texas.[23] They were the first arrivals of the boll weevil, destined to upset the one-crop system of agriculture, upon whose ruin diversified farming increased in the Cotton Belt. Thus the boll weevil made a greater agricultural revolution in the South than had resulted from all the teaching and preaching of the previous half-century. It was more potent economically than the Civil War.

The infant larvae of the boll weevil eat their way into the squares or unripe pods of cotton and spoil it. They then come out to fly away, lay their eggs, and take part in that rapid geometric increase of organisms which lets two boll weevils, in theory at least, start in the spring and have 12,000,000 offspring before the summer is over. By 1922 the ever increasing army of boll weevils had infested the entire Cotton Belt. The rising tide of damage reached its high-water mark in 1921, when this insect pest caused a reduction of one-third in the nation's cotton crop, making the smallest crop since 1895.

At first the cotton farmers were panic-stricken, and it was two or three years before the United States knew what was spoiling the cotton crops in the corner of Texas; a few people actually died of starvation in the early years of the boll weevil. In time the farmers learned that the boll weevil hibernated in dead grass and cotton stubble, about 6 per cent surviving the winter, and by burning or plowing under the old cotton stubble before the

[22] Isaiah Bowman, *Forest Physiography*, p. 524, in which he quotes from E. W. Hilgard, *Soils*, 1906, pp. 218–19.

[23] Our attention had been called to them years before as they worked their way along the coast of Mexico, but unfortunately a democracy is a poor machine to fight an insect invader.

first frost in the fall, the spring crop of boll weevils could be reduced. Since the boll weevil attacks young cotton plants, it was found expedient to plant early-maturing varieties, and to plant the cotton as soon as possible. Another remedy for reducing the ravages of the boll weevil has been to spray the growing cotton with poison, usually calcium arsenate; on a few big plantations airplanes have been used to dust the cotton fields. The only sure cure for the boll weevil, however, is to stop growing cotton and plant other crops instead. Consequently, with the arrival of the invading pest, cotton acreage was reduced in one county after another, and the farmers turned, for a while at least, to crop diversification.[24]

Fortunately, the Cotton Belt was well suited for the success of crop diversification, and the necessity for it came at a fortunate time. In 1909 the boll-weevil army had subjugated most of the cotton-growing land west of the Mississippi, and the advance scouts were just crossing the Alabama line. In another twelve years the conquest of the Cotton Belt was complete. It was during the decade 1910–20 that crop diversification in the South received its first great impetus. (The New Deal gave it another.) This decade was marked by rising land values in the central West, accompanied by an increase of price to Southern consumers in the cost of meat and grain supplies from the North. Higher prices also meant increased income to the Southern grower of supply crops. The movement for agricultural education and county demonstration service was also organized at this time. In 1915 it was estimated that the South was still buying from the North $600,000,000 worth of farm supplies that might have been grown at home. Then came the World War, which greatly enhanced all farm prices, so between 1913 and 1920 ten Southern states increased their production of corn 18 per cent; oats, 50 per cent; rice, 72 per cent; white potatoes, 60 per cent; sweet potatoes, 111 per cent; hay, 150 per cent; milk cows, 16 per cent; hogs, 23 per cent. There was also a substantial increase in the shipment of truck crops to Northern markets. Georgia watermelons and peaches supply half the United States during the early part of the season.

In 1918 a traveler taking a 15-mile ride east of Montgomery, Alabama, in the Black Belt saw almost no cotton, but much corn and many cattle at pasture, and fields of alfalfa. In March, 1919, the State of Mississippi alone shipped 65,000 hogs to St. Louis.[25] Then came the slump in farm prices which depressed agriculture in all parts of the country, both North and South.

While momentous changes occurred within the Cotton Belt and many a farmer renounced his allegiance to King Cotton in favor of the peach tree, the dairy cow, the hog, or the peanut, it is not to be assumed that diversification was universal. Ever since 1865 the tenant-farmer system has remained the great obstacle to diversification. It is "all right" for a farm-owner to

[24] After the first invasion of boll weevils had been survived, many farmers increased their acreage in order to compensate for the lower yields. Since the labor supply is the limiting factor that determines the acreage that can be planted, cultivated, and harvested on any farm, the average landowner could go only so far in expanding his acreage.

[25] In 1910 the people of Enterprise, in southern Alabama, flush with pig money, peanut money, and cattle money, erected a monument to the boll weevil, whose advent had caused their prosperity — they were "rolling in prosperity," the mayor said.

diversify, but not for the tenant. Chickens and pigs and other edibles in the hands of a tenant farmer have a disconcerting habit of disappearing.

The boll-weevil revolution brought about crop diversification in many parts of the Cotton Belt, but there were other important consequences, too. In the first place, a tremendous amount of private and public money has been, and still is, spent to fight the boll weevil. Second, Cotton Belt farmers have been faced with lower yields per acre, a discouraging fact in terms of labor and cost. Third, the price risk to the farmer has increased, for now the farmer must worry not only about the weather but also about what the boll weevil may do. Fourth, the boll weevil destroyed the famous sea-island cotton industry, which stimulated the growing of long-staple cotton under irrigation in the Southwest. And fifth, the boll weevil helped to cause a westward migration of cotton-growing, for this insect does not thrive so well along the drier and cooler margins of the Cotton Belt. For example, the average annual cotton acreage in Georgia declined by 35 per cent between 1909–13 and 1926–30, while the acreage in Texas increased by 53 per cent.[26] Hence the good land of western Texas beckoned cotton-growing westward, while the boll weevil pushed.

SCIENCE, MECHANISM, AND THE AGRICULTURAL FUTURE

The agricultural possibilities of the Cotton Belt are astonishing. If they can be utilized as fully as are those of Denmark or Prussia, the Cotton Belt will make those countries, originally poor like the Cotton Belt, seem like poverty flats in comparison. It has been noted that much Cotton Belt soil is poor. But the climate is wonderfully productive, about twice as productive potentially as that of Denmark or Prussia. We have discovered technique, supplies of commercial fertilizer and of lime, and the lore of legumes. If all these things are well used in the productive climate of the Cotton Belt, poor sandy soil can be made very productive. The method is to stuff the soil with humus by plowing under legumes. In some cases this is being done by growing a succession of crops the tops of which the pigs eat, leaving nearly all the organic matter in the earth and on the field [27] (Figs. 309 A and 311 A).

Schools, colleges, county demonstration agents, the United States Department of Agriculture, and the agricultural press all join in one chorus urging the people to diversify, grow a variety of crops — become independent by the "cow-sow-hen" method. And as long as the people can get by on the basis of a cotton crop, the majority does not give a hang. Sell cotton, go to the store, buy and "set" for nearly half the year!

[26] The average annual cotton acreage in Texas increased from 10,900,000 acres in 1909–13 to 16,700,000 acres in 1926–30. During this period the average acreage in Georgia declined from 5,100,000 to 3,300,000; in South Carolina, from 2,700,000 to 2,100,000; and in Alabama, from 3,700,000 to 3,400,000.

[27] Oats, rye, vetch, crimson clover, red clover, alfalfa, Sudan grass, Bermuda grass, sorghum, Japanese cane, cowpeas, soybeans, velvet beans, sweet potatoes, peanuts, corn — and still the list of possibilities is not exhausted. The western part of the Cotton Belt in Texas and Oklahoma has less rainfall than the rest. Here the possible crop list is smaller and the possible production per square mile is less. In this area, the drought-resisting kaffir corn often replaces maize.

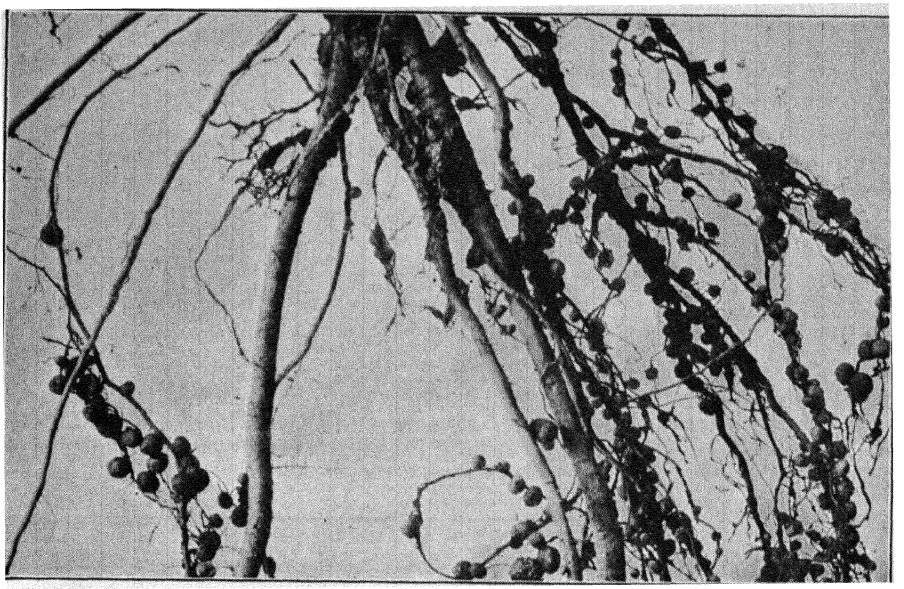


FIG. A. Free food from Heaven. The nodules are formed by nitrogen-gathering bacteria on the roots of a legume (soybean). They get enough free nitrogen to feed the host plant and leave some for the plants that come after. (Courtesy U.S. Dept Agr.)

It is difficult to appreciate the significance of our recent and yet undeveloped conquests by agricultural machinery. The cotton gin is an old story, but it made a revolution and created migrations, states, policies, and wars. The reaper is another old story, but it made a revolution in the North Central states. Machine processes long used on wheat have been applied to rice. From colonial times until recently a few thousand acres of rice had been grown by Negroes who waded about the swamps along the Atlantic Coast of Carolina and Georgia, after the age-old fashion of the Orient. Suddenly we apply tractors, road-graders, steam pumps, reapers, and threshers, and the rice industry moves to the level prairies of southwestern Louisiana, southeastern Texas, and the lowlands of Arkansas, which are now diked, plowed, planted, irrigated, and harvested by machines. The perfection of a successful cotton-picker might well cause a far greater revolution than did Eli Whitney's cotton gin.[28]

The ability of the tractor to double the amount that the farmer can plow is well known, but its significance is rarely appreciated. The principle is applicable in some form to all cultivated crops.

The South has applied machinery to the culture of the soybean, long the chief source of protein and cooking fat for millions in China, Japan, and Manchuria. On the sandy loams of eastern North Carolina, near Newbern, they make corn rows 5 or 6 feet apart, with a row of soybeans between. There

[28] As yet no mechanical picker has been devised which can distinguish between a green boll and a ripe one. If cotton bolls matured simultaneously, the Rust Brothers' cotton-picker would be causing a great revolution right now.



FIG. A. To a resident of the Cotton Belt this scene is too common for comment. (Courtesy Farm Security Adm.)



FIG. B. The Machine Age comes to the Cotton Belt. Homeless wanderers talk of being "tractored out." (Courtesy Allis-Chalmers)

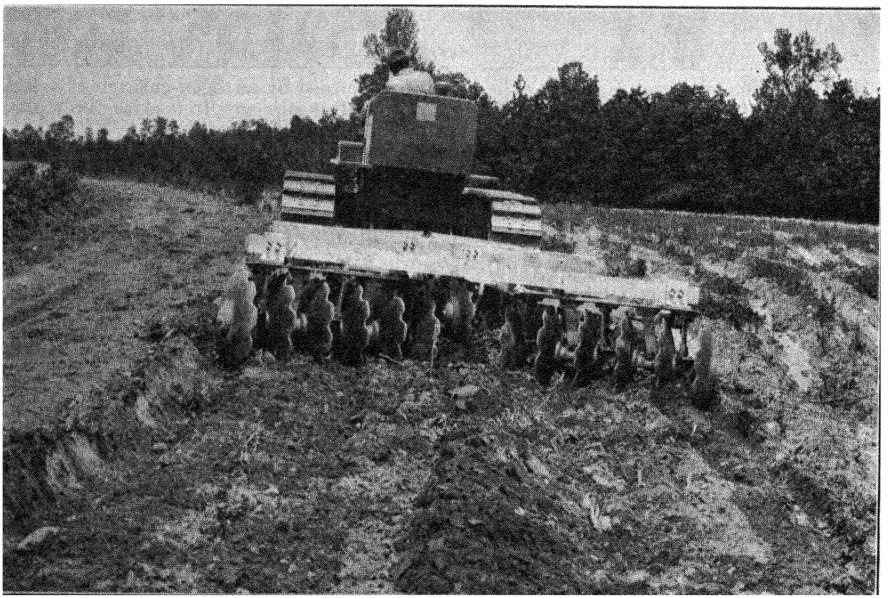


FIG. C. A Georgia cotton field. These ripping, cutting, turning disks of unbelievably hard steel drawn by 20- or 30- or 40-horse power from tireless oil and engine will give to most land all the plowing it needs. Two gallons of 10-cent fuel do $1\frac{2}{3}$ acres in an hour. Exit mule — but see Fig. 293 B. (Courtesy Allis-Chalmers)

seems to be enough moisture and light to make almost a full crop of each — 20 to 30 bushels of beans. The beans are threshed by driving a machine astride the row. With one journey through the field the machine shakes the beans into a sack and delivers them harvested and threshed at the end of the row. Mechanical production of nearly a full crop of corn and soybeans on



FIG. A. The cow's sandwich. Velvet beans climbing to the top of Cotton Belt corn — protein and carbohydrate. Also the pig's sandwich. (Courtesy U.S. Dept Agr.)

the same ground the same year is indeed a triumph, and the resulting possibilities rival those of the reaper itself. The corn and beans are almost a balanced ration for man, and the nodules on the roots of the beans fertilize the earth with the precious nitrogen.

The peanut, which grows on the underground stems of a cloverlike plant, was originally picked from the plants by hand. Seven people might pick 25 bushels in a day. Today the mechanical picker will pick 250 bushels a day, removing the small stems, cleaning the peanuts, and bagging them. The peanut has come out of the garden into the broad field, and has become a staple of agriculture in the Cotton Belt.[29] It has gone from the peanut roaster on the sidewalk into the eight-story factory, it is rapidly becoming a staple article of diet, and its oil, a staple cooking fat as a substitute for butter and olive oil.

Mr. J. Sidney Cates, of the *Country Gentleman* staff, tells me of a farmer in southern Georgia who has 1000 acres of rather light soil on which he grows wheat each year. He sows the legume crotalaria in the wheat. It is poisonous for forage, but after the wheat is grown it makes a mass 5 or 6 feet high which is plowed under for fertilizer, and wheat is sown again, to be harvested with a combine. It is occasionally injured by rust, but often makes 30 bushels to the acre.

The harvesting of a tangled mass of corn and velvet beans by cattle, and of fields of peanuts and sweet potatoes by pigs, might be called supermechanical agriculture.[30]

[29] The American peanut crop has increased from 19,400,000 lbs. in 1909 to 1,300,000,000 lbs. in 1938.

[30] In the vocabulary of the economist, it would be called the "creation of form utility."

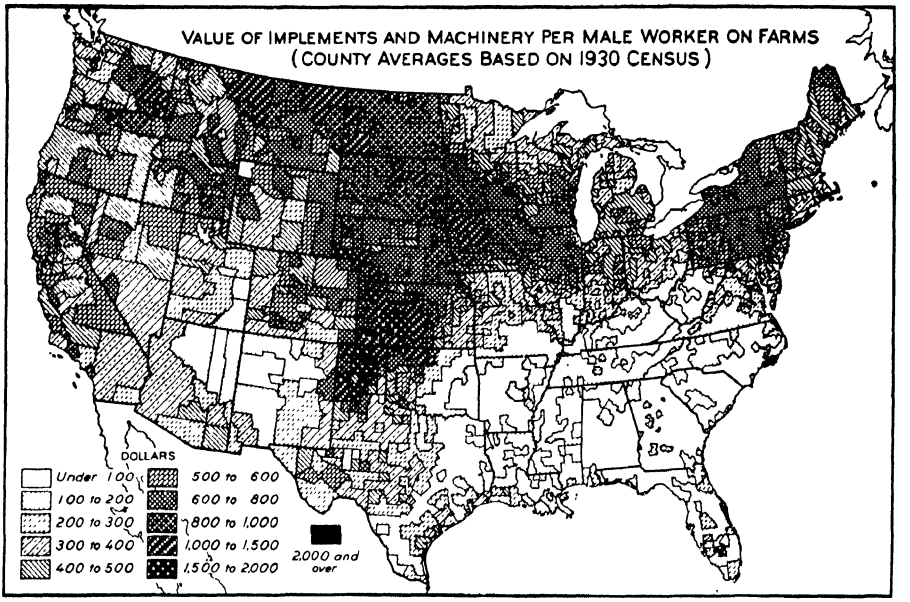


FIG. 312 A

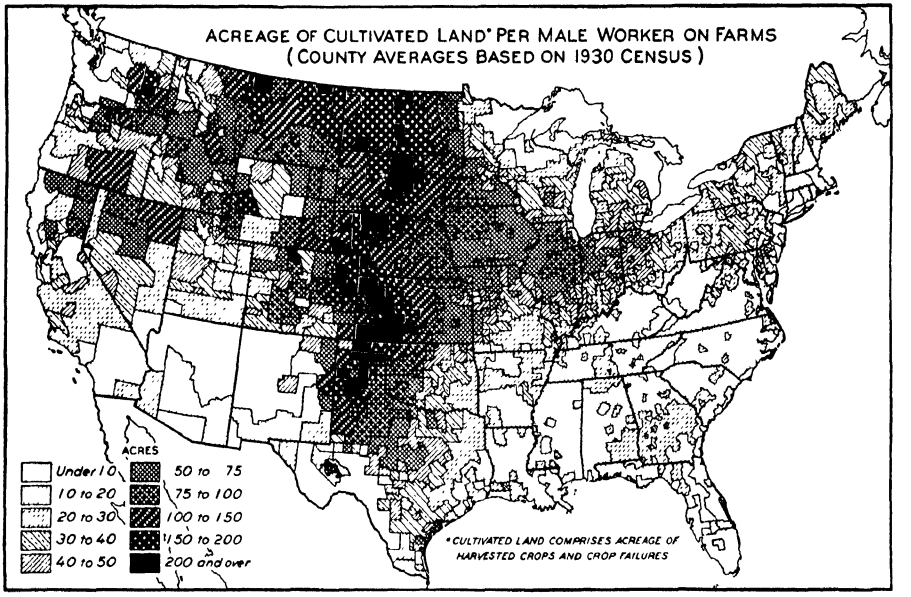


FIG. 312 B

Cotton requires hand labor; small grains do not. Small capital requirements encourage share-cropping. Machinery had not got very far in 1930. Watch out for 1940. (Courtesy U.S. Dept Agr.)

The Cotton Belt is too humid to permit hay to be satisfactorily cured, but the invention of the silo permits almost any kind of forage to be kept perfectly. This method of utilization of crops is a great aid to the cattle industry. It is also possible in much of the Cotton Belt to pasture animals nearly all of the year, if a proper succession of crops is planted.

In 1937 experiments in southern Georgia showed that a succession of forage crops harvested by the hogs made pork at a price of 3 cents per lb. live weight, and frequent plowing of the ground kept the earth clear of swine parasites, hence the hogs were unusually healthy.

The cattle industry of the Cotton Belt, which for decades languished because of the ravages of a fever spread by the cattle tick, is now in a position to compete on more than even terms with the North, because the cattle tick has been conquered. The process is simple now that we have found that the tick is to blame. Keep the cattle out of a field for a period, and the ticks are left in the field starve to death. Drive the cattle through vats of disinfecting liquid, and every tick on them is killed. The cattle are clean; the field is clean. By the use of this method, coupled with a drastic Federal quarantine of infested areas, the South has been able to conquer the cattle tick.[31]

In the *Country Gentleman* for April, 1939, Mr. J. Sidney Cates published a startling article of which the essence is this: All our well-known beef and dairy breeds came from cool northwestern Europe. They cannot sweat. In hot weather they suffer from the heat, and actually get a fever. Milk production falls off sharply. Therefore geography as well as the tick has helped to keep down beef and dairying in the Cotton Belt. Therefore, the successful introduction of Indian cattle (zebu) along the Gulf Coast, especially in Texas, has a better basis than the introducers knew. Information on this subject is likely to collect rapidly now that Mr. Cates has blown the horn.

If Cotton Belt swamplands are needed for farm purposes, steam dredges and ditching machines of many designs enable us to cut ditches a hundred times as fast as could be done with the spade in Grandfather's time.

The ability to drain land and the knowledge of the life history of the malaria germ will enable us to wipe out malaria in the Southern states whenever we take the matter as seriously as we do war, or even automobiles.

By learning how to bud and graft the pecan tree, and by planting it in orchards, the South has made the most important addition of a native plant to Caucasian agriculture since America gave the world tobacco, corn, and potatoes. The best specimens of native pecan trees have been selected as parents, propagated by the thousand, and set out in large orchards. In 1938 the South had a pecan crop worth over $4,000,000, more than a third of the crop being produced in Texas. It would seem easy to increase this crop tenfold if the demand arose. These lordly trees permit the growth of many crops between and beneath them, thus permitting a two-story agriculture,

[31] The United States Department of Agriculture co-operates with state and county officials in the campaign to eradicate the cattle tick. In 1934 Federal and state agents supervised 25,328,261 inspections or dippings of cattle and 2,368,581 inspections or dippings of horses and mules. At the end of the year the Federal quarantine was limited to small parts of Louisiana, Florida, and Texas. It is a bit discouraging to know that this law met much local opposition, even to the destruction of vats.



FIG. A. The Machine Age builds a road. The nearer machine is called a bulldozer, and very properly. Note the mass of earth and boulders that it is pushing out of its way. From one end of the country to the other this new metallic superbeast-of-burden is ripping highways through the hills and mountains. (Courtesy Caterpillar Tractor Co.)

important in itself, and suggestive of the future of intensive agriculture if we ever used it.

The list above of things that have come to pass in the Cotton Belt, many of which are revolutionary if carried to a logical conclusion, is not meant to be complete, but merely suggestive. In the long growing-season, the possible crop list is so rich that there might be developed many kinds of farms, each best in its place.[32] The important thing is that every Southern farmer shall promptly adopt some rational system.

The long growing-season, with abundant rain, the possibility of growing several crops of vegetables per year, would enable the Cotton Belt to keep on growing present supplies of cotton, and enlarge them, and to produce almost incalculable quantities of food if we should make large use of dehydration, a method of food preservation now thoroughly established and awaiting the

[32] A rotation followed successfully in some localities, particularly in Texas, is most suggestive: first year, corn with cowpeas sown in it at the last cultivation; second year, winter oats, followed by peanuts; third year, cotton, followed by bur clover sown in it at the last cultivation; fourth year, same as the first. This rotation permits the farmer to grow the old staple of cotton with two of the world staples, corn and oats, and each year the field also produces a leguminous crop to leave nitrogen and humus in the soil. The cowpeas may be harvested and sold as grain, eaten by pigs, or plowed under to fertilize the earth. The peanut, which can be grown after the harvesting of winter oats in May or June, can yield a ton of hay to the acre and then a rich crop of food for men, or for the pigs to root up and eat at their leisure. The bur clover that follows the cotton, like the other legumes, leaves nitrate in the ground and can be used to some extent as winter forage for pasturing animals. The oat plant is a grain which, fortunately for the South, will mature in more moisture than wheat, and having an extra husk, will keep in climates where wheat will spoil.

SEASONAL DISTRIBUTION OF MAN LABOR ON CROPS
5 COUNTIES IN CENTRAL ALABAMA

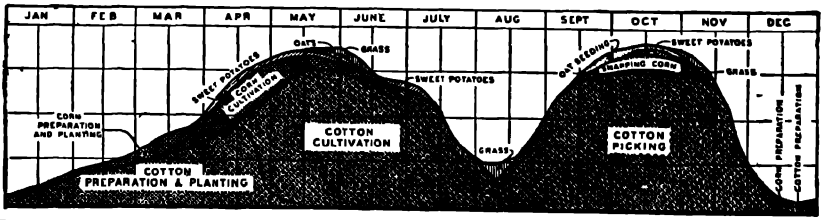


FIG. A. If you can grow nothing but cotton, there is leisure time — for joy or for more labor according to the capitalistic or noncapitalistic point of view. For generations some of this time has been used to clear forest for new cotton fields. (Courtesy U.S. Dept Agr.)

spread of knowledge and a slight change in culinary and dietetic habits. Sandy land produces sweet potatoes to perfection, and the Cotton Belt has large areas of sandy land. With dehydration this or some other starchy root might easily be grown in quantities that rival our present supply of wheat, along with almost limitless amounts of dehydrated spinach, cabbage, beans, carrots, tomatoes, and other vegetables.[33] It is true, of course, that changes in diet come slowly. Canning as a process was invented in 1809. The Civil War established the widespread use of canned food, and today the humble tin can with its scientifically prepared contents is about the first prerequisite for housekeeping.

The experience of an old Negro (a former slave), Sam McCall, was made the subject of a bulletin by the United States Department of Agriculture. This old man owned many acres, but he preferred to get much income from few acres rather than little income from many. Accordingly, he limited himself to 2 acres, but for many years he got from $200 to $350 from the 2 acres, an amount larger than that which his Negro tenant neighbor got from 20 or 30 acres. In a typical year one of these acres yielded 75 bushels of winter oats and 3 bales (1520 pounds) of cotton. The other acre yielded three crops as follows: 1 bale cotton, 50 bushels corn, 50 bushels oats. He interplanted corn and cotton.

Farmer McCall planted the cotton in preweevil days in the same rows with the corn. As soon as the ear of corn was established, he cut off the tops above the ear to let light in on the cotton. As soon as the cornstalk was ripe, he removed it, thus giving the cotton the full possession of the ground during the latter part of the summer.

When we notice that the average yield of cotton per acre in the United States was then about 300 lbs., the production of the old Negro's farm is astonishing, but it is much less than the yet more careful farmers of China produce. McCall had a better income than the average farm hand or city worker of the same territory and time, and his work left him in better condition and with more leisure than the average factory worker. This story

[33] Ordinary dehydration is not the only method of preserving the sweet potato, which is a nutritious but very perishable root. A process of making sweet-potato flour by flaking, the process used for white potatoes, is described in *Chemical Age*, April, 1921.



FIG. A. This farmer on the South Carolina Piedmont hills is really fighting soil erosion with his terraced peach orchard and strip crops of cotton and oats. Of course it costs more to cultivate a strip crop; but there is more fertility and more yield — and the farm remains. This last fact should be emphasized, but it can come about only by vigilance such as tenants rarely give.

The apparent stairway is a runway for surplus water. Strips of Bermuda grass, which look like steps, will quickly sod it all and keep it from cutting as water from the terraces escapes. (Courtesy U.S. Soil Cons. Service)

is exceedingly suggestive of the possibilities of the South if population should press heavily upon resources.

Here and there throughout the South are little agricultural islands, groups of people of continental European agricultural origin who have brought good soil-preserving agricultural practices with them. They have legumes, crop rotation, livestock, good farms and barns. Furthermore, they work about twice as many days per year as their neighbors of the American settlement, who claim to be true Americans and who follow the "cotton and set" system.[34] Managing a plantation and farming the land are often two different things; landlord and worker may have totally different ideas and ideals.

The long growing-season of the Cotton Belt has a handicap — the cold wave. A warm week in winter, green with growing things, may end with

[34] See Walter Kollmorgan, *A Study of These Cultural Islands*, U.S. Dept of Agr., Division of Agricultural Economics.

"Tell us what kind of a society you want in the South, and I shall tell you what kind of resources you have." — Erich W. Zimmermann, "Resources of the South," *South Atlantic Quarterly*, July, 1933, p. 215. What are the social objectives of the Cotton Belt? What are its individual human wants? What is the present status of the technological and institutional arts? (Can its citizens improve its social and economic institutions as well as they can use tractors and fertilizer and cotton-pickers?) These are some of the vital questions that must be answered before the resources of the South can be fully appraised.

hard freezing. New Orleans has had a winter temperature of 5° F. These occasional winter freezes almost limit winter crops to hardy forage and winter grain, and point the way to a greater animal industry.

Since 1930 several large plants making Kraft-Phoenix cheese and dried milk have been built in that corner of Texas near northern Louisiana. The cheaply made trench silo filled with sorghum is in general use, and spreading.

When one considers the environmental equipment of the Cotton Belt, it is indeed obvious that nature endowed the region with a lavish hand. The possibilities of agricultural production are tremendous. To convert potentialities into realities will call for a vast amount of hard work, chemicals, and applied intelligence.

Chapter 14. THE COTTON BELT: II. POPULATION, CITIES, AND MANUFACTURES

PEOPLES, ATTITUDES, AND ECONOMIC DEVELOPMENT

MANY Southerners declare that they have no desire to duplicate the "Yankee" rate of speed and hustle and Yankee thrift.[1] A delightful friend in the South once said: "The Yankees eat what they can't sell. We sell what we can't eat." There is a savor of truth in this. It is an admirable description of two points of view, and it is true that the Southern fried chicken and hot corn pone have a better reputation as delicacies than the fried potatoes and cold wheat bread of the North. A great gulf separates these two points of view — the gulf that separates debtor and creditor.

Perhaps this difference in attitude toward thrift and expenditure is a legacy of the society based upon the old aristocratic concept of slavery. Perhaps the lesser keenness for work is a natural result of the climate. Certainly many people of the South think so, and frankly tell a newcomer from the North: "If you stay down heah six months you won't rush about like that. Take youah time," they say. Also I remember my sense of wilt in the summer weather of Louisiana and Carolina.[2] On this point Dr. Clarence H. Mills, professor of experimental medicine, University of Cincinnati, says:

> All bodily and mental functions are intimately bound up with the combustion of food and production of heat inside the body.
>
> When the dissipation of this heat is difficult, as in a tropical moist warmth, automatically combustion is suppressed and all internal activities slowed down; growth and development are retarded and resistance to infection is lessened. In cooler regions metabolism increases, growth and development are more rapid and a higher

[1] "Here We Rest" is the motto of the great State of Alabama. Since Dec. 29, 1868, it has appeared in Latin on the official seal of the state.

[2] I was spending a little time one July on an island off the Carolina coast. A physician, a native of the state but Northern-trained, came. "Well, Mr. Smith," said he on the third day, "has the climate down here got you yet?" Then he stated how yesterday morning he had got fixed on the porch after breakfast and just couldn't move for two hours. Whereupon our hostess, who had spent some time in Oklahoma, chimed in: "I just hate to *move* down here. When I am standing up I just want to keep on standing. If I am sitting down I want to keep right on sitting. It's just an effort to move, and you know that's no way for folks like us to be." Personally I should not be inclined to blame the climate quite so much as these people did. They were too highly fed on fried meat, fried fish, fried hominy, and other frying-pan products, with a dearth of vitamins, milk, and greens. It is a fact that hundreds of thousands, if not millions, of people in the Cotton Belt suffer from malnutrition, in a land carrying every possibility of riotous plenty — if the people only knew — and *did*.

energy level and more vigorous existence are possible. This is a relatively new concept, but well demonstrated, particularly in children.[3]

Whatever the cause, it is certainly true that the Cotton Belt is a land where resources are still relatively undeveloped, even for the United States. This is probably partly due to the Civil War, which the South fought to a finish. Since nearly half its population was black and all the fighting was done by the white population, its relative losses were several times as great as those of the North. One can only speculate as to what might have happened had the slaves been bought, and the hundreds of thousands of war victims been permitted to live their normal lives and to influence the region through the decades that followed. Another retarding influence has been the loss of 5,000,000 white people by emigration from the Southern states east of the Mississippi River between 1865 and 1900, and many more since. There are hosts of Southern men in positions of influence in Northern cities from New York to San Francisco. There can be no question that the export of brains and ambition to other regions, where the chance for individual gain seemed brighter, has been costly to the South. Fortunately, in recent years the young men of the South are finding more opportunity at their own doorsteps.

The slow economic development of much of the South might also be attributed to the large proportion of Negroes in the population. In the Coastal Plain the proportion is often more than half, and South Carolina, being largely a Coastal Plain state, until 1924 showed a majority of Negroes. The Negro, with his low standard of living, his low rate of daily wage, has effectively kept the nineteenth- and twentieth-century European immigration out of the South. While the Negro has done the bulk of the manual labor, his race is without experience in organizing industry or our kind of government or participating in democracy. Nearly all the burden of carrying civilization has been upon the white portion of the population. The large proportion of Negroes has often caused social isolation for the white people as well as rural neglect, because whenever possible in many localities the whites have moved to town even if moving has resulted in financial loss and in the decline of the rented land. If the Negroes are in the minority, they tend to move to town.

Whatever the differences between the white and the black may be, the dark skin, geography's greatest curse to man, marks off the man of color, keeps him and his seed forever classified, and keeps him from receiving the treatment accorded to a white. This is true even if the Negro chances to be similar in all cultural, intellectual, and economic respects.[4]

We hear much about Negro shiftlessness and laziness, but, taking a long view, one of the most startling things about the Negro is the amount of

[3] *New York Times*, May 8, 1937, p. 34.

[4] The Indians of Oklahoma (late Indian Territory) have the advantage of being received by the whites more nearly as social equals. The home training of the Indian woman makes her a good wife, and intermarriage is not uncommon. Some tribes still holding their lands in common have become enormously and dangerously rich through oil royalties. This new wealth in such hands has made many ludicrous incidents. For example, one chief fancied for an automobile only a white motor hearse, so he bought one and used it for his private conveyance.

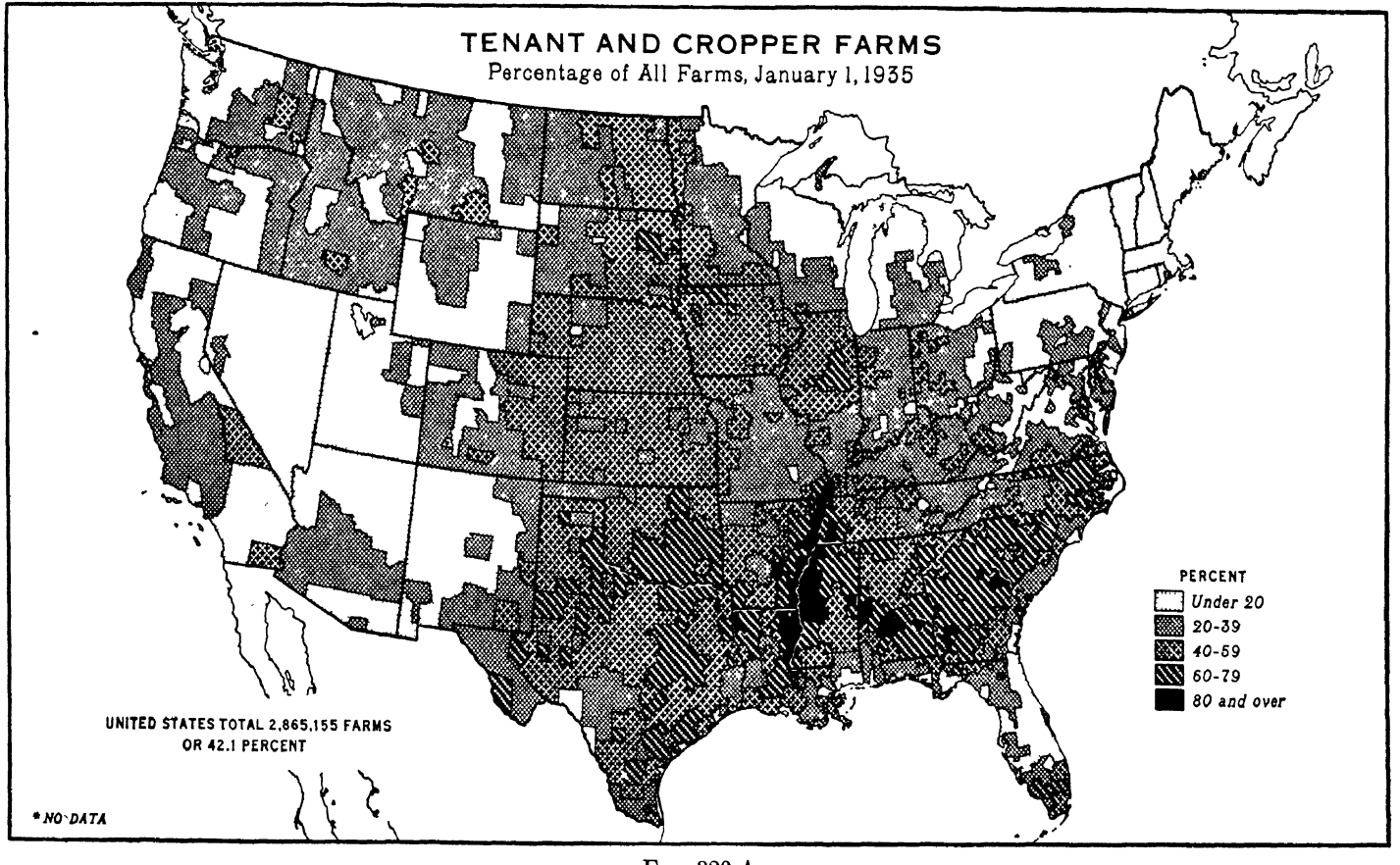

TENANT AND CROPPER FARMS
Percentage of All Farms, January 1, 1935
PERCENT
Under 20
20-39
40-59
60-79
80 and over
UNITED STATES TOTAL 2,865,155 FARMS
OR 42.1 PERCENT
*NO DATA

FIG. 320 A

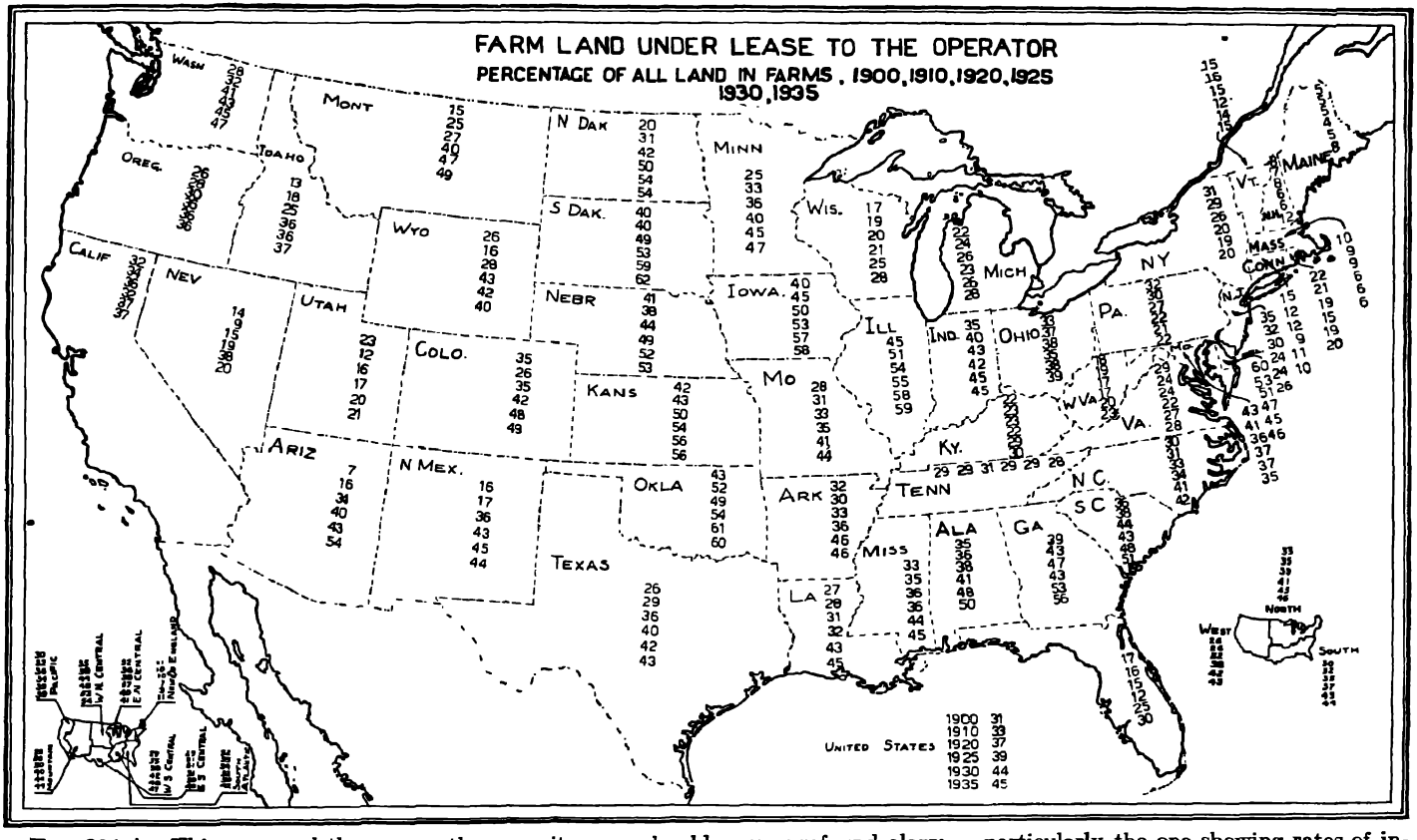


FIG. 321 A. This map and the one on the opposite page should cause profound alarm — particularly the one showing rates of increase. Especially look at Oklahoma, our most recently settled state. Here is also a partial explanation of the labor supply for manufacturing. (Courtesy U.S. Dept Agr.)

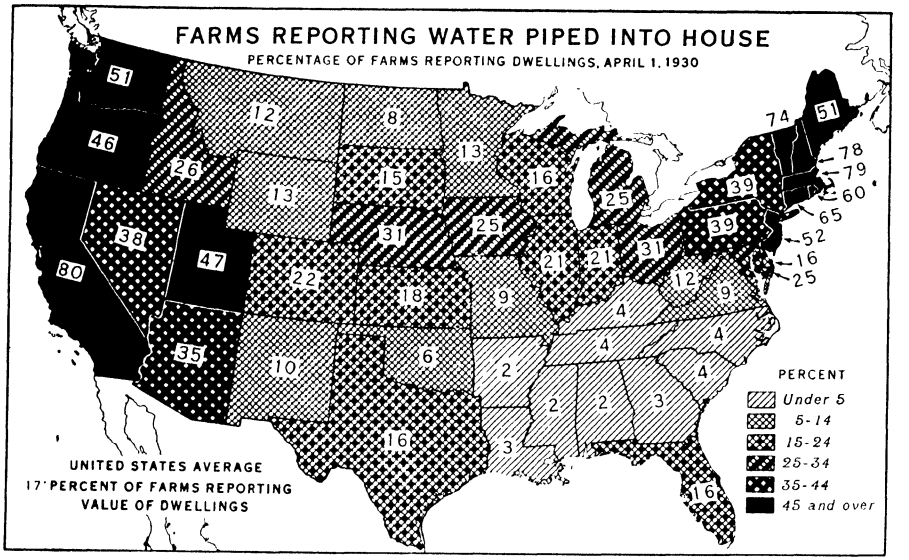


FIG. A. This should be considered in relation to tenancy (Fig. 320 A). What a boom there would be in the plumbing industry if the South equaled the North in this respect! (Courtesy U.S. Dept Agr.)

property he has managed to amass since his emancipation, and the progress he has made. Perhaps this is a result of climate. The Negro, coming from the tropics, is in a climate that is more stimulating and invigorating than that from which he came. It is also a fact that the whites from northwestern Europe are in a less invigorating climate than the one from which they came. What happened a few years ago in a summer school is suggestive of the racial competition. All the teachers, both white and Negro, were urged to come to summer schools, and similar inducements were offered to both races. There was a school for white teachers and one for Negro teachers, and both were addressed, in some cases at least, by the same men. Thirty per cent of the whites came, and 60 per cent of the Negroes came. This is perhaps ominous for a region where the population is almost evenly divided, where the whites feel that it is a duty of life

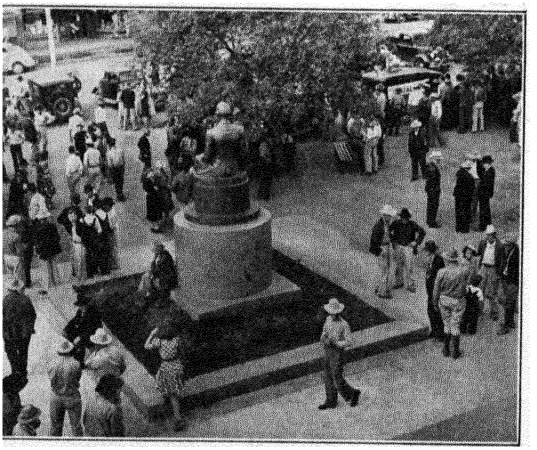


FIG. B. The courthouse square in a rural county usually has a statue and a crowd — a surprisingly large crowd. This one is in Texas, but it might be almost anywhere in the South, the Midwest, or the West. (Courtesy Farm Security Adm.)

and death to dominate society in every respect and where they expect to maintain dominance or die in the attempt.

NEGRO MIGRATION TO THE NORTH

A sudden change has taken place in the Negro question in the United States. Since the World War the Negroes have been migrating to the North in vast numbers. After the middle of the nineteenth century each period of industrial prosperity in the Northern states drew hundreds of thousands of unskilled workers per year from Europe. These people stayed in the North, while the Negro stayed in the South. The World War shut off European immigration. The Northern mills demanded labor. The Negro moved North to supply it. Then Congress checked immigration, and the Northern mills again demanded labor in the postwar boom. Again the Negro moved North to supply it. By hundreds of thousands he went. Unofficial estimates have it that 500,000 went North in the twelve months ending September 1, 1922 — 120,000 from Georgia alone. South Carolina claimed (1924) for the first time in generations that it had a majority of white population. The 1920 census showed that in the decade 1910–20 the number of Negroes had actually declined in Mississippi, Louisiana, and Alabama, but the black race is a prolific one, and by 1930 the number of Negroes in each of these states had grown to exceed the number in 1910 in spite of the continued northward migration. Between 1910 and 1930 the relative importance of the Negro population declined from 43.1 per cent to 36.9 per cent in Louisiana; from 56.2 per cent to 50.2 per cent in Mississippi; from 42.5 per cent to 35.7 per cent in Alabama; from 45.1 per cent to 36.8 per cent in Georgia; and from 55.2 per cent to 45.6 per cent in South Carolina.

It appears that by checking European immigration we have elected that the Northern cities shall be filled with Southern Negroes rather than with Europeans.[5]

The transfer added to the difficulties of Southern agriculture. Wages went to heights before unknown. Many farmers could not pay them, much land went out of cultivation and was sold at nominal prices, $10 to $20 per acre. The Cotton Belt used to be a little low-wage world of its own. It now shows some possibilities of being on a wage level with the rest of the United States.

THE FUTURE OF THE WHITES

The prospect of the white race in the Cotton Belt is distinctly better for the future than it has been in the past. The continued vigor of the Acadian French after two centuries [6] in the swamps of Louisiana is very encouraging for the possibilities of good stock in the Cotton Belt.[7]

[5] What kind of Negro migrates? And what will be the effect of this on the Negro race, especially if the migrants die out in Northern cities?

[6] These people have maintained such complete isolation that the companies of recruits in the draft army during the World War had to be drilled by French-speaking officers.

[7] The case of a Norwegian colony in Texas reported by Dr. Austin O'Malley (*Literary Digest*, Sept. 6, 1919, p. 77) seems to show that perhaps some races cannot survive. In fifty years there was no surviving Norwegian descendant.

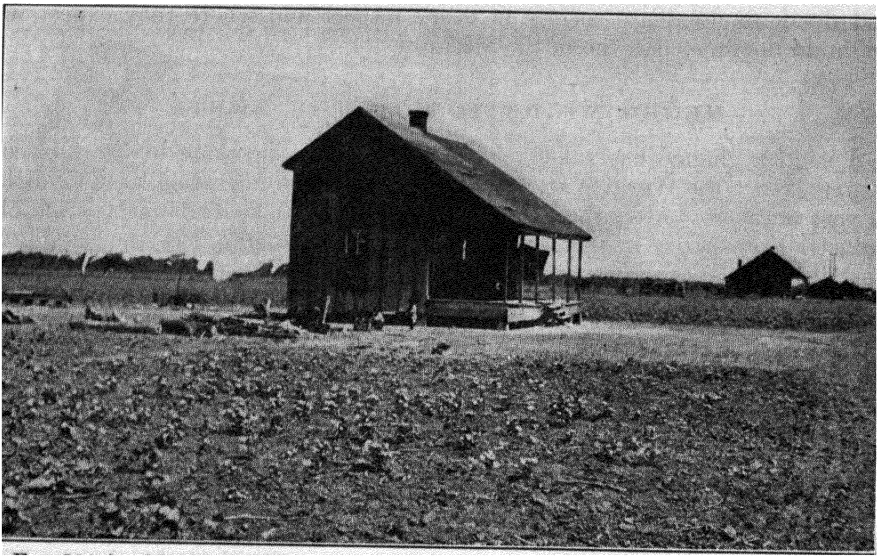


FIG. 324 A. Many heard the call of Harlem and Detroit. The cabin of a share-cropper on the Mississippi flood plain — one of the finest soils in the world. This picture has what might almost be called an omission. No one is rocking on the porch. (Courtesy Farm Security Adm.)



FIG. 324 B. A Southern mansion, typical of *much* fiction and *some* fact

The better prospects for the future seem very clear when we consider the sciences of sanitation, preventive medicine, and nutrition. The puzzle of malaria has been solved, and its eradication is easier than was the defeat of the Central Powers in the World War.[8]

The science of nutrition is still young. Industrial education, health education, rural organization, are all young yet, and the earnestness of the educational reconstruction in the South promises the rapid utilization of all these things for the improvement of the mental and physical welfare of the white man in this land of great possibilities.[9] In some parts of Southern states faith in education amounts almost to a superstition. Between 1910 and 1930 illiteracy among people over ten years of age declined in Alabama from 40 per cent to 26.2 per cent among Negroes, and from 9.9 per cent to 4.9 per cent among whites.

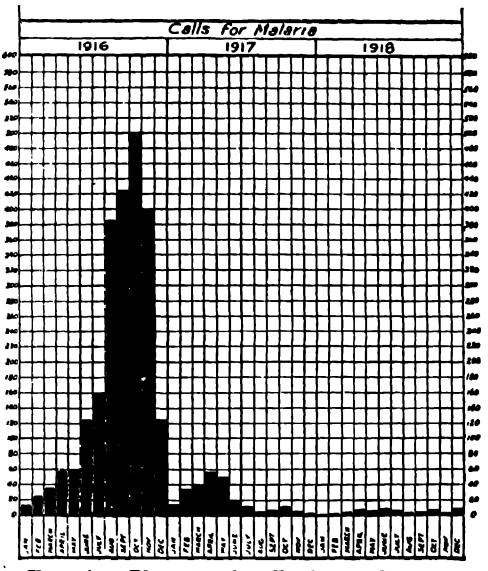


FIG. A. Physicians' calls for malaria in a Cotton Belt town before and after the beginning of active control measures by the Rockefeller Foundation. This one thing is enough to settle the fate of empires. It shows how important a public-health service may be, and how the South may easily make great improvement. Compare the two Octobers. I hope the local physicians approved. (Courtesy Rockefeller Foundation)

Tomato clubs, pig clubs, chicken clubs, corn clubs, and canned-food week are very practical and effective kinds of education for the improvement of the people in a region where malnutrition stalks and much land is still almost free.

In June, 1923, the North Carolina Agricultural College put out a leaflet (No. 31) comparing the acre yields of high-school agricultural students with the state average for the years 1919–20, as follows: corn, 52 to 17.7 bushels; cotton, 512 lbs. to 278; tobacco, 814.8 lbs. to 610 lbs.; sweet potatoes, 178 bushels to 106.6. These figures promise better economic conditions for the next generation, especially when the progress in agricultural education is taken into account. The technique of better farming is known. The big problem is to get young people with education to return to the farm and apply their ideas.

[8] Between 1900 and 1933 the death rate due to malaria dropped from 239.2 to 6.5 per 100,000 people in Jacksonville, from 204.3 to 27.5 in Memphis, from 82.5 to 0.8 in San Antonio, from 56.1 to 3.2 in New Orleans, and from 42.9 to 0.8 in Norfolk. The typhoid and paratyphoid death rate dropped from 104.6 to 1.6 in Richmond, from 79.3 to 5.4 in Norfolk, from 74.6 to 5.7 in Atlanta, from 52.6 to 9.1 in New Orleans, from 49.5 to 9.0 in Nashville, from 47.9 to 8.0 in Memphis, and from 46.9 to 5.3 in San Antonio. What greater proof is needed of the virtues of land drainage, milk inspection, and pasteurization! And vitamins and mineral salts are (largely) yet to come.

[9] In 1923 Alabama sent a commission to Kansas to study Corn Belt efficiency.



FIG. A. The new South — machinery. Exit the mule, and laborious rolling of logs onto wagons. The truck has abolished a lot of logging railroads and shifted industry from locomotive works to the truck-builder. (Courtesy U.S. Forest Service)

LUMBER AND FORESTRY

The Cotton Belt was originally all forested, with the exception of certain coastal prairies and flood lands that were too wet, and with the further exception of the Black and Grand prairies of Texas and the country beyond them where the Cotton Belt has been extending westward in the attempt to escape from the boll weevil. The prairies inland from the coast in Texas and Louisiana are so flat that the trees drown out after periods of rain, although an elevation of as much as a foot or two makes an island of pine forest in a sea of grass. Similar prairies of much smaller extent are found along the coasts of Carolina and Georgia, where the savanna type of landscape, grass with occasional clumps of trees, gave its name to the city of Savannah.

In the Cotton Belt as a whole, pine trees grew on the sandy soils — hard pine for flooring, soft pine for house and barn framing. Oaks, hickories, pecans, gum, and some other broad-leaved trees grew on the clay hills or flood plains, while the moisture-enduring cypress produced its valuable timber in many areas of swamp. This was a fine variety for city markets.

In the wetter parts of the Cotton Belt the branches of the trees are draped with the long hanging Spanish moss (an epiphyte or air plant), which nearly always produces a depressing effect upon the stranger because of its resemblance to crape and mourning veils in the somber shade of the forest.

In no other part of the United States has lumbering been easier than in the Cotton Belt. Wagons and temporary railroads can run in almost any direction over most of its surface at all seasons. Hither came the lumberman who had migrated first from New England to the Lake states, then from the Lake states to the South. For a time these states led the United States in lumber production, but the lumberman, after his usual orgy of appalling waste, has gone on to the Pacific Coast and with him the leadership in lumber production (see Fig. 176 A).[10] Louisiana, which took the leadership after Wisconsin and Michigan had had it in turn, has now been surpassed by Washington and Oregon.

[10] On the banks of the Columbia River in Washington State, a Southern lumber company began building in 1923 and 1924 a lumber city, probably the greatest lumbering enterprise in the world (see Chapter 34).

Although paper-manufacturing in the South can be traced back to the operation of a small mill by Moravians at Salem, North Carolina, in 1766, the South never had a great paper industry until recent years. Prior to the World War the small paper mills of the South were dependent for their raw materials upon rags, spruce from the Appalachian highlands, and various hardwoods. With the development of the sulphate process, the South in 1909 first began to turn to its vast resources of yellow pine. By this process pine can be converted into pulp for the manufacture of kraft paper, a tough, lightweight brown wrapping paper. The South now dominates this branch of the paper industry, and in 1936 more than 2,000,000 cords of Southern yellow pine were converted into pulp. In another branch of the paper industry, bigger things are yet to come!

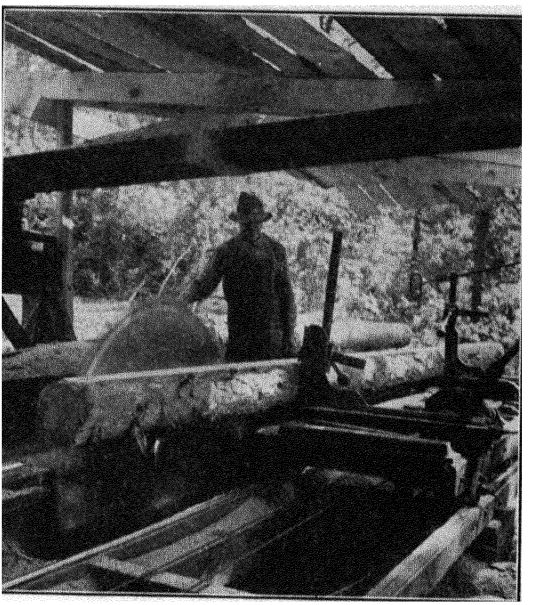


FIG. A. Honest-to-goodness work in a small portable Southern sawmill. It can move in a day or two, follow the logs, and save heavy handling. Larger mills use the pond (Chapter 34). (Courtesy U.S. Forest Service)

As a result of research by the late Charles Holmes Herty, science once more has smiled on the Cotton Belt, for in 1933 an experimental paper plant at Savannah produced the first newsprint out of pulp made from loblolly or slash pine, the rather poor stuff that grows up after abandonment of fields. Within the following two years Herty found that both young trees and old trees could be used and that the alpha-cellulose content of Southern pine is higher even than that of spruce. Briefly, this means that the entire pine forest of the Lower South is potentially a pulpwood forest for newsprint paper and for the manufacture of rayon, lacquer, and other cellulose products. In December, 1938, $5,000,000 was raised to establish the South's first newsprint plant at Lufkin, Texas, in the midst of 60,000 acres of eastern Texas pine land. If the original Herty process is used, it will take only from seven to nine years to produce pulpwood in the Cotton Belt, as compared with the sixty to eighty years needed in Canada.[11] Patently, the paper industry of the United States is on the brink of a revolution, from which the Cotton Belt should benefit greatly. New England? Canada?

Turpentine and rosin, so-called naval stores, have long been made from the sap of pine trees, which were usually killed in the process of turpentining.

[11] The Lufkin plant expects to produce newsprint for $27 a ton, the Canadian price being about $45 a ton. If so, woe to Canada!



FIG. A. Fire-fighting de luxe. They have water. Angelina National Forest, Texas. Often on privately owned lands the fire is started and let alone, so that there may be grass among the few trees. (Courtesy U.S. Forest Service)

This industry began in eastern North Carolina in 1810. In 1849 this locality led with 91 per cent of the national output. In 1879 South Carolina led. In 1880 and 1899 Georgia led. In 1909 and 1919 Florida led, while North Carolina, the original home of rosin, produced less than .5 per cent of the crop, so thorough had been the annihilation of the Carolina forest. In the meantime, Georgia has regained supremacy, producing in 1937 about 40 per cent of the nation's output of rosin and turpentine.

In 1930 the South, with an original forest area of 299,000,000 acres, had 191,000,000 acres of forest land, 57,000,000 acres consisting of saw timber and 53,000,000 acres having trees of cordwood size. Over a third of the original forest area has been already cleared of trees. The double advantage of a long growing-season and a good location in respect to markets make Southern forests a great resource.

Destruction in the Southern forest proves again the oft-proved charge that we regard timber as a mine rather than as a crop. In this region fire often ran through the forests ahead of the lumberman. It was set to clear out the brush so that grass would grow for the roving cattle. The razorback hog finds a good morsel in the thick root of the longleaf pine when it is a few inches high, so he roots it out as he does sweet potatoes or peanuts in the fields of the more progressive farmers.

Fire and the razorback keep most of the cutover land from reproduction, although the long, warm, moist summer makes this the region of greatest possibility for quick timber growth. The United States Forest Service reports measurements of red spruce in Maine seventy years old showing an average diameter of 1.8 inches. Hemlock in Otsego County, New York, at seventy years averaged 3.3 inches, while loblolly pine in eastern Texas at the same age was 24 inches in diameter. A lumber company in eastern Texas finds that it can cut the lumber on a tract every five years if it keeps the fire out and takes no trees smaller than 15 inches in diameter. The removal of these larger trees leaves light and fertility for the smaller trees, which add a $\frac{1}{2}$-inch ring (an increase of 1 inch in diameter) each year. Thus, 15-inch trees become 20-inch trees and good saw logs in five years.

THE DEVELOPMENT OF MANUFACTURING

In spite of its great potential resources for manufacturing, the Cotton Belt of the nineteenth century was distinctly agricultural. At the turn of the century about two people out of three were engaged in farming, whereas only one person in ten was employed in manufacturing. For the most part manufacturing was of a rather simple type, such as the ginning of cotton and the sawing of lumber.

The dependence of Southerners in the 1880's upon manufactures from other regions was well summed up by the Georgia orator Henry W. Grady, who described a Georgia funeral as follows:

> The grave was dug through solid marble, but the marble headstone came from Vermont. It was in a pine wilderness, but the pine coffin came from Cincinnati. An iron mountain overshadowed it, but the coffin nails and screws and shovels came from Pittsburgh. With hardwoods and metals abounding, the corpse was hauled on a wagon that came from South Bend, Indiana. A hickory grove grew near by, but the pick and shovel handles came from New York. The cotton shirt on the dead man came from Cincinnati; the coat and breeches from Chicago; the shoes from Boston, the folded hands were incased in white gloves from New York, and round the poor neck, that had borne all its living days the bondage of lost opportunity, was twisted a cheap cravat from Philadelphia.

While the Cotton Belt of today is still predominantly an agricultural region, great progress has been made in manufacturing.[12] In 1930 less than half of the people were engaged in farming, and about one person out of five was employed in manufacturing.[13] The twentieth century has witnessed a decline in the relative importance of agriculture as an occupation and an increase in the relative importance of manufacturing.

INDUSTRIAL RESOURCES

Unquestionably, the Cotton Belt has resources for manufacture almost as great as its resources for agriculture.[14] Within its borders or easily accessible from near-by areas are great power resources that can be tapped by Cotton Belt industries. Alabama coal and coal from near-by Appalachia are already playing an important role in industry. The coal fields of Oklahoma and the poorer lignites of Texas in the future may have their day. Millions of horse power have been harnessed from falling water in the Tennessee Valley, in

[12] It should be remembered that belching chimneys, power wires, mill villages, and factories, especially when they are new, are conspicuous features of the landscape. To a casual observer, they often obscure the fundamental agricultural character of the region.

[13] It is often impossible to obtain statistics for human-use regions, but the U. S. Census of 1930 showed that of the 10,300,000 persons who were gainfully employed in the states of North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Arkansas, Oklahoma, and Tennessee, 4,600,000 persons, or 44.5%, were engaged in agriculture, and 1,900,000, or 18.4%, were employed in manufacturing. In 1900 of the 6,500,000 who were gainfully employed, 4,200,000, or 64.5%, were in farming, and 605,000, or 9.4%, were in manufacturing.

[14] In the newer mineral industry of bauxite Arkansas furnished 95% of the United States production in 1938. Aluminum is manufactured, as yet, in other regions.

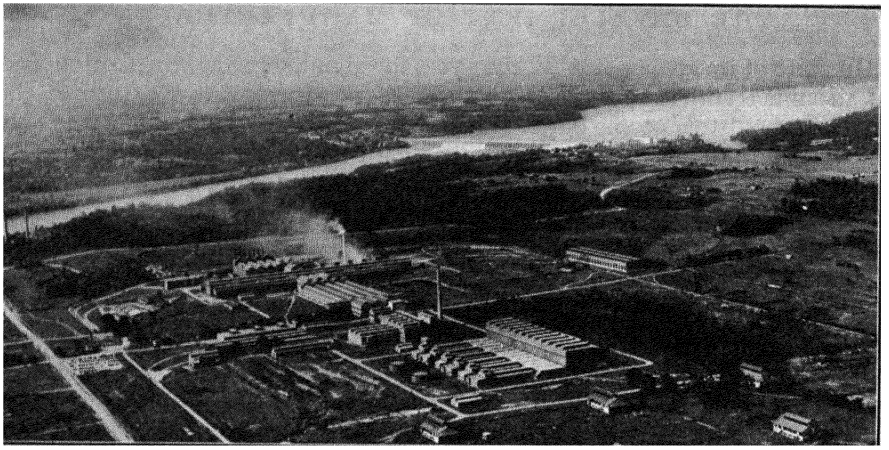


FIG. A. The new South. Wilson Dam, TVA Nitrate Plant No. 2, and experimental superphosphate plant, Muscle Shoals, Ala. A government enterprise. (Courtesy TVA)

Appalachia, and along the Fall Line. These comprise a permanent source of power in contrast with the fleeting stores of oil and gas in Texas, Louisiana, and Oklahoma, which are now being used with such reckless abandon. For the application of this great store of energy, the Cotton Belt is blessed with a great abundance of raw materials, the manifold products of field, forest, and mine.

The Cotton Belt has adequate transportation facilities, and very few points are more than 10 miles from a railroad with the exception of Texas, where distances seem to mean so little.[15] The Southern railroad-rate structure has long been notorious for its discriminations, and is badly in need of overhauling.[16] If the discriminations are removed and the problem of freight rate differentials is solved, traffic would move with greater ease within the Cotton Belt, and Southern manufactures would have better access to Northern markets. Highways are constantly improving, and, as in other sections of the country, more and more freight is moving by motor truck. The Cotton Belt is well endowed with inland waterways, which are slowly increasing in importance. In the past, Southern manufacturing has been handicapped by a lack of capital, but during the present century Northern capital has penetrated the South in vast quantity, and local capital is accumulating rapidly.

[15] See Mark Jefferson, "The Civilizing Rails," *Economic Geography*, July, 1928, pp. 217–31.

[16] Note the following contrasts in freight rates (1939) for the carriage of 100 lbs. of first-class freight: $1.38 for 734 miles from New York City to Fort Wayne, Ind., but $1.91 for 731 miles from Atlanta to Chicago; $.87 for 296 miles from Indianapolis, Ind., to Kent, Ohio, but $1.23 for 297 miles from Nashville to Indianapolis; $1.86 for 911 miles from Milwaukee, Wis., to Salisbury, N.C., but $2.17 for 913 miles from Lumberton, Miss., to Charlottesville, Va. Man-made freight rates, like man-made tariff duties, can easily nullify a region's natural advantages. In January, 1940, the Interstate Commerce Commission upheld the South's long-standing complaint against discriminatory freight rates and ordered reductions in northbound rail charges on a dozen manufactured articles. This is but a small start in a long-needed reform.

For decades Cotton Belt manufacture, like that of the South in general, was handicapped by the absence of skilled and semiskilled immigrant labor, but in recent years the vast reserve of unskilled labor is being trained and put to work in factories. Low-wage Southern labor has been a potent factor in postwar years in attracting many industries, especially the textile industry, into the South. One European capitalist said that the Southern mountaineer learns more quickly than the European worker.

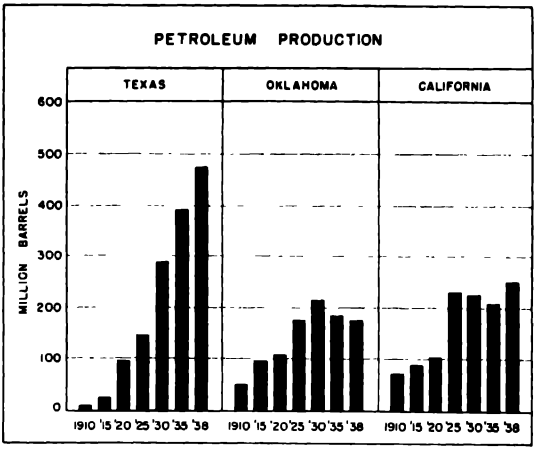


FIG. A. The new South. The chart shows one reason why Texas and Oklahoma towns have boomed in recent years. In 1938 Texas, Oklahoma, and California produced three-fourths of the nation's petroleum. Observe the ominous flattening in the Oklahoma curve. (U.S. *Statistical Abstract*)

It is true that the Cotton Belt does not have the most invigorating climate for mental and physical activity, yet the long warm season is a factor making living-costs cheaper for workers, with a saving in fuel, clothing, and even food. Also they accept a lower standard of comfort than Northern workers have. This is but a brief summary of the resources that underlie the industrial de-

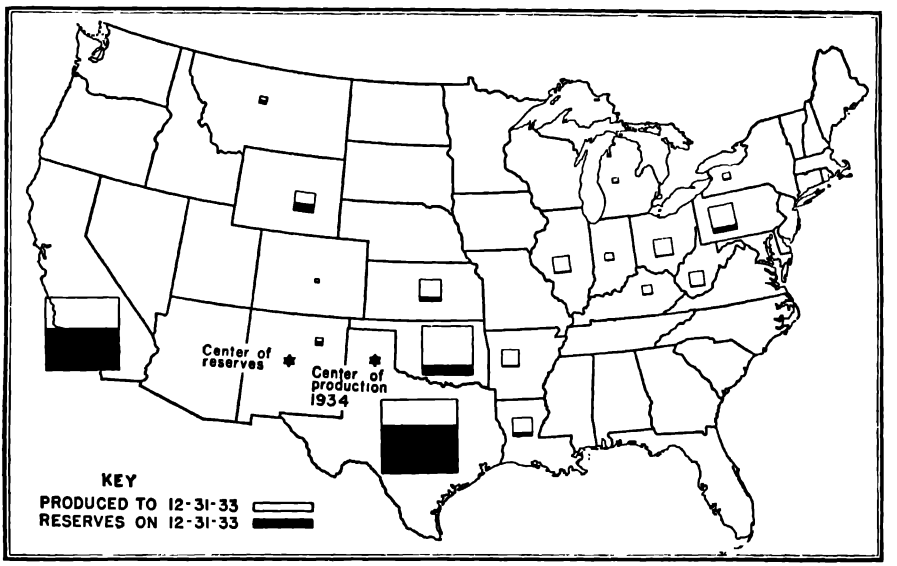


FIG. B. The oil that we have had and the U.S. Geological Survey estimates of the oil that we may get by present methods. The improvements in technique have probably kept the graph about up to date. (After Carter Goodrich)

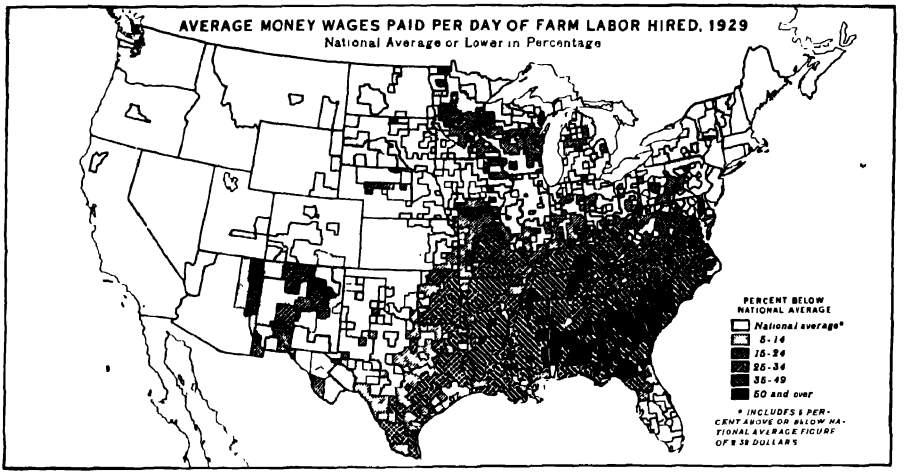


FIG. A

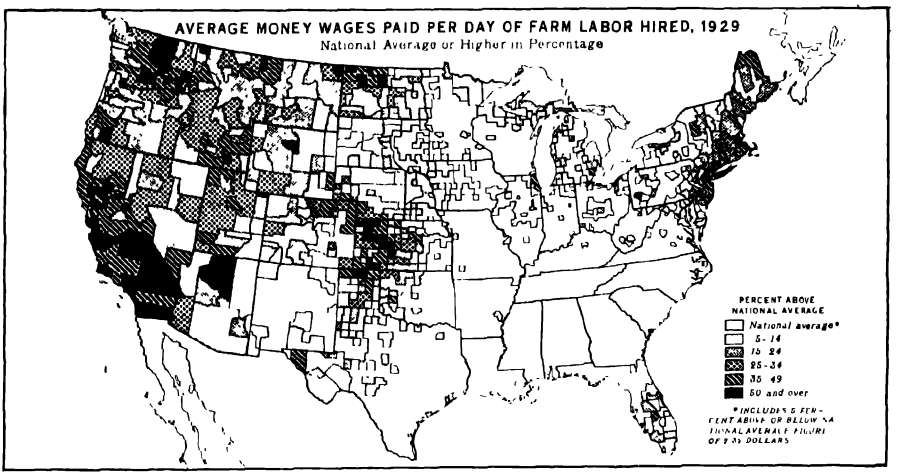


FIG. B

The old South feeds the new. These maps, combined with the high rural birth rate, go far to explain low factory wages and the Southern boom in manufactures.

No Southern state has a daily wage equal to the national average. The high wages were near to cities and in machine-using areas — perhaps part of the Northern exploitation of the South by way of tariffs. (Courtesy U.S. Dept Agr.)

velopment of the South, and the Cotton Belt in particular. As the population of the region increases and as purchasing power is put into the hands of the masses, the local market will continue to expand and to require a greater output from local factories. To raise the standard of living of the poorer classes, thereby enlarging the market for the products of factory and farm, is a real problem confronting the South, and indeed the nation.

CENTRALIZATION AND DECENTRALIZATION OF INDUSTRY

For many years Cotton Belt manufacturing was subject to certain forces of centralization. Since colonial times mills and factories have been established at Fall Line water-power sites. Within the last fifty years a ring of cities has grown up around the southern end of the Appalachian Mountains, taking advantage of wood, coal, and electric power from the mountains, cheap Piedmont and mountaineer labor, and the climate of the Piedmont, which is cooler and freer from malaria than the adjacent Coastal Plain. With the advent of the basic Bessemer process, a small spot of industrial concentration was marked by Birmingham iron and coal.

These established forces of regional centralization still continue to operate, but in recent decades there has been a pronounced trend toward local decentralization of industry. Today mill villages and factory towns are scattered across the Cotton Belt all the way from North Carolina down into Texas. Behind this trend toward decentralization are such motivating forces as the increased availability of electric power, new pools of labor, new inventions and technological processes, and the discovery or increased use of widespread raw materials for industry.

COASTAL CITIES: MANUFACTURING AND TRADE

Industrially, there are two main types of towns and cities in the Cotton Belt, namely, coastal towns where manufacturing has been tinged by the impact of foreign and coastwise commerce and interior towns that have capitalized upon local advantage.

Largest city of the Cotton Belt, and for over two centuries a great citadel of commerce, is the city of New Orleans (pop. 459,000), located on the Mississippi River about 110 miles from the sea. Before the era of canal- and railroad-building, the entire Mississippi Valley drained commercially through New Orleans.[17] Its prime advantage of general location has always outweighed the disadvantages of its local site, soft foundations and lack of drainage. At New Orleans the river, strait-jacketed between great levees, actually flows at a level above the city, and all sewage and water is drained or pumped out the back door into Lake Ponchartrain, which is lower than the river and not subject to such changes of level. New Orleans has fought and won two great battles to maintain public health, its nineteenth-century battle with yellow fever and its twentieth-century battle with malaria. With a high water table beneath the city, building construction is difficult, and even the dead in New Orleans must be buried aboveground.

Seventy-two steamship lines serve the port of New Orleans, which is well

[17] The great disadvantage of the Mississippi River as an artery of commerce is that it flows in the wrong direction, into the Gulf of Mexico instead of into the Atlantic in the direction of Europe. However, New Orleans holds one key to the Pacific Ocean, for it is 670 miles nearer Panama than is New York.

equipped with terminal and harbor facilities. Among these facilities is the world's largest shipside cotton warehouse, with 33 acres of covered space. New Orleans is peculiarly fortunate in that the State of Louisiana owns and operates the water front, thereby reducing traffic congestion, giving access to all ships that wish to call, and serving the public at reasonable rates.[18] This port ranks far ahead of its Gulf rivals in the value and variety of its commerce. In contrast with all other Southern ports, the outbound and the inbound traffic of New Orleans are fairly well balanced in value, although the tonnage of inbound cargo is greater. Exports consist largely of lumber, cotton, grain, and miscellaneous manufactures; imports include bananas, sugar, coffee, sisal, crude petroleum, bauxite, and nitrate. Commerce and manufacturing are very closely related. Petroleum-refining, sugar-refining, and the manufacture of celotex, molasses, industrial alcohol, wood products, cotton goods, and fertilizer are among the city's leading industries.[19]

Second largest city in the Cotton Belt is Houston, Texas, whose population increased from 79,000 in 1910 to 138,000 in 1920 and to 292,000 in 1930.[20] Prior to the opening of the Houston Ship Canal in 1915, Houston was virtually a commercial nonentity at the back door of Galveston. Today the total cargo tonnage of Houston is frequently second to that of New York. Houston is a city of boomers and builders, and the remarkable growth of population and commerce is due largely to the fact that it dug its way to the sea at an expense of over $250,000,000.[21] Its major industries include petroleum-refining, cotton-compressing and warehousing, cottonseed-oil compressing, meat-packing, flour-milling, and the manufacture of machinery and equipment for the petroleum industry. Vast quantities of oil, cotton, and grain are exported from Houston, and its sundry imports are minute in comparison. Within a radius of 100 miles are to be found proved reserves of 1,200,000,000 barrels of petroleum, about one-fourth of the known Texas reserve. Ten refineries, with a daily capacity of 378,000 barrels, are located in the city. Houston, Galveston, and New Orleans are keen rivals in the cotton trade, but for twelve consecutive seasons (1925–26 to 1936–37) Houston held the lead as the world's greatest cotton-exporting port.[22] Houston's cotton warehouses have a storage capacity of 2,500,000 bales, and it claims to be the largest spot-cotton market in the world. The phenomenal rise of Houston is a cogent illustration of the fact that man can build a harbor, but only nature can provide a hinterland, and man cannot keep it insofar as it is made of oil.

The city of Galveston (pop. 53,000) is located on an island and is connected by two giant causeways with the mainland. Until it was surpassed by Houston, it was the leading port of Texas. In most years Galveston handles more grain and flour than all other Gulf ports combined, and it claims to be the

[18] Public ownership dates back to the Louisiana Purchase in 1803, the terms of which dedicated the river front to public usage.

[19] The country's largest celotex plant in New Orleans is able to convert the bagasse from Louisiana sugar cane into celotex at the rate of 1,250,000 board-feet per day.

[20] U.S. Census estimate, July 1, 1937: 350,870.

[21] Total expenditure of Federal, state, and county funds prior to 1937 on digging and dredging the channel and turning-basin, and the construction and installation of 30 wharves, 19 locomotive cranes, a $4,000,000 grain elevator, and other improvements.

[22] Houston's exports of cotton in 1937–38 amounted to 2,250,000 bales.

world's greatest sulphur port. Its three large grain elevators have a combined capacity of 7,500,000 bushels. In 1936–37 its exports of 1,500,000 bales of cotton temporarily exceeded those of New Orleans and Houston. Port Arthur near by (pop. 51,000) more than doubled its population between 1920 and 1930 and has a commerce much like that of Galveston except for an emphasis on oil.

The coastal cities of the Southeast in recent years have lagged far behind the progress achieved by the rapidly growing ports of the Southwest. During the decade 1920–30, the population of Mobile (68,000) increased by 6000 people and that of Savannah (85,000) by only 2000, while the population of Charleston (62,000) declined by 6000. The chief exports of these southeastern ports are cotton, lumber, and naval stores. These cities have no oil and no grain to export. The production of cotton in the Southeast is declining as the crop moves west.[23] The same thing has happened to lumber. Hence, these cities do not boom. One finds there pulp and paper mills, lumber and woodworking establishments, fertilizer plants, a few textile mills, and refineries that use imported petroleum. Mobile seems to have the greatest potential advantages for progress, and in 1938 a $6,000,000 plant for the reduction of Guiana bauxite was established there.[24]

CITIES OF THE INTERIOR

The railroads made Atlanta very much as they made Chicago. In 1851 there was no Atlanta, Georgia. In that year the Western and Atlantic R. R. was opened to traffic between Chattanooga on the Tennessee River (a navigable branch of the Ohio) and a small place in Georgia called Marthasville that was later given the name of Atlanta.[25] This first railroad made Atlanta the gateway between the Middle West and the eastern Cotton Belt. Nine years later Atlanta had railroad communication with the Atlantic Ocean at Savannah, with the Ohio River at Louisville, and with the Mississippi River at Memphis, and rail and water connections with the Gulf at Mobile. For more than seventy-five years Atlanta has been the South's chief railroad center, and the greatest distributing center of the Southeast.[26] In 1930 it was the third largest city (pop. 270,000) in the Cotton Belt, and in 1937 the value of

[23] If the cotton boll weevil erected monuments to its achievements it might inscribe thereon: "See the industries I have moved and the cities I have quenched."

[24] Mobile's advantages include a good harbor, state-owned docks, cheap coal that moves down the Warrior and Tombigbee rivers by barge service, and natural gas by pipe line from Louisiana and Mississippi fields.

[25] This railroad was built and operated for many years by the State of Georgia.

[26] In 1938 Atlanta was served by 15 main lines of 8 major railroad systems, with 100 passenger trains a day. Over these lines more than 500 merchandise and package cars moved out of Atlanta daily. The Railway Express agency there handled more express shipments per capita than in any other American city, totaling 6,852 cars per month. In 1938, 33 commercial airplanes arrived and departed daily, Atlanta ranking seventh among American cities in volume of air mail.

A powerful factor contributing to the growth of Atlanta was the basing-point rate system of the South, Atlanta being a major basing-point. All freight rates to places near Atlanta are made up of the rate from the distant point to Atlanta plus the local rate *from* Atlanta. Thus the rate on goods from New York to a point 30 miles north of Atlanta is higher than the rate from New York to Atlanta.

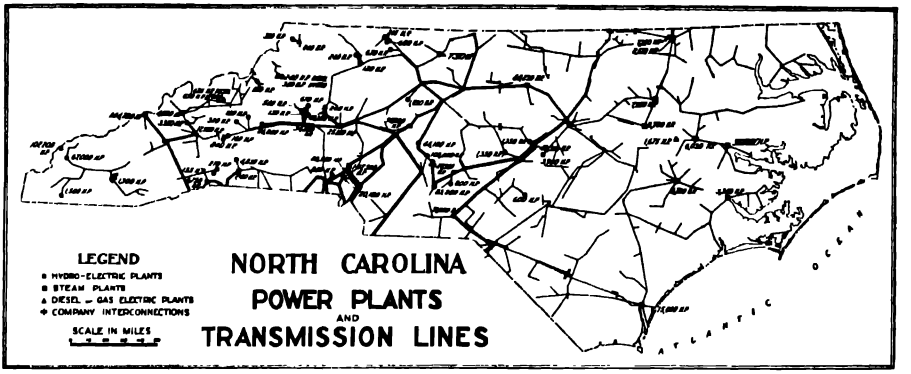


FIG. A. Heavy rainfall, evenly distributed throughout the year and falling at high elevations, is the chief basis for this power-line net which helps to make the North Carolina Piedmont such a manufacturing region. (Courtesy North Carolina power cos.)

its manufactures ranked first.[27] No one industry has dominated the development of Atlanta; more than 1500 different commodities are produced there, including textiles, chemicals, fertilizer, furniture, and paper.

Along the Piedmont section of the Carolinas, Georgia, and Alabama is to be found the oldest and most important textile-manufacturing section of the South. The manufacture of cotton and rayon has developed here largely because of the presence of cheap labor and the abundance of electric power.[28] A long string of cities, towns, and villages comprise this textile belt, including Charlotte and Gastonia, North Carolina; Spartanburg, Columbia, and Greenville, South Carolina; Athens, Georgia; and Montgomery, Alabama. Charlotte (pop. 83,000) and Montgomery (pop. 66,000) are the largest cities.

Geologically Birmingham is part of the Appalachian Ridge and Valley Region, but economically it belongs to the Cotton Belt. Here, as nowhere else in the world, are to be found within a narrow radius of 10 miles the three great raw materials needed for an iron and steel industry — iron, coal, and limestone. With the perfection of the basic Bessemer process, the phosphatic iron ores of the area were turned from a potential resource into an actual resource.[29] Chiefly because of this technological improvement, the site of a cornfield in 1870 has developed into the city of Birmingham (pop. 260,000) and the center of the South's iron and steel industry.[30]

[27] Value of manufactures (1937) in millions of dollars: Atlanta, 153; Memphis, 151; Houston, 146; Dallas, 141; New Orleans, 127; and Birmingham, 94. In comparison are the Piedmont cities: Winston-Salem, 344; Richmond, 338.

[28] Over 72% of the rayon yarn used in the South is consumed by the textile mills in the Piedmont section of North and South Carolina.

[29] The limestone lining of the Bessemer converter removes the undesirable phosphorus from the iron.

[30] The first iron furnace was built near the site of Birmingham by Daniel Pratt during the Civil War, and was later destroyed by Union troops. In 1873 Henry De Bardeleben, Pratt's son-in-law, erected new blast furnaces in Birmingham. So great was the excitement on the first day of operation that De Bardeleben's dogs started up a deer and chased him right over the pig bed. Later the Tennessee Coal, Iron, and Railroad Company acquired ownership of the industry, and the T.C.I., in turn, was absorbed by the United States Steel Corporation.

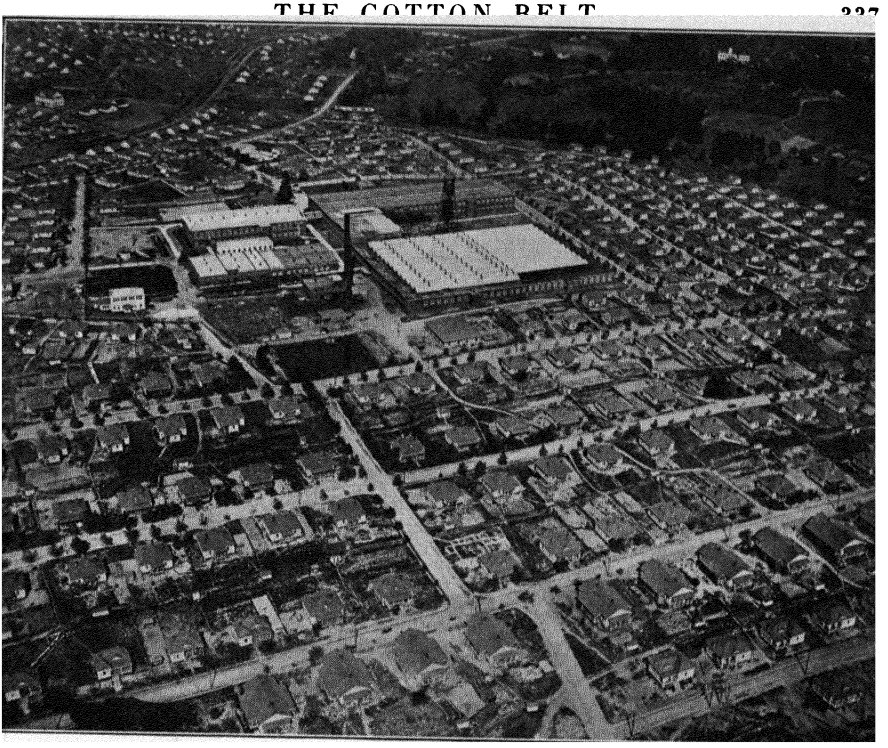


FIG. A. A cotton field becomes a cotton factory and a factory town. There can be a little gardening if the urge exists. (Courtesy Greenville (S.C.) Chamber of Commerce)

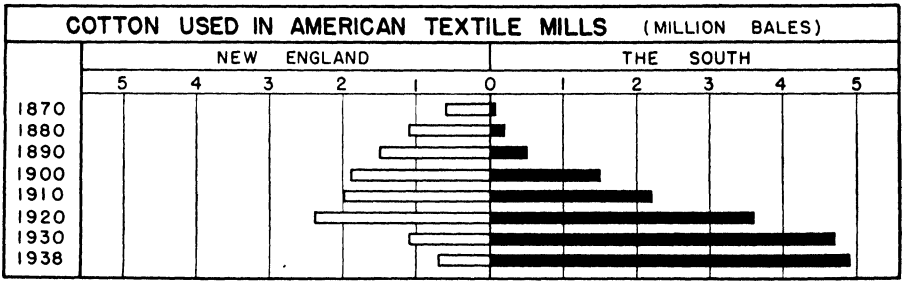


FIG. B. The new South. The South boasts. New England fears that it sees handwriting on the wall. It is not quite so bad for New England as it looks, because the finer New England goods require less raw material. (U.S. *Statistical Abstract*)

One great question is why is Birmingham not bigger, why has it failed to become a great steel center like Pittsburgh and Gary. The fact that nowhere else in the world can iron, coal, and limestone be assembled so easily caused many geographers, economists, and industrialists not so many years ago to prophesy that Birmingham would become the iron center of the habitable globe and a greater steel center than Pittsburgh, yet these enthusiastic pre-

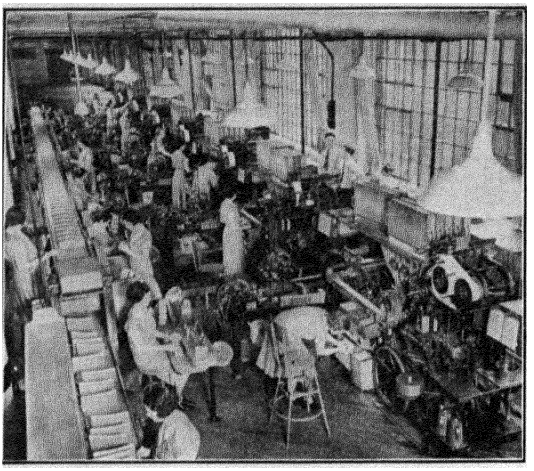


FIG. A. The new South. The boom in cigarettes, produced in part by advertising, keeps these machines busy at Winston-Salem, N.C. (Courtesy Winston-Salem Chamber of Commerce)

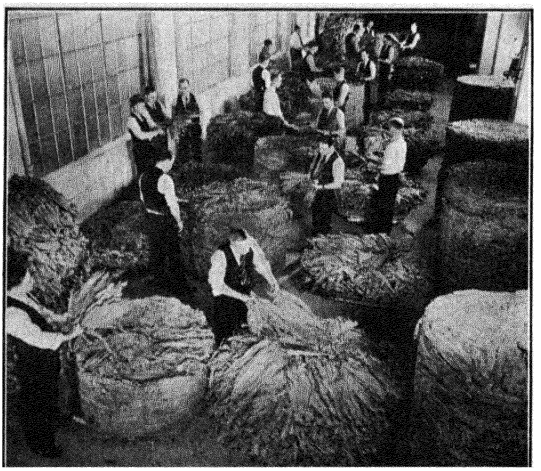


FIG. B. After "curing" in hogsheads for two or three years the leaf tobacco is graded from these hogshead piles. This picture shows an inspection, not regular work. (Courtesy Winston-Salem Chamber of Commerce)

dictions have not been fulfilled.[31] In 1937 the Birmingham district produced only 7 per cent of the nation's pig iron and 13 per cent of the steel rails. Its sole claim to leadership in the iron and steel industry was in the manufacture of cast-iron pipe (60 per cent). Offsetting Birmingham's great raw material advantage [32] is its chief handicap, the lack of an industrial market.[33] The Cotton Belt, like the South in general, is primarily an agricultural region. There are no great heavy industries requiring vast quantities of steel and providing, in turn, large amounts of industrial scrap to be used in the manufacture of iron and steel. If the Cotton Belt, or a portion of it, becomes heavily urbanized and industrialized like Pennsylvania and certain other sections of the North, the Birmingham steel industry will stand to gain.

In the middle part of the Cotton Belt the largest cities are Memphis, Tennessee (pop. 253,000), and Little Rock, Arkansas (pop. 82,000). This is

[31] H. C. Frick predicted that Birmingham would be bigger than Pittsburgh by 1940.

[32] Iron ore from Red Mountain moves by a special railroad downhill to the Fairfield plant in less than 30 minutes. Coal is almost equally accessible, and limestone is right at hand.

[33] Other disadvantages may be mentioned briefly. Birmingham iron ore lies deep beneath the surface; it cannot be scooped out with steam shovels like Lake Superior ore. It is harder and requires much drilling, blasting, and crushing. Its iron content is more than 10% lower, and hence more ore and more coal per ton of pig iron must be used. Because of its high phosphatic content, the pig iron is first Bessemerized and then worked through an open hearth in order to produce quality steel; this duplex process involves a greater overhead cost per ton of finished steel.

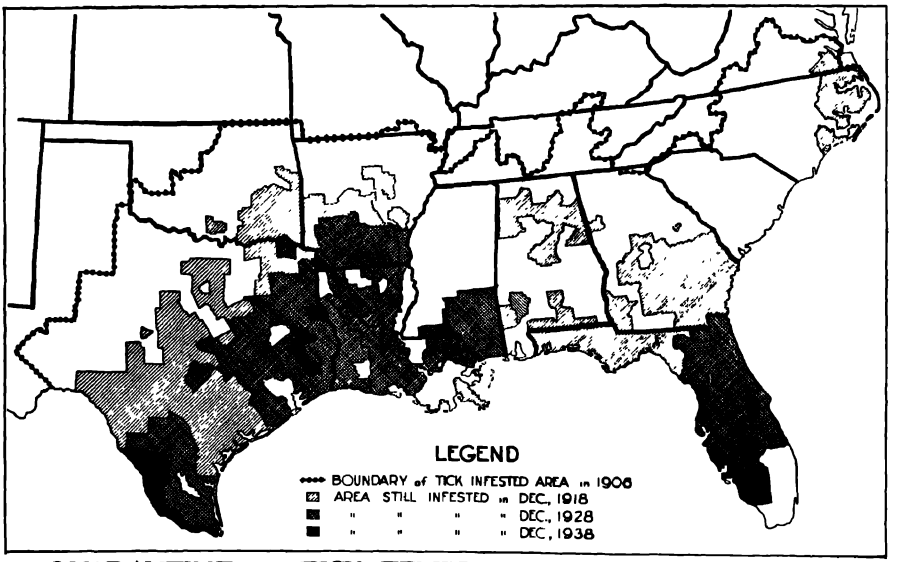


FIG. A. This is a fine example of a triumph in the application of scientific knowledge. The South, like the rest of the United States, and other countries, has many opportunities of like nature awaiting constructive imagination and administration. (Courtesy U.S. Dept Agr.)

one of the old and rich cotton-growing sections of the South, and these two cities are great marketing centers.[34] Since antebellum days dusky dock hands have been loading bales of cotton on river steamers at Memphis, and the marketing of cotton is still its leading industry. Cotton cloth, clothing, and cottonseed products are among its manufactures. At one time Memphis was the largest hardwood market in the world, and the manufacture of boxes, flooring, furniture, and farm tools is still important.

The interior cities of Texas — Dallas (pop. 260,000), Fort Worth (pop. 163,000), and Waco (pop. 53,000) — are commercial centers of a large and productive area. For these cities, the story of prosperity is written in terms of cotton, wheat, cattle, and especially oil. Here are located oil-refineries, machine shops, flour mills, meat-packing plants, cotton-compressers, textile mills, and clothing factories to meet the needs of a rapidly growing local demand.[35]

The cities of Oklahoma are the newest of all. In many cases cotton and

[34] In 1933 the planters in the rich delta country of Jefferson County, Ark., plowed up much cotton under the New Deal program and reaped the advantage of higher prices. Again in 1934, 1935, and 1936 they curtailed their acreage, and it seemed that restriction might eventually leave them with no occupation at all. Consequently, they turned to raising beef cattle, dairy cattle, and poultry. Thus the New Deal has supplemented the boll weevil as a diversifier of agriculture.

[35] Dallas claims to be the largest inland cotton market in the world, handling about 2,000,000 bales annually, and Fort Worth claims to be the largest (inland) grain terminal in the South.

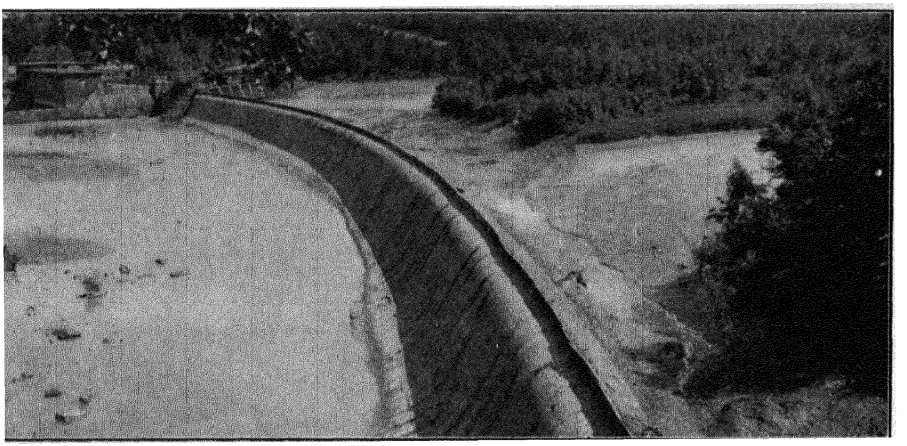


FIG. A. Alas for Southern water power! Cutting its own throat with gullies, Southern agriculture commits double suicide. This fine concrete dam in the Piedmont region of Virginia near the Carolina boundary was built to last a thousand years. It probably will. It made a lake to store water for the power plant at the far end. In a few years it filled up with farm wash. An island formed in the center. Trees are growing on it. See the feeble board additions to raise the height of the dam. (Courtesy U.S. Soil Cons. Service)

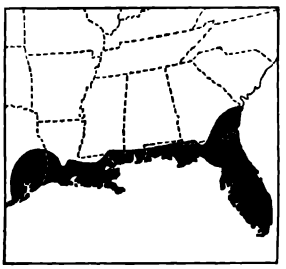
cattle gave them a start, but it was oil that made them cities. Oklahoma Territory and Indian Territory were not combined to form a state until 1907. The area had long been reserved for the Indians, but it proved to be good, and that ended the Indians' claim.[36] In 1892 the white man surged into Oklahoma in the great race for a quarter-section of land (see page 21). This land was immediately valuable, because the lands of Kansas and Texas were already occupied. Then oil was found. Oil, the greatest goad to speculation known to man. In rushed other thousands. As a result of newness and oil the Oklahoma cities are chiefly local commercial centers and oil-field centers where the fortunes of people, and the people themselves, come and go with the ups and downs of oil. Today Oklahoma City (pop. 185,000) and Tulsa (pop. 141,000) are the largest cities in the state.

The manufacturing and the trade of Cotton Belt cities have been rapidly growing in recent years. Diversification of industry, if it is not a hothouse product of tariff protection or the consequence of human exploitation, is a good thing. The Cotton Belt of today is confronted with a labor problem, a Negro problem, a poor-white problem, a tenant-farmer problem, a soil-waste problem, a railroad-rate problem, and many other problems which, it is hoped, may find happy solutions. President Roosevelt called the South the nation's Economic Problem Number One. There is ample evidence that in many respects it is also the country's Economic Opportunity Number One.

[36] The late W. J. Spillman remarked one day after a long survey of Indian reservations: "They put the Indian on lands where a white man would starve. They expected him to starve, but he fooled them." A living geographer: "If you want to know where the poor land is, just look up the Indian reservations."

Chapter 15. SUBTROPIC COASTS AND THE FLORIDA PENINSULA

THE GULF COAST SECTION



THE north coast of the Gulf of Mexico is a hot, moist lowland which consists of barrier beach, lagoons, muddy tide washes, flat forests, wet prairies too flat and water-logged to grow trees, Mississippi flood plain — plenty of mud. Most of this land or semiland is the natural home of waterfowl and of the mosquito, which has a long breeding-season in a land where frost never lasts more than a day or two at a time (Fig. 174 A).

East of the Mississippi River there is much less mud; sandy flats replace mud flats, but the area is still flat.

THE RICE CROP

Rice culture requires level land, a fertile soil, an impervious subsoil, plenty of water, and a temperature of over 70° F. Much of the flat prairie land that extends westward from the Mississippi Delta across Louisiana into Texas consists of a rich, friable, silt loam with a watertight subsoil of clay. The average annual rainfall of southwestern Louisiana is 56 inches, and rice needs from 45 to 65 inches of fresh water during its growing-season. Hence man supplements nature's supply by diverting water from streams and artesian wells onto the rice land, and one finds irrigation companies in one of the wettest parts of the United States.[1] In contrast with the Orient, rice production is conducted with large-scale mechanized methods, diking, plowing, planting, and threshing being done by machines. Consequently, the number of acres *per worker* is from 80 to 170 times as great as in Japan or China, and the labor cost *per acre* is far less. With the abolition of slavery, rice culture in the swamplands of Georgia and the Carolinas declined, and since 1889 Louisiana has led the Union in rice production.[2] During the 1937–38 season 1,472,000,000 lbs. were produced in the United States (40 per cent in Louisiana and 23 per cent in Texas), 337,000,000 lbs. being shipped to our insular possessions (chiefly Puerto Rico), and 289,000,000 lbs. being exported to foreign countries.[3]

[1] Along the Mississippi River the water is conveyed over the levees by siphons, but in most of this area powerful pumps lift the water from streams into irrigation canals.

[2] 1937–38 crop record in millions of bushels of rough rice of 45 lbs. each: Louisiana, 20.7, Texas 13.0, California 9.1, and Arkansas 9.4 (U.S. Dept of Agr., *Agricultural Statistics*, 1939).

[3] American rice production is a mere drop in the bucket in comparison with the Far East, for fully 97% of the world's rice is grown east of Suez.

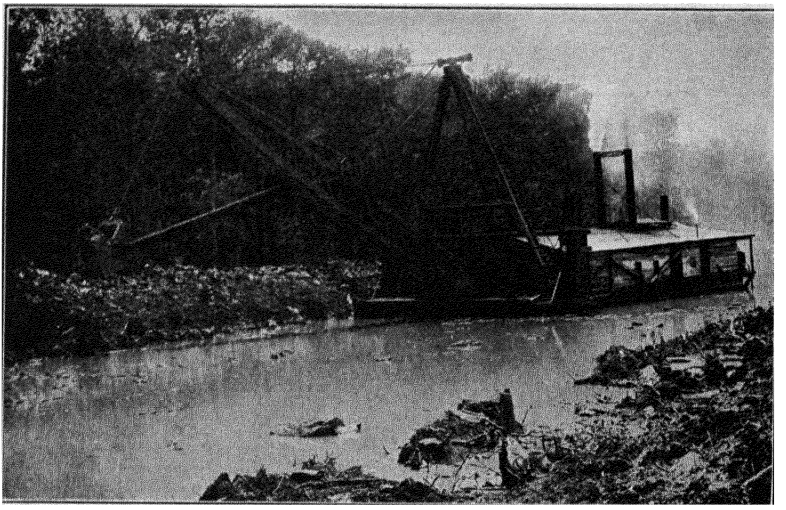


FIG. A. Mississippi flood plain reclamation work. The steam shovel uproots the forest and digs the canal along which floats the barge that carries it. At the same time it builds a levee to protect the reclaimed land from flood. It is too bad that we can't apply real constructive imagination to our machines and land reclamation, and clean up whole areas. (Courtesy Southern Alluvial Land Ass'n, Memphis, Tenn.)

When an industry is on an export basis, no further proof of its effectiveness is needed.

The swampland of this rain-drenched coast, especially in the wilder sections, is the home of the muskrat and other fur-bearing animals. As many as 6,200,000 muskrats, worth $6,500,000, have been trapped in southern Louisiana in a single season (1929–30), but in recent years the annual take has declined to about 2,500,000 pelts.

SUGAR

For many years the only sugar cane produced in the United States was grown on the Mississippi Delta. Today it is scattered throughout fifteen parishes of Louisiana. Sugar cane has higher and more dependable yields in the frostless tropics. Therefore Louisiana is a perilous and costly place in which to grow sugar. Cool, wet autumns sometimes give the cane low sugar content. Because of the frost hazard, the cane must be planted later and harvested earlier than in the tropics. In Cuba six or seven good commercial crops can be obtained from an original planting. In Louisiana the planters used to consider themselves lucky to get more than one good crop.[4] Of late new varieties have been bred in Louisiana, and now the practice of getting "stubble crops" is increasing. The nearness of this section to the northern limit of cane-growing is well shown by the influence of small lakes a few miles wide, which

[4] In recent years it has become more common to apply commercial fertilizer to the first "stubble crop" (ratoon). Sugar cane is a perennial. A stubble crop is one that grows up from the old roots without replanting. The best farmers follow the practice of planting cane in fields where leguminous crops have been plowed under.

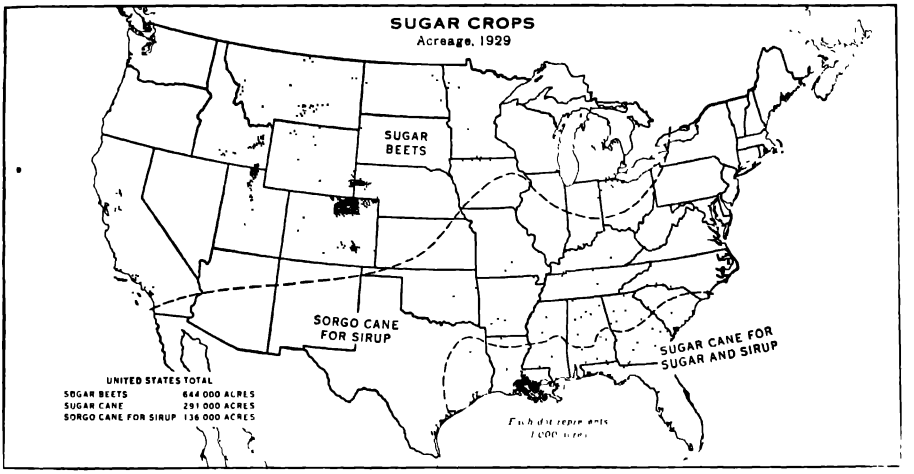


FIG. A. Sugar is another crop that sticks to special centers. Sorgo is the same as sorghum. (Courtesy U.S. Dept Agr.)

often serve to temper a "norther" so that cane fields along the south shore escape a freeze which destroys cane on the north shore of the lake.

With such natural handicaps, the high-cost Louisiana cane sugar could not compete with imported sugar from the tropics, where the yield per acre is greater, if it were not for the American tariff.

Florida has recently started a cane-sugar industry in the Everglades, with a production of 1000 tons in 1928 and 66,000 in 1937. During this time the Louisiana's crop increased from 135,000 to 444,000 tons.

Rice and sugar cover but a small percentage of this area of heavy soils. A considerable portion of it is flooded at times by high tide, heavy rain, or Mississippi overflow.[5] Large tracts of this unused land have been set aside as a national bird refuge, where hunter or gun cannot enter, and where birds and wild animals can live undisturbed in their native haunts.[6] This wise provision does not interfere with forest growth.

STRAWBERRIES

An area of good trucking soil just north of Lake Ponchartrain has been developed into a commercial strawberry section in which the town of Hammond, Louisiana, claims to be the leading strawberry shipping-point in the United States. The state sends 2500 to 3000 cars of fruit a year to Northern markets.

[5] Is it land or water? If a canoe paddle will stand up in the stuff, it is land. If the paddle falls over in the soupy mass, it's water. There is a water and boat culture of hunters and fishermen in these swamps and bayous. It is as definitely aquatic or amphibian as that of the first settlers in those reedy isles of Venice.

[6] A result of diligent effort by Theodore Roosevelt and many other nature-loving, far-seeing citizens. Such is the technique of social progress.

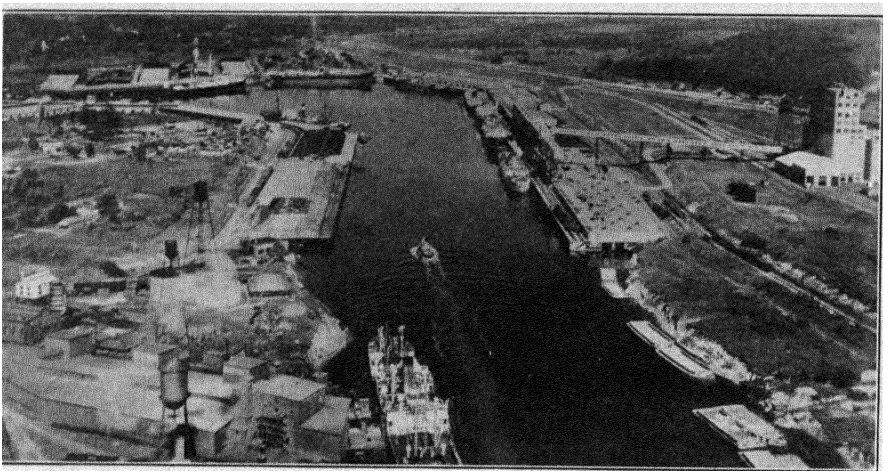


FIG. A. Air view of a part of Houston's 45-mile ship canal and the turning-basin. To appreciate size, note that the turning-basin is 1000 feet across and that a number of large-sized seagoing vessels are in it. With more than 20,000,000 tons of freight per year, Houston leads all U.S. ports in bulk of exports.

This new waterway through the level plain gives almost unexampled opportunity for the location of plants of the heavy-industry types — cement, oil, fertilizer, paper, shipyards, heavy chemicals. The 25 miles between the city and the bay are scantily peopled, therefore plants can get all the land they need. At the harbor are terminals owned by the city and the navigation district. For miles along each side of the waterway there is a belt-line railway, an electric power line, natural-gas mains, crude-oil pipe lines, fire mains. Crude-oil pipe lines and gas mains to many oil fields make it for the time being one of the cheapest power centers in the world. (Courtesy Houston Chamber of Commerce)

FISHERIES

Oysters cannot live in either salt water alone or fresh water alone, but along the coasts of Louisiana and Mississippi the mingling of fresh water from the land and the salt water of the sea produces that brackish water favorable to oyster culture. Some 500,000 acres of area are available in Louisiana for this purpose, and this area is sufficiently removed from human habitation to render it immune to sewage pollution. The value of the Louisiana oyster crop in 1937 was in excess of $2,250,000. Steam canning is carried on in a number of coastal parishes, but Biloxi, Mississippi, is the recognized center of this phase of the industry, with 17 plants located there.

Shrimp thrive in Gulf waters, and Louisiana is now the leading producer of salt-water shrimp in the United States. The catch in 1937 amounted to 76,000,000 lbs., with a value of approximately $2,800,000.

MINERALS

In the coastal-plain section of Louisiana and eastern Texas is the world's greatest and cheapest sulphur-producing region.[7] The sulphur occurs in dome-

[7] These deposits are scattered from Freeport, Tex., to the Grande Ecaille dome in Plaquemines Parish, La., 43 miles southeast of New Orleans. For a concise analysis of the sulphur industry of this region, see Stanley W. Preston, *Sulphur in Louisiana, Louisiana Business Bulletin*, Vol. 1, No. 1, Louisiana State University Press, Baton Rouge, 1937.

like structures (much the same as oil, gas, and salt domes) about 700 to 1300 feet below the surface of the earth. Early attempts to sink shafts resulted in cave-ins because of the quicksand formations which had to be penetrated, and it was not until after the discovery of the Frasch process in 1890 that these great deposits became economically available. By this process superheated water is introduced into the sulphur beds at or above the melting-point of sulphur; compressed air is forced down through a second pipe, which forces the molten sulphur (over 99 per cent pure) up through a third pipe to the surface of the earth, where it flows into bins, cools, and solidifies.[8] Because of this remarkable process, the Texas and Louisiana deposits now produce about two-thirds of the world's sulphur.[9]

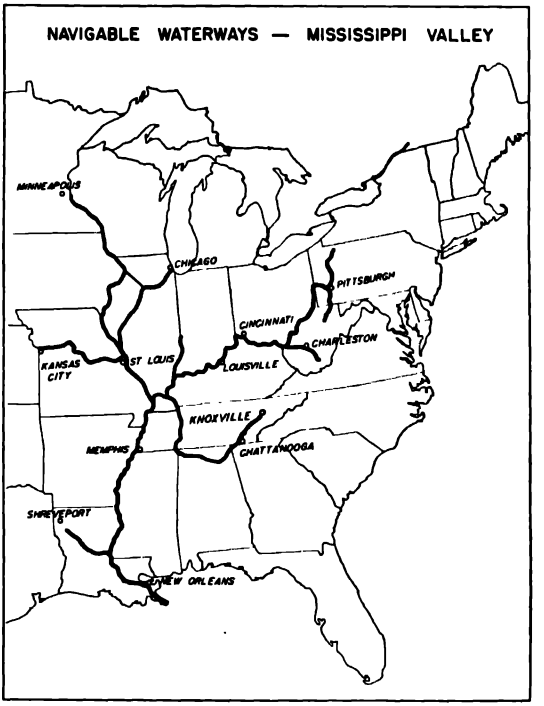


FIG. A. With this map the Pittsburgh Chamber of Commerce boasts of its position in steel (see Fig. 402 A). The cheapness of barge freight gives many cities a close parity with Pittsburgh in cost of steel and coal. It is a boon to New Orleans as a port and a future manufacturing center. (Courtesy of Pittsburgh Chamber of Commerce)

In 1938 Texas led all states in petroleum production with an output of 476,000,000 barrels, about one-fifth of which came from its Gulf Coast fields. Louisiana ranked fourth with an output of 95,000,000 barrels, two-thirds of which were produced in the Gulf Coast district.

There are also some valuable and puzzling deposits of salt, valuable because they are more than 99 per cent pure and exist in solid layers hundreds of feet thick. One of the layers comes to within 12 feet of the surface of an island on the south shore of Louisiana. The puzzle is, how did salt, a product of desert conditions, come to be produced in this place?

[8] Sulphur-mining calls for a considerable investment of capital, the smallest plants requiring $500,000 or more. The new plant at Grande Ecaille contains six 860-h.p. water-tube boilers capable of supplying 2,800,000 gallons of water a day to the mines at 350° F. at a pressure of 250 lbs. per square in. Air pressure for lifting the sulphur from the wells comes from three 800-lb. high-pressure air-compressors. The cost of the Grande Ecaille plant is estimated at about $3,000,000.

[9] Production in this region reached a peak of 2,559,000 long tons in 1930; average production during 1930–34 was 1,680,000 long tons. The remainder of the world's sulphur is obtained chiefly from Sicilian sulphur deposits (25% pure), from pyrites (about 45% sulphur), and as by-products from copper and zinc smelteries. In 1938 Texas supplied 86% of the nation's sulphur; the largest output came from the Boling Dome, property of the Texas Gulf Sulphur Co.

The sandy lands of southern Mississippi, southern Alabama, and western Florida, the home of the longleaf pine, the turpentine still, and the sawmill, are but little used for cultivation. Near Mobile Bay there is considerable trucking, and about 500,000 hardy Satsuma orange trees. Oranges are also grown on the Mississippi Delta in Louisiana, to the extent of 250,000 or 300,000 boxes a year.

This whole coast is subject at times to the visitation of stray West Indian hurricanes. These storms, 100 miles wide and whirling with destructive fury, normally pass east of Florida and proceed northeastward at a safe distance from the coast. Once in a while one is pushed westward and crosses the Gulf, whence it turns northward into the United States. Such was the storm that wrecked Galveston in 1900. From time to time New Orleans or Mobile receives the deluges of rain and fierce winds that accompany one of these storms. In 1909 and again in 1915 a storm was strong enough to blow down the iron bridges of the Louisville and Nashville R. R. east of New Orleans. A special type of bridge had to be designed to resist them. Fortunately, these storms rarely visit any one particular place, and their fury abates when they reach the land. Probably the worst one of recent record crossed southern Florida near Miami in 1926. One result of its destruction was a building code requiring stronger house construction.

THE FLORIDA PENINSULA: AN ECONOMIC FRONTIER

The Florida peninsula is about 140 miles wide by 400 miles long — a distance greater than that from Washington to Albany. It was recently raised from the bottom of the sea. The surface is low, flat, or rolling sandy plains dotted with swamps, lakes, lagoons, and old beaches. During the seventeenth and eighteenth centuries, when the North Atlantic states were developing populations, industries, and institutions, Florida was an almost unsettled claim, a small pawn, passed back and forth across the treaty tables by England, France, and Spain in their rather frequent settlements of wars. It had no era of subsistence farming, as did New England. The soil was and is too poor. Bought by the United States from Spain in 1819, it had no feverish period of antebellum settlement and exploitation, because it had no areas of rich land suitable for cotton or any other exploitive agriculture.[10] Therefore Florida has been a late arrival in settlement. Progress began about 1870 and received a great impetus after the completion of the first railroad line from the North. Indeed, Florida may still be called a frontier in the economic sense — the last frontier east of the Mississippi River. It shows its frontier character by the rapid increase in population, which was 42 per cent in the decade ending 1910, 25 per cent in the following decade, and 52 per cent in the decade ending 1930. In no other Eastern state, not even in metropolitan New York, have numbers increased so rapidly.

This is striking in comparison with static Georgia or with almost static

[10] A few clay hills in the north long marked the end of cultivation as well as the southern boundary of the Cotton Belt.

Iowa. To duplicate such increase we must look to the Far West. Florida also shows its frontier character by the small amount of cultivated land. Of its total area of 35,000,000 acres, but 5,000,000 are in farms, and in 1930 less than 1,500,000 acres, or 4.3 per cent, were actually in crops. Parts of the south are mangrove swamp, but little explored, and coral reef.

. Still further proof of the frontier stage is to be seen in the land speculation which accompanied the rapid arrival of Northern people between 1920 and 1929.[11]

POPULATION

Florida is the only Southern state with a large Northern element in its population. It calls itself the melting-pot of the states. The percentage of Negroes has declined sharply from 43.7 per cent in 1900 to 29 per cent in 1930. It is a strange and appalling fact that in Miami, largely Northern, the suppression of the Negro is perhaps more complete and more merciless than in any other Southern city.

THE CLIMATE AND THE TOURIST

The most distinctive thing about Florida is its climate. This has been called the "most marketable climate in the world," and Florida is marketing it in many ways. Florida climate is sold at $5 to $100 a day in Miami and Palm Beach hotels or at 50 cents a day in tourist camps. It is sold by the carload of fruits and vegetables delivered in midwinter to Northern markets. And it is sold at fancy prices by the acre for orange groves or at so much a front foot for building-lots.

Florida's climate is made chiefly by two factors. The first is much sunshine, the winter having little rain and little cloudy weather. The second climate-maker is warm water. The equatorial drift in the Atlantic flows through the Caribbean into the Gulf, and out through the Florida Straits as the Gulf Stream, which is like a mighty river of warm water carrying in a northeasterly direction toward Europe 1800 times as much volume as the Mississippi pours into the Gulf. Thus the Florida peninsula has warm water on three sides and on the north is exposed to the land influence, which means an occasional dash of cold, carrying frost to the very tip of the peninsula. Then all Florida shivers, the houses being built for comfort for the average warm day. The visitor from the North is appalled at the number of houses without cellars and furnaces, and he is volubly chagrined when he encounters frost in Florida.

The summer from May to November is showery without the extremes of heat (especially in southern Florida) that occasionally visit Washington or Chicago.[12] The winter is bright and sunshiny, with occasional showers which

[11] Florida experienced a tremendous land boom in 1925–26. Even in northern Florida building-lots were staked out and sold near small towns. Many lots were sold and resold with only a small down payment and after the collapse of the boom reverted to the original owners. There are still to be seen a number of unfinished hotels in northern Florida, monuments to the greedy God of Speculation, and pavements and toppling lampposts turn up in the most surprising and desolate tracts of scrub.

[12] In twenty-one years the extreme of heat recorded at Jupiter was 96° F. A million square miles of the North had higher temperatures.

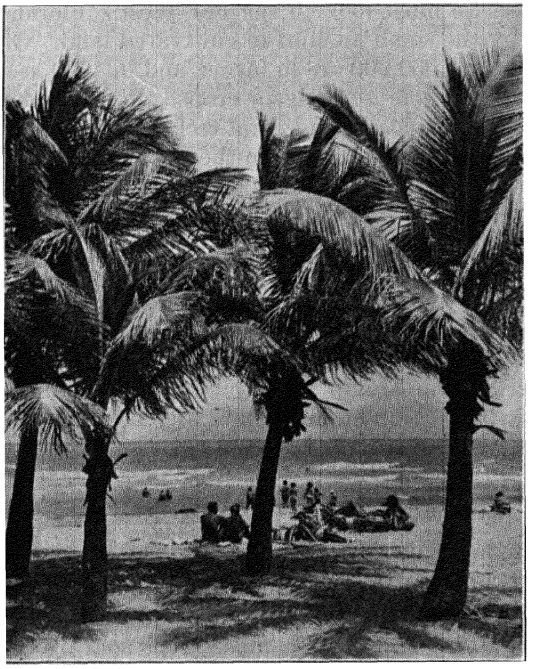


FIG. A. Florida's chief crop and chief source of income. The healthy condition of these too few small palm trees is proof that repeated photographing does not injure a tree. (Courtesy Miami Chamber of Commerce)

are soon over. This winter climate is attractive to the denizens of the North. For an unknown time hundreds of thousands of waterfowl in search of food have winged their way from the northern United States and Canada to spend the winter on the lakes and swamps of Florida, and have flown back again in the spring to rear their families in the North. And now Northern man, the sun-hunter, with new-found powers of flight, is following the waterfowl to Florida.

The tourist is Florida's greatest source of income. At the height of the season the population actually doubles. They come by automobile, trailer, bus, sleeping-car, and airplane. Some come down the coast in private yachts and on the line steamers. By the end of February the rush homeward is at its height. The last to go, as well as the first to arrive, is the horde of hotelkeepers, waiters, and others who take care of vacationists in Florida in winter and in the North in summer.

The millionaire goes to Palm Beach, Miami, Jacksonville, where he can stay in some of the most luxurious hotels in the world at a charge of from $20 to $100 per day. This tourist enjoys the beach and the bathing. He goes golfing or tarpon-fishing and gets his picture in the Sunday supplements of metropolitan dailies.

The farmer of the Middle West, of New England, and even of Canada, gets an equal amount of vacation in a very different way. He hooks on his trailer, perhaps a homemade affair, to the back of his Ford, or rolls up his tent, and camps by the wayside — "tin-can tourist," the hotelkeepers contemptuously call him. Many spend the winter in one tourist camp after another, at an expense of $1 or even 50 cents a day per person. Others take rooms, which are to be had at very reasonable prices away from the few fashionable and very expensive resorts.

The "tin-can tourist" has free access to the pines, the sun, and the seashore. He has the gentle excitement of a strange land and of moving from place to place — and pitching horseshoes. The enthusiasm for this simple

sport is amazing. Its contestants compete for a national championship. To the slightly rheumatic of advancing years it is refreshing to bask in the Florida sun and read about blizzards back home. The Florida papers give him plenty of chance to read about the blizzards, because it is a part of the stock in trade of the Florida paper to cheer up its guests with news of freezing weather in the North and especially of misfortune in California. According to the Florida papers, this great rival winter-tourist region is a terrible place, going rapidly to the bad with frost, storms, earthquakes, and other calamities. California and other resort places reciprocate.

Tourists spend many millions of dollars each year in Florida, and many a retired farmer or businessman, after a few migrations to the land of sunshine, decides to stay, or at least to build a winter home.[13] Indeed, it is sometimes difficult to ascertain just who is a native Floridian. A strong case can be made for naming Florida and California the "enemy states of the Republic." Just as a man and wife attain the age of wisdom and have the leisure to become very useful in local public affairs, they produce civic emasculation by removing themselves for half the year or all of it to the land of sunshine, where they have no roots and can never become as effective as in the home neighborhood.

THE LAND BOOM

A land boom is an interesting phenomenon. It seems to the traveler that there was a lot staked out for every inhabitant of the United States in the days of the Florida land boom. There were daily auction sales of lots in many towns and sometimes in country places which now seem puzzlingly remote.[14] An Illinois man of our acquaintance who had bought a "Miami" lot by mail went to hunt for it. He did not succeed in seeing it, but he got it located — 12 miles from Miami. It was under water in the Everglades, 2 miles from the nearest passable road.

The chief objective of this lot-buying was not to produce crops, nor to build, but to sell again, a process that is very profitable while it lasts and is characteristic of land booms everywhere. In 1925–26 tourist and native alike had caught the universal fever to hold a lot or two, perhaps half a dozen, as a speculation. Meanwhile, of course, each year brought tens of thousands more winter tourists, and many more to buy lots on which to build bungalows where they hope to pass the winters of their later years.

The development of Florida as a place of residence and resort has been greatly promoted by the enthusiasm of New York multimillionaires who have been charmed by the state and have thrown money into it without thought of adequate return. One of these men built a railroad into the unsettled wilderness, and actually carried it 114 miles at sea, flinging the railroad from

[13] This is convincing proof of the soundness of the answer that a little Florida colored boy gave my uncle years ago: "We live on wattahmillions in summah and sick Yankees in wintah."

[14] "Hence an endless, vociferous campaign of real-estate enterprise, of building and boosting, of speculations and bonuses and invitations to free trips with luncheons and eloquence thrown in." — Clara G. Stillman, "Florida: The Desert and the Rose," *Nation*, Oct. 31, 1923, p. 435.

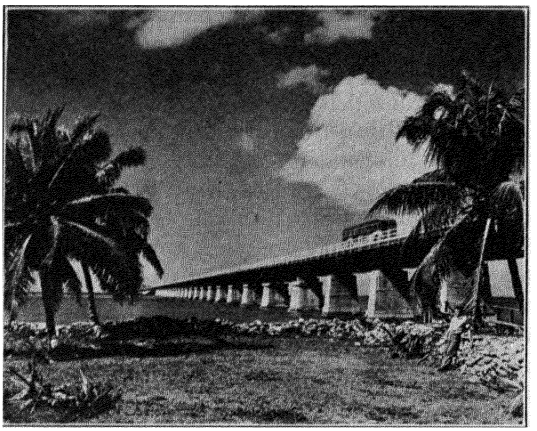


FIG. A. The road to Key West, result of a multi-millionaire's fancy. Picture of Seven Mile Bridge taken from Pigeon Key. (Courtesy Key West Chamber of Commerce and the Florida Motor Lines)

islet to islet with concrete arches at a fabulous cost that could only have been a profitable investment in such a place as the English Channel or New York Bay.[15]

CLIMATE AND THE MONEY CROPS

Climate makes Florida's first money crop, tourists; the second, fruits, chiefly oranges and grapefruit; and the third, vegetables for the Northern markets in winter. The fruit and vegetable industries are cursed by a double dread — the glutted market and the freeze. From time to time a cold wave brings stark frost into the green and palm-embowered winter. Tampa has had temperatures below 20° F. Once it had also in succession four winters out of five without frost, and the one frost came on November 21.

FRUITS

Citrus culture is one of the oldest industries in America, for the orange and grapefruit were grown in Florida more than three centuries ago by the few Spaniards who were there. Through-railroad transportation made it an export industry. Most of the first commercial groves were located along the St. Johns and other rivers, as the early growers had been dependent on the river boats. In the early '90's both banks of the river were lined solidly with prosperous groves, each grower with his own wharf and small packing-house.

Then came what the old residents of Florida still call the "Big Freeze." Previous freezes had often destroyed a crop without damaging the trees greatly. The two severe cold waves in the winter of 1894–95 ruined the orchards of the entire state by killing most of the trees down to the ground.[16]

[15] The Key West Extension of the Florida East Coast R.R. was opened for traffic in January, 1912. It was built at a cost of $212,000 per mile and was soon called "Flagler's Folly," for Henry M. Flagler, the Standard Oil millionaire, who owned all but 9 shares of the railroad's stock. The first 14 miles on the mainland south of Homestead were built through a swamp. The remaining 114 miles followed the arc of the Florida keys to Key West, 13% of the mileage being over bridges. The keys, a low-lying chain of islands flanked by coral reefs, are long and narrow with intervening channels and many inlets, which were crossed at great expense, and a hurricane later demolished most of the bridge part of this folly. Key West is now reached by highway.

[16] The hard freeze of 1894 lasted three days. At Jacksonville the temperature dropped from 60° F. at 8 A.M. on December 26 to 36° at 8 A.M. on December 27. At midnight on December 28 it had fallen to 19.5°, and at 7 A.M. on December 29 it reached its lowest point, 14°.

A period of warm, moist weather in which the trees had been growing was followed by a quick drop in temperature, a factor which very much increases the destructiveness of frost. Thousands of groves were so completely ruined that the owners did not even try to restore them.[17] The industry started up again in central and southern Florida. Even this move did not bring with it frost immunity, for other freezes have killed young orchards until, from experience, the margin of safety from ordinary frost is now fairly well defined. It is the practice in Florida to protect the lower trunk and bud union of young trees by piling up 18 inches of earth around them. Systematic frost protection has not become as well organized a practice as in California, but some of the growers keep oil heaters in their groves or piles of wood ready to be ignited at the approach of a cold wave. In the central lake region of Florida the numerous lakes reduce the frost hazard; during the freeze of 1917 groves on the south shore of Lake Apopka suffered little damage, while others 2 miles south were severely set back. Air drainage is also better understood, the groves which were even slightly elevated above the surrounding country having fared better in 1917 (with 5° difference in temperature) than groves in the flatlands. The Florida sugar industry with its sudden rise is on the southern shore of the large Lake Okeechobee.

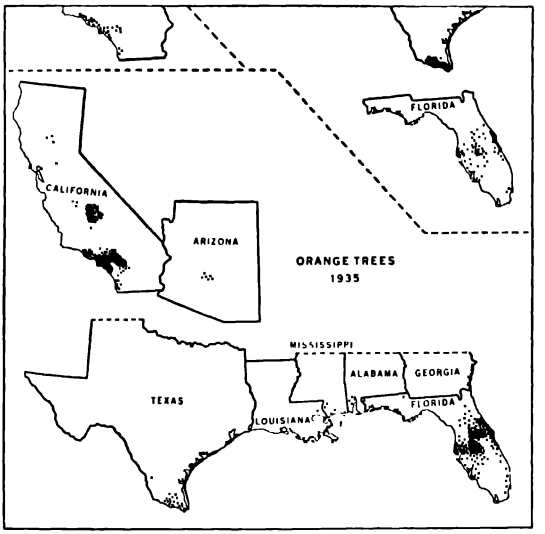


FIG. A. At the upper left in this map the California section shows the lemon trees, 1930. The Florida and Texas sections at the upper right show the grapefruit trees of 1935. A million grapefruit trees of Arizona, 1935, are not mapped. Each dot represents 100,000 trees. In 1935 there was a total of 39,000,000 orange trees, 13,000,000 grapefruit trees, and more than 3,000,000 lemon trees. The production of citrus fruits in these small areas now equals the total American apple crop. (Courtesy U.S. Dept Agr.)

While oranges are grown to some extent in every county in Florida, the heart of the citrus belt at present is the central lake region, the so-called Backbone of Florida, famous for its timbered hills and innumerable clear lakes. There are extensive plantings of young orchards here because of the good air and water drainage and the sandy soil underlaid with a clay subsoil at a depth of about 6 feet. There is also still plenty of unused land.

Florida has another orange-growing district, along the Indian River on the east coast, and also one on the west coast. Each claims the best oranges, and

[17] The extent of the catastrophe is best realized by a glance at the production figures: The Florida citrus crop in 1893–94 was 5,055,000 boxes; in 1894–95, 2,808,000 boxes; in 1895–96, only 147,000 boxes; and in 1896–97, 218,000 boxes.

the three districts have never been able to co-operate in marketing, as have the growers in the different parts of California.

Florida maintained almost a monopoly in the production of the pomelo, better known as the grapefruit, until the Lower Rio Grande Valley of Texas began to compete. Although the grapefruit has been known and grown for a long time, it attained popularity only within the last twenty-five years — a striking example of the possibilities of developing the public taste for many other now unknown fruits. The tangerine and other kid-glove varieties are also grown all through the citrus belt. Lemons and limes do not meet with as much favor in Florida, being delicate and easily frosted. The lemon can be commercially grown only in the warmest sections of the peninsula, as the trees are subject to great injury when the temperature falls below 28° F.

One cannot take a trip through the citrus area, with its young groves springing up on every side, without wondering who will buy all this fruit and what the price will be. Glutted markets or a marketing clash with California and Texas — since Texas is extending citrus plantings — seems an inevitable result within a few years unless the demand for citrus products is miraculously increased.

TRUCK AND VEGETABLES

As the boll weevil changed the planters of the Cotton Belt from one-crop farming to diversified agriculture, so the freeze of 1894 urged Florida toward a widespread trucking industry in place of the single crop, oranges. Much of the soil of central and southern Florida is a fine sandy loam, an excellent garden soil like that of the North Atlantic Coastal Plain. Express-train and motor-truck service to the Northern cities gave a winter market to the Florida truck-grower, and now the motor truck is widening the market by giving direct service to smaller places. Green beans, lettuce, tomatoes, and other vegetables are now seen in an ever increasing number of markets every week in the year. The vegetable business has become so important to the coast-line railroads that it has been said, partly in jest but actually in fact, that a trainload of millionaires en route to Palm Beach will be run off onto a siding to wait for a trainload of cabbages to pass.

Although the trucking industry is general throughout the peninsula, the process of centralization has worked its normal result (see Chapter 7, "The North Atlantic Coastal Plain"). Sanford, near the east-central interior of the state in Seminole County, is by actual records the greatest celery-producing and celery-shipping point in the world. The Seminole "Celery Delta" comprises some 30,000 acres lying in a rough triangle between Lakes Monroe and Jessup and the connecting St. Johns River. Part of the soil is a sandy loam underlaid with clay at a depth of from 18 inches to 2½ feet, while the rest is muck, black as any prairie of Illinois or Texas. The celery fields have all been carefully tile-drained, irrigated by means of flowing artesian wells, made productive by heavy applications of commercial fertilizer, and given a very intensive cultivation. Although only one-tenth of the delta is in use, Sanford shipped 4562 cars during the season of 1937–38, as follows: celery, 4414 cars; lettuce, 94 cars; cabbage, 42 cars; miscellaneous vegetables, 12



FIG. A. A Florida spinach field with a background of forest hung with the Spanish moss that grows over a wide area of the humid Southland and produces such a peculiar effect upon the mind of those who see it for the first time. (Courtesy Jacksonville Chamber of Commerce)

cars.[18] Although Seminole County produces nearly all Florida's celery crop, there is nothing to indicate that its soil or its climate has any celery superiority to dozens of other localities in the state or elsewhere.

Just as a reference to Sanford means celery, the name of Hastings, near the mouth of the St. Johns River in northern Florida, means Irish potatoes. Potatoes often bring from 10 to 15 cents per pound in Northern stores during the latter part of March. Three-fourths of the Hastings crop is dug and shipped before the end of May, which is the usual planting month for the great potato-producing sections of the North.

Plant City near Tampa is a strawberry center. It shipped 1009 carloads of strawberries to the North between December, 1936, and May, 1937, and 815 carloads the next year.

While individual truck crops may be localized, as in the cases mentioned above, the truck business itself is not limited to any one section of the state. Dozens of towns are centers of districts where vegetables are grown whole-

[18] In 1937–38 Seminole County ranked first among all Florida counties in rail shipments of celery, second in lettuce, and fourth in oranges. In addition, an enormous volume of fruits and vegetables moved forward by motor truck. A considerable amount of citrus fruit also was shipped via the St. Johns River, which has an 8-foot channel to Jacksonville.

sale — islands of agriculture in a sea of pines. Many of these centers have growers' associations that sell produce, buy supplies, and run packing-houses and icing-plants. When it is remembered that it takes 5 tons of ice for the first refrigeration of each carload of perishable stuff sent out and several re-icings en route, and that Florida shipped 84,000 cars of fruit and vegetables during the season of 1929–30, some idea may be gained of the importance of ice, and therefore of fuel, in this business.

In supplying the Northern markets with vegetables the Florida grower has high transportation costs, which limit the amount that can be sold, and the markets are easily glutted. The Florida grower is shut out from the market as soon as the market gardens farther North can get into the swing of production. Southern Florida has the shipping-season first. Then it shifts to central Florida, then to Savannah, Georgia, Charleston, South Carolina, Newbern and Wilmington, North Carolina, and on to the North Atlantic Coastal Plain. The Florida grower who netted just 7 cents for a whole car of fine cabbage (March, 1922) when it was retailing at 8 cents a pound in Atlantic City was merely experiencing one of the common hazards of his business, which has been well described as one having a six-week season and a gamble at that. In a land of limitless resource something must limit an industry.

A Florida bean king with extensive acreage in the drained lands on the eastern edge of the Everglades near Miami told me, "There is no money in it unless there is a calamity — a rust or a frost to reduce the supply." He plants the same land twice a year and gets two crops in the winter-spring season, and here is Florida's great limitation — he has to put a ton of high-priced fertilizer on each acre with each planting.

While Florida has about 30,000,000 acres of land suitable for truck crops, a study of the small acreages needed to produce the vegetables used by the nation will show the futility of the belief that any large part of Florida can be used for market gardens or citrus fruit for generations or even centuries, even if our population should increase.[19]

THE TUNG-OIL INDUSTRY

The rapidly growing tung-oil industry along the Gulf Coast and in northern Florida is a splendid example of what may be accomplished in rejuvenating

[19] FRUITS AND VEGETABLES, 1934

Commodity	*Area cultivated,* U.S.	*Thousand acres,* Florida
Vegetables grown for sale	3,774	158
Peanuts, velvet beans, cowpeas	5,374	139
White potatoes	3,582	26
Sweet potatoes and yams	967	21
Corn [for grain]	62,247	685
Soybeans	5,692	5,423
Number of trees (thousands), citrus fruits	13,161	

From U.S. Bureau of the Census, *United States Census of Agriculture*, 1935, Vol. III, *General Report.*

the desolate, cutover pine-barren lands of this region when some intelligence is applied.[20] Today the tung-yu-shu of China is taking its place alongside the Satsuma, the pecan, and the loblolly pine, and is helping to create a new pattern of tree life in an area where the noble longleaf pine once reigned supreme.

The American tung-oil industry was born in a Tallahassee cemetery in November, 1906, when five tung seedlings that had been imported from China were planted there. Seven years later a bushel of tung-oil nuts was shipped to New Jersey, and 2.2 gallons of oil were extracted, the first tung oil produced on the North American continent. As a result of years of research, it was found that the tung tree could be grown successfully in the northern third of Florida, parts of southern and southeastern Georgia, and a strip of land about 100 miles wide along the Gulf Coast of Alabama, Mississippi, Louisiana, and Texas.[21] The acreage in tung trees has grown from about 140 acres around Gainesville, Florida, in 1923 to 160,000 acres in 1938 scattered from Florida to Texas.[22]

Tung oil is vastly superior to linseed oil in the manufacture of high-grade paints and varnishes, and for years this country imported its supply from China.[23] In 1932 the first two tank cars of American tung oil were shipped from Gainesville to New York. In 1938 American tung trees produced over 3,000,000 lbs. of oil, or about 1.5 per cent of the nation's total consumption. Mills for the extraction of the oil are now located at Gainesville, Florida, Cairo, Georgia, Picayune and Wiggins, Mississippi, and Bogalusa, Louisiana, and undoubtedly others will be built.

FLORIDA PHOSPHATE

Florida phosphate beds contain phosphorus preserved in fossil bones — jaws of rhinoceros and crocodile, teeth of mastodon and shark, ribs of whale, and myriads of small crustaceans whose remains give us the most important element in commercial fertilizers.[24] The deposits are scattered

[20] See M. Ogden Phillips, "Tung Oil: Florida's Infant Industry." *Economic Geography*, October, 1929, pp. 348–57.

[21] The tung tree has stringent climatic and soil requirements. While it is more hardy than the citrus tree, temperatures below 18° F. are likely to be fatal, although a few mature and thoroughly dormant trees have been known to survive at a temperature as low as 4°. On the other hand, a certain amount of cold weather each year is needed to induce complete dormancy. Optimum yields are obtained from an annual rainfall of from 40 to 50 in., with a maximum precipitation during the summer months. Tung trees will grow on a variety of soils, provided that these are not alkaline or wet; limestone within the reach of roots must be avoided. Failure of farmers to have soil tests made is one of the chief causes of trouble. What the next "big freeze" will do to them remains to be seen.

[22] At the age of three years tung trees begin to produce fruit, or nuts, as they are commonly called, and in their fourth and fifth years production becomes commercially important. An acre of 116 trees five years old will produce about 116 bushels of nuts, yielding 5.6 lbs. of oil per tree. All acreage yields of trees of any sort are suspect until proved. The innocent and beautiful tree doth so tempt man to prophetic misinformation. See J. Russell Smith, *Tree Crops*.

[23] Chinese tung oil is inferior, owing to adulteration and crude methods of extraction. In 1937 the United States imported 175,000,000 lbs., worth $20,100,000, and in 1938, 107,000,000 lbs., worth $11,900,000.

[24] In 1938 Florida produced 2,723,000 long tons of phosphate; Tennessee, 999,000, long tons; and the Western states, only 138,000 long tons. The Western deposits, located in

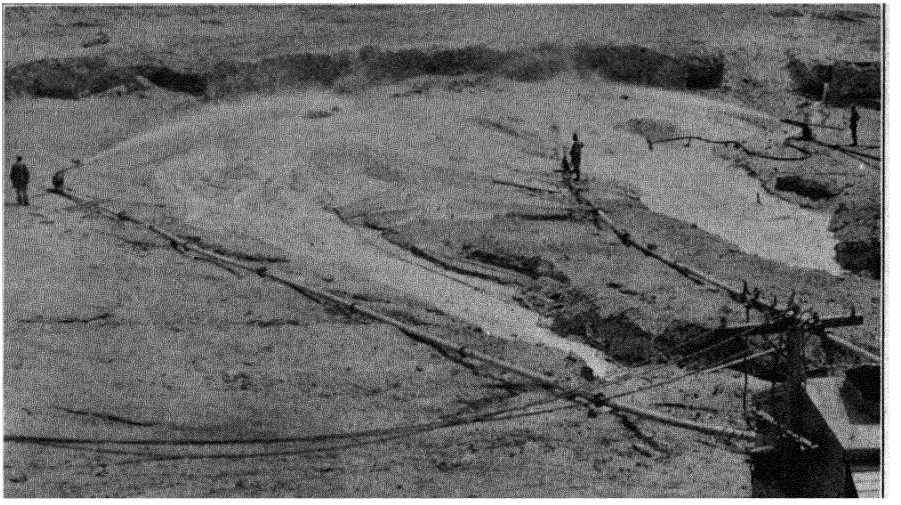


FIG. A. Placer mining in the Florida phosphate beds. The stream of water, forced by centrifugal pumps, washes away the sand and earth, leaving the phosphate pebbles. Gold is mined by this method, the water and earth being washed through troughs where the heavy gold remains in prearranged crevices in the trough while the lighter earth and stones pass on. (Courtesy Nat'l Fertilizer Ass'n, Washington, D.C.)

over 100 miles along the west side of the peninsula, where one-fourth of the world's phosphate is mined. The phosphate, usually in small pieces of hard rock scattered through much earth, is obtained by hydraulic methods. Modern machinery and the use of the flotation process permit the poorer deposits to be worked.

Florida is well located to supply the large amounts of fertilizer needed by the farmers in the Southeastern states. Without available phosphorus the Coastal Plain sands would remain in scattered pine. Fertilizer plants, which are located in many Southern seaport water fronts, mix German potash and Chilean nitrate with Florida phosphate. Florida phosphate exports are shipped through the ports of Tampa and Fernandina, chiefly to Japan and European countries.[25] Since the World War the European market has declined because of competition from North African mines.

THE FUTURE OF FLORIDA LANDS

What then is to become of these millions of acres of sand, sandy loams, and mucky swamp soils not now needed for farm or orchard? The area

Idaho, Montana, Utah, and Wyoming, contain 94% of the nation's reserves and are superior to the Florida phosphate in quality, but they are located too far from the market to be of importance at the present time.

[25] Since 1929 exports have varied between about 500,000 and 1,000,000 long tons annually; in 1938, 1,141,000 long tons were exported. Between 1907 and 1914 exports varied between 1,000,000 and 1,300,000 tons annually.

is a land reserve. First, it should be put to growing pine, all of it — immediately. The longleaf pine forest of the northern half of Florida was the only thing in Florida to exploit, and it has been exploited as ruthlessly as any other American forest. Florida passed its peak of lumber production in 1916, and is now second to Georgia in the production of naval stores. In traveling through the state one becomes increasingly impressed and depressed by the seemingly endless stretches of cutover and burned-over forest, much of it public open range for stock, which until recently were undersized victims of the devastating tick (see Fig. 339 A).[26]



FIG. A. Florida. This is the picture of most of it. Other uses have claimed spots. (Courtesy U.S. Forest Service)

It is Florida, not an island at the south of Chile (Tierra del Fuego), that is the real "Land of Fire." One may say that the state has a curse of cows, for from end to end fires are deliberately set to burn little trees and old grass so that new grass may come for the cow to eat. You may see half a dozen forest fires in a day as you travel across the state.

Florida's lands are relatively infertile; all save a very few muck soils need to be fertilized from the beginning of cultivation. This low fertility is not so great a drawback to producers' cost as at first appears. For corn and meat it differs but little, perhaps, from that of the richest lands of Illinois. Land worth $200 an acre (Illinois) has an interest charge of from $10 to $12 per acre per year. Put from $10 to $12 worth of fertilizer on cheap Florida sandy loam each year, and it can be built up quickly by stuffing it with legumes, especially the giant velvet beans.[27] It is simpler, of course, to mine the rich land than to make the infertile land productive. Therefore we use Illinois and neglect Florida, and at present we do not need both as meat-producers.

Here and there in the Florida peninsula are dairy farms and hog farms of the most modern type where animals are pastured twelve months in the year, on a variety of forage plants similar to that discussed in Chapter 13, "The Cotton Belt." These are suggestive examples, and it should be remembered that corn, the great Southern supply crop, covers far more acres than all of Florida's truck and fruits combined. The level surface and sandy soil invite intensive and continuous machine agriculture, as erosion need not be a problem in Florida and machinery can be used to the maximum.

[26] Northern tourists are sometimes quite annoyed by cattle roaming across the highways. Only a few counties have voted to require the fencing of livestock.

[27] It is more nearly true than was once believed that "the sterility of the Florida soil is compensated by the fertility of the air."

The most likely place for extensive agricultural development is in the Everglades, where there are 5000 square miles of treeless swamp. It looks like a vast wheat field, being covered with a crop of saw grass 6 or 8 feet tall. Experiments with saw grass indicate the possibility of an important paper industry. In 1937 Florida harvested 19,000 acres of sugar cane, much of it in the Everglades area. The Florida yield was 33.4 tons per acre in contrast with 20.6 tons per acre in Louisiana. Everglades cane is ground in sugar mills located at the southern end of Lake Okeechobee, and the raw sugar is shipped largely by water to Jacksonville and Savannah. A celotex plant utilizes the bagasse.

"It's all a matter of water control," said the county agent at Miami in talking about the Everglades and southern Florida agriculture. The heavy rains of summer turn large areas of flat grassland into a lake. Tom, Dick, and Harry have dug drainage ditches as they pleased, draining off too much water, with the result that grass and peat fires in the spring of 1929 destroyed large areas of Everglade *land*. There is a hope, perhaps we might call it a plan, for an Everglades National Park of over 2,000,000 acres.

The development of the Everglades will advance only as the result of extensive enterprise. Florida now leads in swampland.[28] Because of porous sand and underground channels in the soft limestone, much of Florida has no surface streams. The possibilities of new crops are indicated by the fact that mangoes, avocados, papayas, and other tropic fruits have been planted experimentally and in small commercial orchards.

Granted the continuous growth of population in the United States, the greatest question concerning the full development of Florida is probably the climate. The winter sojourner takes the best of it and flies away, leaving the permanent resident to face the long season of steady, humid heat without the bracing effect of cooler dry spells.[29] The temperature is, however, less extreme and therefore less unpleasant than that of Washington or Philadelphia.

The late R. DeC. Ward of Harvard, one of the most diligent students of hygiene and climate in America, said: "Too long a sojourn in such a climate, may, however lead to a marked toning down of the system, to loss of appetite, and to digestive and nervous difficulties." Mr. Howard Martin, of Illinois, says: "In plain English, you get lazy. I noticed it. The first two weeks I was there I ate oranges with enthusiasm. Then I got too tired to peel an orange and always bought tangerines; the skins pull off with about two motions. Then I got too lazy to handle the tangerines and ate kumquats the rest of my stay."[30]

[28] Many of Florida's swamps are due to sheer flatness, and many are due to the lime sinks. Soft limestones underlie much of the state. Limestone dissolves, and the material above caves in. This may dam up an underground watercourse and make both a lake and a swamp.

[29] According to Ellsworth Huntington, *Civilization and Climate*, man is most energetic physically in a temperature of 60° to 70° F., with frequent small changes of temperature. His temperature for mental optimum is between 40° and 50° F. For the production of ideal climate inside of community houses, see the last chapter.

[30] Kumquats, the smallest of the orange family, about the size of the last section of man's thumb, are eaten as one eats a berry.

MANUFACTURING

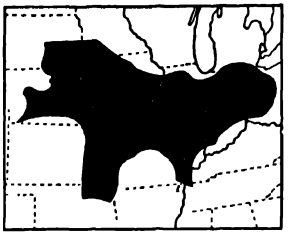
The Florida peninsula has many thriving small cities and towns. Its metropolis, Jacksonville, locally known as "Jax," had a population of 130,000 in 1930. Good railway connections and coasting steamers make it a distributing-point for the northern part of the state, and it is an ocean port of considerable importance. Jacksonville exports considerable lumber and naval stores.

Tampa (pop. 101,000), the distributing-center for the west coast, has the leading cigar-manufacturing industry of Florida. Cigar-making started at Key West (pop. 13,000) because an American duty on Havana cigars gave a decided advantage to cigars made inside this country. In 1930 Key West had 45 cigar and cigarette factories, employing chiefly Cuban and Spanish labor, but today most of them are closed. With abandonment of railroad service to the mainland, Key West was stranded, the town went bankrupt, people went on relief, and the population declined. Key West is now making a valiant effort to attract the tourist trade, and motorbusses that "go to sea" travel a new highway that has been built along the old railway right of way to the big rock that is Key West, at the end of the Florida keys.

A project which was begun, but later halted by congressional action, is the proposed Florida Canal connecting Jacksonville on the east coast with the town of Inglis on the west coast, north of Tampa. The cities of southern Florida are bitterly opposed to it, and the shipping companies say they would not use it.

There is as yet no sign of any important manufacturing in Florida aside from forest products, fertilizers, and cigars. The most probable addition is that of fruit- and vegetable-canning and sugar-refining. Much progress has been made in the successful canning of grapefruit and grapefruit juice. If the cost of commercial fertilizer could be reduced, the amount of vegetables that might be produced for canning or dehydration is beyond computation — witness the practice of a truck farmer who marketed, from the same ground, lettuce in January, tomatoes in March, potatoes in May, and then grew a huge crop of velvet beans to feed the mules and enrich the land with their nitrogenous nodules, which are about as large as the end of your thumb.

Chapter 16. THE CORN BELT



THE world is large, but nowhere on its surface is there an equal, or even a rival, to the Corn Belt of the United States, an area of 250,000 square miles.

The Corn Belt is a gift of the gods — the rain god, the sun god, the wind god, the ice god, and the gods of geology. In the middle of the North American continent the gods of geology made a wide expanse of land where the rock layers are nearly horizontal. The ice gods leveled the surface with their glaciers, making it ready for the plow, and also making it rich. The wind god accumulated dust through the ages and helped build up a soil. The rain god gives summer showers. The sun god gives summer heat. All this is nature's conspiracy to make man grow corn. Having corn, man feeds it to cattle and hogs, and thereby becomes a producer of meat, and Chicago, the economic capital of the Corn Belt, becomes the meat capital of the world.

This Corn Belt enabled the United States to export wheat through the troubled years of our Civil War, to the astonishment of Europe and the support of our foreign credit.[1] Again its products sustained the Allied armies during the World War (1914–18).

GLACIAL BENEFITS

Repeatedly the continental glacier advanced and retreated across the Corn Belt. The glacier moved across a rolling and hilly land, much like the Northern Piedmont. The pushing ice sheet, like a giant gardener, scraped off the tops of little hills and filled up the little valleys with the scrapings. Wells and excavations show the story piece by piece, and the record is now plain.

Because rain leaches the rich qualities from the earth and plants extract food from it, surface soil is sometimes poorer than subsoil where the soil has been exposed to plant roots for a long time. The glacier mixed subsoil with surface soil, thereby putting greater soil riches within reach of the farmer's crop plants. One measure of this enrichment is seen in the high lime content of the recently glaciated areas as compared to the low lime content of the unglaciated areas which have been exposed to continuous leaching by rain.[2]

[1] This shows how surely the Corn Belt is the child of steam. At the beginning of the railroad era, thirty years before the outbreak of the war of 1861–65, the Corn Belt, away from the navigable rivers and west of Indiana, was almost in a state of nature.

[2] The differing lime content of soils placed by different glacial advances serves as one means whereby we may estimate the time since glaciation. Great age makes great leaching. Therefore, little lime remains.

By some freak of surface form, no glacier overrode an area several thousand square miles in extent and situated in the southwestern corner of Wisconsin. This nonglaciated region, which includes parts of Minnesota, Iowa, and Illinois, is known as the Driftless Area. Here is an admirable opportunity to compare the land before and after glaciation. Careful studies [3] on both limestone and sandstone formations show conclusively that the glaciated land is richer and more level. Consequently, glaciated land has a larger percentage fit for the plow and gives larger yields per acre.

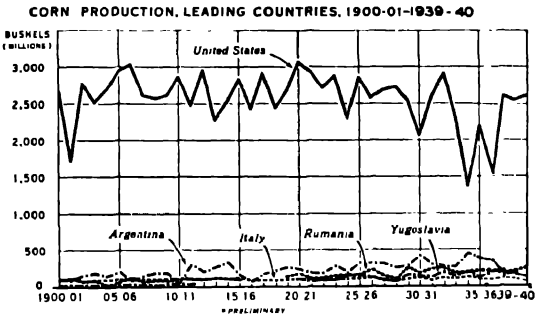


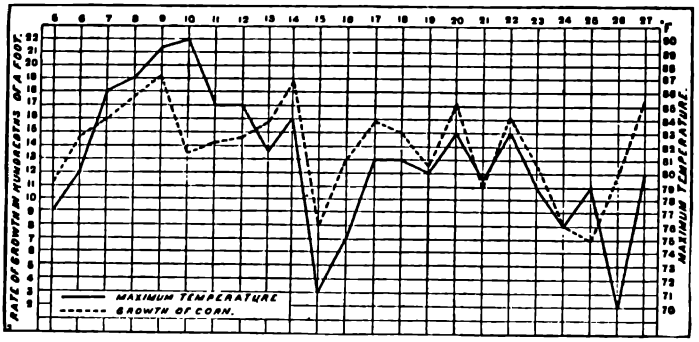
FIG. A. Although the United States is producing less than it used to, there is not a corresponding increase in other parts of the world — further proof that our Corn Belt, though declining in fertility and in soil resources, is still without a peer. (Courtesy U.S. Dept Agr.)

Geologists are fairly well agreed that the glaciers, scooping out the beds of the Great Lakes, spread earth to a depth of about 100 feet over the surface in northern Ohio, and to a depth of about 300 feet on the southern part of Wisconsin. These glaciers, because they crossed no mountains, found but few stones to spread upon the land. The local rock — sandstone, limestone, and shale — was ground to bits and would not make boulders. New Englanders, familiar with millions of glacial boulders of granite, would be amused at the labors of the students of Cornell College, at Mt. Vernon, Iowa. They went several miles into the soft earth country, and with hard work and the help of many horses managed to drag a large granite boulder to the campus, to be its crowning ornament and curiosity. The campus of the University of Nebraska at Lincoln and other Corn Belt institutions have similar glacial curiosities — of which millions of tons litter New England.

The western part of the Corn Belt was further improved by wind action — wind-blown dust settling year after year built up the typical soil called loess, one of the finest agricultural soils in the world if it can be kept from blowing away. Loess is uniform, porous, fertile, friable and highly tillable. An alfalfa root was reported 97 feet down in digging a tunnel through Kansas loess.

At the height of the glacial epoch, streams like the Wabash, the Illinois, and others carried enormous volumes of water, and developed wide valleys. These valleys are entirely too large for the present streams, are often marshy, and distinctly interfered with east-west travel in the early days. Easy crossings became townsites.

[3] R. H. Whitbeck, "Economic Aspects of the Glaciation of Wisconsin," *Annals of the Association of American Geographers*, Vol. III, 1913, pp. 62–87 — a most excellent and convincing study. Similar results were obtained by Edgar W. Owen, on the south edge of glaciation in Ohio. See "The Influence of Glaciation on Agriculture in Ohio," *Bulletin of the Scientific Laboratories of Denison University*, Granville, Ohio, 1914, Vol. XVII, pp. 390–94.



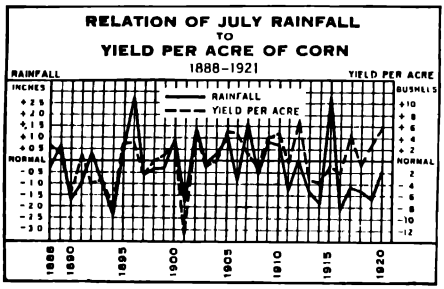


FIG. A. These graphs might be called Corn Belt boundaries. One shows how dependent corn is on moisture and the other how dependent it is on temperature. (Courtesy U.S. Weather Bureau)

SURFACE AND ARABILITY

The almost stoneless surface of the Corn Belt is either level or gently rolling over most of its area, and wonderfully fitted for the plow.[4] Save for a few steep hills near the streams, and for structures made by man, a plow could run almost without interruption from Columbus, Ohio, to the western bounds of the Corn Belt in South Dakota or Nebraska, or indeed much farther. In this level or gently rolling country, hills are so rare that the United States Government, in parceling out this empire for the homesteader, laid off the roads at right angles, one mile apart and running due east and west, and due north and south. The square mile contained between the roads was divided into four quarter-sections, each of which, therefore, faced a mile of road. This plan gives so great a total mileage of roads[5] that to maintain them in good condition is a heavy burden on the revenues.

During the glacial era Lakes Erie and Michigan were larger than they

[4] One appreciates the value of topography by considering the following facts. In southeastern Iowa, not far from the Mississippi River, a section of maturely dissected hill country was settled before 1830. The prairie was settled between 1830 and 1880. In the hill country home industries perished, and commercial agriculture could not replace them very well. A number of Iowa counties in this section lost 25% of their rural population from 1920 to 1930 by a combination of farm consolidation and farm abandonment. The farms were too small for proper grassing-down to stop erosion, and in the first six months of 1934 the relief burden was 60% more than in the rest of Iowa.

[5] Many parts of Europe have an entirely different rural organization, more favorable to sociability and transport, but less favorable to farm operation. Twenty or a hundred farm families live in a village and go out to till the lands within a radius of several miles. *Lanes* reach the fields. *Roads* connect the villages. The roads are generally good.

now are. As the waters receded, the old lake bottoms appeared as very flat lands. These old lake beds and also river bottoms, and tens of thousands of square miles of flat uplands in many parts of the Corn Belt, are so wet in rainy years that the crops spoil because wetness makes it impossible to cultivate the soil. Most of these lands have been ditched and underdrained with tile, of which there are literally hundreds of thousands of miles.[6] This is a laborious and costly process, but it means that the land is so level that erosion is very slow or even sometimes impossible, and the moisture supply for crops is good. Upon the whole, it is difficult to conceive of better or more enduring agricultural lands, unless it be some of the deep and uniform formations of volcanic ash or loess.[7] And the Corn Belt has considerable areas of loess in the western part.

CLIMATE

The climate of the Corn Belt rivals its soil in suitability for corn production. Corn needs heat and sunshine. The Corn Belt summer is hot, with

[6] "It [drainage of land] promotes aeration of the soil, allows the soil to be used by plants to greater depths, improves the texture of the soil, increases soil temperature, promotes the activity of nitrobacteria, allows for earlier seeding of the land, permits crops to begin a healthy growth at once, prevents loss of fertilizers by surface washing, makes crops better able to withstand drought, prevents loss of crops from heavy rains, lessens frost damage, and decreases diseases among farm animals." — W. LeRoy Perkins, "The Significance of Drain Tile in Indiana," *Economic Geography*, October, 1931, pp. 380–89.

[7] In many localities the land is so flat that it has been necessary to dig main ditches which are virtually canals or artificial creeks miles in length. Thus a runoff was provided for the drains from the individual farms. This necessity of the environment has produced an interesting response in the organization of a new governmental unit; namely, the drainage district, whereby the people of a given territory vote for or against a bond issue to pay for digging main canals. This method is, of course, exactly analogous to that used for school and road districts in many parts of the country.

In the disastrous flood of 1913, as much as 11 inches of rain fell on already saturated soil in central Ohio and caused over $100,000,000 worth of damage to Dayton and vicinity. This catastrophe had an even more extensive social result than the one cited above. It was found that the streams subjected to this unusual demand had become choked, partly because of the encroachments of the abutments to highways and railroad bridges. To control this matter the state created in 1915 a new piece of government, namely, the Miami Conservancy District. This is a territory having drainage or a flood problem as its basis of unity. Thus the Miami Valley became a conservancy district which runs across the boundaries of county, township, congressional district, and any or all political divisions except the state. The conservancy district is authorized to take such action as seems best to cope with the single problem of water control. Through building permits it controls the character and location of roads, bridges, and structures near the streams.

The conservancy district bought a whole village and the adjacent farms and made it a dry reservoir. Dams were built with an opening of such a size that the water flows out of it no faster than the stream can carry it away. Thus, at times of flood, the reservoir may be full of water three days or a week. At other times the dry reservoir, enriched by flood mud, is ready for maximum and continuous corn production. In 1939 about 8000 acres of the district land were leased to farmers on a share basis, and 2000 acres were devoted to tourist camps, hiking trails, picnic grounds, and shelter houses. The dams, reservoirs, and river improvements have been so effective that in recent years flood damage has averaged only $12,000 a year.

Very different was the outcome of the Pittsburgh Flood Commission survey following the disastrous flood of 1907. Deforestation was found to be increasing the height and frequency of floods at Pittsburgh. The recommended cure was reservoirs in mountain sites which were in four states, and would benefit the entire river to the Gulf. This, however, was an interstate problem requiring state co-operation or Federal action. And so it waits — an expensive process, as the terrible flood of 1936 demonstrated.

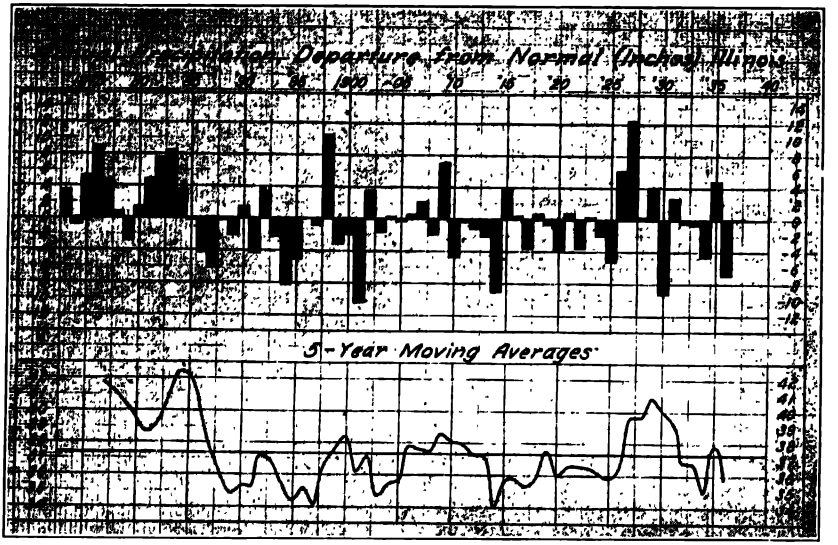


FIG. A. How much does it rain? It is rarely the same two years in succession. The eastern part of the Corn Belt is blessed, in comparison to most parts of the world, by the small amount of variation. The early 1880's saw heavy migration to the western Corn Belt. (Courtesy J. B. Kincer, *Is Our Climate Changing?* Illinois Farmers' Institute)

bright sunshine. Corn needs moisture, but the ground should not be so wet as to interfere with weekly cultivation. The moderate rain [8] of the Corn Belt usually comes in thundershowers which last but an hour or two and are promptly followed by the return of sunshine. This gives the corn the combined benefit of rain, heat, and light and lets man get back to his fields after the shortest possible interruption of labor.

The summer weather cycle consists of some bright, sunny days, increasing in heat and sultriness, which culminate in a series of showers lasting a day or two. The rain is usually followed by clearing

[8] Kansans recognize "gully-washer," "sod-soaker," "growing shower," "drizzle drazzle."

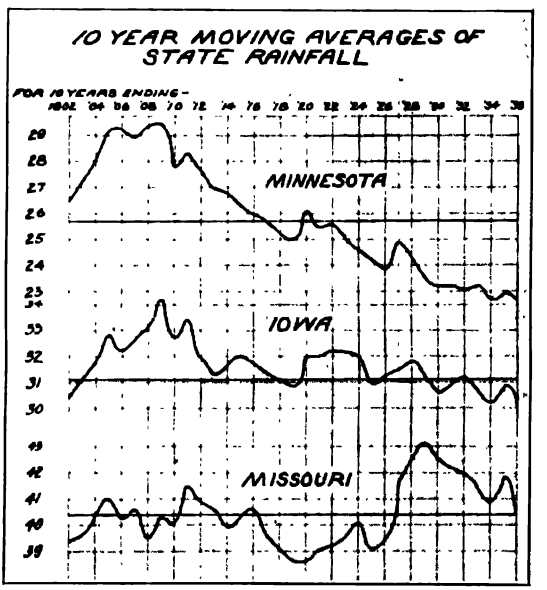


Fig B. These ten-year moving averages of the rainfall for whole states show an astonishing condition for Minnesota, and show how adjacent areas have different trends at the same time. (Courtesy J. B. Kincer, *Is Our Climate Changing?* Illinois Farmers' Institute)

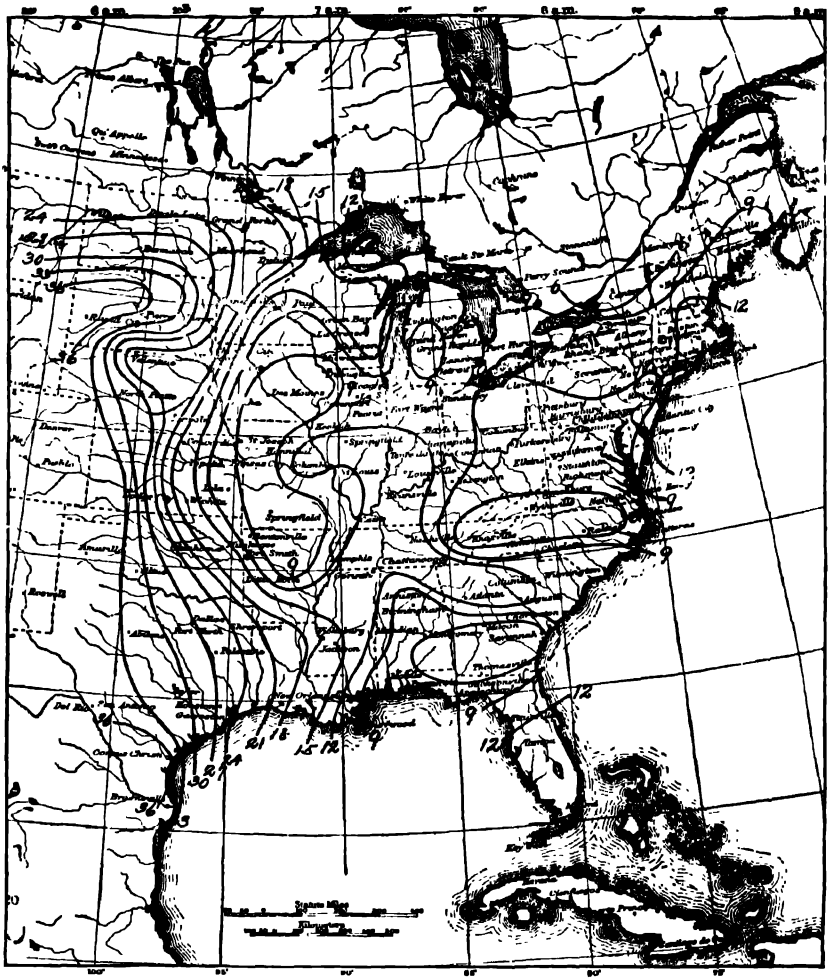


FIG. A. Another boundary of the Corn Belt. This map shows the number of times in twenty years that there was a 30-day period without a rainfall of 0.25 inch in any 24-hour period. (Courtesy U.S. Weather Bureau)

weather with northwest breezes and cooler dry air that is distinctly more bracing than the air in the Cotton Belt.

The summer is, to be sure, too warm for the comfort of man, but corn belts are not summer resorts. In the hot nights which man dislikes corn grows so fast that one can almost hear it grow. But this is a wholesome climate. It makes for a vigorous, energetic type of man, one able to produce great quantities of crops in the summer season, even though the longer period of sunshine sometimes produces greater heat than that of many tropic places.

The rainfall declines from east to west (Fig. 290 A), and the winter is cold, with little precipitation, mostly in the form of snow. The dry cold winter is

rough on insect pests, and it certainly lays fungi low for a season. It locks the soil tight with freezing and protects the fertility from the leaching which is so damaging to lands farther south. The western boundary of the Corn Belt is at the place where the rainfall is so slight that corn is no longer the main crop dependence. The northern boundary is set by the line of shorter growing-season, which again limits corn from being the main crop dependence.[9]

NATURAL VEGETATION

When the white man found the Corn Belt, its eastern part (in Ohio and Indiana) was a magnificent forest of oak, hickory, maple, ash, elm, and other hardwoods. Most of the part east of central Illinois was forested (Fig. 41 A). Here and there in the eastern forested part were open, grassy glades, where buffalo, deer, and elk fattened. The western part was as completely treeless as the eastern part was completely forested. The lessened rain of the west probably made it possible for the grass fire to kill out the tree growth and have wide stretches of grass where now tall shade trees or forests grow if given a chance.[10] Only along the streams of Kansas, Nebraska, and Iowa was there forest. Illinois was transition ground, with forest along the streams and with large stretches of open prairie between.[11] There were even large tracts of open prairie in northern Indiana and southern Michigan.

These prairies were at once ready for the farmer, and they were richer than

[9] Dr. O. E. Baker explains the boundary of the Corn Belt on his well-known map of North America as follows ("Agricultural Regions of North America, Part IV — The Corn Belt," *Economic Geography*, 1925, p. 449): "The western and northern boundaries are climatic, whereas the eastern and southern boundaries are owing to topography and soil. In general, the boundaries have been drawn where the production of corn falls below 3,000 bushels per square mile, but along the western margin, where agricultural development is incomplete, possibilities of production have been taken into account, and the boundary has been drawn where the production of corn is much less. This western boundary follows, with only slight deviations, the line of 20 inches annual rainfall, the density of corn production diminishing rapidly beyond this line. The northern boundary follows more or less closely the line of 70 degrees mean summer temperature east of the Missouri and 69 degrees west of that river. To the north of this boundary hay and forage become more important than corn, and dairying replaces the production of beef cattle and hogs as the principal livestock enterprise. The eastern boundary follows the line where the more or less level limestone lands of western Ohio give place to the hilly shale and sandstone lands of the eastern portion of that state. On these hilly and less fertile lands hay and pasture, used mostly for cattle and sheep, replace corn and hogs as the dominant system of farming. The southern boundary across Ohio, Indiana, and Illinois corresponds almost exactly with the southern limit of the Wisconsin glaciation; and across Missouri follows in a general way the northern limit of the hilly Ozark plateau. The unglaciated lands of southern Indiana and Illinois and the Ozark mountain lands are much less productive, particularly of corn, than the smoother, younger, richer lands to the north. In western central Missouri and eastern Kansas the boundary is less definite and migrates back and forth with the relative price of wheat and corn. Across northern Kansas the southern boundary of the Corn Belt is very stable, and appears to be determined largely by the hot winds of July and August, which frequently dry out the corn plants and frequently reduce the yield."

[10] It was the Indians' custom to burn last season's dead areas so that buffalo and other game could eat the tender young grass.

[11] A prairie is an extensive tract of land, level to gently rolling, without a timber cover, and having grassy vegetation — a sod. It may or may not be dotted with trees. The reason why some of these eastern areas were prairie in the midst of forest is still a question for rather warm dispute among ecologists.

the forest soils. The forest areas had only about 25 per cent as much organic matter as the grass-covered prairie. At least two factors seem to contribute to this difference. Trees have large roots, but the great number of roots of grasses may give nearly or quite as great a mass of roots. The tree lives longer than most grass plants. Therefore many crops of grass roots may be produced while one crop of tree roots is forming.

It may also be true that the large hole left by a decaying tree root lets in air to hasten the processes of decomposition of vegetable matter, while the tiny grass root does not give such aid to aeration.

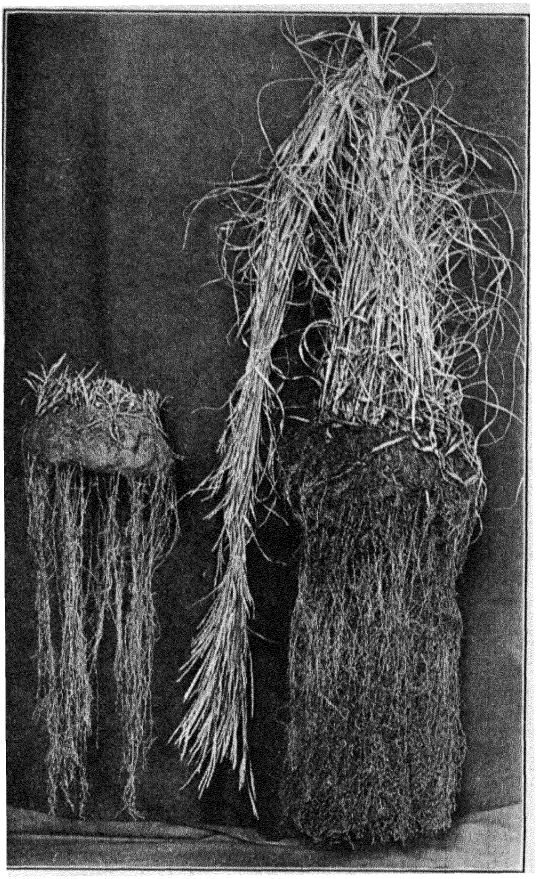


FIG. A. Why are the treeless Corn Belt soils black? Why are they rich? Why did they remain intact until the plow came, and why do they begin to wash away and blow away and creep away when plowed? The whole story is told by this picture. It shows the huge difference between a one-year growth and a two-year growth of a plant of big bluestem grass from eastern Nebraska. The roots are 2 feet long. Great is our gratitude to Professor J. E. Weaver of the University of Nebraska for this most illuminating picture.

SETTLEMENT AND PEOPLE

Three streams of colonists flowed into this Eden. The Yankees from New England and New York came by way of the Erie Canal into northern Ohio. Some continued westward through Indiana, Illinois, and Iowa to Nebraska and down through northern Missouri to Kansas.[12] Another Yankee stream came by the way of the Great Valley and Pittsburgh.

The Southern stream of colonists, having passed through the Cumberland Gap into Kentucky, went down the Ohio River. Groups of the people would

[12] ". . . the State was invaded by immigrants from New England or sons and daughters of New Englanders, who came to Kansas to make this a Free State. A fair fight in an open field ensued; the abolitionists crowded out the proslavery people, outvoted them, and captured Kansas. The first Kansans, therefore, were crusaders, intellectual and social pioneers, covenanters of various sorts; which, if you like to live comfortably upon your soft yesterdays, means that Kansas was full of cranks. . . . Abolitionism was more than a conviction . . . temperamental habit." — William Allen White, "Kansas: A Puritan Survival," in *These United States*, ed. by Ernest Gruening, Ser. 1, p. 2.

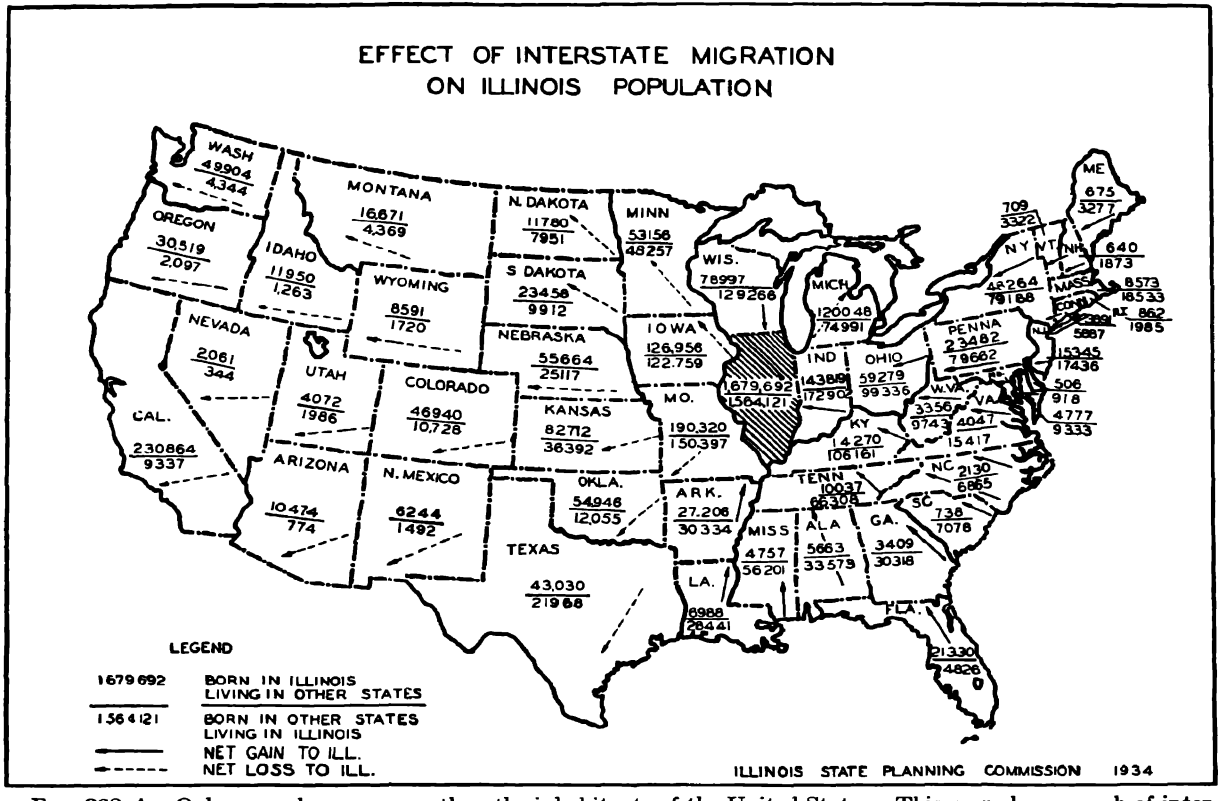


FIG. 368 A. Only nomads roam more than the inhabitants of the United States. This map shows much of interest. In addition to Chicago's growth, Illinois, especially rural Illinois, has had human pressure relieved by the departure of 115,000 persons to find homes in other states. The lower figure in each state shows the number who went to Illinois; the upper figure, those who came from Illinois. How could Illinois have managed to get along without California as a place to settle? And what now? Illinois is merely a type. (Courtesy Illinois State Planning Comm'n)

find a place where they wanted to live, and there they would stay and settle together in a community. Other groups went on down the Ohio and even up the Mississippi and the Missouri, carrying with them from Virginia, Carolina, and Tennessee their ideas and their politics.

The prairie land offered no wood. The Easterner, accustomed to forest land, thought there was something wrong with land that did not grow trees. The first settlers, therefore, took land along streams where there were trees, and with painful labor and with ax and fire cut clearings for their farms and fought stumps and roots as their fathers and grandfathers had done on the Atlantic Coast, in the Piedmont, and in Appalachia. Sometimes these clearings were right beside the open prairie.

The tough sod of the prairie was a substantial discouragement to the poor plow of that day, and the prairie was settled only when good timberlands along streams were no longer available. Professor H. H. Barrows tells the story of a man in southern Illinois who lost an election because his neighbors knew that anybody who was fool enough to go into the prairie and settle, as he had done, was lacking in the good judgment required of persons in office. The first arrivals, being from the South, got the woods and voted Democratic. Those who came later, being from the North, got the prairie and voted Whig or Republican — a line of difference that was visible for decades.

The third and recent element in the population is European. Those whose occupation is farming are chiefly German, Scandinavian, and British. The more recent immigration from southern and eastern Europe came after the land was taken. These people live in the cities and are but a small proportion of the population.

THE CORN BELT FARM

This Corn Belt, with its great uniformity of climate, surface, and soil, has a corresponding uniformity in the type of farm. From a car window in western Ohio you will see about the same things that you will see in Indiana, and again in Illinois, Missouri, Iowa, South Dakota, Nebraska, and Kansas — a seemingly endless expanse of black or dark-brown flat or gently rolling land upon which is a seemingly endless succession of farms with rich crops of corn, oats, hay, or wheat, and herds of big, cubical cattle or fat, cylindrical hogs. The homes, some good and some not so good, and the big barns are usually sheltered behind a windbreak of trees and surrounded by yard, garden, orchard, and perhaps feed lots, the whole comprising from 2 to 4 acres. There is commonly a hog pasture of from 1 to 10 acres; a cattle and horse pasture of 10 to 30 acres; a hayfield of uncertain size; the rest of the farm is given over to growing grain. More than half of the grain acreage is in corn, and the rest in small grains — oats, wheat, barley, sometimes even rye.

This is not a land to thrill one who loves hills, wild landscape, mountain panorama, waterfalls, babbling brooks, and nature undisturbed. In this flat land of food crops and murky streams, rich with silt and the odor of pigs, man must find thrills in other things, perhaps in travel, print, radio, or movie.

Even if the soils would permit such a miracle, the Corn Belt farmer cannot grow one crop only and keep himself, his teams, machines, and hired man (if

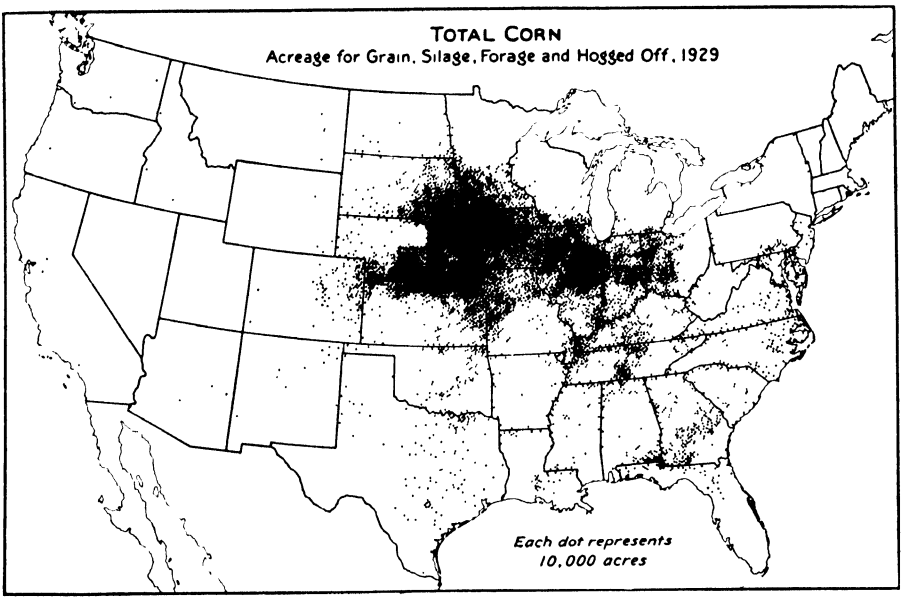


FIG. 370 A. This map shows very clearly that some situations suit corn better than others — for example, the sand hills of north-central Nebraska, the rolling land of northern Missouri, of southeastern Ohio, of southern Indiana and southern Illinois. (Courtesy U.S. Dept Agr.)

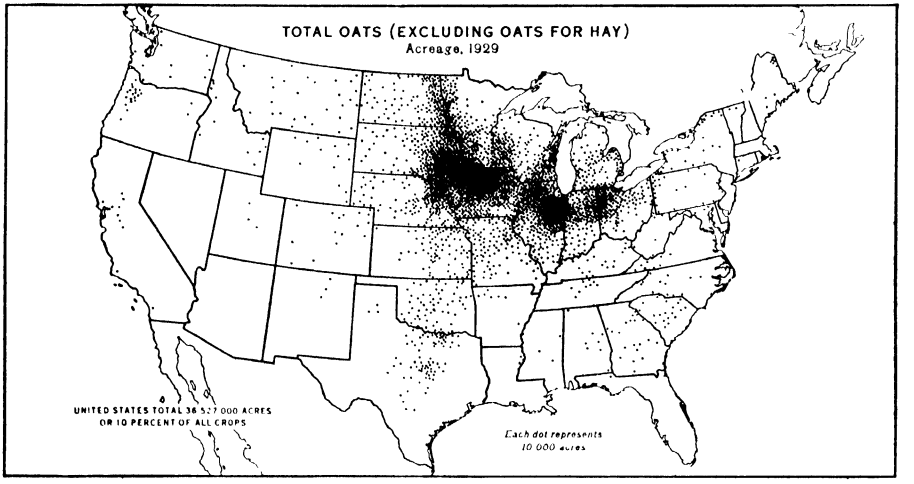


FIG. 370 B. Look at this map and at the same time look at Corn, Fig. 370 A, Winter Wheat, Fig. 417 A, and Sorghum, Fig. 417 B. (Courtesy U.S. Dept Agr.)

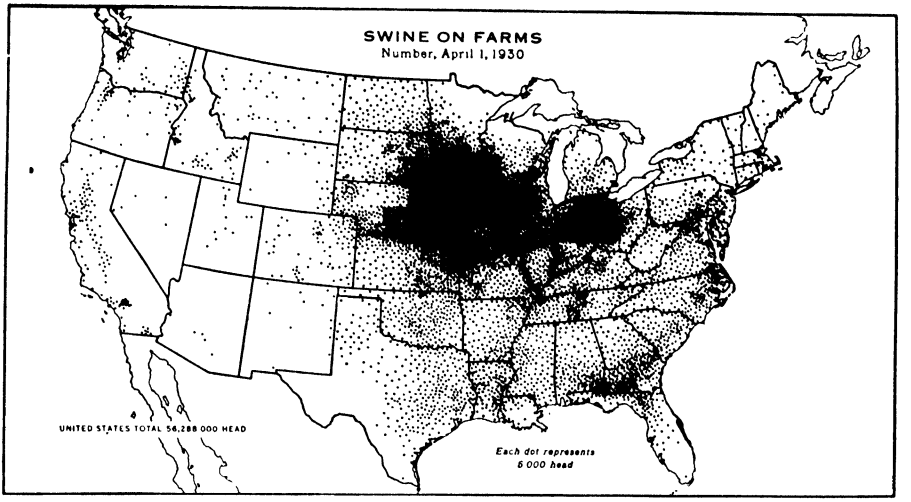


FIG. A. Compare this closely with Corn, Fig. 370 A. (Courtesy U.S. Dept Agr.)

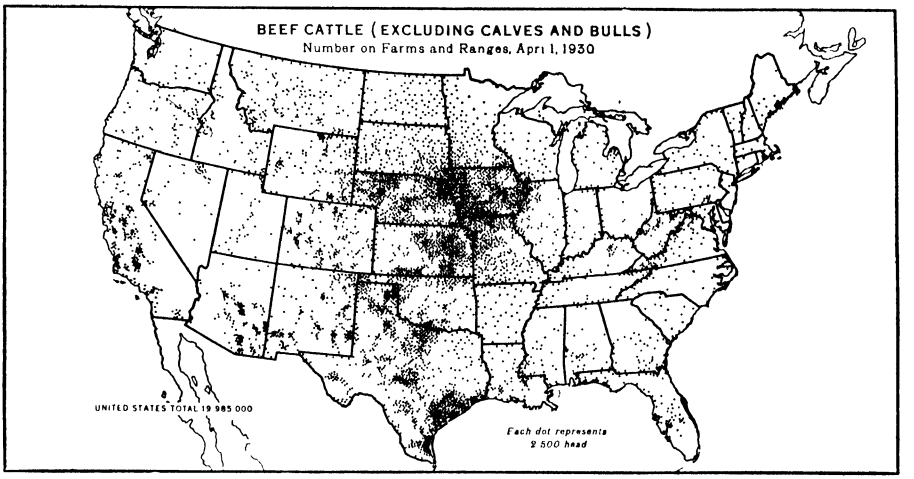


FIG. B. This map reflects the fact that whereas cattle may be fattened on corn, they spend a part of their life eating grass. (Courtesy U.S. Dept Agr.)

there is one), constantly employed. Therefore he has a crop series which divides his time to good advantage. Nearly all Corn Belt farms grow wheat or oats. Wheat is planted in the autumn either before or after the corn harvest. If his small grain is oats, it can be planted while frost is still in the ground, and before corn can be planted. Afterward come corn-planting, corn cultivation, wheat harvest, hay harvest, and oat harvest. Then comes August, when the weeds are cut, the fences are mended, and other repair work is done. Now is the time for a little rest and vacation, for soon will

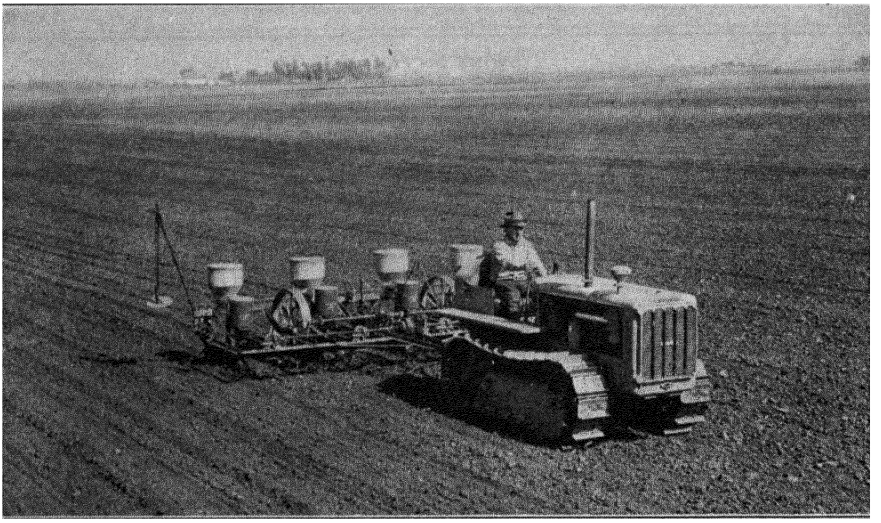


FIG. 372 A. The Corn Belt mechanizes agriculture. Planting four rows of corn on the level glacial plains of north-central Indiana. Typical flat landscape with windbreaks around farmsteads. (Courtesy Caterpillar Tractor Co.)



FIG. 372 B. Cultivating corn with the new iron horse. (Courtesy International Harvester Co.)

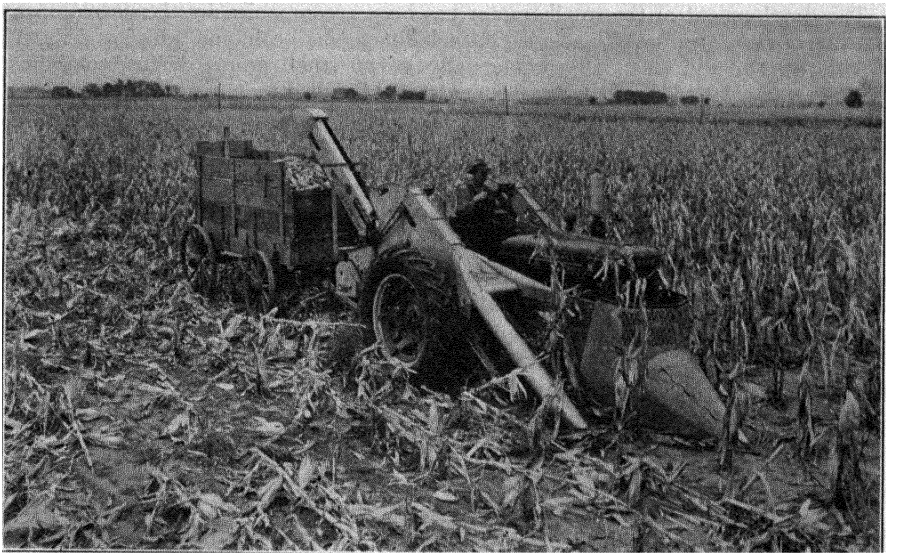


FIG. A. For decades it was standard for two horses to pull the wagon, with a man to walk behind it and husk the corn by hand. Note the waste of fodder, and the level ground required for this machine. (Courtesy International Harvester Co.)

come autumn and corn harvest. The winter is a dull season of idleness except for feeding the stock and tinkering with the machinery. If the children are grown and times are good, the farmer may leave his animals in the care of a neighbor and spend the winter in Florida or California. By thousands he has gone there to stay when he retired.

As in the American factory, technological improvement is sweeping the Corn Belt faster than ever. Cornhusking machines are widely used. A new type of tractor, which can be used for plowing and fitting the land and also for cultivating corn, spread across the Corn Belt in the late 1930's almost like a prairie fire. An expert in farm machinery at the Iowa College of Agriculture says that with this machine one man can now produce 120 acres of corn in a season. This means, of course, that the 160-acre farm is an inefficient unit (and is now so regarded in the western part of the Corn Belt) unless several men can harness their individuality sufficiently to use one set of machinery. Perhaps recent improvements in the "baby tractor" may give the smaller-sized one-man farm a chance to come back — but it is not likely on the basis of cash grain crops.

In 1940 Allis-Chalmers, a manufacturer of tractors, said:

One of the most significant developments in the farm equipment industry in the last two years has been the introduction of the small tractor, designed to take the place of two to four horses or mules, which have for years been the principal power employed on small acreage farms. These new tractors cost less than the purchase price of four good work animals, and also cost less to operate. As a result, this new type of tractor has appealed strongly to small farmers, and thousands are now to be found in daily operation on farms in every section of the country.

The development of the small tractor has been accompanied by the development of a line of new farm tools to go with it, including a small combine, which is designed to cut, thresh, and clean all commercially grown small grains, beans, sorghums, legumes, and grass seeds. It is small enough to be handled by one of these small tractors, and its cost is very little more than the cost of a binder. It enables the small farmer to compete on an equal footing with the large farmers who have for many years farmed with power machinery.

In 1939 a professor of agronomy, Iowa College of Agriculture, said that with the new type of tractor to cultivate it one man could produce 120 acres of corn. What is the proper size now for a one-family farm on good arable land?

Unfortunately co-operation is not one of the strong points of the American type, and we may therefore expect to see the size of the Corn Belt farm increase. The average size of Iowa farms in 1900 was 151.2 acres, and in 1930, 158.3.

Corn Belt agriculture is not the hoe or garden type of agriculture, not saddle supervision of a bunch of cowboys raising cattle, or a bunch of Negroes raising cotton. Neither is it the foreman-bossing-a-gang-of-dagoes-weeding-onions type. It is the old, independent kingdom-of-my-own type. The farmer is nearly independent of outside labor, but his farm is transformed by machinery. The farmer and his sons, with perhaps one hired man, do all the work, except at harvesttime, when additional help is secured. The hired man is often a neighbor's son and the social equal of his employer. Few parts of the world, and no equally large part of the United States, can match the Corn Belt for social equality of the people. Unfortunately this is now on the decline.

Less than 2 per cent of the Corn Belt corn is put up in the poetic corn shock. To cut the stalks and assemble them into shocks is too much work for broad acres and few men. Instead, the cornstalks stand in the field until the ears are thoroughly dried and cured. Then in the autumn, and sometimes even in winter, unless the farmer uses one of the new husking machines, he drives a two-horse wagon to the cornfield. The horses are trained to walk astride a row of corn. Meanwhile the man walks beside the wagon husking two rows as he walks and throwing the ears into the wagon bed. Back and forth across the field they go. When the wagon is loaded, the corn is hauled to the corncrib. Cattle are now turned in to pick the leavings of the fodder. This is wasteful in that man fails to obtain the maximum yield per acre: nevertheless, it permits one man to cultivate the maximum number of acres and get the maximum output per man.

In the southwestern part of the Corn Belt, in Oklahoma and Kansas, the drier and hotter summer weather injures corn more often than it injures the sorghums. Varieties of sorghum commonly called kaffir corn, of dry African origin, have largely replaced corn. Indeed the maps (Figs. 417 B, 370 A) show that we have a sorghum belt as distinctive in *area* as the Corn Belt, but we should at once note that sorghums are like corn in the culture that they require and in the service that they render in farm economy.

So intimate is the dependence of corn upon rain, July rain indeed, that the difference of an inch of Corn Belt rainfall in that one month made a difference

of 500,000,000 bushels in the crop on the acreage grown before 1914.[13] The Hopi Indian, a corngrower in a dry land, is quite right in his elaborate attempts to propitiate the rain god.[14]

The Corn Belt farmer's small-grain crop varies according to location, soil, and circumstance. Wheat is the chief small grain in the southern part and especially in the southwestern part, where droughts become a menace. In the northern and northwestern part the maps show that oats take the preference. The crop is spring-sown and therefore misses the rigors of the colder winter, which sometimes kills out the winter wheat, the kind that must be planted in most of the Corn Belt.

ALFALFA

West of the Missouri River the Corn Belt farmer grows much alfalfa, because of a nice adjustment to the soil and climate of this area of this most valuable hay plant. Alfalfa does best on a deep neutral, or slightly alkaline soil. Soils such as those of western Kansas are limy because of lack of leaching, but they do not have enough water for alfalfa without irrigation. Eastern Kansas and eastern Nebraska are arid enough to be limy, and wet enough to suit alfalfa, and they have much loess soil well suited to deep-rooted plants. Here is the greatest alfalfa section of the United States. Corn with its carbohydrate, and alfalfa with its protein, make a splendid cattle-fattening ration.

THE MEAT INDUSTRY

What does the Corn Belt farmer do with his crops? He sells the wheat for human breadstuff. Most of the oats and corn are fed to stock in the states where they are grown. Selling grains is generally conceded to be a bad agricultural policy, because of the large loss in soil fertility. The high cost of freight to market has much to do with deciding who can or who cannot sell grain. The grain-shipping practice is therefore greater in central Illinois, because this locality is near the city markets and the freight rate is low. Also, it is the most level and richest part of the whole region. In 1937 it took 20.04 bushels of corn (1122 lbs.) to pay for 100 lbs. of hogs.[15]

This shows that the freight problem is less if the produce of the farm is

[13] J. Warren Smith, "The Effect of Weather upon the Yield of Corn," *Monthly Weather Review*, February, 1914, pp. 78–87 — one of many remarkable studies by the same author.

[14] Experiments at the University of Illinois showed these results in June, July, and August:

CORN YIELDS

No. years	*Amount of rain in inches*	*Corn yield on plots*
8	less than 7	23.5
9	7–10	32.0
11	more than 10	40.0

Since sorghum endures drought better than corn, this table shows why it is important in the Winter Wheat Region.

[15] In 1937–38: Hogs, average price Chicago per 100 lbs., $8.40; corn, average farm price per bu. in Illinois, 47 cents. (U.S. Dept of Agr., *Agricultural Statistics*, 1939, pp. 46, 328)

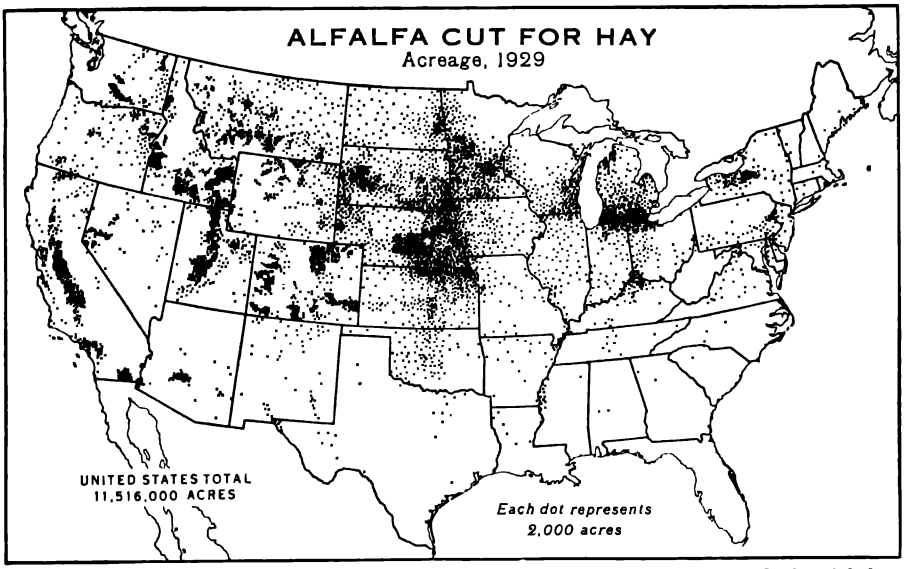


FIG. A. Why this peculiar distribution? Alfalfa must have limy soils. Soils with low rainfall are usually limy, and so are many of the glacial soils of Michigan and New York. The farmer may also put lime on the field, but that is much more trouble than finding it there already. (Courtesy U.S. Dept Agr.)

condensed into meat. So the Corn Belt farmer usually takes his choice between fattening cattle, producing milk, growing hogs, or, less frequently, growing horses and mules. If the price of grain goes up, he may be losing money to feed animals, so he stops as soon as he can and sells some corn. At other times the price ratio may send him hunting around among his neighbors for additional corn which he may buy to fatten more animals for the meat market.[16] The influence of distance in this process gives the largest number of animals per farm to the most distant parts of the Corn Belt; on April 1, 1930, there were 22 hogs per farm in Illinois, 47 in Iowa, 36 in Nebraska, and 32 in South Dakota.

The hog industry has been greatly benefited in recent years by the discovery of serums which, by a process akin to vaccination, permit the farmer greatly to reduce loss of animals by hog cholera. This disease is highly contagious, and was for many decades the bane of the hog-grower, causing nine-tenths of all fatalities among hogs. Indeed, the grower rather expected his herd to be wiped out every third or fourth year. With the increased use of anti-hog-cholera serum, the number of cholera outbreaks in the United States has been reduced to about 3000 annually.

Fattening cattle is more speculative than growing pigs. It costs $40 to

[16] A change from 2 cents to 4 cents per bu. for corn, granted static hog prices, may decide whether a man wishes to ship or to feed his corn. The great fecundity of swine permits their numbers to rise and fall quickly in response to demand. The sow will give birth to two litters a year of from four to ten each, and pigs are commonly marketed at the age of six months.

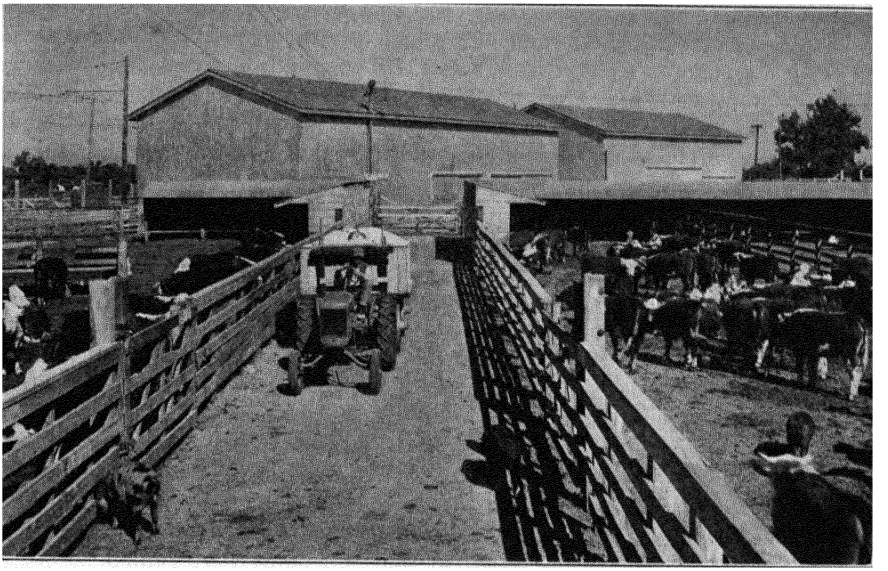


FIG. A. Height of impertinence! The wagonload of grain is brought to the Corn Belt feed lot by an iron beast of burden. (Courtesy Allis-Chalmers)

produce a calf in the Corn Belt. Therefore most of the young cattle are produced on the ranges in the arid country to the west and southwest and pastured there until they are ready to be fattened. Tall and lanky — called "feeders" — they are then sent to Kansas City, Omaha, Minneapolis, Sioux City, or Chicago for distribution over the Corn Belt farms for what the farmers call the "cornerib cross" — fattening for a few months before going to the slaughterhouse. Sometimes the cattle market is such that the farmer buys stockers low and increases their weight and sells them at a distinct advance per pound. This is profitable. But it frequently runs the other way, making loss. This speculative element in buying and selling does not occur so much with hogs, because they are nearly always born on the farm where they are fattened, and if bought, the proportion of final weight that is bought is usually lower than in cattle.

Hogs make more pounds of meat per 100 lbs. of feed [17] and are therefore increasing in popularity in Corn Belt agriculture.[18]

LAND VALUES AND MIGRATION

The jump in land values during the period 1900–21 was the most dynamic thing that has happened to the Corn Belt in this century. This phenomenon,

[17] About 6 lbs. of grain and 6 lbs. of hay produce 1 lb. of lamb live weight; 10 lbs. of corn and 10 lbs. of hay, 1 lb. of beef, and 5.6 lbs. of corn, 1 lb. of pork.

[18] So excellent is the Corn Belt for meat production that over 4,000,000 geese are produced, not in the swamps where the paddling is good, but chiefly in the Corn Belt where the fattening is good; the same is true of ducks except for concentrations on Long Island and near Boston.

so full of social results, occurred in the Corn Belt with almost unbelievable speed. A certain farmer bought unbroken prairie in central Iowa in 1877 for $7 an acre from a railroad company. He gradually increased his holdings at $25 an acre, $46, $70, $84, and finally in 1914 at $195 an acre. At that time fully improved farms in his neighborhood were bringing from $200 to $225 an acre. This was only one generation (thirty-seven years) from the time when the land was just raw prairie.

The first white woman born in Nebraska died in 1922. During her life whole counties of land had risen from free homesteads to a value of $200 an acre.[19] Then came the World War, trebling the prices of corn and meat. As a result the Corn Belt, after two decades of profitable land-buying, had one of the wildest orgies of farm-land speculation on record. Farmers would drive up to the courthouse and sell or buy a farm without getting out of their automobiles. Prices went to $400, even $500, an acre. The same farm often changed hands several times in the course of a few months. This increase of land values added billions to Corn Belt valuations. Then came the postwar decline in meat prices, and the farms went back to $300 or $200 an acre. Then came the terrible 1930's, and an acre of farm land went to $100 or less. Billions of supposed valuation were gone, and thousands of men who had bought by making partial payments at the high value were ruined.[20]

This shows us that life in the Corn Belt is not so simple after all. This place *was* recently a free Eden, but it *is* no Utopia. Mr. Henry Seidel Canby, once editor of the *Saturday Review of Literature*, startled me by saying that the Middle West had produced the literature of despair.[21] In explanation he pointed to the fact that this Eden was settled, particularly in Indiana, by many groups of people who entertained Utopian ideas for the revolution of the world by improved social organization. Others believed that mankind would receive enormous benefit by the practice and spread of their own particular religion, their own new kind of education, their own diet reform, etc. Two generations later their grandchildren found themselves in a world still unregenerate, and tortured by a terrible World War in which the grandsons of the Utopians had to take part.

On the other hand, perhaps the Corn Belt literature reflects the uniformity, the monotony, of life, people, and environment — same corn, same hogs, same level land, same fat barns, and the same Main Streets and Babbitts.

As another cause of despair one should add that the fathers settled in an Eden that was given away to the homesteader. This created the cultural

[19] The men who owned this land while its mounting value made them rich instinctively felt virtuous about it, as little Jack Horner felt virtuous when he found a plum that he had neither made nor earned. Are we not a nation of Jack Horners? This unearned land value enabled tens of thousands of farmers to retire, especially in California.

[20] As a measurement of this sad settlement, the *Literary Digest*, quoting the *New York Herald*, Jan. 26, 1924, cites the case of 8.5% of 69,000 farm-owning farmers who had lost their farms, while 15% more, actually insolvent, held on through leniency of creditors. Similarly, of 26,000 tenants, 14% lost their farms and 21% more held on only through leniency of creditors. In the 1930's there were cases in which Corn Belt farmers in masses (mobs?) stopped the legal processes of foreclosure. And but for Federal farm loans and the host of other props, it is hard to guess what would have happened.

[21] He cites as examples *Main Street* and *Babbitt* by Sinclair Lewis, *The Spoon River Anthology* by Edgar Lee Masters, *Miss Lulu Bett* by Zona Gale.

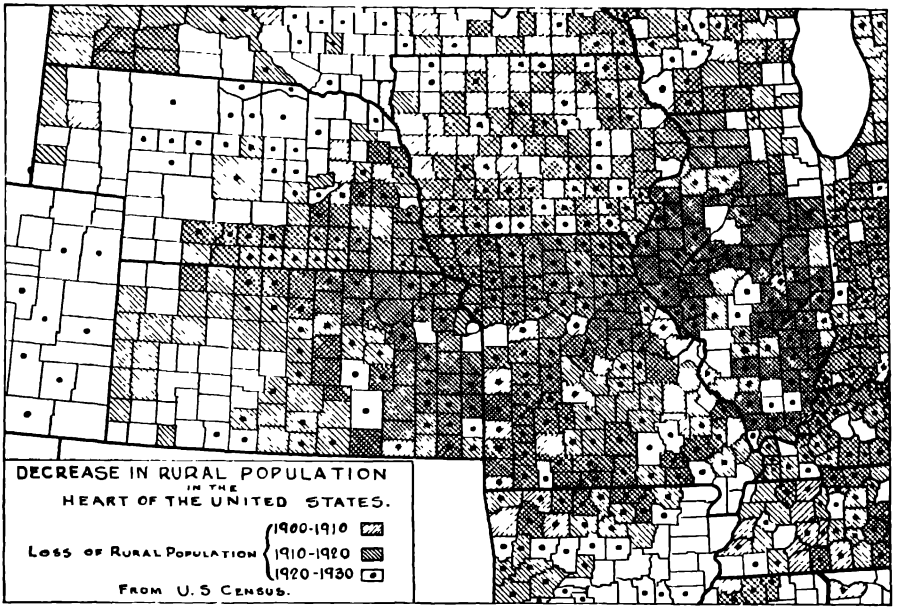


FIG. A. This map tells much: the results of farm machinery, of European tariffs, of fewer children per family, of soil exhaustion. The results of the next census will be interesting to watch. They will probably report substantial changes. (From U.S. Census 1930)

atmosphere of abundance, of limitless room — no end to hope. Suddenly there came a dash of cold water. The children found themselves in a region of high-priced land. A farm such as grandfather got free the grandson must buy for $20,000 to $40,000.[22] To equip the farm he needs $5000 more. To make interest on such a valuation the farmer may have to face the extreme of deadening drudgery by being always in attendance upon the dairy cow, the most exacting of mistresses. If he cannot pay for land and wishes to farm, he must either bear a great burden of debt, become a tenant on a farm that he rents, or migrate.[23] Thousands have migrated to the Pacific Coast, to Canada, some even to the Atlantic slope, where farm land is cheaper and the young farmer's opportunities for independence are much better. Tenancy, the sign of good land, is increasing rapidly — alarmingly.

With high schools almost everywhere, with excellent state universities whose buildings are of imperial magnificence, the splendid educational opportunities of the Corn Belt states have trained thousands of young people for whom the farms offer no opening. They must go to town or to the West

[22] Census value of farm land per acre, Iowa: 1920, $199.52; 1930, $93.68 — and that was far from the bottom.

[23] The relation of men to land in the Corn Belt is shown by the following: In 1840 we had per capita in the United States 1.44 hogs. In 1900 we had .82, in 1920, .56, in 1930, .46, and in 1937, .33. In 1861 dressed pork cost $2.50 per 100 lbs. in southeastern Iowa, corn was 15 cents per bu., wheat was 43 cents. Common labor was 75 cents per day. That seeming low wage bought 40 lbs. of pork and 5 bu. of corn. What will a day's wage at common labor buy now?

or to the East, and the West is well filled, their own region has few towns. A cursory examination of lists of Eastern educators, professional men, and businessmen shows that astonishing numbers were born west of the Alleghenies.

Like New England and the South, the Corn Belt has become a region which exports its men — a sad thing indeed for any region that is compelled to do so. Population figures, particularly the map of rural population, show in a startling manner this movement of men.[24]

MACHINES, POPULATION, AND TENANCY

The declining farm population of the Corn Belt does not, as in New England, mean abandoned farms. It means that machinery enables the farmer to cultivate more acres of land and that he therefore needs less help.[25] American agriculture has been undergoing a Mechanical Revolution, with a shift from animate to inanimate energy. In 1850 the average farmer worker had $1\frac{1}{2}$ horse power at his disposal. In 1900 he had $2\frac{1}{2}$ horse power, 2 of which were animal power and $\frac{1}{2}$ was mechanical power. In 1930 the American farm worker had $5\frac{1}{2}$ horse power at his disposal, but only $1\frac{1}{2}$ came from live horses, the other 4 being produced by machines. It is obvious why fewer men are producing more and more, with ensuing problems of crop surpluses and less employment of human beings on the farm. The Mechanical Revolu-

[24] FARM POPULATION *
(thousands)

	1920	1930	1940 (preliminary figures)	*Ratio of farm population to total population*		
				1920	1930	1940
				(Per cent)		
Ohio	1139	1013	1084	19.8	15.2	15.7
Indiana	907	813	818	31.0	25.1	23.9
Illinois	1098	999	977	16.9	13.1	12.4
Missouri	1211	1114	1127	35.6	30.7	29.8
Iowa	985	978	931	41.0	39.6	36.7
Nebraska	584	586	499	45.1	42.5	37.9
	5924	5503	5436			

**Note:* Farm population includes all persons living on farms, regardless of occupation.
Source: U.S. Dept of Commerce, *Statistical Abstract of the United States*, 1938, pp. 8 and 607, and 1940 census.

The early 1930's sent many recent migrants back to a rural roof under which they had a claim. The normal migrants of the period could not get jobs, but mechanization went on just the same.

[25] The Research Department of the National Association of Farm Implement Manufacturers announced in 1924 that American farmers had saved 1,382,000,000 days' work in a year on leading crops by using modern machinery. That amounts to 50 days' work for 27,000,000 men who would probably have been needed to grow the crop. This helps to explain why the nation is so rich and why it can feed itself with so few workers on the farms and can therefore keep millions unemployed.

tion continues. It makes (1) hard times for the worker displaced; (2) possible *long-run* good effects for society as a whole. *But we live in the short run.*

The influence of machinery on the decline in farm population is proved in an interesting way by comparing the hilly and less valuable sections of southern Indiana and Illinois below the Corn Belt with the level, productive, and more valuable machine-using lands of the Corn Belt. The decline was less in the hilly, non-machine-using section, because there men had to do the work.

The tractor, the most revolutionary farm invention since the reaper, enables the farmer to seize a spell of good weather, plow with great speed night and day, and greatly enlarge the acreage that he can plant.[26] Everywhere except in market-garden localities, farms throughout the Corn Belt are getting steadily larger. In thirty years, from 1900 to 1930, the average size of all farms in Illinois increased from 124.2 acres to 143.1; in Nebraska, from 246.1 to 345.4.

The high value per acre of the enlarging farms makes ownership more and more difficult and so increases the tendency to rent. A man who operates a farm as a tenant may not have the hope of being able sometime to buy the farm. But the larger farm, because of its great productivity, can support both landlord and tenant.

The Corn Belt rivals the Cotton Belt as one of the two great areas of tenancy in the United States, and presents one of the many social problems facing the American people. The writer of the allegory of the Garden of Eden has Jehovah tell Adam, "In the sweat of thy face shalt thou eat bread." Today He might tell the man of the Corn Belt, as of almost any other region, "In the sweat of thy mind and thy spirit shalt thou have a good society." Can we organize rural production on the basis of tenantry and have a good society? [27] Or can we do without tenancy?

[26] On the smaller farms in the eastern part of the Corn Belt it has often been found that the ordinary tractor does not pay. In 1938 and 1939 the leading tractor manufacturers announced that special "baby tractors" would be manufactured that would meet the needs of farms under 70 acres in size. One of these light tractors weighs 1700 lbs. Its four-cylinder engine will pull a 16-inch plow bottom or a one-row middle buster for furrowing cornfields and cotton fields. It is designed to replace one team of horses and will plow, disk, harrow, cultivate, plant, haul, or act as a small power plant. With a full load, it operates on 1 gallon of gasoline per hour, and it has a top speed of 10 miles per hour. See L. A. Reynaldson and others, *Utilization and Cost of Power on Corn Belt Farms*, U.S. Dept of Agr., *Technical Bulletin* 354, 1933, and W. M. Hurst and L. M. Church, *Power and Machinery in Agriculture*, U.S. Dept of Agr., *Miscellaneous Publication* 157, 1933.

[27] Paul E. Vogt, in *The Land Problem and Rural Welfare*, American Economic Association, 1916, advanced arguments showing that the increase of Corn Belt tenancy is disastrous to education, standards of living, and above all, to the co-operative movement which is regarded as so highly necessary for rural advance. The chief change since 1916 has been more tenancy — much more tenancy (Figs. 320 A, 321 A).

A socially satisfactory tenancy system has not yet been achieved in America. England has tenant-landlord regulations that give the tenant great permanency of possession, and ownership rights in improvements he makes, even a stand of grass and unused fertilizer in the ground. "I don't want to own a farm," a prosperous Scotch tenant farmer said to me when he was showing me his layout. "Lord W., who owns it, only gets 2.5% income. If I bought it I'd have to pay 5% for money at the bank. I'm a good farmer and have no trouble getting land."

A Cotton Belt landlord put a tenant off because "he was terracing the land and acting like he owned it." That was probably exceptional, but it is much too nearly symbolic of farm-renting in the United States. Willard Atkins has said, "In the Corn Belt tenancy is a capitalistic enterprise. In the Cotton Belt it is a social estate."



FIG. 382 A. This haymaking series shows mechanization equal to that with corn. (Courtesy Allis-Chalmers)



FIG. 382 B. The side-delivery rake is a great improvement over the old-fashioned kind because it turns the moist side of the windrow up to dry. It also turns the dry part in and keeps it from getting too dry. The hay left by this machine may be made into cocks as in this picture, or it may be picked up by the hay-loader (next picture) or by another device, the windrow-baler. (Courtesy Allis-Chalmers)



FIG. A. The hay-loader picking up hay from a windrow. It uses power from its own wheels, therefore from the tractor. A fine example of good Corn Belt farmstead in the background. (Courtesy International Harvester Co.)



FIG. B. Pickup baler on an Illinois farm. It happens to be baling the straw left by the combine (next picture). (Courtesy Caterpillar Tractor Co.)

There are several differences in the background of the tenant-farm situation in the Corn Belt and the Cotton Belt.

1. The Corn Belt was naturally very fertile when settled. Most of the Cotton Belt was not fertile when settled.

2. Corn Belt fertility is greatly preserved by the winter freeze-up and by the natural cover of sod which stops erosion.

3. There is in the Corn Belt no highly salable cash crop like cotton which tempts man to an agriculture without livestock. Keeping livestock in the Corn Belt is therefore almost a farmer's necessity.

4. To get possession of animals and machinery the tenant must have capital. Such farming is psychologically and therefore financially beyond the reach of that large proportion of us who are thriftless, i.e., cannot save, lack the capitalistic instinct which would make possible the equipment of any farm.



FIG. A. The combine puts the grain in the sack in front of the operator and drops the straw behind. The combine, used for years on the large tracts of the Middle West and the Far West, has recently been reduced in size and has invaded the East, clear to the Atlantic seaboard. (Courtesy Allis-Chalmers)

Despite these great advantages possessed by the Corn Belt, tenancy is making great ravages through soil destruction. It must be a shock to anyone who knows the Corn Belt to get the idea of national forests in Iowa (see Fig. 285 A). National forest — the last refuge of poor or abused land!

THE FUTURE OF AGRICULTURE IN THE CORN BELT

"Skimming the cream" off a farm has long been a common saying and a common practice in the Corn Belt. Some of the first settlers made a practice of moving farther west every ten years to get new land to skim. The inhabitants of the black and fertile lands have been outspoken this last half-century in their contempt for what they called the poor, red-looking soils of the East, and for the Eastern practice of saving manure and buying fertilizer. Corn Belt soils, deep with fertility and black with the myriad roots of prairie grass,

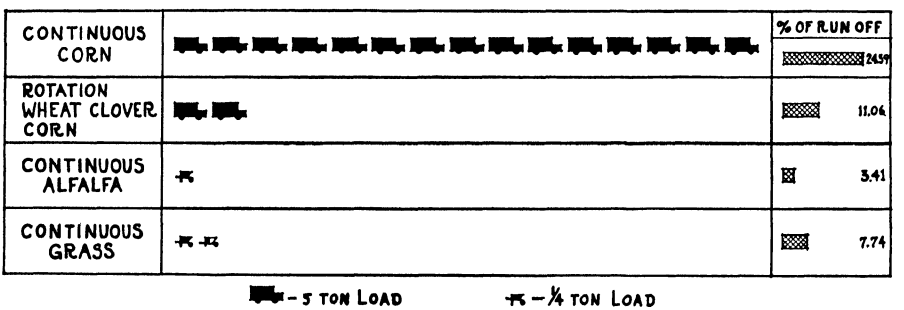


FIG. B. These figures of soil loss, worked out by very careful measurements, show why over large areas of the Corn Belt the layer of rich black soil is much thinner than it used to be, and why in some localities the gullies are eating up the country almost as fire licks up grass. (Courtesy U.S. Soil Cons. Service)

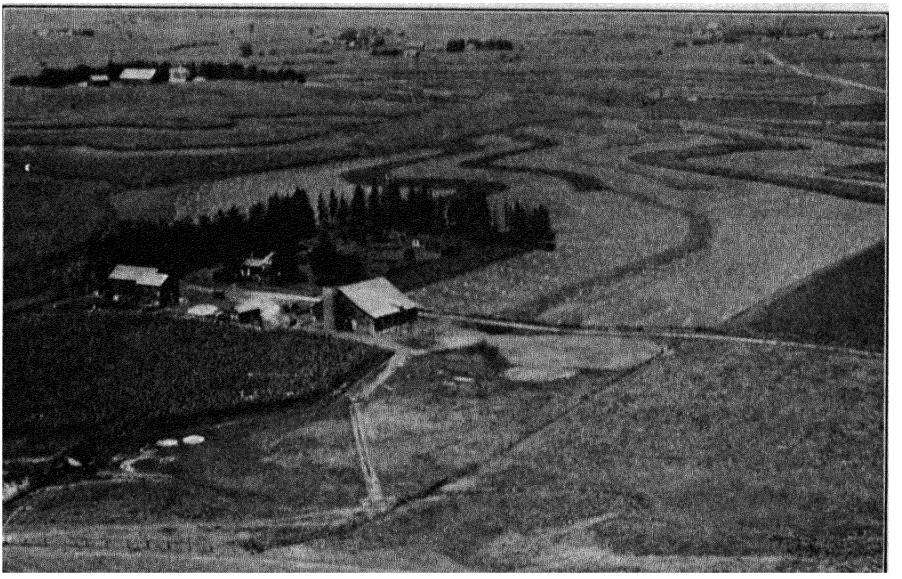


FIG. A. A gently rolling section of the Corn Belt in Iowa. Windbreak about the farmstead is standard equipment, and the points of the compass are not hard to guess. How long will these farms last? That depends on the farmer. Experiments in strip cropping, contour drainage, and coiled fields to prevent soil loss have followed the discovery that by old practices this area was doomed to early destruction. (Courtesy U.S. Soil Cons. Service)

had no such needs.[28] I have heard Iowa farmers boast of 25 consecutive crops of corn on the same field.

But nearly all of those rich black lands need fertilizer. Already soil erosion has become a problem. Bulletins of Indiana and Illinois agricultural experiment stations show pictures of desolate destruction and abandoned lands; Illinois gullies, 65 feet deep in extreme cases, are rapidly removing the leveling benefits of the glaciers.[29]

In this part of Iowa (lat. 43° N., 15 miles from Missouri River) there are many gullies fifteen to thirty feet deep and fifty to seventy-five feet wide. The sides and head of these guillies are vertical, and, during rainy periods, these vertical earth banks cave so that the loose earth is carried away, widening and lengthening the gully. Some gullies are five or six thousand feet long while others are only one hundred feet long but have every prospect of lengthening as much as two to eight thousand feet in the future. The cultivated land is very steep (25%) and the runoff is very high, causing these gullies to cut rapidly (15 to 50 ft. per season). — Letter from N. E. Perrin.

[28] Tree roots are larger than grass roots. They do not incorporate themselves so intimately with the soil, and they do not make soil black.

[29] F. L. Duley, *Controlling Surface Erosion of Farm Lands*, Missouri Agricultural Experiment Station, *Bulletin* 211, 1924, and F. L. Duley and M. F. Miller, *Erosion and Surface Runoff under Different Soil Conditions*, *Bulletin* 63, give definite and alarming results of erosion measurements. The Missouri State Planning Commission published an appalling map. We must mend our ways or few will be our generations in the land.

By 1910 it was reported that "it is safe to say that at least two-thirds and probably three-fourths of all the cultivated soils of Illinois are already in need of phosphorus and organic manures, and most of this vast area is also deficient in limestone." [30] Equally significant was the experience of the Ohio Experiment Station at Wooster, which tried a four-year rotation of corn, oats, wheat, and clover and fertilized the fields with commercial phosphate, lime, and stable manure. This treatment cost for the four-year period $14.50 an acre,[31] and was paid for by the increased yield of each of three of the four following crops: corn, 27 bushels per acre (increase); wheat, 14 bushels per acre; hay, 1½ tons to the acre; oats, 10 bushels per acre. Similar evidence can be secured in every Corn Belt state. The frontier has indeed passed.

Since the Corn Belt is now primarily producing meat, the next steps in development are to increase the intensity of the type of agriculture, and to use methods that are more scientific.

Dairying is the most natural step toward intensification of agriculture in a meat-producing region. Dairy products are of increasing importance in the Corn Belt, particularly around its margins, where corn production is less easy, and of course around the larger urban markets. The silo, with its efficiency in the use of fodder, has become almost standard equipment for those who keep cows or cattle over the winter. Some cattlemen use silage in the summer instead of pasture, thus letting corn, the greatest yielder, replace pastures, the smallest yielder.

The application of more scientific methods is aided mightily by the very efficient agricultural experiment stations and agricultural colleges with their highly specialized staffs of well-trained men. It is estimated that their work has increased the average yield of corn in Illinois by 6 bushels per acre.[32] Their lines of work and the possibilities of the results are indicated by the following:

1. Introduction of the soybean. The Iowa station began experiments in 1910. Soybeans covered, in 1937, 762,000 acres in Iowa, 2,151,000 acres in Illinois, and 862,000 acres in Indiana.[33] Experiments proved that soybeans can be grown as a crop by themselves or with corn. This makes a slight reduction in the yield of corn, but leaves a profit through the increased fertility by way of nitrogen from the roots of the beans. Soybean-oil mills are also appearing.

2. Plant-breeding and the use of the best strains of seed hold great possibilities of increased output without much increase of farm effort. Six years of experiment in Illinois changed the oil content of Indian corn from 4.7 per cent to 7 per cent, and during the same period other experiments reduced the oil content from 4.7 per cent to 3 per cent. Since corn oil is edible and is a

[30] C. A. Hopkins, *The Illinois System of Permanent Fertility*, Illinois Agricultural Experiment Station, *Circular* 167, 1914, p. 9.

[31] *Increasing Crop Yields in Ohio*, Ohio Agricultural Experiment Station, *Circular* 138, 1913.

[32] The European corn borer is moving westward across the Corn Belt, but is not causing nearly as much damage as did the boll weevil in the Cotton Belt.

[33] Total acreage in soybeans in the United States: 1909, 2000; 1919, 113,000; 1929, 1,962,000; 1938, 7,789,000 acres, grown alone, plus approximately one-half of the interplanted area. (U.S. Dept of Agr., *Agricultural Statistics*, 1939, p. 271.)

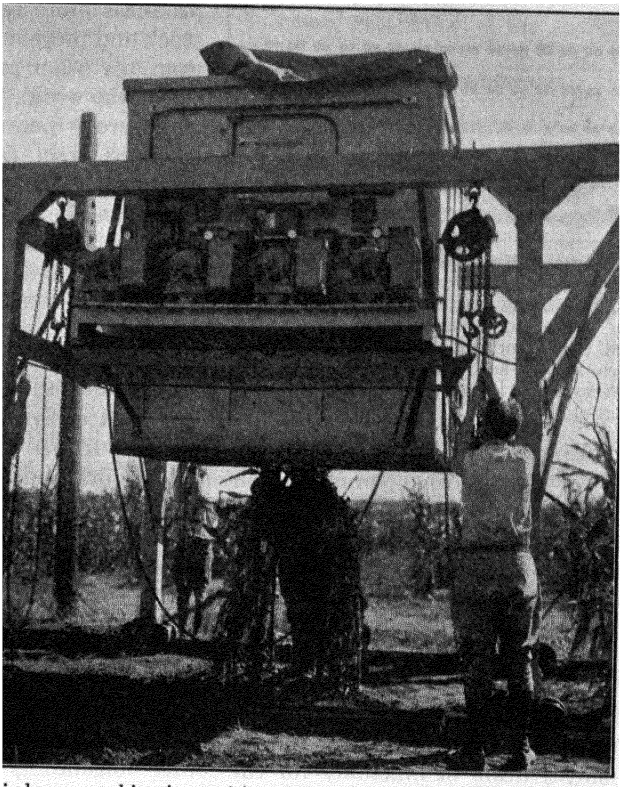


FIG. A. This huge machine is a refrigerator to be set down around selected corn plants to see which will stand greater cold as the plant approaches maturity. Experimenters have succeeded in finding and developing cold-resistant strains which should extend the Corn Belt farther north. (U.S. Dept Agr., *Circular 285;* Courtesy J. R. Holbert, Illinois Agr. Exp. Station)

substitute for lard, olive oil, cottonseed oil, and butter, the significance of these experiments is at once evident. Other Illinois experiments with corn changed its protein content from 6.6 per cent to 16 per cent, which is more than the average protein content of wheat. If the population of the United States should double, treble, or even quadruple, the Corn Belt, with the assistance of the Cotton Belt, could easily feed all the people, provided they made a heavy reduction in the consumption of meat and ate instead more grain and vegetable products.[34] At the present time the animals eat the produce of more than three-fourths of all our agriculture.

The Corn Belt is in reality a tremendous food and feed reservoir, since it

[34] While meat is good, the heavy consumption of it has no great defense in the science of nutrition. See Arthur Hunter (chief actuary, New York Life Insurance Co.), *Blood Pressure, What Affects It;* E. V. McCollum and Nina Simmonds, *The Newer Knowledge of Nutrition,* 4th ed., Macmillan Company, 1929; Victor G. Heiser, *You're the Doctor,* W. W. Norton and Company, 1939 (especially his account of the diet of the Sikhs of India); Henry C. Sherman, *Food and Health,* Macmillan Company, 1934 (a book every intelligent family should have).

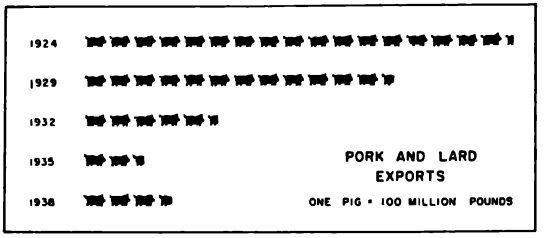


FIG. A. Under the New Deal the United States Government, in order to create scarcity and raise prices, has paid farmers not to grow so many hogs. This is partly cause and partly result — result of European hard times and the ferocious attempts of many countries at self-sufficiency by way of high tariffs. (Courtesy U.S. Bureau of Foreign and Domestic Commerce)

produces more feed for livestock and more meat for man than any other area of equal size in the world.[35] The value of its crops per square mile is more than 50 per cent greater than in any other farm region in the United States, and it is unquestionably the best-balanced agricultural region in the country. Of the five major American crops — corn, cotton, wheat, hay, and oats — all but cotton are grown extensively in the Corn Belt. Fully 40 per cent of the corn crop is fed to hogs, 15 per cent to cattle, and about 25 per cent to other animals on the farm. Pork and lard and beef are the principal finished products.

The chief dangers that threaten the economy of this great, productive region come from soil erosion and technological improvement within, and competition without. A glut in prices for farm produce in the early 1930's resulted, as is well known, in a national policy of deliberate limitation of agricultural production by the Government and in some cases the actual destruction of crops.

Part of this glut was due to bad times at home, part to lessened exports resulting from European tariffs and other attempts to achieve self-sufficiency;[36] part to the substitution of machines for the forage-consuming horse, which released 35,000,000 to 40,000,000 acres of land; part to the shift from less productive to more productive crops per acre, corn to cotton, wheat to corn, releasing 14,000,000 acres; part to the shift from beef to more productive pork and milk, releasing 9,000,000 acres; part to increased efficiency in feed utilization because farmers kept better grades of animals, and had less loss of young, releasing 5,000,000 additional acres.

The distant tropics arise as competitors of the Corn Belt as a result of technological improvements, such as the hydrogenation process.[37] The world's numerous vegetable fats and oils have recently become highly interchangeable, and abundance menaces the Corn Belt's early advan-

[35] See O. E. Baker, "Agricultural Regions of North America. — The Corn Belt," *Economic Geography*, October, 1927, pp. 447–65.

[36] For decades the farmers of Iowa and other Corn Belt states have been dependent upon the European market for the sale of much of their grain and meat. Yet these farmers have continued to vote for Congressmen who supported a high tariff. Both farmers and Congressmen should study elementary economics and learn that we cannot sell abroad if we do not buy abroad. A high American tariff restricts imports of foreign goods, which in turn reduces the ability of foreigners to buy American goods. Furthermore, a high tariff often enables American manufacturers to charge a higher price for the things that are sold to farmers. If the Corn Belt farmers, nearly all white and Yankee or Nordic, will be so stupid, what chance has democracy? Education is a prerequisite of democracy.

[37] See Erich W. Zimmermann, *World Resources and Industries*, Harper & Brothers, 1933, Chap. 17.

tage.[38] The United States has long been the champion of animal fats and oils, especially hog products. On the expensive land of the Corn Belt, with costly equipment and large amounts of labor, we grow corn and feed it to hogs. This involves two stages in production. Two-stage animal fats and oils are now confronted with increasing competition from cheaper, one-stage vegetable fats and oils, which are produced on plantation or farm (cottonseed oil, peanut oil, etc.), or which grow wild in the tropics (palm-kernel oil, coconut oil, etc.).[39] For decades northern Europe has been a heavy consumer of American animal fats and oils, especially lard and lard compounds, but will this market continue? The fact is that the world in general is turning toward the production and consumption of the cheaper vegetable fats and oils. How far will this go? This is the unpredictable danger that seems to hang like the sword of Damocles over the Corn Belt — the menace of abundance. The Corn Belt farmer could get a higher price for the lard hog if he did not have to compete with the fat food from the palms.

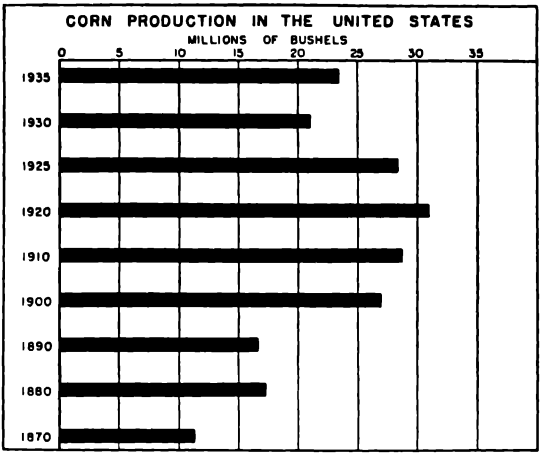


FIG. A. Can the Corn Belt expand? It is a very significant fact that Illinois had greater corn acreage every year between 1900 and 1907 than in any year between 1918 and 1938. (Facts from U.S. *Statistical Abstract*)

CITIES AND MANUFACTURING

The Corn Belt is not a great manufacturing region, though it is rich in material and human resources. In addition to being rich in food, the Corn Belt is also rich in power, and it is close to raw materials. There is coal in Ohio, Indiana, Illinois, Iowa, Missouri, Kansas, and Oklahoma. Nearly half the area is underlaid with coal. Right through the center of the region, in Ohio, Indiana, Illinois, and also in Kansas and Oklahoma, there are or have been oil fields, and oil pipe lines traverse the region in a great arc from Oklahoma to Ohio.[40]

Along with the oil was natural gas, which gave the cheapest and best of all fuel to many Ohio and Indiana towns. Much of this gas was wasted, as was

[38] Interchangeability is also enhanced by clarification, neutralization, decoloration, deodorization, blending, and the removal of flavor.

[39] As yet tropical fats and oils come chiefly from wild natural growths, although plantation products are increasing.

[40] In 1916, 516 oil wells were abandoned in Indiana. Recent discoveries of petroleum in Illinois caused production to increase from 4,500,000 barrels in 1936 to 7,500,000 barrels in 1937, and to 24,000,000 barrels in 1938. Production in leading states in millions of barrels, 1938: Texas, 476; California, 250; Oklahoma, 175; Louisiana, 95; Kansas, 60,

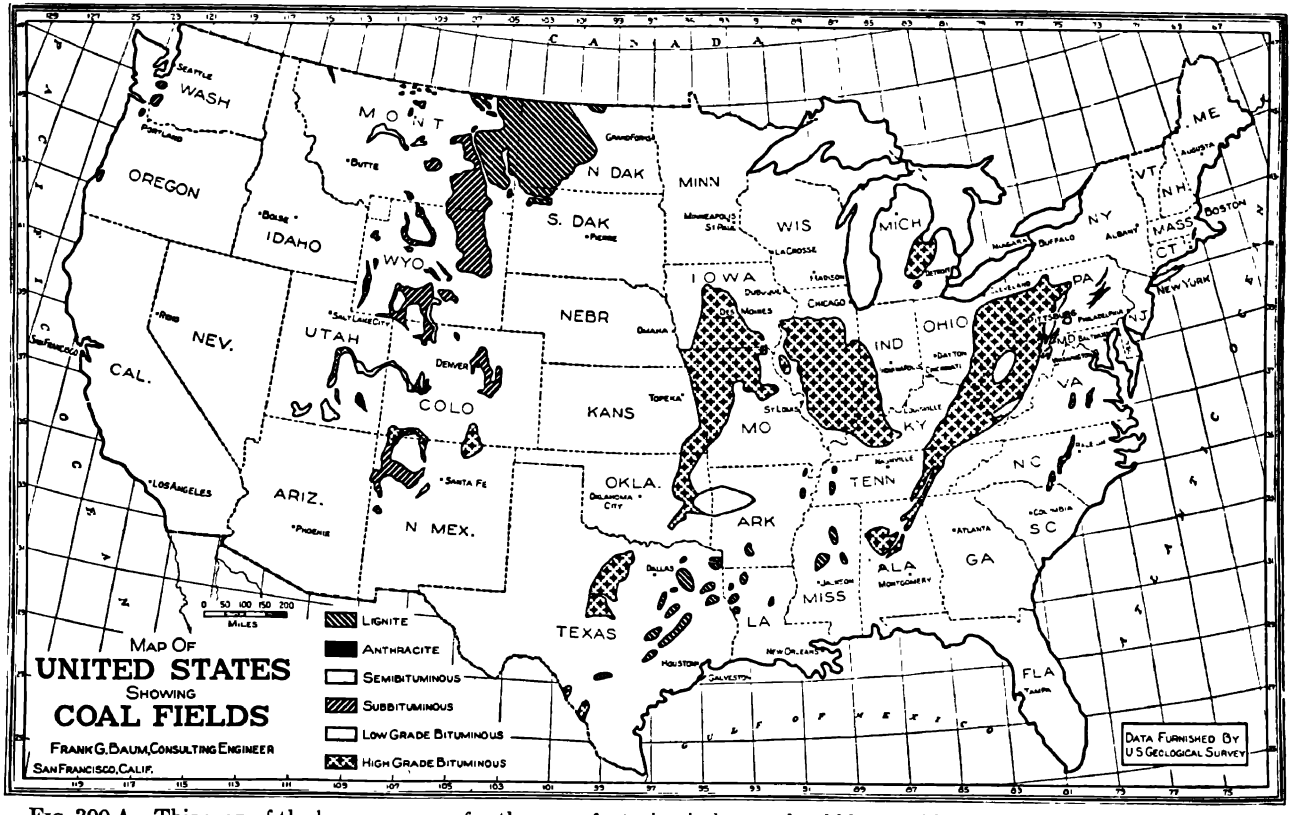


FIG. 390 A. This map of the base resources for the manufacturing industry should be considered in connection with Fig. 331 A, the food facts of the Corn Belt, and the transport facts of the lakes, the New York State Barge Canal, and the St. Lawrence navigation. The total equals the basis for great economic power. (Courtesy F. G. Baum, *Atlas of the U.S.A.*, *Electric Power Industry*)

the case in most other places that possessed it; but while it lasted its excellence made Indiana the leader in the production of glass, for which the materials are so easily melted by gas flame. Gas was also used in cement mills. Many of these gas-using plants have disappeared. Others have been compelled to put in equipment that uses coal.

The Corn Belt has not become a great manufacturing region, because it has no first-class waterways except the Mississippi to give it the advantages of location, while the immediately adjacent Lake Region has long had this advantage. If the Great Lakes had been good prairie, the Mississippi and the Ohio would probably have had more big cities along their banks.

The levelness of the Corn Belt, which permitted railroads and highways to pass freely in all directions across its surface, gives no paramount superiority of location to any point within the Corn Belt such as created New York, Chicago, Buffalo, Cleveland, or Detroit.[41] Most of the Corn Belt small towns are completely dependent upon the farms around them, their chief activities being the collection of grain and farm produce, the distribution of merchandise, or the marketing of small amounts of home manufactures that have a local demand.

Agricultural implements are the manufactured product for which there is the greatest advantage of production in the Corn Belt. There is a distinct advantage in making a bulky product in the locality in which it is to be used.[42] Nevertheless, the decline in the number of agricultural-implement works shows the fate of the small plant in the small town when competing with the great organizations of a big city in the era of standardization, which has come to stay.

Chicago is, in reality, the economic capital of the Corn Belt, but it is also a product of the lake, and will be discussed with other lake cities in Chapter 23, "The Lower Lake Region."

The Mississippi-Missouri waterway cutting through the Corn Belt gives the most commanding city locations in its area. We see its fruit in the two largest cities, St. Louis (pop. 822,000) and Greater Kansas City, which includes Kansas City, Missouri (pop. 400,000), and Kansas City, Kansas (pop. 122,000).

St. Louis started as Astor's fur post, and became an outfitting point for Western trade. Its location near the junction of the Mississippi and Mis-

[41] The comparison of population on both coasts with lake and inland states offers suggestive evidence.

PER CENT POPULATION CHANGE

	U.S.	*N.Y.*	*Calif.*	*Iowa*	*Mich.*	*Kan.*	*Mass.*
1890–1900	20.7	21.1	22.4	16.7	15.6	3.0	25.3
1900–1910	21.0	25.4	60.1	−0.3	16.1	15.0	20.0
1910–1920	14.9	14.0	44.1	8.1	30.5	4.6	14.4
1920–1930	16.1	21.2	65.7	2.8	32.0	6.3	10.3
1930–1940	7.2	7.1	21.7	2.7	8.5	−4.3	1.6

[42] During the course of a century the chief manufacture of farm machinery, implements, and wagons moved westward in order to be nearer to the great markets: Rome, N.Y.; Columbus and Springfield, Ohio; Indianapolis, Ind.; and now Chicago and Milwaukee.

souri rivers on the first high ground south of the mouth of the Missouri made it a river emporium in the days before the railroads. When railroads came, they naturally sought St. Louis, as an established city, and this made it a railroad center. The city has a great distributing trade in the Southwest, even into Mexico; it has large stockyards and meat-packing plants, and important manufactures of boots, shoes, tobacco, hardware, beer, and chemicals. St. Louis also has an iron and steel industry, which utilizes southern Illinois coal and coke, scrap iron, and Lake Superior iron ore. Across the river is East St. Louis (pop. 74,000),[43] which is the greatest producer of alumina in the country.[44] It has meat-packing establishments and petroleum refineries, and is the greatest horse and mule market in the United States.

Greater Kansas City, located at the bend of the Missouri River nearest Santa Fe, was for a time a terminus of boat traffic on the Missouri and an outfitting point for wagon trains for Santa Fe and for Southwestern trade.[45] This soon made it the focus for railroads, and twelve major trunk-line railroads now pass through the city. Kansas City is a great grain and livestock market, and also the greatest market for stock cattle. In 1933 over 500,000 of these animals passed through its yards en route to Corn Belt farms. A slightly greater number passed in from the land of grass to the land of corn through Omaha, Sioux City, and St. Paul. About half of Kansas City manufacturing employees are engaged in the slaughtering industry.[46]

In 1934, during the most terrible drought in the recorded history of the Corn Belt, Kansas City handled hundreds of thousands of cattle which had been bought by the United States Government to keep them from dying of hunger, thirst, and disease.

Kansas City is one of a ring of cities located just far enough within the Corn Belt to have an advantage of location as grain markets and for the meat-packing industry. These cities, Kansas City, St. Joseph, Missouri,[47] Omaha, Nebraska,[48] Sioux City, Iowa, have 100 miles or so of cornfields beyond them, so that range cattle can be fattened and never break their eastward movement from the range to the cornfield, to the packing-plant, to the Eastern market. Before the invention of cold storage and the refrigerator car it was necessary to send live animals to Eastern cities to be slaughtered

[43] East St. Louis suffered continually from flooding and malaria until its street level was raised, in some places as much as 15 feet, and levees were built to keep out flood waters.

[44] The alumina is extracted from bauxite which comes by rail from Arkansas and by water from British and Dutch Guiana, moving up the Mississippi River by barge. The alumina, a whitish powder weighing half as much as bauxite, is shipped to reduction works in other parts of the country which have very cheap electric current and is converted into aluminum, which is later manufactured into finished products.

[45] After completely dying out, this boat traffic revived after the World War, owing in part to the congestion of the railroads. A towing boat with a 36-in. draft draws seven barges 200 by 36 by 8 ft., with a draft of only 18 in. The boat rate to New Orleans was but 80% of the railroad rate, a fact which has caused the Mississippi to have a lowering influence on the railroad rates in the whole area from Chicago and Kansas City to the Gulf, very much as the Erie Canal has controlled rates from the Great Lakes to New York.

[46] In number of animals handled in 1935, the principal stockyards ranked as follows: Chicago, St. Louis, Omaha, Kansas City. Area of largest stockyards: Chicago, 225 acres; Kansas City, 137 acres; Omaha, 120 acres; St. Joseph, 101 acres.

[47] St. Joseph claims to have the largest pancake-flour mill in the world.

[48] Omaha claims to have the largest lead-refinery in the world and to manufacture more butter than any other city, with an output of 30,000,000 lbs. annually.

near the point of consumption. But now, since it is cheaper to ship meat than live animals, the packing-plants are along the western edge of the Corn Belt, not in the Eastern cities. Grass grew for some years, literally, in the stockyards of Philadelphia before they were abandoned in 1923. Meanwhile, directly across the street carloads of chilled beef had been unloaded every day for years.

Des Moines, Iowa (pop. 143,000), a state capital, shares some of the industry of Omaha (pop. 214,000) and Kansas City, and is the insurance center of the West. Cedar Rapids, Iowa, in the midst of the oats belt, has the largest cereal mills in the world, and is the home of Quaker Oats.

The Corn Belt small town may be termed inert. Except for the grain-dealer, the coaldealer, the storekeeper, and the garage man, its population consists chiefly of retired farmers and their families, most of whom are much more desirous of economy than keen about enterprise. Now in the age of the automobile, the main highways have been built from county seat to county seat, leaving the hamlet out in the mud. And sticky mud it is that the Corn Belt soil makes when wet.

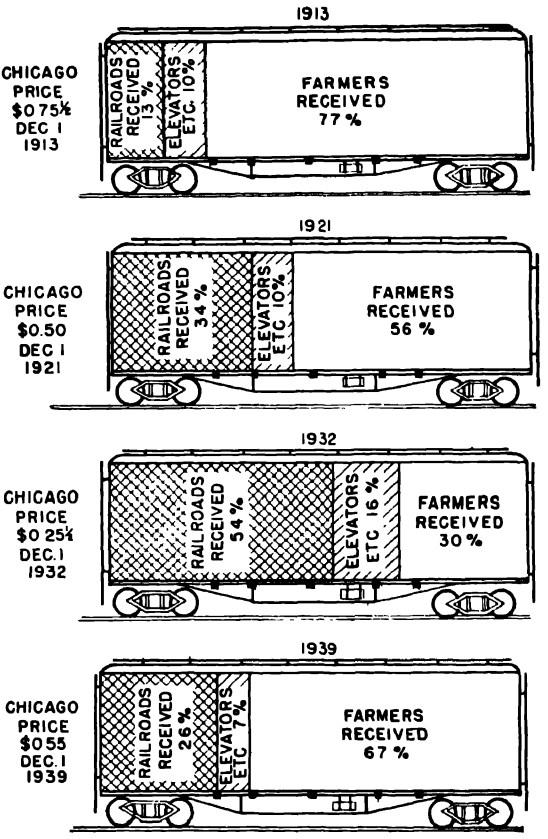


FIG. A. The strife for the product. The record of an unequal struggle between city and country. If such costs as railroad freights, interest, taxes, elevator charges, are fixed and the price of farm produce fluctuates, the farmer takes nearly all the kicks. This chart shows the proportion of the Chicago price received by the farmer after paying 500 miles of freight on a bushel of corn from Sioux City, Iowa, to Chicago, on different dates under different price conditions. This graph shows why in the year 1932 much corn was used as fuel in the parts of the Corn Belt most distant from the market. (Data from U.S. Dept Agr.)

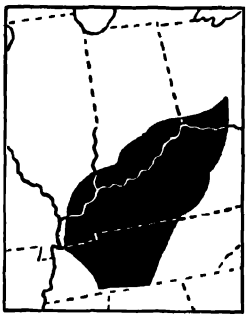
The Corn Belt small city, ambitious like all small cities to become a metropolis, has often tried its fortune in manufacturing, but rarely has it developed beyond what might be called the subsistence type of manufacture, whereby things are made to be sold near home. As an example take the case of a certain small Illinois city, 10,000 people, which a few years ago had two farm-implement factories, a pottery and stoneware plant, a brick plant, a

drain-tile plant, a soap plant, a cigar plant, a mitten factory (cornhuskers use a pair of cheap mittens per day), and a boiler plant for making culverts to use in roads. Most of these small industries were purely local as to markets, and several of them were not prosperous. The fairly common fate of such plants that do not have a local market is to be absorbed by a company that owns a chain of them and closes the least profitable.

The eastern end of the Corn Belt, with the lake cities to the north of it, plateau cities to the east of it, Ohio River cities to the south of it, and coal, oil, and gas under it, has fared better in manufactures than the western part. Indianapolis (pop. 364,000) is the largest city in the Corn Belt not located on navigable water. Its leading industries include hosiery production, metal trades, and the manufacture of pharmaceutical products and clothing. It has caught the overflow of the automobile industry to the north, and makes parts for assembly elsewhere. Like Hamilton, Dayton, and Springfield, Indianapolis has many manufactures of machinery. Dayton, well known for its airplanes, makes most of the cash registers of the United States and has extremely varied manufactures. Many towns in the eastern Corn Belt make wire fencing and other iron manufactures, especially agricultural implements. The list of workers of Peoria is instructive — 5000 making tractors, harvesters, and threshing machines; 1600, alcohol and alcoholic beverages; 800, wire fences, nails, staples, etc.; 400, electric power and gas; 350, washing and ironing machines; 300, alcohol, chemicals, and solvents; and 250, cotton gloves and mittens.

There is much to be said in favor of an industrial organization which gives to the farmer a winter job with modern machinery and under modern efficient management. This merely restores the yearly round of labor that he had in the old days of home industry and the domestic system described in Chapter 4. The winter-work factory would tend, however, to be limited to the full employment a part of the year of all those whom agriculture needed there for another part of the year. This is the choice: Shall men, or machines, loaf half the year? The almost static population of Iowa since 1910 is a significant thing to contemplate in this connection. The early prospect of the universal distribution of electric power to every hamlet makes possible this development of small-town manufacture. A good start in power supply has been made by the carriage of current from the power plant (200,000 horse power) at Keokuk, Iowa, 200 miles to St. Louis and considerable distances across the prairies both east and west. A survey made in the 1850's by Robert E. Lee, of the United States Army, refers to this power resource.

Chapter 17. THE LOWER OHIO VALLEY



THE weather in the Central Region of North America changes its tempo frequently. The region is in the area of cyclonic storms. Today, in January 500,000 square miles of warm Cotton Belt weather move northward. This weather crosses the Lower Ohio Valley. The warm south breezes seem like spring. Tomorrow there will be rain, but it will wind up in snow followed by blustering northwest wind and freezing weather. Then will come some bright, sunny days, and the whole thing begins all over again with variations, often surprising variations.

All winter long the Lower Ohio Valley weather is one tall club sandwich made of alternate layers — Corn Belt weather, Cotton Belt weather, Corn Belt weather, Cotton Belt weather. This kind of climate is not to be recommended for human comfort, or for the preservation of soil fertility,[1] but it is wholesome and far better for man than is the continuous heat of the West Indies, and perhaps also better than the cold of Saskatchewan. The summer is Corn Belt summer plus more length and more heat.[2]

The chief difference between the Corn Belt and the Ohio Valley is found in the surface of the land. The Corn Belt is nearly level. Most of the Ohio Valley is hilly. Its northern boundary in Ohio and Indiana is the beginning of the more level glaciated land of the Corn Belt — a transition zone 10 to 20 miles wide. Its southern boundary is at the line where the season is too short for cotton. If the Ohio Valley were as level as the Corn Belt, it might be a part of the Corn Belt. Corn is grown on almost every Ohio Valley farm, but it is not the crop king that it is in the Corn Belt. Kentucky and Tennessee together produce only half as much as Illinois. In 1930 the parts of Kentucky and Tennessee that are in the Lower Ohio Valley had about one-sixth as many tractors as Illinois, and the decline in rural population was not quite so universal.

The Lower Ohio Valley has a longer summer than the Corn Belt, but not so long as the Cotton Belt. While the Lower Ohio Valley agriculture resembles that of the Corn Belt, the people of the Kentucky and Tennessee part of the valley partake more of the Southern than of the Northern point of view. There is also a considerable Negro population. The North may be said to begin at Cincinnati, which has a large German element in its popula-

[1] There is more winter rain than in the Corn Belt, therefore more leaching.

[2] Professor S. S. Visher, Indiana University, points out (private letter) that Evansville, Ind., on the Ohio, has on the average 77 days each summer that are warmer than the average temperature of the warmest day each summer at Indianapolis, and this is not any advantage for Indian corn.

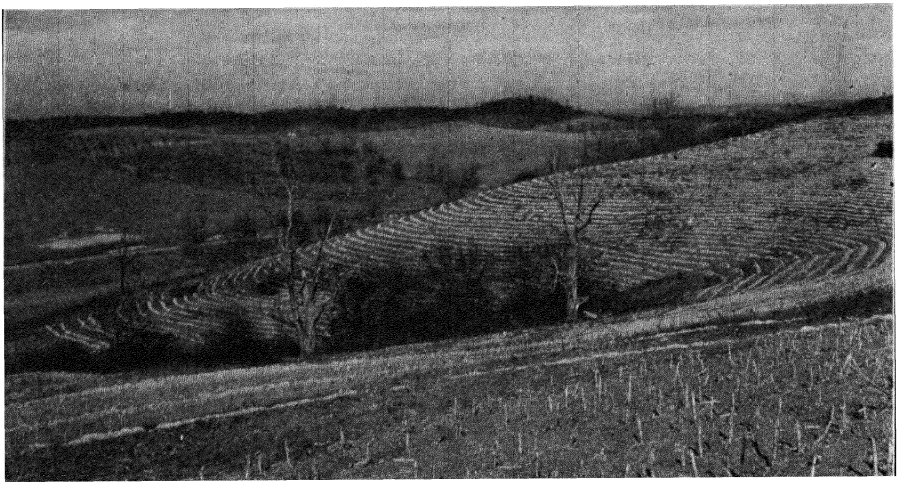


FIG. A. The typical Ohio Valley landscape is hilly. The hill contoured for tree-planting has about 25% slope. Like hundreds of thousands of other hills in this and other regions of North America, it has lost most of its surface soil and fertility. (Courtesy U.S. Soil Cons. Service)

tion, and people on the Ohio River above Cincinnati and on the hills of West Virginia and Ohio belong socially to the North rather than to the South. Their ancestors came originally by way of Pittsburgh, not by way of the Cumberland Gap.

Much of the Lower Ohio Valley is composed of rock strata similar to those in the Appalachians, but they are of lower elevation, with lower hills. Geologists sometimes call it the "Inland Low Plateau."

THE LOW SECTIONS AND THE HIGHLAND RIM

Three sections differ from the rolling hills of the usual Ohio Valley type of land. One of these is the alluvial lands along the Ohio and its branches, Wabash, Cumberland, Green, and Tennessee. Many of these lowlands are continuously planted in corn, and occasionally the river overflows them, to the great enrichment of the soil but sometimes to the destruction of a crop. There are several truck-growing centers on this lowland. The two other tracts of smoother land are the limestone plains, called the Kentucky Bluegrass, and the Nashville Basin. These areas of limestone plain are much like the Great Valley in their origin (Fig. 236 A) and therefore in fertility and use. Between these limestone plains and the Appalachian Plateau is an area of rugged hills of sandstone and shale, the outer fringe of Appalachia, known locally as the Barrens, the Knobs, and the Highland Rim.

One day I crossed from the plateau down into the Bluegrass — a journey of contrasts. The transition hills reminded me of some of the more isolated parts of the Appalachian ridges and valleys or of some of the rougher sections of the Virginia-North Carolina Tobacco Belt. The hills were often gullied,

but sometimes covered with bluegrass sod, which held the earth. The proportion of land under the plow was small. The barns were poor; the houses, usually of one story, were poor; paint was rare; and most fields were without fences. There were many unused tracts of land, and they were mostly covered with small oak and bushes. I traveled miles without seeing a farm that was systematically laid out, fenced, and cleaned up. Instead, there were little patches of corn and occasionally of wheat stuck around here and there in what seemed to be almost wilderness. Trees were everywhere, up the gullies, along the fences, along the roads, in the fields, but saw logs were rare. Many of the fields were so worn by erosion that the corn was small, and the hillsides were often uncultivated, with little corn patches in the moister places at the foot of the hills. In the midst of it all, a beautiful farm with tile silo, good buildings, and good crops showed what the region might become, and what I think some parts of it will become in the next fifty years — granted intelligent planning and peace.

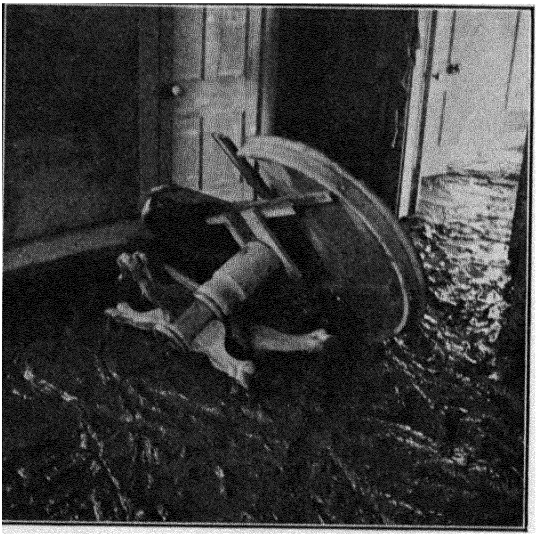


FIG. A. Fifty Ohio River floods in fifty years drowned 1000 people, and destroyed $1,000,000,000 worth of property. Water-holding terraces on contours reduce floods. (Courtesy Farm Security Adm.)

Suddenly I passed out upon the limestone. It seemed to be another world instead of a part of the same state and same county. The white surface of a limestone pike shone in the sun. Farmhouses were of two stories and painted. The barns were good, the fields were fenced, the sod was thick and heavy, like that of the Valley of Virginia. A Jersey cow was the first pure-bred animal I had seen in fifty miles. Near by were herds of fat beeves, flocks of sheep, and an engine and thresher at work. The land here was worth ten or twenty times as much as that a few miles back on the shale. Most of the shale hills were for sale; most of the flat plain was not for sale.

TOBACCO

Tobacco is the most distinctive crop in the agriculture of the Ohio Valley. In the days of isolation at the beginning of the nineteenth century, the only means of exporting heavy produce from this region was by flatboat to New Orleans. The high value of tobacco gave it an especial fitness for export. Then, as now, the farmer on the fertile soils of the Bluegrass found tobacco to be his best money crop.



FIG. A. One of the diversions of rural America is the county fair, and here is one of its attractions known to many communities. (Courtesy Farm Security Adm.)

It is common for the Bluegrass farm-owner to have much of his land in sod and a small proportion of corn, wheat, and tobacco. Because of the work required by intertillage, worming, and plucking of buds, a family can grow only a few acres of tobacco. The tobacco field, usually not more than 6 or 8 acres in extent, is made by plowing up old bluegrass sod. The soil, derived from rotten limestone rock, is so rich in phosphate that fertilizer is not commonly used. To grow tobacco requires much labor, and because much of the work can be done by women and children, tobacco is largely grown by tenants—"croppers," they are often called—who work a field on shares.[3]

West of the Kentucky Bluegrass area is the section locally known as the "Pennyrile" because of the pennyroyal plant which grows so thickly on neglected fields. This is the same formation as the shale hills of the Highland

[3] Agriculture affords many examples of the profit to be obtained from better methods, intensive cultivation, and higher yields. A cost of production study of two tobacco farms of equal fertility and only a mile apart which were operated by tenant farmers gave the following results:

TOBACCO PRODUCTION

	Farm No. 1	*Farm No. 14*
Man labor	302 hours	251.7 hours
Horse work per acre	81.6 hours	98.8 hours
Yield per acre	1088 lbs.	553 lbs.
Cost per acre	$81.12	$69.36
Cost per pound of tobacco sold by tenant*	0.11	0.19
Price received	0.20	0.10

*Since the tenant farmer gave one-third of his crop as rent to the landlord, the cost of the tenant-farmer's tobacco is obtained by dividing the cost per acre by two-thirds of the yield.

Source: J. B. Hutson and W. A. Finn, *Man Labor, Horse Work, and Materials Used in Producing Crops in Christian County,* Kentucky Agricultural Experiment Station, University of Kentucky, *Bulletin* 274, June, 1926.

Observe carefully the yield per acre, the cost per pound, and the price received (apparently due to better tobacco). The differences in yield were due largely to better cultural practices on Farm No. 1.

It is a common practice in Kentucky for the share-cropper to give the landlord one-third

Rim[4] (on the eastern side of the Bluegrass), but it is less steep and much of it is in general farms with tobacco as a money crop. Here more fertilizer must be used, and the tobacco is dark, in contrast to the light Burley tobacco of the Bluegrass.

Farther westward yet, dark tobacco is grown on alluvial lands near the junction of the Ohio and the Mississippi. In some places the tobacco area has crossed the Ohio into Indiana and Illinois and also southward into Tennessee, but it is chiefly in Kentucky, where one-fourth of the tobacco in the United States (1929) was grown upon 123,455 farms. The market towns of the Tobacco Belt have large warehouses where the leaves are sorted and piled in classified heaps for the inspection of buyers. Louisville (pop. 308,000) has as its chief industry the distilling of liquors, and has long been famous for its Kentucky Derby. It is also a very important tobacco warehousing and manufacturing center. Tobacco comes to this place chiefly in hogsheads, which often cover the sidewalks and can be seen dimly in great vaultlike warehouses as one passes along the streets. For some years Lexington (pop. 46,000), in the heart of the Bluegrass, has been the world's largest loose-leaf tobacco market. During the 1938–39 season, 75,561,000 lbs. of loose-leaf Burley were sold in Lexington.

THE BLUEGRASS

The Kentucky Bluegrass pastures have been famous for a century as the feed of fast horses. The pastures are probably no better than are similar pastures of many Corn Belt localities, but to the early settler, as to the present traveler, the impression of richness is most vivid after long journeys through rough Appalachia, with its poor, sandy hills, and shaly ridges.[5] Because of this contrast, the Bluegrass has perhaps received a fame greater than its excellence merits, but we should not forget the enduring richness of the phosphatic limestone upon which it rests.

This region has suffered badly by soil erosion wherever cultivated. This fact is a major reason why much of the land is in grass. The wealthy landlords are able (because of tobacco, fast horses, and prior to the Civil War, slaves which were reared to sell) to conserve most of the soil by keeping it grass-covered.

Once this was the center where were bred the carriage horse, driving-horse, and race horse of the United States. The rich man of Chicago and Boston drives through the park in an automobile now, instead of behind a pair of $1000 or $5000 horses, and ordinary farmers talk mournfully of the golden age which is past. The unromantic mule, without pride of ancestry or hope of posterity, destined for the cotton fields of the South, often nibbles the

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of the crop as rent. In the preceding example the landlord on Farm No. 1 sold his share of the tobacco crop at a price of $72.60 per acre, but the landlord on Farm No. 14 obtained only $18.40.

[4] Farther south in Tennessee the western Highland Rim is higher, steeper, poorer, and shows its small production on many of the United States Department of Agriculture production maps.

[5] The first 50 villages of Kentucky were on the Bluegrass.

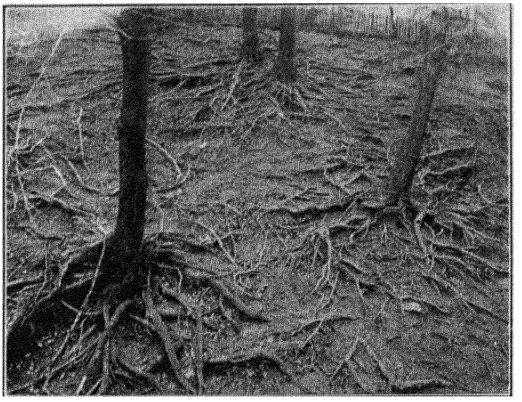


FIG. A. This mat of roots shows how trees hold the earth for the use of man. (Courtesy C. S. Deam, State Forester, Indiana)

grass where his more romantic and pedigreed relatives trod in the opening years of the twentieth century.

So much for the ordinary farm. But no sooner does the horse go out of use for work than he assumes new importance for play. Horse-racing has increased greatly. One is scarcely a millionaire if one is not in horses. For this reason the bluegrass of the Kentucky pastures with its roots in limestone puts good bone into the colt that feeds upon it — very good bone indeed. The Bluegrass region is now the great race-horse breeding area. The marvelous Man-o'-War on Faraway Farm is insured for $500,000. Breeding race horses is more a sport than a business — the sport of millionaires, who can pour out money to erect bronze statues to favorite steeds, buy up farms, make great estates, and spoil a rural community. In the spring special trains run in sections carrying people from New York to witness the Kentucky Derby — a great horse race.

The Nashville Basin, with less tobacco, is more like the Corn Belt in producing larger quantities of corn and hogs.

THE AGRICULTURAL FUTURE

The forward movement in agriculture described at some length for the Cotton Belt and the Corn Belt includes this region also. Tennessee affords an interesting example of the revival. It was not until 1909 that the per capita wealth in this state again equaled the figure it had attained at the opening of the Civil War. It doubled between 1909 and 1917. In 1903 Tennessee had 1 rural high school, and in 1917 there were 70. Although a state law in 1909 made at least one high school compulsory in every county, there was still one county in 1925 that had to be compelled by court action to comply with the law. The county farm agent has become general here, as elsewhere. In many locations in both Kentucky and Tennessee the bankers are selling calves, and eggs for hatching, to schoolboys and girls, to be paid for at the end of the season. The thoroughbred stock movement, characterized by the slogan "Better sires, better stock," is making considerable progress, together with a gradual growth of dairying. Crimson clover, a soil-building legume which is used for a hay crop, is being increasingly grown.

If one takes a long look ahead, the greatest problem of this region of hills is to keep the land from washing away. With its summer rain and winter rain the toll of erosion is one of the most difficult problems that agriculture

must face.[6] Thousands of acres in each of the five states have been ruined and abandoned. Nature's invitation to develop a tree-crop agriculture is particularly strong. Wild pecan trees of excellent fruiting habits reach the height of more than 100 feet along the Ohio lowlands west of Cincinnati, the walnut attains its most majestic proportions, and the fruitful persimmon grows wild in what they call "throwed-out land," so that in the autumn pigs and sheep make paths from tree to tree as they gather the fruit. The Highland Rim has been described as being fairly alive with food in the autumn — butternuts, hickory nuts, walnuts, chestnuts, pawpaws, and persimmons lying on the ground in great abundance.

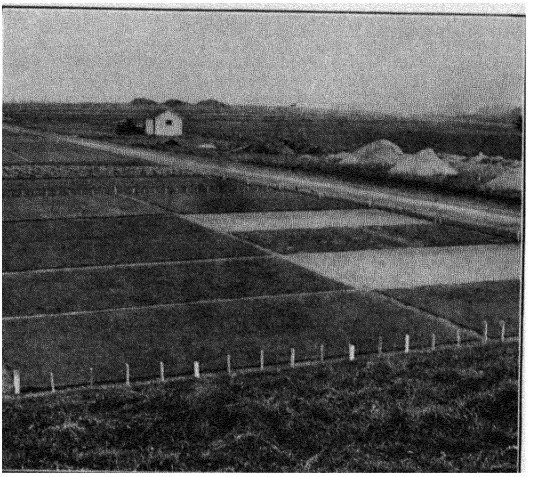


FIG. A. This picture was taken at Pennsylvania State College, but its experiments may be just as serviceable to the Ohio Valley and other eastern regions as to Pennsylvania. This station has isolated 174 individual selections of bent grass (*Agrostis palustris* and *Agrostis canina*) and 130 types of Kentucky bluegrass and red fescue. It is now making performance tests on about 150 of these isolations as to their disease tolerance, cold resistance, earliness, general vigor, foliage density, and heat tolerance. (Courtesy Pennsylvania Agr. Exp. Station)

CITIES AND MANUFACTURING

The Ohio Valley seems to be quite the equal, possibly the superior, of the Corn Belt in materials of manufacture and possibility of access. The element of superiority comes from the Ohio River, a navigable waterway running through the center of the region, connecting with the coal and iron centers around Pittsburgh at one end and with the great Mississippi at the other. In 1824 our first national river and harbor bill was passed to improve the Ohio-Mississippi. In 1929 a 9-foot channel was completed between Pittsburgh and Cairo, and in recent years the Ohio River has handled about 20,000,000 to 25,000,000 tons of freight annually, chiefly coal. Before long the Tennessee Valley Authority will complete a 9-foot channel in the Tennessee River making navigation possible between Knoxville and Paducah, Kentucky, at the mouth of the river. These waterways should be a much greater boon to cities along their banks than they now are.

[6] "Even on the fairly level lands of central Kentucky, soil washing is a serious problem. Every summer witnesses one or more torrential rains, which carry many thousands of tons of rich soil into the creeks and rivers; and an equally serious loss occurs in the winter time. Unlike the soils of northern latitudes, which freeze up during the winter and remain frozen until late winter and early spring, Kentucky soils wash badly during the winter. This is due to the frequent thaws followed by hard rains, which result in the sloughing off and washing away of land which is at all sloping, unless this land is covered by a heavy sod." — W. D. Nicholls, "Two Thousand Acres of Grass," *Country Gentleman*, Feb. 2, 1918.

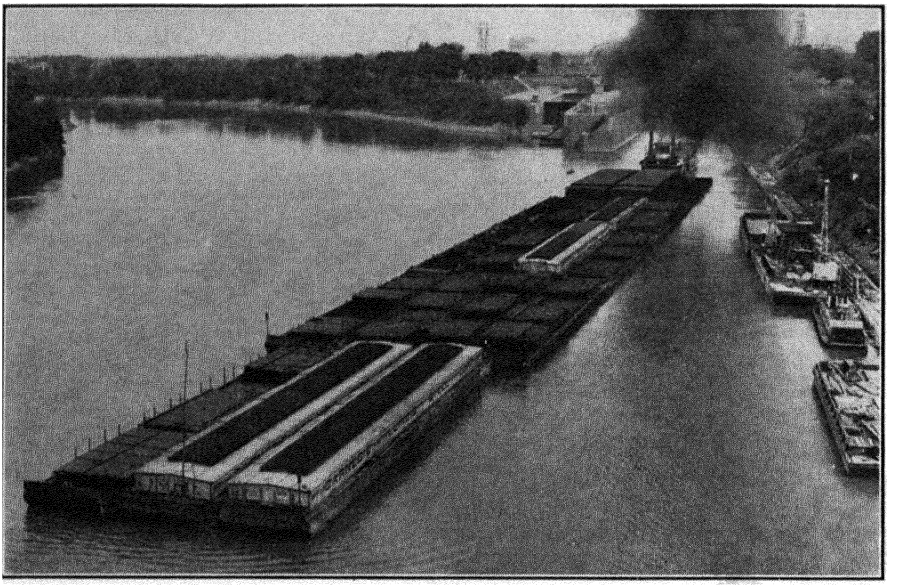


FIG. A. A towboat leaving Lock No. 41, Ohio River, en route from Pittsburgh to New Orleans with 19 barges carrying 14,800 tons of steel products. Draft of barges, 8 feet; length of tow, 1,118 feet; width of tow, 104 feet. The cities along the Ohio River have a great commercial and industrial opportunity. (Courtesy U.S War Dept)

The Ohio River made Cincinnati the first metropolis of the West. In 1930 this was a city with 451,000 people, but in 1860 it was the largest city west of the Alleghenies and north of New Orleans. Although the Civil War shut off and devastated its trade area in the South, and it has long since been surpassed by Chicago, Cleveland, and St. Louis, nonetheless it still has a great distributing trade and important manufactures of great variety.[7] Cincinnati leads the country in the manufacture of machine tools, soap, and playing-cards. In 1937 machine-tool manufacture, with an output worth $40,000,000, was the city's principal industry. Cincinnati has long been an important meat-packing center, drawing supplies from the Corn Belt and the Ohio Valley. Other industries include the manufacture of paper, motor-vehicle bodies and parts, clothing, office furniture, laundry machinery, and malt liquors. The city is sometimes spoken of as the most Northern of Southern cities and the most Southern of Northern cities.

Kentucky, the home of Bourbon whisky, boasts (or admits) that the distilleries of Louisville and other Kentucky cities make it the leading whisky-producer among the states. In 1939 a seven years' supply was ripening in its warehouses. Tobacco, whisky, race horses, and horse races! — Kentucky! Is she proud!

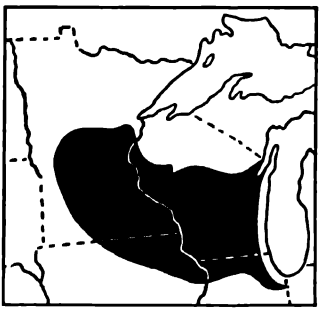
Cincinnati and Louisville seem to be the southwestern outposts of the northeastern manufacturing region, which may be said to go from southern

[7] In the attempt to regain Southern trade, the city built a railroad to Chattanooga, the longest municipally owned railroad in the world.

Maine to Chicago. Other cities of the Lower Ohio Valley, Nashville (pop. 154,000), capital of Tennessee, with an important rayon industry, Evansville, Indiana (pop. 102,000), an important furniture center, Lexington, the horse and tobacco market and capital of the Bluegrass, do not seem to show signs of becoming large cities, although they have excellent access to the sources of power and raw materials. It may or may not be a temporary incident that the cities of the Great Lakes and the Atlantic Plain have grown more rapidly than the cities of the Ohio Valley. Perhaps in the course of time it will be found that summer temperature makes the factory worker on the shores of the Great Lakes slightly more efficient than his brother on the banks of the Ohio. This is a matter which only time can tell, and then there is air-conditioning, with tremendous possibilities.

The study of this region in comparison with some of those previously described shows what needless curses some American states have received from the accidents of history combined with the facts of geography, facts quite unknown to statesmen of the past. Kentucky, for example, has in its legislature men from two worlds — the Bluegrass and the "mountain" (Cumberland Plateau). Which shall rule? Sometimes it has taken rifles to decide. Someone has said that Tennessee has no *state* consciousness, no *state* ideals. How could it be otherwise? Look at the *different states* within its borders: from east to west — a part of the Great Smoky Mountains, a part of the Great Valley, a part of the Cumberland Plateau, the Nashville Basin, the western Highland Rim, and finally a part of the Coastal Plain, with a climate that makes it Cotton Belt. Tennessee is an amazing cross-section of many good things, but it is too much to put the representatives from such diverse regions into one legislature and ask them to make good *state* laws. It is more difficult than making general dietary regulations for Mr. and Mrs. Jack Spratt. Many of our states share Tennessee's perplexity. The efficiency of government in America would be considerably enhanced if existing state boundaries were wiped out and new states were created upon the basis of human-use regions. This would simplify and unify the problems of government. The creation of the Tennessee Valley Authority was in part a response to this situation.

Chapter 18. THE NORTH CENTRAL DAIRY REGION



ECONOMIC situations are usually a balance of many factors. Small differences in the weight of one or two factors make a different balance. A good example is furnished by the Corn Belt and its neighbor, the North Central Dairy Region. Like the Corn Belt, this has corn, small grain, hay, and pasture; nevertheless, there are differences. In this region earth, air, and history join to make the silo and the dairy barn the most conspicuous features of the rural landscape; the herd of cows in the pasture replaces the fat beef cattle of the Corn Belt, and the creamery and the cheese factory at the railroad station or the crossroads replace the stockyards and the grain elevator.

Earth helps to make these changes, chiefly through what the glacier did and left undone. Here the glacier dealt more roughly with the land. There are many long or roundish hills called drumlins, which the glaciers made, and there are moraines piled up, marking the ends of glaciers. The landscape is dotted with glacial lakes, wet with glacial swamps, interspersed with gravel banks and sand stretches; in some places it is littered with stone.

This region also includes a nonglaciated area, which is more hilly and less fertile than the Corn Belt. Unlike the western Corn Belt, too, the Dairy Region was fully forested, and farming therefore started with a long fight against the stumps as well as against the works of ice. In comparison with the Corn Belt farm area, the grain area must be smaller. More land must be in pasture — hill pasture, wet pasture, rough pasture.

As this territory is farther north than the Corn Belt, it has a slightly longer winter and a shorter and slightly cooler summer, less suitable for corn. The problem of escape from frost sometimes arises. Dr. O. E. Baker relates the experience of a section in the Driftless Area near Madison where the hills were much better than the valleys for growing corn because air drainage made the valleys cooler at night.[1] Sometimes this difference amounted to 15° F. in from 100 to 150 feet of elevation, and because of it, different varieties of corn were grown on the hills and in the valleys. Corn was planted in the valleys a week or ten days later than on the hills. These facts indicate the necessity for a very careful utilization of the cropland. The conditions favor the silo for the more careful preservation of forage and the cow for more efficient utilization of forage. In 1938 Wisconsin produced over 365,000,000 lbs. of

[1] Speech at the 1915 meeting, Association of American Geographers.

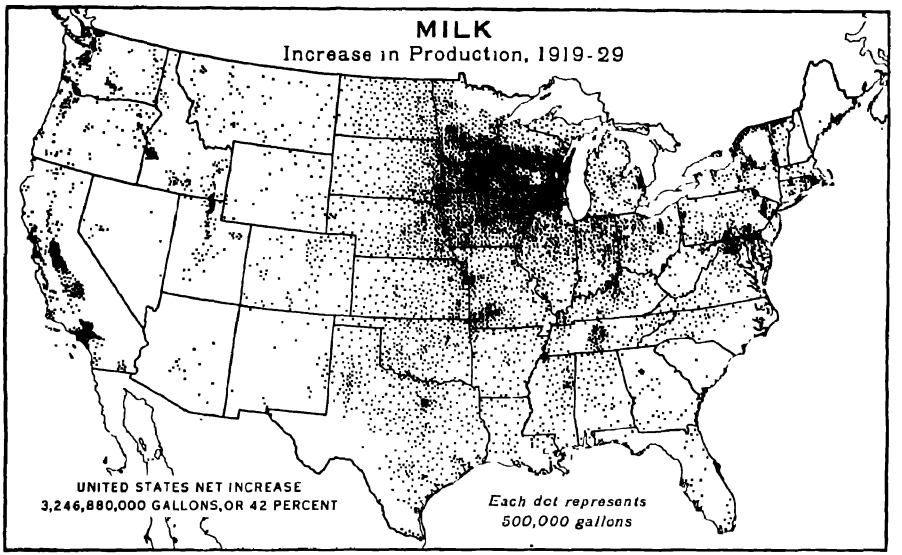


FIG. A. During the period 1919–29 the prosperity of the United States showed itself by wholesome increase in the use of our most vital food, milk. (Courtesy U.S. Dept Agr.)

factory cheese, almost exactly half of the nation's output. It ranked first in the production of whole milk, evaporated milk, and casein, second in the production of condensed milk, and third in the production of butter. The rapid increase of dairying here and the slower increase in the Corn Belt are natural results of the settings.[2]

[2] In 1937 whole-milk production in billions of lbs.: Wisconsin, 11.4; Minnesota, 7.6; New York, 7.4; Iowa, 6.0; butter production in millions of lbs.: Minnesota, 275; Iowa, 211; Wisconsin, 178; Missouri, 98; Ohio, 90. Source: U.S. Dept of Agr., "Disposition and Value of Milk Produced on Farms 1937 and 1938" (mimeographed), and *Dairy Products Manufactured in Factories in 1937*, 1939.

NUMBER OF MILK COWS ON FARMS, JANUARY 1
(thousands)

	1913	1923	1933	1938	*Per cent change* 1913–38	*Rank*, 1938
Wisconsin	1,504	2,195	2,175	2,157	43.4	1
New York	1,465	1,678	1,438	1,395	− 5.	5
Minnesota	1,129	1,641	1,776	1,668	52.4	2
Iowa	1,337	1,160	1,503	1,472	10.	3
Illinois	1,007	1,148	1,122	1,123	11.5	6
Pennsylvania	943	1,071	904	887	− 6.	8
Ohio	869	1,069	966	1,033	19.	7
Texas	1,034	1,052	1,391	1,444	40.	4
United States	20,497	24,429	25,285	24,834	21.5	

Source: U.S. Dept of Agr., *Yearbook of Agriculture* and *Agricultural Statistics*.
Note the changes in rank between 1923 and 1938. The East declines as butter ceases to be a farm industry and moves to the factory and to the West.

Most of this region is in Wisconsin, and Wisconsin had been through two periods of exploitation before it entered the epoch of the dairy cow. The need for lumber was responsible for the first period of exploitation. The treeless western Corn Belt called for lumber with which to build houses, barns, and fences; lake boats gave easy access to the Eastern markets; the rafts on the Mississippi reached the Southern markets; so the trees of Wisconsin floated away, and that state was important first as a producer of lumber.

Following the lumberman came the stump-fighting farmer. He grew wheat — wheat by exploitation: again and again he planted wheat in the same place, and then the wheat business was bowled over by soil exhaustion, chinch bugs, and cheaper wheat from the Northwestern Plains. Wisconsin then heard the call of diversified farming. It could not refuse to hear, as the South has done. It had no such cash crop as cotton. The long season of frost gave the dairy cow the queen's position in the new regime in the North.

THE HISTORICAL FACTOR

History has furnished its contribution to the changes in this region — the land was settled by the Yankees, who were accustomed to strenuous labor; by Danes, Swedes, Norwegians, Swiss, and Germans, also accustomed to strenuous labor and to dairying.

Then came Governor Hoard and the university. As a practical dairyman Hoard established the periodical called *Hoard's Dairyman*. It became the leading dairy journal of the United States. Hoard was elected governor. He put the machinery of the state back of the state's greatest industry. The agricultural department of the University of Wisconsin became the leading dairy school of the United States. Its extension service carried dairy lore to every hamlet and farm; in its laboratories were produced five of the six tests used everywhere in dairying. One of its staff, Professor Babcock, invented in 1890 a machine for testing milk. Instead of making a million out of his invention, Professor Babcock patented it, and gave to the world the Babcock Tester. By using this machine in his own barn a farmer can test the quality of the milk of every cow. There are now hundreds of cow-testing associations in the United States. Twenty or thirty dairymen hire a man who visits their farms at intervals, weighing and testing the milk of a day while the farmer goes on with his business. As a result these herds are improving. The machine records the cow's history and her horoscope—it tells of her past and her future. The farmer reads that this cow's milk has 3.1 per cent butter fat — away with her to the hot-dog factory! She is not worth milking, nor is she fit to become the mother of the next generation of cows. By the simple process of eliminating the unfit and breeding from good sires, the average annual output of a herd of cows can, in a decade or two, be raised from 3000 to 6000 or 7000 lbs. of milk per cow. Good cows occupy no more space than poor cows, nor do they eat very much more food.

When one notes that an average of 1 lb. of milk more per week per cow is worth $20,000,000 a year to the United States, we begin to see how millions and even billions of new wealth are arising, and may arise, from the applica-

tion of science to production. In giving this boost to farming, the agricultural colleges and their extension service ("University on Wheels") are among the great creative factors in national enrichment. Wisconsin was a leader in this, but every American state and Canadian province is also working at it; so is Europe, and so are the Antipodes.

Wisconsin was fortunate in its human material. It started with the Yankees who emigrated. Then it received a lot of German liberals who were driven out of their native land in 1848. These people attracted other northern European liberals. Wisconsin's young state university had a president named John Bascom who taught Charles R. Van Hise, who in turn became president and was able, perhaps more than any other, to make a university a part of a state and to make the state feel it. "Wherever spirit grows by mysterious contact with spirit, in the passion to make knowledge serve human needs, there is the essence of the University Idea," said Major Edward Fitzpatrick of the Wisconsin Board of Education.

Out of all this came the ability to co-operate, so necessary in agriculture, especially in dairying. Wisconsin has a large number of co-operative creameries, cheese factories, milk-selling associations, breeding associations, telephone companies, insurance companies, livestock-shipping associations, etc., the majority of these co-operatives being creameries and cheese factories.[3] Thus geographic, historic, racial, and cultural factors have worked together to make a dairy industry.

THE DAIRY FARM

The typical farm in the Dairy Belt has a hayfield, an oat field, a cornfield, and a silo into which a substantial part of the corn is put. Fields of corn with the ripened grain are not so often left standing while the fodder wastes, as is expedient in the Corn Belt. Instead, most of the corn that is not put into the silo is cut and put in the shock, and the fodder is carefully saved for winter feed. The hayfield is more important than on the Corn Belt farm. Pasture fields cover a larger area of the surface. A small-grain crop for sale is not very common. The oat crop is used as stock food on the farm. Pigs, an important side crop, are fed in part on the skimmed milk that remains after the cream has gone to the churn and on whey from the cheese factory.

The successful dairyman, unlike the successful Corn Belt farmer, is not in a position to spend the winter in Florida or California. His twenty, thirty, or forty cows must be milked morning and evening. Their stables must be cleaned. The milk must be cared for every day, including Sunday, the Fourth of July, Labor Day, Christmas, an extra day in leap year, the day the farmer dies, and the day he is buried. The cow is terrible in the regularity

[3] In March, 1937, Wisconsin had the following co-operatives: 800 cheese factories; 275 creameries; 225 livestock-shipping associations; 275 supply-purchasing associations; 24 milk-bargaining associations; 1 central butter-sales organization; and 1 central cheese-sales organization. Prof. Loyal Durand, Jr., of the University of Wisconsin reports that at the present time (1940) candidates for a teaching certificate in Wisconsin are required to present credits in Co-operative Marketing and in Conservation.



FIG. 408 A. Mechanization comes to the dairy farm. The arduous and backbreaking jobs of cutting ensilage corn, picking it up from the ground, and loading it on the wagon are done by the power of petroleum and a fraction of the previous man power. The rubber tire has recently invaded field and farmyard with almost as much satisfaction as it has given on the highway. (Courtesy Allis-Chalmers)

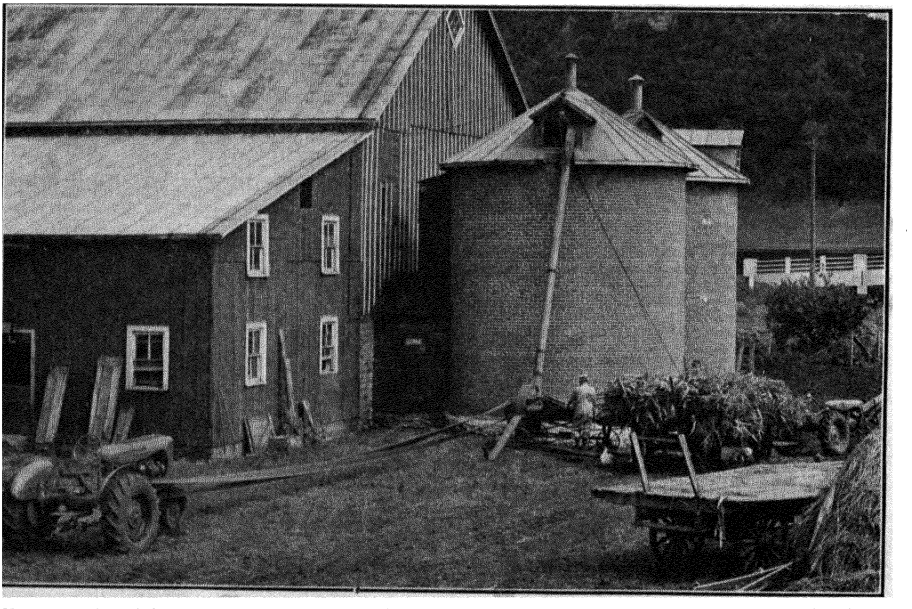


FIG. 408 B. The power of petroleum chops the cornstalk, ear, husk, and all, to little bits and blows them into the top of the silo. (Courtesy Allis-Chalmers)

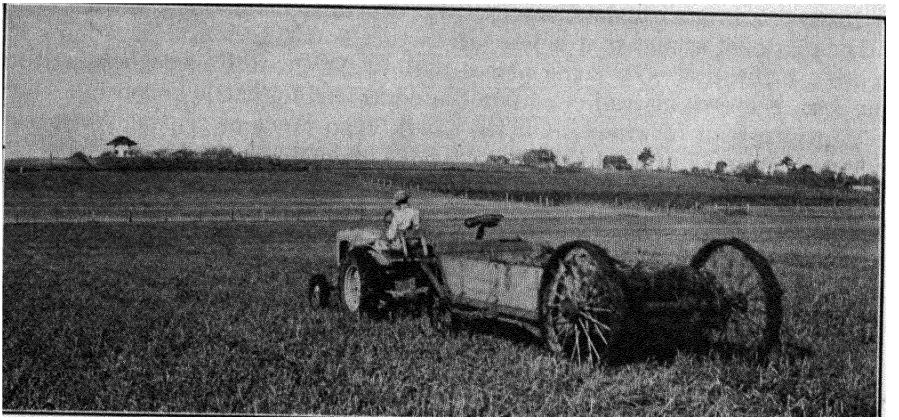


FIG. A. The tractor that cut the corn, chopped it into silage, and blew it into the silo now draws the manure-spreader that returns the refuse to the field for the repetition of the life cycle of vegetation. With the addition of chemical fertilizers, chiefly a product of machinery, and the further addition of the mechanically driven milking machine, we have the basis for an abundant milk supply for everyone as soon as we become smart enough to devise a system that lets people work if they wish to. (Courtesy Allis-Chalmers)

of her production, especially the butter cow. The cheese cow is not so terrible. She takes some time off.

In the Driftless Area and in some of the other hilly sections, the cheese industry predominates. Cheese is a good summer industry, because the cow, supported by the pasture of the farms where it is difficult to raise winter forage, is milked only during the pasture season, and spends her winter on scanty maintenance rations.[4] For the continuous production of milk — the practice on farms which sell milk to the butter factory — it is necessary to provide expensive milk-producing winter feed for cows, and to see to it that cows begin their milking periods at such times as will maintain regularity of herd output.

European cheese-makers who emigrated to Wisconsin brought their art with them, so Wisconsin turns out American Swiss, American Camembert, American Roquefort, American Limburger, and many other brands, each with its hosts of appreciators in many Eastern cities.

In 1935 Governor La Follette signed a bill requiring all public eating-places to serve two-thirds of an ounce of Wisconsin cheese and two-thirds of an ounce of Wisconsin butter with every meal costing 25 cents or more. So when you eat a meal in a Wisconsin restaurant, the law requires that you get cheese for breakfast, cheese for dinner, and cheese for supper. One shudders to think of what might happen to restaurant meals in other states if their legislatures should decide to boost the sale of local products.

[4] Cheese-making in the summer only is particularly common in the foreign cheese areas of southwestern Wisconsin. In most of the state the cheese factories operate right through the winter season, although the amount of milk received is not so great as in the spring and summer. Some of the factories may make cheese only every other day during the winter, since they are able to keep milk fresh at that season, but in the spring, summer, and autumn cheese is made daily.

In comparison with the Corn Belt, the North Central Dairy Region bears other marks of a land that is less fat, farther north, and in need of more intensive utilization. In some places barley, the great European substitute for corn, is grown instead of corn and used as feed for cattle and swine. Rye is grown instead of wheat. On the sandy loam lands of central Wisconsin, potatoes are an important money crop. The heart of the Corn Belt is too hot for a good crop of potatoes. Not so the heart of the Dairy Belt. Moreover, its summer coolness permits green peas to thrive so well that they are grown in the fields as a money crop. Peas are planted broadcast like wheat, cut with a mowing machine like hay, and raked up with a horse rake, thrown upon a wagon to be forked off into a threshing machine that hulls them out as peanuts, wheat, and rice are threshed. The pea vines are put into the silo, and thus finally get into human consumption as milk.

In considering this agriculture, it should be remembered that the Corn Belt has more possible productivity per square mile and that the Cotton Belt has more than either — granted similar expenditures of capital, labor, and intelligence. This region is a dairy region more from economic necessity than from geographic superiority. In this connection, however, we should remember about the cow and heat (see page 313).

The southeastern corner of the Dairy Belt owes its existence to market conditions — the demand for fresh milk by the millions who live in Chicago and other cities near the southern end of Lake Michigan. Further growth of Lake Shore cities will increase the Dairy Region at the expense of the Corn Belt and the Spring Wheat Belt, where the farmer seeks to rid himself of one-crop bondage and submit instead to labor bondage. The boundaries between the Dairy Belt, the Corn Belt, and the Spring Wheat Belt are transition lines that tend to move. Already the dairy industry is invading the lands of meat and wheat, and butter from Illinois, Iowa, Missouri, and the Dakotas can be found in competition with Wisconsin butter in the great urban markets of the East. Butter from this region is distributed over the United States almost as widely as are fruits and vegetables from Florida and California. New England, be it remembered, produces one five-hundredth of Boston's butter.

THE AGRICULTURAL FUTURE

The agricultural future of this region has already begun. Increasing population in North America, causing an increased demand for food, can also cause an increase of output through the use of better animals, better varieties of crop plants, better tillage, reduced acreage of pasture, and other forms of intensification such as prevail in Denmark, Holland, or Switzerland. Filled milk, a cooking material in which vegetable oil of tropical origin replaces the fat of skimmed milk, is a suggestive way of increasing regional efficiency. Class legislation killed this perfectly good food — good provided the vitamin supply can be obtained from some other source. The chief change that is likely in the Dairy Region is that it may spread out into the Corn Belt and the Spring Wheat Belt. Dairying is a natural next step for both of these regions, and dairying is increasing in both of them.

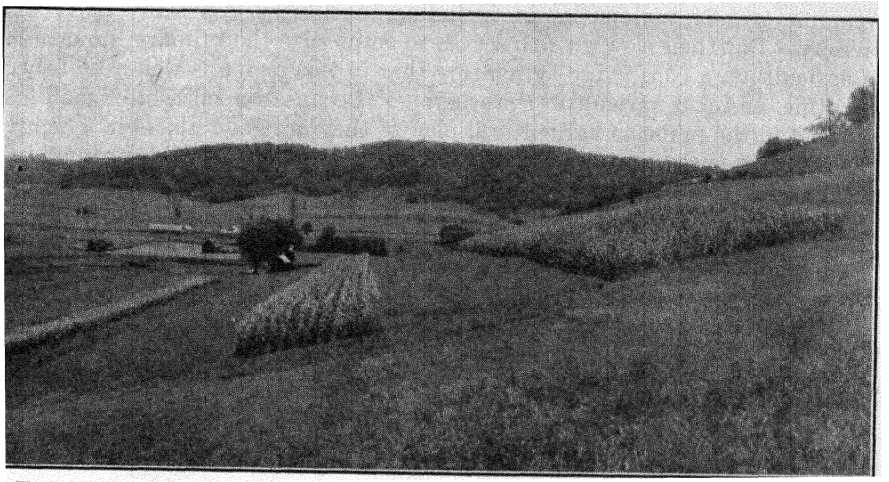


FIG. A. This strip-crop farmer near La Crosse, Wisconsin, expects his land to last. At the top is woods, then above the fence, pasture. Below the fence the strips are: clover, corn, alfalfa, corn, alfalfa and potatoes, corn. The small amount of runoff in the corn strips is checked, spread, and partially absorbed in the alfalfa strips, so that it does virtually no damage in getting down the hill. (Courtesy R. H. Davis, U.S. Soil Cons. Service)

CITIES AND MANUFACTURES

Milwaukee is on the edge of this region, but like Chicago it is primarily a creation of the lake and is presented in another chapter. The northwestward extension of dairying places St. Paul and Minneapolis within the Dairy Region, but the economic function of the Twin Cities is as the metropolis of the Spring Wheat Region, and they are presented in that chapter.

CITIES OF THE NORTH CENTRAL DAIRY REGION

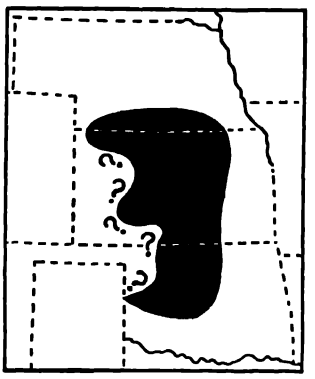
(pop. in thousands)

City	1910	1920	1930	1940	*City*	1910	1920	1930	1940
Minneapolis	301	380	464	492	Madison	26	38	58	67
St. Paul	215	234	272	288	Elgin	26	27	36	38
Oshkosh	33	33	40	39	Aurora	30	36	47	47
Fond du Lac	19	23	26	27	Dubuque	38	39	42	44
Winona	18	19	21	22	Eau Claire	18	21	26	31
La Crosse	30	30	40	43					

The other Dairy Belt cities have no particular advantage as cities, as is attested by their small size and slow growth. Most of them, especially those in the north, began with the riotous, exploitive prosperity of the sawmill town, and have since matured into various manufacturers of wood, and in some cases built paper mills, for which glacial streams furnish a moderate amount of power. Some of these towns have developed textile mills and small

manufactures of various kinds, including machinery, especially dairy machinery. But their slow growth serves to emphasize the primary importance of agriculture, a conserving agriculture that in this region is well established, scientific, and (for agriculture) prosperous. Because the cities are small and situated in the midst of agricultural plenty, they are good places in which to live. In comparison with the Corn Belt cities, the longer, colder winter is a disadvantage, and the cooler summer in the vicinity of many beautiful lakes is a distinct advantage, especially with regard to the joy of living.

Chapter 19. THE WINTER WHEAT BELT



IN the middle of Kansas and the neighboring parts of Nebraska and Oklahoma is the Winter Wheat Belt, 50,000 square miles more or less in that sea of treeless prairie that stretches from the longitude of central Kansas to the Rocky Mountains and from Texas far into Canada. In so vast a stretch of surface uniformity, climate sets the limits of producing regions. This region is a wheat region because of a series of neat adjustments of the requirements of the wheat plant to the climates of central North America.

Wheat is a native of some Mediterranean land where the rainfall is slight and occurs chiefly in winter. The wheat plant is adjusted to those conditions. Winter wheat sprouts in the fall and survives the frost of a moderate winter, and in the warmth of spring the little plant makes a big bunch of grasslike leaves. (It is a grass.) In the sunny weeks at the beginning of the dry summer it throws up tall stalks that bear the heads into which the plant finally sends its vitality in the form of rich kernels of grain that fill and mature best during the weeks of unbroken sunshine.

BOUNDS OF THE WINTER WHEAT BELT

The western boundary of this region is set by drought at the place where wheat fails so often that the farmer leaves most of his land in grass. Just where this is remains to be seen. Perhaps it will be set by law, as it should be. The eastern boundary is set where the rain increases to an amount necessary for corn. East of this boundary corn is usually a more profitable crop and becomes the farmer's chief dependence (Figs. 370 A, 417 A), although wheat is also grown on a majority of the farms even though it is occasionally injured somewhat by the humidity and rain of good corn weather in early summer.

To the south the increasing humidity and heat permit cotton and at the same time injure wheat. At the north of the Winter Wheat Belt the cold winter, in a land of little snow, kills the plants too often. It is here that spring-sown oats take its place.

THE WHEAT FARM

Since 1890 the farmers in the Winter Wheat Belt have had a fairly steady practice of putting about three-fourths of their crop area in wheat. Although this belt is not the best place in the world for wheat, wheat happens to be the

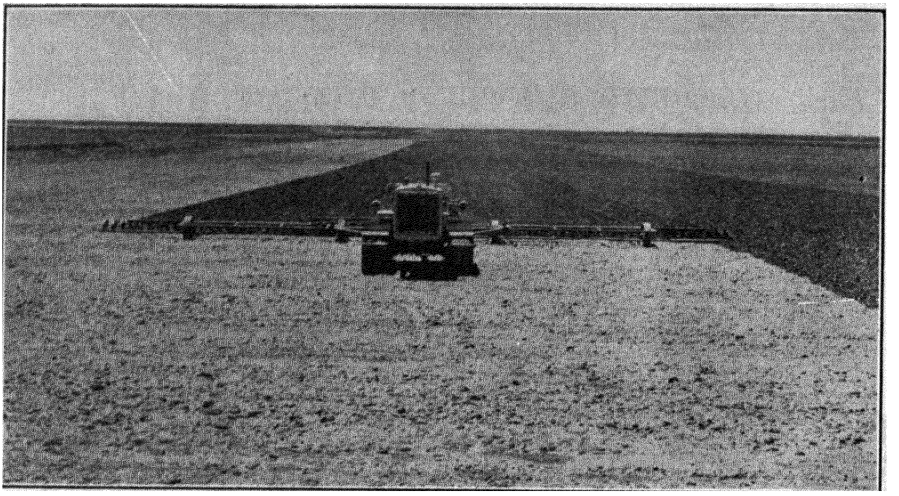


FIG. 414 A. Stoneless, level, seemingly endless -- such a temptation to the makers and users of machinery! The tractor with its spring-tooth harrows tears up a 66-foot strip, doing 30 acres an hour on 5½ gallons of 8½-cent fuel. This tract of perfect-looking land near the Kansas-Colorado boundary is trying to be Wheat Belt. Its future use is uncertain, depending on rainfall and erosion. The little specks on the horizon are farmsteads. The landscape is a perfect type of the level western part of the Kansas Wheat Belt. (Courtesy Caterpillar Tractor Co.)

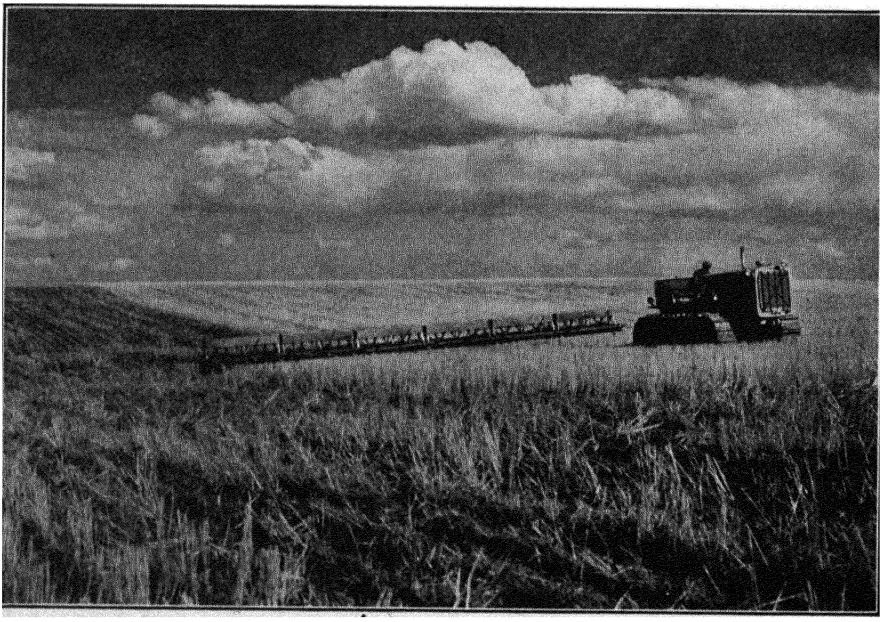


FIG. 414 B. Wheat follows wheat as this outfit seeds 20 acres per hour, and as this owner is planting 4000 acres, we get a hint of population density. (Courtesy Caterpillar Tractor Co.)

best crop for it, although the yield is uncertain, as must be the case in a region which has calamity for three of its boundaries.

A comparison of Kansas and Illinois wheat and corn yields reveals several facts. Illinois is a better place to grow either grain, but it has a far greater superiority over Kansas in the production of corn. Kansas is a poorer place to grow either grain, but it can grow wheat more successfully than corn, with the possible exception of the eastern quarter of the state that lies within the Corn Belt. In Kansas, especially central Kansas, far more than in Illinois, the eternal question is "Will there be enough rain?"

COMPARISON OF WHEAT AND CORN YIELDS

	Wheat yields (bushels per acre)			*Corn yields* (bushels per acre)		
	U.S.	*Ill.*	*Kans.*	*U.S.*	*Ill.*	*Kans.*
1910	13.9	15.0	14.1	27.7	39.1	19.0
1911	12.5	16.0	10.7	23.9	33.0	14.5
1912	15.9	8.3	15.5	29.2	40.0	23.0
1913	15.2	18.7	13.0	23.1	27.0	3.2
1914	16.6	18.5	20.5	25.8	29.0	18.5
1915	17.0	19.0	12.5	28.2	36.0	31.0
1916	11.9	11.0	12.0	24.1	31.0	10.0
1917	13.2	16.9	11.5	26.2	40.0	13.0
1918	14.8	20.0	13.5	23.9	36.5	7.0
1919	12.9	17.2	13.2	27.3	36.0	15.5
1920	13.5	15.4	15.6	30.3	35.0	26.2
1921	12.7	16.2	12.7	28.4	35.0	22.8
1922	13.8	17.4	12.8	27.0	35.5	19.0
1923	13.3	18.0	10.1	28.4	37.5	23.0
1924	16.0	16.1	16.0	22.1	33.0	21.7
1925	12.8	16.1	9.2	27.6	41.0	17.6
1926	14.7	19.0	14.8	25.6	36.0	11.5
1927	14.7	13.9	11.2	26.6	32.0	27.0
1928	15.4	15.9	16.3	26.6	38.0	25.0
1929	13.0	14.7	12.4	25.8	35.5	18.0
1930	14.2	18.2	14.2	20.5	26.5	12.0
1931	16.3	23.3	18.5	24.1	37.0	18.0
1932	13.1	15.6	11.6	26.5	43.0	19.0
1923–32 av.	14.4	17.1	13.4	25.4	36.0	19.3
1933	11.2	16.4	9.1	22.7	27.0	11.5
1934	12.1	17.6	9.8	16.0	21.5	3.5
1935	12.2	14.5	9.3	24.0	38.5	9.0
1936	12.8	17.5	11.5	16.2	23.5	4.0
1937	13.6	17.4	12.0	28.3	48.0	12.0
1938*	13.3	18.5	10.5	27.7	45.0	20.0

* Preliminary.

Source: U.S. Dept Agr., *Yearbook of Agriculture* and *Agricultural Statistics*.

In 1901, an unusually good year, twenty-eight contiguous counties in Kansas earned the title "million-bushel counties." Sometimes wheat spreads over the level or gently rolling plain almost as far as one can see. With the aid of tractors, gang plows, disk harrows, and wide-reaching seeders, farms have grown rapidly in the Winter Wheat Belt. During the World War it became the patriotic and profitable duty of every wheat farmer to grow more wheat. Under the stimulus of high prices during the wartime and postwar booms,[1] the wheat acreage in Kansas was nearly doubled, reaching a peak of 11,600,000 acres in 1919.[2] Some of this was to the west of the area shown as Winter Wheat Belt on our map, but the Wheat Belt also increased its acreage enormously. During the 1920's there developed an era of low prices for what the farmer had to sell and relatively high prices for what he had to buy. In other parts of the country the farmer often had the alternative of growing other crops when the wheat price got too low, but in the Winter Wheat Belt nature gave the farmer no such choice. To meet his taxes, interest, and other debts, he had to keep on growing wheat.[3] He was confronted with a situation of "grow wheat or go bust," and as the wheat price continued to decline, many a Wheat Belt farmer did both.[4] Following the stock-market crash of October, 1929, the nation became engulfed in an acute and prolonged business depression, and it was not until the Government, under the New Deal, began to pay the farmers for not growing crops that the plight of the wheat farmer was alleviated.[5]

The great crisis of the year is the wheat harvest, which comes in June and early July. Can the farmers get labor? Each year at harvesttime there occurs a migration of transient labor through the great American Wheat Belt. The movement begins in Texas about the first of June and moves northward with the advancing season. The unemployed men looking for a job in the harvest fields come from the lumber camps, oil fields, and farms of the South and from the factories, farms, and mines of the North. Some are bums, some are seekers after adventure, and others are college students on vacation. At the peak of the movement, in some years, about 250,000 migrant workers are helping the wheat farmers to harvest their crops. After the work is done, some move on to the grainfields of Canada and thence to the fruit orchards, sugar-beet fields, mines, and railroad construction camps of the West, if perchance there should be any. Others seek work back whence they came, some

[1] In 1913 the average price of No. 2 hard winter wheat on the Kansas City market was 88 cents per bushel. Between April, 1917, and November, 1920, it never dropped below $2 per bushel. Average annual price; 1920, $2.46; 1921, $1.33.

[2] Average annual wheat acreage in Kansas, 1909–13, 5,600,000 acres.

[3] Millions of acres of wheat harvested in Kansas: 1920, 9.3; 1921, 10.6; 1922, 9.8; 1923, 8.3; 1924, 9.8; 1925, 8.6; 1926, 10.1; 1927, 9.9; 1928, 10.5; 1929, 12.1; 1930, 12.4; 1931, 13.6; 1932, 10.4; 1933, 6.8; 1934, 8.6; 1935, 6.9; 1936, 10.5; 1937, 13.2; 1938, 14.5 (U. S. Dept Agr., *Yearbook of Agriculture* and *Agricultural Statistics*).

[4] Average annual price of No. 2 hard winter wheat per bushel on the Kansas City market: 1920, $1.83; 1921, $1.20; 1922, $1.13; 1923, $1.05; 1924, $1.35; 1925, $1.63; 1926, $1.35; 1927, $1.35; 1928, $1.12; 1929, $1.20; 1930, $0.76; 1931, $0.47; 1932, $0.51; 1933, $0.88; 1934, $0.98; 1935, $1.05; 1936, $1.21; 1937, $1.11 (U.S. Dept Agr., *Agricultural Statistics*, 1939, p. 24).

[5] The farmer benefited through the payments that he received from the Government for curtailing acreage and from the higher market price obtained for the wheat which he grew.

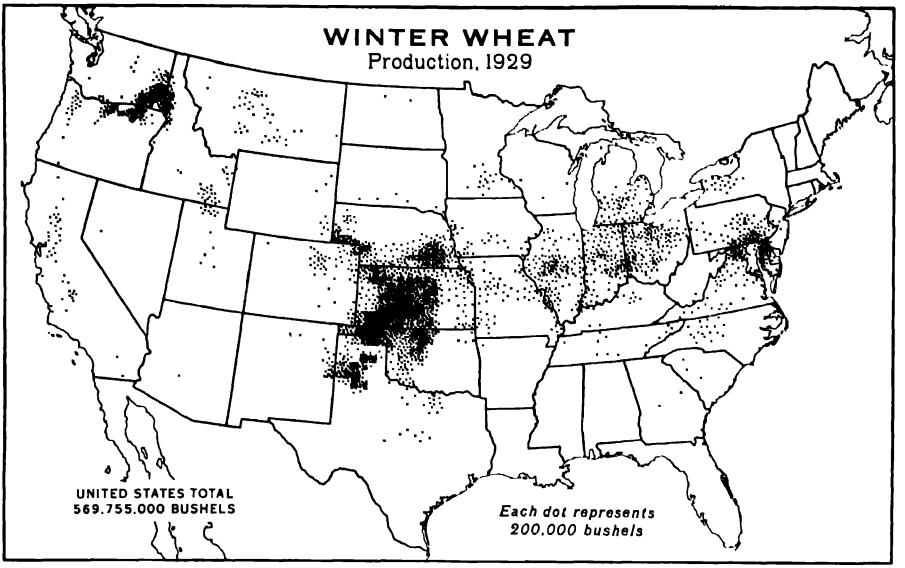


FIG. 417 A. Winter-wheat production, 1929. We hope the Government will remap this every five years. It will be interesting to watch. (Courtesy U.S. Dept Agr.)

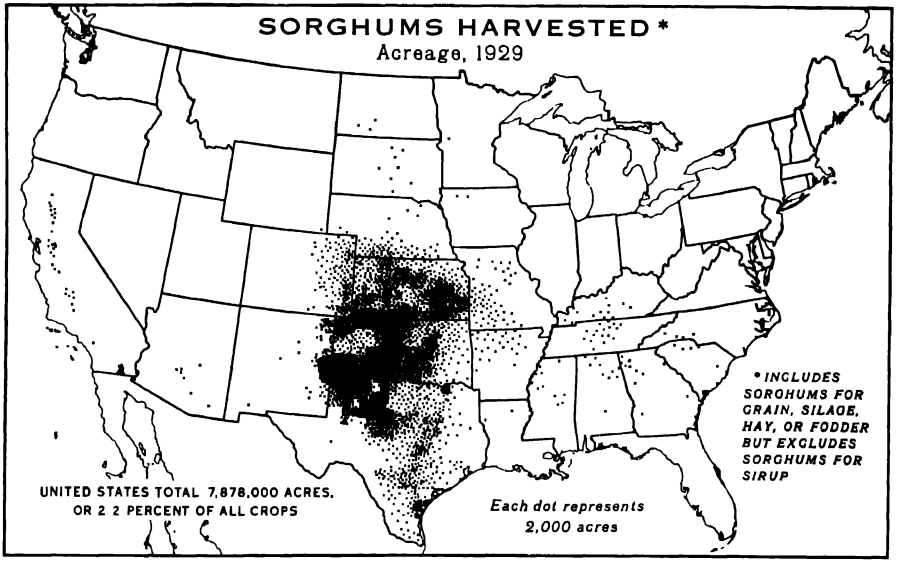


FIG. 417 B. Compare this with the map of corn from period to period as the two grains compete for land. (Courtesy U.S. Dept Agr.)

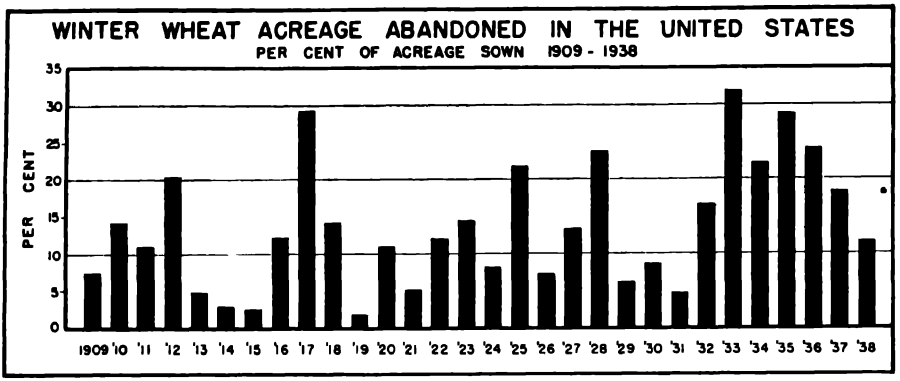


FIG. A. This graph shows how nature continually raps the knuckles of the men who try to extend the wheat areas unwisely. Most of the abandonment occurred west of Missouri. (Courtesy U.S. Dept Agr.)

get on relief, and the rest go back to college. Life is not easy for these transient workers. Bad weather may delay the harvest, while they are impatiently waiting for work. Bumming a ride on the railroad is dangerous, and thumbing a ride on the highway is not always easy. In recent years the use of the combine, which cuts and threshes wheat in one operation, has reduced the dependence of the Wheat Belt farmer upon this supply of floating labor. In still more recent years drought has induced many farmers to go back to threshing in one place, so that they might have a strawstack as emergency feed.

The life of a farmer in the Wheat Belt is a double gamble. Will he get a crop? Climate answers mostly in the affirmative. Will he get a good price? The answer comes from other continents.[6] In addition to the double gamble of weather and market price is the chance that a dust storm may ruin the crop and blow the best soil away, or that the yield will be reduced by Hessian flies, chinch bugs, grasshoppers, rust, and scab.

Sometimes a severe drought strikes the region, as happened in 1930, 1934, and 1936. At such times grain yields dwindle, the grass withers away, trees of long standing are killed, and the farmers sometimes haul water for miles to their thirsty livestock. During the severe drought of 1934 all previous heat records were eclipsed. In Manhattan, Kansas, between May 20 and August 16 there were eighty-six days with a maximum of 100° to 115° F. The temperature of the surface soil ranged from 140° to 156°, and many an insect pest met its thermal Waterloo. Both grasshoppers and chinch bugs were literally fried by Old Sol. Finally came the God-given rain.

So great is wheat specialization that only one-quarter of the Winter Wheat Belt farm-crop acreage is in corn, alfalfa, barley, milo, and sorghum. All the crops other than wheat are forage crops, and fattening cattle is the other occupation of the Wheat Belt farmer. Some of the wheat is pastured a little

[6] In July, 1939, the answer from other continents was most distressing. Advance reports of bumper crops throughout the world caused the wheat price on the Liverpool market to drop to 47¾ cents, the lowest price on record, even lower than the price of 50 cents established in 1592 during the reign of Queen Elizabeth. The Liverpool price, of course, exceeds the price in Kansas City or Winnipeg or Buenos Aires by the cost of transportation.

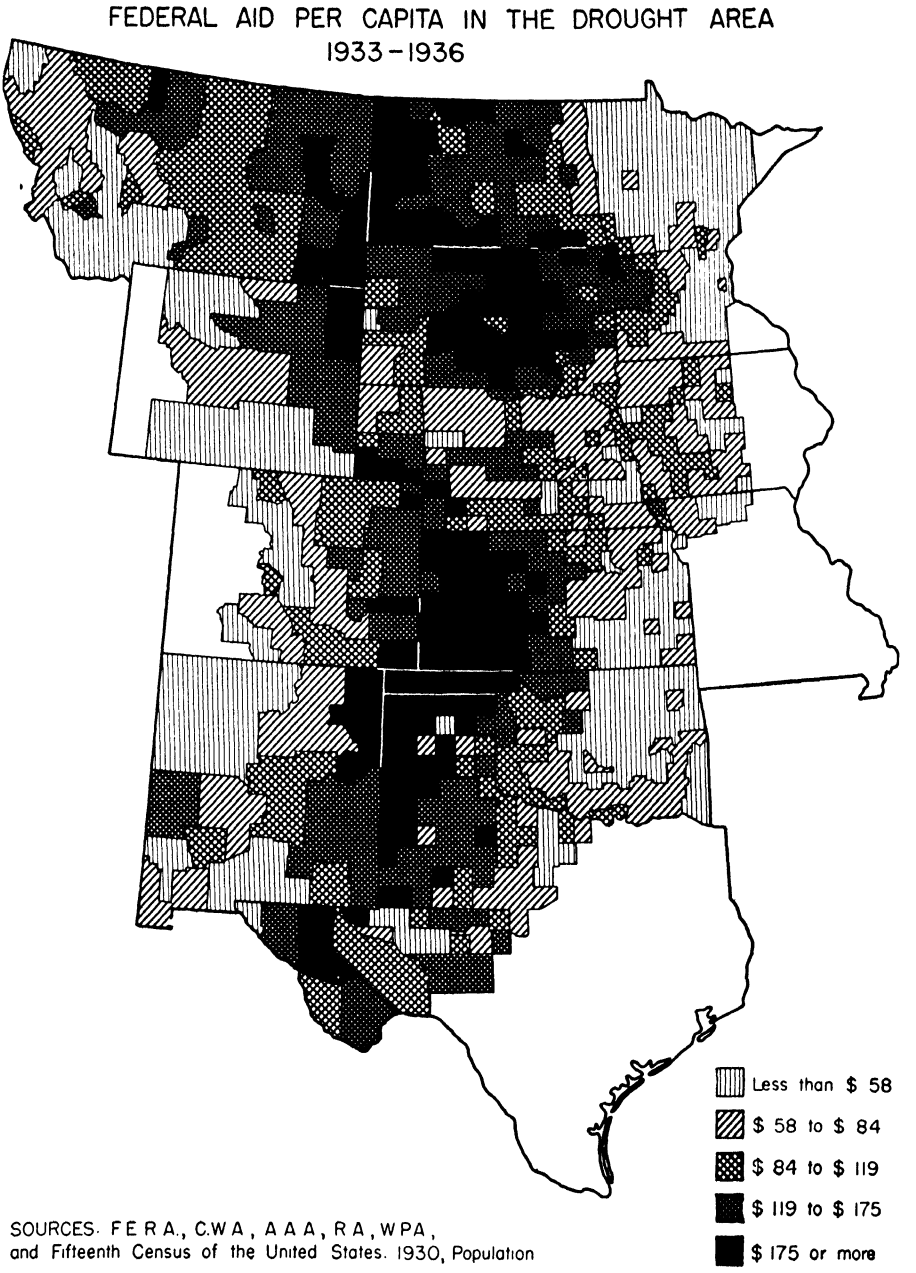


FIG. 419 A. But for these millions of Uncle Sam's borrowing, some would have starved, scores of thousands would have fled at once, neighborhoods and counties would have been abandoned. As it was, Dust Bowl acres of planted ground increased the year after the worst drought.

The government's largesse undoubtedly postponed any real adjustment of man to environment. (Courtesy WPA)

in the spring, and if other pasture is scarce, the wheat may be used only as pasture. Newer drought-resisting crops are increasing. The limiting influence of light rain is shown by the fact that after a crop of the deep-rooting, water-searching sorghum or alfalfa, the wheat crop is poor because alfalfa and sorghum have taken the water out of the subsoil; therefore these crops cannot be grown on the same land continuously.

Life on the big farms is lonely at best, but the almost universal automobile, radio, and telephone have done much to enrich living. The small rainfall and snowfall give a short season of bad roads — the shortness of this season being a social asset. The automobile now permits a man to dash in 5 or 10 miles to dinner, and there are signs of a growth of village residence for farmers whose fields are miles away.

THE FUTURE OF THE WINTER WHEAT BELT

The agricultural future of this land must differ considerably from the present system of mining the agricultural gold out of the land and letting the tailings blow away and flow away. Any permanent system of agriculture will probably have a reduced acreage of wheat. Some kind of crop rotation will be worked out which will provide wheat for the mill and cattle for the packing plant. The silo is coming in, but the farm will remain large. The dryness and levelness of the land compel it. Because it is dry, the yield per acre is small, and because the land is level, great areas may be tilled. Lack of abundant moisture also limits the number of crops that may be grown. This place has no choice among dozens of crops, as the Cotton Belt has. Sixty-four thousand apple trees in a single orchard were pulled up about 1910 in the middle of this belt, because frequent frosts in the level country injured fruit so often that it was more profitable to grow grain.

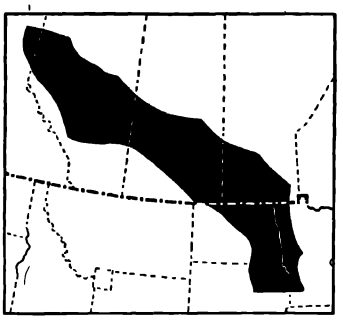
Large-scale use of machinery on the farm makes it possible for one man to operate a large acreage. In thirty years some counties have lost half of their population, with no reduction in crop acreage. This tendency may go farther.

There are few cities in the Winter Wheat Belt, for this is primarily, almost peculiarly, a land of farms. Such cities as it has are largely geological rather than agricultural in support. Oklahoma City's population (185,000) doubled between 1920 and 1930, which was largely due to the development of the mid-continental oil fields.[7] Wichita (pop. 110,000) is near the center of the Kansas oil industry and is known for its flour-milling, meat-packing, and manufacture of airplanes.[8] When the oil is gone, the oil town usually shrinks. There is no reason to expect any extensive manufacturing (save that pertaining to meat, or grain, or oil) to develop in Winter Wheat Belt towns, in competition with more favored locations both East and West. Here, as elsewhere, the cities have of course the function of being centers of local government and of stores for the neighbors, but if the neighbors decrease in number ——?

[7] In 1938 Oklahoma ranked third in the production of petroleum with an output of 175,000,000 barrels. The production in Kansas amounted to 60,000,000 barrels.

[8] Wichita claims to rank fifth among the flour-milling centers of the country, its mills having a capacity of 11,200 barrels of flour a day. It is said to be the largest broomcorn market in the country.

Chapter 20. THE SPRING WHEAT REGION



THE wheat plant can endure freezing weather and frozen ground, but not too much of Jack Frost. Therefore, winter wheat seldom thrives north of Nebraska. In this northern area the wheat is sown in the spring (spring wheat). Between the regions of winter wheat and spring wheat there is a gap — an area too cold for winter wheat and too hot for spring wheat. Fortunately the oat plant thrives in this between-region.

The Spring Wheat Region reaches from central Minnesota, one might say from the line connecting Minneapolis and Winnipeg, westward and northwestward to Edmonton and the Rockies. It is a wide, wind-swept, level — or slightly swelling or gently rolling — land of dark fertile soil. Here the rain falls chiefly in summer, and the average amount of rainfall suits spring wheat. The crop grows well through the summer rains, and ripens in the fall after the rains decline.

Only in the age of the railway, the reaper, and the other devices of the machine epoch have white farmers and townsmen attempted to transplant their sedentary civilization to the land of the Tatar of Central Asia and the Sioux of central North America. When the Corn Belt was full, they settled the Wheat Belt of Kansas. They went northwestward beyond the Corn Belt into the Red River Valley of Minnesota and the Dakotas, where bonanza wheat-farming was in the height of its boom in 1885. On the rich, level, treeless plains, railroad-building and farm-making were at their absolute maximum of ease. Railroads went first and the settlers followed quickly. On through Manitoba they went, and through Saskatchewan and Alberta, to the foot of the Rockies. Most of this region is not yet under cultivation; nevertheless it is the world's greatest wheat-exporting region.

This land, as well as other country much like it in Kansas and Nebraska, has been the seat of political unrest. In the '70's this grain-growing frontier with its financial difficulties produced the Greenback Movement. Populism came out of it in the '90's. In the '20's of this century, it produced the Non-Partisan League of North Dakota [1] and the Farm Bloc in the American Congress. In the 1930's it supported the Townsend Plan and the New Deal; and there is no reason to think that its troubles have ended. In the Canadian Parliament, too, the conservative East wrestles with the radical West. The

[1] This was an attempt of the North Dakota farmer to solve most of his business troubles by having the state run banks, elevators, and other business enterprises. It failed. It had the difficulty of business decision plus political selection. Getting votes is one thing; business judgment is quite another.

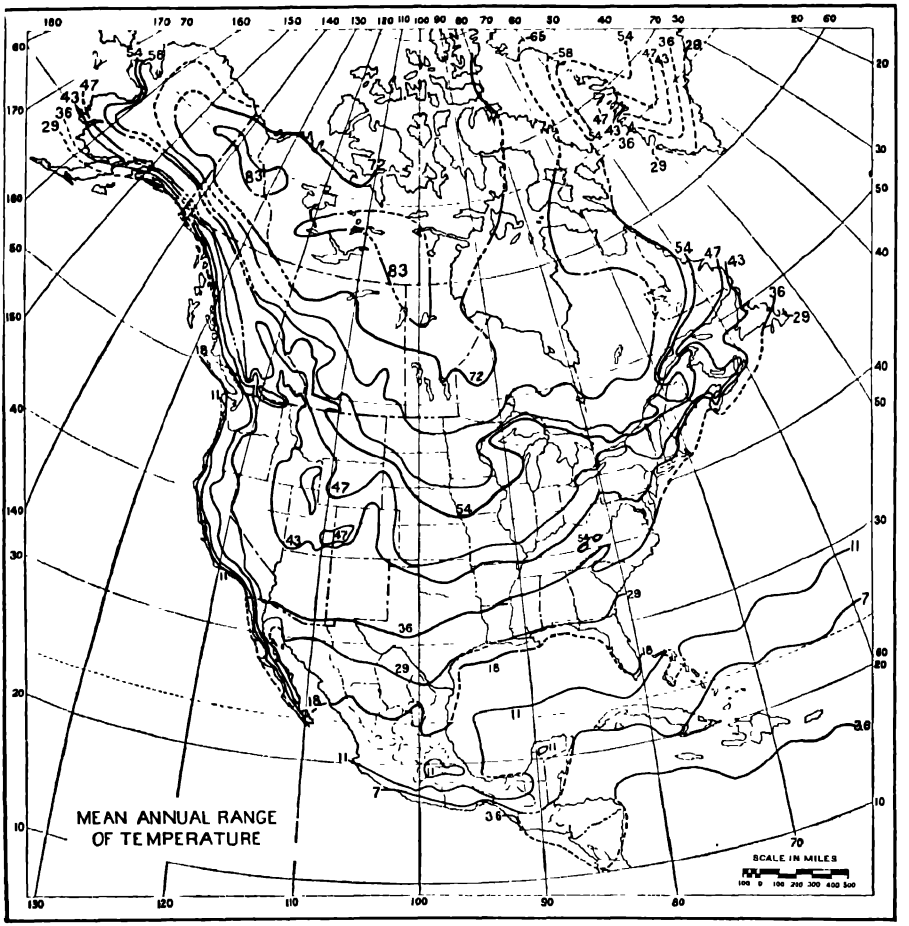


FIG. A. This map shows the difference between the average temperatures of January and July. To see what it means, compare it with the place you know best. (Courtesy Köppen-Geiger, *Handbuch der Klimatologie*, Vol. II, Part J, *Nord Amerika*)

shoreland men of New York and Boston sometimes seem to think that Kansas, Nebraska, the Dakotas, and Minnesota, with their fads and "isms," are places where men's brains are inherently cracked. But such is not the case; for an explanation examine the environment.

THE CENTER OF TROUBLES

Man is a land animal. The earth is his mother, but the sea seems to be his nurse, and the farther he is from Sea, his nurse, the worse he gets along with Earth, his mother. The sea, with its even-tempered water, tends to evenness of climate. The land, now hot, now cold, tends to extremes of climate. The greater the distance from the sea, the greater the extremes. Extremes make

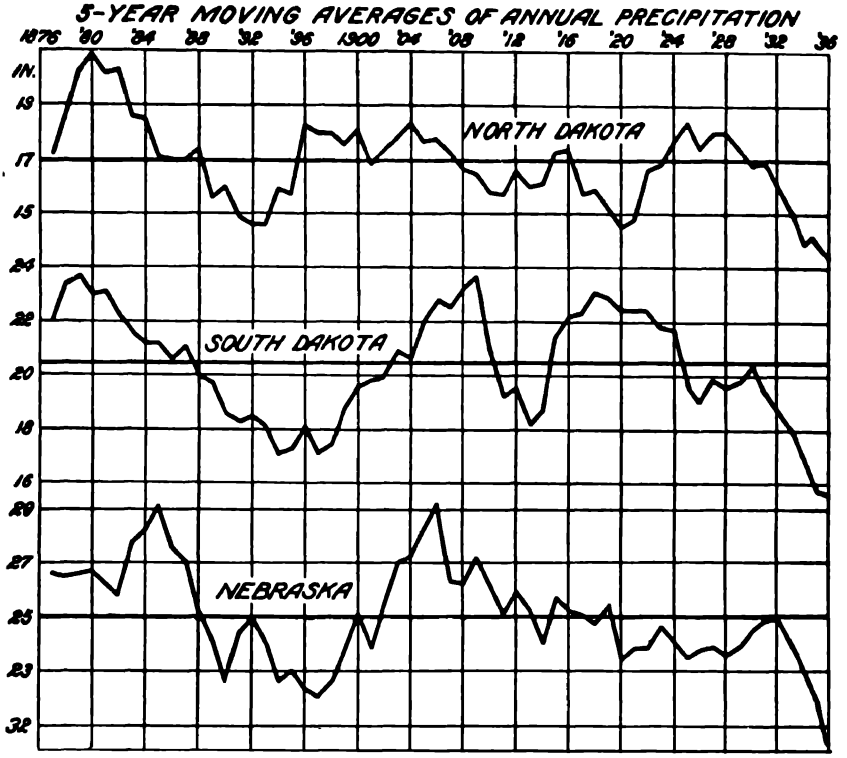


FIG. A. Note that these are five-year moving averages. It is difficult for one who has not been through it to appreciate the agricultural and social difference between the high of 23″ and the low of 16″. (Courtesy J. B. Kincer, *Is Our Climate Changing?* Illinois Farmers' Institute)

trouble. The Spring Wheat Belt is a land of climatic extremes — hot summer and cold winter — and of swift change. In the same year you may see − 50° F. and 100° F. Devil's Lake, North Dakota, has zero one-fifth of the days of the year. One wonders why the Devil got the honor of the name.

The similar area in the Old World, the wide, flat, black, hot-cold plain of central Asia, has for ages been a seat of trouble for that continent. There, as in America, the changeable climate was too much for the primitive farmer. Only the nomad, with his flocks, could survive. It was these nomads on their horses, taking flocks, wives, and children with them, who battered at western Europe and Rome under the name of Scythian, Goth, Vandal, Hun, and turning the other way, battered at China under the name of Tatar, Mongol, Manchu, and those earlier terrors who made the Chinese build the Great Wall — a tremendous monument to the troublemaking capacity of the grasslands.[2] History often repeats itself in similar environments.

[2] The record of grassland man going south is equally instructive; see Greeks, Hittites, Phrygians, Hyksos, Medes, Persians, and the hordes who changed the complexion of half of India.

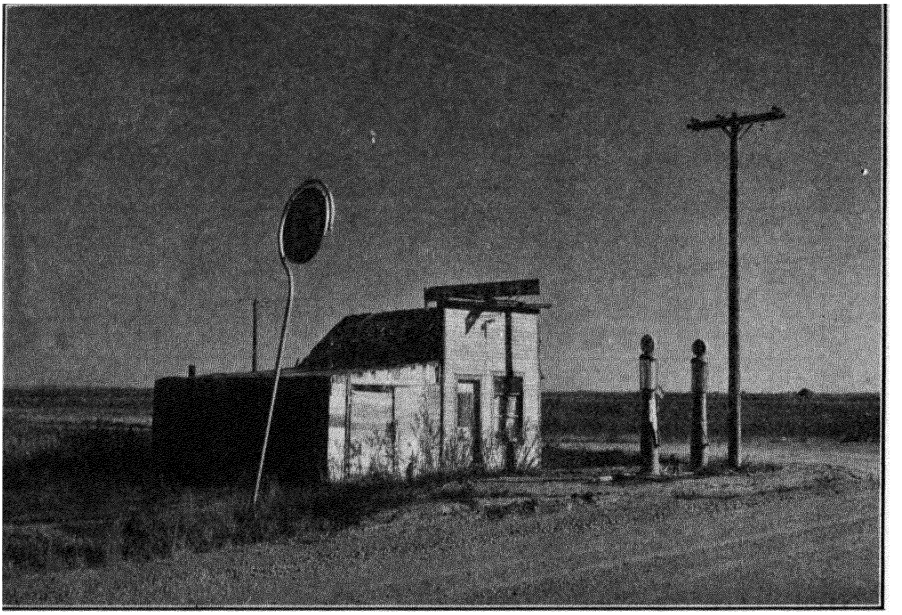


FIG. A. The light that failed. It could not stand the spring-wheat country drought. (Courtesy Farm Security Adm.)

The region which we are now considering (like the Old World counterpart) is a natural seat of troubles for the farmer — troubles of a kind that do not stay bottled up at home. At this point we must consider the troubles. It is true that the averages of temperature and rainfall are good. But crops are not grown in average weather. They grow in the weather of the moment, and because of the continental climate of the Spring Wheat Region, the crops of particular localities have often proved to be uncertain. One year, in large sections of South Dakota, the early summer rains did not come until September, and wheat sown in April or May did not sprout until September, making, of course, not a money crop, but only a little late pasture. The fury of a dust storm may strike the region, or along comes a severe drought, as happened in 1930, 1934, and 1936.[3] Frost may desolate. If the season happens to be

[3] Weather Bureau records show that there are two kinds of droughts: (1) those of a transitory nature affecting a relatively small area and of comparatively short duration, frequently lasting only a year; (2) major phases of minimum precipitation covering a good many years and affecting large areas. When a long-run phase of minimum precipitation prevails, there occur at short intervals what may be called "families" of droughts, in contradistinction to the "transitory" droughts of the first class. The outstanding wet phase in American meteorological history during the nineteenth century was from about 1865 to 1885, which was interrupted by a number of transitory droughts. Then followed a long-run phase of minimum precipitation, lasting from 1886 to 1895, which was interrupted by fairly abundant rainfall in 1892 and which culminated in severe droughts in 1894 and 1895. The year 1896 had fairly good precipitation, but the following year was deficient in moisture between the Rocky Mountains and the Mississippi River. A wet phase prevailed during the first two decades of the twentieth century. The present dry phase began in 1930 and has been marked by three exceptionally dry years — 1930, 1934, and 1936.

damp, rust may annihilate crops almost like fire. In the year 1916 it is estimated that the black rust did $200,000,000 worth of damage to the wheat crop in the United States part of this region alone. Hail comes with a frequency unknown in the East and in five minutes beats a promising crop into the dirt. Grasshoppers may rise up in countless millions and devastate whole counties. If the crop comes through to a full, fair harvest, the grower often finds himself competing with a bumper crop from Russia, or Australia, or Kansas, or western Europe, or with all of them. That makes a low price. If we compare these new settlers with the early settlers of Massachusetts and Pennsylvania, we find a great contrast in economics and psychology. Instead of a self-sufficient farm, supplying all its own needs, we find the Western settler depending upon a money crop or two, selling wheat or oats or flaxseed to markets thousands of miles away, and buying everything from a store supplied largely from factories also far away. The grower is absolutely dependent upon the railroad, which at best must haul a crop hundreds of miles, and the freight must be paid. If his business is bad, it is not unnatural for the farmer to think that he has been imposed upon by the grain-dealer, or the unseen middleman who graded his wheat as No. 2 or No. 3 or worse, or the banker who loaned him money at high rates, or the railroad with its high freight rate. In addition to these man-made troubles, nature staggers him with visitations of frost, drought, and dust storms, with rust and hail and grasshoppers. A farmer is no match for all these enemies, but (sometimes) he does not run away, or migrate as the hordes of central Asia did.[4] He fights. He organizes and turns to government. Hence we find here the most active governments in North America.

[4] The farmer is indeed a victim of circumstances. Consider the contrast between him and the big manufacturer. Eastman may hold a patent on kodaks and Du Pont a patent on a rayon process, but no farmer or group of farmers can get a monopoly on sunshine, rainfall, soil, or how to grow spinach. The factory engineer can turn on or shut off his steam and electricity, but nobody can control solar radiation. Swift and Armour can speed up or cut down their production schedules, but a calf belonging to Farmer Jones takes as long to mature into a cow as it did in the days of Methuselah. The production of Packards can be spread evenly throughout twelve months of the year, but farm crops arrive on the market in concentrated doses, with a concomitant drop in prices. The output of Chesterfields or Lucky Strikes can be set at any figure, but pity the Secretary of Agriculture who tries to control the cotton crop without knowing what the yield will be. Goodyear can determine the quality of its tires with micrometric precision, but nature, more often than man, sets the quality of farm produce. The sulphur-producers of America and Sicily can divide the world into exclusive sales territories, but just try to get a lasting agreement among the wheat-producers of the world, of a nation, or even of one county! Westinghouse can operate its machinery twenty-four hours a day if necessary, but the wheat combine of Farmer Jones is just so much idle capital during three hundred and fifty days of the year. The more automobiles Chrysler can run off the assembly line, the lower is the cost per car — but the more bushels of potatoes a farmer can extract from an acre of soil with increased labor, fertilizer, etc., the greater is the cost per bushel. General Electric can run its laboratories day and night to invent what it wants, but the farmer can only take or leave the farm implements that are offered for sale. Henry Ford can declare independence from the bankers and finance himself out of an accumulated surplus or by sales quotas imposed on his dealers, but Farmer Jones must go hat in hand to the storekeeper, the landlord, or the banker and pay whatever may be asked for credit. The number of big manufacturers that are outside the realm of competition is remarkable, but the farmers, operating under competition, must take whatever price they can get. Still there are smug denizens of the big city who laugh at the farm problem! For a penetrating analysis of the fundamental differences between agriculture and manufacturing, see Erich W. Zimmermann, *World Resources and Industries*, Chap. 11.

GOVERNMENT ACTIVITY

Let us select as a type Saskatchewan, the middle province of the Canadian plains and the greatest wheat-producer. It has an excellent and progressive university, whose buildings are of stone, solid, ornate, standing above almost raw prairie where shade trees have had to be planted and watered in order to grow, and are not yet so very large. In addition to the ordinary curriculum one would expect in such an institution, special and very practical courses are offered — short courses in rural telephony; agricultural extension after the style of Wisconsin; running "better-farming trains" with poultry cars, tree-planting cars, dairy cars, etc. Livestock conferences are held regularly at the university.

Since wheat-growing is so often a gamble, all students of agriculture at once take up the refrain "Diversify." Escape from the banker, the storekeeper, and the railroad by the "cow-sow-hen" route. The "better-bull" campaigns amount almost to rivalry. Years ago the livestock branch of the provincial Department of Agriculture began selling pure-bred bulls at cost to farmers. Soon the livestock branch of the Dominion Government loaned them free. The provincial government takes charge of testing dairy cows and grading for improving the breed, and avails itself of the advice of a Better Farming Commission composed of wise men, not *elected* to office.

The provincial government aids in marketing in many ways. It sees that egg-dealers are licensed and that they candle eggs before selling them. The provincial grader grades cream to guarantee the quality of butter. At the Canadian National Exhibition in 1933 Manitoba creameries won sixty-one first prizes, Alberta eight, Saskatchewan six, and Ontario six. The Canadian Government aids co-operation all it can.[5] The Premier addressed a meeting called to establish a wheat pool to sell provincial wheat in one block, and assured the meeting of the moral support of himself and his government. Nevertheless, the venture failed. The problem was too big for any *one* country.

The government Labor Bureau seeks farm hands at harvest and issues a call to townspeople to close their places of business early and help the farmer with the harvest. The weed-and-seed commissioner advises farmers to send seeds to the Dominion seed analyst at Winnipeg to be tested. "Municipalities" (townships) have laws providing for weed-cutting so that the wheat may be free from tares. Swampy lands are drained for settlers at cost by the government, which also runs a soil survey.[6]

[5] For reasons never explained, the United States Government has stimulated production but has strangely neglected marketing, especially co-operative marketing. Perhaps we should remember Harold Laski's definition of government — a function of the group that can exert the most pressure.

[6] The Saskatchewan Soil Survey is conducted by the Department of Soils, University of Saskatchewan, Saskatoon, with the co-operation of the Department of Agriculture in Ottawa. Fieldwork for the classification and mapping of soils was begun in 1921, and the need of a land-utilization policy for poorer lands soon became apparent. Hence the provincial government established a Land Utilization Board, which designates as "public lands" such areas as are deemed undesirable for grain-growing. Such lands, if they become the property of a rural municipality through default of taxes, or otherwise, cannot

The provincial ornithologist introduces foreign birds, and figures that one pair of birds per 2 acres would in the course of a season eat 100,000 insects, to the great relief of agriculture. The provincial government carries war into the land of the grasshopper. In a typical spring, upon telegraphic appeal, the provincial officials accompanied the Dominion entomologist on a field survey. They found forty-six municipalities affected by grasshoppers, which were sweeping across the country in a strip 50 miles wide. Poison is the cure. The materials used for the purpose in Saskatchewan in one season were as follows: 2668 tons of bran, 1671 tons of sawdust, 260 tons of molasses, 220 tons of arsenic, 120 tons of salt, 810 tons of amylacetate. All these cost the provincial government $150,000, and very few grasshoppers were to be found there the next year.[7] Every year in the autumn government experts map the areas of potential grasshopper attacks, and when the insects arrive in the following season, men, armed with poison at the mixing-stations, are ready to receive them.

Shortly after the World War the Saskatchewan government, and also that of Alberta, began to render the farmer a service that is sinister in what it implies about a part of their area. It was the Debt Adjustment Bureau, which by special legislation protected debtors from the legal enforcement of collections by creditors. This, however, was done only in certain sections of the country, the drier parts, where nature has been so hard on man that the provincial legislatures thought it fair to protect him for a time from his creditors.

Municipal hail insurance is another government aid, resembling the debt adjustment in its implication.

The fury with which the problems of the Spring Wheat Belt are being attacked by states, nations, and private organizations is a surer indication of the seriousness of the problem than it is of speedy solutions. Increased knowledge and organized effort have not maintained the demand for wheat, nor has effective limitation of output been achieved by conferences between the four big exporters of the 1930's — the United States, Canada, Australia, and Argentina.

BOUNDS

The ranch country of the Great Plains which makes the western boundary of the Winter Wheat Belt and the Corn Belt is also the southwestern boundary of the Spring Wheat Belt. Fortunately for western Canada, 15 inches of

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be sold or used for grain-growing without the consent and approval of this board. In view of the rapidity with which much of the prairie land was settled, it was natural that considerable land was put into grain production that never should have been plowed. The Land Utilization Board aims to correct such mistakes and to help settlers become re-established on better lands. It also makes recommendations to the proper tax authorities regarding reassessments when land is found to be taxed too high. See Saskatchewan Department of Agriculture, *Soil Survey Report No. 10*, May, 1936, and *Guide to Saskatchewan Agriculture*, 1936.

[7] Mr. C. L. Corkins reported to the American Red Cross in 1920 concerning its donation of $15,000 to fight the grasshopper in a North Dakota county. He reported 240,000 acres of wheat in that county yielding 8 bushels of wheat to the acre, or 1,920,000 bushels, of which one-third was saved by the grasshopper campaign — an excellent illustration of the need of organization and quick action in this land of uncertainty, where there are at times 20 to 50 bushels of grasshoppers to the acre.

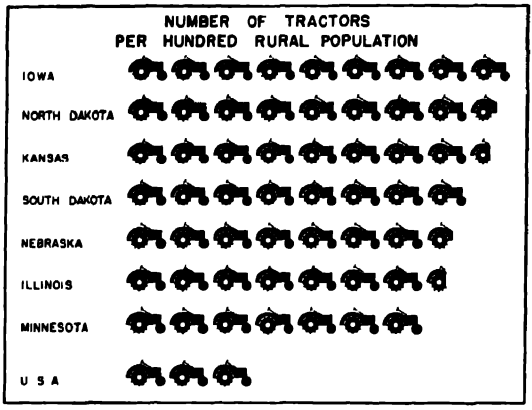


FIG. A. The Industrial Revolution comes to the land. The number of tractors per 100 rural population. (Courtesy *Farm Implement News*, Apr. 9, 1939, and U.S. *Statistical Abstract*)

rainfall produce a crop, while 20 inches are inadequate in Kansas or Nebraska.[8] This difference permits the wheat belt to cross the whole Canadian plain, from Lake Winnipeg to the Rockies. It has two perilous boundaries of climatic transition. The southwestern boundary is a drought boundary. The northern boundary is a frost boundary. These boundary lines fluctuate from year to year, and will be more clearly settled by experience, the improvement of crops, and the adjustment of farm practices.[9]

The western boundary is the clear-cut wall of the Rocky Mountains.[10] The eastern boundary is almost equally definite, the edge of the old, hard-rock formations we have previously seen north of the St. Lawrence lowlands. The Canadian Pacific R.R. train rushes out of 800 miles of rock and cuts into the smooth plain around Winnipeg, an old lake bed.

SURFACE AND SOILS

The continental glacier, as it retreated, blocked the Red River of the North so that no water could flow to the Hudson Bay. Therefore the river covered all the land in front of the glacier until it overflowed at the source of the Red River into the Minnesota River (branch of the Mississippi), as a wide channel still shows. At its height this glacial lake, called Lake Agassiz,

[8] The figures for annual rainfall totals or averages are not so directly indicative of relative fitness as are those of the growing-season, and within the growing-season we need to know which end of it got the rain.

[9] The physical limits of wheat-growing will probably never be definitely or permanently established during a period of technological improvement. Then there is also a human factor in the equation. Man has pushed back the aridity frontier with dry-farming methods and with drought-resisting species, such as durum wheat. He has pushed back the frost frontier with short-season Garnet wheat. The handicap of excessive moisture is overcome by drainage. Hilly land may be terraced or subjected to contour plowing, and infertile land can be improved by commercial fertilizer and crop rotation. Then, in addition, there is the increasing evidence of climatic fluctuation.

[10] An area at the foot of the Rockies in southwestern Alberta gives promise of having a winter-wheat crop rather than a spring-wheat crop, for the following reasons: The mountains shelter it from the full force of prairie winds. It is also warmer in winter than localities farther east. (This is usual with lands to leeward of high mountains.) It has more snow, more rain, and more spring rain than the open plains farther east, so that the Canadian Wheat Belt is likely to include a little corner of winter wheat. It is a kind of little region within a region. Unfortunately, this area seems to be strictly limited; beyond a brief stretch from the foot of the Rockies it is too dry for the farm, and the land is good only for ranching. (Information from Charles F. Brooks and A. C. Stine.) This temperature influence of the mountain foot is very pronounced.

had an area of 110,000 square miles, more than the present combined area of the Great Lakes. It was 700 miles long. Parts remain — Lake Winnipeg, Lake Manitoba, Lake Winnipegosis, Lake of the Woods. Several deltas built in this lake still remain. One covers 400 square miles, another 100 square miles. Some deltas have steep fronts 100 feet high. Some are fine farm land. Some are assorted sand and gravel. One has yielded tens of thousands of carloads of gravel for railroad ballast and road-making.

The main floor of the old lake is made of material that settled from muddy water, making a fine soil, almost as sticky as taffy when wet, but fertile and most easily cultivated by machinery. The old lake bed, about 800 feet above the sea level, ends on the southwest at the foot of a series of hills that rise to another plain about 1600 feet high, which in turn ends at another step up called the Missouri Couteau (pocket map). The plain west of the Couteau is about 3000 feet high.

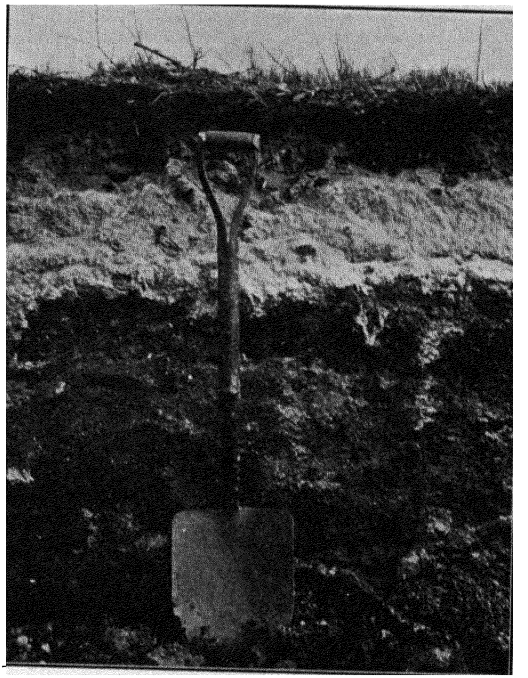
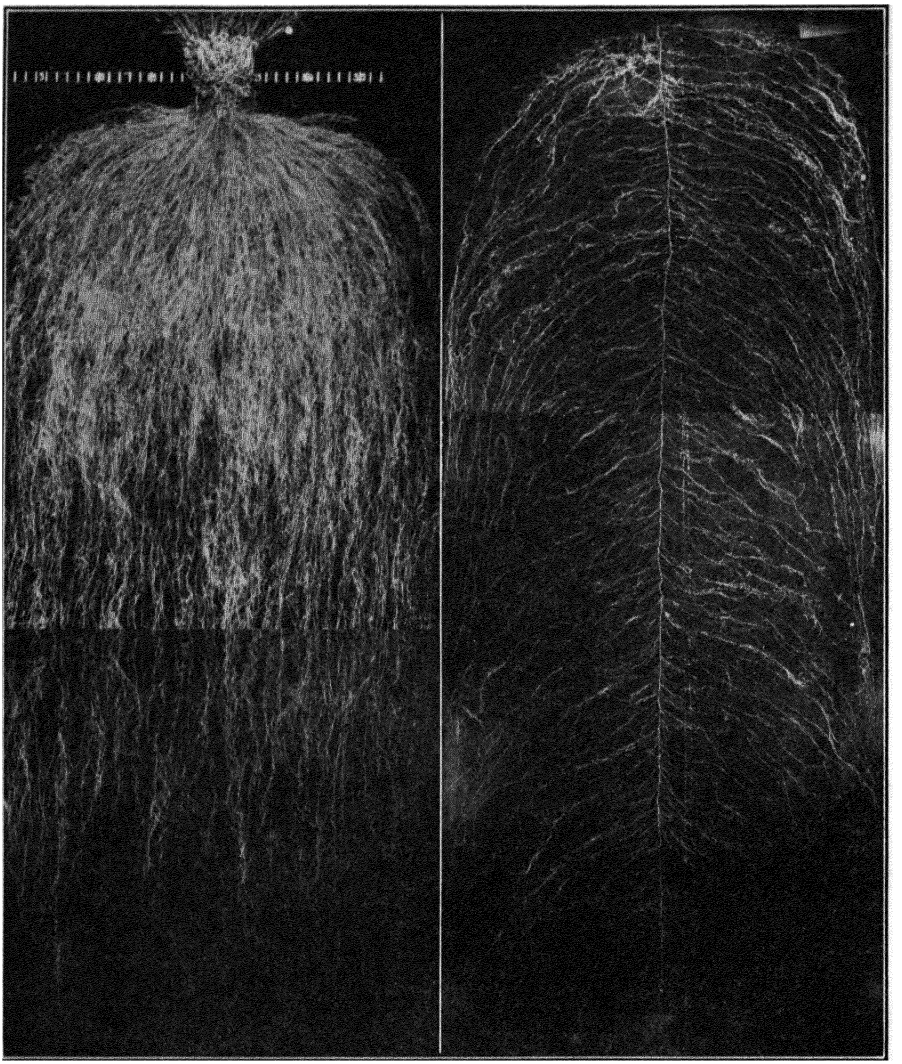


FIG. A. Soil long undisturbed becomes more and more a product of climate rather than of the underlying rock. In many tree-covered sections in cold climates a white layer forms a few inches beneath the surface. It is not so rich as black soil. Photograph from the northern edge of the Canadian Spring Wheat Region. By its low fertility this area joins with spring and autumn frosts (shorter summer) to set a natural boundary to that region. (Courtesy University of Alberta)

This part of Canada is fortunate in its elevations. Near the Alberta-Montana boundary it is about 4500 feet. Streams drain away toward the Arctic, so that declining elevations combine with the longer day of increasing latitude to maintain great temperature uniformity. Thus, Fort Chipewyan on Lake Athabaska, latitude 59°, has a summer temperature only 1.8° cooler than Edmonton, latitude 54°, elevation 2200 feet, and 1.6° cooler than Calgary, latitude 51°, elevation 3400 feet. We appreciate these facts better by noting that the distance between Calgary and Fort Chipewyan would take one from Norfolk (Virginia) to Albany (New York); from Memphis (Tennessee) cotton to Madison (Wisconsin) potatoes and milk.

In the northern part of the Wheat Region the transition to northern forest is shown by the growth of small aspens and willows, which grow larger as one goes north and finally merge into a kind of park landscape where there is enough wood to aid the settler. The glacier leveled much of this land, made



FIGS. 430 A and B. Why dust storms? For an answer examine this picture of the root system of a single plant of crested wheat grass and of one crown root of the same separated from the root system. When cultivation and decay destroy these fibers and drought comes, the wind takes possession. There is a great lesson in these two pictures. These cuts are much reduced in size. Each of the roots is over 90 in. long.

The one wheat grass plant pictured above had 996 main roots with a total length of 1,025 meters; 445,265 branch roots of the first order, length, 39,106 m.; 10,572,666 branches of the second order, 335,853 m.; and 62,638,064 branches of the third order (root hairs) 204,260 m. Total length of root system, 360.5 *miles*!

Plants spaced ten feet apart and excavated at maturity showed total root lengths as follows: 1st wheat plant, 46 − miles; maximum penetration, 60 inches. 2nd wheat plant, 44 + miles; max. penetration, 63 in. Spring rye, 49 + miles; penetration, 62 in. W. oats, 54 + miles; max. penetration, 63 in. (Courtesy T. K. Pavlychenko, University of Saskatchewan)

some change in the direction of streams, created numberless lakes and ponds, and left in some sections just about enough stones for building purposes.

These glacial ponds and swamps give the settler clouds of mosquitoes, waterfowl by the thousands, and a considerable problem of draining swampy lands. There are large areas of swamp that cannot be drained, for when an acre or two of swamp is in a little round hole in the middle of a farm, there is no place into which its water can be drained save at an expenditure beyond any possibility of profit.[11]

SETTLEMENT AND AGRICULTURE

In 1870 Alberta and Saskatchewan were the range of the buffalo and the Indian, occasionally traversed by fur-traders. In Manitoba there were only 25,000 people.[12] Less than 3 per cent of the people of Canada dwelt west of the Lake of the Woods. Toward the end of the century the free lands of the United States suitable for farming were about gone. Then came Canada's opportunity. It began to build railroads across its plains, and to advertise. Figures of population show the result.

CANADIAN POPULATION

	1901	1911	1921	1931
Alberta	73,000	374,000	588,000	732,000
Saskatchewan	91,000	492,000	757,000	922,000
Manitoba	255,000	461,000	610,000	700,000
Totals	419,000	1,327,000	1,955,000	2,354,000

In addition to the many aids previously mentioned, the Canadian Government ran a regular sales campaign to attract settlers. In the years 1914 and 1915 alone, nearly $2,000,000 was spent in advertising. For twenty years free homesteads were advertised in many American farm papers; Canada maintained immigration offices in Syracuse, New York, Harrisburg, Pennsylvania, Omaha, Nebraska, and in many other American cities — a regular real-estate business with land being given away.[13] The young men of the

[11] Near Indian Head, on the main line of the Canadian Pacific, I passed 16 miles where not a single field was as large as 40 acres. This was a section where all good land was in use, but nearly all the area was swamp and wet thicket — the wild duck's idea of heaven. But alas for the ducks! The great droughts of the 1930's turned many of these little duck heavens into hadeses. Hades for ducks does not need fire and brimstone! Drought is enough. One dry season baked the swamps, killed the duckling crop, and greatly reduced the duck census.

[12] Population of Manitoba in thousands: 1871, 25; 1881, 62; 1891, 153. No data are available for Saskatchewan and Alberta in these years. Largely because of the settlement of the prairie provinces, the population of Canada increased by 34% during the first decade of the twentieth century, the greatest rate of increase at the time for any country in the world. During the second decade it increased by 22%, being exceeded only by an increase of 23% in Australia.

[13] Canada's migration problem has had two sides. Between 1901 and 1910 the Dominion received 1,500,000 immigrants but increased its population by only 1,835,000, or 5% more than the immigrants. Canada has for a long time sent emigrants to the United States, especially from the eastern provinces.

Corn Belt sought escape from high-priced land. The station at Omaha forwarded nearly 50,000 emigrants in twenty years. The good homesteads are now about gone, and free land in Manitoba came to an end on July 15, 1930, when the land policy was changed from a policy of homesteading to one of sale.[14] In Saskatchewan and Alberta there is still some land to be had for the asking, chiefly in the north.[15]

It was found that a homesteader could haul his wheat about 20 to 30 miles as a maximum, so if railroads were 40 or 50 miles apart settlers could cover the entire territory.

In the treeless areas some sod houses were built, but the railroads, in the attempt to encourage settlers, carried lumber back from eastern forests as return freight at low rates. The later settlers in the park country to the north have often built a house called a mud house. Posts are set vertically in the ground, and laths of willow branches nailed across them. Mud or tenacious clay is next plastered upon this, with bare hands, greased or frequently wet to keep the mud from sticking to them. Pieces of sod, 1 foot by 2, resting upon poles and laid on after the fashion of shingles, make a roof that is warm in winter and cool in summer. With a dirt floor this makes an inexpensive house, warm and comfortable, in which flowers can bloom all winter.

The winter is the bane of this region. As a Canadian settler told me: "We have a great country, we have good soil, and can grow great crops. We mostly have a good summer, but the winter gets your goat." In the five months of cold, with frozen ground, mostly covered with snow, there is not a thing for the wheat-grower to do in the little one-story house of hope or in the straw-covered shed where he hopes to have a barn. In the spring he plows and plants. In the summer he watches the grain grow. He watches the sky and the crop with anxiety. Will the next few weeks bring hot, wet weather that will rust his crop, or hot, dry weather to wither it? Will grasshoppers come, or will there be devastating hail? Or will good fortune bring a rich harvest of stiff upstanding straw supporting heavy heads of No. 1 hard? Must he go back to his people or to his wife's people, or will he strike it rich? In the late summer or autumn, if the season has been good, he has a fury of labor, with harvesting, threshing, and hauling to the station. Then five months of leisure by the fire.[16] The short work season is an incentive to grow oats, which happen to ripen before wheat and lengthen the work season, but all grains grown are planted in the spring and harvested in the fall. The winter is too cold for winter grain, but hardy strains are being tried.

The evils of the labor situation of this business appear plainly in Calgary, in western Alberta, at an appallingly early date. To help harvest, in summer thousands of harvest hands were brought in. Forty thousand came in 1923.

[14] Much of the land is in the hands of the absentee owners, land companies and railroad companies, and still waits for the user. But where is the market for the settler's produce?

[15] During the fiscal year 1933–34, 3706 settlers took out homesteads in Alberta.

[16] Sometimes the farmer who is in luck turns the horses out, watches them for a couple of days to see that they have established themselves by the pile of oat straw left from threshing, and goes away to Vancouver or California for the winter. In spring he returns, finds the horses in good order, and starts another crop.

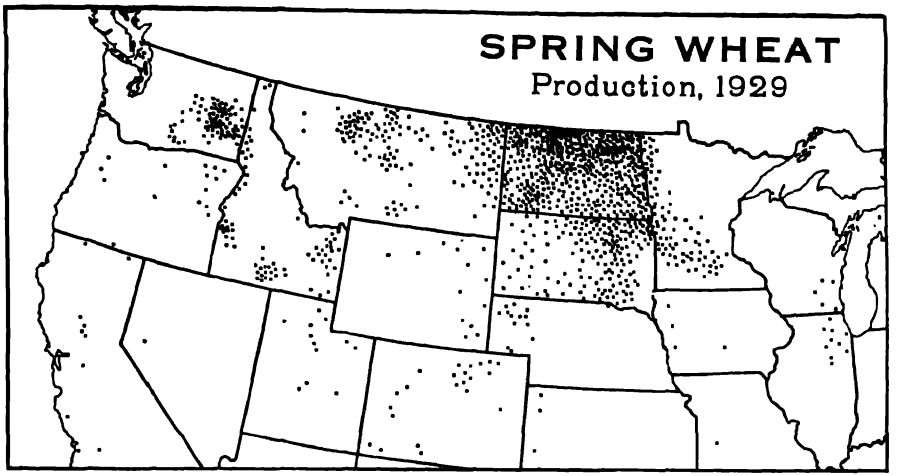


FIG. A. Production of spring wheat, 1929. Each dot represents 200,000 bushels. To see the rest of this region, consult the pocket map at the back of this book. (Courtesy U.S. Dept Agr.)

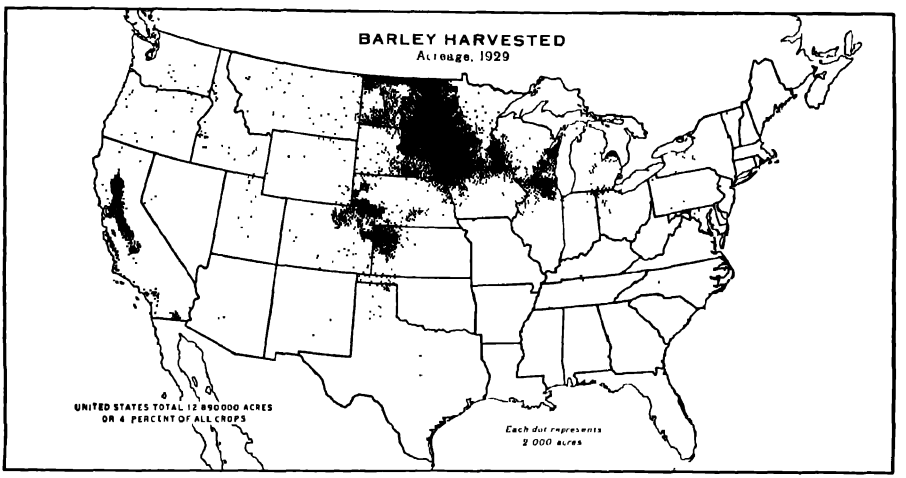


FIG. B. Barley is the rival of wheat, a tougher plant, surviving drought better in western Kansas and Nebraska, surviving heat better in South Dakota, competing with corn as forage in the Dairy Belt. Be careful to observe the meaning of dots on wheat and barley maps. (Courtesy U.S. Dept Agr.)

In the winter some of them went to town, along with some of the settlers whose crops had failed. There was not enough work for them to do in town, so Calgary even in that early day of the ("rich"?) frontier took up contributions for soup kitchens and advertised in the papers advising people without money to stay away. This is a strange cry for a new country, a relatively empty land, where one would expect papers to say, "Come and grow up with the country." Indeed that is just what the Dominion advertisements were

saying in the newspapers of the United States and Europe, but they were advertising for people with some capital. A man with empty pockets doesn't take up land, even free land.

The winter idleness, combined with the midsummer idleness of untilled small grains, is one of the reasons for keeping cows. One would think the homesteader who stays home would want a few cows merely for the sake of their company through the long days of whistling wind, when a basket set down by the kitchen door will go skating away across the prairie until it disappears in the distance. On the other hand, there are many persons who are just suited by a spasm of work and a long period of loafing.

The occasional crop failures previously mentioned make the income of the grain-grower so uncertain that preaching diversified farming to Spring Wheat Region farmers brings about a change more speedily than in the Cotton Belt.[17]

We should naturally expect this diversification to begin in the older settled parts. The statistics for Minnesota prove the point beautifully. In that state, which, by the way, has part of the Corn Belt and part of the Dairy Belt, the wheat acreage was half the total crop land in 1899, one-fourth in 1909, one-sixth in 1920, and less than that in 1937. Between 1910 and 1922 the oats area increased one-third and the corn area doubled. In 1937 Minnesota oat fields nearly doubled the area of its wheatfields, and corn more than doubled the wheat area. The experiment stations have striven to create improved, quick-growing varieties of corn.[18] For example, Minnesota No. 13, which ripens in thirteen weeks after it is up, was perfected in one of the Minnesota stations, and with other varieties is steadily permitting corn to grow farther north. The silo, which so materially shortens the period necessary for corn to grow to a useful stage, permits a great advance northward. Occasional fields of silage corn are to be seen in the latitude of Winnipeg and Regina. In 1937 Minnesota had more than 500,000 acres in silage corn, being exceeded only by Wisconsin and Nebraska.

For a time the qualities of the sunflower suggested that it might eclipse corn along the cool margin. Numerous experiments have shown that silage made by chopping up the whole sunflower plant, just as the whole corn plant is chopped up, has feeding value nearly or quite equal to that of corn silage.[19] The sunflower will stand more drought, more coolness, and much more frost than corn. For example, the Agricultural Experiment Station at Fort Ver-

[17] In a fourteen-year period before the beginning of the recent American droughts, the wheat yield in the United Kingdom was over 30 bu. per acre every year. Yields below 10 bu. per acre were reported as follows: Ohio, 1; Alberta, 2; Saskatchewan, 1; Manitoba, 0; Minnesota, 4; North Dakota, 8. Then came real droughts and the price slump — the urges of desperation and the promotion of diversification if not migration. But for charity, governmental and otherwise, we would certainly have had much more migration and probably some starvation.

[18] Mr. M. R. Gilmore (Heye Foundation, New York), authority on Indian agriculture, bewails the stupidity of the white man, who has brought to the West and the Northwest the strains of corn he secured from the first Indians he met, namely, those of the Atlantic Coast. Centuries ago, meanwhile, the Indians had adjusted corn to the particular climates and were growing corn far beyond our Corn Belt and well up into the present wheat region of Canada — varieties which have not thus far been made the basis of agriculture.

[19] The Canadian Pacific Experiment Farm near Calgary reports it quite the equal of corn. See also bulletins from the Illinois Experiment Station.

milion, latitude 58½°, nearly 700 miles north of the American boundary, about 300 miles north of Edmonton, in 1921 had corn seriously injured by frost. At the same time sunflowers were unharmed and yielded 30 tons of silage to the acre, a yield that would make an Illinois corngrower think he was a silage king. In 1940 the promise of the sunflower era in the cow barn is not so imminent. The sunflower has not gone bad, but grass silage has arisen in the dairy firmament. It is so much easier to handle oats and peas or sweet clover. But then there is the new machine that goes through the cornfield and delivers the crop in half-inch lengths to the truck alongside. What will it, with modifications, do to the sunflower?

The Canadians, like the people in the Cotton Belt and elsewhere, have learned that they can keep silage in a hole in the ground. They dig a pit 8 feet deep, 16 feet wide, and as long as desired. The silage is packed in tight, and covered with 2 or 3 feet of straw. This is a very inexpensive kind of barn and a great boon to the man who is earnestly tackling the long, hard job of building up a farm home on the treeless plain.

This pair, the sunflower and the pit silo, may help greatly to emancipate the stock farmer from dependence on root crops, which the European farmer produces by much labor as a substitute for our corn silage.[20] Already the dairy industry is making rapid strides in the Spring Wheat Belt, especially in the longer-settled southeastern part.[21] At the same time that the Corn Belt rural population declined, the rural population increased (1910–35) in nearly all counties in the Red River Valley, because the dairy farm is replacing the bonanza wheat farm.

In the Corn Belt and the Winter Wheat Belt of the United States we find a kind of normal farm evolution: (1) the grain-growing stage; (2) the meat-making stage; and then gradually, after decades and the pressure of land values, (3) the introduction of the dairy stage. In the Spring Wheat Region the long, cold winter, the shorter pasture season, the risk of grain crops, and the greater expense of winter feeding are causing a swift jump from the grain stage to the dairy stage, with a much shorter intervening meat stage. Dairying here has an advantage over that in the eastern United States and Canada. Modern sanitary methods do not have to compete with old established notions of the "way Father did."

Farmers in the Dakotas are beginning to turn to agricultural specialties. Around Fargo, North Dakota, are 22,000 acres of sugar beets, which are taken in the fall to the local refinery to be manufactured into sugar. The beet tops and pulp are used to fatten cattle and sheep. Potato production, chiefly of the Early Ohio variety, on the black loams of the Red River Valley is steadily increasing. North Dakota is one of the leading turkey-raising states, and an All-American Turkey Show is held in Grand Forks each winter.

[20] In recent years the sunflower has not kept pace with oats and peas as silage material. The big, heavy, rough-top sunflower is so mean to handle — but here comes the ensilage corn-harvester. The second best is yet to come.

[21] The production of creamery butter in Saskatchewan has increased from 8,900,000 lbs. in 1922 to 23,600,000 in 1937. Production in millions of lbs. (1937): Alberta, 26.3; Manitoba, 24.3; Ontario, 81.2; Quebec, 74.0.

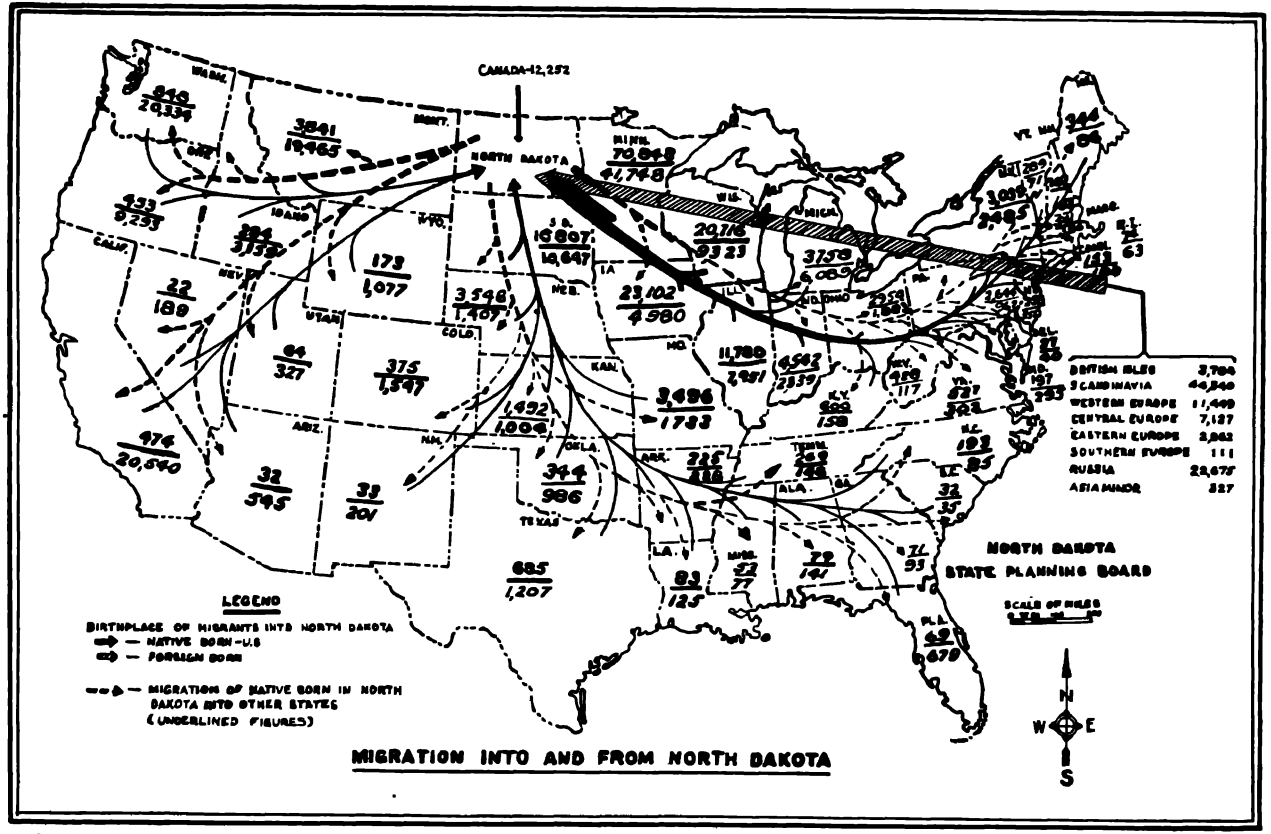


FIG. 436 A. This map answers the question Is the Spring Wheat Region a frontier that welcomes settlers? The upper figure in each state shows the number of people who were born in that state and resided in North Dakota in 1930. The lower figure shows the reverse. We have no figures for those who went to Canada.

THE AGRICULTURAL FUTURE

As a basic fact, it should be remembered that the soil of this region is rich. It is frozen all winter and leached but little in summer. Water erosion is much less of a problem here than in the Corn Belt, but the problem of wind erosion in the Spring Wheat Region is much greater. It is therefore reasonable to assume that the heroic, almost frantic efforts of governments, railroads, civic organizations, and individuals will result in the working-out of crop rotations that fit the various parts of this Wheat Belt. For a long time to come this region promises to export vast quantities of breadstuffs and butter and cheese, and probably some meat and potatoes if they are wanted.

In general it is a good land for grain — more exactly, grain is about the only cash crop that can be grown. Market conditions and farm plans decide which of the small grains — wheat, barley, rye, or oats — shall be grown. It is a good place also for flaxseed, but flax is a soil-robber grown chiefly in the first years after breaking the new prairie. Its acreage is declining both in the United States and in Canada, and Argentina and Russia are now growing it for us.

The quality of grain grown in the Spring Wheat Region is usually good.[22] Both wheat and oats yield more per bushel than in the United States.

Spring wheat is harder than winter wheat, makes better flour, and commands higher prices. In spite of our high tariff, some of it is imported from Canada by the Minneapolis millers to mix with the American wheat. It makes what is called a "strong" flour.

We may expect much improvement in varieties of wheat and other grains suited to the climate of this region. Unsuitable varieties of wheat from farther south were a handicap in the days of early settlement. In the deliberate search for drought-resisting varieties, the United States Department of Agriculture sent Mr. Mark Carlton, cerealist, to the dry country of southeastern Russia. There in a transition zone of scanty rainfall between good farm land and the dry pastures of the cowboy nomads, he found the seed of durum wheat. It proved to be hardier than any we then had, earlier-ripening, and so much more drought-resistant that in some seasons it produced from 40 per cent to 50 per cent more than any other variety. In 1901 there were 70,000 bushels of durum wheat grown in the United States; in 1903, 6,000,000; in 1928, 96,000,000; but during recent years production has declined.[23] In the days when durum was tops, thousands of farmers were successful in the dry western part of the Spring Wheat Region of the Dakotas. Without this wheat they must have failed.

Equally swift has been the rise of other wheats. By 1918, 90 per cent of the wheat grown in Saskatchewan was of the variety called Marquis, much

[22] The prize wheat at the Philadelphia Centennial Exposition in 1876 came from Alberta. In 1922, at the Chicago International Grain and Hay Show, Saskatchewan took eleven out of twenty-six wheat prizes. It had taken the best prize nine out of the eleven previous years. During the years 1920–33, Alberta took the first prize six times at this show.

[23] Production in millions of bushels: 1929, 54.7; 1930, 57.7; 1931, 20.7; 1932, 40.6; 1933, 16.1; 1934, 7; 1935, 27; 1936, 8; 1937, 28; 1938, 40 (U.S. Dept Agr., *Yearbook of Agriculture* and *Agricultural Statistics*).

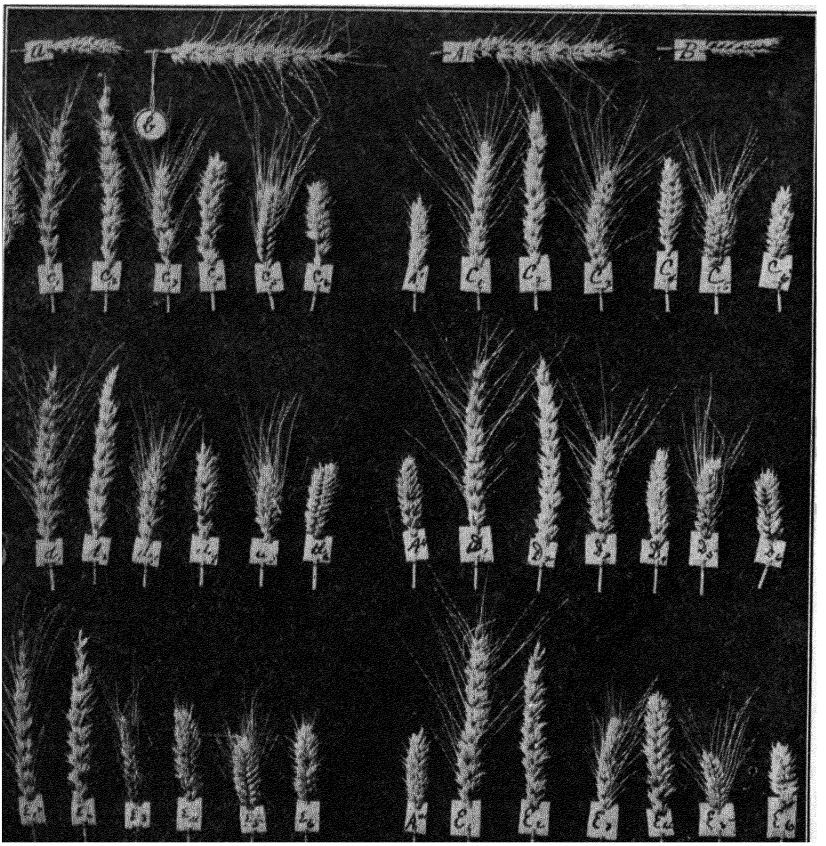


FIG. A. An exhibit in plant-breeding. At the top, parent wheat heads A, B. They were artificially crossed, producing the heads A′, A″, A‴ (see center). The natural offspring of A′, A″, A‴ are beside them. Note the difference in size and character. At the left are three other families similarly descended from the same stock (parents reversed) shown at the top. (Courtesy W. J. Spillman, U.S. Dept Agr.)

superior to Red Fife, which had been the standard variety.[24] Marquis is still the dominant variety, but in certain areas where stem rust has become a serious problem it has been replaced by the rust-resistant Ceres wheat.[25] The history of Marquis wheat is suggestive of the new agriculture. Dr. Charles E. Saunders, the Dominion cerealist, found one head of superior wheat growing in a test plot. It was a fine-looking head with unusually choice grains. Chewing tests showed it to be highly elastic, therefore glutinous. This was

[24] A. H. R. Buller, *Essays on Wheat*, Macmillan, 1919, p. 144.

[25] In 1935 black-stem rust, more than any other factor, was responsible for reducing Canada's potential crop of 550,000,000 bu. to 275,000,000 bu. As a result of robber-cropping and the damage done to crops by drought and rust, it is estimated that at least 9,000,000 acres of what was once rich wheatland today are producing less than 5 bu. an acre, and another 16,000,000 are producing less than 10. All of this land was in the 20-bushel class not long ago.

in 1903. Careful planting had produced 23 lbs. by 1907. By 1909 it was tested on many farms, and in nine more years it had swept most of the spring-wheat-growing section of this continent. Its origin is due to a cross, made in 1892, between Red Fife and an Indian wheat, and it was one of thousands of strains produced by deliberate hybridization in search of new strains.[26] Another important development in recent years has been the increased use of Garnet wheat, which because of its shorter growing-season has enabled the farmer to push the wheat frontier farther north.

The resources for the home garden are better than one would expect. Raspberries, currants, strawberries, and gooseberries find a natural home in most localities. At the north blueberries also thrive. Watermelons will ripen over much of the area. A windbreak of trees and irrigation will permit the growth of surprising gardens. After much search and thousands of tests, a few varieties of hardy Russian apples have been found. The scientific creation of fruits for this area has only begun. Similarly, almost nothing has been done toward domesticating and improving many promising wild plants. Why should agriculture be so deferential to the grains domesticated by our primitive ancestress!

THE POTATO

Many parts of the humid side of the Spring Wheat country are as good for the potato as they are for wheat, and the potato looms large in any consideration of this region as a part of the future North America with 200,000,000 or

[26] "Crossing two kinds of wheat is a relatively simple operation, the technique of which it is not difficult to acquire. However, new varieties are not obtained in one generation only; for a cross-bred kernel, in succeeding generations, always gives rise to a large number of plant types which differ from one another in one or more characters — such as length and strength of straw, length, compactness, and uprightness of the heads, the color and hairiness of the chaff, presence or absence of awns, color, shape, size, and milling qualities of the grains, liability of the grains to shell, earliness in maturing, resistance to disease, baking qualities of the flour, and so forth — and most careful selection through a series of years is necessary in order to isolate the best of its progeny." — A. H. R. Buller, *op. cit.*, p. 150.

"More striking than the growth of an oak from an acorn is the fact that the vast hard spring wheat industry in the United States with all the milling, baking, transportation, and trading dependent on it, developed from a few seeds saved from a single wheat plant. The origin of this plant shows how plant breeding cuts across and disregards national boundaries, to develop products useful to all men and all nations.

"The variety that founded the hard spring wheat industry came originally from Galicia in Poland. From Galicia it went to Germany. From Germany it went to Scotland. From Scotland it went to Canada. From Canada it came to the United States.

"It was David Fife of Otonabee, Ontario, Canada, who first obtained a small sample of the wheat from a friend in Glasgow, Scotland. He sowed it in the spring, but it proved to be a winter wheat. A single plant of spring wheat developed out of the lot, however, and this was saved and increased. From this descended the wheat that became known throughout Canada as Red Fife. The cultivation of Red Fife wheat in the United States dates from 1860, when J. W. Clark, a Wisconsin farmer, had an excellent crop. The really efficient use of hard red spring wheat, however, had to await the invention of the roller mill and the purifier which could handle the grain effectively.

"This Red Fife, in turn, became one of the parents of the world-famous Marquis wheat, also developed in Canada by C. E. Saunders. Marquis was a cross between Red Fife and Hard Red Calcutta, and it was introduced into the United States in 1912 by commercial seed and grain firms." — U.S. Dept Agr., *Yearbook of Agriculture, 1936*, pp. 214–15. This *Yearbook* and the 1937 number contain excellent summaries of most of the plant-breeding experiments on various crops.

300,000,000 people. Possibilities of production are enormous. A tractor can draw across the level plain two potato-diggers, each laying out behind it a row of potatoes. In part, at least, the potato has also joined the machine-grown crops. In 1916 it was estimated that potatoes could be grown in rotation with wheat in the Red River Valley of Minnesota for 25 cents a bushel. Potatoes can survive more frost than grain, and they do particularly well in the greater coolness and the humidity along the northern edge of this Spring Wheat Region. They also thrive in a rather large area along the foot of the Rocky Mountains, where there is more rain than in the middle of the plain.

The fact that 50,000,000 bushels of potatoes rotted or were fed to the pigs in the United States in the winter of 1922–23 is one of several good reasons why potatoes are not more extensively grown in the Spring Wheat Belt in the present era. If we should develop an intensified agriculture like that of Germany, Spring Wheat Belt farms will have various rotations, including wheat, other small grains, corn, the sunflower, hay, and potatoes.[27] If exhaustion of resources should shift motor fuel to alcohol, this whole area would quickly have a great money crop of potatoes for the distillery. Although Red River Valley potatoes are now sold throughout the Middle West, most potatoes grown in the Spring Wheat Region probably will be eaten there, for the simple reason that the potato is so low in value in proportion to its bulk that it can seldom stand the cost of a long haul to market in competition with supplies grown nearer to the market.[28]

POPULATION

The population of this region may easily be said to be among the best. Sociologists are generally of the opinion that mixed races are the best, especially if the mixture is of northern-European stock. On both counts, the Wheat Region ranks high. In the Canadian part of it the matrix is East Canadian, largely British, but partly French. Mixed with this is the recent immigration. About one-third came from the American Middle West, one-third from the United Kingdom, one-third from widely scattered (chiefly northern and central) European countries.

The American part of this region has in most sections a Yankee matrix, but more Scandinavian and Teutonic blood than the Canadian section. A survey of a township in south-central Minnesota at the very southern edge of the region showed in 1910: 30.8 per cent German; 24.2 per cent Norwegian; 21.3 per cent mixed; 11 per cent American; 5.8 per cent English; 3.7 per cent Irish; 2.9 per cent Swedish. This particular township had far fewer of Scandinavian stock than many other parts of North Dakota, South Dakota, and Minnesota. Witness the University of Iowa yell at football

[27] In Germany the price levels of 1900–14 and after gave the potato an indefinite outlet as stock food and distillery material. (See J. Russell Smith, *Industrial and Commercial Geography*, new ed., Henry Holt and Company, 1925.)

[28] In a few instances special advantages permit potatoes to be transported regularly over long distances to the market, for example, the off-season advantage of Florida potatoes and the size and baking quality of Idaho potatoes.

games with Minnesota in the 1890's — "Ole Ole, Ole, Ah, Better go back to Minnesotah!" Ole is a common Swedish and Norwegian name.[29]

If the verdict of history is worth anything, the people of the Spring Wheat country will achieve.

CITIES AND MANUFACTURING

The northern Wheat Region is not a land of cities, save those needed for its own trade. It is too new. Perhaps it is not destined to be a land of cities. Such cities as it has show well the influence of the small, local advantage in a wide area where every place has about the same natural possibility of becoming a city.

Minneapolis (pop. 464,000) and St. Paul (pop. 272,000) are the largest cities anywhere near this region, because Minneapolis, at the falls of the Mississippi, has the advantage of water power that gave flour-milling a great start.[30] St. Paul, a few miles below, was at the head of navigation and had steamboat service in the prerailroad days. Sioux Falls, with about 33,000 people, is South Dakota's largest city. It was started by water-power advantage, as its name indicates. Fargo, the largest city of North Dakota (pop. 29,000), is like Omaha in being on the west side of a river that naturally stopped travel in the early days. It was the natural place for a road center and later a railroad center. Bismarck, North Dakota, was a railroad terminal point long enough to get an advantage over neighboring bits of prairie. Grand Forks, North Dakota, was for a time head of the steamboat service which once operated on the Red River.

Minneapolis and St. Paul have an enormous mercantile business with the whole territory lying between Lake Superior and the Rocky Mountains and reaching well into northern Iowa — the "Bread Basket of the World," they call it. These cities, now contiguous, had a period of delightful and bombastic rivalry in the boom decade of the 1880's. Streets were being laid out rapidly across the prairies, new houses were going up, newcomers arriving by every train, and each town had the great pleasure of boasting of its growth and telling how it was surpassing the other town. So earnest was the desire for the winning record of numbers that in the United States Census of 1890 the enumerators, being residents of their respective towns, gave way to the boom fever and padded the returns to such an extent that the United States Government had to send in outside enumerators to retake the census. The rivalry of this period is well indicated by an oft-told story to the effect that one Sunday evening a Minneapolis minister started his sermon by saying, "I take my text this evening from St. Paul," whereupon the congregation rose en masse and filed out of the church, refusing to listen to any such doctrine.

[29] Mr. John Visher reports that all of the beds in the men's dormitories at the University of Minnesota are 6 ft. 6 in. long, instead of the conventional 6 ft.

[30] It is but a short time ago that the advance of dairying pushed the boundary of the North Central Dairy Region north of Minneapolis and St. Paul. These cities had their origin and have their life as trading center, grain market, and milling center for the Spring Wheat Region. Therefore we present them in this chapter.

The rivalry is now over. The leadership is settled by the greater growth of Minneapolis, and the cities now speak of themselves as the "Twin Cities," which have a population of 900,000 within their metropolitan area.[31] St. Paul has the state capitol, but Minneapolis has more business and the splendid state university, and has also become the head of navigation on the Mississippi River, with a 6-foot channel to St. Louis. Minneapolis has the waterfalls of St. Anthony, which make power. In its early days it was a sawmill town. Power has given the city a wonderful sky line of flour mills, and today it is second only to Buffalo as a flour-milling center.[32] In 1938 its flour mills, with a daily capacity of over 36,000 barrels, shipped more than 6,000,000 barrels of flour to other parts of the country. Minneapolis is a natural center for the manufacture and distribution of agricultural machinery and implements. In 1937 the value of its manufactures exceeded $270,000,000, and its leading industries included the milling of flour and other grains; textile manufacture; printing and publishing; linseed oil, cake, and meal; bread and bakery products; iron and steel products; and railroad-car construction and repairs.

The absence of other large cities in the American part of the Spring Wheat Region is shown by a combined population of less than 50,000 in Grand Forks and Fargo, metropolises of the Red River Valley. The Canadian cities other than Winnipeg are provincial capitals (made by politics) and local distributing centers for the collection of grain and livestock, with here and there a little subsistence manufacturing. It is ominous that between 1931 and 1936 the urban population of the prairie provinces declined 10 per cent while the rural population increased 4.5 per cent.

Winnipeg is properly called the Chicago of Canada. It started at the junction of canoe routes on the Red River and the Assiniboine. With the coming of railroads, it was found to have an advantage not unlike that of Chicago. It is situated virtually at the south end of Lake Winnipeg, which is almost as long as Lake Michigan and which reaches northward into the

[31] Flashes of the old fighting spirit sometimes disturb even the calm of Twin City existence. Outsiders still chuckle at the pass made by the Minneapolis businessman when the Chamber of Commerce met at a Twin City banquet to bury the hatchet once and for all. He rehearsed the essential unity of Minneapolis and St. Paul and concluded: "Even the names of these cities might to advantage be combined. I would suggest Minnehaha: 'Minne' for Minneapolis and 'Ha! Ha!' for St. Paul."

[32] W. L. George, the British novelist, says of these mills, "It was in Minneapolis, at the Washburn-Crosby Mills, that I rediscovered the magnificence of the Middle West. Here again is the immense swiftness of modern industry, not bloody this time, but dainty. The flour-mills are like drawing-rooms, lightly powdered as befits. For the first time in my life, I saw a factory with parquet floors. There is a fascination in these things, the fascination of uniform movement. You watch the grain from the elevator on to the belt, then to the grinder, to the shaking-sieves, to the tests which exhibit purity, to the hoppers, which humanly discharge just as much as the sack will hold. The sack falls into a truck, and it is gone. There is something lovely in these great works. They are deserts, void of men. Nothing is handled that can possibly be seized by fingers of steel. There is solitude and activity; there is nothing there save iron and lumber, in the midst of which sits some secret invisible soul. Somehow I feel that in these great plants I see before me the future of the world, a world where the machine will be a servant shepherded by new men and women, in raiment which they no longer need to soil, and who will with polished finger-nails touch buttons that convey intelligent messages. The great plants of the Middle West seem to me to sublimate human intelligence and to promise a time when mankind will be free from sweat." Mr. George forgets that sweat is essential to health.

rough woods beyond the limits of agriculture. Any railroad going to the west must pass to the south around Lake Winnipeg, as railroads do around Lake Michigan. Winnipeg (pop. 219,000) is the center of five railroad systems with twenty-seven converging lines. Chicago as the world's greatest grain market has long been surpassed by Winnipeg. Its freight yards, full of box-cars in the rush season, cover an astounding expanse of flatland. Winnipeg has the largest stockyards in Canada and, like Chicago, has many mail-order houses sending packages to many a distant farmhouse.

The populations in 1931 of the largest cities in the Canadian section other than Winnipeg (Calgary, 84,000; Edmonton, 79,000; Regina, 53,000) rank them in population with the minor manufacturing cities of Massachusetts, of which few people have ever heard.

What will be the future of manufacturing in this region, which is yet so young? To the east and also the northeast there is much water power. Winnipeg, with a municipally operated water-power plant selling power at cost, claims to have the cheapest power in the world. Thousands of families use electricity for cooking. The coal field underlying the western part of this region is one of the largest in the world, although it is chiefly lignite. If it had been possessed this past hundred years by Italy, France, or Japan, the course of world history might have been changed. Near the town of Macoun, Saskatchewan, on the east side of Souris River, longitude 103½° W., and between 49° and 50° N. latitude, a drill found a hundred feet of lignite coal in the first 1000 feet of depth, although 22 feet is the usual maximum.[33]

It is difficult to predict the result of these power resources in the middle of the continent. The distance to well-established centers of manufacturing is great, and the freight rate on manufactures is high. Therefore it is hard to see why this region should import, after a few decades, shoes, stockings, underwear, plows, or many other standard manufactures. Mr. Ford's idea of establishing factories for the part-time employment of farmers finds even a greater possibility of function in this land of longer winter — if we only knew how to distribute what we can produce.

Whether the inland location can support extensive populations manufacturing goods for export is a question that can be answered only by the coming decades, and the present indications seem negative. It has resources of food and fuel, but it has the disadvantages of a winter that is too cold and an interior location that is far removed from the advantage of the ship. For years the politicians promised the farmers of the prairie provinces that the Government would build a railroad to Hudson Bay that would provide a shorter route for Western grain shipments to Europe. The promise was finally fulfilled, and the new Hudson Bay R.R. extends from the port of Churchill for 510 miles through the wild lake and forest country of Manitoba to connect with the Canadian National R.R. system at Hudson Bay Junction in eastern Saskatchewan, over 300 miles north of the American border.

[33] "The strata lie practically flat except for a syncline under the Souris River Valley and the seams outcrop along ravines and on hillsides. A good deal of coal is mined in the Souris Valley region and in a number of other places, and wagon mines are common, as many of the western families dig their own coal. The tertiary coal is practically all lignite." — E. S. Moore, *Coal*, John Wiley & Sons, 1922.

The Hudson Bay route has the advantage of being the short route to Europe. Because of the narrowing longitude of high latitudes, the distance from Churchill on Hudson Bay to Liverpool is about 100 miles less than the distance from New York to Liverpool, and 160 miles less than the distance from Montreal. The distance by rail from Edmonton to Churchill is 109 miles less than to Port Arthur on Lake Superior.

The building of this railroad is a good example of geography, politics, and economics that were badly mixed. The new route is getting little traffic, although the politicians who sponsored it did get a lot of votes.[34] The first trial shipment of grain was made in 1931. In 1932, 10 ships entered the port; in 1933, 10; in 1934, 15; in 1935, 8. There is no inbound traffic to speak of through Churchill. The through outbound traffic consists of grain, to which may sometime possibly be added timber and minerals from the Great Northern Forest. Local traffic along the railroad is almost nil. The navigation season on Hudson Bay is exceedingly restricted owing to ice. In 1936 there were 14 sailings from Churchill.[35] The first tramp steamer to get away left on August 12, and the last one sailed on October 1.

In 1937 only 2 ships called at Churchill for grain. The first entered in ballast and loaded about 320,000 bushels of wheat. The second entered with a mixed cargo of coal, glass, and general merchandise and left with 290,000 bushels of wheat, only 10,500 bushels remaining in the Churchill elevator. A third vessel, a British man-of-war, entered the port for a short visit and took on oil fuel from tank cars. The great 5,000,000-bushel elevator, which was built with government money in 1931 at Churchill, has never been filled. In the season of 1937-38 over 111,000,000 bushels of wheat, oats, barley, rye, and flaxseed poured into the 32 elevators in Port Arthur and Fort William; over 11,000,000 bushels were received by elevators on the Pacific Coast; but Churchill exported only 604,000 bushels of wheat during that season. Although rates on the government-owned Hudson Bay R.R. are reasonable, the great bulk of the grain crop continues to move via the Great Lakes.[36]

This trade fiasco seems to indicate that the prairie provinces really are inland, and that the Great Lakes and the Pacific are their water outlets.

Will manufacturing cities rise on the inland lignites, or will this low-grade fuel be turned into producer gas and be piped 10,000 miles or more to places where it can be more efficiently used? The latter result seems more likely, but the time is not yet.

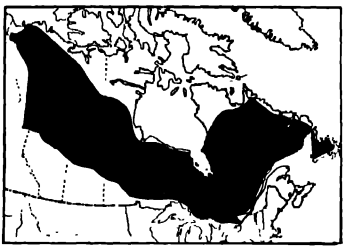
[34] Mr. Chas. F. Wilson, statistician, Agricultural Branch, Dominion Bureau of Statistics, Ottawa, reports wheat exports from Churchill in recent crop years to be as follows: 4,050,000 bu. in 1934–35; 2,407,000 bu. in 1935–36; 4,294,000 bu. in 1936–37; 604,000 bu. in 1937–38; and 917,000 bu. in 1938–39. (Letter of Dec. 15, 1939.) See Fig. 70 B.

[35] "Hudson's Bay Shipments," *Fairplay*, Oct. 8, 1936, p. 50.

[36] In 1933 the actual average railroad rate on wheat from producer to Churchill was 12.9 cents per bushel; to Fort William and Port Arthur, 13 cents; to Vancouver, 13 cents.

Chapter 21. THE GREAT NORTHERN FOREST

THE INDIAN'S COUNTRY



THE white people of the United States and Canada seem to think that the whole continent of North America is theirs. Our maps solemnly aver that such is the case. But the fact is that there are several million square miles where most of the inhabitants are not white people. The land may be claimed politically by the white race, but it is not occupied by them. I was much impressed in 1920 to receive a manuscript map from one of the bureaus of the Canadian Government which showed that most of the area of Canada had more Indians or Eskimos than white people living in it, and but few people of any sort. The white people of North America have settled the arable lands whose climate and surface permit a developed agriculture of the western-European type.

North of the St. Lawrence Valley, of the Lake and the Spring Wheat regions, is the Great Northern Forest. Under present demand for land in America this region is too cold or too rough for any large development of European agriculture.[1] The white man roves through it to hunt for game and minerals, but when it comes to making a home, most of it remains a land of the Indian. Its southern boundary is the northern line of Canadian agriculture, its northern boundary is that uncertain transition line which marks the limit of tree growth — trees, not bushes. On the west it reaches up to the Alpine vegetation on the slopes of the Rockies. On the east it reaches almost to the Atlantic, but not quite, because the chill of Arctic waters, flowing down the coast of Labrador, prevents tree growth for a short distance inland.

GLACIATION

This is the largest region we have considered, and the least well known. Even more than the Corn Belt it is glacier-made. And a bad job the glaciers made of it from the standpoint of human economics! The Great Northern Forest is the place whence came some of the earth material for the upbuilding and enrichment of the North Central Dairy Region and the Corn Belt. It is a case of robbing Peter (Canada) to pay Paul (the United States). Thousands of square miles of Quebec, Ontario, Manitoba, and Saskatchewan are scraped bare to the hard rock, scraped down past the last fissure, so that the surface is smooth. If a little earth collects and a tree establishes itself, it finds no

[1] There are some exceptions. Farmers have penetrated across the southern border of the region and sometimes well into the interior, witness the agricultural developments in the Peace River country and the Clay Belt of northern Ontario and Quebec (page 451).

crevice in which to catch a toe hold. Standing thus in shallow earth, unable to grip the rocks, whole clumps of trees are sometimes overturned by the wind, with all of the thin mass of earth clinging to their upturned roots. The surface from which the mass of earth and roots was upturned is left as flat and smooth as though the trees had grown on top of a cement floor.

The earth mantle is generally scanty and of the highly mixed character left by glaciers in rough areas. Most of the surface from the Gulf of St. Lawrence to the Rockies is of the old worn-down mountain roots described in Chapter 22.[2] There is a variety of geological formations, but the rocks are very old.

From Labrador to James Bay, from James Bay to Lake Winnipeg, and from Lake Winnipeg far to the north among the highlands is a region peculiarly devoid of valleys. Note that the Mackenzie Valley is excepted. There are of course some other valleys, but they are few. The continental glaciers filled up most of the ancient valleys. As a result, the present streams, without well-defined valleys, wander aimlessly around over a surface whose irregularities turn them into a multitude of lakes — Great Bear Lake, Great Slave Lake, Lake Winnipeg, Lake of the Woods, each of which is many hundreds of square miles in area. Besides these larger lakes there are hundreds, thousands, perhaps tens of thousands of smaller lakes; lakes without names; lakes that are not on the maps; lakes that no white man has yet seen except from the air.[3] In recent years reconnaisance by airplane has enabled man to survey by photography vast areas that were previously unexplored. Is an airplane map of a land you have not touched real exploration? If so, it is a perfect example of mass production. The veteran prospector studies airplane maps minutely in deciding where he will go with his pick and pack.

FURS AND THE LIFE OF THE INDIAN

This is the land of the life primeval, the land of the moose, the caribou, the mink, the marten, beaver, otter, wolf, and bear. This is the land of the life of hunting; the land of the Indian, of the snowshoe; the land where the rivers are roads; the land of the birchbark canoe and the dog sled. Up the rivers and across the lakes — that is the way to travel in the Great Forest unless perchance you fly. In winter the dog sled follows the same trails over the ice of river and lake, and across the snow of the same portages. Therefore travelers other than those in the airplane have seldom seen the land except along a few of the better watercourses.

[2] "The Bridge," 920 miles of the Canadian Pacific R.R. from Kenora on the Lake of the Woods to North Bay, Ontario, is a traffic desert, devoid of farms. It has been described in six words — rocks, trees, and water; trees, water, and rocks. To build a railroad through the almost continuous rock was one of the greatest engineering feats — one of great mass rather than great skill.

[3] *Geographical Review*, March, 1918, p. 235, shows a map of unexplored areas made by the Canadian Geological Survey. An unexplored area lies more than 15 miles from an explored route and has "no reasonably accurate survey" and "no records of the geography, life or general character of the region." Unexplored tracts varying from 8000 to 75,000 sq. mi. covered most of the area north of the line running from the Strait of Belle Isle to the south point of James Bay, thence to the west end of Lake Athabaska, and thence west to the Rockies.

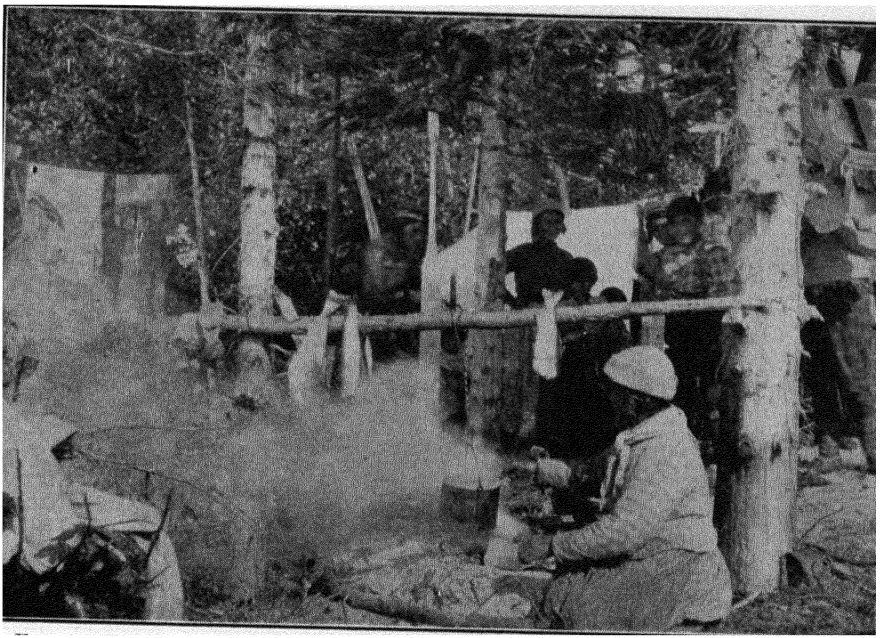


FIG. A. The Great Northern Forest is the scene of the activities of four kinds of men. First, and perhaps last, is the Indian. Here the Montagnai squaw, cooking supper, shows much influence of the relation of her people with man number 2 (see Figs. 418 A, 456 A, 459 A). (Courtesy Fred C. Sears, Amherst, Mass.)

The great commercial output of most of this forest region is fur. Those wonderful pieces of clothing and ornament in the shop windows of Fifth Avenue, New York, or State Street, Chicago, or San Francisco or London, by which people display their wealth, bedeck themselves, and keep warm while motoring, first entered commerce as a bale of raw furs lifted out of an Indian's canoe at a trading-post on the southern edge of the Great Northern Forest. There and along the shores of Hudson Bay are scores of trading-posts. Upon his success in getting this bale of fur depends the prosperity, almost the life, of the Indian. He is not a man with a surplus, who can afford to have a poor season; he lives too near the margin of existence in his simple and direct combat with nature, in his lack of capital.

At the trading-post the two cultures meet — the white man of the complicated life of books, machinery, and wide knowledge of many things, and the red man and the half-breed, of simple life, bookless, but with a more accurate knowledge of the things of the forest than most white men have of anything. This man of the forest has no learning by which he could pass an examination to enter a school, but he must pass a daily examination that decides whether or not he eats and is clothed, or starves and freezes.

In summer the Indians come from the far woods and gather at the trading-posts. There they camp, enjoy a vacation, and transact the year's business by trading their furs. The men often work for the Hudson's Bay Company

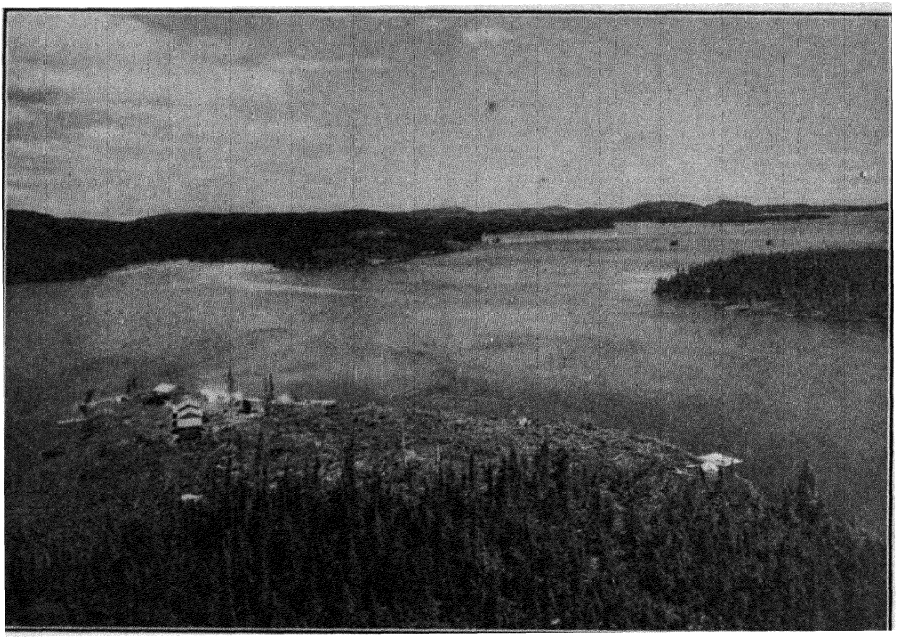


FIG. A. A trading-post in northern Quebec. The first white man to enter this forest region was the trader — the second kind of man in this area. For three centuries he has scoured it for fur. His trading-post looks bigger on a map than on a photograph. (Courtesy Royal Canadian Air Force)

or other trading companies for a time during the summer camp. They may work the company boats for a month or two, or help to build an addition to the post, or help the fur-trader to lay in his annual supplies, thereby picking up extra cash to eke out the income from furs. But with the approach of autumn a camp of 400 Indians will disappear even to the last family, each in its own canoe. Each goes back to his own hunting-grounds, for the Indians have property in hunting-grounds, with boundaries as clearly recognized as the signposts of the white man, and often more scrupulously and honorably observed.

On the journey back from the post to the hunting-ground the entire property of the family — house, furniture, business equipment — is in their canoe. At every waterfall all must be unloaded and carried around to smooth water. At every portage, from stream valley to stream valley — portages are innumerable on some routes — all must be unloaded and carried. This is work, hard work. The labor of this transport shows why the Indian travels light. He cannot carry enough food for the winter, not even enough food for the journey, which may last for weeks. His purchases, if he has had furs with which to buy, are a tent, a sheet-iron stove, a stovepipe, white man's clothing except shoes (he prefers to make his own moccasins), steel traps, rifles, cartridges, ax, saw, knife, and bucket. After the long journey is ended and the family has reached the home hunting-ground, they set up the winter camp,

or the first winter camp, and there they live — fishing, hunting, and eating the kill. The sheet-iron stove and the stovepipe are great improvements to the tent, which may be pitched over 3 feet of snow, but a thick carpet of spruce boughs and the little stove keep it warm even with a temperature of 40° below zero outside.[4]

From this base, the man makes his round — sometimes two or three days in extent — setting his traps and collecting his kill. Strong-smelling meat has been carefully saved, and he drags it along the ground to draw animals to the traps. He uses a steel trap to catch the smaller animals — otter, beaver, mink, marten, and muskrat. At times he sets a deadfall to catch bears. A log pen is built, having a small door. As the bear gets to a certain position in entering the door, he grasps the bait, thus releasing a string that sets free a weighted log which falls upon him and breaks his back. The hunter makes the round of his traps on snowshoes, and often he takes his dog sled, on which the game is carried home to the squaw. Her work it is to skin the animals and to prepare the flesh and the pelts. As the pile of skins accumulates against the spring journey to the trading-post, the family uses it for a bed. The Indians often move their camps a few miles several times each winter, to be nearer to unhunted game.

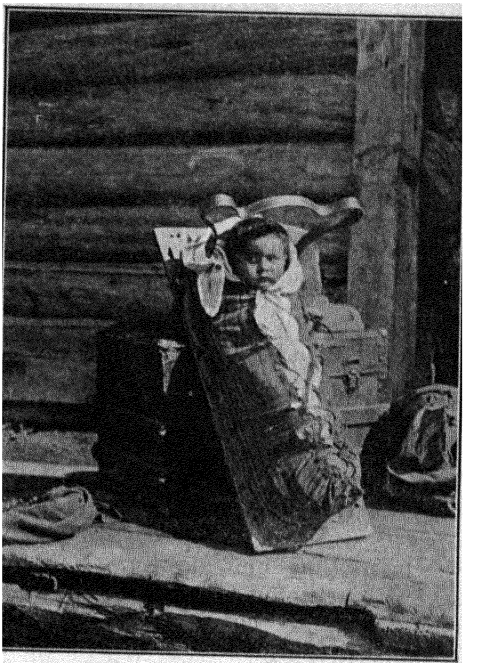


FIG. A. Airplanes may come and go, but the Indian mother still binds the baby to the carrying-board and carries him by the forehead strap. Baby is packed in moss, which they change once in a while. This trading-post porch shows a mixture of equipment, but it all depends on fur. (Photo by E. S. Holloway)

A land can support only a small population on this basis of life, hence the Indians are few. The lakes are rarely fished, so the fishing is usually good. In winter, fish is the great staple food of these people. In summer, they have in addition many wild berries and waterfowl. This does not sound like a balanced ration, nor is it. It is poor food, and when the irregularity of supply is taken into account, we have an explanation of the high death rate of these people. Ask an old Indian woman how many children she has had. "Nine," or "Ten," or "Twelve," she will answer. "How many are living now?" you will ask. "One" or "Two" is the usual answer. Children die in infancy like

[4] Some authorities feel that the stove and the tent are not as conducive to the health of the Indians as the tepee and the open fire. In the tepee the Indians spit into the fire; in the tent they spit anywhere.

flies in winter. Sometimes the wolf or the bear gets the hunter, or he may get lost in a blizzard. Then the wife and children, unable to subsist without his aid, may perish of starvation.

It is not an uncommon feat for a lone hunter, armed with rifle, cartridges, traps, blankets, and warm clothing, to start in at the coast of Labrador in the autumn and come out upon the shore of the St. Lawrence in the spring having spent all winter trapping, hunting, sleeping on the dry snow by campfires, and eating his kill. We are forced to admire the nerve of such a man. Think of the number of accidents that could cause that journey to wind up in one good meal for the wolf pack that nightly sniffs about his campfire!

It is true that the Indian got along in the North Woods for an indefinite period before the white man came; nevertheless, his struggle has been greatly aided by the white man's tools and weapons. It is doubtful, however, whether the Indian has benefited by the coming of the white man. These same weapons, in the hands of the white hunters, have reduced the game supply. The white man's forest fires have done the same. Yet more, the white man brought the Indian the curse of strong drink, and devastating diseases. Measles is often a fatal disease to the Indians, and the "flu" epidemic of 1918 was many times more deadly to them than to the white man, who is, after all, a very tough, enduring animal. The score of the Indian against the white man has one more item. The trading-post in the North Woods is not often a competitive place. It is easy for the trader — how shall we say it, to make large profits, or to cheat the Indian? The trader can price his stuff high and the furs low. Thus many a poor Indian is kept in debt for years, a kind of peonage not unlike that to be found in parts of Latin America and somewhat similar to the relationship between many share-croppers and landlords in our own South.

THE MODERN EPOCH

If this Great Northern Forest region is used in the best way for the service of the white man, it will continue to be a land from which comes fur, but also it must be a land of wood, of water power, and of vacations. It is fortunate that these four utilities combine in demanding one common condition, namely, *fire protection*, of which it unfortunately had little until recent years. The vast distances in the North Woods made it difficult to locate fires until after they were well started. Distance also makes it impossible to transport men and fire-fighting equipment in canoes or afoot to the scene of conflagration. Today, however, airplane patrols can sometimes spot a fire soon after it has started, and men, equipment, and supplies can be transported quickly by airplane to the scene of action.[5] As a result, more of the Great Northern Forest is getting fire protection.

[5] Picks, shovels, axes, saws, and gas engines with hose are standard equipment in fighting North Woods forest fires. A fire lane is cut through the woods in the path of the approaching fire, trees are felled and removed, and as much slash and debris as possible are removed or covered with dirt. This takes time and men. If the wind shifts and blows toward the approaching fire, a second fire may be started to burn out the timber in the path of the main conflagration.

AGRICULTURAL POSSIBILITIES

This region with its rock base has two islands of softer earth which have possibilities of agriculture. One is the northward extension of the prairie rock and soil formations in the Mackenzie Valley. The temperature map shows that the land at the base of the Rockies has a much warmer summer than the land farther east. It is possible that many thousand square miles of the forest region here may some day become another Sweden — a land of wheat, barley, rye, oats, potatoes, hay, and laborious farming — but that day is some generations away.

The same is probably true of the Clay Belt of northern Ontario and northwestern Quebec. This is a wide arc of clay laid down like the soils of old Lake Agassiz, now the Red River Valley. When the continental glacier, retreating to James Bay, held water between it and the height of land, the clay mantle was laid down on the old hard rocks.

The Canadian Government has put out many booklets praising agricultural opportunities in this Clay Belt — it is fertile but swampy, stumpy, and too often visited by summer frost. Mining and farming have shown considerable development in recent years in the Ontario counties of Cochrane and Timiskaming and the Quebec counties of Abitibi and Temiscamingue. Between 1921 and 1931 the population increased from 80,000 to 140,000; the area of cleared land increased from 200,000 to 330,000 acres; the area under field crops, from 150,000 to 260,000 acres; and the number of cattle, from 25,000 to 60,000. Agriculture has made its greatest progress along the Canadian Pacific R.R. Perhaps this settlement will continue. Perhaps it is a land reserve for the future like that of the Mackenzie Valley, but with a colder, longer winter. When one considers the amount of good unused land elsewhere, the question arises as to why anyone ever settles there at all.

Small patches of similar clay are scattered through the region, especially west of James Bay, where, luckily for the temperature, the surface is lower.

THE GREAT CANADIAN TIMBER MINE

We must keep in mind that much of this forest is little known, especially as to its wood resources. Wood is the great visible resource of this region, but its wood resources were until recently more visible than real. The land travelers have always gone along the streams, where the best trees are. Thus erroneous impressions of the forest riches have gone forth. Recent airplane surveys produce sad disillusionment in regard to timber by showing sparse and scattering tree growth on the interstream spaces and even bare areas with no trees at all. These facts are not discovered by the man who travels upstream in a canoe, because he cannot see beyond the fine growth at the stream's edge, especially as the creeping junipers beneath the alders and the willow trees contribute to turn the forest's edge into a veritable evergreen hedge that offers great discouragement to interstream travel.

In a region so vast we should expect to find a great variety of conditions. Peat bogs, called muskegs, are common in many places, and west of Hudson

Bay they cover large areas.[6] They are often open or covered with trees of no commercial value. Other places have fine stands of timber or pulpwood.

It is estimated that of the total forested area of 1,223,500 square miles in Canada at the present time, about 29.5 per cent has merchantable timber, 33.4 per cent has young growth, and the remainder is unproductive under present conditions.[7] The total amount of accessible timber is estimated at 170,000,000,000 cubic feet, of which 68 per cent is located in Ontario, Quebec, and the Maritime provinces, 15 per cent in the prairie provinces, and 18 per cent in British Columbia. Within these three forest divisions of Canada are to be found 160 different species of plants reaching tree size. Only 31 species are coniferous, but the wood of these trees accounts for 80 per cent of all the standing timber in Canada and 95 per cent of all the lumber that is sawed. In addition, there are about 104,000,000,000 cubic feet of standing timber which at present is not accessible.

The total forest resources of 273,656,000,000 cubic feet are capable of being converted into 425,250,000,000 board feet of sawed lumber and 1,746,639,000 cords of pulpwood, ties, poles, and similar forest products.[7]

Between 1928 and 1937 the average annual cut in Canada was equivalent to 2,600,000,000 cubic feet. The average annual drain on Canadian forest resources (including loss by fire, insects, and other agencies) is perhaps greater than the present rate of tree growth.[8] As the supply of the more accessible timber continues to dwindle and as consumers turn more and more to wood substitutes, the forest history of other countries will repeat itself in Canada, and the rate of cutting will inevitably decrease.

Forest resources mean much to Canada. Forest products provide Canadian railroads with 15 per cent of their total freight. The export of wood, wood products, and paper for 1937–38 amounted to over $211,000,000, or over one-fifth of the Canadian export trade. Although logging is chiefly a winter enterprise employing the average worker less than a hundred days of the year, the cutting of 2,600,000,000 cubic feet of timber provided employment for over 250,000 men during the logging season, farmers and others, at a time when employment is at low ebb. And upon the work of the woodsmen rests the foundation of Canada's greatest manufacturing industry, paper and pulp, which ranks first in capital investment, volume of employment, wage and salary distribution, and net value of output.

With the dwindling of American forests, the United States is also interested in the timber resources of Canada. More than half of our newsprint paper is purchased from our northern neighbor. In 1938 we paid more than $118,000,000 for Canadian newsprint, other paper, wood pulp, wood, and cardboard. Many of our paper companies have found it expedient to lease

[6] Canada, Dept of the Interior, Surveys Branch, *Annual Report, Topographical Surveys Branch*, 1914–15, p. 113.

[7] Canada, Dominion Bureau of Statistics, Dept of Trade and Commerce, *Canada, 1939: The Official Handbook of Present Conditions and Recent Progress*, 1939, Chap. IV; for the second reference, p. 37.

[8] It is estimated that between 1928 and 1937 the average annual depletion of Canadian forests by fire amounted to 651,000,000 cubic feet; depletion due to insects and disease, 700,000,000 cubic feet. (Dominion Forest Service)

large tracts of Canadian forest land. In 1922 the United States Forest Service reported that we were cutting our timber four times as fast as we were growing it. Although the depression beginning in 1929 slowed down our consumption, the handwriting on the wall of the not distant future seemed to say, "Can Canada meet our requirements, and for how long?" Since then things have been happening in our Cotton Belt. Technology improves with accelerated pace. With the new processes for producing wood pulp out of slash pine for newsprint, paper, and rayon-making, it seems that we may be on the eve of declaring our paper and pulp independence of Canada just as we declared our political independence from the mother country some generations ago. If so, it will be tragedy in Canada. The swift growth of pine in the long moist Gulf-states summer and the low standard of living accepted by the Negro may make American competition deadly to Canada, where trees grow so *much more slowly*. Much of this slowness may be overcome by planting *hybrid* poplars. The foresters slept for a generation after others were using the known laws of plant-breeding.

There is no question that both Canadian and American lumbermen have been mining their timber. Canadian lumbermen have pursued the virgin forest westward, just as ours have done.[9] When the grand forests of British Columbia are depleted, the Canadians may penetrate deeper into the Great Northern Forest, while our lumbermen may be turning to the slow business of reforestation. Fortunately, in Canada 90 per cent of the forest land, except in the Maritime provinces, is the property of the Crown, and the provincial governments have followed the wise policy of licensing timber-cutting rights, mining, water-power development, and fishing and hunting privileges. Government regulation has been able to eliminate many of the wasteful and destructive practices that have characterized American lumbering. The American cycle of cut, slash, fire, and land abandonment has not been allowed to run its dismal course. Forest history has been lived in many nations, but the evolution is almost always the same — (1) exploitation, tree-butchering, and forest cremation; (2) increasing dependence upon imports from other lands; and (3) reforestation and greater social control. Perhaps forest history will be different in Canada, since it has been able to avoid many of the evils of exploitation. Its greatest problem at present is fire.

From all parts of Canada, as from all parts of the United States, returned travelers bring back tales of forests gutted by fire. Government explorers in previously unexplored Manitoba report "fire-killed timber," "small fire-killed spruce," and "surface soil seriously damaged by repeated fires." The forest fire, set by Indian (rarely), camper, prospector, hunter, or lightning, travels so far ahead of the settler and so far ahead of the possibility of commercial exploitation that it is one of the most difficult problems facing our commercial civilization.

Forestry in the North Woods means primarily protection from fire; then nature will make forest if it has the chance. The result will be the lumber

[9] Value of all sawmill products in 1936: total Canada, $80,343,000; British Columbia, $45,546,000; Ontario, $13,069,000; Quebec, $11,871,000. In 1937 Canadian lumber production was 4,005,000,000 board-feet; average production in 1908–12, 4,184,000,000 board-feet.



FIG. A. The universal enemy of nearly all forests and forest denizens. The most terrible of fires is this, the crown fire. Minnesota spruce. When the resinous needles burst into flame, only the end of the forest or a change in wind or humidity can stop the fire. Man is powerless without these. (Photo by Minnesota Dept of Conservation, courtesy U.S. Forest Service)

camp once in twenty, thirty, or forty years, or possibly less often — great activity in the cutting of mature trees, the logs and wood seeking cheap water routes to market.

Pulpwood holds out a ray of hope in the fight with fire and insects in the coming era of forestry. The great increase in the use of cartons shows that wood pulp is competing successfully with sawed lumber and rapidly replacing it for many uses. This is a great gain to man. Pulpwood can be made out of pieces the size of a man's thumb if we choose to bother with them, and 3-inch sticks are regularly used. To make boards a saw log is required, and to make saw logs big trees are needed. A tree that will grow to be 4 inches in diameter 20 feet from the ground in fifty or seventy-five years may need a hundred years more to become a saw log; it may even require more time than that in the cold North. The interest charge at the end of a century of conservation amounts to something appalling, but for the shorter time needed to grow the raw material for the pulp mill the interest charge is not so prohibitive, and the business aspects of forest conservation are greatly changed. It is therefore natural that the paper companies, the chief users of wood pulp, should be pioneers in forest preservation and forest-planting in America.

WATER POWER

The Great Northern Forest region is second in North America only to the mountains in the Pacific Northwest as a seat of water-power resources. The eastern part of it is a plateau. It has tens of thousands of square miles of lake surface (in some localities 25 per cent of its surface), making natural reservoirs to produce an even flow in the streams that drain this region. Then too, these streams, lately disarranged by glaciers, are tumbling over the edges of plateaus making waterfalls, rather than running down forty-million-year-old valleys where they have had time to wear the rocks away and make

an almost even slope, like those of the Potomac and the James. These glacial streams give the hydraulic engineer his easy opportunities. The lakes not only make natural storage, but also offer the easiest possible opportunity for artificial storage. A little dam 5 feet high at the outlet of a lake may produce water storage 5 feet deep on 100 square miles of lake surface. While 5 feet of flooding of the shores of a lake might work great devastation to houses or farms in Indiana, it would produce but little damage in a land with so few people as the Laurentian Plateau.

Unfortunately, much of this water power is far from centers of population, but now most of the eastern forest region is within power-transmission range of the shores of the St. Lawrence and the Great Lakes. The central part is within reach of Winnipeg and the Wheat Belt.

MINERALS

The mineral resources of this forest region may give it its largest population, at least for a time. The rich mineral region around Lake Superior has had approximately the same geological history as hundreds of thousands of square miles of the Great Northern Forest. This is a part of the old Laurentian Plateau, which is, theoretically at least, one of the finest mineral regions of the world. Some of it is easy to prospect because it is bare, but most of it is very difficult because the surface made by glaciation gives no idea of the character of the rock beneath. The world's greatest nickel deposits at Sudbury, Ontario, and the rich silver deposits at Cobalt, Ontario, were discovered by chance as men dug railroad cuts through the rock. The mineral output of the Canadian area has thus far been much less than that of the United States part of the Lake Region. There is every reason to expect continued important discoveries with increased knowledge of the country. And for every mineral enterprise there will be a town, which will last months, years, decades, or generations, according to the character of the deposit. But it cannot last like the well-kept forest or the concrete power plant at the base of the water fall.

Perhaps the greatest excitement in regard to minerals for this whole territory will be furnished by oil. For years tar sands and flows of natural gas along the Mackenzie River about 500 miles north of Edmonton have created considerable excitement. In 1789, seventy years before the first oil well was drilled in Pennsylvania, Sir Alexander Mackenzie reported oil seepages at Fort Norman, latitude 65° N., on the river that bears his name. Indians at that time were gathering it from pools to smear on their canoes.

In August, 1920, a pioneer oil well about 50 miles downstream from Fort Norman proved to be a small gusher, and in twenty minutes it was capped. This well and several others were uncapped in 1932 for local use.[10] What can you do with a gusher in an essentially uninhabited forest, several hundred miles from a railroad? Is this waiting volcano of oil worth a pipe line that might cost $50,000,000? No one knows. But it is known that the rocks of

[10] There is a small refinery at Fort Norman. Gasoline and fuel oil from this refinery are used in the mining operations in the Great Bear Lake field.

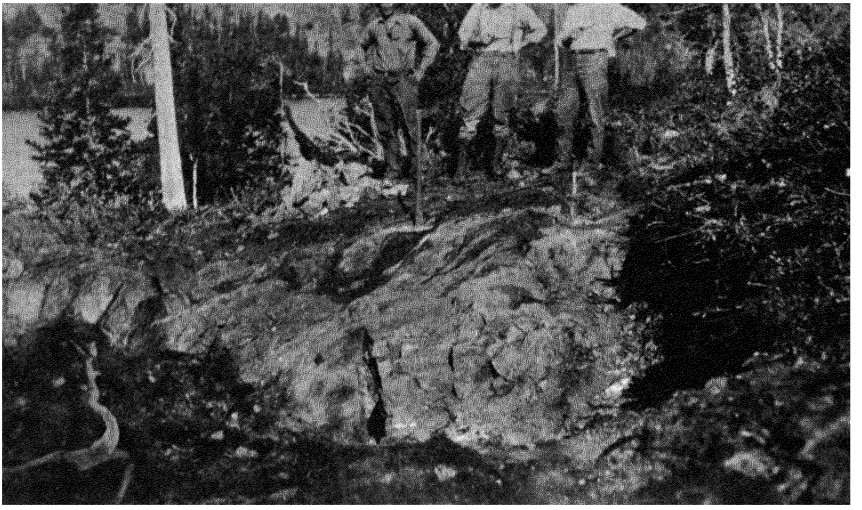


FIG. A. The prospector was the third man to arrive in this area. The glaciers have exposed many rocks for his inspection. The picks here rest on a high-grade silver lode on the shore of Great Bear Lake. (Courtesy Northwest Territories, Dept of Mines and Resources)

the Devonian formations, one of the greatest of oil-producers, extend for a distance of 600 or 700 miles along the Mackenzie, thereby holding out the possibility of a great oil region, which will, of course, be provided with outlets if valuable finds of oil are made.

Huge bodies of iron ore are reported near Lake Athabaska, but they may remain unused for years to come. Because of the vast distances and difficulties of transportation, only the most valuable metals, such as gold, silver, and radium, can stand the cost of transportation to the outside world unless the quantities are very great indeed and warrant the building of railroad or truck road.

We may, therefore, expect that the gold rush and the oil boom will bring a flare-up of boisterous life in a few spots within the great silent Northern wilderness, shanty towns that will swell and then decay when the riches are gone, and then the inevitable return to hunter, fisherman, and forest.

TRANSPORTATION

For many, many years this has been the land of the snowshoe, the dog sled, and the birchbark canoe. Even today the innumerable lakes and the meandering rivers are the main avenues of travel in the Great Northern Forest. Only one railroad stretches across the wilderness, the line that was built by politics to Churchill on Hudson Bay, and more lines like this are not likely to be built.

Paddling a canoe through a wilderness sounds romantic, but actually it is hard, tedious work. With two men in a canoe, 20 miles a day is good paddling, and in the North there are many portages. As a carrier of freight the canoe



FIG. A. A transport junction in the Far North. The airplane's cargo goes forward by the age-old method introduced from Asia at an unknown time in the past. (Courtesy Northwest Territories, Dept of Mines and Resources)

has obvious disadvantages, for much of the space has to be given to food and supplies. The same holds true when an outboard motor is used, for gasoline is so much dead weight, and one does not find a filling-station and hot dogs around every bend of the stream.

For many decades the silence of the forest was broken only by the rhythmic splash of the paddle and the noisy yelps of the dog pack, but today it is penetrated by the purr of the airplane motor and the persistent chug-chug of the tractor train. In this age of mechanical power, the airplane and the tractor are making the wilderness resources far more available to man.

It is probably true that in this region man is more dependent upon the airplane than in any other, unless it be the similar forests of the USSR. A few years ago prospecting in the forest interior was largely a summer job. In some sections a start could not be made until June 1, and if men had to spend thirty days paddling in and thirty days paddling out, the season for work was short. The modern prospector moves quickly by airplane, when the report comes out of the forest that someone has struck it rich. In 1932 prospectors swarmed in by air from Edmonton to the Great Bear Lake district, where radium and other mineral wealth had been found. In a day's time they moved 1000 miles to a point that was otherwise accessible only by canoe and sled. Twenty-two hundred claims were staked out. Airplanes charged 75 cents a pound for hauling freight. As a result of modern facilities of transport, good-sized mining camps in the interior can now operate the year round.[11] Then came the gold boom around Great Slave Lake.

On January 12, 1936, the *New York Times* reported a bumper season for the freight business in the new gold-mining area of northern Ontario. Thousands of tons of mining machinery, supplies, and equipment were carried by rail to Hudson, Sioux Lookout, and Kenora, which were the points of departure for aerial transport and tractor freight trains. As many as 16 tractors with 60 sleds operated from each of these transshipping points. One tractor, 3 heavy sleds, and 40 tons of freight made up the usual train, which moved forward

[11] For a description of modern pioneering de luxe in Canada's Far North, see Edgar Laytha, *North Again for Gold*, Frederick A. Stokes Co., 1939.

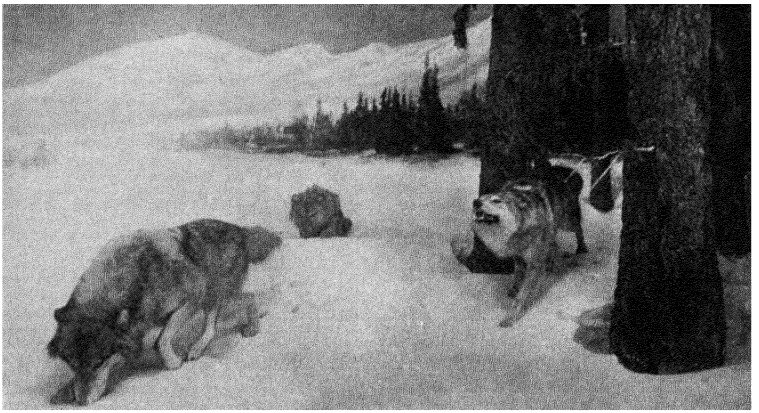


FIG. A. This is the winter form of the land that draws some men, and a group of its more primeval occupants. "That looks just like Northern Canada," said Vilhjalmur Stefansson, Arctic explorer and son of an Icelander, as he stood before the original of this picture. "My, how I would like to be there!" he continued. Gray-wolf group. (Courtesy American Museum of Natural History, New York City)

across the frozen rivers, lakes, and land of the North. For mutual protection, two or more tractor trains would travel together. In the absence of man-made highways, freighting by tractor has one prime disadvantage — its dependence upon solid ice. In 1935, 4000 people in the mining camps of northern Ontario taxed a fleet of 20 airplanes to feed them and supply them with necessities until the ice became strong enough for the tractors to make their way through.

CONSERVING WILD LIFE

In Northern Canada the conservation of wild life takes on a special significance due to the fact that the natives of this area are almost entirely dependent upon the wild life for their livelihood. For this reason the administration of the Northwest Territories has taken definite action to conserve the wild life in those territories. In the Northwest Territories an area of approximately 584,000 square miles out of a total of 1,309,682 square miles has been set aside as game preserves in the interests of the Eskimos, Indians and half-breeds. In addition, the Wood Buffalo Park, 17,300 square miles (partly in Alberta), has been set aside as a reserve for conservation of a herd of buffalo and other wild life, while the Thelon Game Sanctuary, 15,000 square miles, was established in the interests of conservation of wild life in general, and particularly, the preservation of the musk-ox and caribou.[12]

THE FUTURE OF THE GREAT NORTHERN FOREST

Let them come — paper mill, sawmill, power plant, prospector, mining engineer, farmer on the clay belts, trapper for furs, trout-fisherman, hunter

[12] Hoyes Lloyd (superintendent, Wild Fire Protection, National Parks Bureau, Parks and Forest Branch, Canada Dept of Mines and Resources), "Progress of Wild-Life Conservation in Canada" (mimeographed pamphlet).

for moose and caribou, canoeist journeyer in the wild. If in years to come these people should use this land to its best advantage, 95 per cent of it will need the forester. He is the key man of this region. If he succeeds, every other interest is aided thereby.

The forester patiently watches the forest, and when fire appears he fights it fiercely, that we may have saw logs and pulp from a land that appears to be good for little else.[13] Good forest improves the storage of water and the shelter for fur, game, and fish. Good forest improves it as a vacation land for the man who likes to paddle a canoe through uninhabited woods, to fish in little-fished streams, to hunt moose, caribou, deer, and bear. It promises to be a permanent refuge for the Indian, and a choice retreat for the type of man who loves to keep alive a spark of the Viking spirit, a trace of the explorer's instinct. It may be a long time before all of this region will be explored, with every stream and lake properly located, except from the air. The enterprising, exploring geographic canoeist can go and add a bit to the map of the world, at the same time that he is toughening his muscles and calming his nerves far from the rack of city life. The journey will also be enlivened by the contest to keep from being eaten alive, for in this mossy, marshy land of lake and stream the black fly eats you, if it can, in the first half of the summer and the mosquito eats the rest of you, if it can, in the second half of the summer. The best vacation season is the short autumn after frosts have laid the insects low and before the coming of ice and snow. I will never forget the clouds of mosquitoes that rose every time I put down my foot on the moss, inches deep, that covers so much of the earth in this (from my view) accursed land. Some people like it.[14]



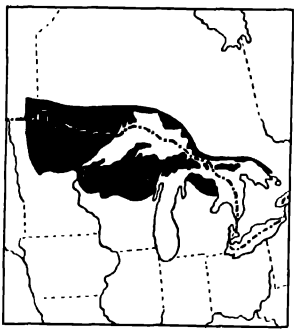
FIG. A. The sportsman was the fourth and last to arrive. First the hunter, and last the pursuer of the bloodless winter sports. Laurentian foothills, Quebec. (Courtesy Canadian Nat'l R.R.)

[13] The mantle of moss that covers much of the surface adds greatly to the difficulty of fire-fighting, by letting fire smolder for days, or even weeks, and then flash! roar! hell has returned, to claim what man thought he owned.

[14] See Kathrine S. A. Pinkerton, *Wilderness Wife*, McClelland, 1939.

Chapter 22. THE UPPER LAKE REGION: A LAND OF EXPLOITATION AND RAW MATERIAL

GLACIATION, SOIL, AND SURFACE



SUPPOSE that someone should cut down a big tree 6 inches below the surface of the earth and fill the hole with dirt and take away every vestige of the tree. Suppose that afterward a forester should come and excavate the roots. It would be a simple matter for him to tell how much earth had been filled in where the tree had been. By examining its roots the forester could tell the age and the size of the tree, and moreover he could also tell what kind of tree had been there.

By a similar process of interpreting the signs, the geologist can tell us that the region of the Upper Lakes — that is, eastern Minnesota, northern Wisconsin, the upper peninsula of Michigan, and the northern part of the lower peninsula of Michigan — has been through the following processes in its making. Long ago mountains were there, mountains as high as the Alps and Rockies, perhaps even higher. These were worn down to an almost level plain where hills of harder rock were left sticking up here and there.[1] These mountain roots of old, hard, twisted, bent, and broken rocks were loded, here and there, with rich deposits of iron and copper. Then the whole area was submerged for a long time beneath the sea. Sandstones and limestones were spread over it. Then, millions of years ago, it was raised up, and these newer rocks were partly worn away. One particular layer of rock, the one over which the Niagara River pours (in some places called the Niagara Cuesta), has been traced by geologists from New York through the Lake Region and on into Iowa. It lies on top of the old sawed-off mountain roots mentioned above.

Next came the continental glacier, benefactor in the Corn Belt, destroyer in the Upper Lake Region. In some places it scraped bare the old hard rocks of the ancient mountain roots. On far too many acres they are still bare of that few feet of earth which permits the land surface to be the home of plants and the sustainer of man. The digging glacier piled up the earth unevenly and gouged out the softer rocks, leaving basins, often now filled with water — lakes. Most unfortunately, the iron deposits were softer than the rocks in which they lay, and billions of tons of good iron ore were scooped up, scattered

[1] Only a little of the land is more than 1600 feet above sea level now.

uselessly over a hundred counties to the southward. In scattering its scrapings the glacier left rock piles, piles of gravel, stretches of sand,[2] stretches of sandy loam and of clay. Hence even in a small area the soils are sometimes of the greatest variety.

Glacial scraping made holes. Glacial dumping dammed up stream valleys, made pockets in the plain. If there came enough water, these irregularities became lakes. Nowhere in the world are lakes so numerous, unless it be in Finland, whose history is also glacial. Minnesota has 10,000; Michigan, 6000; Wisconsin, 2000; most of them are in this region which we call the Upper Lake Region. Many depressions were not quite deep enough to become lakes, and remained swamps — hummocky swamps with cedar trees in them; flat swamps with tamarack trees; weedy-looking swamps with cranberries; and many other kinds of swamps, besides partly filled lakes, called muskegs, where the newly made muck is covered with bushes and grass. Some of the muskegs are filled with peat, in which trees do not grow.

Much of the northern peninsula of Michigan was covered to a depth of more than 300 feet with scrapings from farther north, and its surface is often an outwash plain of coarse sand, suitable for pine but poor for farming.

The Upper Lake Region is bounded on the west and the south by transition to three regions where farming can occupy most of the land. The northern boundary of the region as shown is an arbitrary line in a vast area of rock, wood, and water (see Chapter 21), which ends in cliff along the shores of Lake Superior and Lake Huron (see pocket map).

It would be hard to find a greater contrast between two regions than that between this Upper Lake Region and its neighbor, the Spring Wheat Region, or its next neighbor but one, the Corn Belt. It is no wonder that the waves of migrating farmers drove past it to the prairies of Illinois, Iowa, Kansas, Nebraska, Minnesota, and Dakota. It is also no wonder that even yet the maps of agricultural production show it to be a land that figures little in agriculture but high in abandoned farms.

LUMBER: THE FIRST EXPLOITATION

This area has more rain than the Spring Wheat Region. The lakes and swamps add moisture to the air. Hence the whole of it was forested, save for areas of muskeg and bare rock. The varying soils gave a forest of great variety, chiefly white pine, spruce, hemlock, and maple. The fall of snow is heavy. Snow piles up from November to March as it does in the Northeastern Highlands, and it is easy to move the logs. The lumber industry moved hither from New England, New York, and Pennsylvania — lumbermen, chopping camp, logging methods, log drive, and all. Statistics show us that exploitation has marked our short possession of this continent. First Michigan led in lumber production. Then Wisconsin led. Then the lumbermen flitted to the South. In 1904 Michigan cut only half as much lumber as was cut in 1890. In 1910 it cut half as much as in 1900, and in 1920 half as

[2] A locality on the Wisconsin-Michigan boundary has the suggestive name "Lac Vieux Désert" — Old Lake Desert.



FIG. A. Mealtime in a logging camp. There is no statutory rule against conversation, but there seems to be a physiological one — five hours of ax work before. (Courtesy Farm Security Adm.)

much as in 1910; and the state is now a heavy importer of lumber, having dropped from first place in 1890 to sixteenth place in 1930. In 1889 Michigan cut 4,300,000,000 board-feet of timber; in 1936 it cut less than one-tenth of that amount. Wisconsin's decline has been almost as rapid, and Minnesota has followed suit. (See Figs. 176 A, 491 A.)

In 1920 Michigan began a popular movement to save Isle Royal in Lake Superior, an island 45 miles long and 5 miles wide. Isle Royal contained one of the few remaining tracts of virgin wilderness under private ownership in the North Central states. The moose and the caribou still roamed there. An Act of Congress in 1931 provided for the establishment of a national park on Isle Royal, but the acquisition of funds took time, and a lumber company continued to cut some of the beautiful stand of timber until July, 1936. That summer a large portion of the island was burned over, and in the following year the last privately owned land finally became public property.

It would not be so bad if the lumbermen had left what they could not use, but the fire followed them and kept on coming. It seems that in humid climates forests can, in the course of centuries, help to make a soil and extend themselves over bare rock. When a dead tree falls outward on a bare rock surface, a mass of wind-blown leaves and trash catches in its reclining top. In time the trash decays and short-lived weeds take root from wind-blown seed. They add to the accumulation. Little trees take root and die. Some trees live to grow to bush size. Meanwhile more trash collects around them, wind-blown dust accumulates at a speed that really counts, and an extension of earth and a crop of trees spread across the erstwhile bare stones.[3] In the course of thousands of years this has happened over large areas of otherwise bare stone. A thousand years of building are as but a day — a day of destruction by fire.

Professor Frank Williams of the University of Pennsylvania tells me that he has done much geological "cruising" for lumber companies in northern

[3] Observation in humid forests will show many small examples of this process on the flat tops of large stones.

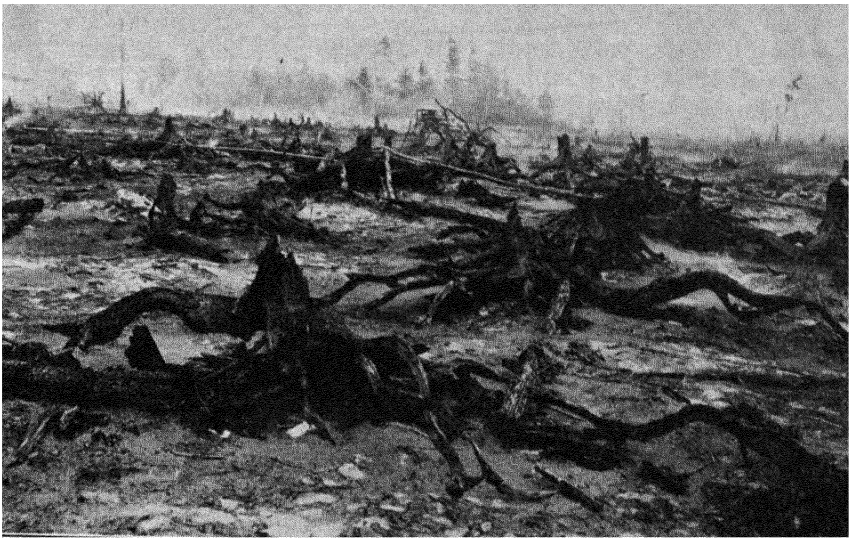


FIG. A. After the lumberman follows the fire. Here the peaty soil also burned, making almost complete destruction of organic matter in the soil. Observe the stones and the exposed roots. (Photo by E. S. Shipp, U.S. Forest Service)

Minnesota. He traversed the section lines, advising the companies as to the possible mineral content of their lands — whether it was worth keeping or should be abandoned to save paying taxes. For hours at a time he walked over bare, gently rounded knolls of granite smoothed off by the continental glaciers. Swamps often filled the depressions between them. But here and there, sitting on the smooth granite, was a telltale stump left by the lumberman. Repeated fires had killed the small growth and all new growth, and burned up most of the spongelike vegetable soil. The digging raindrops and wind had done the rest. The lumberman had found a fine stand of timber and a producing forest; the ten or twenty years of fire had made it bald knobs of granite, more sterile than Sahara — and many Americans boast because they personally got rich by this murder of their country.

Professor Carl Sauer of the University of California, speaking of the sand-pine lands of the upper part of the lower peninsula, reports that repeated fires have so eaten the humus out of the soil that nothing but the jack pine, the poorest of timber trees, will grow. He estimates that it will take five hundred undisturbed years for nature to restore the soil and produce a pine forest like that which was so recklessly lumbered in the 1880's and 1890's.

The slow process of restoration started when the states began to get possession of some land through default of taxes.[4] There are also some small

[4] Massachusetts and Pennsylvania have wisely abandoned the vicious general property tax, which, with its high assessments, placed a premium on the quick cutting of timber. In lieu thereof they have substituted a nominal annual property tax, together with a yield tax which is levied on the timber when it is cut. In most states the general property tax is a great impediment to the adoption of scientific forestry by private enterprise.

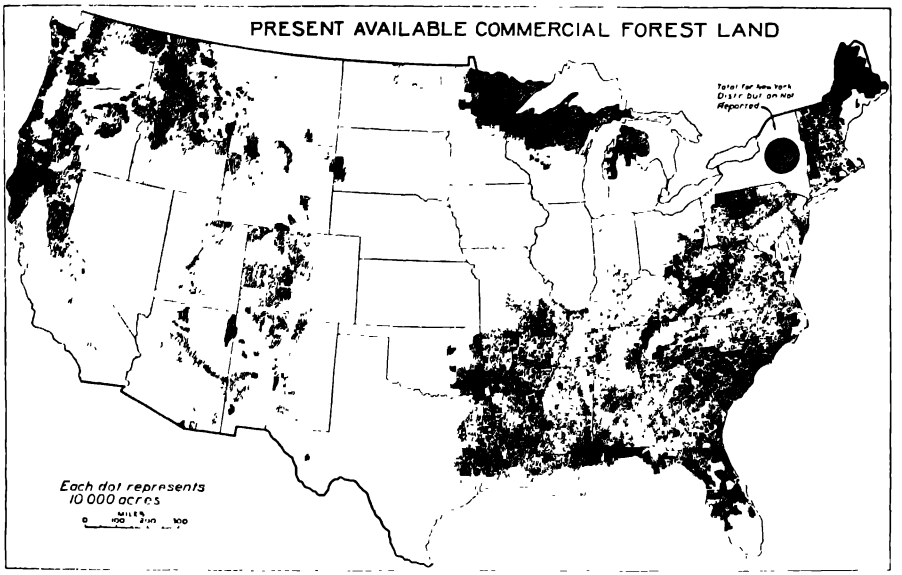


FIG. A. A study of "Forest Land Resources, Requirements, Problems and Policy" by the National Resources Board, 1935, results in this map telling where our forests ought to be if we use our land properly.

national forests, but the fire still runs over most of the area, and reconstruction is far below destruction. The forest fire here is sometimes a sweep of death; scores of villages and hundreds of people have been burned. In 1908 one Wisconsin fire burned 2000 square miles and destroyed young trees that would have been worth scores of millions in a few score years.

On July 31, 1939, President Roosevelt submitted to Congress a recommendation of the National Resources Committee for a long-range program to rehabilitate residents of the cutover timber areas of the Lake states, embracing 57,000,000 acres in 86 counties. The President declared:

> The cut-over region in the northern part of the States of Michigan, Minnesota and Wisconsin was once the scene of a flourishing lumber industry. Today a large section of the population in that area depends for its very existence on public aids, work relief, and security payments. The large expenditures for these purposes in the area have enabled these people to survive, but could not provide a satisfactory permanent solution to their problem.

Among the recommendations for this desolate area were long-time capital loans to settlers on land suitable for agriculture, relocation of other residents, elimination of uneconomic units of government, development of co-operative marketing, and a large-scale public-works program for forest restoration. We are now paying high for the individualism of the booming 1880's and 1890's.

It seems to have been easier for the few families of the owners of sawmills and timberlands to "cut out and get out" than for their many workmen and the subsidiary population.

MINING: THE SECOND EXPLOITATION

In the chance shufflings of geology nature seems to have handed its highest cards to the Upper Lake Region. On the south shore of Lake Superior were large deposits of copper, some of it being pure copper.[5] The deposits were worked before the white man came, and they made Michigan the leading copper-producing state for many years before it was surpassed by Montana in 1887. Inasmuch as this was the greatest mining industry for a time — almost the only mining industry of the state — the Michigan School of Mining and Technology was located near by at Houghton. Some of these mines have now reached such a depth that the miners actually travel more than a mile in going from the outlet to their work in the mines.[6] This fact indicates the approach of the end. Meanwhile, Montana has passed Michigan in copper production, and in turn has been surpassed by Arizona and Utah.

The stores of iron were much more extensive than the copper, and were the richest in the world. Both to the north and to the south of the western end of Lake Superior, there are ranges of hills containing great masses of iron ore. There are smaller deposits of richer ore, but the larger area is so easily mined that here is the greatest exhibit of mass-production mining now in operation. The solid masses are near the surface, and so soft that a steam shovel can scoop up the ore, which it drops into a freight car to be whisked away to the lake steamer beside the wharf. The chief ore ports are Duluth, Superior, Ashland, Marquette, and Escanaba. It is no wonder that the iron mines of the Pittsburgh district and the Champlain district and many less important locations in the United States have shut down, for a time, while the furnaces of Buffalo, Pittsburgh, and Chicago and all the region between are fed exclusively by the mines of Lake Superior. Even the furnaces of the Schuylkill Valley and Harrisburg are sometimes supplied in part from this source, although much of the ore used east of the Alleghenies and north of the Potomac is imported.

The population of the region is found chiefly in a series of towns clustered around the iron mines.[7] Since the iron mines are owned by great absentee corporations and embrace most of the property of the locality, the people of these counties succeed in saddling most of the taxes upon the foreign corporations. One sees sometimes very odd contrasts — there will be a big, magnificent high school and a beautifully kept highway, with uniformed

[5] The average purity of the copper ore now mined is approximately 20 lbs. per ton, or 1%, but sorting of waste below and above ground raises the recovery to about 30 lbs. per ton, or 1½%. The richest copper ore now being mined is that of the Belgian Congo and Northern Rhodesia, which averages about 6% copper.

[6] In 1932 the Quincy mine was digging copper at a depth of 6200 feet, the deepest mine in the United States at the time.

[7] "A school principal in New Duluth, near Duluth, analyzed his three hundred and thirty children as Slovene, 49; Italian, 47; Serbian, 39; American, 37; Polish, 30; Austrian, 22; Swedish, 22; Croatian, 20; colored, 9 [it is instructive to note that he did not include these among the "Americans"]; Finnish, 7; Scotch, 6; Slav unspecified, 5; German, French, Bohemian and Jewish, 4 each; Rumanian, Norwegian, and Canadian, 3 each; Scandinavian, unspecified; Lithuanian, Irish, Ukrainian and Greek, 2 each; Russian and English, 1 each — 60% of them from Southern and Eastern Europe." — Sinclair Lewis, "Minnesota: The Norse State," *Nation*, May 30, 1923, p. 625.

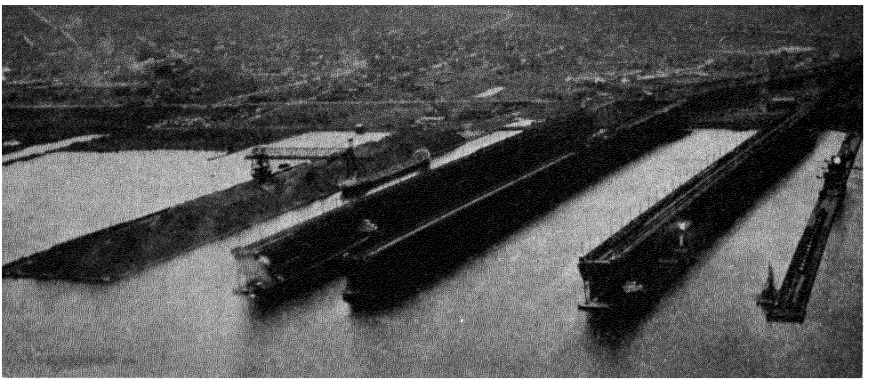


FIG. A. After the mining of the forest came the mining of the earth. These iron-ore docks at Duluth are one of the chief outlets of the richest iron-ore deposits in the world. The apparently diminutive size of the ore vessels gives some measure of docks and ore pile. This excellent view of the lake steamer shows clearly that it is a floating box with a house at each end. (Courtesy U.S. Steel Corp.)

workmen caring for the road, and then, at the next moment, as you make a little turn, a deer may dash across the road and vanish in the scrubby wilderness, which should be a forest but is not.

CITIES

The chief cities of this region are the ports on Lake Superior: Duluth (pop. 101,000), Superior (36,000), Ashland (11,000), Marquette (15,000), and Sault Ste. Marie (14,000); and on the Canadian side, Port Arthur (20,000) and Fort William (26,000). Duluth and Superior, economically one city like Minneapolis and St. Paul, make the first port of the world for iron-ore export.

Port Arthur and Fort William are the chief outlets for wheat from western Canada. A small portion sent from time to time by way of Duluth has been sold to American millers. Duluth is the chief outlet for the wheat of the American part of the region. Duluth and its smaller neighbors also handle the export of iron and such lumber as still goes eastward.

In theory these cities should be large, since they handle the trade of an extensive territory. One thinks of Chicago and San Francisco. Instead, these cities remain small, because, primarily, they have been points of *transfer* rather than centers of *distribution*. The centers of distribution are on the edge of a productive plain. Hundreds of thousands of shipments of goods are sent into this plain over the many railroads which radiate from distributing centers such as the Twin Cities and Winnipeg. Through shipments of goods between these distributing centers and the East are transferred from boat to rail, or rail to boat, at Port Arthur, Fort William, Duluth, but the actual distribution takes place at the big city nearer to the people. There is no reason for the 5 railway systems of Winnipeg to run their 15 lines on through the unproductive woods to Port Arthur, or for the 27 railway systems of

Minneapolis and St. Paul to run their 23 lines through the unproductive woods to Duluth, so these ports have remained but little more than ports for distributing centers. They hold records for handling vast quantities of material, and records for speed.[8] Grain is poured from elevator to ship. Ore is dumped from the freight car to the ore pocket on the dock, and from the ore pocket through chutes to the ship below. There is a basis for the statement that these cities are funnels through which great quantities of traffic pour. The urge to speed is great, because a year's work must be done in the seven months during which ice does not lock the harbors.

These Upper Lake ports tend to be storage places for grain. About two-thirds of the crop can get down to Montreal before ice closes the harbor. The rest must be carried down the next spring and summer, a time when the Great Lakes route is much better than the Hudson Bay route. The operator of a grain ship often tries to get his vessel to the Upper Lake port the last thing in the autumn so that it may be loaded with grain and thus through the winter earn a little as a storage warehouse, and be ready to sail away in the spring at the first hour that the harbor icebreaker can let it get through the ice cakes to the open lake. The lake traffic opens in the spring with a great rush. As many as 60 vessels, some of them holding 14,000 tons of grain, may sail from Fort William and Port Arthur at the opening of navigation. Two abreast, they go in regular procession, as though on parade, every captain doing his utmost to make a quick journey to the lower lake and to get to the dock ahead of his rival. On the other hand, many ship-operators prefer to use their ships as floating elevators at Buffalo and other Lower Lake ports during the winter season, which gives the grain-dealer the advantage of delivery upon demand. During the years 1929–34, an average of 24,000,000 bushels annually were stored in ships laid up at Buffalo.

Duluth has a small iron and steel industry, which utilizes the rich iron of the Mesabi Range only 100 miles to the north. West Virginia and Pennsylvania coal is delivered by lake carriers at exceptionally low rates, since these carriers are eager to carry coal up the lakes rather than to travel in ballast, as most of them are compelled to do. If the market to the westward grows, the Duluth iron and steel industry will stand to gain. Then too there is the nefarious threat of Minnesota to tax ore that goes out of the state.[9]

[8] Great Lakes freighters are specially built to facilitate the rapid loading and unloading of bulk freight. Some of them have 20 hatches or more, and when the hatch covers are pulled back, the entire hold of the ship is exposed to view. The largest of these freighters will hold the equivalent of 2500 boxcar loads. With special machinery ashore, some of them have been loaded in the incredible time of 16½ minutes and unloaded in about 3 hours. Gravity is a great aid in loading the vessels, but at the Lower Lake ports huge clamshell buckets are used to unload the iron ore and suction pipes are used for grain. I once had the experience of working as a deck hand on one of these freighters. On cold Lake Superior (deepest sounding, 1,290 ft.) I often found a heavy sweater or reefer to be quite comfortable during the middle of the day in July and August, but on warm Erie and sometimes on Huron it was a pleasure to sleep on a mattress on deck. The water for the shower baths came directly out of the lake; most of the men aboard ship made it a point to do their bathing while sailing through Lake Huron and Lake Erie.

[9] See the Constitution of the United States, and consider the recent alarming growth of state substitutes for tariffs. No trade barriers between states has meant promotion of regional specialization and national economic development. What next?

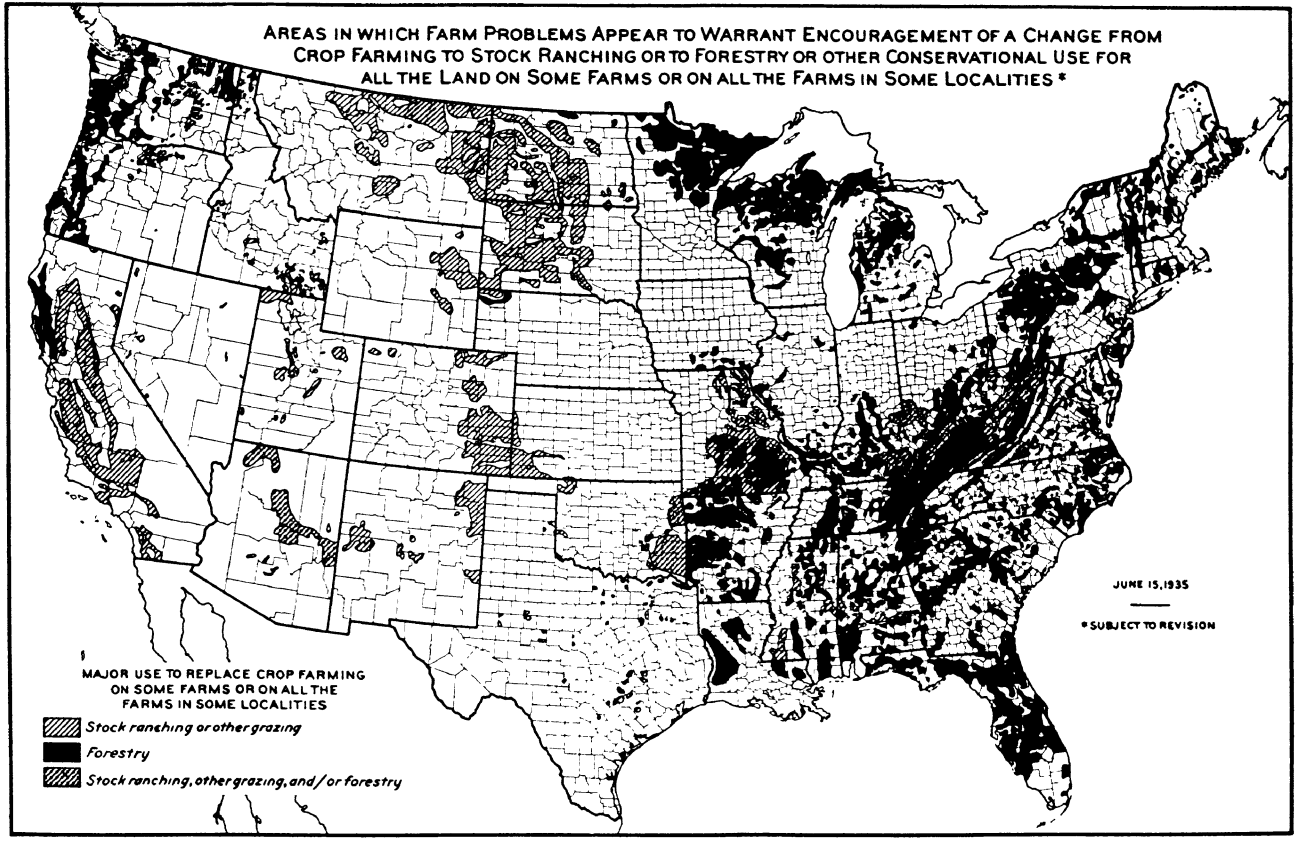


FIG. 468 A. After the settlement and after the wreckage we investigate, and here are some surprising recommendations after investigation. (Courtesy Nat'l Resources Board)

THE FARMER: THE THIRD EXPLOITATION

Some counties in this region have 20, 40, or even 60 per cent of their area covered with bare rock, swamp, and lake. Scattered around among these are patches of arable soil, that is to say, arable after the stumps and perhaps some stones have been removed and perhaps some ditches have been put in to drain it. These tracts of arable land are of all shapes and sizes. As previously explained, the soils are of great variety. Some of them look good, and are. Some of them look good, and are not. Thereby hangs the tale of many a bankrupt settler who tried to make a home where a living could not be made.[10] Parts of the sand plain of the upper peninsula of Michigan have been called "a fire-blasted wilderness that sends the settler's wife to the insane asylum."

In the enthusiasm for development which is so strong in America the states having parts of their area in this territory have created immigration bureaus whose task it was to get settlers. A state bulletin showing nice pictures of barns, homesteads, cattle, and crops looked good to the land-hungry man of Norway, England, or New York, or even of Illinois, especially when the low price of the land was considered. Land companies, getting cutover tracts, have sold 40-acre units to settlers for a small cash payment, and required no further payments and no interest for three or five years. This was fine for the man who succeeded, but it tempted the man destined to failure to hang on for a heartbreaking length of time and then be forced to abandon his house and improvements to the land company. The company then had an "improved farm" to sell. And the farmer? Did he escape a broken heart?

Settlement here required exact knowledge of the locality and considerable capital — two things that the frontiersman usually lacks. Here is one case in America where it was the man who got exploited more than the land. Upon the average, it is probably true that most of the farmers who have gone into this territory would have gained more material possessions for the same effort if they had bought the cheap lands of the North Atlantic Coastal Plain, some parts of the Northern Piedmont, or the more wholesome sections of the Cotton Belt. But thousands of them have gone in and have succeeded, and if demand for agricultural produce should increase at some later date, more will follow. In this climate men are hardy and vigorous.

The growing-season is short. In some places it does not exceed one hundred days, and the summer frosts are much too common, especially on low, flat ground. The summers are especially cool in the peninsula lying between cold Lake Superior, the tip of cool Lake Huron, and the tip of cool Lake Michigan. Perhaps the area earned the name of "Michigan's Icebox." Snow on the ground and ice on stream and lake get 2 or 3 feet thick every winter. Strawberries do not ripen here until August, and along the eastern shore of Lake

[10] In 1923 Minnesota became the first state to enact a farm mortgage moratorium law, but in the twelve years that followed the state was forced to take over by foreclosure and quit-claim deed the title to more than 4000 farms. In March, 1935, the state had on its hands 3800 properties embracing 650,000 acres, valued at $24,000,000. With the state as the landlord, three-fourths of the original owners were operating their farms on a crop-share basis. The remaining farms were leased to other farmers on a similar basis.

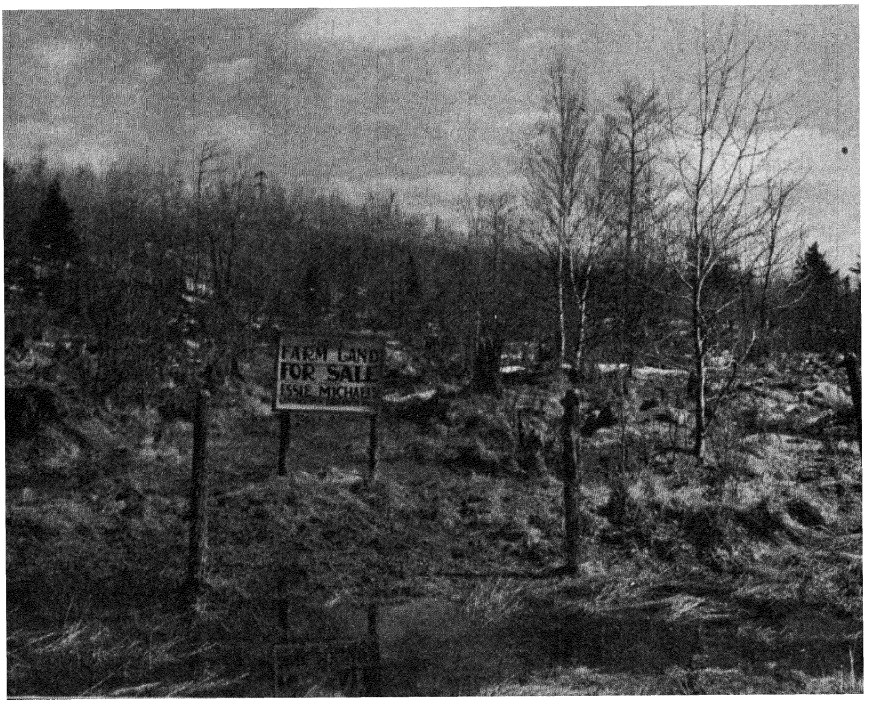


FIG. A. After the fire a scattering growth of weed trees and the attempt to get farmers to settle. (Courtesy Farm Security Adm.)

Superior the July temperature of 60° F. is as cool as southern Norway — a very proper place for Scandinavians.

Upon the whole, the agriculture of this region has a clearly marked tendency toward livestock, especially the dairy farm, and above all, toward the potato, for which its cool, moist summer offers conditions that are almost ideal. As in Maine and Quebec, many of the farmers have a second job for winter in mine, woods, or town.

THE FUTURE OF THE UPPER LAKE REGION

In value and weight the most conspicuous thing about this region in the ensuing decades will be the millions of tons of iron ore from the hustling mining towns. In a few generations most of the mines will be empty holes, unvisited save by the curious. In that day the mining towns may shift over to manufacturing, using electric power, for which the lakes of this upland region are so helpful. There is also much Canadian water power within present transmission distance. The mining town *may* shift to manufacturing, but the unpleasant fact must not be forgotten — the more common next stages of the mining town are ghost town, bat roost, hazy memory.

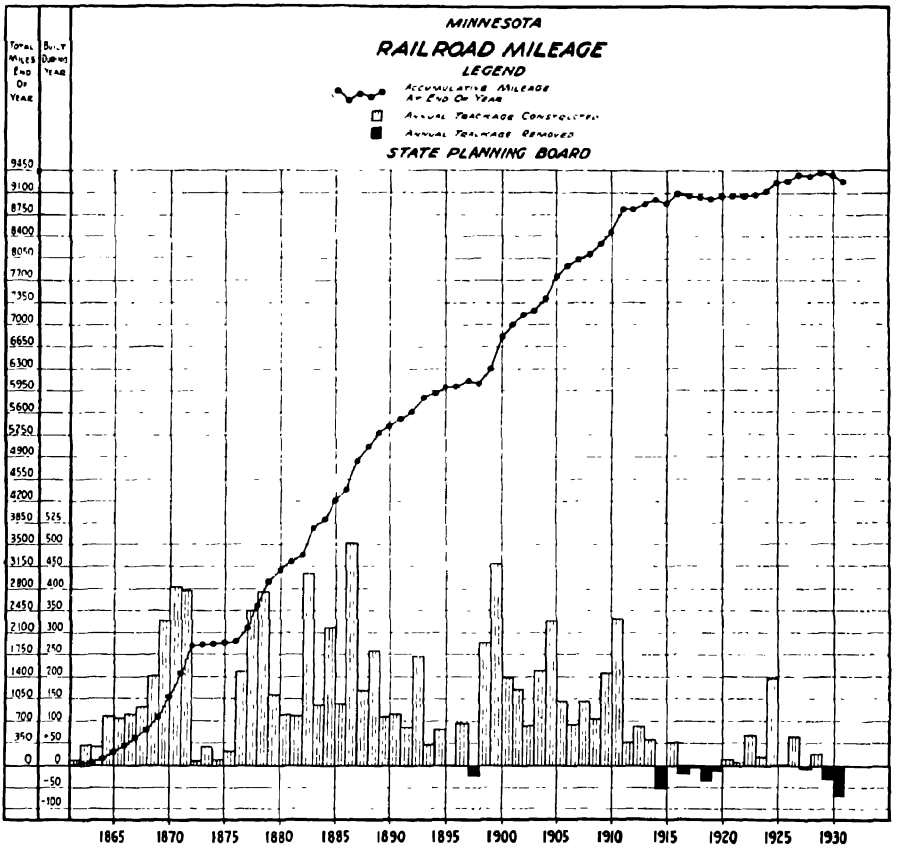
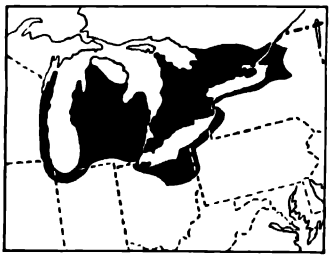


FIG. A. This graph gives us a record of transport development, transport maturity, boom and depression. Especially compare 1872 and 1873, 1897 and 1899. It would be interesting if we could superimpose upon this the construction of good modern hard-surfaced roads. (Courtesy Minnesota State Planning Board)

Most of this region should be at once protected from fire. This will make it automatically a forest in most places. In others, replanting is necessary — so bad have been our fires! Switzerland and Scandinavia suggest that forests here might support a considerable population and give winter work to farmers. The agriculture here can be increased by intensification and by reclaiming land from water, stump, and stone.

The efficient utilization of this region must make it a sea of forest, scattered with islands of farms and islands of water — its thousands of lakes. These are already a favored summer pleasure and vacation ground. Fishing, canoeing, sailing, swimming, sitting on the cool veranda in the presence of a beautiful landscape of lake, hill, and forest — this is a beneficial way for any industrious person to spend a part of the year, if he happens to like it. In a continent of increasing population this region will have steadily increasing use as a vacation land.

Chapter 23. THE LOWER LAKE REGION



AT the north the Great Lakes project into a rugged, rocky wilderness. The steep shores are backed by a land hostile alike to traveler and settler.

At their southern end these lakes are poised miraculously at the level top of the continent. Almost without a step-up canals go east and west from the southern ends of the lakes. In the Lower Lake Region the shores are low, and back of them is a smooth, soft land — rich and inviting. It spreads away to populous commonwealths, not to staggering frontiers. The shores of the Upper Lakes have funnel towns. The Lower Lake shores have metropolises.

Factories — factories with boats and trains bringing crude raw materials — of such is the Lower Lake Region. Iron ore, pig iron, steel, coal, coke, cement, sand, gravel, lumber, rubber, cotton, wheat, corn, oats, flaxseed, cattle and hogs — these are the things that glide and dump, bellow and squeal, make dust, smoke, tonnage, jobs, and profits in this region of cities — cities which the lakes, the most-used of all inland waterways, have created.

On the shores of the lakes are focal points of traffic. Water freight rates of lake steamers are cheaper than land freight rates of railroads.[1] Therefore bulky and heavy commodities seek the lakes, where they can move more cheaply in ships. Cities — cities with great advantage of location — have risen at lake-shore points which command the trade of interior areas. These areas are rich. They have made lake cities prosperous. At the ends of Lake Erie, Buffalo commands the East and Toledo the West. Between them are Cleveland, Erie, and other ports where Appalachian coal and Mesabi iron meet to perform their alchemy. On the northern shore of Lake Ontario are Toronto and Hamilton, industrial counterparts of the American cities. Between Lake Erie and Lake Huron is Detroit, a great trading-post long before the other lake ports were born. Greatest of all is Chicago, at the southern end of Lake Michigan, nearest the heart of the productive Corn Belt, focal point of Illinois coal and Mesabi iron, and railroad junction between the East and the West.

The Great Lakes favor traffic in a wonderful manner. All are now one navigation unit. The low falls at Sault Ste. Marie once isolated Lake Superior, but now the United States Government and the Canadian Government are friendly rivals in offering free passage to ships through the canals, which

[1] Average freight rates on wheat from Chicago to New York in 1937: by lake and canal, 4.8 cents per bushel; by lake and rail, 7.8 cents; by all rail, 14.7 cents. The lake boats would be used much more than they are but for the determined and skillful opposition of the railroads, by their refusal to co-operate, and in other ways.

have been built at an expense of more than $30,000,000. Michigan and Huron are on the same level, with a navigable channel between them.

The channels of the lower St. Marys River, the St. Clair River, Lake St. Clair, and the Detroit River have been deepened by dredging and blasting to provide a 20-foot channel,[2] which governs the maximum draft of lake vessels. The water level of the lakes has a direct effect upon the profits of shipping companies, and it is estimated that a decrease in 1 foot in depth has caused an aggregate loss of $7,000,000 in a single season.[3] In 1929 ships could carry full loads, for the mean water level was above normal, but in the dry year of 1933 the recommended maximum loading drafts for ships passing through Lake St. Clair varied from 17 feet 9 inches to 18 feet 9 inches.[4]

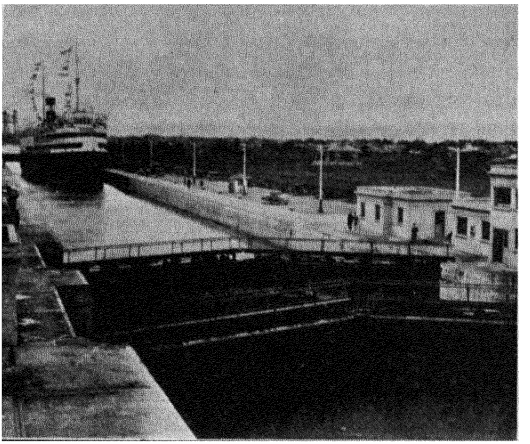


FIG. A. This perfect picture of a lock on the Welland Canal, which connects Lake Erie and Lake Ontario, symbolizes the great feature of the Lake Region — transport. Notice the low level of the water in the foreground. (Courtesy Canadian Nat'l R.R.)

Great Lakes freighters are especially designed to meet the needs of the bulk cargoes that they carry,[5] and the efficiency of these vessels is the envy of the maritime world. The largest vessels are over 600 feet long and will carry a cargo of 572,000 bushels of wheat,[6] 760,000 bushels of oats, 16,282 tons of coal or iron ore. Some of these carriers have as many as forty hatches, and when the hatch covers are pulled open, the ship resembles an open barge, a great aid to quick loading and unloading. Gravity loads these vessels. At Upper Lake ports wheat pours through elevator spouts at the rate of 2600 bushels per minute. Iron ore rumbles and thuds into the ship's hold at the rate of 100 tons per minute.[7] At Lower Lake ports the return cargo of coal is loaded at the rate of 1000 tons per hour by a huge machine that picks up a

[2] The minimum channel depth is 21 ft. over rock bottom and 20 ft. above earth bottom. In navigating these channels, a loaded ship moves slowly and cautiously, for there may be only 3 in. of water to spare between the keel and the mud.

[3] Hobart S. Perry, *Ship Management and Operation*, Simmons-Boardman Publishing Co., 1931, pp. 218–19.

[4] In 1927 the maximum loading drafts for these ships varied between 18 ft. 1 in. and 19 ft. 9 in.

[5] About 98% of the Great Lakes traffic consists of bulk cargoes, chiefly iron ore, grain, coal, and limestone.

[6] Consider what this means. At a yield of 20 bu. per acre, it took 44.7 sq. mi. to grow the wheat to fill this large ship. Wheat occupies 47 cubic ft. per ton, a bushel weighs about 60 lbs. and an ordinary boxcar holds about 40 tons, so it took over 7 trains of 60 cars each to haul the wheat to the ship.

[7] The *S.S. D. G. Kerr*, a vessel of 12,508 gross tons, loaded a cargo of iron ore in 16½ minutes. (U.S. War Dept, Board of Engineers, and U.S. Shipping Board, *Transportation on the Great Lakes*, 1930, p. 29)

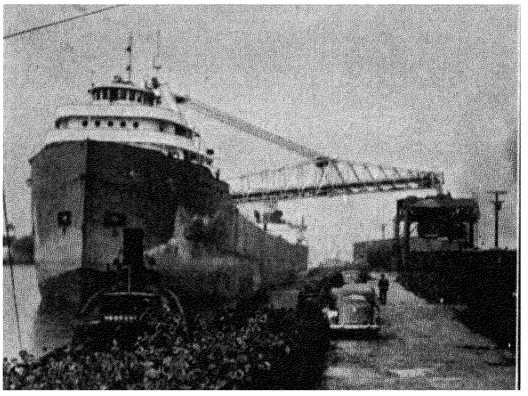


FIG. A. Up by machinery, forward by steam, down by gravity — that is transport on the Great Lakes. Here an endless-belt conveyor carries an endless stream of limestone for blast-furnace flux from ship to loading chute. Under this chute two trains standing side by side receive their cargoes simultaneously. (Courtesy William M. Gregory)

huge gondola car from the railroad, tilts the car, and allows the coal to slide into the ship's hold. Unloading takes more time. Huge clam-shell buckets with mighty jaws reach down into the hold of a ship and grab as much as 12 tons of ore or coal at a single bite, and suction pipes are used to unload grain.

Aided by these most efficient freighters, the heavy industries of the surrounding regions have sent over the Great Lakes so much traffic that the St. Clair River has well been called the greatest commercial artery in the world. In 1929, a boom year for iron and steel, it carried more traffic than the Suez and Panama canals combined, by weight.[8] Lake traffic fluctuates greatly. This is because iron ore is by far the greatest single factor in lake freights. The iron and steel industry lives continuously in chills and fever, the fever of boom and the chill of depression. For example, the Lake Superior district mined 64,000,000 tons of ore in 1916, and 25,000,000 in 1921. Accordingly, the Soo Canals carried 92,000,000 tons of freight in 1916 when munitions for the World War called for steel without limit, and only 49,000,000 tons in 1921 when industry slackened. Yet over a broad sweep of time there has been a marked increase in tonnage. In 1890 the Soo Canals handled only 9,000,000 tons of freight; in 1937, about 88,000,000 tons. The great variation in lake traffic is also shown by the total shipments from American ports, which amounted to 108,000,000 tons in 1920, 151,000,000 tons in 1929, 47,000,000 tons in 1932, and 126,000,000 tons in 1936.

The passenger traffic of the lakes is carried in the finest fresh-water ships in the world. Some of them rival ocean liners in their elegance. Most of them are side-wheelers, since the shallow channels of most lake ports precludes the use of screw propellers on these large passenger vessels. The lake shores also furnish recreation at many beaches and summer resorts.

THE STEEL INDUSTRY

A few decades ago Pittsburgh was the undisputed capital of the American kingdom of steel. Pittsburgh and its industrial offspring — Youngstown, Canton, and the cities of the upper Ohio Valley — still comprise the greatest

[8] By *values* the comparison of ore and coal of the Great Lakes with the tea, rubber, silk, seeds, and spices of Suez tells a different story.

steel-manufacturing district in the country, and their dominant industry continues to grow. On the other hand, as we have seen, the manufacture of iron and steel is developing elsewhere, at such far-flung points as Birmingham, St. Louis, and Duluth. But the greatest shift of all has been the migration of steel to the southern shores of Lake Erie and Lake Michigan. Here in the Lower Lake Region, a land of cities, the supremacy of Pittsburgh is being seriously challenged.

Iron and steel plants have risen along the shore of Lake Erie in Buffalo, Erie, Ashtabula, Conneaut, Cleveland, Lorain, Sandusky, and Toledo; and also at Detroit. These plants vary in size and in the nature of their products.[9] Some of them are controlled by the giant United States Steel Corporation of Pittsburgh, but others belong to independent companies. The significant fact is that the lake shore has a magnetic power that has drawn steel from its home in Pittsburgh. Specifically, this district meets the prerequisites for a great steel industry. As already noted, the Great Lakes provide unusually cheap access to the abundant and high-grade deposits of iron ore near the western end of Lake Superior. The lake-shore district has ready access to Appalachian coal and coke. The iron-ore train moving southward to the Pittsburgh area often returns to the lake cities with a load of coal or coke, which makes the freight rates cheaper in both directions.[10] Finally, this district has the advantage of a splendid industrial market. In the great cities of the Lower Lake Region and throughout the Northeast, there are many industries requiring vast quantities of unfabricated steel, and others that have specific needs for finished products.

The greatest of Pittsburgh's rivals today is Gary, Indiana, an economic suburb of Chicago. The Carnegie-Illinois Steel Company, a subsidiary of United States Steel, erected at Gary a monster steel plant, the largest and most comprehensive plant in the world. Here at the lake front are assembled Superior ore, Appalachian coke, and southern Illinois coal. Lake freighters discharge their cargoes of iron ore alongside the blast furnaces. Molten pig iron runs directly from the furnace into the steel mill.[11] After treatment the hot steel is rushed through the rolling will, where it is pressed into shapes that are desired by the fabricating plants. At first glance it might seem that the transportation of coke all the way from Pennsylvania would be a serious handicap, but coking coal is actually only a small part of the coal requirements of a steel industry, and some Illinois coals have been found to be good for coking purposes. In general, this mighty development at Gary should be interpreted as a movement of the steel industry toward a large and rapidly growing market, a development that was made possible by the cheap carriage of iron ore on the Great Lakes and the steel consumption on their shores.

We have, therefore, a rough triangle bounded by Buffalo, Pittsburgh, and Chicago which is truly the American Ruhr, the heart of our heavy industry.

[9] For example, the National Tube Company manufactures pipe at Lorain, Ohio. The Ford steel plant at River Rouge, Mich., manufactures steel for Ford automobiles.

[10] Much of the iron ore destined for Pittsburgh moves through Conneaut, Ohio, as this is the nearest lake port. In 1936 Conneaut received over 7,000,000 tons of ore.

[11] At least 70% of all pig iron produced today in the United States is used directly in its molten state, without the waste of cooling, handling, and remelting.

THE AUTOMOBILE INDUSTRY

The age of machinery which began about the time of the American Declaration of Independence maintains its revolutionary influence in the industrial world by a process of continuous mechanical improvement. This progress has been marked by a few machines of especial importance, each of which has made or made over man's affairs in a particular section of the earth's surface. Thus, cotton-spinning and cotton-weaving machinery made England a manufacturing nation. Because of the cotton gin the South re-embraced slavery and produced cotton.

In the first three decades of this century, the automobile, like an industrial rocket, made Detroit increase its population more than fivefold; Lansing, sixfold; Pontiac, sevenfold; Flint, twelvefold; and scores of Michigan towns have shared this growth and prosperity.[12] During this period there was a sixfold increase in the population of Akron, Ohio, the world's greatest tire center. The manufacture of motor vehicles, bodies, and parts was also a factor contributing to the growth of Cleveland, Toledo, and various other cities. In 1935 the value of motor vehicles produced in the State of Michigan was about $1,200,000,000, or over half of the nation's output, and about half

[12] POPULATION OF MICHIGAN AUTOMOBILE CENTERS AND AKRON, OHIO, 1900–1930
(thousands of inhabitants)

	1900	1910	1920	1930	1940
Detroit*	285.7	465.8	993.7	1568.7	1623.5
Flint	13.1	38.6	91.6	156.5	151.5
Highland Park	0.4	4.1	46.5	53.0	50.8
Hamtramck	0.0	3.6	48.6	56.3	49.8
Lansing	16.5	31.2	57.3	78.3	78.8
Pontiac	9.8	14.5	34.3	64.9	66.6
Akron, Ohio	42.7	69.1	208.4	255.0	244.8

*Detroit alone does not tell the tale, for its suburbs registered a great increase also. Most of the cities of the southern peninsula of Michigan were sharing in the prosperity by making some of the many things that are assembled in the process of making the completed automobile. Battle Creek, however, is the breakfast-food capital of the world, and Grand Rapids specializes in furniture.

In the period between 1910 and 1930 the urban population of Michigan increased from 47.2% to 68.2%; in the same period the urban population of Nebraska increased from 26.1% to 35.3%; in 1940 it was 39.1%.

POPULATION OF MICHIGAN

Year	*Total rural (thousands)*	*Per cent urban*
1900	1468	39.3
1910	1483	47.2
1920	1426	61.1
1930	1540	68.2
1940	1801	65.7

The lure of high wages in automobile factories caused many thousand farms to be abandoned in Michigan alone in a short time after the slump in farm prices in 1921. It also caused an enormous northward migration of Negroes from the South.

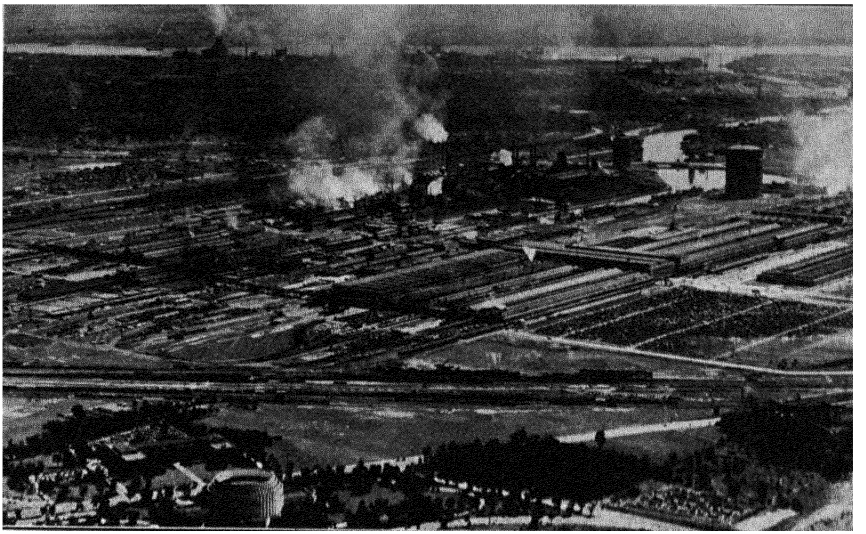


FIG. A. River Rouge Plant of the Ford Motor Company, Dearborn, Michigan, said to be the largest industrial plant in the world. See the artificial harbor, ore boats, ore pile, blast furnaces. In the upper left center are yards of freight cars; in the lower right foreground, yards of employees' automobiles. Plant area 1200 acres; buildings 160.7 acres; floor space 225 acres; railroad tracks 100 miles, roadway 14 miles, docks 1.33 miles. This is one result of standardization. (Courtesy Ford Motor Co.)

of the value of Michigan's output originated in the city of Detroit. The speed of the automobile conquest is evidenced by the decline in the production of horse-drawn buggies and carriages from about 843,300 in 1909 to 3600 in 1929 and the increase in the manufacture of passenger motorcars from about 128,000 to 4,795,000 during the twenty-year period.

The Lower Lake Region, with its cheap lake transportation and its supplies of heavy metal and wood, is a natural place for this industry. In addition to its cheap lake transportation to bring raw materials, it also has the best of railway transportation, for it is threaded by the various railroads connecting Chicago with Philadelphia, New York, Boston, Montreal, and other population centers. This region is also close to the center of population on the American continent. For these reasons, it was the center of carriage-manufacturing before the automobile came. It was very natural that the carriage center should take over the successor of the carriage, the automobile.

It is probably an accident that made Detroit the center rather than Toledo or Cleveland or another city. Detroit happened to have the factory of Mr. Henry Ford, who first effectively applied cheap mass production to the automobile. He secured cheapness and efficiency to an almost unimagined degree by the use of specialization and the interchangeable part. Time was when machines were individuals, as individual as men, each part made to fit its particular fellows. Then by standardization we began to make wheels, axles, bolts, nuts, bodies, engines, all alike so that each one would fit any machine of

the same model. Specialization permitted machines to turn out these standardized parts in great quantities at low cost.[13]

This made a world market for machinery. Because of the advent of the cheap standardized part, the reaper-owner or the plow-owner or the automobile-owner can rush to the agency in Argentina, Australia, Arizona, or Alaska, call for part number so and so, and get it, if it happens to be in stock — which it too often isn't. He takes out the old part, sticks in the new one, starts the machine or clucks to his horses, and away he goes. The art of repairing machinery has almost disappeared through the simplicity of sticking in a new part. The cheap, standardized machine is not always a particularly good machine, but it is a wonder for the money. This can easily be proved by comparing the cost and the possibility of performance of a low-priced automobile and of old Dobbin. It has been well said that there are about 10,000,000 farmers in the United States who cannot afford to be without automobiles, now that standardization has made them so cheap.

The wonder of speedy production in the Ford plant is one of the oft-told tales. The axles and running gear of the machine are placed on a belt conveyor. This is the skeleton upon which to build. Another skeleton car follows, then many others in endless succession. The conveyor carries them forward between two rows of workmen each standing in his place and each repeating continually his small part of the speedy and endless performance. Piece after piece appears from the sides or from above, is grabbed by the appropriate man and bolted into place. An engine swings out on a little crane and drops upon the moving frame. It is bolted on. A gasoline tank follows, then a seat, and this and that and the other piece, until in very few minutes indeed a car — a Ford — rolls off on its own wheels. You look back at the long belt, full of other cars each going through the various stages of completion. So rapid is this process, and so cheap the product, that the plant has a capacity of 9000 cars a day. On October 31, 1925, the main plant actually made 9109 Model T Fords, more cars in one day than it produced in the entire year of 1908. In May, 1934, the plant turned out 4651 of the Ford V-8's.[14] There is basis for the joke about the man who applied for a position as an experienced mechanic because he had worked in a Ford plant for four years. "What did you do?" he was asked. "I put on bolt No. 47."

The result of standardization and specialization on cost of product is well known. What its monotony will do to man by reducing his ingenuity and leaving his capacities unused is not so well known. A man may be on the scrap heap at the age of forty or forty-five. This universal correlative of

[13] Equally important here has been the amazing service of new steel alloys (tungsten, chrome, etc.) that permit a machine tool to do a dozen times as much metal-cutting as was the case in the old days of carbon steel.

[14] The Ford Motor Company with its unprecedented surpluses has built up a gigantic example of vertical integration of industry. It makes most of the things it needs, even down to glass and paint. At River Rouge, a short distance from Detroit, are blast furnaces and two huge steel plants using ore dug from Ford's own mines, using coal brought from Ford's own coal lands in Kentucky and carried from Toledo to River Rouge in Ford's own boats. Ford's steamers carry lumber to Detroit from Mr. Ford's large timber holdings in the Upper Lake Region. Forestry is being applied to the 125,000 acres of coal lands in Kentucky and also to Ford's other timberlands.

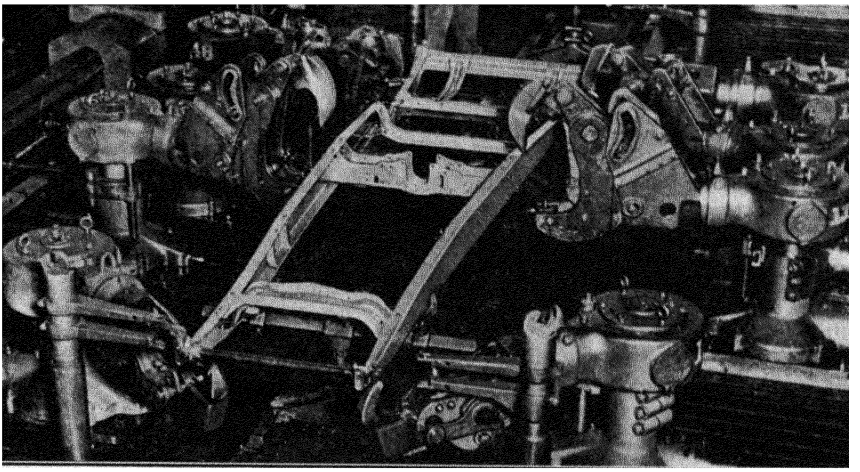


FIG. 479 A. This is not the beak of a mythological bird nor yet the claws of an equally mythological dragon; it is hard strong steel — automatic riveting machines doing their part on the chassis of automobiles as they pass down the assembly line on their way to swift completion. Machines not made with hands. (Courtesy WPA)

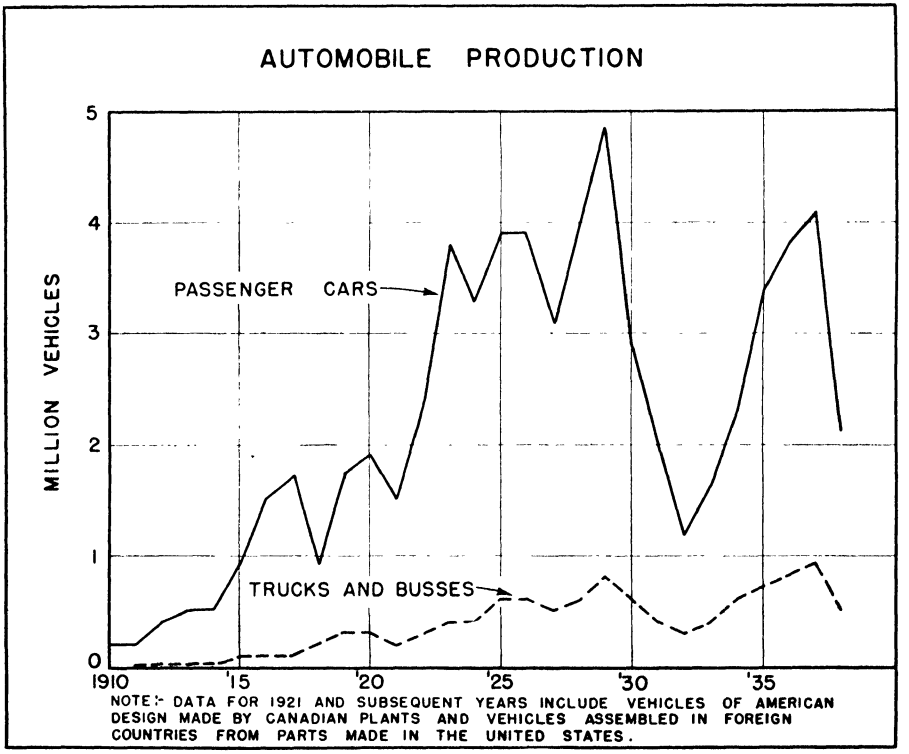


FIG. 479 B. Chills and fever — fever of prosperity, chill of depression. Consider what this chart means to wage-earners. Almost the entire American and Canadian output is produced within the Lower Lake Region. (*Statistical Abstract of the United States*)

manufacturing is one of the problems of our age. Experiments seem to show that a chimpanzee or an orangutan could learn to do many of the jobs of a modern factory, but spiritually he would not stand for it. What's the use of being a man unless he can make a life *outside* of his work?

Detroit grew like a mining town after a rich lode is struck, and it shared many of the signs of the frontier town, both physical and psychological. Physically there was house shortage and extreme congestion. Detroit got rich quick. This is a psychological as well as a financial fact. The mechanic who has suddenly become a millionaire and the workman whose wages have been doubled and trebled have an interesting and a conspicuous psychology. Publishers say that Detroit is a poor book market.

Detroit also has the mixed and foreign population of the boom town. Its analysis shows the wide human pull of its prosperity and explains the need of the great efforts that have been made to teach English and in general to Americanize the population.[15]

The statistics of manufactures show that the growth of Detroit has been chiefly dependent upon the automobile industry and its allies.[16]

The automobile industry is not a gold mine. It is better. It is a permanent industry, promising on the average an enduring prosperity to the automobile workers. It is probably true that no other industry has a national field for its distribution that is quite so extensive as that of the automobile industry. California, Florida, Iowa, Alabama, and New England are alike in their dependence upon Detroit, so great is the centralizing force of standardization, specialization, and an organized *service*. If they can buy, Detroit is prosper-

[15] Detroit population (1930 census) 1,569,000. Native white of native parents, 538,000 (about one-third of total); native white of foreign parentage, 353,000; native white of mixed parentage, 150,000; foreign-born white, 399,000; Negro, 120,000. Country of birth of the foreign-born: Canada, 23.6%; Poland, 16.6%; Germany, 8.2%; England, 7.2%; Italy, 7.1%; Scotland, 6.0%; Russia, 5.5%; Hungary, 3.0%; Yugoslavia, 2.2%; Belgium, 2.2%. *Cf.* New York, page 152.

[16] MANUFACTURES, 1929, VALUE OF PRODUCTS
(millions of dollars)

All industries	2014
Motor vehicles, bodies, and parts	1068
Foundry and machine-shop	60
Machine-tool accessories, etc.	52
Printing and publishing	64
Slaughtering and meat-packing	58*
Bread and bakery	45

*Including two establishments not in Detroit.

Automobile Industry (autos, bodies and parts)	*Value of All Products, (Census)* (millions of dollars)							
	1937	1935	1929	1919	1914	1909	1904	1899
Detroit	1193.3	851.2	1068.0	550	164	60	6	
United States	5176.2	3942.0	5260.7	3080	633	249	30	5
Michigan	2926.6	3263.]	1885.6	1620	398	97	8	
Ohio	374.1	272.8	455.6	379	86	39	6	

ous. Conversely, if Detroit buys, they can prosper — witness the complaint of the secretary of a Washington State Apple Growers' Association that hard times in Detroit dropped the purchase of Washington apples (largely used in lunch boxes) from five cars a day to one car a week.

Before the automobile absorbed Michigan, its cities (especially Grand Rapids and Saginaw) were famed for their furniture mills. This was a second stage of industry that grew up in places that started as sawmill towns. Many of these furniture mills, long established, now operate under the handicap of imported lumber. A few have begun the practice of scientific forestry on their timberlands.

LAKE ERIE CITIES

Cleveland got its start through the building of the Ohio Canal, which connects Lake Erie with the Ohio River at Portsmouth. When the railroads came, Cleveland was on the main line of traffic between East and West. It has never served as large a hinterland as that of Chicago, and it has never had an automobile boom, as did Detroit; hence its growth has been smaller, its population exceeding 900,000 in 1930.[17] Since 1828, when a little iron furnace with a weekly output of 20 tons was established, the manufacture of iron and steel has been Cleveland's leading industry. Today the blast furnaces of Cleveland have a capacity of over 3,000,000 tons of pig iron annually, some of them producing as much as 1000 tons a day. One plant has a capacity of 700,000 tons of steel products a year. Yet iron and steel do not dominate Cleveland, for it is a city of many industries.[18] Its varied manufactures include many types of machinery, heavy hoists and conveying machinery being especially important; motor vehicles, bodies, and parts; paints and varnishes; clothing; and electrical apparatus and equipment.

Among the ports on the Great Lakes, Toledo since 1929 has ranked second [19]

[17] As in the case of Detroit, the population of the city does not tell all. Its suburbs have many people. In 1930: 40 Lakewood had 71:69 (thousands) and Cleveland Heights, 51:55.

[18] Of the 280 classes of industry reported by the U.S. Census, Cleveland had 218.

[19] COMMERCE OF PRINCIPAL GREAT LAKES PORTS, 1936
(millions of short tons)

	Receipts	*Shipments*	*Total*
Duluth-Superior	11.8	32.8	44.6
Toledo	3.0	21.7	24.7
Buffalo	13.5	3.2	16.7
Cleveland	13.2	2.6	15.8
Detroit	12.1	1.3	13.4
Chicago	11.7	1.1	12.8
Conneaut	7.6	2.6	10.2
Sandusky	*	9.7	9.7
Ashtabula	5.0	4.5	9.5
Gary	8.4	*	8.4
Milwaukee	5.6	1.3	6.9
Indiana Harbor	4.6	2.3	6.9

*Less than 25,000 tons. Source: U.S. Dept of Commerce, *Statistical Abstract of the United States, 1938*, 1939, pp. 411–12.

only to the twin port of Duluth-Superior in the volume of tonnage handled. Its eminence among lake ports is due almost entirely to its large shipments of coal from the mines of southeastern Ohio, West Virginia, and eastern Kentucky, which rank in importance with those from Hampton Roads.[20] Indeed, more than two-fifths of all soft coal shipped from Lake Erie ports moves through the port of Toledo.[21]

Erie, Pennsylvania (pop. 116,000), with a small tributary hinterland, has grown less rapidly than Toledo and Cleveland. The situation of Erie is one of "betwixt and between," with Buffalo to the east and Cleveland to the west and no great cities to the south. Its docks handle over 2,000,000 tons of soft-coal and hard-coal shipments annually and about an equal amount of inbound traffic, chiefly iron ore and wood pulp. In Erie, Toledo, Ashtabula, Conneaut, Lorain, Sandusky, are various forms of the iron and steel industry.

THE CHICAGO DISTRICT

The growth of the automobile industry in the Michigan district carries no promise that Chicago will be surpassed as the metropolis of the Lower Lake Region. Chicago has more people than Detroit and Cleveland combined, because it has more reasons for being a big city.[22]

Chicago's growth began with the beginning of steamboat traffic on the Great Lakes. One steamer reached Fort Dearborn (Chicago) in 1832, four in 1833. By 1848, 400 vessels, including 64 steamers, operated out of Chicago in the lake traffic. By 1852 the rate war had cut the $25 passenger fare from Buffalo down to $6 and $8. Chicago became the unloading-point for settlers bound for the prairies and the shipping-point for grain and livestock bound for the East. It was natural that any railroad to the Northwest had to pass around the lower end of Lake Michigan, and any railroad anywhere near Chicago had to have a terminus at Chicago to receive and deliver freight at the port of commanding location. As the central West grew, Chicago naturally became the grain center, the meat-packing center, and later the agricultural-implement manufacturing center for the wide farming region of the central plains. All this made it the transportation center of North America and the greatest railroad center in the world. On the average, 1294 passenger trains carrying 216,500 persons arrive at or depart from Chicago stations daily, or nearly one train per minute. This volume of traffic is

[20] In 1936 Toledo shipped 21,700,000 tons of cargo, almost entirely coal; in that year 17,500,000 tons of coal were shipped out of Hampton Roads.

[21] See Walter G. Lezius, "The Lake Port at Toledo," *Economic Geography*, April, 1936, pp. 197–204.

[22] POPULATION (thousands)

	Chicago	*Detroit*	*Cleveland*
1900	1699	286	382
1910	2185	466	561
1920	2702	974	797
1930	3376	1569	900
1940	3397	1623	878

handled by 369 through trains and 925 suburban trains. Of the total, 190,500 are suburban passengers and 26,000 are through passengers. The trunk-line systems join Chicago with both oceans and with the Gulf of Mexico. They have their connecting ramifications throughout Canada and Mexico as well as the United States.

Chicago is the natural economic capital of the Middle West. The question uppermost in the mind of the wheatgrower of Kansas and South Dakota is "What is the price of wheat in Chicago?" In Iowa and Nebraska it is "What is the price of hogs in Chicago?" In Illinois, "What is the price of corn and oats in Chicago?" In Wisconsin, "What is the price of butter and cheese in Chicago?" For thousands of farmers in all these regions the event of the year is a trip to Chicago to sell something or buy something or see something — the annual grain show, land show, or fat-stock show. In a certain sense Chicago may be said to be the city of Iowa or Kansas, because it performs in part the city functions of market, supply, and factory for those states. Thus Illinois became (1930) 73.9 per cent urban, chiefly because of Chicago's population, while Iowa was 39.6 per cent urban; Kansas, 38.8 per cent; and South Dakota, 18.9 per cent.

After it had grown rich as a distributing center and a grain and livestock market, the refrigerator car (invented 1874) enabled Chicago to slaughter the meat animals which had previously been sent on to Eastern and even to European cities. Chicago, capital of the kingdoms of cattle and swine, quickly extended sovereignty over beef, ham, bacon, and lard. A number of definite advantages contribute to Chicago's supremacy in meat-packing. Most of the livestock of the country is produced west of Chicago, and most of the meat is consumed east of it; hence Chicago is well located roughly midway between production and consumption. Second, Chicago is the greatest railroad center in the world and enjoys unusually good transportation facilities for its products. Third, about 5,000,000 people live within a radius of 50 miles, comprising a tremendous market for all grades of meat. Fourth, in and around Chicago is a ready market for the by-products of the industry; what the meat-packers do not use can be easily sold — hides to the tanneries, wool to the textile mills, grease to the soap factories, etc. This gives the big meat-packers a competitive advantage over the smaller firms, for it is a well-tested principle of economics that when the by-products can be used or sold, the cost and price of the main product can be lowered.

The Chicago packing plant is a marvel to match the Ford factory, the chief difference being that automobile-manufacturing is an assembling industry, while meat-packing is just the reverse. At the end of its last mortal mile, the good steer enters the gate, gets bumped on the head with a huge mallet and stuck underneath with a knife, and erelong leaves the establishment as beefsteak, tennis-racket strings, crochet needles, fertilizer, oleomargarine,[23] and

[23] The oleomargarine business seems to have started the development of allied industries, and now the Chicago packers are often regarded with dread because of the power of monopoly that seems to lie in their hands. As producers of oleomargarine they soon handled butter also. They became owners of creameries and of milk condenseries as a natural next step. As shippers of chilled meat they had to have refrigerator cars, and they soon offered nation-wide service in supplying refrigerator cars to shippers of perishable produce.



FIG. A. Machinery, there is no end to it! Here an endless-belt conveyor carries 4200 cartons past the girl each hour. Machinery squirts 1 lb. of lard into each. It is the girl's job to remove defective cartons and any lard that may accidentally get on the outside of a package. (Courtesy Armour & Co.)

a thousand other things. A great corps of specialists assist in the operation. It is said that 50 cents an hour is paid to the man who does nothing but split backbones all day long. A 50-cent man uses the knife on the most delicate parts. A 40-cent man cuts a different texture, where less skill is involved. A 23-cent man cuts off a part where no good leather is to be found. Thus, skill has become specialized to fit the anatomy, and the poor 20-cent man does nothing all day but pull off the tail.

Chicago is the greatest food-distributing center in the world.[24]

The great weight and low comparative cost of farm machinery gives an advantage in freight cost to the factory that is close to the market. This industry, keeping step with the strides of agriculture, rapidly passed from western New York through Ohio and Indiana to the Chicago district, which is now the greatest farm-implement market and producing center in the world.

For the transfer of freight and the service of its factories, Chicago leads all the cities of the world in the development of belt lines or railroads that run

[24] Here are some of the farm products that Chicago received and shipped during 1937:

CHICAGO FARM PRODUCTS

	Receipts	*Shipments*
Cattle	1,980,992	595,650
Calves	386,068	54,096
Hogs	3,968,398	525,919
Sheep	2,500,966	400,355
Horses	13,422	11,272
Total	8,849,846	1,587,292
Wheat	38,106,000 bu.	32,009,000 bu.
Corn	66,727,000	30,025,000
Oats	24,445,000	27,064,000
Rye	5,285,000	5,514,000
Barley	10,819,000	3,012,000
Soybeans	8,118,000	3,852,000
Flour	10,325,000 bbls.	6,589,000 bbls.
Cheese	128,123,000 lbs.	62,825,000 lbs.
Butter	393,581,000 lbs.	274,994,000 lbs.
Eggs	7,388,549 cases	4,224,281 cases

Source: Chicago Ass'n of Commerce, *Chicago Facts*, 1938.

around the city and shift cars from road to road. They total 2100 miles in length and handle more than 12,000 carloads of freight daily.[25] The outer belt line starts at Waukegan, 35 miles north of Chicago, and swings around to Gary, Indiana. In addition, the Chicago Tunnel Company operates 62 miles of underground track serving the downtown business district.

Chicago, the railroad center, close to the center of population, is the most commanding location for mail-order houses, which distribute their wares to every state. There is little doubt that the Chicago mail-order catalogue is the most-read book (sad to relate) in thousands of American homes, and it also goes to foreign lands.

Because Chicago is on the plain, expansion has been easy. But even though it stands in a flat plain, it has had many physical problems to solve in its rapid growth. For a time its sewage was poured into the lake, while the city water supply was drawn from places much farther out in the lake. The growth of the city made it impossible to continue to dispose of the sewage so conveniently. Owing to the flatness of the country, Chicago was able to divert water from Lake Michigan into the Illinois River, a branch of the Mississippi, by digging a canal, the Chicago Drainage Canal.[26] The Chicago sewage was then turned into the Illinois-Mississippi system. Chicago has realized an additional ambition in seeing this route become a Lakes-to-Gulf waterway on which barges carry freight to St. Louis and New Orleans.

Chicago is called the Windy City, because in addition to the normal wind of its latitude it gets from the lake the unbroken raw blasts of winter and the pleasant breezes of summer.

Occasional periods of southwest winds in summer drive Chicago's sweltering population to the lake shore for comfort that they cannot get, because the same wind blows the surface water away from the shore, replacing it with water from greater depth at a temperature of 50° F., colder than most spring water. The people who swelter in the hot air immediately above the lake cannot bathe in such chill waters. When the breeze happens to blow from the stockyards (nearly a square mile of barnyards), across the city, it is impossible for the people of Chicago to appreciate their greatest industry.

When Mr. H. G. Wells, the English novelist, called Chicago a "lapse from

[25] Every day 1500 package cars leave Chicago with less-than-carload shipments of merchandise destined for about 800 points throughout the country without transfer and for 60,000 other points with transfer.

[26] Upon its own initiative and without authority, Chicago was alleged to have increased the diversion of water from 6000 cubic ft. per second, which had been permitted by the U. S. War Department, to over 10,000 cubic ft. per second. This raised a storm of protest from the other lake ports and from Canada, which claimed that the diversion of lake waters interfered with water levels on the lakes and also with water power at Niagara and on the St. Lawrence. On April 21, 1930, the dispute was settled by a Supreme Court decree which ordered the State of Illinois, under whose authority the Chicago Drainage District had been organized, to provide the necessary funds to complete adequate sewage-disposal plants by December 31, 1938. The decree ordered that the diversion of water should be reduced to 8500 cubic ft. per second, that on December 31, 1935, it should be further reduced to 5000 cubic ft., and that on December 31, 1938, it should be finally reduced to 1500 cubic ft. This was done.

Lake outlets seem to be destined to cause disputes. Similar and even hotter is the clash between New York and Chicago over the St. Lawrence waterway, which promises to give Chicago a cheaper outlet by way of the Canadian ports than it now possesses by way of the United States ports.

civilization," he probably thought only of its money-getting.[27] Probably he was not fully aware of the great university in its heart or of the civic interest that beats against the unplanned chaos from which Chicago suffers along with every other big city in the world. Chicago's struggle for parks, playgrounds, and art centers has not been fruitless.[28]

Chicago, with its varied industries, suffers less violent fluctuations of fortune than Detroit. Like Detroit, it promises continued growth. Mr. James J. Hill predicted that when the Pacific Coast has 20,000,000 people, Chicago will become the largest city in North America. He may be right.

Milwaukee (pop. 578,000) might be called a second Chicago, or side Chicago, in the economic sense. It shares in a smaller way the advantages of Chicago but, in comparison with Chicago, is more dependent upon manufactures than upon trade. The manufacture of motor vehicles, bodies, and parts, of iron and steel products, electrical machinery, and leather, are its leading industries, and of course Milwaukee has long been famous for its beer, which is sold throughout the country. The benefit of the lake location is well shown by its import of about 6,000,000 tons of freight a year, mostly coal, a fundamental need for a city whose cold winter calls for much house-heating and whose factories call for much coal-made power.

South Bend, Indiana, with a population of more than 100,000, 80 miles east of Chicago, is on the main-line railroads going east, and might with all propriety be called an economic suburb of Chicago. It is headquarters of the Studebaker Corporation (automobiles), and manufactures agricultural and other machinery.

Indiana Harbor might be called the twin sister of Gary — an artificial harbor on the shore of the lake, excellent lake transportation, lake traffic as great as that of Milwaukee, and the naturally resulting heavy industries.

THE ONTARIO SECTION

The cities of the Ontario part of this region are also prospering, although tariff barriers still prevent their full participation in the great advantages of the American market. The Lower Lake Region has become conspicuous since 1910 through the utilization of two economic factors. One is the standardized machinery typified by the automobile area, and the other is the cheap power supplied to Canadian cities by the Ontario Hydro-Electric Power Commission. The attempt to establish diversified industries in the towns of the

[27] The description of Chicago by its poet, Carl Sandburg, is in part:

> "Hog Butcher for the World,
> Tool Maker, Stacker of Wheat,
> Player with Railroads and the Nation's Freight Handler;
> Stormy, husky, brawling,
> City of the Big Shoulders."
>
> — "Chicago," in *Chicago Poems*, Harcourt, Brace and Company, 1926

[28] It is interesting, unique in America, and perhaps very suggestive, that a group of Chicago's successful businessmen can paint pictures that are said to be worth while as pictures. The best-known citizen of all is a fair musician.

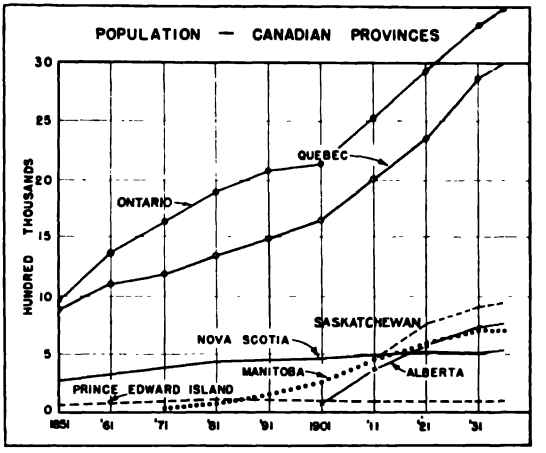


FIG. A. Predominance of Ontario in Canadian population shows the importance of the Lake Region in Canadian economic life. Location and water power are big factors. (Data from *Canada Yearbook*)

Ontario plain led by gradual steps to the working-out of a new system of power supply. It is a kind of municipal partnership. Cities contribute money as investors to a central hydroelectric commission. The commission, an arm of the provincial government, builds power plants and transmission lines from plants to cities. The cities then sell the power at cost, which includes payments for interest, depreciation, and sinking funds to retire the bonds. By this means the plants will be owned by the commission (the cities) debt-free after a period of years. Since there are very efficient operation, no promoter's profits, and no watered stock, the manufacturers and householders in this region have power at low cost, much lower cost than prevailed before the operation of this system and much lower than American consumers must pay for electricity produced by private enterprise on the other side of the border.

The people of Ontario are dependent upon the United States for coal — a vital dependence that contributed to drive them to co-operative action. They believe that "whoever dominates power dominates industry," and are well satisfied with their system.[29] It is fortunate that Ontario has an abundant supply of water power,[30] as this reduces the fuel handicap caused by its deficiency in coal. Between 1910 and 1939 the developed water power of Ontario increased from 2500 to 2,600,000 horse power.

The statistics of city growth show that the towns are prospering with manufactures much as the American cities are across the boundary. Owing to tariffs, many American companies have Canadian branches.

Toronto, the second city of Canada (pop. 631,000, 1931), gained 20.9 per cent between 1921 and 1931. This gain is not in the class of Detroit, but it compares well with the decennial increase of other American cities: Buffalo (573,000), 13.1 per cent; Milwaukee (578,000), 26.5 per cent; Cleveland (900,000), 13.0 per cent; St. Louis (822,000), 6.3 per cent; Boston (781,000), 4.4 per cent; Pittsburgh (670,000), 13.8 per cent; San Francisco (634,000), 25.2 per cent.

[29] Between 1907 and 1910, the people of 29 Ontario municipalities voted 3 to 1 in favor of the system; in 1912 municipal balloting was at the ratio of 6 to 1. Since that time the vote has been 14 to 1, and in some places the vote has been unanimous. The figures are impressive indications of success.

[30] Total available horse power at 80% efficiency at ordinary minimum flow on Jan. 1, 1939: Canada, 20,347,000 h.p.; Quebec, 8,459,000; Ontario, 5,330,000.

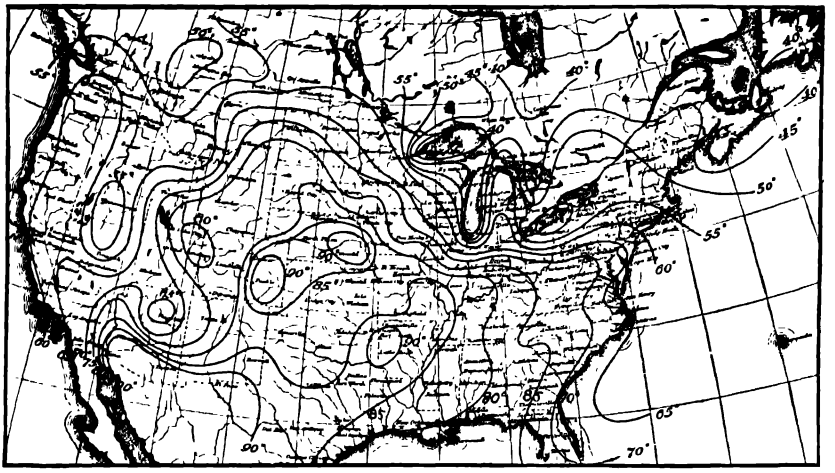


FIG. A. The large volume of water in the Great Lakes is never warmed to any great depth. Michigan, Huron, and Superior are almost ice-cold in the middle of May. This map shows how they cooled the shores on the evening of a hot thirteenth of May, the very time of year when fruit buds need to be kept in check for fear of a late frost. A burning southwest wind has often driven sweating thousands to Chicago's water front. (Courtesy U.S. Weather Bureau)

Three out of Canada's four leading industrial cities are located in the province of Ontario. In 1936 the value of manufactures in the city of Toronto was $417,000,000; in Hamilton, $131,000,000; and in Windsor, $105,000,000.[31] Of the 2800 industrial plants in Toronto, over 400 were branch factories of American and British firms, an excellent illustration of the fluidity of capital — if it feels safe. Toronto is the leading meat-packing center in the Dominion and has a diversity of industries, including the manufacture of clothing, tires, electrical apparatus, machinery, and metal products. Like Toronto, Hamilton (pop. 156,000) is a port on the western end of Lake Ontario; the production of iron and steel is its leading industry. Among the products turned out by Hamilton's factories are rolled steel plates, machinery, railway rolling stock, wire, coke and gas products, textiles, tobacco, and canned foods. Windsor (pop. 63,000), opposite Detroit, is the Dominion's leading automobile center, with about 40 establishments engaged in making motor vehicles, bodies, and parts. Beneath the city is a thick deposit of salt, which has given rise to salt and chemical industries.

AGRICULTURE

The agriculture of the Lower Lake Region is marked by four influences: the lakes, the North, intensification, and, strange to say, abandonment.

The temperature control of the lakes in a latitude of severe winters permits the fruit industry in a latitude which otherwise would be too cold. This can be seen quickly by observing fruit areas at the latitude of Rochester on any

[31] Montreal ranks first with an output worth $427,000,000.

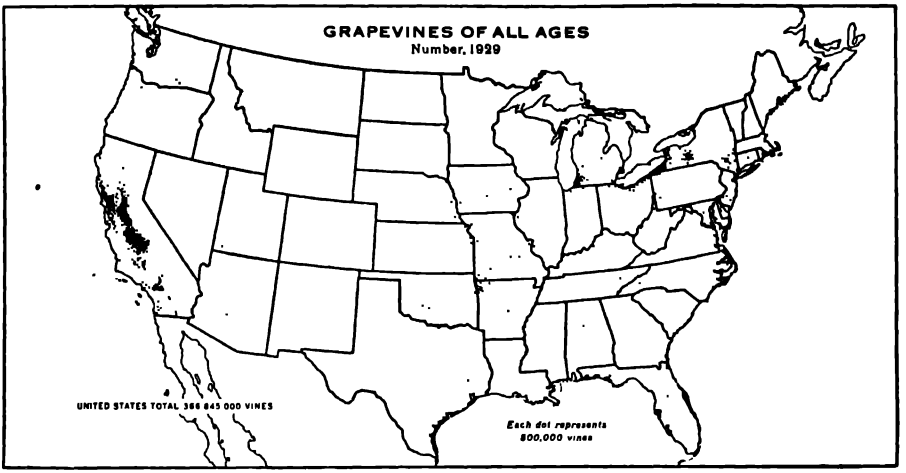


FIG. A. In the East the important grape industries cluster on the Great Lakes and the so-called finger lakes of west-central New York. (Courtesy U.S. Dept Agr.)

map of fruit production. The lake influence on crops is well illustrated by temperature facts on the opposite shores of Lake Michigan. One winter day the United States weather map showed 0° F. at Milwaukee, and 22° F. at a station on the opposite shore. The lake, being unfrozen, had the temperature of 32°. The moderate southwest winds of the cold wave were warmed by passing over the lake waters (temperature 32°), so that the eastern shore was 22° warmer than the western shore. This reduces winter-killing of buds. In the spring a warm southwest wind is cooled by the lake waters, giving much cloudy, foggy, cool spring weather to its eastern shore. Thus the fog adds its influence to temperature to hold back the blossoms. As a result, the eastern shore of Lake Michigan produces many peaches, apples, grapes, and cherries.

The influence of the lake as a climate control also shows itself in a much longer growing-season along the lake shore — one hundred and eighty days in the extreme southwest of Michigan, one hundred and fifty days at the northern part of the lower peninsula, while the interior of the peninsula has but one hundred and thirty. We may call the lake a climatic thermostat; there are few late frosts in spring and few early frosts in fall.

Three small peninsulas getting the benefit of water on three sides have marked horticultural response to the water factor. Door County, Wisconsin, lies between Green Bay and the lake, while just across the lake is Leelanau County, Michigan, between Grand Traverse Bay and the lake. In both of these counties cherry orchards are important on the farms and cherry canneries important in the towns. On the south shore of Lake Erie is Ottawa County, Ohio, which includes several islands in the lake and the peninsula partly surrounded by Sandusky Bay. In 1930 this county had 499,000 peach trees, while the county to the south of it had but 43,000.

The protective influence of Lake Erie also causes its southern and northeastern shores to produce most of the table grapes grown east of California,

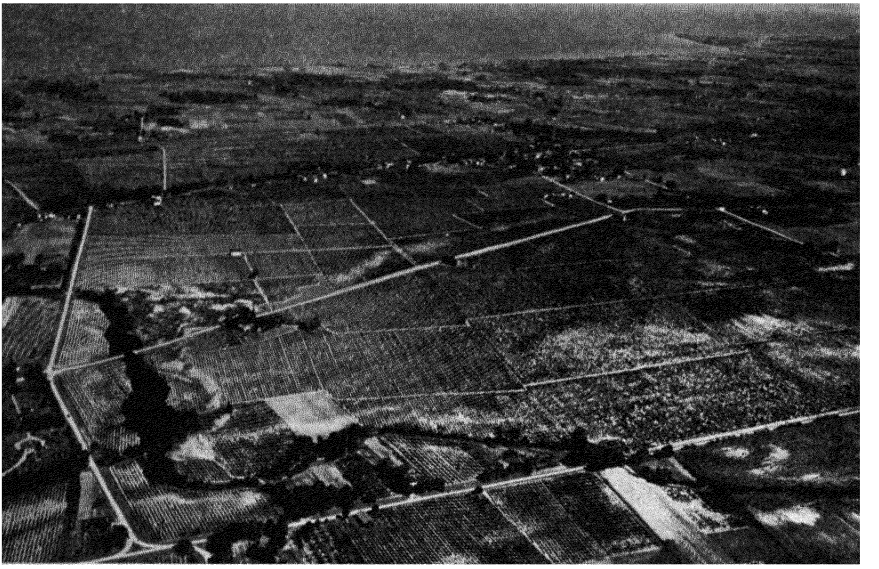


FIG. A. Air view showing remarkable concentration of vineyards in New York State near the eastern end of Lake Erie. (Courtesy Welch Grape Juice Co.)

although Michigan is a rival. Four counties near Cleveland have 1,000,000 vines each, but the New York end of Lake Erie has a greater concentration of the grape industry.[32]

The greatest fruit district in all this region is along the south shore of Lake Ontario. The Ontario part has a lake both south and north, but Lake Ontario alone gives enough frost protection to cause the Ontario plain in New York to be for many decades the leading apple district in the United States. You can ride for miles and be continuously in the sight of orchards of apples, peaches, cherries, or pears. New York ranks fourth as a pear-producer.

INTENSIFICATION AND SIGNS OF THE NORTH

Signs of the North appear in the declining importance of corn and in the small acreage of improved land per farm. In these respects the Lower Lake

[32] In 1930 Lorain, Cuyahoga, and Lake counties had more than 1,000,000 vines each, and Ashtabula County had over 2,000,000. In New York State Chautauqua County had about 18,000,000 vines, and Yates County about 4,000,000.

An even more striking example comes from Canada. "Districts along the shore of the Georgian Bay are remarkable in that the European plums and all varieties of pears and apples do extremely well, and peaches are found growing, though not in a commercial way. Again, on St. Joseph's Island, farther north, and on Lake Huron, a great many of our fruits are grown successfully; although they do not succeed in some of the higher sections inland and south." — Letter from P. W. Hodgetts, director, Ontario Department of Agriculture, Fruit Branch, Sept. 18, 1920; confirmed by another letter in 1939.

In 1915 the growing-season along the lake shore in northeastern Ohio was 190 days while it was but 130 in the next county to the south, on the edge of the plateau.

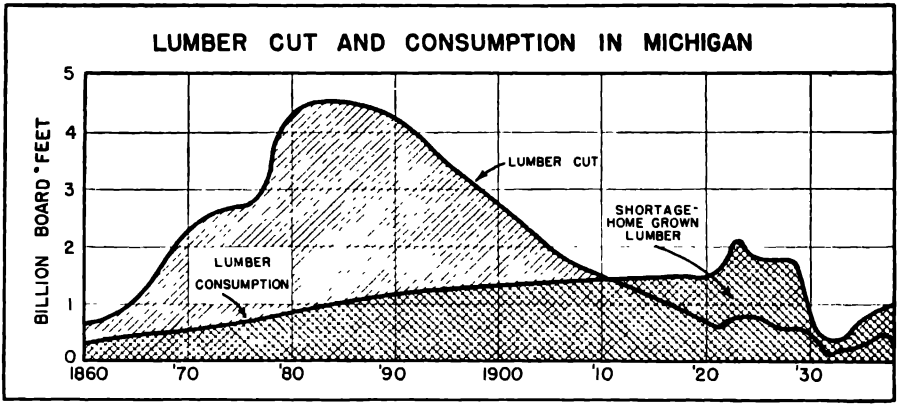


FIG. A. The forest history of Michigan might well be entitled "From Prince to Pauper." This record from a lumbering and industrial state might also be called "The Handwriting on the Wall." (Courtesy U.S. Dept Agr.)

Region resembles the North Central Dairy Region, not the Corn Belt. The smaller farm calls for more intensive use. Beef cattle and hogs are few, dairy cattle are important.

There are several important crops that bespeak the intensive agriculture. The potato is an important crop in lower Michigan and western New York. A hundred thousand acres of sugar beets around Saginaw Bay made Michigan the third beet-sugar State in 1936.[33] North of the latitude of Detroit 500,000 acres of beans made Michigan second only to California in bean production. In southwestern Ontario about 50,000 acres of tobacco are growing. Tobacco production in Ontario increased from 6,200,000 lbs. in 1927 to 71,700,000 lbs. in 1938; most of it is flue-cured.

In the Ontario plain of New York canneries vie with apple-storage houses and vinegar works to preserve food for future use. Fields of tomatoes, sugar corn, and green peas help to occupy the applegrower's spare time and spare land. With fruit and truck crops, this locality is one of the most productive agricultural districts in the United States. Aside from the above-mentioned centers of special crops, the dairy farm is the chief agricultural dependence. Markets, surface, soil, and climate combine to make it so.

THE FUTURE OF THE LOWER LAKE REGION

This region (except the Ontario section) started as a Yankee outpost of New England.[34] Its future is to continue its present. Does the United States want more meat? Chicago will slaughter it. More reapers? Chicago will manufacture them. More mail-order goods? Chicago will keep them in store.

[33] As evidence of the fitness of the beet for intensive agriculture, it yields 8 or 9 tons per acre in Michigan, and after the sugar is removed the pulp and tops have a forage value about equal to that of the average crop of hay in the United States.

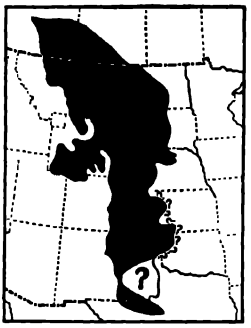
[34] Every New England state sent a governor to Michigan, and five of them sent superintendents of public instruction.

More automobiles? Mr. Ford, Michigan, and its neighbors will make them. More apples, peaches, grapes, pears, or cherries? The lake-shore localities will gladly grow them, though there is plenty of competition from other sources. Overproduction or limited demand alone prevents the extension of the fruit industry here. In the summer of 1921 or 1922 orchards of perfect Duchess apples were left unpicked in Michigan because the first shipments had netted a loss. In June, 1924, second-quality apples of the large crop of 1923 were being given away in western New York to anyone who would pay the cold-storage charges. These occurrences are not typical, but they recur at irregular intervals (1938, for example) and are the factor that controls production in a region that could produce more fruit.[35] No lake-shore county has 10 per cent of its area in apples. Ontario had less rural population in 1921 than in 1901, although the rural population increased slightly between 1921 and 1931. This increase, however, may have been due to the return of the jobless sons who had migrated to town and back again. Michigan with its extensive farm abandonment had a similar experience, due in part to mechanization of farms, but more especially to the high wage of the automobile worker.

[35] "You would have enjoyed our forty-seven-mile automobile trip from Rochester to the home of Mrs. E., the route lying altogether through highly cultivated orchards, the trees loaded with fruit. There would have been a note of distress, however, for the economist in the fact that most of the orchardists were not picking their peaches. Here and there along the route we found baskets in front of farm-houses by the wayside offering peaches at $.15 a peck basket and plums at $.30 a peck basket. Most of the people, however, were not picking their peaches and plums at all, as there was no market.

"Mrs. E. stated that she would allow 300 bushels of peaches to go unpicked and one of her neighbors stated that he intended to treat 400 bushels in the same way. In the presence of this situation I saw a Greek fruit-store in Rochester displaying nothing but California fruit at ridiculously high prices." — Letter from Dr. Robert T. Morris, New York, Sept. 22, 1922. That quotation is a type. In essence, i.e., glut, it can be duplicated almost every year several times in the United States and Canada.

Chapter 24. THE GREAT PLAINS RANCH REGION



THE region of the Great Plains is a land of romance. Its most widely distributed products are fiction and movie plots, Wild West shows and Indian fights, buffalo hunts, cowboy skill, round-ups and shoot-ups; stage holdups; escapes from prairie fires, wolves, and rattlesnakes; wanderings in blinding blizzards; conquest of bucking broncos. The stories of these have gone far beyond the limits of the English language — and have raised the hair of youth in all continents, to be followed by the miserable anticlimax of wind-blown dust and drought refugees, ruin and abandonment.

The Great Plains region is a land of tragedy. For two and a half centuries the white man marched westward, conquering the land, settling and making successful homesteads, and building up communities. Thus he worked his triumphant way from the Atlantic to eastern Kansas and Nebraska. On westward, into the region of the Great Plains, marched this army of settlers, but here the battle turned against them and they were thrown back by hundreds of thousands. But this battlefield of their defeat, of the triumph of their enemies, is not marked by tablets, monuments, and the usual signs of victory. A lion does not write a book, nor does the weather erect a monument at the place where the pride of a woman was broken for the want of a pair of shoes, or where a man worked five years in vain to build a home and gave it up, bankrupt and whipped, or where a baby died for the want of good milk, or where the wife went insane from sheer monotony and blasted hope, or where whole communities got into their rattly flivvers and fled with no place to go.

From Plymouth Rock and Jamestown the westward march of the colonizing Americans had had two and a half centuries of unbroken success. There was a moment — that is to say, a decade or two — of alarm when they first saw the prairies of Indiana and Illinois and thought they were bad, but afterward they found that these prairies were extra-good for the homes of men. Then from 1820 to 1880 there were two generations of quick settlement on the prairies of Illinois, Iowa, eastern Kansas, eastern Nebraska, and the Red River Valley. West of the prairies stretches the country marked on our maps as the Great Plains. To settlers the land looked much the same. It had good grass. The brown soil was a sign of fertility, so they pushed on into the land where they were to meet defeat.

Years ago I knew one of these men. His name was Simpson. He started in Iowa with nothing and saved a little money. One June day in the middle

'80's he and some friends took a prospecting vacation trip out into Dakota. They traveled in wagons, camping as they went. At last one day the beauty and promise of a particular place captured their fancy. The land was worth $30 or $40 an acre back home. They could homestead here for nothing. Simpson picked his quarter-section on the shore of a little lake. All about was a sea of waving grass, bright with blossoms, as is the wont of the Great Plains in time of summer rain. Antelope occasionally scampered away in the distance. A railroad was being built only 10 miles behind them, a few miles to the south. The next spring he took his wife and little girl to this place and there they built a shanty, broke a field, and planted a crop with the team and tools brought from Iowa. The season was not very good, but they knew that the next would be better; they doubled the acreage — but the crop was cut in half. The next winter the little lake in front of the house went dry and the jack rabbits came by moonlight and dug in its bottom seeking food. The third year Simpson again doubled the acreage, and the crop was again cut in half. The golden future had disappeared. He swapped his tools and horses for steers and heifers and sold these for enough money to get back to his wife's folks in Iowa. He found that the ticket back cost a great deal more than the ticket out had cost. The railroads were encouraging settlement, not abandonment.[1]

These people had gone West to found a home and to be independent. They were bankrupt when the man was forty years of age. He was a man of parts, but he never again succeeded in getting on his feet in a way that was satisfactory to him. His case is but a type. It is said that 250,000 people were similarly driven out of western Kansas by a series of bad years in the '90s. Eastern investors also lost millions that had been loaned on these farms. Before 1930 the record of the drier portions of the Great Plains was, to a great extent, a record of settlement and abandonment. Each wave of settlers entrenched itself a little better as it got away from the methods of agriculture and the seed that the first settlers brought from more humid lands.

THE DUST BOWL

In the spring of 1933 the newspapers of the United States gave the Great Plains a new and ominous name — the Dust Bowl. The cause of the rechristening was a series of dust storms that the people of all eastern America could see. In the second week of May, 1933, the citizens of New York, Washington, Richmond, Atlanta, and other places throughout the East and the South were surprised to observe a sickening, yellowish-brown haze in the sky. The fine topsoil of the Great Plains — from Denver to Dodge City, from the Dakotas to Middle Texas — was blowing away to sea, never to return. Effete New Yorkers, Washington politicos, and blue-jeaned farmers through-

[1] "From the ninety-eighth meridian west to the Rocky Mountains there is a stretch of country whose history is filled with more tragedy and whose future is pregnant with greater promise than perhaps any other equal expanse of territory within the confines of the Western Hemisphere." — E. C. Chilcott; "Some Misconceptions Concerning Dry Farming," U.S. Dept of Agr., *Yearbook*, 1911, p. 251. Mr. Chilcott was in charge of dry-farming investigations for the U.S. Dept of Agriculture.

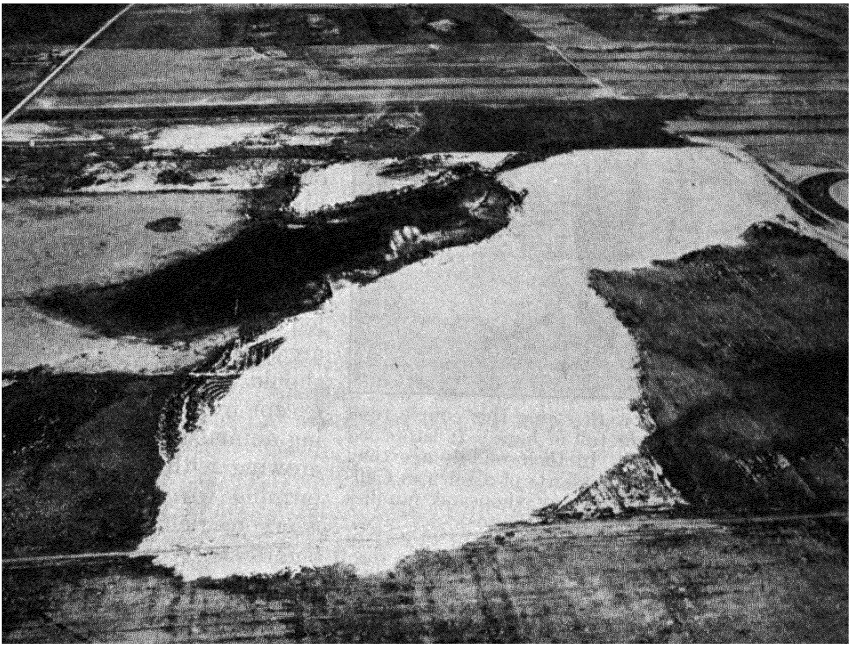


FIG. A. This is not a lake; it is a blowout spot from which the wind year by year has been picking up the topsoil and carrying it away. Note that in the foreground it has crossed a road. The Soil Conservation Service hopes to get it back in grass. (Photo by J. G. James, U.S. Soil Cons. Service)

out the East were literally watching the farms and ranches of the Great Plains blow by (Fig. 37 A).

Out on the plains the wind had been blowing since January. As spring came on and things got worse, buildings, fences, and highways were buried in soil drift. Traffic was stopped, schools were closed, and lights burned in the daytime. From Amarillo, Texas, the United States Soil Conservation Service received a report:

> We could not see our hands in front of our faces. We tried to look out, and it was black as night. We turned all lights on and ran upstairs to look out, and it was black every place. We could not realize that it was just a dust storm, for it was so quiet. We could not hear any wind or any sound of any kind — just jet black. Today at ten o'clock the dust and the wind are terrible.[2]

In western Kansas wheat fields were turned into craters 4 feet deep and more. A traveling salesman sent a bill to his company for two new windshields in a single month; the old ones had been neatly sandblasted by the storm. In 1934, 1935, and 1936 more dust storms came.

[2] See J. Russell Smith, *Men and Resources: A Study of North America and Its Place in World Geography*, Harcourt, Brace and Company, 1937, pp. 355–61.



FIG. A. When they were young this couple took up land and built a home full of hope. It happened to be in the Dust Bowl. In their middle age they fled and built this on the outskirts of a town in California. They are one of many thousand families similarly situated. (World Wide Photos)

What happened to cause this aerial exodus of Great Plains soil? Had nature gone stark mad? No, it was merely revolting against man, who since World War days had been suffering from delusions of grandeur, a form of agricultural insanity. In the western part of the Great Plains wartime and postwar wheat prices and the new machinery had led man to plow under large areas of grassland that never should have been touched except by the best of pasturing animals. Bonanza wheat-growing with the aid of dry farming was going to make everyone rich.[3] Farther west man was afflicted with pastoral insanity even before the World War. This had caused the soil to move from large areas of grassland, especially the public range, because the land was badly overstocked and overgrazed. First came cattle, then sheep, then sometimes goats, each clipping the grass closer and closer until it could not reseed itself. Thus man, by plowing or overstocking the land, contributed to the quick evolution of a desert.

Throughout most of the 1920's nature was kind with its rainfall. Then came the severe droughts of 1930, 1934, and 1936, greatly upsetting the attempts of the New Deal to adjust the supply of farm crops to the demand. The drought of 1934 was the worst on record.[4] In South Dakota grainfields were dried into stubble in May. Millions of trees in the Great Plains area, and even in Iowa and Missouri, died of thirst.[5] Alfalfa roots in parts of Kansas and Nebraska went down 25 feet or more in search of moisture, and then gave up. In Kansas some of the farmers were reduced to cutting rag-

[3] The main idea of dry farming is to retard the rate of evaporation and conserve the moisture in the soil. Clean fallowing in occasional years, the land being worked so as to prevent the growth of moisture-robbing weeds, helps to build up the supply of soil water. Plowing right after harvest slows up the capillary action of soil water, helps the fall and winter rains to soak in, and helps to retard the drifting of snow which might leave bare spots with little moisture. Sowing seeds thinly and planting them deeply also helps to prevent overtaxing the limited supply of soil water. In general, dry farming has been more successful in the northern parts of the Great Plains than in the south, where the rate of evaporation is greater.

[4] The drought of 1934 was almost nation-wide, only Washington, Florida, Alabama, North Carolina, Virginia, Maryland, Delaware, and the New England states receiving more than normal rainfall. In the fourteen-month period from June, 1933, through July, 1934, Montana received 87% of normal rainfall; Wyoming, 69%; Colorado, 76%; New Mexico, 83%; North Dakota, 57%; South Dakota, 61%; Nebraska, 63%; Kansas, 71%; Oklahoma, 78%; and Texas, 85%. In much of the Great Plains a slight deviation from normal often spells the difference between disaster and success.

[5] This happened as far east as Indiana in 1936 and in Virginia in 1930.

weed for ensilage, very bulky and filling but rather short on vitamins, calories, and those things which make good sirloins and hamburgers. Hogs were slaughtered or else placed on trains and shipped hither and yon in search of water. More than 50,000 sheep from the Great Plains were taken to the wetter parts of Iowa. Tens of thousands died of hunger and thirst. Cattle were shipped by thousands into Georgia, Tennessee, Maryland, and Pennsylvania, for this was cheaper than transporting feed and water to the livestock or letting them die in their tracks.[6]

Since the last bad blow in 1936 considerable progress has been made in rehabilitating the Dust Bowl.[7] In an effort to restore grass the Soil Conservation Service has promoted the use of earthen ridges with water gaps in them at strategic places in order to collect and distribute better the runoff. Already thousands of miles of almost level terraces and contour furrows have spread their sinuous trails across the slope lands within the Great Plains to hold every drop of water on the land upon which it falls. The farmer is urged not to burn crop stubble, but leave it in place to hold the moisture and the soil.

Along the eastern margin of the Great Plains a much overadvertised Shelter Belt, extending from Canada to Texas, has been started by planting more than 80,000,000 seedlings — not solid acres of seedlings, but scattered rows of cottonwood, locust, wild plum, mulberry, and chokeberry along ridge tops and bordering the fields and highways. The greatest need of all, however, is that millions of acres shall be restored to grass and never again be put under the plow.[8] This will take time and reduce the population, but it is the only real insurance that we have against a desert in most of this region.[9]

CLIMATE

The western portion of the Great Plains is characterized by rainfall insufficient to permit the farmer to depend upon agriculture of the Corn Belt and Wheat Belt types. It is a land of considerable variation in rainfall.[10] In

[6] People too would have died or gone away but for the unthinking munificence of generous Washington. Government loans for this, that, and the other plus direct relief let so many people stay in the Dust Bowl that the year after the drought saw increased acreage sceded there. See Works Progress Administration, Division of Social Research, *Social Problems of the Drought Area*, 1937.

[7] In 1939 conditions in the southern part of the Dust Bowl were being brought under control, but conditions in Wyoming, western Nebraska, and the Dakotas were still considered hazardous.

[8] In the Texas and Oklahoma Panhandles, eastern Colorado, and New Mexico, more than 6,500,000 acres should be retired from cultivation and be put into grass.

[9] See Carter Goodrich, *Migration and Economic Opportunity*, University of Pennsylvania Press, 1936.

[10] It is also a land of temperature variation and extremes. Glendive, Montana, near the eastern border, recorded 117° F. in July, 1893, and 80 miles to the west a temperature of −63° was recorded in January, 1885. For years this was the coldest record in the United States, and Stefansson, in his interesting book *The Northward Course of Empire* (Harcourt, Brace and Company, 1922), says it is colder than any record of the mainland of North America. On Feb. 9, 1933, a new record for the United States was established at Riverside Ranger Station in the Yellowstone National Park, when the temperature dropped to −66°. Winter changes are also very sudden. Western Texas has a record of a fall of 63° in sixteen hours. A few days of hot wind will sometimes kill the corn crop even when the soil is moist. The section at the foot of the mountains is warmer than the farther plains. The Black Hills even produce this usual influence of the mountain. Snow cover is often removed from this mountain-base area by the "snow-eater," the warm chinook winds.

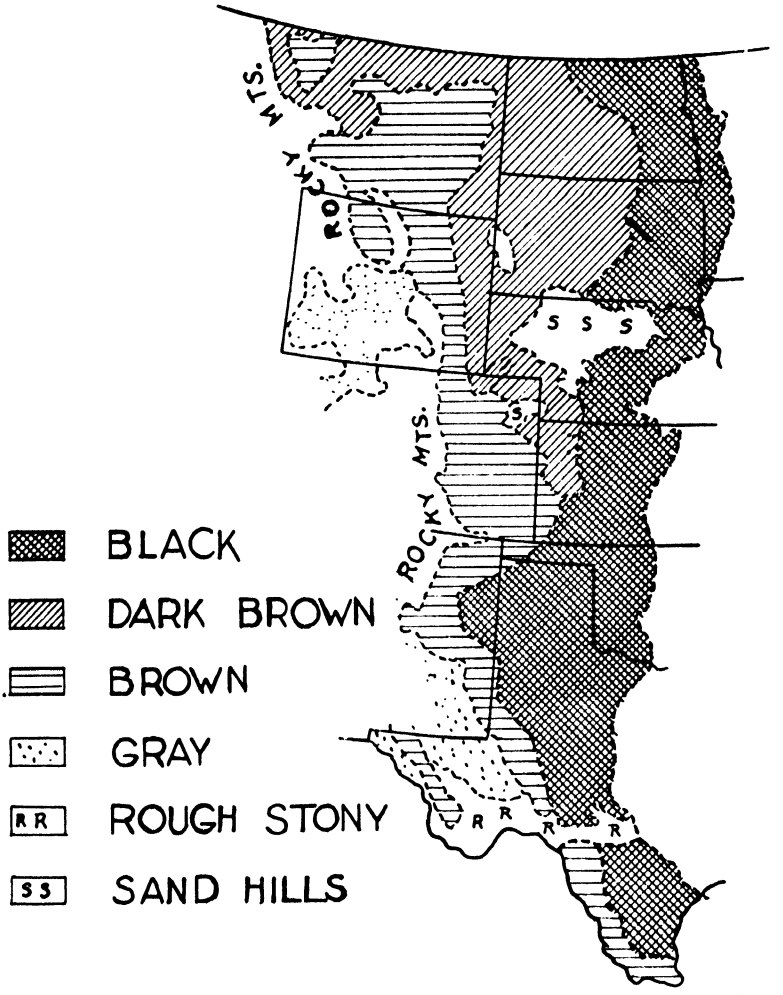


FIG. 498 A. Compare with U.S. Rainfall Map (Fig. 290 A). The color of soil in treeless areas depends much upon rainfall. Much rain — much grass — many grass roots — black soil, and gradations thereof. But it is also true that the heat of lower latitudes causes speedier decomposition of the organic matter, and the soils are not so dark in Texas as they are farther north. Rain also affects *character* and *composition* of soil. East of the area shown on this map the rain soaks through and carries away most of its solutions. On the area mapped here most of the solutions from the topsoil are left in a limy layer or zone of variable thickness as the water returns to be evaporated from the surface. Light rain leaves the lime layer near the surface; heavier rain or sandy soil causes it to be farther down. The late Curtis Marbut, long Chief of the U.S. Soil Survey, has repeatedly guessed the annual rainfall of Great Plains localities to within one inch by looking at soil sections in roadsides. This location of the lime layer is one of the best of all agricultural indexes. (Map drawn especially for this book by Dr. L. A. Wolfanger, East Lansing, Mich.)

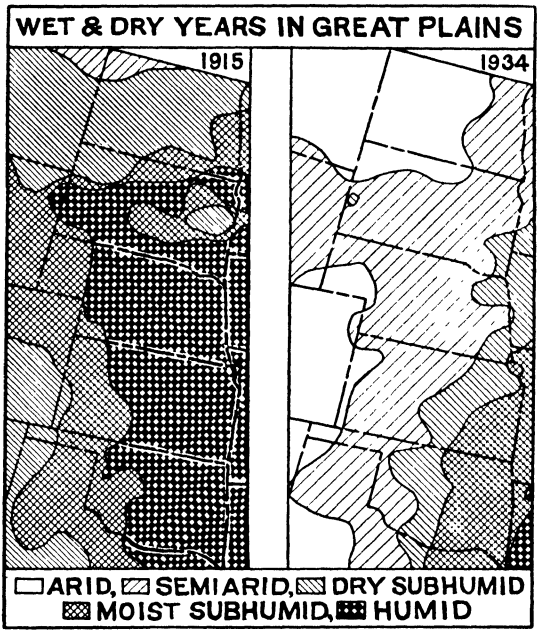


FIG. A. The repeated shuffling of a deck of cards sometimes gives you a hand of deuces, sometimes a hand of aces. This map shows that it is sometimes that way with rainfall. In the country west of the Missouri River the humid area here shown meant greenness, tall grass, abundance, promise, and incoming settlers. The other meant dust storms and ruin for those who had plowed the ground. Which shall we take as the type? Time will tell. (After Thornthwaite in Carter Goodrich, *Migration and Economic Opportunity*)

some places the rainfall is only from 10 to 12 inches on the average. In other places it is 16, in others again 18 — facts which make a very great difference in the lives of men.[11] But averages do not tell the whole story. Averages rarely happen. The freaks of the season decide man's chances. Thus Mon-

[11] RELATION BETWEEN PRECIPITATION AND THE GRAZING CAPACITY OF RANGES

Table 1. Arizona, New Mexico, Texas, and Oklahoma, where grazing is possible for most of the year

Annual precipitation	*Cattle per sq. mi.*
0 to 5 in.	0
5 to 10	9
10 to 15	15
15 to 20	24
20 to 25	32

Table 2. In the Great Plains states north of Oklahoma, where there are usually periods of considerable length in the winter when grazing is not possible

Annual precipitation	*Cattle per sq. mi.*
10 to 15 in.	19
15 to 20	38
20 to 25	76
25 to 30	265
30 to 40	409

Figures from J. Warren Smith, "Relation between the Annual Precipitation and the Number of Head of Stock Grazed per Square Mile," U.S. Dept of Agr., *Monthly Weather Review*, June, 1920. *Annual average* precipitation does not tell the story. It is made from yearly figures that fluctuate greatly. The figures of the year do not tell the tale, because the rainfall by months is so uncertain. Moreover, more rainfall is needed for crop production in the southern plains, where evaporation is greater.

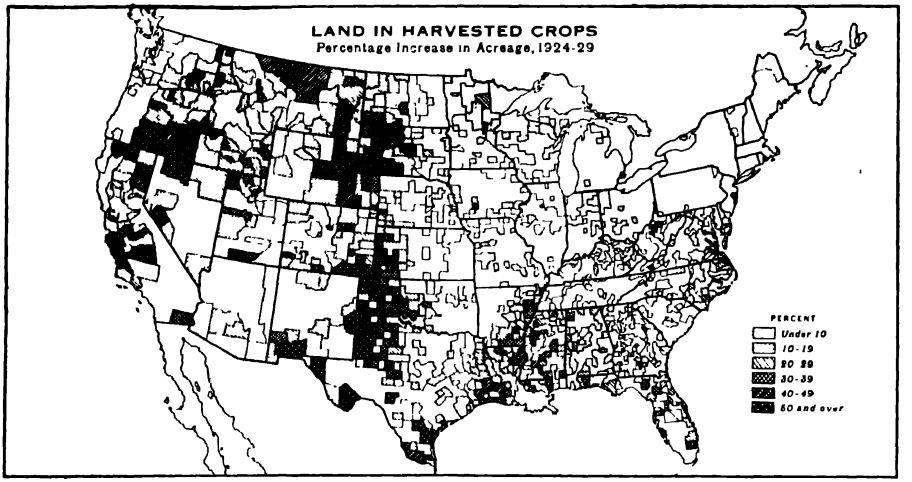


FIG. A. Machinery invades the dry West. This map might be called "Getting Ready to Receive Nature's Revenge" — the droughts of the 1930's, then the dust storms and the flight of human beings with no place to go. See Chapter 1 of this book. (Courtesy U.S. Dept Agr.)

tana had three splendid years in succession, 1914–15–16. This happened shortly after much talk about dry farming and after a new Homestead Act (1909) which let settlers have 320 acres instead of 160 acres. Settlers flocked into this area by tens of thousands.[12] On the basis of those three good crops they built houses, schools, churches; they sold bonds, and sold land at $30 and $40 an acre. On the last of these three good years came the third Homestead Act, letting one man have 640 acres. Also came World War prices for wheat, the tractor, and a land rush. Then the three succeeding years were periods of unprecedented drought and crop failure.[13] It seemed almost like a trap for the settler. Whole townships and counties could have been bought at $10 an acre. Some counties ceased to pay interest on their bonds. The United States Government appropriated money to buy seeds for farmers, and the government of Saskatchewan did likewise. It is because of such cycles as these that some of the Great Plains area has been settled three times, and three times has it been abandoned.

ERRONEOUS SETTLEMENT

In our mania for development (and catching votes) our Government has been foolish enough. The land shark also gave aid in this erroneous settle-

[12] In Montana 17,865 homestead entries were filed in 1912. A survey of former occupations of settlers in a Montana county showed that only half had been farmers. The list included musicians, butchers, bartenders, miners, deep-sea divers, maiden ladies, merchants, preachers, plasterers, printers, peddlers, gamblers, and Jacks-of-all-trades — truly a democratic outpouring. Thirty per cent arrived with no capital, so we should not saddle the climate with full blame for all failures.

[13] Unfortunately Montana is not the only sufferer from such calamity. Western Texas had a similar drought about the same time, but it did not find so many trying to farm.

ment. Witness the farmer from Georgia who, after having been shown some Great Plains land by a real-estate gentleman, said to me with real reverence: "Ain't it wonderful! The Lord just knows we needed more land and has gone and made it rain more out here in this country than it used to." The statement, quite unfounded, that plowing the land increases the rainfall has probably made tens of thousands of sales and helped to wreck thousands of families.

The railroads have had a great temptation to overpraise the region. They had received large land grants for building the roads. A settler in the Great Plains region was worth $500 a year to the railroad in freights in 1910. He was worth several hundred dollars to the road if he failed. I wonder how many of these victims remember with bitterness an advertisement I saw in an Eastern newspaper showing the Great Plains farmer plowing the wide expanse and turning up piles of coined dollars.

STAGES OF DEVELOPMENT

The region of the Great Plains began its history as a roadway — people crossing to get to some other place, to Santa Fe to trade with the Mexicans, to the Rockies for fur, to California and Idaho and Colorado to dig gold. It began its modern epoch in 1869. In that year the Union Pacific and Central Pacific railroads were completed and were joined near Ogden, Utah, providing the country with its first transcontinental railway service.[14] At that time the roving Indians of the Sioux and other tribes still had possession of most of the Great Plains, and millions of buffalo made the annual migration northward from Texas and Oklahoma in the spring, returning southward from Canada in the autumn. Sometimes the trains of the Union Pacific had to stop while great masses of these cattle of nature shambled across the tracks, followed by Indians. It is no wonder that Plains Indians' food, raiment, law, religion, and folklore centered in the buffalo. It was easy for them to kill buffalo, and to dry the meat and use the skins for clothing, tents, and tackle.

In the four years 1868–72 the railroad, the repeating rifle, and hunters from everywhere were too much for the buffalo. It was slaughtered by millions, and the cowboy and the white man's cattle took its place and that of many of the Indians.[15] The land belonged to the Government. No one wished to

[14] The Union Pacific built its line westward from Omaha on the Missouri River, and the Central Pacific built its line eastward from Sacramento, a junction being effected at Promontory Point, about 53 miles west of Ogden, Utah, on May 10, 1869. The difficulties of construction were enormous, and both lines were heavily subsidized by the Federal Government, which gave each company 20 sections of public land for every mile of line constructed. All told, the Union Pacific received about 12,000,000 acres, and the Central Pacific over 10,000,000 acres. In order to help the companies secure capital funds, they were both authorized to sell government bonds bearing 6% interest, the amount which they could sell varying from $16,000 per mile for the level stretches up to $48,000 per mile for the mountainous stretches. Under these provisions, both companies received over $27,000,000 in government bonds, the government taking a second mortgage to safeguard its loan.

[15] Fortunately a few men of vision formed the American Bison Society and came to the rescue of the buffalo before complete extinction was its fate. In 1906, Dr. Hornaday, the learned director of the New York Zoo, reported that the bison in America numbered 506 or 507. In 1934 there were more than 17,000 bison in Canada and 4,000 in the United States, and they are now increasing steadily in many herds in national parks and also in

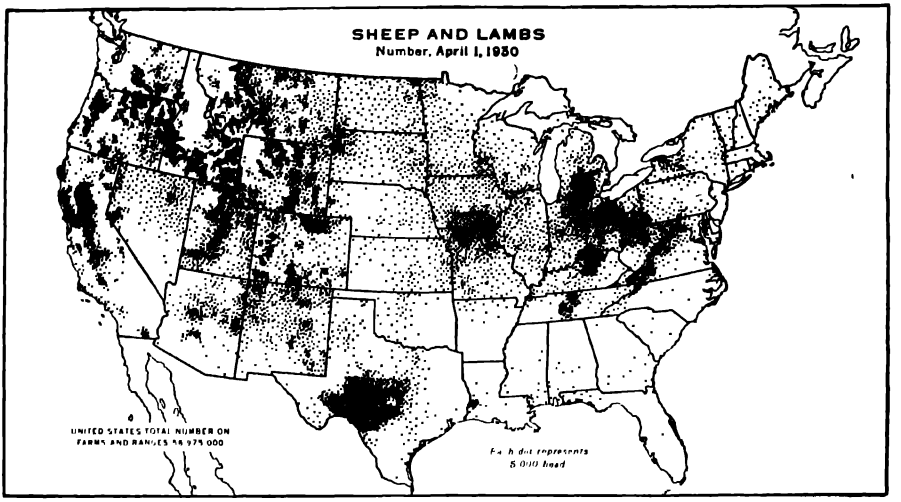


FIG. A. Sheep occupy many Western uplands, the rocky Edwards Plateau of Texas, hill lands of northern Missouri and southern Iowa, of eastern Appalachia, of the upper Ohio Valley, also the good grass of central Tennessee and the good level lands of the Kentucky Bluegrass, the eastern Corn Belt, and southern Michigan. (Courtesy U.S. Dept Agr.)

settle there, and one of the easiest businesses in the world was to buy cattle, brand them, and turn them out to live as the buffalo had lived on its old pasture. The cattle picked their own living. In early summer a great drive was made, which rounded up all the cattle in a wide area. The cows were lassoed and pulled out of the bunch, followed by their calves. To settle the question of ownership the calf was branded with the mother's brand and at the fall roundup the animals that were to go to Eastern markets were picked out. Cattlemen made great profits for a decade or two, until they overstocked the range, overpastured it, and lost 50 or 60 per cent of their cattle by starvation in the severe winter of 1886–87.

Then came the homesteader, trying his luck on the homestead defined by the act of 1862 as 160 acres. In this region of little rain 160 acres was not enough. The homesteader failed, mostly through no fault of his own. He was in a strange land, very strange indeed so far as farming was concerned. After tens of thousands of men had been failing for a couple of decades Congress waked up a little and enlarged the homestead to 320 acres (1909), then to 640 acres (1916). Experiment stations were established throughout the length of the Great Plains to gather facts for the farmer, decades *after* he first needed them. It should be noted that a cycle has been completed. For much of it, it is from grass back to grass — so the recommendation goes.

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private hands. There is still one wild herd in the woods around Great Slave Lake. They may yet become the cattle of the plains. They are superior to our breeds in ability to stand blizzard and drought, and to maintain flesh under an adverse food supply. They are bigger. The meat is said to be more digestible. The hide is thicker and stronger. The animal can be combed to yield wool that can be woven. (Information from Dr. Frank Speck, University of Pennsylvania.)

By 1930, fifty years after the settlement of western Kansas, man had made considerable progress in adjusting himself to the conditions — or thought he had. Then came the dust storms of recent years and the severe droughts of 1930, 1934, and 1936. The bad droughts of 1889, 1890, 1901, 1910, and other early years fell on cattle-ranchers. Those of the 1930's fell upon the men with reaping machines. These later droughts have created distressing problems for the people of the Great Plains, and it is uncertain what the eventual use of the land will be in many areas.[16] Land utilization in this region of uncertain rainfall may perhaps never be permanent or stable unless by government fiat, for climate is bound to fluctuate and man loves to battle (or gamble) with nature even when he has less than a fifty-fifty chance. By turning back the hands of time for about two decades, we gain a more normal, long-run perspective of the human-use aspects of the region than at the present time. What do we find? The eastern boundary of the Great Plains (Fig. 508 A) follows roughly the 20-inch annual rainfall line, and in 1919 it marked sharp contrasts in economic use of the land. West of this line pasture took up more of the farm than did the

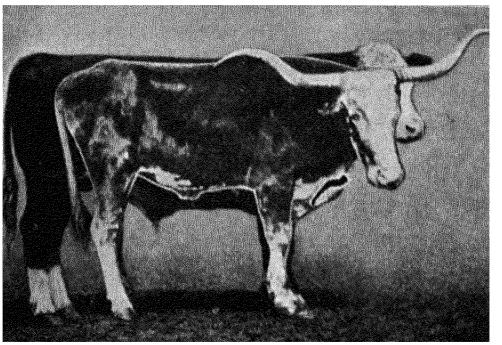


FIG. A. This ingenious photograph of two steers on the same scale shows the modern beef animal, weight about 1000 lbs., and the now nearly extinct long-legged, thin-bodied Texas Longhorn, weight 500 lbs. One animal is the result of careful selection by man, the other the result of three centuries of blizzard, drought, and wolf selection applied to wild cattle of Spanish stock that escaped early from the Mexican settlements. (Courtesy W. H. Black, U.S. Dept Agr.)

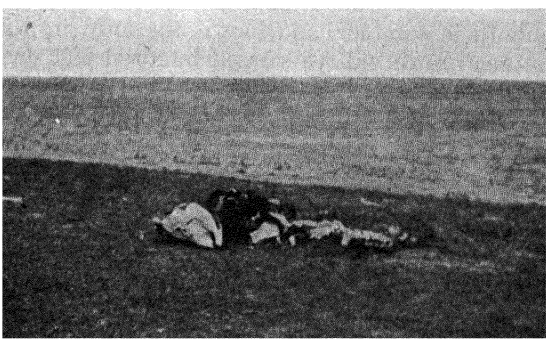


FIG. B. One of the processes of natural selection. A long hard winter leaves thousands of skeletons like this on the plains, where forage is not provided. This was one of thousands which perished in a wet snow on May 8 when the emaciated animals could not resist an ice-cold soaking. A few yards back of these miserable remains is the edge of an acre of dry and plantless alkaline mud, the bottom of an ephemeral lake with no outlet. Alberta. There are thousands of such lakelets. (Photo by J. Russell Smith)

[16] Dr. O. E. Baker, U.S. Dept of Agr. tells us that he does not know enough about it yet to make a statement — and he probably knows more about it than any man alive. See the report of the Great Plains Committee, *The Future of the Great Plains*, Gov't Printing Office, 1936. See also Carter Goodrich, *op. cit.*

cultivated crops.[17] This is one of the most important boundaries in American agriculture. It is, of course, a transition line. Fifty miles east of it the farm product in most counties in 1919 was over $15 per acre. Fifty miles west of it the farm products were under $5 per acre. Fifty miles east of the boundary the average size of farms varied from 300 to 400 acres. Fifty miles west of it the average size of farms was from 600 to 1200 acres. Fifty miles east, the landscape looked like Corn Belt or Wheat Belt. Most of the land was in fields and crops. Fifty miles west it looked like open plains, with fences far apart and often lacking, some of the land still in the native grass, untouched by plow.

This line at the edge of the Great Plains, close to 20 inches *average* precipitation, in the latitude of Kansas happens to divide the United States into two nearly equal parts. The eastern half is the land of humid agriculture and heavy population; the western half is the land of dry farming, grazing, irrigation, and scattered population. The northern boundary is the Spring Wheat Region; the western boundary is the foot of the Rocky Mountains and the western breaks of the Staked Plain (Fig. 508 A).[18]

THE SURFACE OF THE GREAT PLAINS

The surface of the Great Plains can, in general, be spoken of as level or gently rolling, but in a land of such vast extent, 1500 miles from north to south, and from 300 to 700 miles east and west, there is naturally room for much variation. In western Montana, near the mountains the surface is so high that there are frosts every month in summer, and hay is the only crop attempted. The rivers of Montana are in valleys several hundred feet deep. The land comes down to them from the higher elevation, often in level benches edged by a series of hills, locally known as "breaks" or "Badlands."

The rock strata in most of the Great Plains are nearly horizontal, with softer material above and below. As the softer material is worn away, cliffs or rows of hills are left with rocks sticking out from their sides and labyrinthine valleys cut into them. In such places it is hard for a wagon to get from one level to the next. Once the wagon has reached the top, it can travel for days over a level or gently rolling surface. One well-known section, Goshen Hole, in western Nebraska and eastern Wyoming, is a lower area walled nearly all around by such a line of breaks.

At various places in the Great Plains, remnants of these old strata stand

[17] Dr. O. E. Baker's careful and statistical study, "The Agriculture of the Great Plains Region," *Annals of the Association of American Geographers*, September, 1923, also the U.S. Dept of Agr. *Yearbook*, 1921, have been followed in this discussion. For a comprehensive study of a much greater area, including the Great Plains, see O. E. Baker, "Agricultural Regions of North America — The Grazing and Irrigated Crops Region," *Economic Geography*, October, 1931, pp. 325–64, and October, 1932, pp. 325–77.

[18] The wide-open plains of the Green River Basin and central Wyoming are not a part of the physiographer's Great Plains, but considered from the standpoint of human use they are the same region. The Laramie Plain, of 2000 feet altitude, has 15 inches of rain and is fine pasture. To the west is a mountain-enclosed area with less than 10 inches of rain. It has shifting sand dunes and is called the Red Desert. This Wyoming land is in the drainage basin of the Colorado and has possibilities for irrigation in the alluvial lands of an old lake bed in Green River Basin.

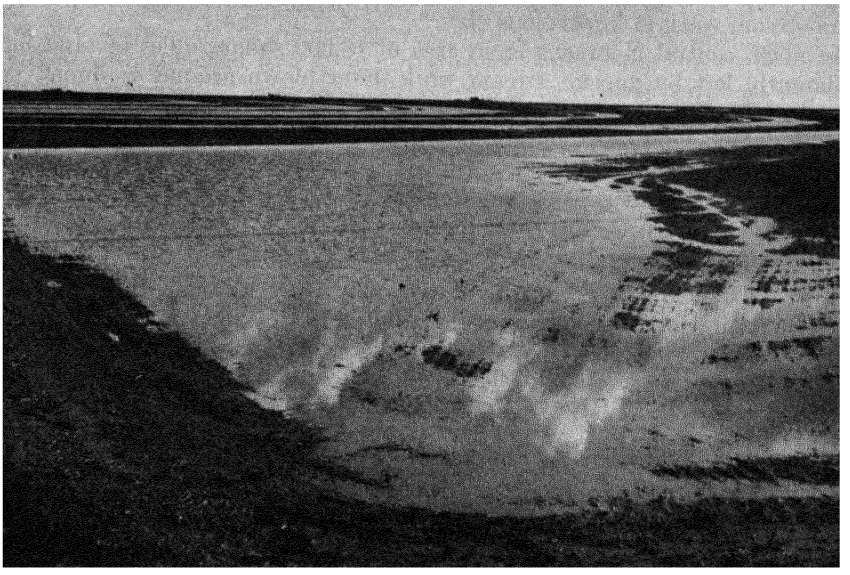


FIG. A. One of the many areas where the Great Plains surface is nearly level. On the high plains near the New Mexico-Texas boundary the U.S. Soil Conservation Service did this terracing on a 1 per cent slope. The terraces are holding the runoff from a 7.78-in. rain of which 4.96 in. fell in three hours. Picture taken 17 hours after the rain stopped. Most of the wheat that was harvested grew where the water stood. The average of rainfall figures for this section is about *17 in.* (Courtesy U.S. Soil Cons. Service)

up as high hills, known locally as mountains. At other places ancient lava flows and volcanic rocks remain above the plain. The Black Hills were pushed up through the horizontal rocks of the plains. They are, therefore, ringed about by the upturned edges of the plains rocks, just as the western border of the plains at the foot of the Rockies has a similar upturned edge where the granites of the Rocky Mountains pushed through.[19] Because of their higher elevation, about 7000 feet, the Black Hills receive more rainfall and are covered with forest. They stand out in the Great Plains like a green island in a sea of brown parched grass (at some seasons). The Black Hills have deposits of gold, silver, and lead, which have given rise to a mining industry, not so great now as in the golden age of the West. New Deal artificial prices for gold and silver stimulated mining activity.

In southwestern South Dakota and adjacent parts of Wyoming and Nebraska there are several thousand square miles of Badlands. This land, which is mostly of heavy clay, is so steep that it washes badly, and the earth absorbs so little water that it is bare of vegetation. But in among these bald, fan-

[19] This gives opportunity for the collection of artesian waters. These proved of great value for irrigation in North Dakota, until many wells ceased to flow — another case of wasted resources ruined by our best-known citizen, the resource hog. In that state artesian wells are now controlled by state law, administered by the state geologist.

tastic; bare Badlands are flats where good grass grows. The Badlands result from stream work in impervious clay.[20]

In north-central Nebraska is an area of 18,000 square miles of sand hills, apparently left by ancient stream work, later blown around as dunes, still later fastened by grass into a rolling area; it contains many pocketed valleys.

In Kansas, Nebraska, and Colorado the surface is more level than it is farther north. Much of it is outwash left by streams fed by Rocky Mountain glaciers in an ancient era of greater rain.[21]

The Staked Plain (Llano Estacado) of western Oklahoma, Texas, and part of New Mexico, despite its great elevation, is the largest tract of nearly level land in the United States.[22] Its base is a horizontal layer of limestone with breaks to the west and many breaks to the east, which make an area of rough country in north-central Texas.

RIVERS OF THE GREAT PLAINS

As most of the scanty rain falls in one season — fortunately for man, it is the summer — most of the streams that rise in the Great Plains are dry part of the time, and have channels choked with sand. The master streams, fed by Rocky Mountain snows and springs, naturally flow all the time, usually with declining water content as the distance from the mountain increases. Man has now seized their waters for irrigation, so that the Arkansas and the South Platte are dry a good part of the year and only the Missouri continues to flow at all times. Even the latter would doubtless have been dry at times if it had wide expanses of good, irrigable land to which its waters could be led by gravity.

From Saskatchewan to the Staked Plain, inclusive, there are upon the surface of the plains many little inland basins without outlet whose waters are brackish, saline, or even alkaline.[23] This makes drinking-water scarce in this region. Many a rancher has had wide acres all his own (really government land) because he owned the only water hole where stock could drink. Farm wells are often several hundred feet deep.

NATURAL VEGETATION

The region is naturally treeless except for strips of cottonwoods and willows along the watercourses. Trees planted in the grass usually die. The grass gets the water supply with its surface roots before it reaches the roots of the

[20] The old resident on the plains lives on soils of sandy loam and raises forage. The hard soils, better for wheat, often change hands.

[21] See Bowman's *Forest Physiology*, p. 417.

[22] "A place where you saw a visitor coming at sunup and watched him all day, and then he didn't get to your place until half an hour late for supper." — A quotation from the horse-and-buggy era.

[23] In the sand hills of Nebraska drifting dunes have choked up most of the streams until this area is normally dotted with lakes from a few acres to 2 or 3 sq. mi. in extent. A few have flowing outlets. More have outlets through the sand and are therefore sweet, but some are in basins without outlets and have collected enough potash to make them a considerable source of potash supply during the potash famine of 1914–18. Its cost, however, is many times that of mining the good deposits of Germany and Alsace and New Mexico.

trees. Cultivation makes many varieties of trees grow in the more humid parts of the area.

The grasses fall into two groups, the short, surface-rooting varieties and the taller, deep-rooting varieties. In seasons of light rains the short surface-rooting varieties thrive, and the deep-rooting varieties wait. In seasons of heavy rain the deep-rooting varieties can get moisture, grow tall, and make seed.

As is the case with most arid regions, the grasses are very nutritious and hold their nutriment through the winter so that animals can find feed if their numbers are not greater than the food supply. Overpasturing prevents the seeding of good grasses and has caused a great increase of weeds in some localities. In sandy locations overpasturing breaks the grass protection of old dunes; the sand thus liberated is again blown about. Thus the dunes may move to the next man's land and ruin it. Therefore Kansas has a law that a man whose land is injured by drifting sand or soil can collect damages when his neighbor has been careless and let his sand or soil loose. Many parts of this area have had the pasture value cut in half by overgrazing. The cure is to let the grass have a chance to seed before it is pastured — a thing that is easier to say than to do. One of the troubles is that the cattle need food every year, every month, even every day.

AGRICULTURE

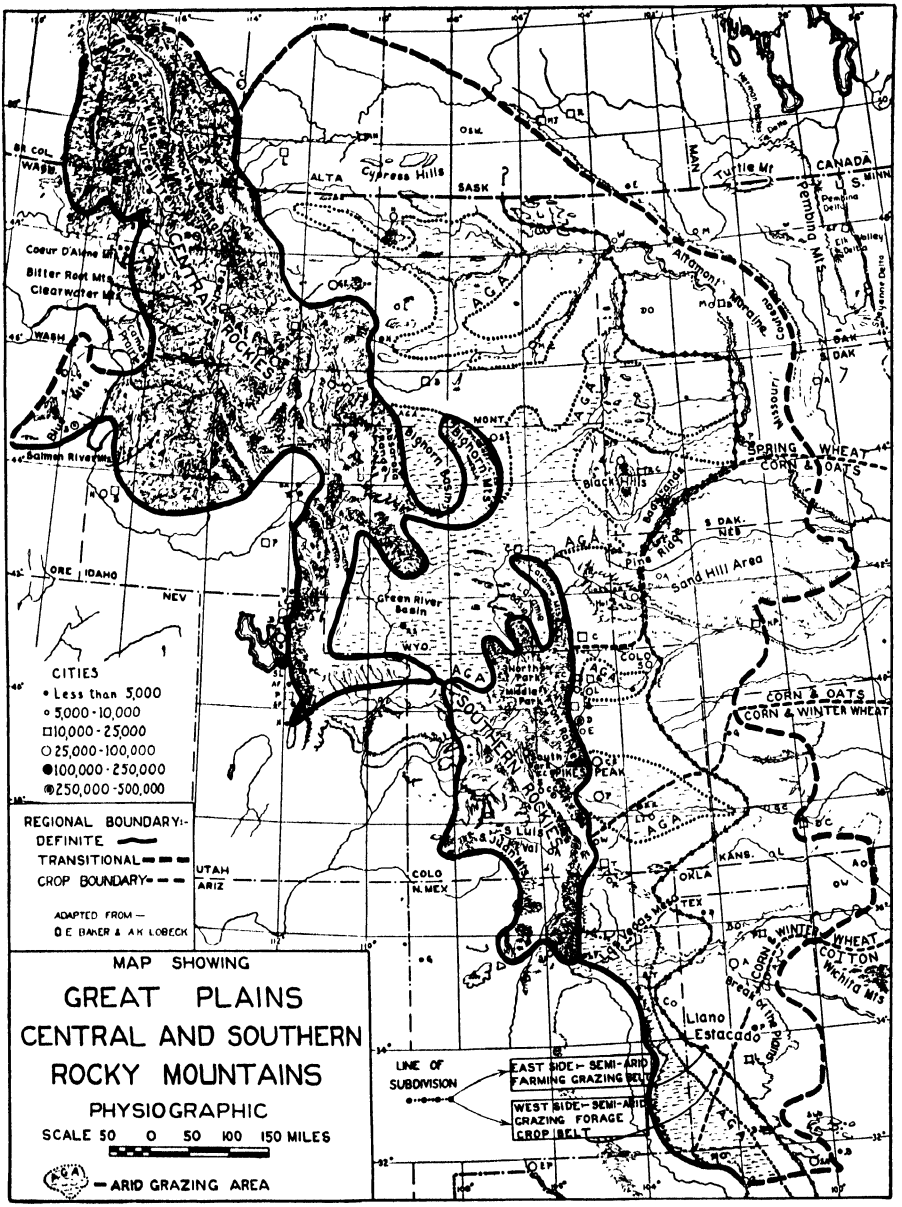
Dr. O. E. Baker, as a result of his careful studies previously mentioned, classifies the Great Plains in three main agricultural types: the farm-grazing, the grazing-forage, and the arid grazing (Fig. 508 A).

1. The farm-grazing belt is the eastern or more humid part of the Great Plains. It is about 50 to 150 miles wide. In this area the crops are more valuable than pasture, but pasture takes up more of the land than the crops, only 21 per cent being in crop in 1919.[24] The farm here needs to have from 1 to 2 square miles, from 640 to 1280 acres. In 1919 there were on the 81,000,000 acres of this land 90,000 farms using on the average 900 acres of land each. In the Dakotas it takes from 5 to 15 acres of grass for a cow or a steer; in Texas from 15 to 25 are necessary.[25] Livestock is almost a necessity for the farmer here, because the frequent failures of grain crops may leave him temporarily without income, but if he has cattle, his failed wheat crop may be mowed for hay, and his corn may make fodder if it does not make grain.

The crops in this long strip are in each case the same as the crops grown in

[24] Some may not unnaturally ask, Why use 1919 figures? The waves of tillage advance and retreat that have followed that date leave us dazed. Perhaps 1919 figures give a truer picture than later ones of the region in the light of what it really *is*. *Don't forget that these three zones still exist. Boundaries* may waver. In the different sections of this farming-grazing area the percentage of land in crop was as follows: spring wheat, 33; corn, 29; corn and spring wheat, 22; cotton, 8.

[25] The line of 15 acres per cow or steer crosses the Canadian boundary with 14 inches of rainfall in northeastern Montana, and reaches the Gulf of Mexico near Corpus Christi with 25 inches of rainfall. The greater heat makes greater evaporation and less net effect of rainfall.


CITIES
• Less than 5,000
○ 5,000 - 10,000
□ 10,000 - 25,000
○ 25,000 - 100,000
● 100,000 - 250,000
◉ 250,000 - 500,000
REGIONAL BOUNDARY:-
DEFINITE
TRANSITIONAL
CROP BOUNDARY
ADAPTED FROM —
O.E. BAKER & A.K. LOBECK
MAP SHOWING
GREAT PLAINS
CENTRAL AND SOUTHERN
ROCKY MOUNTAINS
PHYSIOGRAPHIC
SCALE 50 0 50 100 150 MILES
— ARID GRAZING AREA
LINE OF SUBDIVISION
EAST SIDE — SEMI-ARID FARMING GRAZING BELT
WEST SIDE — SEMI-ARID GRAZING FORAGE CROP BELT
CANADA
ALTA
SASK
MONT.
WYO.
COLO.
N. MEX.
UTAH
ARIZ
NEV
ORE.
IDAHO
WASH.
CALIF.
N. DAK.
S. DAK.
NEBR.
KANS.
OKLA.
TEX.
MINN.
SPRING WHEAT
CORN & OATS
CORN & WINTER WHEAT
COTTON
Cypress Hills
Turtle Mt.
Pembina Mts.
Coeur D'Alene Mts.
Bitter Root Mts.
Clearwater Mts.
Salmon River Mts.
Black Hills
Sand Hill Area
Pine Ridge
Green River Basin
Wind River Mts.
Pikes Peak
Wichita Mts.
Llano Estacado
Edwards Plateau
Big Bend Park
Guadalupe Mts.
Davis Mts.
Chisos Mts.
Sierra Blanca
Organ Mts.
Sacramento Mts.
Capitan Mts.
Jemez Mts.
Sangre de Cristo Mts.
Wasatch Mts.
Uinta Mts.
Bighorn Mts.
Big Horn Basin
Laramie Basin
Park Range
Front Range
Wet Mts.
Spanish Peaks
Raton Mts.
Sangre de Cristo Mts.
Cimarron Mts.
Arkansas Valley
Red River Valley
Pembina Delta
Lake Agassiz Basin
Missouri Valley
Yellowstone Valley
Missouri Valley
Cheyenne Delta

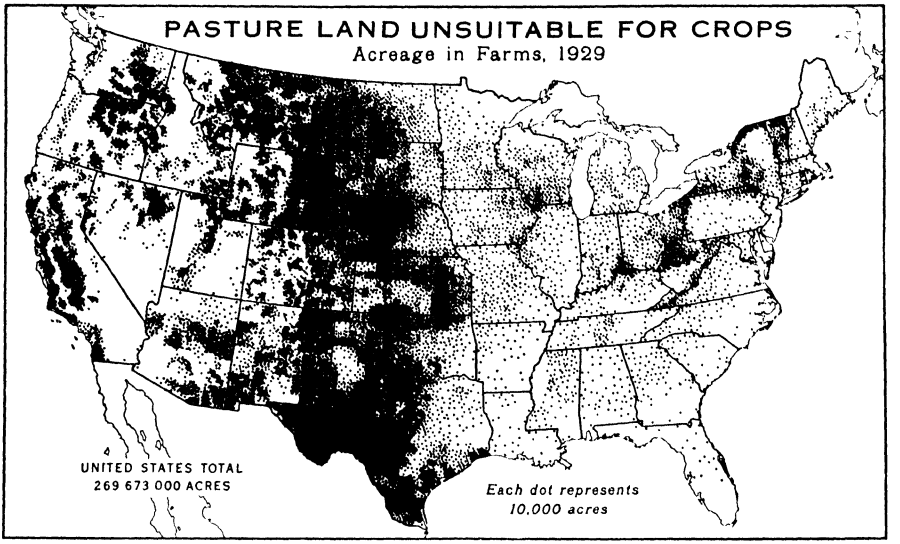


FIG. A. This is a record of land that is too dry or too rough for tillage, and it far exceeds the tillable area. (Courtesy U.S. Dept Agr.)

the agricultural region to the eastward. The map (Fig. 508 A) shows the extension into the Great Plains of the spring-wheat area (also barley, oats, and rye). Farther south there is a feeble extension of the corn zone, then of winter wheat along with corn and sorghum. In the south, there is sorghum for the cattle and some cotton, but the cotton plants are small and the yield is sometimes low. An important advantage is that scanty vegetation cover and cold winter make it hard for the boll weevil to survive the winter. Hence a great boom in cotton in western Texas (Fig. 288 B).

2. The grazing-forage section is separated from the farming-grazing section by the line where pasture product becomes more valuable than crops.[26] Crops here cover only 7 per cent of the whole area. Most of the land is, of course, in pasture. It takes from 15 to 25 acres to keep a cow. The chief crops are corn and sorghum for winter forage, often with a field of wheat as speculation. If the weather is just right, the crop will be fine, often far above the national or state average. If the weather is wrong, the failure may be complete. On the average, wheat yields three-fourths as much as in the farming-grazing district, and three-fifths as much as it does in the wheat area to the east.

This section had 120,000,000 acres of land and 98,000 farms in 1919. The

[26] The line is determined by the place "where wheat-growing ceases to be a good gamble and becomes a bad gamble" — a Canadian saying.

"Last May 28 [1922] men and women of various creeds at New England, N.D., united in one common prayer for a bountiful harvest, following five successive wheat-crop failures. On October 31 they joined in a Community Thanksgiving." — *Philadelphia Evening Bulletin*, Oct. 31, 1922.

Prayers for rain, public, organized prayers, are about as common in the United States as are bad droughts. Sometimes these prayers are specific, witness this, a true quotation: "O Lord, send us a sod-soaker and not a gutter-drencher."

land requirements are from 2 to 4 square miles per farm, from 1280 to 2500 acres, provided there is no irrigation.

3. The arid grazing sections appear on the map in a number of places. This is the rough land of the breaks and the Badlands; the dry lands of valley bottoms and the sand-hill country of Nebraska; and lowlands that are usually too arid for any agriculture except possibly here and there a little field of sorghum or corn fodder. As compared to the highlands, there is less rainfall in the lowlands and more heat and more evaporation. These latter tend to decrease the efficiency of the little rain that does fall.

The arid grazing areas need from 20 to 40 acres to keep a cow, and from 2500 to 10,000 acres for a one-family farm. Since sheep have cleft lips and can pasture closer than cattle, and also need less water, these sections have more sheep than the rest of the Great Plains, which is largely given over to cattle.[27] In the northern part so much of the land still belongs to the Government as to interfere with satisfactory fencing, and the sheep travel in bands of from 1000 to 1500, accompanied by a shepherd and dogs. Most of them spend the summer in the Rocky Mountain national forests, often above the timber line. In winter the sheep go down to eat the alfalfa hay of the irrigation areas and the dry, nutritious grass of the plains. In Texas, where the land was given out in great Spanish grants,[28] it is all privately owned; most of the sheep land is fenced with wolfproof fences against coyotes, and the sheep run at large.[29] Incidentally, the range on which sheep are free is twice as productive as a similar range in which they are herded in compact bunches, because the trampling of great numbers of sheep injures the grass. The hoofs of the woolly idiots en masse are amazingly destructive. The sand-hill country of Nebraska is unlike the other grazing sections in that its moist valleys grow enough forage to winter the stock, which is almost entirely cattle. The barbs of needle grass enter the skin of sheep.

These arid grazing areas, having the lowlands, contain nearly all of the irrigated land of the region. Owing to the deep, narrow valleys of the Montana streams, the largest irrigations are on the Bow (Saskatchewan), Platte,

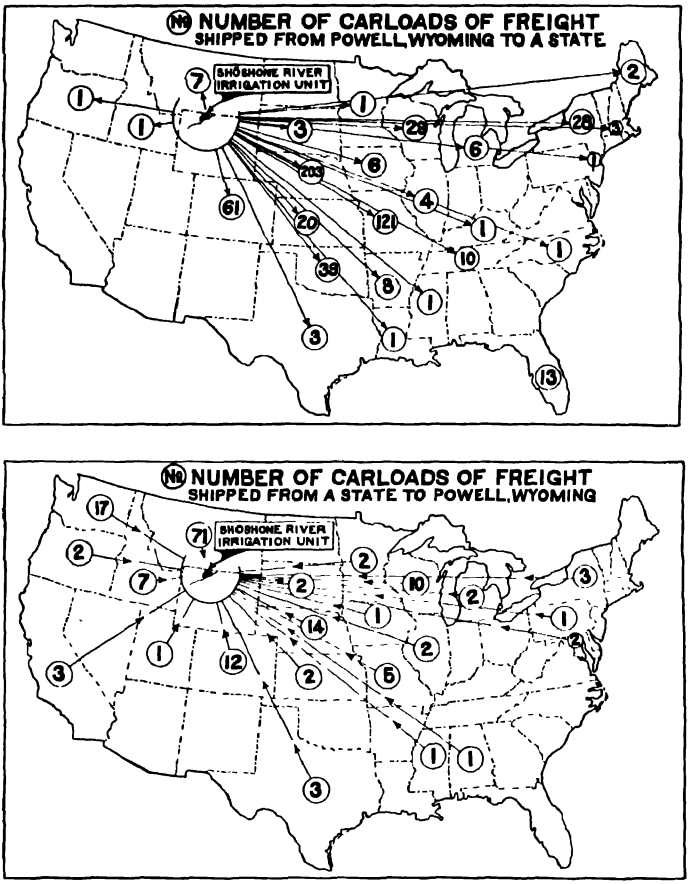
[27] Partly from this ability of sheep to pasture closer arose the bitter feud between sheep and cattlemen, resulting in the deaths of both animals and men, and sometimes approaching the proportion of civil war.

[28] There is a sign on a Texas ranch reading "Seventy-eight miles to headquarters."

[29] Over much of this region the United States Government now maintains a staff of government hunters whose sole job is to exterminate predatory animals — wolves, coyotes, mountain lions, bear. One lone and wary she-wolf with only three toes on one foot, indicating trap experience, cost the cattlemen $15,000. It ranged a radius of 40 miles and killed two yearling cattle a week for five years before it could be killed. Another wolf in the Badlands of South Dakota was so well known that the farmers made up a purse of $1000 for its capture, and one Jim Young, government hunter, followed it for nine months across two states — and finally got it.

The killing off of coyotes by white men removed the natural check against prairie dogs, which increase like rabbits, and by 1901 had completely taken about 4000 sq. mi. of western Kansas. Just as men had begun to despair and to fear that the dogs would take the whole plains, poison-gas warfare was discovered, and the prairie dog ceased to trouble the ranchmen.

In the Santa Catalina Mountains of Arizona the hunters got *all* the mountain lions. They had eaten deer regularly. Suddenly the deer increased like magic, ate all the forage, and starved out the cattle. Then a murrain carried off the deer. Tampering with nature's balance is not completely simple.



FIGS. A and B. What is the value of irrigation water, and to whom is it valuable? Powell is a town in an irrigated section of the dry Big Horn Basin (Fig. 508 A) in a section watered by canals fed by streams from the Absoraka range (heavy with snow in winter). (Facts from Chicago, Burlington & Quincy R.R.)

We are so prone to forget that this age lives by trade, and that a pile of goods is of no use to the maker until he has exchanged it for a thousand other things.

and Arkansas rivers (Fig. 508 A). Irrigated land is usually put through a crop rotation consisting of wheat, corn, beets or potatoes, and alfalfa, which stands for a number of years. The scattered oases of alfalfa render a great service by furnishing winter forage to the flocks and herds that spend most of the year on near-by grazing-land. It is in these better sections also that most of the dairying of the region is concentrated, because of the alfalfa hay and the corn, and because of the physical fact that a dairy cow cannot easily make the daily mileage necessary to pick her living from 20 to 40 acres of land, get back to the barn to be milked, and have much milk. The Arkansas Valley of eastern Colorado sends cantaloupes, "Rocky Fords," late in the summer to widely scattered markets.



FIG. A. A proper future for most of the Great Plains. Livestock summering on pasture and wintering on the haystacks. This white-faced Hereford is the predominant beef animal of most of the United States. (Courtesy Nat'l Cotton Seed Products Ass'n)

THE AGRICULTURAL FUTURE

If prices and land values should rise, there can be considerable extension of irrigation by water storage, but most of this great region must continue to be a land of farms and ranches, depending upon the rains of heaven rather than upon the waters of a ditch.[30]

It must continue also to be a land whose yield is uncertain because of the fluctuating rainfall. This will perennially trouble the farmer. At present he is pressed also by two problems of adjustment: first, getting the land divided off into family-size farms; and second, finding the system of agriculture that fits his particular soil, climate, and location, provided it is suitable for farm-

[30] The well-established fact that irrigation costs more than letting it rain has helped to put a check upon the extension of irrigation for a time. "Some irrigated land on at least fifty per cent of the farms of these three states [Montana, North Dakota, and South Dakota] is possible by making use of the flood-waters from torrential rains and the melting snows in the spring. In these three states, where it is possible to soak the ground down four to five feet once during the year, a good crop is almost certain. . . . Many farmers of the drought-stricken 'triangle' area of Northern Montana have taken advantage of this flood-water on from one to one hundred acres of their farms and are receiving bumper crops from it. The use of flood-waters for irrigation is not an experiment but has proven to be one of the best practices of dry-land farming of northern Montana and there is no reason why it could not be used in places with similar conditions." — Blaine Ferguson, "Use Flood Waters for Irrigating Farms," *Dakota Farmer*, July 15, 1923. The Montana Agricultural Experiment Station (Boseman) has a bulletin on this. There has been talk of diverting Platte River floods to high plains.

This suggestion is a perfectly feasible, tractor-road-scraper edition of an age-old practice of the primitive agriculturist (see p. 572). It is real agricultural adjustment applicable in all lands of limited rain. It should spread as swiftly as styles in clothes. There are pages on this interesting idea in J. Russell Smith, *Tree Crops*. The United States Soil Conservation Service has given it a great boom (Fig. 571 A). It may stop the downward retreat of water surface in wells — a menace now even in Ohio.

ing at all.[31] The first problem of all is to get several hundred thousand people out of the region and keep them out.[32]

First, the family-size farm. It has already been shown that this varies from 600 to 10,000 acres, and if the man does not have the right-sized tract, he is greatly handicapped in conducting the right kind of farm business, which may be grain farming or mixed farming or livestock farming. If the man needs 1200, or 2500, or 5000 acres, it is plain that the homestead law permitting him 640 acres does not provide for satisfactory farms, which should be large enough to carry 100 cattle.[33] In 1925 the United States Department of Agriculture and the Montana Experiment Station started, with a 55,000-acre reservation at Miles City, Montana, to "experiment in stock raising and growing forage crops in connection therewith," but in recent years experimentation has been devoted to the problem of wintering beef cattle on the Great Plains.

At long last, and at least sixty years too late, we have an attempt at intelligence in the care of public land in the Great Plains — the Taylor Grazing Act. Under the Homestead Law, a person could obtain only 640 acres of free land from the Government; of course he might buy land from private owners. If his land possessed the only water supply for miles around, this gave the ranchman a monopolistic control over a large area of public range, which he could use with little or no interference from others. But if there were other water holes in the community, then he was almost certain to encounter competition in the use of the public range.

If he did not place as many cattle or sheep as possible on the open range, somebody else would. In years of drought many animals might perish, but the ranchman felt that this involved less loss than to keep his animals off the range and let someone else use it. As a consequence of such competition, much of the public range has been overstocked, and the grass was not able to reseed itself. Weeds, desert, and dust storms were the inevitable result. This was almost as bad as plowing, and the inflexible and very unintelligent land policy of the Government was much to blame. The amount of land turned over to a settler *should* be determined by such factors as climate, soil, and potential use. For many decades we have needed a land policy that would enable the man who occupies the land to take decent care of it.

As a part of his conservation program, President Franklin D. Roosevelt withdrew the entire 165,695,000 acres of public domain from further settle-

[31] In western Texas a kind of crop-insurance is sought by planting alternate rows of corn, one of an early, and one of a late variety. They make different calls for moisture. It is being found in some places that corn in the fallow year of dry farming does not hurt the next crop much. It is also being found to our horror that too much tillage removes organic matter and soil blows away. In some places blowholes were 100 ft. deep before the modern era of dust storms began. Verily this is a land of problems.

[32] See Carter Goodrich, *Migration and Economic Opportunity*, a very useful book.

[33] "They thought, when the Kincaid law was passed increasing the homestead allotments from a quarter to a full section, the people would make out better, but they are disgusted right along. They stick around two or three years, long enough to prove up on their land and get title to it, and then they sell. At the usual price for a section a man can just about consider himself paid for the time he put in on it, not considering the work done by the wife and kids.

"As the homesteaders quit, the ranches are getting back to their old size again. Ranch people buy up most of the sections. For a time there were mighty few really large ranches left." — J. E. Ogier of North Platte, Neb., *Philadelphia Evening Bulletin*, July, 1924.

ACREAGE NECESSARY FOR A SATISFACTORY FAMILY INCOME

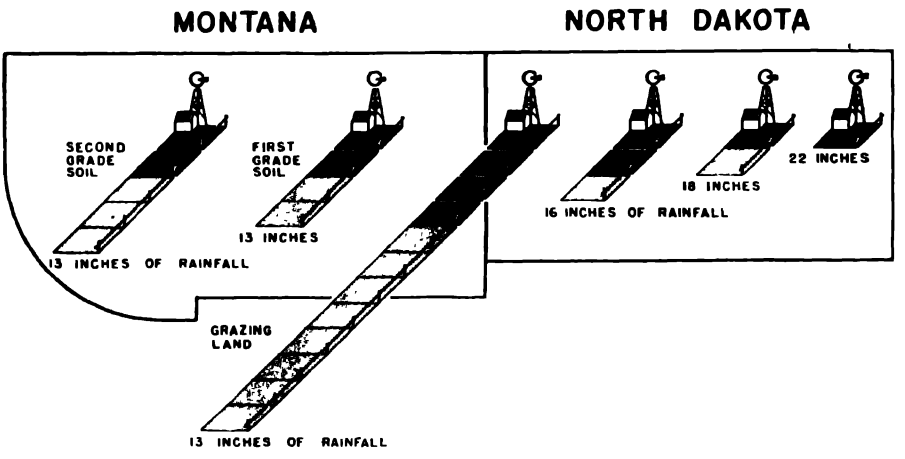


FIG. A. This figure is the companion piece to Fig. 515 A. It gives some measure of the almost unbelievable agricultural difference that lies between 22 in. and 13 in. of Dakota rain in a year. (Report of Great Plains Drought Area Committee, August, 1936, Morris L. Cooke, chairman)

ment, sale, or entry by executive orders in 1934 and 1935, and 80,000,000 acres in 12 different states were set aside as permanent grazing-land under the provisions of the Taylor Act. The Government has the power to limit the number of livestock that may be pastured on the public range, and Secretary of the Interior Ickes declared that the free and unrestricted use of the public range must give way to a policy of prudent use for the welfare of the whole country. This new policy *should* achieve beneficial results.

The whole region was settled first by the cattleman, who exploited the natural grass, and then often came the bonanza wheatgrower, who exploited the good soil. This is a type of man who is willing to take a chance. I rode past a 100-acre field of magnificent wheat in marginal territory in Alberta. Said my experimental-farm guide, "That crop of wheat is good enough to keep that fellow broke for six years" — while he tried in vain for another one as good.

The wheat farmer hopes for the great crop of 40 or 50 or even 60 bushels an acre, with a good price, which sometimes comes and makes him independent. Meanwhile growing wheat permits him to loaf for most of the year. Meanwhile also come the Department of Agriculture man from Washington

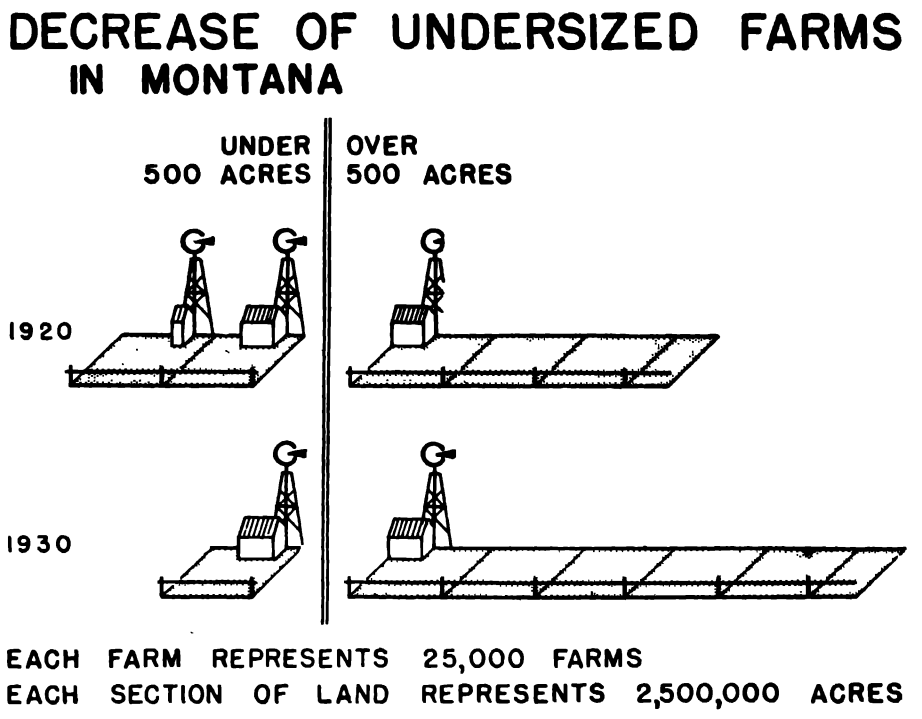


FIG. A. The swift kicks of nature have caused the people of Montana to make rapid progress in reducing the number and increasing the size of their farms. (Report of Great Plains Drought Area Committee, August 1936, Morris L. Cooke, chairman)

and others; the man from the state college of agriculture; the county demonstration agent; the railroad representative; and commissions of wise men dinning in his ear the old sermon of diversified agriculture[34] — corn or sorghum fodder, wild and tame hay, cattle, sheep, even cows with twelve months of work. The bonanza wheat farmer has a saying to the effect that he would

[34] "Your Commission concludes that a system of farm management in the Southwest [the Great Plains section of Saskatchewan], to be reasonably certain of success, should be of a diversified character. The more the risk is divided the less heavily the losses will fall in any one season. There must also be live-stock of some kind to consume farm products, such as straw, corn, fodder, sunflowers, alfalfa, sweet clover, millet, low-grade grain, which are of a nature unsuited to direct marketing, and to employ home labor the year round. This live-stock must be an important and constant part of the farm and not merely a side-line. There must be grazing-land or access to grazing-land in order to take care of the stock during a part of the summer. There must be fodder and feed-crops. There must be summer-fallow or fallow substitutes. There should be a reserve of fodder and seed from year to year. There should be among the grain-crops a cash-crop and preferably an autumn-sown crop as well as spring-sown ones. There should be produced every year as much as possible of the farm family's needs, so as to reduce the outlay for supplies." — *Report of the* [Saskatchewan] *Royal Commission for Inquiry into Farming Conditions*, 1921, p. 55. This recalls the Cotton Belt plus Joseph in Egypt. Some of this deluge of good advice was taken, because in the ten years 1922–31 the number of pounds of creamery butter produced in North Dakota increased by 140%, the output nearly doubled in Saskatchewan, South Dakota, Montana, and Wyoming, and it increased by a third in Alberta.



FIG. A. A Montana farmstead with feeble-looking windbreak trees and the contoured signs of a new resolve to adopt the advice of the U.S. Soil Conservation Service and hold the water where it falls upon the farmer's land.

"In the Southern Plains region of Texas, Colorado, New Mexico, Kansas and Oklahoma, 2,474,000 acres were listed on the contour early in 1936, with the result that practically all the spring rain was held in the fields. One inch of moisture was stored in the subsoil as the result of this contouring. Tests following these May rains showed that the moisture penetration was more than a foot deeper on contour listed land (about twice as deep) than on untreated land of the same character receiving the same rainfall. This stored moisture resulted in far better growth of sorghum than on the untreated land." (Photo by J. G. James, U.S. Soil Cons. Service)

rather have $4 from wheat than $10 from milking cows, so he takes another chance. The bonanza wheatgrower is a psychological type. This region hung on to its wheat acreage, enlarged by the World War. One reason for this is lack of alternatives. After the sod was broken, it was grow wheat or move away. In the drought years before 1940 many would have gone by the sheriff route (perhaps starvation route) but for props (many props) from Washington, and to a lesser extent from Canadian governments.

The Great Plains are a land that you love or you hate. In the winter come blizzards so blinding that you cannot see the length of your automobile, and getting lost is most easy. In the spring in many parts of the plain there is usually a wind storm or two strong enough to blow half the water out of a bucket which you may be carrying. All summer long the wind blows and blows, and the sunshine glares. If the rain comes, it is in showers that are soon over. Meanwhile there is little to do except watch the weather. Many

a settler's wife has paced the floor of her shadeless little kitchen until she wore it through, and there is a high record of women's insanity in some parts of the plain.

"Only six more months here until we prove up," exclaimed a pent-up woman in the sand hills of southwestern Nebraska to a stranger who stopped for a drink of water. "Then you bet we're going to take title, sell out, and leave this place." It *must* be miles to your neighbor if your farm has 2000 acres, but this poor woman was on a farm of only 640 acres where they needed 2500. So they had to give up the struggle, as did many others who had tried to make homes on the plains. Often the house was built of sod, and heated with "Hereford chips," dried cow-dung, made into a harmless chunk of cellulose by wind and rain and sun. This is the fuel of the dweller on treeless plains in all ages and on all continents, and it is good fuel.

On the other hand, there are people, especially men, who love the plains. There is a charm, somewhat like the charm of the sea, about the treeless plains and endless, rolling hills, and the horizon devoid of any object. I feel it myself. To some this gives a sense of peace, of largeness, of being near to nature, to the Infinite, to God.

MINERALS

This region has great mineral resources and a small mineral industry. The Wyoming plain has several oil fields, which produced 19,000,000 barrels in 1937, or 1.5 per cent of the American output. Along the eastern margin of this region is a part of the mid-continental oil fields of Kansas and within it are the oil fields of the Panhandles of Oklahoma and Texas. Of much greater permanent importance is the coal mined in Colorado near Trinidad, in several counties in Wyoming, and in Montana and Alberta. Perhaps the greatest potential resource of the region is in the vast reserves of subbituminous and lignite coal in Wyoming, Montana, North Dakota, Saskatchewan, and Alberta. The amount is estimated at three times that of the entire coal wealth of Appalachia. Its production, of course, is an insignificant fraction of that of Appalachia, and any heavy utilization of it seems to await a rather distant future.

North of Amarillo, Texas, is a gas field of about 50,000 acres that is a monopoly of the United States Government. From this field comes almost all the world's supply of helium, the noninflammable gas that is so desirable for the inflation of dirigibles. At the government plant near Amarillo the natural gas is purified and cooled to 300° below zero and liquefied, leaving the helium in a gaseous state.

The Panhandle of Texas is the center of a huge deposit of gypsum — anhydrite and salt. The gypsum deposits vary in thickness from a thin layer to about 60 feet. The deposits run from Salina, Kansas, through Oklahoma, Texas, and New Mexico, to the Pecos River.

A few years ago valuable deposits of potash were discovered east of the Pecos River, covering an area of about 40,000 square miles and extending across the New Mexico state line into Texas. The proved area in New

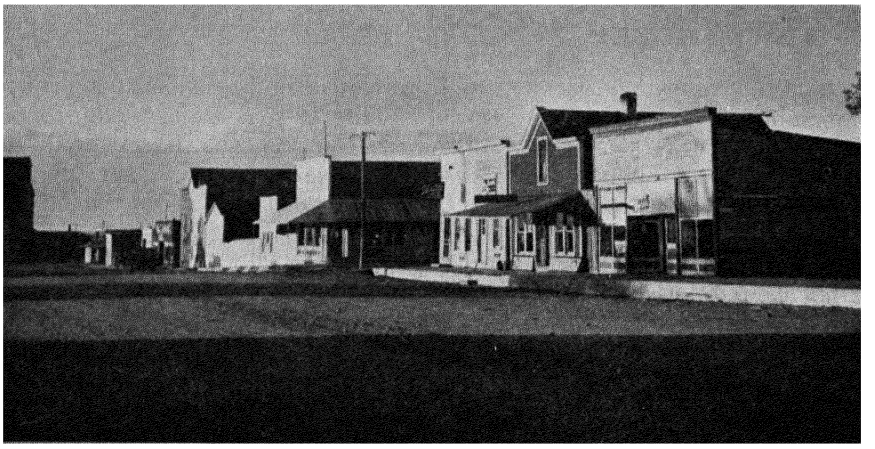


FIG. A. A typical business street of a sheep or cow town or a grain farmers' town trying to look big with false fronts — almost anywhere east of the Rockies, west of central Kansas, north of the Rio Grande, and south of the Great Northern Forest. (Courtesy Farm Security Adm.)

Mexico alone contains more than 100,000,000 tons, one-fourth of which is of excellent grade, being twice as pure as the splendid deposits at Stassfurt in Germany. Commercial production in this area began in March, 1931, and in 1933 the United States produced about 46 per cent of its potash requirements, most of the output coming from the Carlsbad, New Mexico, district. For many years we imported nearly all of our potash from Germany, but now our independence in potash is assured. Indeed, these great potash resources may be sufficient to supply our needs for the next two hundred or three hundred years.

CITIES

The great bulk of this vast human-use region is a land of long distances, few towns, and no cities. Some wheat farms, sheep ranches, cattle ranches, and open range are the chief features of the landscape, for this is a region that lies west of the aridity frontier. Few towns have any particular advantage of location except as railroad centers, and fewer still have had any good reason to grow.[35] In general, most of the region has just enough towns to wait upon the country and the railroads. The first towns here, sometimes called "hells on wheels," were those interesting collections of technical skill, transient labor, and floating vice that make up the construction camp of a frontier railroad. When a new section was begun, it moved on to the new site, leaving a lonely station agent and perhaps a few section hands among the old tin cans and refuse heaps. Many of the towns today are places where railroads change crews and repair their equipment.

The larger towns and cities are lined up near the western edge of this region at the foot of the Rockies: Denver (pop. 289,000), Pueblo (50,000),

[35] Amarillo, Texas (pop. 43,000), had the stimulus of gas, oil, and helium.

Colorado Springs (33,000), Greeley (12,000), and Trinidad (12,000) in Colorado; Great Falls (29,000) and Billings (12,000) in Montana; and Cheyenne in Wyoming (17,000). These are gateways between mountain and plain, and they have had more reason to grow. The mines of the mountains and the ranches and farms of the plains give these cities an important distribution trade. Here at the edge of the Rockies is to be found the great blessing of mountain water, which has given rise to irrigation agriculture on the level land of the plains. Billings, Montana, for example, is the market center for thousands of acres of irrigated land.

Denver is the financial and marketing metropolis of the region, serving its central area. Seven railway systems serve its great distribution trade. In 1936 its stockyards received over 3,000,000 sheep, 563,000 cattle, 497,000 hogs, and 12,000 horses and mules, a business worth $65,000,000. In 1935 its 781 manufacturing establishments had an output worth $145,000,000, meat-packing being the largest industry. The well-advertised climate and the scenery west of Denver bring it a large tourist trade.[36]

The remoteness of this population from the manufacturing East gives local enterprises a distinct advantage for the home market. For example, Pueblo is called the "Pittsburgh of the West," for its iron and steel industry produces some of the steel rails that are used in the West. Iron ore is brought from eastern Wyoming, good coking coal is mined near Trinidad, and limestone is near at hand. Heating coal is secured from Canon City and Walsenburg. Pueblo also produces mining machinery, farm implements, and various foundry and machine-shop products. A thousand miles of distance from competing manufacturing centers farther east gives such towns as Pueblo an advantage in the local market. Conversely, this distance also makes it difficult for factories in these towns to export to outside markets.

The beauties of the Rocky Mountains bring to Denver and Colorado Springs a large tourist business. These thriving cities are in beautiful locations near the foot of the mountains. The crisp dry air has made these cities health resorts to which people come on stretchers and remain in business. Denver's municipal automobile camp, with water, laundry, clubhouse, shower baths, steam table, and other conveniences, is ahead of the inns of much of the world.

In considering the future of the cities of the plain we should not forget overgrazed pastures, Dust Bowl, and the universal advice of students and economic statesmen that many people should move out and stay out. The West has already been skimmed and skinned, as well as partly blown away.

[36] Average temperature at Denver for 65 years: winter, 31.9° F.; spring, 47.8°; summer, 51.4°; fall, 51.3°.

Chapter 25. THE LOWER RIO GRANDE REGION



LAST April [1932] the people of Eagle Pass, a city of 6,000 on the Rio Grande, tossed their hats into the air and entered a grand celebration. For four days the holiday lasted — with fiestas, parades, beauty contests, dances by visiting Indians from Oklahoma and Mexico, and climaxed with bullfights in the friendly Mexican city of Piedras Negras across the river.

Why such jubilation? It marked the completion of a canal and a hydro-electric plant. Their Quemado Valley would no longer be the "burned" valley, as the Spanish name implied. Their arid desert would be transformed to luxurious gardens. On the high side of the canal there is and will be nothing but cacti, grass, and brush. Below the canal, less than a stone's throw away, will be orchards of figs, grapefruit, peaches, plums, grapes, pecans; fields of cotton, alfalfa, spinach, strawberries, sugar beets. The climate — 270 days each year without frost . . . permits several crops annually. From the same land seven to nine cuttings of alfalfa can be taken; two crops of corn can be grown. . . . Sixty-six thousand acres can ultimately be irrigated by gravity while an additional 25,000 acres can be irrigated by low-lift pumping.[1]

This news report of 1932 tells much: aridity, heat, low-grade pasture unirrigated, productive Eden when irrigated, and then the Spanish and Indian flavor — *four days* of fiesta, dancing, and a bullfight. But don't forget what it's all about — *water*, water in a thirsty land.

The rainfall map of the United States shows plainly how the moisture-laden Gulf air travels north most of the time. Brownsville at the mouth of the Rio Grande averages 27 inches of rain. Rio Grande City 85 miles upstream has less than two-thirds as much, and Eagle Pass nearly 200 miles farther inland is in "Burned Valley."

The long hot summer with its great evaporation gives rainfall a low efficiency per inch. The summers are hot, very hot, but not humid. Along with its light rainfall the region suffers from severe droughts similar to those that visit the Great Plains. Most of its area is sandy semidesert, marked by cactus, chaparral, mesquite and other brush, and bunch grass.[2] Most of the area is fit only for ranches of low productivity and therefore of large size.

[1] C. L. Dowell, "The Rio Grande Goes to Work," *Electric Journal*, November, 1932, pp. 449–502. Reprinted by permission.

[2] Mr. O. F. Cook of the United States Department of Agriculture reports that mesquite and other brush and small trees have replaced large areas of grass in southern Texas since the white man came. This happened because in Indian days grass grew and waited for fires, which killed the young trees. The heavier pasturing by cattle and sheep left no grass to burn and the bushes had a chance to live.

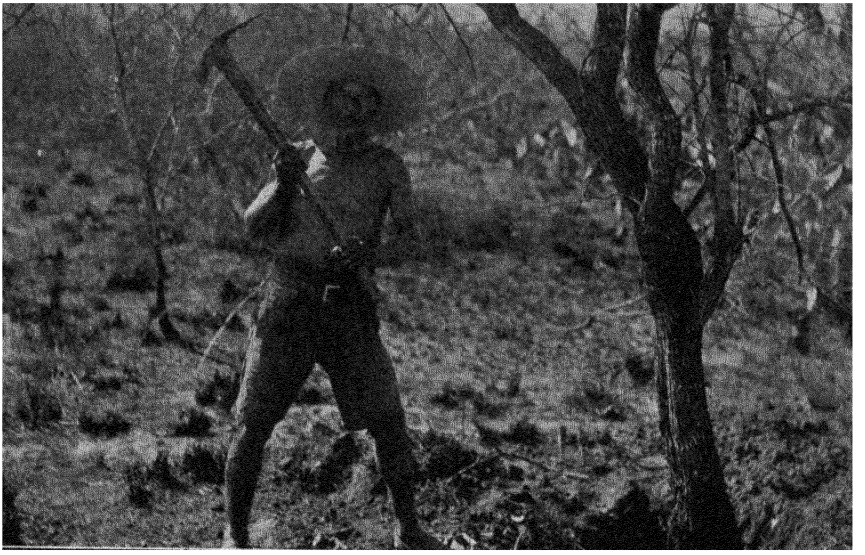


FIG. A. Lower Rio Grande Valley natural landscape of mesquite trees and bushes. Mexican workman clearing it ready for a farm. (Courtesy Brownsville Chamber of Commerce)

These ranches are occupied chiefly by cattle, but also by some goats. This region is an arid grazing-land with agricultural oases where water can be had for irrigation. The climate is hot enough and the growing-season long enough to make it, acre for acre, where water can be had, another Florida for fruit and truck, another Cotton Belt for cotton.

BOUNDS

The horizontal limestone layers of the Staked Plain slope downward through the Edwards Plateau, south of the Great Plains, and finally end in a great fault that is called the Balcones Escarpment. The dissected escarpment stands up like a mountain front for many miles southwest of Austin. The line of this escarpment bends, and after passing San Antonio its direction is nearly east-west. South of the escarpment the land is low and flat. The Lower Rio Grande Region lies between the Balcones Escarpment, the Mexican uplands, the Cotton Belt, and the sea. At its eastern edge it has a barrier beach, and behind the beach are the usual lagoons and marshes.

THE RIVER AND ITS PROBLEMS

Rivers that serve as international boundaries usually have serious problems, and the Rio Grande is no exception. As a line of demarcation between two countries, the Rio Grande is a shifting failure. The statesmen of an earlier generation decided that if the river slowly eats its way into the land and

builds up the opposite bank, the boundary has changed. On the other hand, if the river suddenly breaks across one of the narrow necks at a point of avulsion and thereby transfers a tract of land to the other bank, the nationality of the tract that has been shifted to the other side of the river remains unchanged. Thus, for a time the city of El Paso, on the plateau to the west, had a piece of Mexico in its midst, and many annoying problems resulted. There is along the Rio Grande a jest about a mythical town called Fat Chance, so named because any stranger who goes there has a fat (little) chance of getting out alive. The Mexicans claim that this town is on the United States side of the border. The Texans claim that it is on the Mexican side.

A second problem that is of utmost importance to the people of the Lower Rio Grande Valley is that of flood control. In its upper course the flow of the master stream can be controlled by the great Elephant Butte Dam above El Paso, but in its lower course the erratic flow of the Pecos, the Conchos, the Salado, and other tributaries sometimes causes serious floods. Just above Brownsville (pop. 22,000) the capacity of the channel is about 60,000 cubic feet per second, but during a period of flood the river is swollen with 300,000 cubic feet per second. The counties on the American side struggled for some time to provide flood protection,[3] but in 1928 a project was completed which provided levees and a series of floodways to accommodate the floodwaters. The main floodway diverts water at the town of Mission above Brownsville and carries it through the Arroyo Colorado, a former channel of the Rio Grande, into the Gulf north of the present mouth of the river. In 1932 the American and Mexican governments agreed upon a joint flood-control plan that called for 300 miles of levees, 150 miles of floodways, deepening of the river channel, and the construction of additional protective works. With the aid of PWA funds, work on the project was begun in December, 1933. Bigger and better levees are undoubtedly needed, but they fail, of course, to strike at the heart of the flood problem, for they have no effect upon the fluctuation in stream flow. This can only be controlled by reservoirs, for it is the nature of arid regions to have torrential downpours of the cloudburst variety, little or no forest cover, and nearly bare ground from which the runoff is appallingly swift.

Irrigation is a third problem that means much to the people of this valley, for without the silt-laden waters of the river much of this area would be nothing but the poor range country it has been for a century. It is said that the average annual flow of water could be made to irrigate 2,000,000 acres of land.[4] Certainly the wasted flood waters could be impounded in reservoirs and gradually released upon the thirsty land. When the Elephant Butte Dam was built above El Paso, the United States agreed to give Mexico 60,000 acre-feet of water, and the Mexicans agreed not to divert any water for 85 miles below El Paso. Beyond that point it was agreed that the two nations should share equal property rights in the water, although the Mexican

[3] In order to assist Hidalgo, Cameron, and Willacy counties, the Texas Legislature remitted most of their state taxes for a period of twenty-five years. The funds thus created, supplemented by local bond issues, were used for flood-control works.

[4] See William T. Chambers, "Lower Rio Grande Valley of Texas," *Economic Geography*, October, 1930, pp. 364–73. Prof. Edwin J. Foscue estimates the maximum irrigable land to be 800,000 acres.

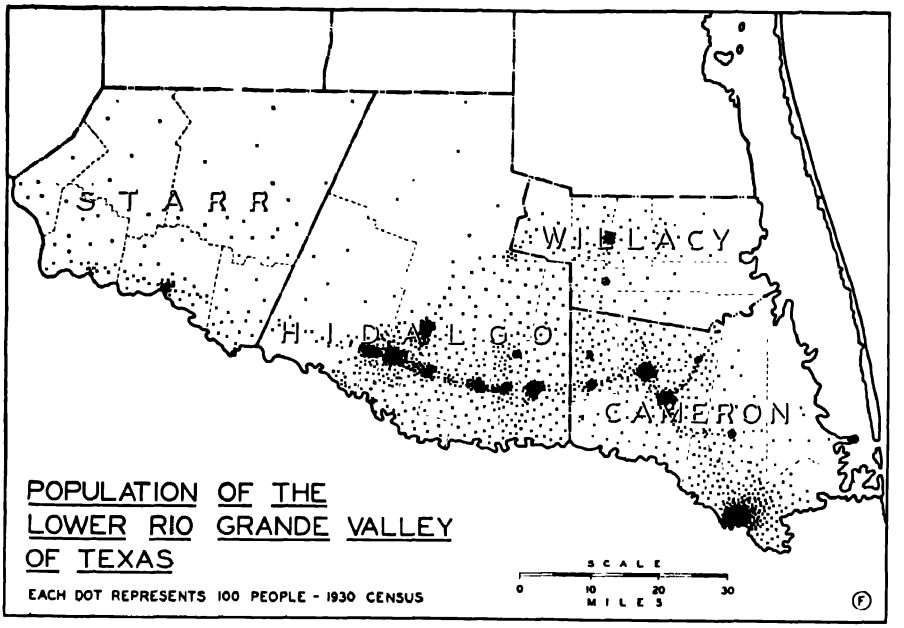


FIG. A. The distribution of population in the four southernmost counties of Texas. Population is concentrated along the slightly curving line of the Mission Terrace about 10 miles back from the river, and thus free from floods. This map is typical of the spotty population distribution of most areas depending chiefly upon irrigation. (After Edwin J. Foscue, in *Field and Laboratory*, April, 1934)

branches of the river contribute 70 per cent of all water that empties into the Rio Grande below El Paso. Nothing was said in the treaty, however, about taking water out of the branches of the river. The Americans who made that treaty must have been graduates of poorly equipped schools. When will a knowledge of elementary economic geography (something *more* than place names) be a prerequisite to high government service? In 1939 the Americans had 633,000 acres under irrigation in this region, but the fact that the Mexicans might take all of the water out of their branches of the river is a factor of unknown power that makes it difficult for the Americans to make future irrigation plans.

Navigation on the Rio Grande below Brownsville was a fourth problem, but in 1936 this problem was solved when a new seaway was opened between the port of Brownsville and the Gulf of Mexico. The seaway was created at a cost of $6,000,000 by constructing jetties 1 mile long through the barrier beach, by dredging a channel for 17 miles between the Gulf and the port, and by digging a turning basin 1300 feet long and 1000 feet wide. This artificial harbor lies 7 miles east of the city. In 1939 work was begun to increase the depth of the channel to 30 feet. In that year 8 steamship lines were making Brownsville a regular port of call. Thus the people of this valley have emulated the example of Houston by bringing the sea to an established inland town.

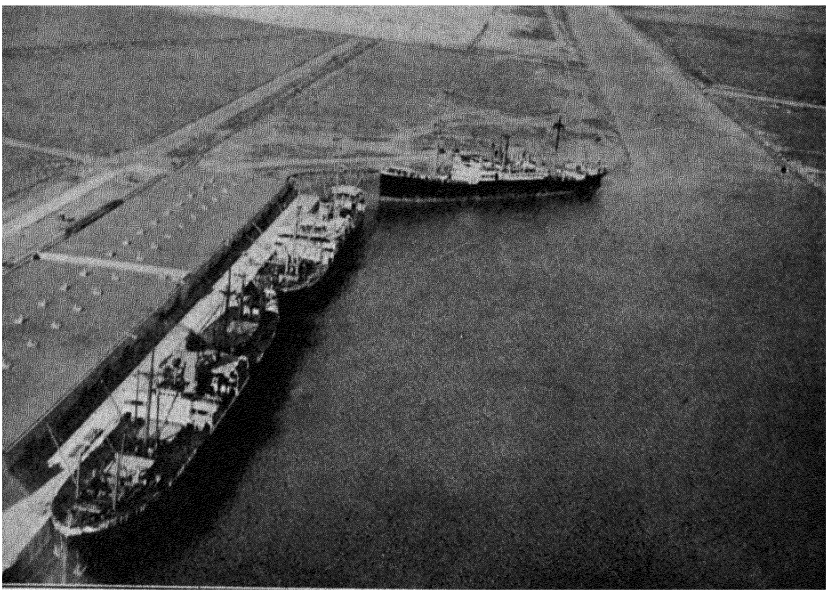


FIG. A. Brownsville's new man-made harbor 17 miles from the sea, and a part of the canal that gives access to it. Like that of Houston, the harbor gives perfect opportunity for industrial plants to spread themselves. (Courtesy Brownsville Chamber of Commerce)

FRUIT, VEGETABLES, AND COTTON

Like its stepsisters, Florida and southern California, the child of the Rio Grande has experienced the exhilaration, the pathos, and the tragedy of land booms. In 1904 the St. Louis, Brownsville, and Mexico R.R. was completed, and in its wake came irrigation companies, land speculators, and settlers. Tracts of from 2000 to 100,000 acres were bought at from $3 to $10 an acre, subdivided, and resold at handsome profits. Dr. Edwin J. Foscue of the Southern Methodist University points out that there are a number of well-defined and often widely separated irrigation areas within the American portion of this human-use region: (1) the Del Rio area, (2) the Eagle Pass area, (3) the Winter Garden area around Crystal City, (4) the Laredo area, and (5) the lower Rio Grande area, including Cameron and most of Hidalgo and Willacy counties.[5]

The first irrigated crops of this era were rice and sugar cane, which were not particularly successful. Since 1919 the best Rio Grande Valley lands have been devoted to citrus fruit, winter vegetables, and cotton. Following the World War, there occurred another land boom, and between 1920 and 1923

[5] See Edwin J. Foscue, "Land Utilization in the Lower Rio Grande Valley of Texas," *Economic Geography*, January, 1932, pp. 1–11. Dr. Foscue tells of a tract of 10,000 acres, lying in the middle of one of the best agricultural sections of the valley, that was bought in 1905 by a man from Mississippi at $25 an acre. The absentee owner left the land idle for twenty-five years and sold it in 1930 for $170 an acre, realizing a gross profit of $1,450,000.

more than 477,000 citrus trees were set out. Owing to the influence of new railroads, land speculators, and plenty of distant buyers, unimproved-land prices went up for a time to $400 and even $600 per acre.

This great citrus garden in the Lower Rio Grande Valley is rapidly growing, and successfully competing with the older citrus areas of Florida and California.[6] The increase in the total number of orange and grapefruit trees has been spectacular: 135,000 in 1920, 1,800,000 in 1925, 6,000,000 in 1930, and over 7,000,000 in 1937. The first shipments of citrus fruit were made in the winter of 1921–22. During the 1936–37 season about 23,000 carloads were shipped out of the valley, and 7000 carloads were taken to canning plants.

Like Florida, the Lower Rio Grande Valley has a climatic advantage in the production of early vegetables. With all truck-growing areas, it shares the dangers of a limited demand and a glutted market.[7] In 1912 less than 2000 carloads of vegetables were shipped out of the valley. In the 1936–37 season about 24,000 carloads left the region, and about 7000 carloads were taken to canning plants. Because early vegetables are usually more profitable than such staples as cotton and corn, and because they yield an income in a few weeks or months after planting, many farmers who plan to become citrus-growers find it worth while to grow vegetables between the tree rows while their citrus plantings are below bearing age. More than 50 different truck crops are grown in this region, but cabbage, carrots, beets, potatoes, spinach, beans, and tomatoes occupy most of the land. About a third of the vegetable cropland is devoted to cabbage. The cabbage is so firm and durable that it can be shipped cheaply without crates in refrigerator cars. Tomatoes are picked just before they turn pink and are wrapped in paper, crated, and shipped as "greenwraps" in refrigerator cars without icing, although much of the crop is marketed as "pinks," which require refrigeration. In recent years growers have begun to ship cars containing several kinds of vegetables; this permits shipments to smaller towns that would not need at one time a full carload of only one vegetable.

In this land of sunshine and long growing-season, some crop is being harvested every month of the year, although the chief agricultural activity occurs during the winter months. Crops such as beans, beets, carrots, and turnips start moving northward in October, the movement increasing throughout the winter. Cabbage plants are set out in September and sent to market in February, March, and April. The early potatoes are shipped chiefly in April, while spinach has a four-month season from December to March.[8]

[6] U.S. Weather Bureau records indicate that on the average there are only 3.5 days out of the year with freezing temperatures at Brownsville, 5 days at Eustis, Fla., and 12.9 days at Redlands, Calif.

[7] *The New York Produce Reporter*, May 3, 1924, told how the carry-over of old onions had made the shipment of new onions net a loss from the beginning of the season. "The average loss on old onions per car is rarely less than $750.00 and often as high as $1000.00 a car. Texas onions that cost $2.50 to $2.60 laid down here were freely offered Friday at $1.45 and less per crate."

[8] Crystal City, a town of less than 10,000 people not far from Eagle Pass, claims to be the center of the largest spinach-producing area in the world. A monument has been erected there to Popeye, a comic strip hero who performs fabulous feats of strength — and all because he eats great quantities of spinach. It has been gravely reported that Popeye *did* increase the consumption of spinach.

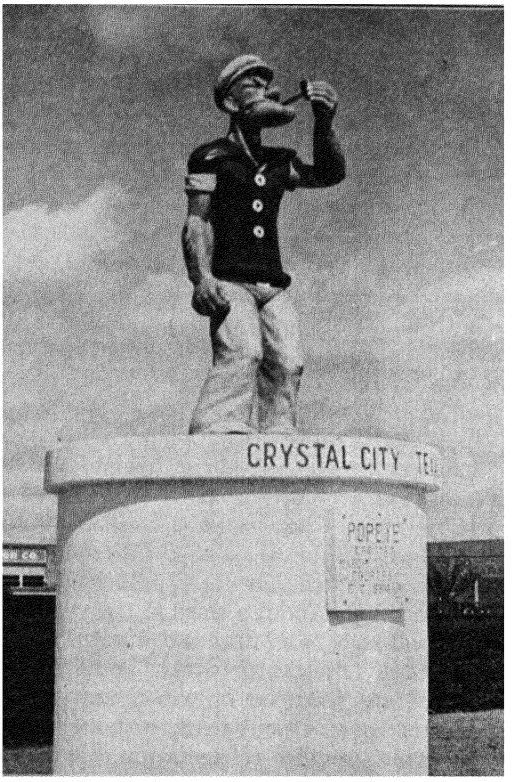


FIG. A. The statue of Popeye in Popeye Park, Crystal City. Thus does a Texas town, which claims to be the largest spinach-shipping center in the world, celebrate Popeye, the spinach-eating strong man of the comic strips — a rival of the boll-weevil statue. (Courtesy Crystal City Chamber of Commerce)

Tomatoes, on the other hand, are very susceptible to frost, and have a short season in May and June, when they come into the market about two or three weeks ahead of tomatoes from eastern Texas and Mississippi. Thus the early-vegetable season extends from October to June; it is followed by the cotton-picking season, which continues on through September. Citrus fruit starts moving in October, and the season extends on through March. Patently, market demand and nature have combined to make an effective use of both labor and land. It is also abundantly clear why the citizens of this section of the country join their compatriots in Florida in demanding a tariff on fruits and vegetables so as to reduce the competition from Cuba and Mexico, which have an even longer growing-season.

Cotton is the summer cash crop of this region, which produced 135,000 bales on the Texas side in 1937. It is grown by dry-farming methods in unirrigated areas, and it proves to be a profitable crop on irrigated lands unless the price is too low. It has an off-season advantage in that it arrives on the market in advance of the enormous crop of the Cotton Belt at a time when the nation's supply is lowest, thereby enabling it to secure a slightly higher price. Cotton-growing, like truck farming, requires much labor, and the region is fortunate in having an abundant supply of Mexican labor at hand.

The Mexican portion of the Lower Rio Grande Valley presents a contrast with its American counterpart. On the American side of the river, irrigation is of prime importance, and citrus fruit and early vegetables are the leading crops, cotton being of secondary importance. On the Mexican side there is very little irrigation, and cotton, corn, and beans are the major crops.[9] This

[9] Between Matamoras and Mier, 125 miles, about 60,000 acres are in cultivation along the flood plain of the Rio Grande, 37,000 in cotton, 22,000 in corn, and the remainder chiefly

contrast is due to a combination of political, economic, and geographic factors. Between this corner of Mexico and northern markets stands the American tariff wall. Long distances separate it from the populous Central Plateau to the south. Cotton is the one cash crop that can stand the expense of a long haul to market. Added to these difficulties is the cost of irrigation, since the Rio Grande is entrenched from 20 to 30 feet below the flood plain, and water would have to be pumped as much as 60 feet to reach the higher terraces.

The chief need of this region is agricultural adjustment. The market for every fruit and every vegetable may glut in any week. One method is to put the eggs into several baskets — grow staples, such as hogs, poultry, and dairy produce. The production of these staples is increasing. In some cases the water supply needs rearrangement and the great question of all is what Mexico will do with the tributary waters.

Many of the land companies had individual pumping plants on the river, which often shifts its course, making trouble for the irrigator. By more comprehensive plans gravity can bring water to the fields.

The long growing-season makes it possible to have a very rich agriculture here with one or two (or even more) summer crops, and also a winter crop of vegetables on the same land each year. Thus the farmer can apply the much-preached diversification and still keep his specialties. Such diversification began after the first rush of settlement.

This region has a grave social problem in that nearly all the laboring people are Mexican Indians and half-breeds — with perhaps a few whites — who have found American wages and security much better than could be had on their own side of the river. They can help make our crops, but can they help make our government?

If labor gets scarce on the American side, it is apt to appear mysteriously without troubling the immigration quotas. The boundary is long and crossing is easy, even if we were watching zealously. If the newcomers get out of a job, the sheriff may "discover" them, haul them down to the boundary by the truckload, and say "scat!" They go, but will be back when wanted.

The term "wet-back," widely used in this region, refers to a Mexican illegally in the United States — wet back because (theoretically) he swam across, although perhaps the river was dry, or at worst only wading-deep. "Wet-feet" might have been a more accurate designation for these new "Americans." Perhaps "Americans pro tem" would be a better name.

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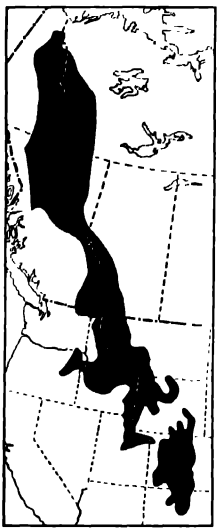
in beans. When the new dam along the San Juan River is completed, water will be provided for about 140,000 acres. See Samuel N. Dicken, "Cotton Regions of Mexico," *Economic Geography*, October, 1938, pp. 363-71.

Chapter 26. THE ROCKY MOUNTAINS



THE Rockies are young mountains geologically. The almost horizontal strata of the plains were folded and upthrust, and since that lifting and tilting of strata there has not been time for water, frost, wind, and the other forces of nature to wear them down. Therefore, like the Alps, they are high, sharp, rugged. Their tops are usually bare rock. They are high enough to be snow-covered late in the spring or early in the summer even in the south, while on the northern part, which reaches almost to the Arctic, the snow coat comes farther and farther down the slopes and lasts longer into the summer. In Colorado, Montana, and Alberta interesting little glaciers hang in the high valleys, while below them are beautiful lakes which these same glaciers, in days of ancient greatness, gouged out with their feet and dammed up with their moraines and now fill with their meltings.

In this upper realm beyond the timber line there are large areas of so-called Alpine vegetation having midsummer foliage of strange beauty. It is a landscape that often fascinates the lover of nature, and it also pleases the sheepherder, because it offers rich midsummer pasture.

Below this comes the zone of forest, its upper (cold) limit getting higher and higher as we go south. Its lower (dry) limit also gets higher as it goes south, because of increasing summer heat and aridity.

Still lower down are mountain valleys, some of them deep with forest, impressive with cathedral gloom, others high with grass and blooming flowers; others again, shut off from good rainfall, show sagebrush, cactus, and even the forbidding alkali, one of the sure signs of aridity.

The mountains first came to the attention of the people of the Mississippi Valley and the East as a source from which daring men brought furs in canoes down the Missouri River or on horseback across the plains. They also figured largely in the minds of the publicists of the prerailroad age as an impassable barrier, the utmost possible limit of useful land, the boundary that God had set to the westward extension of the American people.[1]

These mountains still help to make a barrier, as is shown by the shipment of a little Utah and Montana produce to the East by way of the Columbia River and the Panama Canal, and the corresponding shipment of Milwaukee

[1] We in our wisdom who criticize those "ancients" should remember that we are thinking in terms of the railroad, the airplane, and present knowledge, and that the "ancients" were thinking in prerailroad terms, a thing we cannot do. In prerailroad conditions, the "ancient" was not very far from right.

produce to the Pacific Coast by way of New York and the Panama Canal. It costs money to carry freight up and down 3000 or 4000 feet.[2]

MINING

Shortly after the gold rush to California in '49, prospectors started through the Rocky Mountains, and for thirty years the chief output of this region was precious metal. In 1862 gold placers were found in Madison County, Montana, and in three years they were yielding $18,000,000 a year (worked out by 1900) in a locality 150 miles by wagon from Fort Benton, Montana, then the head of steamboat navigation on the Missouri. We would not think it was navigation now, considering the small size of the boat, the delays from sticking on sandbars, and the cost of cutting wood to burn under the boilers, but there was no alternative save a wagon, which was a much more expensive means of transportation.

A few years later, gold placers were discovered at Idaho City, a short distance northwest of Boise. They yielded more than $1,000,000,000 worth of gold before they were exhausted. Cripple Creek, Leadville, and other mining towns are well known, but the most conspicuous aspect is the quick exhaustion of the mines, together with the abandoned town with shacks boarded up and a few lonesome burros browsing in the erstwhile streets.[3] Here and there the mother lodes that yielded the placers were found. These mines lasted longer, and made Colorado for many years one of the leading gold-producing states. Mining experts say that the best ores were near the top and are now gone. Colorado's gold production has had a drastic decline: 1,394,000 ounces in 1900, 993,000 in 1910, 363,000 in 1920, and 218,000 in 1930. Under the New Deal gold-purchasing policy there has been greater mining activity, with an output of 379,000 ounces in 1937, 375,000 in 1938.[4] Fifteen mountain counties in Colorado lost in total population between 1910 and 1920, and 13 counties

[2] The Canadian Pacific spent $6,500,000 (1913–16) in digging the 5-mile Connaught Tunnel beneath Rogers Pass in the Selkirks (one of the ranges of the Rockies) west of Banff, to lower the tracks 552 feet to an altitude of 3705 feet. The Moffatt Tunnel, 6.1 miles long, under the Continental Divide west of Denver, pierces James Mt. at an elevation of 9000 feet. Work was begun in 1923 and completed in 1928 at a cost of $18,000,000. About 2,500,000 pounds of dynamite were needed to move 300,000,000,000 pounds of rock. In addition 38 miles of railroad, known as the Dotsero cutoff, had to be built to connect the tunnel with the main line. The cutoff was completed in 1934 at a cost of $3,850,000. The tunnel and the cutoff shorten the route between Denver and Salt Lake City by 175 miles, which has helped to reduce train operating-time 14 hours going east from California to Chicago, and 18 hours going west.

[3] The Colorado Rockies are an exploited land with a riotous past and the promise of a conservative future. The riot is furnished by the frequent successions of booming prosperity of mining, followed by dead abandonment. In a 60-mile circuit from Boulder, Colorado, in 1922, there was never a mile of the 60 without sign of abandoned mining enterprise. Sometimes it was only a hole in the hillside with brown or white tailings spread out below it and a tumble-down shack near by. Sometimes it was a sizable mill, with windows smashed and roof falling in; sometimes it was a whole village. Some remains of the earliest epoch showed only the foundations of buildings, on earth as if from the burrow of a digging animal. An abandoned railroad added to the impression of ruin.

[4] In January, 1933, the United States Government paid $20.67 per oz. for gold; in January, 1934, $34.95. As a consequence, men set out to work old diggings and to prospect for gold. Some towns were saved from extinction, and others were revived.



FIG. A. From the mountaintop the Indian surveys his realm. (Courtesy Canadian Dept Mines and Resources, Ottawa)

lost in population between 1920 and 1930. In the latter decade San Miguel County lost 58 per cent of its people. The golden age is past.[5]

Utah has at Park City an important silver and lead mine. After getting $250,000,000 worth of metal from surface workings, deeper ones were found in 1922, and therefore this mining camp has the promise of several decades of prosperity.

The greatest of all the Rocky Mountain discoveries of metal was the copper of Butte, Montana. Ages ago a great hill of granitic rock was cracked by a labyrinth of fissures. Molten lava flowed into the fissures, and the hot lava cooked out and concentrated the copper.

This hill has yielded over $1,000,000,000 since 1869 and has been the greatest copper camp in the world.[6] Its mines and smelters furnish the chief occu-

[5] The riotous past was further evidenced by the all-too-frequent signs of forest fires, fires recent, fires ancient, but always deadly. The conservation that must mark the future, if there is to be one worth mentioning, is indicated by the forest ranger caring for the forest, which must be the permanent use of nearly all this land if it is rightly used.

[6] The word "butte" in French means "knoll," or "rounded hill." One day in May, 1864, two prospectors, Humphrey and Allison, stood on the barren hill that is now Butte after a long trek from Virginia City, a mining town in the Sierra Nevada. Near by were the long-discarded gads and handspikes of some forgotten digger, but the two prospectors

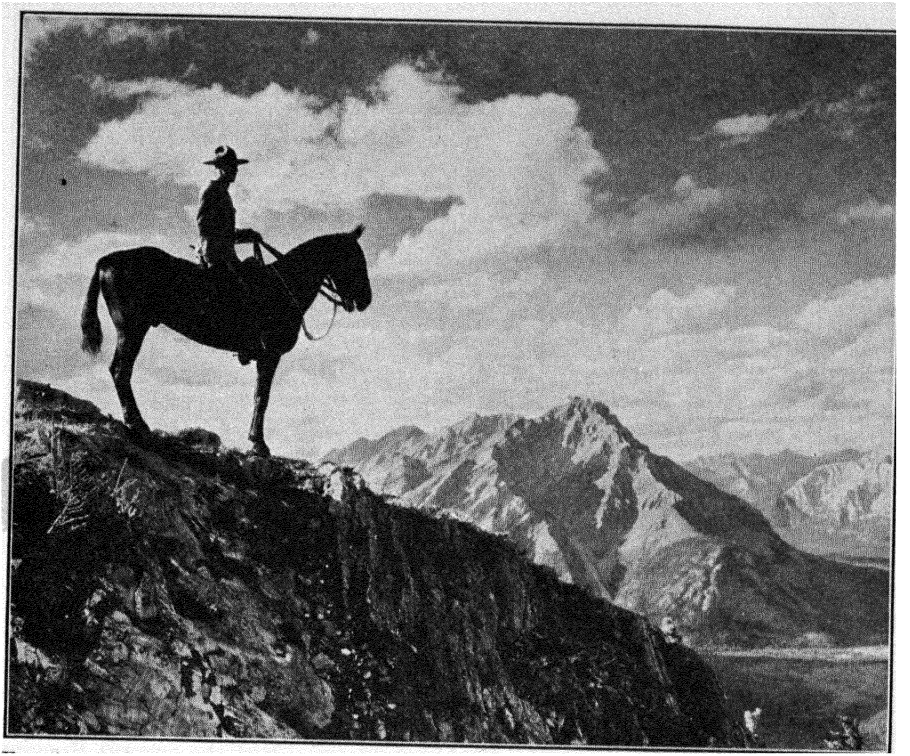


FIG. A. And now it is the white man. The Royal Canadian Mounted Policeman replaces the Indian chieftan. (Courtesy Canadian Dept Mines and Resources, Ottawa)

pation of Butte (pop. 40,000); Great Falls (29,000); Helena (12,000); Anaconda (12,000). The importance of the mining industry to Butte is seen in the names of the principal streets. There is Broadway, then come metals — Copper Street, Silver Street, Lead Street, Aluminum Street; also Granite Street, Porphyry Street, and many others. The city of Great Falls, with water-power plants, furnishes power and has smelters, while Anaconda counts itself famous for having the highest smokestack in the world. This is made necessary by the sulphur that is in the copper ores. Smelting turns sulphur into acidic gases, the fumes from which are so deadly that no green thing can grow for miles around. Hence a desolate neighborhood until improvements in smelting permitted plant growth to replace the man-made desert.

There are numerous deposits of coal in the south-central Rockies — perhaps of greater ultimate value than are all the high-priced metals.

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decided to stay. Deep was the gloom in 1880 when, in a quest for silver, Marcus Daly had the Anaconda mine deepened from 60 to 100 feet, and only copper was struck. Today the hill at Butte is pierced by 100 shafts, some of them 4100 feet deep. When the price of copper is high, as many as 10,000 miners, working in the 2700 miles of underground passages, send 20,000 tons of copper and zinc ores to the surface every twenty-four hours. Copper-smelter output in millions of pounds in 1938: U.S.A., 1125; Arizona, 420; Utah, 230; Montana, 156.

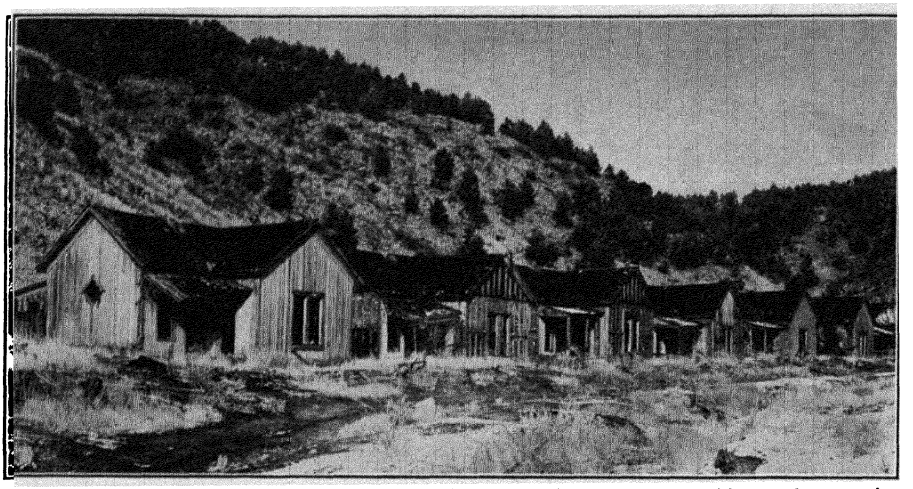

FIG. A. They stop working the mine, and then —— Such scenes as this can be seen in hundreds of places in our Western mountains. (Courtesy Farm Security Adm.)

PHOSPHATE RESERVES

This region promises for the future two industries of gigantic proportion; phosphate, and oil from oil shales. When these industries shall come it is not yet time to say. Some phosphate rock has already been dug, although there is no immediate prospect of a big industry. But the central Rockies and the plateaus hard by contain the world's greatest known phosphate beds. The economic geologist tells us that in Colorado, Wyoming, Idaho, and Utah there are between 6,000,000,000 and 13,000,000,000 tons of phosphate rock. Explorations are continually revealing more. This resource is of staggering importance in a world short of phosphorus and constantly losing it through a commercial agriculture which sends products to distant cities which in turn send their sewage to the sea. Of all the commercial fertilizers phosphorus is the scarcest. Without it all crops fail. Here, therefore, is a great resource for the future. While this Western field contains about 95 per cent of the nation's phosphate reserve, it produces only about 1 per cent of the total output — at one producer in Idaho and three in Montana. Western phosphate is much purer than that in Florida, but unfortunately it lies deep in the earth, and shaft mining is necessary. It is especially unfortunate that it lies so far from market. The phosphate would be far more valuable if it were on the banks of the Great Lakes, the Mississippi, or the Ohio, where it could float to the great sea and to the world market which is so hungry for it. Fortunately, practically all of this mineral land belongs to the United States Government. At present mining is done only under government lease. Let us hope that this great reserve will be handled wisely. Royalties from it and the oil shale might almost pay the pre-New Deal national debt.

OIL SHALE

Great stretches of barren shale, cursed by stockmen because it produced no grass and by farmers because it produced no crops, turn out to be rich with oil. The shale deposits of Colorado, Nevada, Utah, and Wyoming are scattered around in the area where the boundaries of these states converge. Some are in the Rockies, some are in the plateaus. These long-accursed rocks are now said to contain from 75,000,000,000 to 125,000,000,000 barrels of oil that may some day be recovered. This is more than four times as much as has been produced in the United States since 1859.

These shales will not be the scene of the oil fever, nor will they be the gambler's paradise. Those excitements gather around the wildcat well which suddenly spurts forth its liquid fortune. Oil shale must be mined or quarried like any other rock, and afterward it undergoes processes of distillation which require an extensive manufacturing plant. It is claimed that this quarrying and manufacturing enterprise can be so organized as to produce a barrel of oil as good as that of Pennsylvania at a low price — there is much debate as to just how low. It could only be won cheaply by large-scale quarrying, crushing, handling, and distilling. Undoubtedly millions would be required for a start; perhaps millions for experimental work before the start. Then in a few years we would know the cash cost. But it seems to be a comparatively simple problem — merely a big one. The Scotch made oil from shale many years ago.

Getting oil from this shale is a problem for the future, just how far distant a future no one can say. It is merely a matter of price levels. With our present chaotic, well-nigh idiotic methods of competitive well-digging, the problem that most vexed producers in 1939 was how to check production enough to bring the price of crude oil up to $1 a barrel.[7]

MINERALS AND GOVERNMENT

Rocky Mountain government from first to last has been strongly flavored by mineral influence. The gold rush made into one group dozens, hundreds, even thousands of men, gathered from every class of society, from every walk of life, from every country — one might also add from almost every jail — in the world. A crowd like this when flung far into the wilderness must govern itself. When private shootings became intolerable or the sheriff could not keep order, the vigilance committee, the crudest but perhaps not the least fair of democracies, arose to handle difficult cases.

In the later stages, working the deep lodes required the great corporation. Millions of dollars came from New York and Boston, to erect smelters, crushers, concentrators, and other huge works. Hundreds and thousands of men were employed. Most of the men were without families, and most of them were transients. Where men do not expect to remain they do not have much interest in government. On the other hand, the affairs of the state government are usually matters of great importance to the corporation.

[7] See *New York Times*, Aug. 17, 1939.

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[7] See *New York Times*, Aug. 17, 1939.

Here we get prime conditions for political corruption, and by this, unfortunately, the Rocky Mountains have at times attracted much attention to themselves. The stake of the miner in the state is vastly different from that of the ranchman and the irrigator. These latter can succeed only by staying, and they have the attitude of the homemaker rather than the semirobber attitude of him who digs and runs.

ROCKY MOUNTAIN VALLEYS

The Rocky Mountains are not continuous. In central Wyoming there is a wide plain between the Laramie Mountains (8000 feet high) and the Big Horn Mountains (from 10,000 to 13,000 feet). In this gap are the Laramie Plains and the Green River Basin, both of which have been treated with the Great Plains. Within the mountains themselves are many valleys, some of which have been made by filling of glacial lakes, some by the accumulation of soil washed down from the mountains and spread out in great fans at the outlets of gulches. In Colorado these valleys are called "parks." North Park, which comprises 1500 square miles, is 7500 feet above sea level. Its high elevation prohibits the presence of trees, but it causes good rainfall and splendid grass, originally the food for thousands of antelope. South Park, 40 by 45 square miles, is from 8000 to 9000 feet in elevation, and San Luis Park, the largest of the parks, was once a lake. It is drained by the Rio Grande and is a fine agricultural valley because it is made of fine water-borne soil.[8]

Bitter Root Valley in Montana may be taken as a typical Rocky Mountain valley. It seems to have been formed by the settling of a block of the earth's crust. This process made the Dead Sea Basin. A lake filled the Bitter Root Valley, and the lake in turn was filled with mountain washings and drained when the river cut a gorge in the surrounding rock walls. Above the gorge are 511 square miles of valley, 61 miles long and from 3 to 14 miles wide. As the stream cut the gorge that drained the lake it made a series of terraces at varying elevations. These have frost drainage that is excellent for fruit. The Kootenai Valley of Idaho, near the British Columbia boundary, had the same origin as the Bitter Root Valley, but the outlet gorge is so narrow that at times of flood the water dams up and floods some 60,000 acres of valley land, which is now being reclaimed by dikes. Some of these valleys, such as the Purcell Trench and the Rocky Mountain Trench, were so scooped out by glaciers that they are open for great distances.

These mountain valleys have very different climatic conditions because of differing altitudes, differing latitudes, and the differing rainfall that results from the varying height and direction of the enclosing mountains. Some are too high for agriculture, but excellent for summer pasture. Many are dry, but mountain streams often make irrigation possible. Thus the Bitter Root Valley project south of Missoula in Montana has 15,000 acres irrigated by one ditch.

[8] Pork, produced in part by hogging down barley, is an important product here.

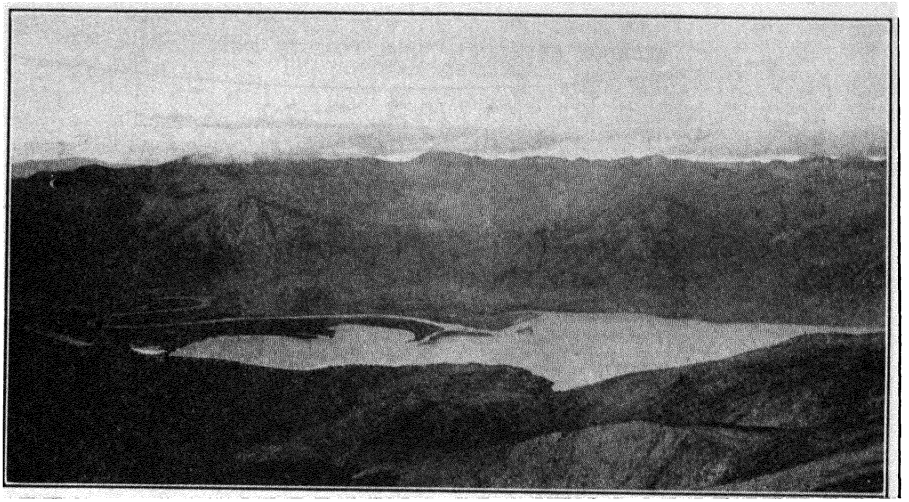


FIG. A. A perfect illustration of the process by which a mountain stream, carrying sediment, builds a delta, fills a mountain lake, and turns it into a level plain of splendid stoneless alluvial soil. There are many such in the Rocky Mountains. We are most grateful to Messrs. Schneder and Mendenhall for finding this unusual picture for us. (Courtesy U.S. Biological Survey)

AGRICULTURE

Agriculture started in the Rocky Mountains when the farmers began to sell food to the miners. In the days when gold was king, thousands of men lived in camps in the wilderness. Their bacon, flour, beans, potatoes, and apples came full 1000 miles across the plains. The railroads or even wagons brought the produce to the base of the Rocky Mountains. From there it was taken long distances by wagon or pack mule to the various camps. The farmer who lived near one of these mining camps and had a little produce to sell got a price that was almost unbelievable. He received what the food was worth at some distant point of production plus the charge for the long haul across the plains and through the mountains. Many a Rocky Mountain garden patch in 1865 or 1870 was a source of income as good as a farm in Illinois at the same time. Under this profitable home market, agriculture naturally expanded, but there came a day when the market was oversupplied. The surplus had to be sold in distant markets. The price that the farmer now received was the amount that was paid in the distant market, and from that amount three charges had to be deducted — the cost of the package, freight charges to the distant market, and commission for selling the produce. If the distant-market price is $1 and it costs 60 cents to get the stuff to market, the price received by the farmer has dropped from $1.60 to 40 cents. This was a terrible day at the valley farms. It was indeed Black Friday, and the catastrophe has lasted through all the weeks and months and years.

This period of readjustment from import-price level to export-price level is one which has come to nearly all the Western country which started on

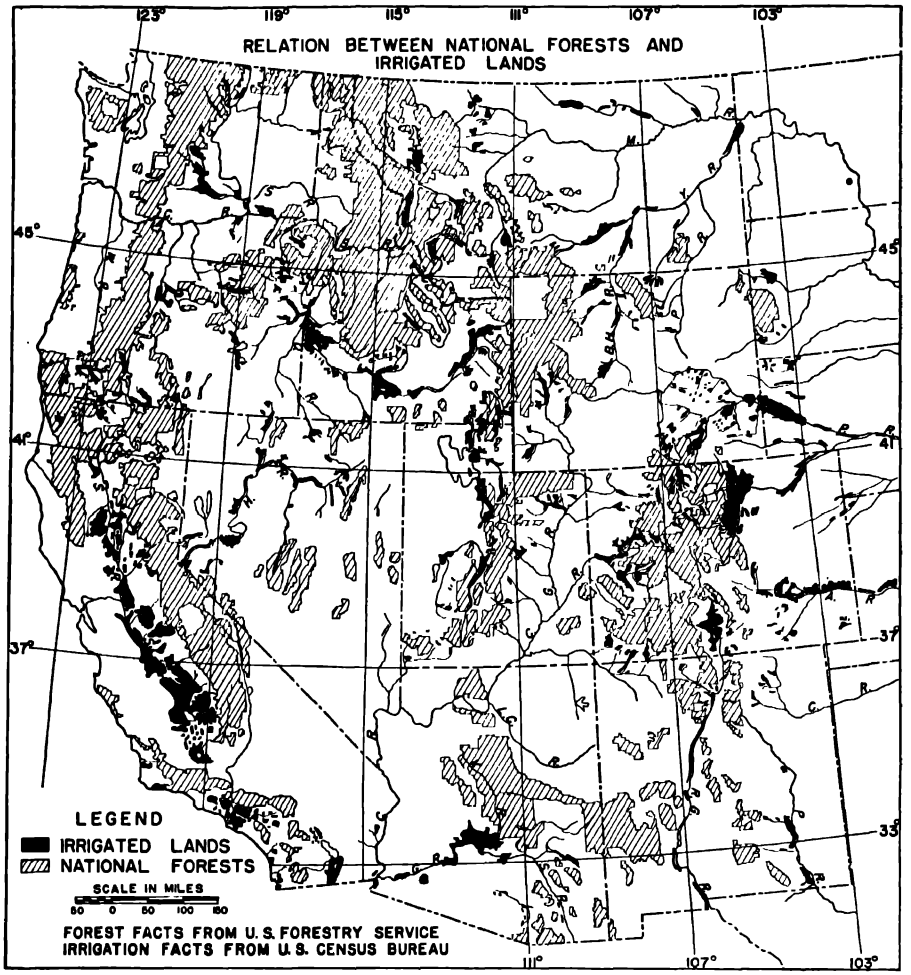


FIG. A. In some parts of the East a man may look up at a mountain and see a forest fire and say, "Well, it isn't my forest." But the man who irrigates land in our West is interested in the forest, whether he owns it or not, because thence cometh his water — slowly if the forest is in good order, torrentially if the forest is burned.

some industry other than agriculture. As a matter of fact, the Rocky Mountain region is close to the bottom of the American price level for farm produce because its location is most distant from all markets.

Valleys and benchlands in the Rocky Mountains and adjacent plateaus are excellent for the production of fruit. Peaches are a specialty in western Colorado. This area is also excellent for staples, as is well illustrated by the Sweet Farm at Carbondale on the west slope of Colorado. Here tracts of well-drained benchland, irrigated by mountain streams, have this rotation: alfalfa, a perennial, standing three or four years, potatoes, wheat, barley, and again

alfalfa. Wheat is sold. Barley and alfalfa are fed to sheep. Potatoes are sold. Potatoes yield sometimes 600 bushels to the acre, and other crops several times the national average.[9] The potatoes are of such excellent quality (being mealy when baked) that they are used on dining-cars and in New York hotels. But the region as a whole is so excellent for potatoes that the markets are often glutted, and therefore the chief produce must be meat and wool. Some ranchers 90 miles from a railroad, or more, walk their produce to the railroad station.

In most of the region, animals pasture nearly everywhere at some time during the year — above the timber, in the timber, below the timber. Such distant locations always have an outlet for produce in the form of butter, cheese, dried milk, and potato flour. But the time has not yet come for the large production of such intensive products.

In 1918 a man tried 10 acres of lettuce in one of the high valleys of Colorado. He is said to have made $10,000. The news flew like rumors of gold, and a lettuce boom got under way. In 1922 the state had 6000 acres devoted to the crop, and shipped 812 carloads of lettuce, the boom reaching its peak in 1927 with 13,240 acres and 2848 carload shipments. Since then acreage and shipments have declined, and they are now less than their 1922 volume. Colorado mountain valleys suit lettuce, because the plant requires cool weather, which is furnished by elevations of from 7000 to 10,000 feet. When the whole Mississippi Valley sweltered in a nonlettuce climate, this Colorado mountain specialty supplied the summer market, but rivals soon rushed in. New Mexico has high valleys too, and Ute Park and Grant are now centers of summer lettuce production. Idaho highland farmers are also growing lettuce. Cool seashore locations in California are shipping 100 carloads a day during the Colorado season.

THE NORTHERN ROCKIES

We separate the central Rockies from the northern Rockies at the Canadian Pacific R.R., which happens to be the northern limit of any important occupation by the white man. At this latitude, an elevation of 4500 feet is fatal to agriculture. At Banff, where an old lake bed affords several miles of beautiful alluvial soil, frost comes every month of the summer, and people do not even attempt gardens. North of this is an incompletely explored land of wild mountains, peaks, snow, glaciers, lakes, lonely valleys, Indians, game, and occasional prospectors. We make this region include a part of the British Columbia Plateau north of the Fraser Basin. It is a plateau with deep valleys, and geologically it is different from the Rocky Mountains, though in the same latitude. For the uses of man it is the same, a partly explored nonagricultural mountainous game land which probably contains minerals. It may become a range, certainly a summer range, for some kind of foraging

[9] The record potato yield in Colorado was established in the San Luis Valley by a farmer who raised 1145.2 bu. on an acre in 1929. This valley, 50 by 150 miles, 7500 to 8000 feet in elevation, is built of alluvial soil and has 400,000 acres under irrigation. It is the leading potato-producing district in the state.

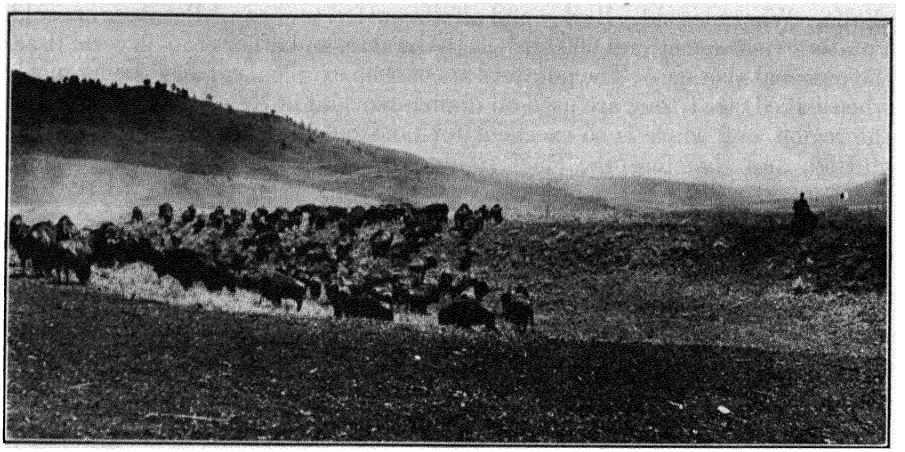


FIG. A. Part of the Yellowstone National Park bison herd. Note the lack of vegetation on low slopes. (Courtesy U.S. Dept Interior)

animals other than those which now use it. The introduction of the reindeer and the semidomestication of the bison in various parks are very suggestive.[10] Almost equally suggestive is the progress in taming the Rocky Mountain sheep. Now that the hunting has ceased, sheep have become so tame in the Canadian National Park, which includes the Bow River Valley, that they can be seen nearly every summer day on the road between Banff and Lake Louise.

FORESTS

The southern and central Rocky Mountains have large areas of forest. It is often of poor quality, and the timber is hard to get. Everywhere these mountains rise from plains that are too dry for forest, therefore forest is limited to a mountainside belt with a transitional dry-line edge below and a transitional cold-line edge above. Both of these transitional edges produce little, poor, scattered, or gnarled specimens of trees. In Yellowstone National Park forests begin at 5000 feet and disappear at



FIG. B. J. Russell Smith examining Engelmann spruce flattened by the wind at the cold timber line on Pikes Peak. There were tall, straight, saw logs of this species in a protected cove 500 ft. lower down. (Photo by Everett G. Rodebaugh)

[10] The Yellowstone Park has its problem of "overproduction," for "no hunting" is an ironclad rule. Every year there is a surplus of elk, buffalo, and bear. In order to prevent overstocking of the range, some of the surplus is used to fill the requests of zoos, game preserves, city and state parks, and other public institutions throughout the country, and the rest of the surplus has to be slaughtered like any other cattle.

9800 feet on the south side and at 9300 feet on the colder (therefore moister) north. On the Big Horns out on the plains the limits of forest are 6000 and 10,000 feet. In Colorado the limits are from 7000 to 11,000 and even 12,000 feet.

One can stand on Bald Mountain in south-central Idaho and look away across the lava plains of farms and pastures. Turning east, one looks over a mass of mountains broken into sharp peaks and cut into sharp valleys so narrow that for 80 miles there is not a single cabin. The Salmon River flows through this maze in a 250-mile canyon between the valley of the Snake, where there are farms, and the upper valley of the Salmon, where there is one of those intermountain valleys of good farmland.[11] Similar mountains of great roughness almost surround Yellowstone National Park.

The San Juan Mountains of southwestern Colorado have many peaks above 13,000 feet high, with a labyrinth of valleys at an elevation of from 4000 to 5000 feet. It is plain that much lumber is in places where it cannot be got, even though Rocky Mountain lumbering makes use of chutes through which logs are slid down from high elevations and water-filled flumes that float wood out of many a gorge where even a donkey could not enter.

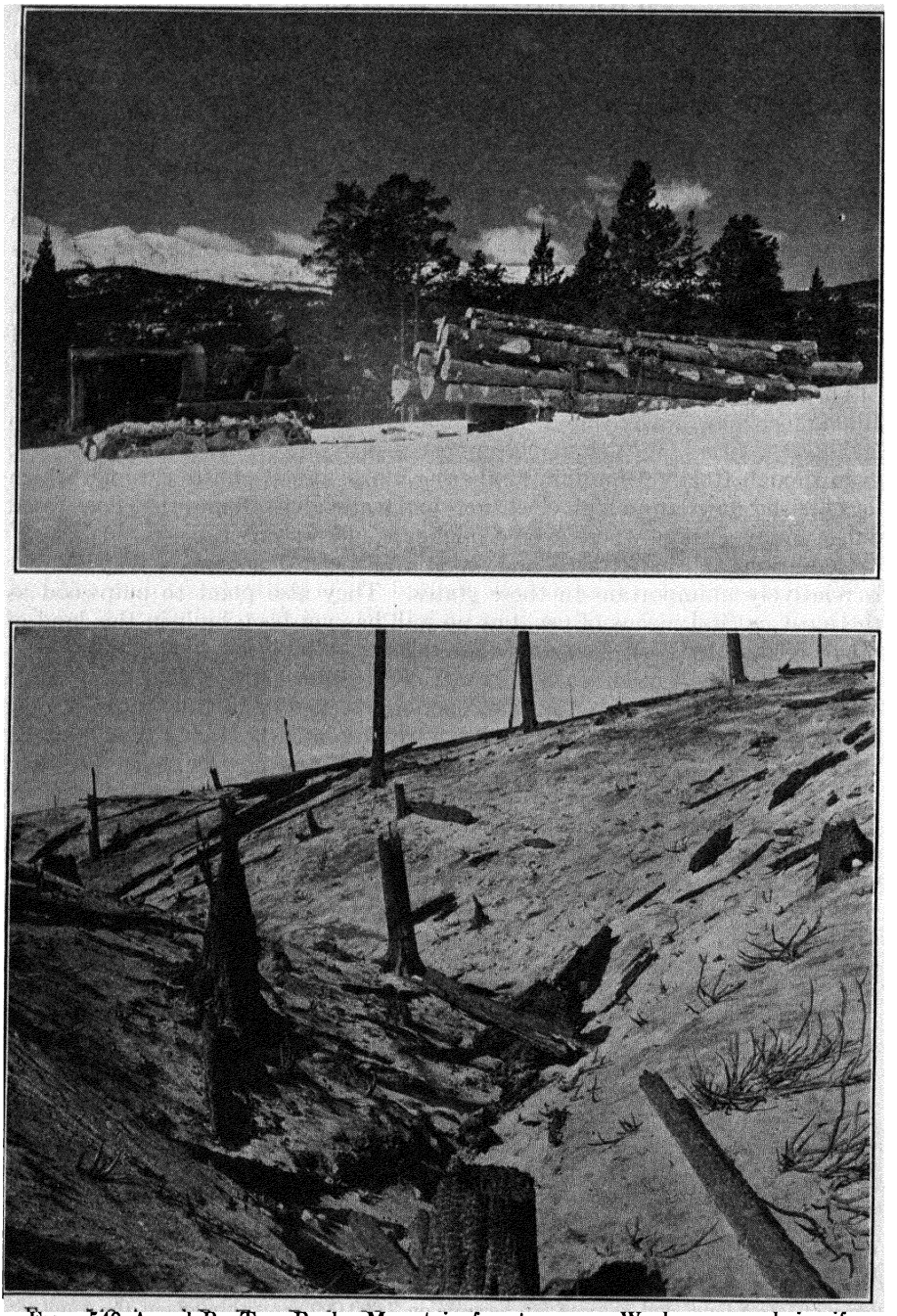
Conditions of tree growth and wood transportation explain why lumber is relatively unimportant in these states. They also point to pulpwood as the most natural means of use, but no mill has yet been built in this land of rough terrain and long distance from markets.

As in nearly all other parts of the United States, fire is here the terrible enemy of the forest. The following facts are sickening in their implications: Most of Pikes Peak and the vicinity were desolated by forest fires between 1850 and 1860. Much of the land is still bare, and now is being replanted with trees about the length of lead pencils and the size of matchsticks.[12] No man living is likely to see them attain saw-log size. Fortunately most of the forests of this area are now in the possession of the United States Government.[13] Fortunately, too, nearly all classes of society want the forest preserved. Farmers who want irrigation water, and city people who want lumber, water supply, and scenery, are enthusiastically behind forest-fire protection. It is only the stockman who pastures the mountain forests whose psychology is questionable. Often there is better grass just after a fire. The vigilant National Forest Ranger Service succeeds in keeping the fires in

[11] Bowman, *Forest Physiography*, p. 323.

[12] In the Rocky Mountain region the U.S. Forest Service is replanting at the rate of 5000 to 6000 acres annually. Within this region are more than 2,000,000 acres that will not restock naturally within twenty years. Apparently we will get them planted in 333⅓ years. Where is the American rush? In 1933 it was recommended that the following areas of Federal land be planted in trees by 1950: New England, 400 acres; Middle Atlantic, 40,000 acres; Lake, 500,000 acres; Central, 215,000 acres; South, 106,000 acres; Pacific Coast, 260,000 acres; North Rocky Mountains, 439,000 acres; South Rocky Mountains, 540,000 acres — a grand total of 2,100,000 acres. See U.S. Forest Service, *A National Plan for American Forestry*, Senate Doc. 12, 73d Cong., 1st sess., 1933. During its first six years, 1933-39, the Civilian Conservation Corps planted 1,741,000,000 trees, improved 3,312,498 acres of forest land, and reduced fire hazards on 2,000,000 acres throughout the country.

[13] Colorado, 23,475 square miles of national forest, over one-fifth of the state; Wyoming, 14,225 square miles, over one-seventh of the state; Montana, 29,617 square miles, nearly one-fifth of the state.



FIGS. 540 A and B. Two Rocky Mountain forest scenes. We have our choice if we work and exercise eternal vigilance — such vigilance! In the death scene a fire killed the forest years ago. Then another one licked the decaying remnants and killed all young growth. (A, Courtesy Caterpillar Tractor Co. B, Courtesy U.S. Forest Service)

national forests down to a small fraction of the area, in some areas as low as .2 per cent per year.[14]

SCENERY AND TOURISTS

It is probable that the tourist is now, and will for a long time continue to be, the most important industrial resource of this region. He is now the most rapidly growing industry.[15] Whoever wishes to see the tourist attractions has but to write to any railroad crossing the Rockies, from the most southerly Santa Fe to the most northerly Canadian National, to receive booklets showing perfect and beautiful photographs of mountain scenery. He can

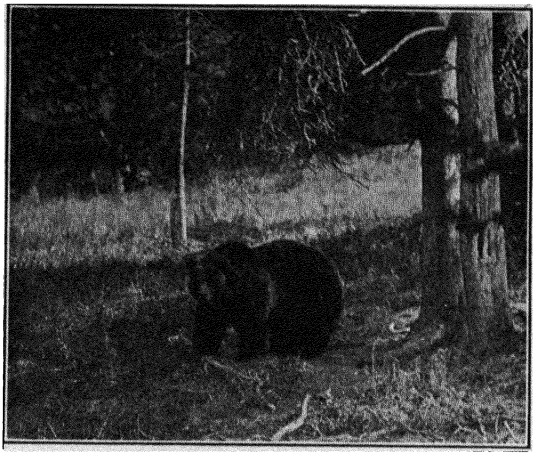


FIG. A. Civilization! What is it? To a park bear it is to live opulently on hotel garbage, to look at harmless unarmed tourists, and also to have its picture taken every summer day, as is the custom with monarchs. (Courtesy U.S. Dept Interior)

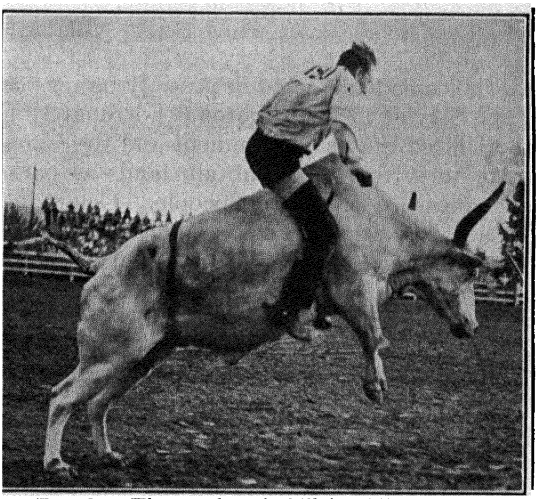


FIG. B. The cowboys' skill in riding has passed from business to sport and spectacle. In the ranch country the rodeo is almost as common as the county fair in farming regions. This riding of wild broncos and wild cattle has become a standard sport, with especial reference to pleasing the tourist. (Courtesy Standard Oil Co. of Calif.)

[14] A U.S. Forest Service tabulation classed the origin of fires in protected areas in 1937 as follows: 15,666 fires, smokers; 13,718, incendiary causes; 9563, debris-burning; 7244, lightning; 3435, campers; 2822, railroads; 1356, lumbering; 4964, miscellaneous; and 4992, unknown. The 63,760 fires on protected areas burned 1,344,000 acres, with an estimated damage of $2,466,000. In addition there were 121,449 fires on unprotected areas that burned 20,637,000 acres, with an estimated damage of $18,203,000. The need for protection is obvious. (U.S. Dept of Commerce, *Statistical Abstract of the United States, 1938*, 1939, p. 691.)

[15] Names reflect the change. Instead of Wildhorse Creek, Dead Man's Gulch, Rattlesnake Butte, names of the day of Bret Harte, the new places have soft-sounding names like Idylwilde, Brookvale, Montrose. Red Bull Draw has become Antelope Canyon, and Skunk Canyon, Blue Bell. Why has Colorado become so tame! Alas for the passing of the Wild West! A press dispatch from Butte in June, 1939, tells of an attempt to revive the city's former wild and woolly reputation. Butte restaurants are now offering rattlesnake meat on their regular menus. "It's meant particularly for wire-whiskered gents with fire-brick-lined stomachs," one chef explained.

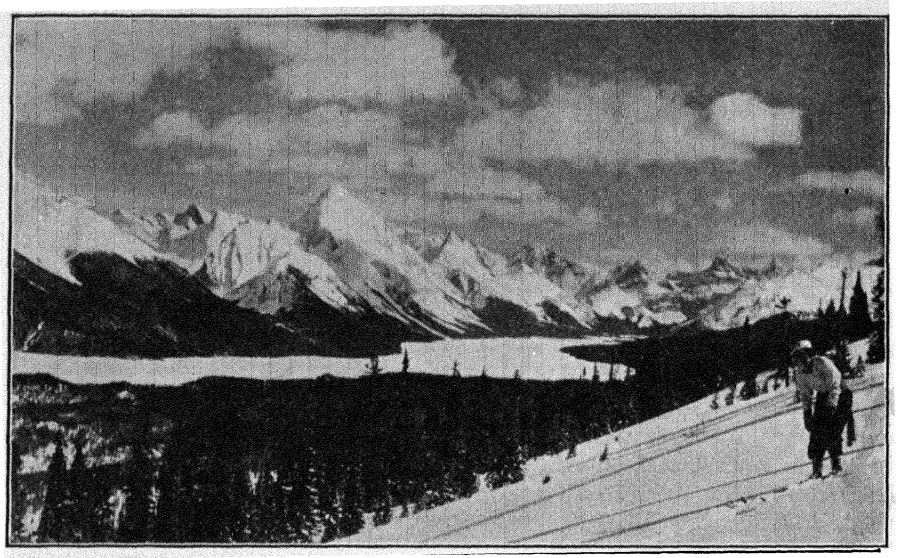


FIG. A. If there is inspiration in winter landscape, perhaps it is here. The Rocky Mountains in both the United States and Canada offer almost endless space for the exercise of our new enthusiasm for winter sports. (Courtesy Canadian Nat'l R.R.)

also get an equally good or possibly better booklet by addressing the National Park Service at Washington. Fortunately for the people of this continent, the United States Government and the Canadian Government vie with each other in setting off mountain lands as parks for the permanent possession and pleasure of all the people. Colorado contains the accessible Rocky Mountain National Park; Montana, Glacier National Park; the corners of Wyoming and neighboring states, Yellowstone National Park, larger than Delaware and Rhode Island combined.[16] Canadian parks are equally large. Arrangements are made, especially in the American parts, for the traveler de luxe in good hotels, and in camps for the traveler of simpler tastes or more moderate means. Here one may get all the pleasure of the out-of-doors, the wild, the unusual, the deep forest, the clear lake, mountain-climbing of all degrees of rigor — including the invalid's method of climbing by automobile. A good automobile road and a cogwheel railway to the top of Pikes Peak make one of the high mountains of the world accessible to anybody whose heart is not weak.

After wheat and hay are harvested out in the Great Plains and the grain belts, tens of thousands of farmers get into automobiles and cross the plains to the Rockies. All the continental railroads give very favorable summer excursion rates, and there is every reason to expect the tourist business to

[16] The completion of the Red Lodge-Cooke City, Mont., highway into the northeast entrance of the Yellowstone National Park has made the park, with its myriad wonders, more accessible to tourists. Montana's tourist business in 1939 was worth about $23,000,000. At this time the U.S. Dept of Agriculture reported that all the sheep in Montana were valued at less than $20,000,000; Montana is second only to California and Texas in sheep The dude ranch and the tourist are indeed getting to be big business.

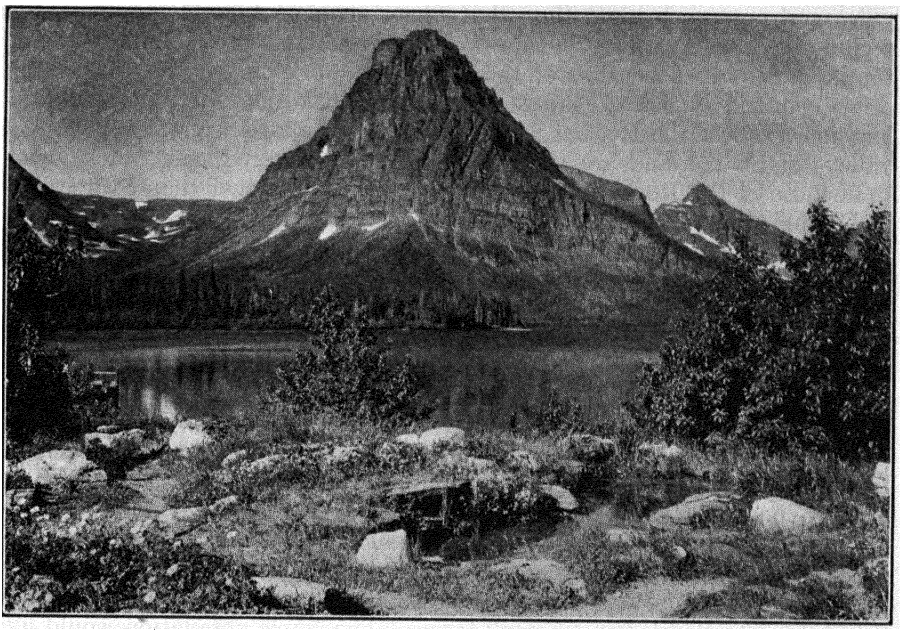


FIG. A. If there be charm in a summer landscape, perhaps it is here. Glacier National Park, Mont., similar parks across the boundary in Canada, other national parks in both countries, national forests in both countries — all these give scope for vacation wanderings that are limited only by one's strength. This landscape is one of America's many invitations to the Alpinist. (Courtesy U.S. Dept Interior)

increase faster than the population of the United States, for the travel habit is growing upon us. It is a pity that these national playgrounds are so far from the great masses of our population.

Since 1932 the Union Pacific R.R. has been systematically and expensively developing Sun Valley, Idaho, north of the Snake River Valley, as a winter resort, despite the fact that it is two days by fast train from New York and hundreds of miles from San Francisco. They claim that the 6000-foot elevation of the valley gives plenty of powdery skiing snow with no surface crust from December to April.

Then this same elevation, plus mountains from 2500 to 6000 feet higher, offers attractions for summer as well as for winter.

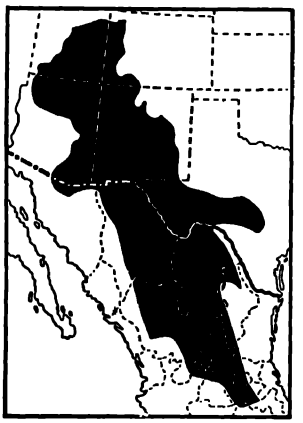
THE FUTURE OF THE ROCKY MOUNTAIN REGION

This region has a good, wholesome, invigorating climate. The people are almost completely Caucasian, of industrious Yankee and European stock. What is to be its future? In many respects its mountains are like the Alps. Switzerland has less than 16,000 square miles and over 4,000,000 people, or 256 to the square mile. The southern Rockies have about 250,000 square

miles and not much more than that many people. Like Switzerland, this region has a great tourist business, but Switzerland probably has greater tourist possibilities because of the greater number of people living in the other countries which are near. Switzerland has a far better commercial location, because the Rockies are so far from large numbers of people. The valleys of Switzerland are more uniformly well-watered, and much lower, than those of the Rockies. The American region is richer than Switzerland in having phosphate, oil shale, and coal. It also has wood, iron ore, and water power. Switzerland, with its 256 people per square mile, is one of the most contented, most orderly, best-educated, most civilized of countries. Certainly it is reasonable to expect that our Switzerland could be equally comfortable for man with one-tenth as many people per square mile, namely, 25 or a total of 6,000,000 people. It could support varied industries supplying most of the needs of its people and pay for the rest with paper made from pulpwood and money received from entertaining tourists. It could with ease supply 6,000,000 people with apples, pears, grapes, peaches, cherries, small fruits, garden stuff, *all* the milk, butter, cheese, and potatoes. It could also produce much wool, all the meat they would need, and most or all of the 36,000,000 bushels of wheat that they would use. Or, if more wheat were needed, a surplus of the near-by plains could probably supply it.[17] Such a population would be scattered in a host of small manufacturing towns like those of Switzerland, and on small farms. The whole population would live always in sight of a noble and inspiring landscape.

[17] The full utilization of so much steep land would probably find place for an extensive use of tree crops, as explained in previous chapters.

Chapter 27. THE SEMIARID SOUTHWESTERN INTERMOUNTAIN PLATEAUS



LYING west of the southern part of the Rocky Mountain Region is the northern part of the Semiarid Southwestern Intermountain Plateau Region. This is a land which nature lifted up high to make it a plateau, and after this it has done much to fence away the rain.

In the United States the western boundary of this area is the edge of the desert lands (lower than the plateaus) of Arizona and Nevada. The region extends southward far into Mexico, where the eastern and western cordilleras fence off the rain-bearing winds from its southern half.

This is a vast region. Everywhere the rain is so slight, the summer so hot, that the farmer with his plow is not the symbol of the settlement. Instead it is the cowboy with his lariat and the leather leggings that keep the cactus from pricking him. Someone has said that this is a region where there are more streams and less water, more cows and less milk, and where one can look farther and see less, than any other place in the world. The "streams" are the surprisingly numerous empty washes or gullies (arroyos) where water runs only after occasional showers. The cows that do not give milk are the ranch cows, whose milk is taken by the calf. "Looking farther and seeing less" refers to the clear air, which lets you see great distances in a land empty of tree, home, field, and man. In no part of this region is there any tillage of importance in the modern sense except by irrigation, and the irrigated areas are small or very far between. Here, more than in any other region in North America, is the land par excellence of the large ranch, where animals must walk long distances to find enough scanty herbage to keep them alive. It is also a land where occasional drought brings death and starvation to beasts unless they can be carried in trains to places of greater rainfall, where water is so scarce that at many times and in many places the land cannot be pastured at all unless man has laboriously provided water. Thus the State Railroad Commission of Texas, for itself and on behalf of the cattle-raising industry and the people of Texas, sent to the United States Food Administration in 1918 an expression of thanks for assistance in moving 1500 cars of livestock from drought-stricken western Texas before the cattle starved or perished of thirst. Again, during the severe drought of 1934 the United States Government purchased 813,436 head of cattle from the ranchmen of western Texas. Of these cattle 22.6 per cent were in the counties of the Panhandle, 17.4 per

cent were in counties west of the Pecos River, and the remainder were in other counties west of the 100th meridian. Nearly one-fourth of all the cattle purchased were in such bad shape that they could not be used for meat and had to be condemned. Such droughts, often accompanied by the death of cattle, are common in all this region.

This area is a part of the vast domain where the Spaniard once claimed to rule the Indian. In the Mexican part of it the Spanish American still ruled until recently, but more than half of the area was taken in the early part of the last century by the Americans. Everywhere are marks of its early Spanish occupation — Spanish names, the Spanish tongue, the Roman Catholic Church, the vast estate. In 1800 the Governor of New Mexico had 2,000,000 sheep with 2700 peons tending them. Up to the time of the confiscation of land under Obregón, the Terrazas estate in Chihuahua extended for 200 miles and was larger than Massachusetts and Rhode Island together. In the Edwards Plateau of Texas one ranch extends for 40 miles on both sides of a creek and has a tract 8 miles square as a sorting-pen for its cattle.

THE EDWARDS PLATEAU

The eastern lobe of these plateaus, a limestone rock area sloping toward the south, is called the Edwards Plateau. It is dissected in its eastern and southern parts by a multitude of little valleys. Thin soil underlaid by limestone, scanty torrential rainfall, a high rate of evaporation, and a scarcity of flowing streams combine to make this an arid grazing region. This is a country where landholdings are measured in sections, or square miles. Most ranches contain 4 to 20 sections, and a few have 100 or more.[1]

The Indians were expelled from the plateau about 1880, and sheepmen were the first to enter.[2] At first they brought their flocks to graze on the plateau only after periods of unusual rainfall. About 1890 came the settler, who bought and leased the land from the state, the railroad, and other owners. The ranchman drilled wells and set up windmills, water tanks, and wolfproof fences. Today this is a combination or diversified ranching country, a land of sheep, goats, and cattle. It is the goat center of the United States. Most of the goats are Angoras, which are famous for their long fleeces of fine mohair.[3] Aridity is revealed by the low carrying-power of the land — only 110

[1] See William T. Chambers, "Edwards Plateau, A Combination Ranching Region," *Economic Geography*, January, 1932, pp. 67–80.

[2] The coming of the white man has worked some strange freaks in nature's balance. The Indians repeatedly burned the dead grass, which burned the bushes and kept this rough country in pasture. When the white man came, it was well covered with grass. A farmer known to Professor Hartman of the University of Texas tells of having had difficulty in finding stones to mark the corners when making surveys. Then the white man stopped the fires, and cedar bushes and trees grew up. They killed the grass. The rain water then washed the shallow earth mantle to the bottoms of the hills, converting areas into places of rocky desolation, where cedar trees cling to the crevices in the bare stone hills and look down upon rich glades of good soil and grass.

[3] Goats used to come to Kansas City by the trainload, but a recent pure-food law says that goat must be labeled goat. Therefore, owing to one of our senseless prejudices about food, the goat comes to Kansas City no more. Many of them produce only mohair, a skin, carrion, and a bleaching skeleton.

"I cannot conceive of goats being so reasonable in price as meat animals but what they

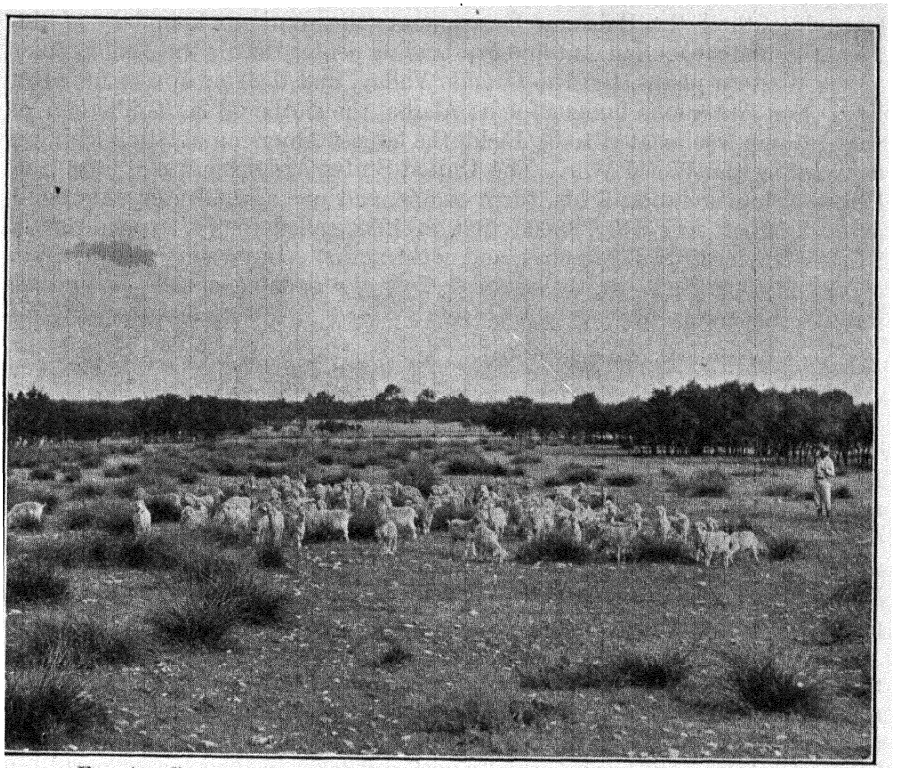


FIG. A. Goats on the range in the Edwards Plateau, a typical landscape. (Courtesy U.S. Dept Agr.)

sheep, 62 goats, and 22 cattle per section. Cattle feed chiefly upon the grass, and the ranchman's water tank is vital to them. The sheep and goats can get along without water for weeks, or even months, and they can subsist on the hardier vegetation — weeds, shrubs, bushes, and small trees. In times of acute drought the ranchmen assist the livestock by burning off the thorns of yucca, prickly pear, and cactus with gasoline torches so that the animals can consume the more succulent parts, and at such times the ranch wells have to be bored to lower levels. About half of the hired labor on the ranches is Mexican, and during the spring and autumn months migratory crews of Mexicans go from ranch to ranch and help to shear the sheep and goats.

As might be expected, there are few towns within the Edwards Plateau, and the few are usually very small. The largest place is San Angelo (pop. 25,000), which lies along the northern border. The great commercial metropolis of this part of Texas is the city of San Antonio (pop. 232,000), which is

would be worth more to take a chance on their living on the range and producing one more fleece. If he should live and produce another three pounds of hair which would bring from forty-five to fifty cents per pound, as recently, you can readily see that a man who owns them is going to take a chance on the possibility of two more fleeces instead of one." — Letter from A. K. Mackey, Texas Agricultural and Mechanical College.

located south of the Balcones Escarpment (the southern boundary of the Edwards Plateau). San Antonio is a trading center that is the joint product of the Western plains, the Rio Grande Valley, and the southwestern Cotton Belt. San Antonio is famous for its Alamo, the shrine of Texas liberty. At San Antonio was located Kelly Field, the largest American aviation training-field during the World War. The United States Army maintains Fort Sam Houston, four aviation fields, three camps, and one arsenal, representing an investment of over $40,000,000 that in 1938 called for an expenditure of $27,000,000 in pay roll, supplies, and construction. In recent years the trade of the city has been greatly stimulated by the opening of new oil and gas wells in this area.

THE FILLED BASIN COUNTRY

Most of this region, west of the Edwards Plateau and south of the Colorado Plateau, is land of filled-basin formation — an arid-land phenomenon. In regions of low but torrential rainfall the vegetation is scattered so that no mat of roots holds the lands, and erosion on steep lands is therefore at its maximum.[4] As a result we often find gaunt mountains of almost bare rock, and between them wide stretches filled with rock waste washed down from mountain summits and slopes.

In old Mexico, as well as New Mexico and western Texas, many parts of this region have so little rain that the intermittent streams which wash mountain slopes to make filled basins cannot fill up their valleys, overflow them, and flow away to the sea cutting valleys as they go. Therefore we have inland drainage basins, usually with salt lakes in their lowest parts.

THE TRANS-PECOS HIGHLANDS

The name Trans-Pecos Highlands is given to the ridge and basin territory drained by the upper Pecos, the upper Rio Grande, and streams in the many mountains between them. The Trans-Pecos ridges were made by the simple process of breaking up the earth's crust into great blocks and tipping them up — fault-block mountains, they are called.

The broken ends of the tilted strata usually face the west, so that the mountains have sharp western fronts and long sloping eastern fronts. Such mountains are always in sight in most of the country between the Pecos and the Rio Grande and in some of the country west of the Rio Grande. The Rio Grande passes through these ranges in a series of narrows. In such a mountain break lies El Paso ("The Pass").

Between the ranges are wide, almost level valleys. Although the soil is fertile, the valleys are not famed as the pleasant homes of men like the valleys of Virginia or eastern Tennessee. Rainfall of 8, 9, or 10 inches a year, such

[4] The rainfall of a humid region supports a dense vegetation with an almost inconceivable mat of binding roots, and a mantle of small growth, leaves, and leaf twigs, all of which stop erosion very effectively. Desert vegetation, usually of the bush, shrub, and bunch-grass variety, affords little protection against washing.

as that of El Paso and other valley locations in this territory, means desert. The fitful rain that falls upon the mountains has long since washed the valleys full of loose and porous earth, and in this earth water promptly disappears, save in a few of the larger valleys where salt lakes, marshes, playas, and alkaline flats occupy the lowest land. There is a considerable area of inland drainage in these filled basins, here called bolsons, the Spanish name for such a basin without outlet. The longest of these basin valleys, close indeed to the Rio Grande, bears the suggestive name of Jornada del Muerto ("Journey of Death"), given to it by the early Spaniards.

What kind of country is this for the homes of man? A New Mexican, describing the ranch house of this region, answers:

> A "dobe" hut of one or two rooms, set out on a sun-blistered flat where bulls paw up clouds of pungent dust, while they bellow challenges at each other. Miles away through quivering air dance the distorted outlines of the cool, timbered mountains. . . . A one-roomed log cabin with a "lean-to," in a beautiful mountain valley, but with every vestige of the native forest cut away from all around the house for fifty or a hundred yards on all sides.
>
> These are by no means the only kinds of ranch-houses, but they are by far the commonest. . . .
>
> The author also appreciates how the lack of control of land, the uncertainty of the returns for labor, the rough character of the work itself, the exposure it entails and the irregularity of habits which it engenders, all tend to render the ranch-house a mere "permanent camp." [5]

In the Trans-Pecos country of western Texas and New Mexico the ranchman needs from 2000 to 8000 acres to support a family. The land shines white between the sparse shrubs.

IRRIGATION AND EL PASO

Here and there the greater rainfall of some upland makes possible a little dry farming, but the chief escape thus far from dependence on the ranch and the occasional mine is afforded by irrigation in the valleys of the two main streams, the Pecos and the upper Rio Grande. By diversion, by pumping, and sometimes from artesian wells, water is obtained to raise large quantities of alfalfa, which fattens the range animals and carries them through periods of snow and drought.[6]

One hundred and twenty-five miles above El Paso the Bureau of Reclama-

[5] E. O. Wooton, *Trees and Shrubs of New Mexico*, New Mexico Agricultural Experiment Station, *Bulletin* 87, 1913, pp. 11, 12.

[6] South of Roswell, N. M., is a noteworthy example of irrigation by artesian water (and also a noteworthy example of waste). Because many wells yielded 1000 and 2000 gallons of water per minute, it was generally believed that the supply was inexhaustible. A well drilled by the Oasis Cotton Company in 1926 yielded 6000 gallons per minute, a record for the United States. Excessive use of water caused the area of artesian flow to decline from 663 sq. mi. in 1905 to 425 sq. mi. in 1925, at which time about 60,000 acres were under irrigation. Finally, in 1931 the state enacted a law declaring underground waters to be public waters and subject to appropriation, in the hope that conservation measures would prevent further decline in the artesian head. How often the legend of the stable door and the stolen horse applies to the use (or misuse) of our natural resources! (See U.S. Geological Survey, *Water Supply Paper* 639.)

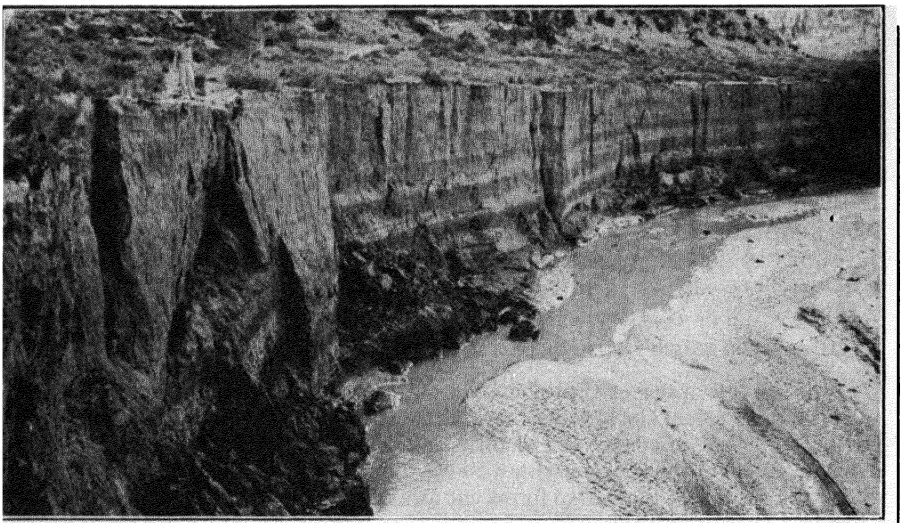


FIG. 550 A. In 1857 Lieut. Edward F. Beale, Indian agent and trail-blazer, was commissioned by the U.S. War Dept to survey a wagon road from Fort Defiance, Ariz., to the Colorado River in Arizona. He left San Antonio June 25, 1857, and reached the Colorado River January 23, 1858. He kept a full and accurate journal. "You will find in my journal," he said, "that we camped sometimes without wood and sometimes without water, but never without abundant grass. . . . "On arriving at the banks of this river [see picture] we found no difficulty in getting down without locking a wheel."

Note the man at the upper left and the layers of different colored material that were laid down as mountain wash filled a wide basin with rich alluvium. (Courtesy Milton Snow, Navajo Indian Service)

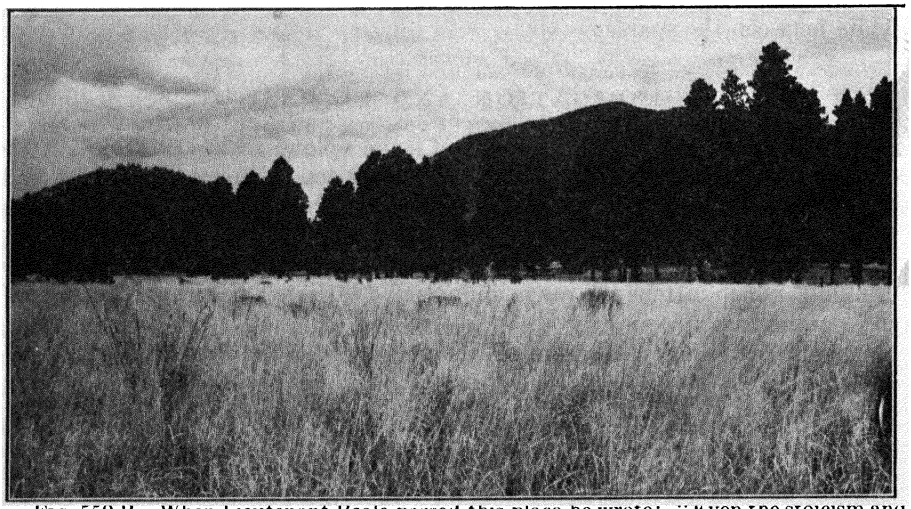


FIG. 550 B. When Lieutenant Beale passed this place he wrote: "Even the stoicism and indifference to beauty and scenery so characteristic of the lower class of Spanish population was moved, and as we passed successive vales and glades, filled with verdant grass knee high to our mules, dotted with flowers, and the edges skirted by gigantic pines, they constantly gave vent to their delight in fervent ejaculations of praise!" It is that way today, because it is national forest, where grazing has been controlled, and though the right number of cattle has been kept there for years, the grass has been allowed to reproduce. (Courtesy Milton Snow, Navajo Indian Service)

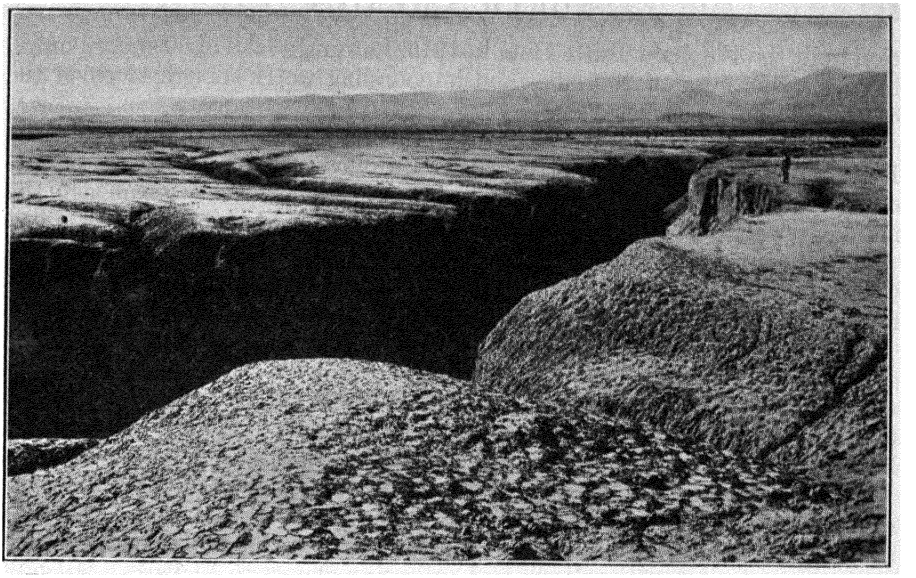


FIG. 551 A. When the late Will C. Barnes visited the valley of this branch of the Gila River in Arizona in 1882 he said it was "covered with soft lush grass, and the stream had no banks." The same man saw it in 1934 and said, "Green meadows were replaced by wide expanses of drifting sand, and the San Simon Creek had become the infamous San Simon Wash, 30 feet deep, 60 miles long, sometimes a thousand feet wide and getting wider." It was also developing branches on both sides. Note the man. (Courtesy Nat'l Resources Committee)

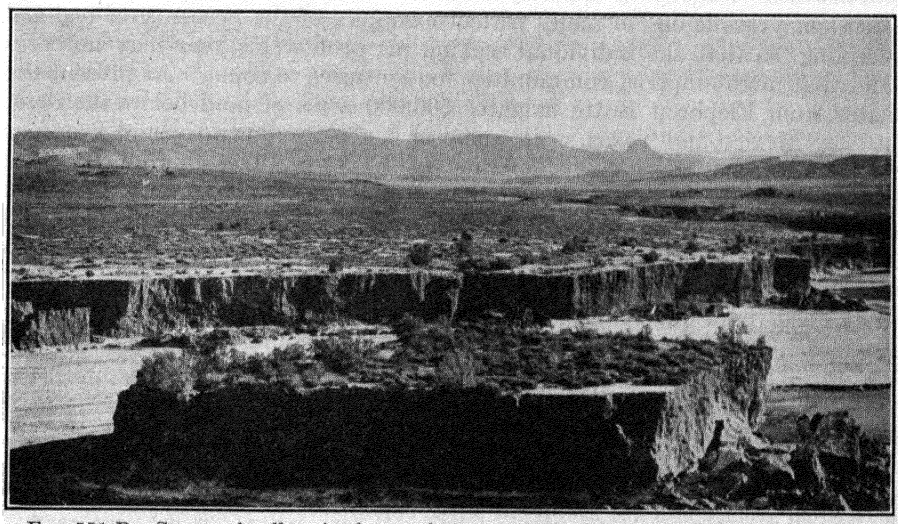


FIG. 551 B. Scores of valleys in the southwestern United States were knee-high or head-high with grass, and now are experiencing this change as a result of overpasturing. Thirty or forty years ago hundreds of acres were irrigated. Now men cannot get the water out of the stream. The fate of irrigation reservoirs downstream from this, such as the Elephant Butte Reservoir, seems plain, and nearly all because we overpasture. Beavers conserve their resources much better than do Americans. (Courtesy B. A. Hendricks, U.S. Forest Service)

tion built the Elephant Butte Dam in 1916, forming a lake of 60 square miles, having a shore line of 200 miles and impounding water enough to cover the State of Delaware 2 feet deep.

Alas for the future of the reservoir and the lands that depend upon it! The Rio Grande drainage area north of El Paso offers a more complete example of regional suicide than most people ever imagined. Sixty years ago the main river had several branches coming through wide, almost level, filled valleys, where sacaton, a good pasture grass, grew 4, 6, or 8 feet high, and thousands of acres were irrigated by simple diversion of the stream that flowed through from the higher mountains east and west.

Overpasturing of these uplands caused increased floods. Many of the streams have cut channels 20 or 30 or 40 feet deep and hundreds of feet wide in their erstwhile beautiful sacaton pastures. Water can no longer be diverted for irrigation, and thousands of acres have not only ceased to be irrigated but have gone down the stream, leaving wide washes in their place.

This new deluge of outwash has filled the Rio Grande. Men have built dikes to hold it in, until now the bottom is above the level of the valley in some places. This raised the water table in the long stretch of irrigated valley beginning north of Albuquerque and extending almost to El Paso. Much of this land has already been abandoned because of water-logging, and more apparently must be.[7] To cap the climax, the reservoir is filling much faster than was anticipated, and when it is full, what will farmers near El Paso do for irrigation water and what will El Paso do to stop the floods, which are being held for the present in the Elephant Butte Reservoir?

This swift tragedy in a valley that the Indians had cultivated for two thousand years is one of many perfect examples of the necessity of regional planning, so that the individual seeking his profits this year may not ruin land that might support communities for centuries to come.[8] At present the water from Elephant Butte irrigates 500,000 acres of land below the dam, in New Mexico and Texas, while some of it goes on down-river to keep our treaty with the Mexicans. Elevation of 4000 feet gives this land a good healthful climate where wheat can grow in the winter and a crop of Egyptian corn can follow it in summer on the same land. Long-staple cotton and alfalfa are the principal crops, and milk and vegetables for the city of El Paso may be expected to claim more land as the city grows.

El Paso (pop. 102,000) is the largest city between San Antonio and Los Angeles. Once a trading-post on the old Santa Fe and Butterfield trails, El

[7] In 1880, 125,000 acres were under irrigation in the Albuquerque-Socorro district in central New Mexico. Between 1880 and 1896 water-logging caused 64,000 acres to be abandoned. Finally, the Middle Rio Grande Conservancy District was organized to cope with the problems of water-logged land, an obsolete irrigation system, and floods. Between 1930 and 1936 the district constructed 345 miles of drainage ditches, 181 miles of levees for flood protection, and 363 miles of irrigation canals. The water table of the district was lowered an average of 3 feet as a result of the improvements. See *Resources and Opportunities of the Middle Rio Grande Valley*, University of New Mexico, *Bulletin* 264, 1935.

[8] Only recently was co-operation achieved between the states involved and the Federal Government in a comprehensive survey of the problems of the upper Rio Grande Valley. See National Resources Committee, *Regional Planning: Part VI: The Rio Grande Joint Investigation in the Upper Rio Grande Basin in Colorado, New Mexico, and Texas, 1936–37*, 1938.

Paso today is served by 8 railroads and is an important distributing center for the Southwest and northern Mexico. Its manufacturing industry includes smelters and a copper refinery using New Mexican coal and ores from New Mexico and old Mexico. El Paso also has petroleum refineries, cotton gins, and cottonseed-oil mills, meat-packing plants, and railway repair shops. El Paso has a large permanent Federal pay roll arising from the immigration, customs, public-health, and border-patrol services; the International Boundary Commission; and Fort Bliss, the largest cavalry post in the United States. Sunshine, dry air, and cool nights make El Paso a health resort of considerable note.[9]

THE INDIAN CULTURE

The white man in irrigating the valley of the Rio Grande cannot claim to be a pioneer, for the first Spanish explorers nourished their famished bodies and replenished their stocks of food from the abundant harvests produced by the Pueblo Indians in the irrigated valley of the Rio Grande, where Indians had lived for unknown centuries. At Taos and a few other places we can still see the method of living these people had developed before the white man came. They have surrendered somewhat to the wiles of window glass and a few other of our conveniences, but we have not yet hurt their culture much. Long may the Taos culture last! Many live under one roof. The pueblo is five or six stories high. Until recently the first story was without windows in the sides, and rooms were entered from the top. The walls and roof are of sun-dried brick, supported on strong poles and piled thick with impermeable clay. If a young man wishes to marry, the fathers of the village point to a place where he may add rooms on the roof of the pueblo. The town of Taos now contains about 300 people and is composed of two "house heaps," one on each side of the river, connected by a bridge.

It is greatly to be hoped that friends of fair play can keep these simple people from being crowded out of their water rights and lands, which are to them life. In most other places in the United States many of the Indians are beginning to adopt the white man's ways — a practice of questionable benefit to them.

THE MANY CULTURES OF NEW MEXICO

New Mexico, with one of the sparsest populations of the country, can boast the greatest number of civilizations: 1. Prehistoric, of which many cliff dwellings and other remains abound, indicating a surprising culture. Dr. J. W. Fewkes, the ethnologist, has even found at Mesa Verde, southwestern Colorado (near the New Mexico line in the Colorado Plateaus), an astronomical observatory left by these remarkable people. 2. Indian, of which many tribes and some towns remain and from which basketry and excellent blanket work are increasingly thrust upon our attention. 3. Spanish,

[9] El Paso has sunshine 81% of the total possible time, a relative humidity of only 41, a mean annual rainfall of 8.96 in.; it is located at an elevation of 3710 feet.

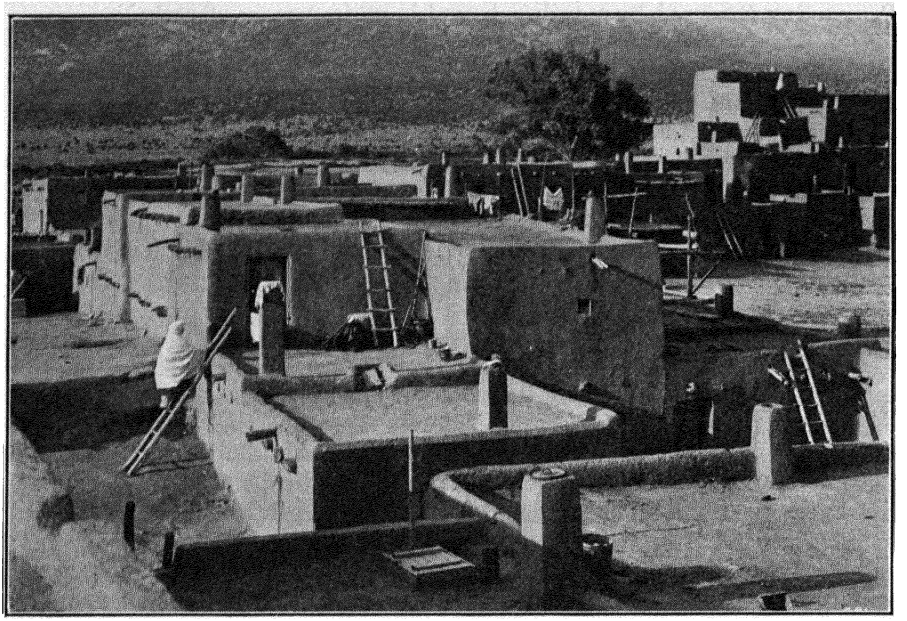


FIG. A. The much-visited Indian pueblo of Taos, 72 miles north of Santa Fe, first seen by a member of Coronado's company in 1540, still thriving, but culturally menaced by too many visitors. (Courtesy Museum of New Mexico)

present in place names as well as the persons and language of the Mexicans in the streets of Santa Fe and other towns. 4. The American culture, which in many cases has had the good sense and taste to follow the native style of architecture. Its buildings are a blend of the Indian pueblo and the Spanish mission. This very pleasing type has been adopted with great enthusiasm. Witness the architecture of Santa Fe, where one sees apartments, office buildings, and museums, even the post office, all in this unique and useful style of architecture which so thoroughly fits into the climatic conditions of the country.[10] The thoroughness with which this new style of architecture has been adopted is well instanced by a public high school in Santa Fe, of which the earlier structure is thoroughly and hideously New England, and the high-school unit beside it thoroughly and pleasingly New Mexican.[11]

El Paso alone stands out as a city of size in the Trans-Pecos country. Such places as Albuquerque (pop. 27,000), the largest city in New Mexico, Santa Fe (11,000), and Las Vegas (5000) are principally seats of governmental activity and tourist centers, where Indian culture and Indian ruins are the stock in trade. Visiting tourists are intrigued by handicraft products that are offered for sale, especially woolen blankets and rugs.

[10] The plainer adobe house may look somewhat like a pile of mud, but it is in reality a comfortable house, cool in summer and warm in winter, because walls and roof are thick enough to turn both water and heat.

[11] Some years ago the University of New Mexico, in Albuquerque, officially adopted a modified pueblo type of architecture.

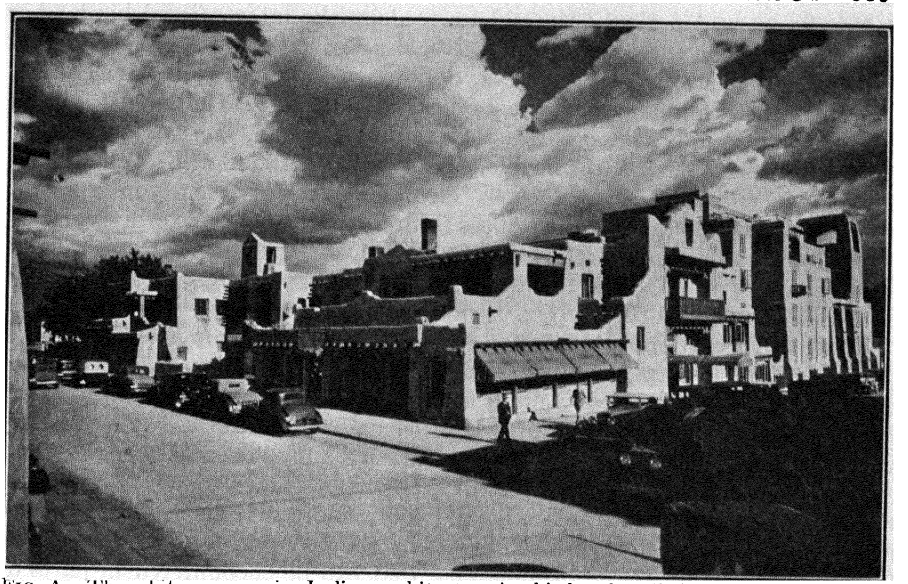


FIG. A. The white man copies Indian architecture in this hotel (called an inn) in Santa Fe. (Courtesy Atchison, Topeka & Santa Fe R.R.)

THE MEXICAN PART OF THE SOUTHWESTERN PLATEAUS

Mexico is not separated from the United States by physical or even by racial lines, for many of the people of our own Southwestern Plateaus are Mexican in origin, and many speak Spanish. The American part is still substantially Indian, while across the Mexican boundary we find the population chiefly Indian and partly mixed, with a small percentage of Spanish. The boundary line, which is strictly an imaginary line for most of the way,[12] is not much of a boundary even where it depends on the Rio Grande, for it is easy to cross the river at low water.[13] Nevertheless the boundary marks sharp political and cultural contrasts.

[12] Boundary troubles are ludicrously illustrated by an episode rehearsed at great length, with diagrams, in the correspondence in 1891 between the United States and Mexico. It seems that an Arizona sheriff in the town of Nogales desired to arrest a drunken man who persisted in staying a few feet across the international boundary, which runs through the middle of the street. A confederate of the sheriff went across the street and "accidentally" bumped into the tipsy one, who went sprawling upon the ground, with his feet in Arizona and his head and shoulders in Mexico. The sheriff grabbed his feet, pulled him across, and locked him up in jail. Whereupon Mexico protested that this removal of the attached head from Mexican territory was an invasion of its sovereign rights. The correspondence dragged on for some months and was never settled officially, for before the matter was concluded the Americans thought the intoxicated one had been in jail long enough and so he "escaped" and the diplomatic question remained unsolved. Now, alas for romance! there is a fence down the middle of the street.

[13] The boundary difficulties caused by the shifting position of the river were discussed in Chapter 25. In order to keep the river from wandering all over the landscape, a $6,000,000 program was begun in 1934 which will straighten the river channel from El Paso to Fort Quitman, reducing the length from 155 miles to 88 miles between these points.

Nearly every American city and town along the international border has its counterpart on the Mexican side: Nogales, Arizona, and Nogales, Sonora; Douglas, Arizona, and Agua Prieta, Sonora; Columbus, New Mexico, and Las Palomas, Chihuahua; El Paso, Texas, and Juarez, Chihuahua; Eagle Pass, Texas, and Piedras Negras, Coahuila; Laredo, Texas, and Nuevo Laredo, Tamaulipas; Brownsville, Texas, and Matamoras, Tamaulipas. These twin cities are by no means "identical twins." When you cross the border southward, you are apt to pass from a reasonably neat, orderly, clean, prosperous-looking town to one that is ill-kept, dirty, unsanitary, disorderly, a place where the saloon, the gambling-den, loose divorce, and the worst haunts of vice flaunt themselves.

These Mexican border towns had a brisk trade during our Prohibition era, and they are still largely supported by American patrons, some of whom are escaping the restrictions of American law by a sojourn across the border. Many an American tourist thinks that he has "seen Mexico" after he has visited one of these border towns, just as many a European makes the mistake of judging America by what he sees in Manhattan. One should not make the mistake of judging all of Mexico by the poor, ignorant Indian any more than he should judge the entire United States by the poor whites of Appalachia or by the flotsam and jetsam of humanity that can be encountered in parts of New York City and Chicago.

Mexico is also the land of the polite and cultured Spanish descendant, who tips his hat upon meeting another gentleman and again upon leaving him. He and his children often have been educated in Europe and the United States and have traveled widely.[14] For years he was the owner of the large hacienda (prior to recent agrarian reform), the mine-owner or mining engineer, the college professor, the lawyer, the doctor, the banker, the statesman — the person of position and responsibility.

This Mexican part of the Southwestern Plateaus, lying between the eastern and western cordilleras, is from 250 to 300 miles wide, and from 800 to 900 miles long. This great plateau, increasing slightly in elevation toward the south, has been built by the outpourings of volcanoes and by mountain washings. Therefore it is a vast sea of water-borne or volcanic soils with old mountains sticking out of it as islands. Fortunately for Mexico and the rest of the world, these islands of old rock contain much valuable metal and give rise to a great mining industry. As on the plateaus to the northward in the United States, but little agriculture is possible. In the north the Conchos River carries water from the western mountains to empty it into the Rio Grande. On both sides of the Conchos are areas of bolsons with salt lakes. Once the Rio Grande flowed into this territory, but a volcano threw a dam across its course, turning it to the present channel. These plateaus are walled

[14] A friend of mine is a professor in a large Mexican university. He speaks English and French nearly as well as his native Spanish, and in 1932 he was studying German in order "to keep up with his children," who were attending a German school in the capital city. He has been an accountant in England and in India and has traveled throughout Europe. He served in the Canadian army during the World War. As part of a day's work, he teaches classes at the university, manages a business enterprise, and practices law as a government attorney. He has time for golf, tennis, and other recreation, and belongs to several clubs. How does the average American college professor compare with him?

in by the cordilleras, so that some parts receive not more than 4 or 5 inches of rain. No parts have more than 20 inches a year.

THE LARGE HACIENDA AND THE PEON

Prior to the present era of agrarian reform, this was long the land of the huge feudal ranch-estate (hacienda), the mine, and the revolution. One who looks into the stormy history of Mexico and reads the chronicles of its civil wars wonders how the country can be as well developed as it is.

Climate and history combined to make the great feudal estates. Without irrigation, the land is good for little but the ranch. Water is scarce, so the possessor of a few good water sites had natural command of large areas around. In the politically disturbed times there was a real feudal basis — the landowner with his fortified house could protect his vassals. Certain it is that the American concept, or the American ideal, of the small farm occupied by its owner was almost unknown in this region. Instead, one vast estate succeeded another. When the Mexican owner visited the borders of his estate it often took several days, and he traveled with coach and six and retinue like a medieval prince, which indeed he was. The large estate in Chihuahua has been mentioned. The Zuloaga family had 2,000,000 acres. In the days of Diaz an American company bought an estate 60 by 70 miles in northeastern Zacatecas. It was occupied by 2000 people and 500,000 (estimated) head of livestock. It was 60 miles from a railroad station to the manor house, a large structure built around a patio, or open court. Near the manor house were the church and a village. The peons lived in villages beside a spring or pond made by damming the channel of a stream to store its floodwaters.

Back and forth from thin and distant pastures to the stagnant water hole moved the peon cowboy and the cattle. The house of the peon was made of sun-dried bricks. It was usually without a window, the door sufficing to let in such light as it could. Some houses were even built without a door, entrance being made only through an opening into a wall, with another opening into an inner room. The women and children had to choose between the gloom of the adobe hut and the glare of the unshaded sun. Here they were tied for life by peonage laws.

For four hundred years the peons were in reality medieval vassals, little better indeed than chattels, strangely like cattle. Corncakes (tortillas), fried beans, and onions were, and still are, the chief food.[15] Their one ornament was the highly decorated and appallingly heavy hat; their one entertainment was the church procession or fiesta, their one luxury to get drunk on fierce liquor — aguardiente, "burning water," an unbelievably strong alcohol distilled from mescal, a member of the century-plant family. Such was the life of the poor peons — millions of them. They could not get ahead financially. They were quite unambitious, and exceedingly conservative. They cut their grain with a sickle and shelled their corn by hand, and only with the greatest difficulty could they be induced to use more efficient tools.

The American owners of the large estate just mentioned sought to improve

[15] From the standpoint of *nutrition* this leaves little to be desired.

conditions and increase output by increasing wages. The peons promptly cut down the number of days of work, because the increased wage enabled them to live by their accepted standards with fewer days of labor.

Such was the Indian mode of living in rural Mexico during four centuries of peonage. A subsistence standard of living still prevails throughout much of the countryside. Today, however, many of the great houses on the haciendas are desolate, and their former owners are gone. In recent years Mexico has been undergoing a revolution — not a bloody one with bullets, battles, and executions, but a social revolution attempting fundamental changes in economic, political, and social institutions with the avowed object of improving the status of the poor Indian. Many of the huge haciendas have been taken by the Government ("expropriation" is the American word for it), broken up into smaller parcels of land, and turned over to the former peons for use under a system of communal ownership. The obvious losers in this social revolution have been the great families of Spanish descent (and foreigners) who once owned the land, the mines, and nearly everything of value. Most of the old aristocrats have vanished to foreign lands or have sunk into the middle class, working humbly in factory, office, or store. There are still large haciendas in Mexico, but they are owned chiefly by generals, politicians, or businessmen who have grown rich in native and foreign business. The present aristocracy has much Indian blood, but if the present trend continues, it too may have to give up much of its wealth.

THE AGRARIAN REVOLUTION

Nowhere in Mexico is there to be found a public statue of Cortés, for after the time of the Spanish conquistadors the lot of the Indian was one of abject peonage. During the last hundred years the Indian has heard many promises. Many a revolutionary leader has swept into power with the slogan "Land for the Peons!" and later has been swept out of office, dead or alive, because he failed to redeem his promise or because he went about redeeming it too slowly. Lázaro Cárdenas, the Tarascan Indian who was elected President in 1934, has been in a tremendous hurry to give Mexico back to its people before the conclusion of his term in 1940. Says Cárdenas, "We want fewer Indians and more Mexicans." The great social revolution that is now in progress south of the Rio Grande will be discussed in Chapter 41, but some of the agrarian reforms that affect this region may be mentioned here.

Since 1917 the Government has pursued a policy of land redistribution, seizing large estates and dividing them among the poor. By 1930 approximately 12,935,000 acres had been distributed among 593,000 families, and by 1939 more than 1,700,000 families had received some 50,000,000 acres of free land. The amount of land granted to each family varies from about 10 acres of irrigated land to about 100 acres of grazing-land, the average grant being about 30 acres. To acquire land, twenty or more persons must ask for it together. The redistributed land does not become the property of the recipient, but belongs to the rural village, or community, known as the ejido. The landholder, or ejidatario, may retain the land for life, and it is usually

reassigned to his heirs, but failure to work the land for two years in succession may lead to forfeiture. Thus the Government has set about to establish communal ownership of land in rural areas, a custom that long prevailed among the Indians before the Spaniards arrived and is still to be found in some parts of Central America. In England or the United States such a land policy would be flayed as Communism, but in Mexico it's just an old Indian custom.

Coupled with this program of land redistribution are extensive programs of financial assistance, education, public health, and public works.[16] The Government has set up special banks to provide the ejidatario with working capital. More than a tenth of the national budget is now spent on education. Illiteracy is diminishing, and the Indian receives instruction in sanitation as well as advice about proper methods of farming. Roads are being built, and in 1939 there were more than 2500 miles of federal highways open to traffic with an additional 800 miles under construction. Irrigation works are being constructed to meet the pressing need for water.[17]

The Laguna district, Mexico's oldest and most important cotton-growing area, may be cited as an example of the recent agrarian reforms.[18] This district, located in the region we are now describing, is in the midst of the arid plateau along the borders of Durango and Coahuila. It depends upon flood irrigation and water pumped from wells. Originally the area was a grant from Charles II of Spain and embraced more than 1,000,000 acres of ranching land. Prior to 1850 there was little subdivision of the land, and as late as 1930 there were only 322 rural properties, namely, 131 haciendas, 93 ranchos, 10 ejidos, and 88 miscellaneous plots. Expropriation in October, 1936, caused the district to be divided into 277 ejidos. In 1937 the Government spent 40,000,000 pesos in wages, machinery, wells, and equipment, and a dam is under construction 150 miles above Laguna on the Nazas River that will provide more water and serve to regulate the stream flow. The government program for the Laguna district involves not only a redistribution of the land but a new plan for agriculture, with a new irrigation system using storage dams, larger ditches, and wells.[19] A new system of crops has been begun, with more area devoted to wheat and alfalfa and to the raising of livestock.

[16] On June 25, 1937, President Cárdenas issued a decree providing for government regulation of farm production, for fixing maximum and minimum prices of farm produce, and for federal control of agricultural exports and imports.

[17] Only 30% of the land area of Mexico is arable land, two-thirds of which cannot be cultivated without irrigation. (See Jesús Galindo y Villa, *Geografía de Mexico*, Barcelona, 1930, p. 155.) If the figure is wrong, it is probably too high.

[18] See Samuel N. Dicken, "Cotton Regions of Mexico," *Economic Geography*, October, 1938, pp. 363–71.

[19] Dr. Dicken says: "The *ejidos* still resemble the *haciendas* and *ranchos* from which they were formed. Usually the old village nucleus is used as headquarters for the *ejido*. A fairly representative *ejido* is Las Conchas, three miles northeast of Torreón. The unit covers 1400 hectares of which 450 were in cultivation in April, 1938. The cultivated land is equally divided between wheat and cotton, the former nearly ready for harvest, the latter only a few inches high. The acreage of wheat has been increased but part of the crop was a failure, due probably to the use of seed ill-adapted to this region. There was no water available on this *ejido* but a well was being dug; one well with a six inch pump will irrigate 40–50 hectares. The *ejidos* which have wells usually grow corn and alfalfa in addition to wheat. The population of Las Conchas is 146, all of which must be supported from the sale of cotton and wheat, since no corn is produced." — *Ibid.*, pp. 370–71.

COTTON, RUBBER, AND ISTLE

So far as area is concerned, the ranch is far and away the predominant industry of the whole Mexican section of the plateau. While aridity decrees that most of the surface is suitable only for grazing, the pressure of population gives a great urge toward irrigation as the new ejidos come into being on the old hacienda lands. Wheat, corn, beans, and alfalfa are the leading food and feed crops; cotton, istle, and guayule are cash crops.

Within this arid plateau are four of Mexico's greatest cotton-growing areas, all four depending upon irrigation.[20] The Laguna district, previously mentioned, consists of about 100,000 square miles of old lake bed forming an irregular basin, which is bordered by mountain ranges that are too low to cause precipitation. Part of the water supply is obtained from wells, but the natives have long had to depend chiefly upon the floodwaters of the Nazas and Aguanaval rivers, which rise in the Sierra Madre Oriental. Great irrigation squares, or fields surrounded by earthen ridges, help to conserve the floodwaters that arrive in September and October and which must suffice for the cotton, which is not planted until the following February. With the completion of the new dam on the Nazas, a larger and more dependable supply of water will be assured. The cotton output varies from 60,000 to 140,000 bales a year and is shipped to the textile mills in Puebla, the Federal District, and Veracruz, a small portion being consumed in Torreón (pop. 66,000), the chief city in the Laguna district.

For 300 miles along the Conchos River in Chihuahua extends a second cotton-growing area, which has an annual output of about 10,000 bales. The upper part of this district lies in the foothills of the Sierra Madre Oriental, the middle part is in broad basins, and the lower part lies in the river flood plain. In the upper part is La Boquilla Dam, with a reservoir covering 43,000 acres.[21] When auxiliary dams now under construction are completed, it is hoped to irrigate 160,000 acres. A third cotton area extends for 30 miles down the flood plain of the Rio Grande below Juarez. A treaty with the United States limits the diversion of water to 60,000 acre-feet. In this area is grown Mexico's finest cotton, which is about $1\frac{1}{8}$ inches in length. In northwestern Nuevo León is a fourth cotton-growing area on the gravelly mesas along the upper Rio Salado. Here the river is entrenched in barrancas, or gorges, from 30 to 60 feet deep. The Don Martín Dam enables the water to reach the top of the mesas, which are never troubled by floods. This area has produced as much as 30,000 bales of cotton a year, and in 1933 about 90,000 acres were under irrigation. In the winter of 1937–38, however, deficient rainfall and excessive seepage caused the great reservoir to run dry.

[20] Two cotton-growing areas beyond the limits of this human-use region are the Mexicali district, which occupies a part of the delta of the Colorado River, and the Matamoras district on the flood plain of the lower Rio Grande, where cotton is grown without irrigation. Laguna, Mexicali, and Matamoras account for more than 80% of Mexico's annual output of about 400,000 bales.

[21] La Boquilla was built between 1909 and 1915 by a Canadian corporation at a cost of $10,000,000. At first it was used only for the generation of electric power, which is transmitted by wire to Parral, Chihuahua, and to various mines. The dam is 243 feet high and impounds over 3,000,000 cubic meters of water.

In the eastern foothill region near Saltillo 1,000,000 or 2,000,000 bushels of wheat are grown each year by dry farming, unless there happens to be a drought.

In the Saltillo-Torreón section of this region there has been an interesting alternation of industrial output between istle and guayule. The istle fiber is taken from a plant that resembles the century plant. It is exported to America and Europe for the manufacture of ropes, sacks, mats, brushes. The fiber business declined when, about 1905, it was discovered that the guayule shrub, growing extensively on the arid pastures, had about 10 per cent of its dry weight in rubber. The shrub was rooted up far and wide and carried to Torreón and Saltillo (pop. 45,000), where factories chopped it up and dissolved the gum. For a few years there was a lively export of rubber, which reached its peak during the World War and in postwar years when the price of rubber in New York and London approached $1 a pound.[22] Then rubber declined in price, owing to rubber production by cheap coolie labor in the East Indies. Guayule could not compete under the new conditions. Rubber factories were torn down and the workers turned to the fiber business, which again rose to its old proportions.

MINING

Mines have furnished the chief export of these filled-basin plateaus. The silver, gold, copper, zinc, and bismuth (chiefly silver) have far outranked in value the cattle, hides, rubber, and istle. Some of the many mountains which protrude through the volcanic and lake deposits were the seat of a thriving industry in colonial days. The mining cities of Chihuahua (pop. 45,000), Zacatecas (33,000), San Luis Potosí (74,000), and Aguascalientes (62,000) are sisters in time with Plymouth and Salem, Massachusetts, and Santa Fe, New Mexico. They are not mining camps, but solid cities of stone, with fine churches and cathedrals, and good two-story houses of Spanish architecture, often surrounded, it is true, by acres of hovels. In Chihuahua stands a church that is one of the finest pieces of eighteenth-century architecture in all Mexico. It was built by a small tax that was laid on the output of the neighboring Eulalia mine between 1717 and 1789. Near Zacatecas the Alvarado mine produced $800,000,000 worth of silver between 1548 and 1867.

The mining industry prospered here during the colonial epoch and languished during the civil wars between independence (1810) and Diaz (1876). It rose to great prosperity under Diaz, and slumped again in the succeeding chaos. Mining revived a little under Obregón and increased under Calles and Ortiz Rubio. In the days of Diaz, American capital, American engineers, and American managers kept the Mexican peons digging quite as busily as they wished to dig, often more busily. There was at least one smelter in each

[22] During the war rubber zoomed to 90 cents a pound in New York, but over in Singapore it brought only 20 cents, as shipping facilities were scarce. Under the Stevenson Plan for curtailing supply in British possessions, the price reached 75 cents on July 31, 1925, and shortly afterward reached a peak of $1.12. In recent years the cost of production in the Far East has been greatly lowered. In 1933 rubber sold for about 3½ cents. Thus the Coahuilan producer of guayule is affected by developments in Akron, Detroit, New York, Europe, and the Far East.

of the four cities named above, which had a prosperous trade in supplying mining camps and in handling ores. Many peons starved in the hungry days of the renewed civil wars, when the mine mule was driven away, the miner driven away, and the superintendent driven away (sometimes shot). Until recently 97 per cent of the mining properties were owned by foreigners, but under the Cárdenas Six Year Plan for the "Mexicanization" of industry 15 mining properties were taken over by the Government in 1938.

The mines of this part of the plateau are not worked out. They are merely waiting for the continued application of capital and labor to dig deep where only surface workings have been possible by primitive methods.

THE FUTURE OF THE MEXICAN PLATEAU

Thus far the plateau has been the source of most of the Mexican revolutions. It seems to be a matter of record the world over that the desert and the semidesert are the places where armed uprising is easy and natural, and conquest is difficult. Witness the determination of President Wilson to catch the troublesome Mexican Villa (general? revolutionist? bandit?) in 1916. We threw an armed force into this region, equipped with the best we had and led by no less a person than John J. Pershing. Without making the slightest criticism of Pershing or of the army, it must be recorded that they did not catch the native half-breed, Pancho Villa. In this respect we were exactly like several Mexican governments, two of which bought Villa's good conduct with heavy payments of cash.

The mind of the landless and usually hungry populace in a land of huge estates has been a good seedbed for revolution. Perhaps revolutions arise on the plateau, in part at least, because of the nervous irritation of hot and stifling winds, a fact which is recognized in the Spanish saying "Ask no favor while the solano blows." It is well known that any populace is likely to blame the government for misfortunes the government does not create, such as business depression. The fluctuating rainfall of a desert's edge is continually causing poor grass, poor cattle, and hard times. Certain it is that most of Mexico's revolutions have started in the drier part of this plateau and have swept southward and upward to the capital city.

The Mexican Army in recent years has been well fed, well paid, well drilled, and well equipped. Under the regimes of such strong men as Obregón, Calles, and Cárdenas the country in general has had peace.

If order and peace remain for some generations in this region, there is no reason to think the Mexican of the plateau would not respond to education, which already has had a healthy beginning, with encouraging results. It should be remembered that he lives in a land where the climate is wholesome and the nights are cool enough to be invigorating.

Granted a government that will keep order, water could be stored in the Sierras here, as in our own mountains. This irrigation could greatly increase agriculture. Even without irrigation there can probably be some dry farming, but it should be remembered that probably 95 per cent or more of the plateau land is fit only for the ranch. The Cárdenas program called for an expendi-

ture of 50,000,000 pesos on irrigation in Mexico between 1934 and 1940. It is one thing to spend government money and another to do it effectively.

It is not likely that irrigation in this plateau will make Mexico an exporter of foods. It now imports some foods from the United States, the kinds and quantities varying with Mexican crops and business. Increased prosperity in Mexico means mines and a bigger home market.

THE COLORADO PLATEAUS

The northwestern part of this region, called the Colorado Plateau or Plateaus, has had a different geological past from that of the filled-basin area just described. The strata, so nearly horizontal in the Edwards Plateau, so broken and tilted in the Trans-Pecos, are here again nearly horizontal. But the rock is broken by faults, and many wide areas, hundreds or thousands of square miles in extent, have been lifted up to various heights. Each differs in height from its neighbor and bears a different name — Kaibab Plateau, Kanab Plateau. High cliffs often separate these many plateaus from each other. The rivers cutting into these high plateaus have made wide, deep canyons, among the deepest in the world, but one may travel over the plateau surface for long distances without any suggestion of being on high land or near deep canyons.

The two-hour railroad journey from Williams to the Grand Canyon takes you across a gently rolling country, past pine forests, sheep ranches, and prairie-dog towns, with no inkling of either elevation or canyon. Even a quarter of a mile from the Grand Canyon brink, the view from the top of a forest ranger's tower shows only a wide, level expanse of treetops, with no hint that the world's deepest valley is within rifle range.

This difference in structure of filled basins and high plateaus cut by canyons makes a very great difference in temperature and tree growth. In the lands of fault-block mountains and filled basins the mountains are narrow, with sharp ridges or sharp peaks. Therefore there is very little room for forests at the elevation where increased rainfall and decreased temperature produce tree growth. On the contrary, the Colorado Plateaus, with their wide areas at the top, have room for thousands of square miles of forest, and in some places the valleys are as sharp at the bottom as the peaks of the filled-basin country are sharp at the top. Both types of landscape have the entire series in the vegetative range from the poor pasture of near-desert at low elevations to good forest at high elevations.[23] The journey on the Santa Fe Railroad from the Rio Grande over to the Little Colorado River shows the sequence

[23] Botanists revel in the way the climate in the Colorado Plateau separates the plants into zones, one above another. These zones come close together on a steep slope where the climatic gamut is quickly run and Dame Botany is compelled to keep her classes close together.

First zone: 3000 to 5000 ft. Cottonwood and cactus and yucca. This is in the deep canyons. Cottonwoods are along the streams; the cactus and yucca are scattered along at intervals with a little bunch grass and dwarf forms of sagebrush and greasewood.

Second zone: 5000 to 6000 ft. Sagebrush and greasewood. Here these desert plants are bushes from 4 to 5 ft. high, sometimes thick enough to make travel difficult.

Third zone: 6000 to 7000 ft. Piñon, the nut-bearer, and juniper, an evergreen bush — 10 to 15 ft. high, and scattered.

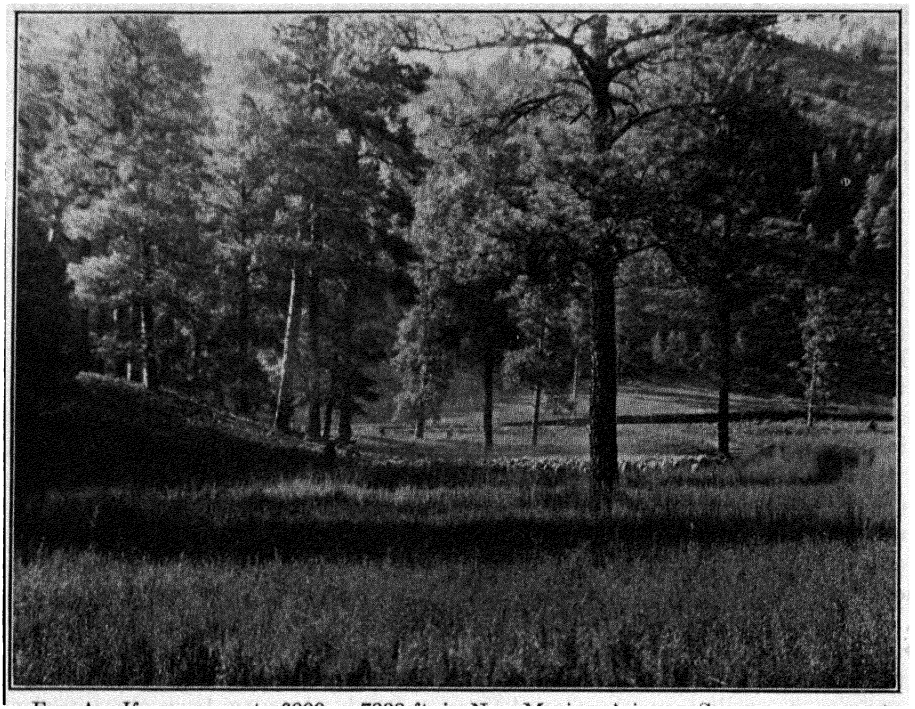


FIG. A. If you go up to 6000 or 7000 ft. in New Mexico, Arizona, Sonora, you come to beautiful open pine forests like this. Note the shepherd and his flock of sheep getting summer living in the open glades. (Courtesy U.S. Forest Service)

of vegetation. As the train climbs up from the Rio Grande, one looks back upon the river valley and sees it as a streak of green trees and alfalfa in a brown and yellow land. For many miles up from the river the train passes through bunch grass standing on bare ground. For miles no houses are seen, no crop — only a cow country where Hereford cows (beef breed) and their calves wander in a desolate land. Still climbing upward, we enter the piñon country, and then an open forest of small pine trees. We have passed the dry timber line (nearly 7000 feet). Piñons and cedars are 20 feet high and give the impression of a forest. Trains loaded with good logs stand on a branch line. They have come from the Zuñi Mountains, which stand on the plateau to the south.

From this elevation of 7200 feet the downward journey begins. The railroad goes down a branch of the Colorado. Again the vegetation changes from

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Fourth zone: 7000 to 8500 ft. Yellow pine, solid forests of pine trees, standing far apart, making a park landscape of great beauty.

Fifth zone: 8500 to 10,000 ft. Here are deep snows and cool summer days, showers, and springs of water. Here, therefore, is the Engelmann spruce, a Northern tree, which often attains saw-log size. In the open spaces is a rank growth of gooseberry, raspberry, grass, and flowers in surprising profusion. Much of this timber, however, is totally inaccessible because the mountaintops and mesas on which it grows are surrounded by labyrinths of rough land.

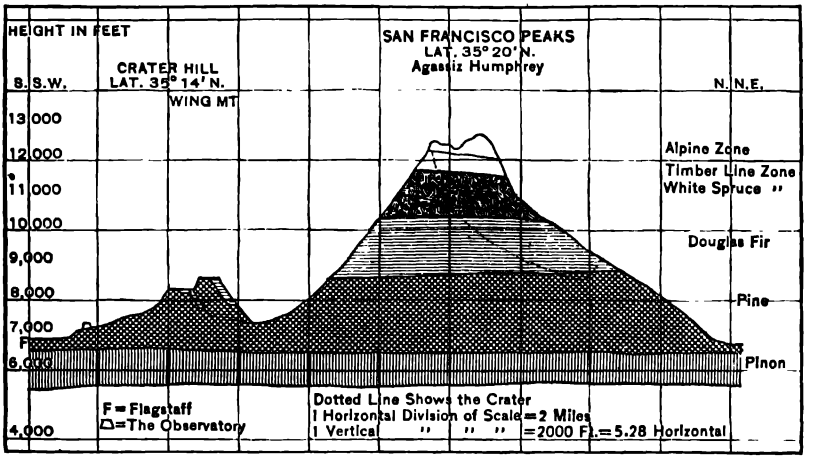

FIG. A. The San Francisco Peaks, built up by volcanic work on the treeless plateau, show a fine example of the zoning of vegetation. (From Isaiah Bowman, *Forest Physiography*)

big piñon to little piñon, then no piñon, then good grass, bunch grass, no bunch grass, but only scattering grass and small bushes and never a field to be seen in scores of miles. A few ranch houses miles apart stand beside windmill reservoirs that store water for the herds, which find in this dear-bought water their only solace from the shadelessness of the sun-scorched range.

THE GRAND CANYON

The world of science and travel finds the Grand Canyon of the Colorado the most interesting thing in the Colorado Plateaus. The United States Government has preserved the canyon by making it a park, a good automobile road now reaches it, and the Santa Fe Railroad has made it accessible by building a branch-line railroad to its brink. Even an invalid may make the journey to see the Grand Canyon. One needs to have only time and money. The tourist may live in comfort in good hotels that are well supplied with water brought more than 100 miles in tank cars, and with food assembled from almost half of the United States, so unproductive is the plateau itself. Automobiles make tours along the rim of the canyon. Cowboys, bravely dressed but thoroughly tame, harmless, helpful, and kind, lead forth trains of hand-picked mules upon which even the tenderfoot may safely ride down an appalling-looking trail. The trail is so steep and narrow that the mules seem to be going down a series of zigzag ladders. After three hours the bottom is reached, and there at the mouth of a side ravine one looks upon the waters of the river that has carved this marvel of valleys. Coronado, one of the first white men to see the Grand Canyon, said that the river had banks that "reached three or four leagues into the air, and were broken into pinnacles higher than the tower of the Cathedral of Seville."

This river, loaded with sand, red with mud, and therefore hiding its depth,

roars over rapids, comes around a bend of rock where man could find no foothold, swirls on, foaming as it disappears around another wall of rock. Looking at the mighty creator of the canyon, one muses upon the intrepid valor of Major Powell, one-armed veteran of the Civil War, who in 1869, taking his life in his hands, had the amazing courage to get into his boat and enter this gorge,[24] which extends for hundreds of miles. From this hazardous trip there could scarcely be any returning except after a safe passage — or did he know enough about erosion and geology to know that the river really has worn a course that could be navigated, though with risk?

As you stand upon the canyon's rim and look down, you see that the Grand Canyon is not just a big hole in the ground. It is a steep and narrow valley with serrated edges where huge rocks stand in strange and fantastic forms. You are astonished to see red, white, green, brown, and black rocks. You may be a visitor from the Atlantic Coast or from the Pacific Coast, but never before have you seen rock formations with color like this. Looking into the canyon, you see a plateau part way down and you want to hurl a stone upon it. The stone sails out and then down, down, and finally hits the cliff almost directly below where you are standing. That plateau must be much farther away than it appears to be. You look closely and perhaps you see a moving speck. Your field glass reveals a man on horseback. The plateau is 3000 feet below you, not just within a stone's throw, as you had supposed. Now the immensity of the canyon begins to dawn upon you.

You can sit in one place all day and make new discoveries, as the moving sun throws light where the cliffs had thrown shadows, and new shadows add blue haze where white light had been. Castles and cathedrals, ships and fortresses, river, ridges, buttes, cliffs, and valleys change before your eyes. Then the next day you can sit somewhere else and see a different series of these moving pictures of nature. To many the Grand Canyon, as an emotional experience, is greatest in the gathering dusk of evening. Then red, white, brown, green — all colors — fade in the hazy shadows; pinnacle and cathedral lose their form, and distance multiplies immensity. You think that you can hear the river grinding its granite bed. While distances across the canyon appear to grow greater, you know that this great gorge from which you have just climbed with such effort is a narrow valley and therefore that it is one of the youngest of valleys, not one of the oldest. Old valleys are wide, not narrow. They have gentle slopes, not steep walls. What is time? And there are the abandoned holes of the miners by the trail and that cliff-dweller's ruined house you saw far above you on the canyon wall in the afternoon. Where is he, and the nomad from whom he fled to that refuge? And how long shall we, the wasters, stand triumphantly on the brink?

The formation of this world wonder is explained by the character of the rock. As the stream saws its way down through the nearly horizontal strata, the rocks stand up almost like the side of a pile of lumber. If there is a soft layer beneath a hard layer, the soft part is worn away more easily, and this undermines the hard layer so that the bottom of the hard layer goes as quickly

[24] The party consisted of ten men with four boats. Three men deserted, seeking safety they did not find. They disappeared without trace.

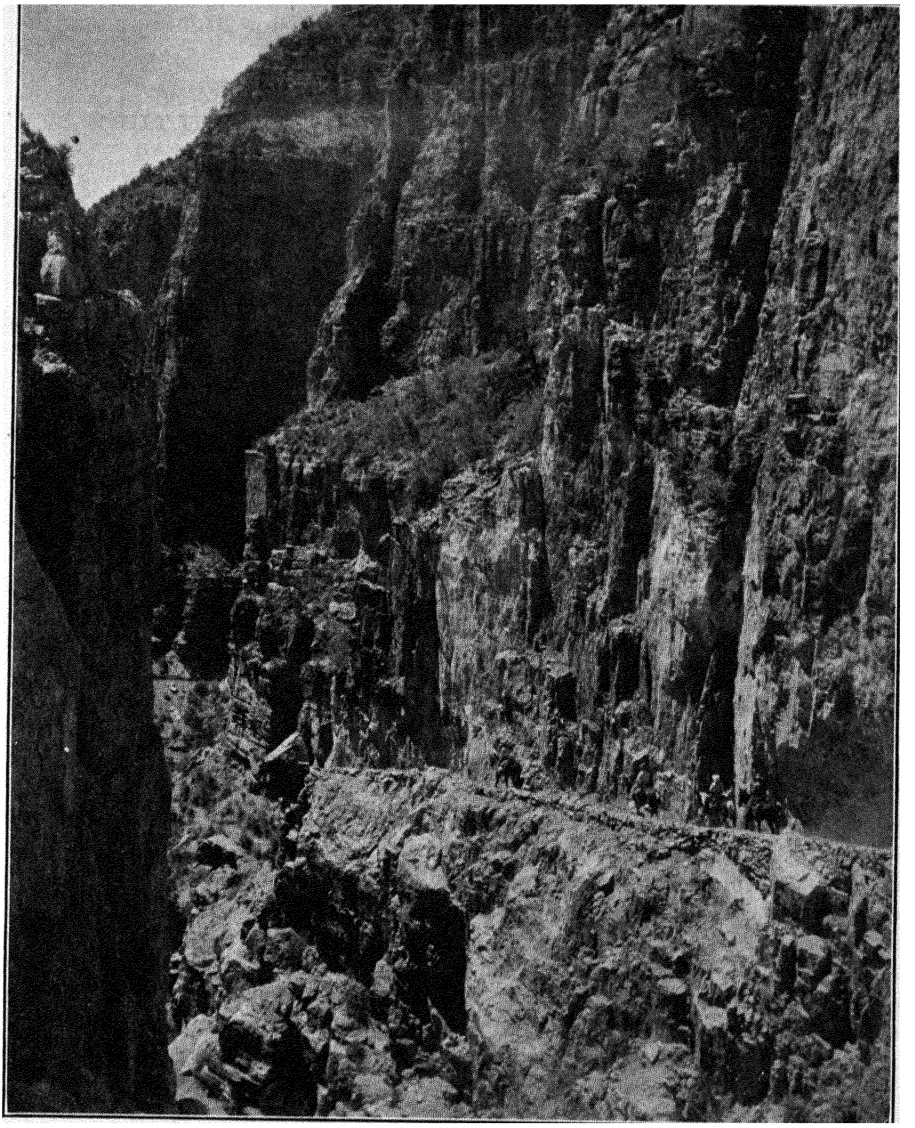

FIG. 567 A. One of the spectacular trails in the heart of the Grand Canyon National Park. The National Park Service has done much to make the wonders of the West available to those who can ride horseback, and even to those who go in automobiles. (Courtesy Atchison, Topeka, & Santa Fe R.R.)

as the top of it. This process of earth sculpture makes buttes and straight-walled canyons in lands of horizontal rocks. Thus the walls of the Grand Canyon fall away in sheer cliffs. A man may travel for 20 miles along the rim and find no place where he can climb down.

OTHER CANYONS AND THE ANCIENT CULTURE OF THE PLATEAU

The plateau over which the tourist goes de luxe is not the whole of the plateau, nor is the Grand Canyon the whole of the canyons. These famous parts of the region are indeed but a small corner of the whole. The Colorado Plateaus section alone is as large as the United Kingdom. Its western edge overlooks the Arizona Desert from the Grand Wash Cliffs, a wall of rock 1000 to 2000 feet high and 150 miles long and which continues to the south under other names.

To the eastward, plateau rises above plateau with bare rock wall hundreds of feet high and with tops of hundreds, and even thousands, of square miles in extent. Through all this high, dry land of flat, hard rocks are the deep-sawn canyons of the Colorado and its several branches.

These various streams come together above the Grand Canyon. We may think of that canyon as a wrist and of the other canyons as outstretched fingers. The Grand Canyon is from 4000 to 5500 feet deep and 217 miles long, but before reaching it the Colorado flows through the Marble Canyon, 65 miles long, and the long Glen Canyon. The Dolores River reaches the Grand River (a branch of the Colorado) in a canyon 2000 feet deep, and if America had no other canyons like those of the Green River or the Grand River, they would be considered world wonders. Because travel is so difficult, this is the least-known part of the United States. Inaccessibility (natural protection) is probably the reason why it is the site of the oldest civilization and the place where Indian culture in this country reached the most advanced stage. Building a civilization takes time, much time. Rare is the human mind that devises something really new, and slow is the process of teaching it to others, of building upon it and improving it until finally industries, arts, crafts, customs, order, and law have evolved. Many successive generations must continue their efforts before culture reaches an advanced stage.

The situation of cliff dwellings in canyon walls or of the pueblo on the mesa top gave the necessary natural protection. It is far back in the plateau that the greatest ruins are found, and these ruins show evidences of the most advanced native culture.[25]

THE NAVAJO COUNTRY

The Navajo country may be taken as a type of the central part of this region, indeed of most of it. The term "Navajo country" is applied to the

[25] Dr. J. Walter Fewkes, former chief of the Bureau of American Ethnology, reported the finding of pre-Columbian pottery with paintings showing a game of draw poker (1923 Meeting, American Ass'n for the Advancement of Science).

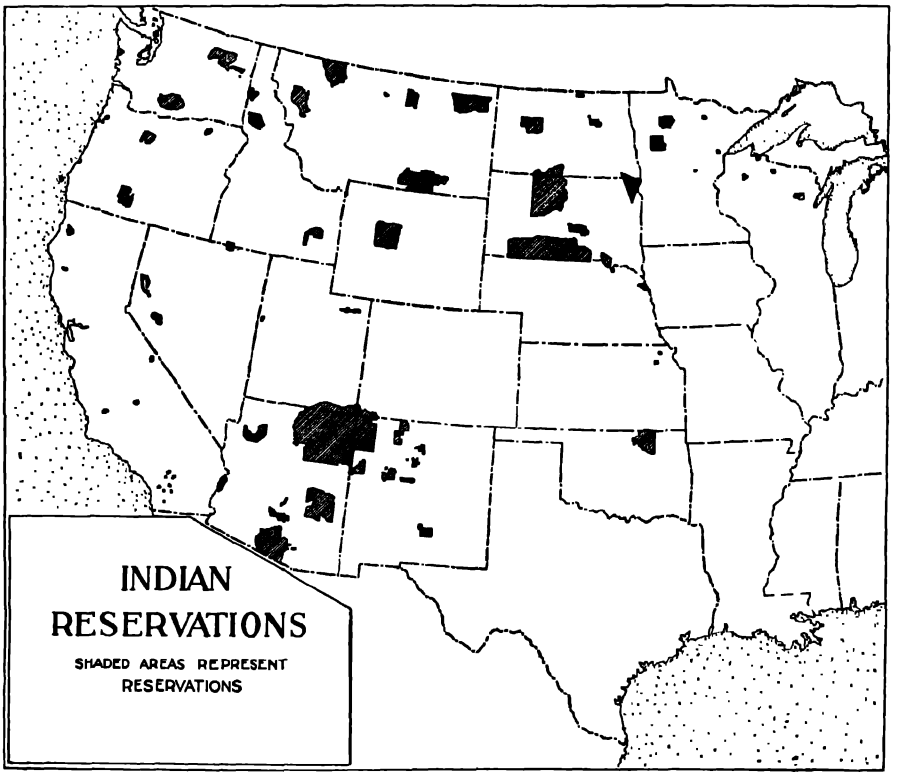

FIG. A. Indian reservations do not occupy the best land in America.
(Courtesy U.S. Forest Service)

land between the Colorado River and its two branches, the Little Colorado and the San Juan. It embraces the northeastern corner of Arizona, the northwestern corner of New Mexico, and a little of southern Utah. It is a land of high plateau, flat-topped mesa, high, inaccessible butte, sharp, deep canyon, and sandy and gravelly wash. The wash is a valley or canyon whose rock bottom is covered to a depth of 10 or 100 feet with sand, soil, or gravel, over which the water rushes after rain. Above the plateau stand volcanic remains, sometimes cores of old volcanoes, sometimes wide runs of lava which make level-topped uplands, with steep faces.

As the general level of this perpendicular plateau country is about 5500 feet, with canyons cut 2500 feet into it, the climate at its tops is like that of the Colorado mountains, and at its bottom it is like that of the Navajo Desert. Here, as elsewhere, elevation is a great controller of rainfall. Holbrook on the Little Colorado, elevation 5000 feet, has a rainfall of 9 inches. At Flagstaff, 6900 feet, the rainfall is 23 inches. The rain has two seasons, one in the winter and one in July and August, with April, May, and June as the driest season of the year. The summer rain comes as showers, which is the common desert type of rain. It is caused by the air near the surface being heated by

the hot earth. The heat expands the air. This makes it light, and it rises. As it rises the hot air is cooled sometimes to the point of condensing its moisture, which falls as rain, sometimes coming down in torrents for a few moments. The climate further troubles man because the scanty rainfall, like the rainfall in all arid lands, is very fickle and irregular. Hundreds of square miles of the Navajo country have no cover of vegetation.[26] The ripping waters and the hard winds have carried away every vestige of soil, and the surface consists of bare rock and blowing sand. Patches of this bare rock are scattered almost everywhere.

It is often only thirty minutes from sunshine to sunshine, during which time it has clouded up, rained half an inch, and cleared off. As a result of downpours, water rushes down steep slopes and carries gravel, sand, or stones, which fill up watercourses with wide, level stretches of sand and gravel washes.

These watercourses are nature's roads. Sometimes the traveler innocently going over them with his pack train is overtaken by a rush of water from a shower miles upstream, and he has to scramble in order to escape drowning — if he does escape. The whole Southwest is well supplied with authentic stories of drownings in desert washes. You cross the dry wash every day for a thousand days, and then a wall of water overwhelms you as suddenly as a puff of wind takes off your hat. The Colorado River sometimes rises 20 feet in a night.

The larger streams and their branches have cut the country into a labyrinth of canyons. The land of the Navajos is pre-eminently a horseback country. A pack train is the only type of outfit which offers freedom of movement. Quicksand is to be expected in all stream channels and in the beds of "dry lakes." [27]

Water is scarce in this Navajo country. As one enters it from Gallup, New Mexico, on the Santa Fe R.R., there is only one permanent stream in the first 35 miles. Plateaus with an area of 100 and 200 square miles without any permanent water are very common. Only 5 per cent of the Navajo country has permanent streams, and man and beast must therefore depend upon pools, water pockets, or tanks — left in the beds of streams and carefully enclosed by artificial dams. The Navajo has a saying "Where feed (grass) is, there is no water; where water is, there is no feed." He says this because the water is in a few deep canyons and the grass is far away on the higher land where winter snow gives moisture for grass growth in spring.

In this country are about 22,500 square miles of the Hopi and Navajo Indian reservations, containing about 43,000 Indians, 500 whites who belong there because of their official relationships with the Indians, and a number of

[26] As to bare places, John C. Van Dyke, in his book *The Desert* (Charles Scribner's Sons, 1930), says of the Painted Desert northeast of the Grand Canyon: "In spots not a living thing of any kind is seen, where there is nothing but dry rock in the mountains and dry dust in the valley."

[27] All crossings should be tested before wagons or pack trains go over. Owing to the possibility of a sudden rise of water, streams and dry washes should be crossed at the earliest favorable opportunity and camp should never be pitched on the floor of even the most innocent-looking dry stream bed or "adobe flat." (Herbert E. Gregory, *The Navajo Country*, U.S. Geol. Survey, *Water Supply Paper* 380, 1916)

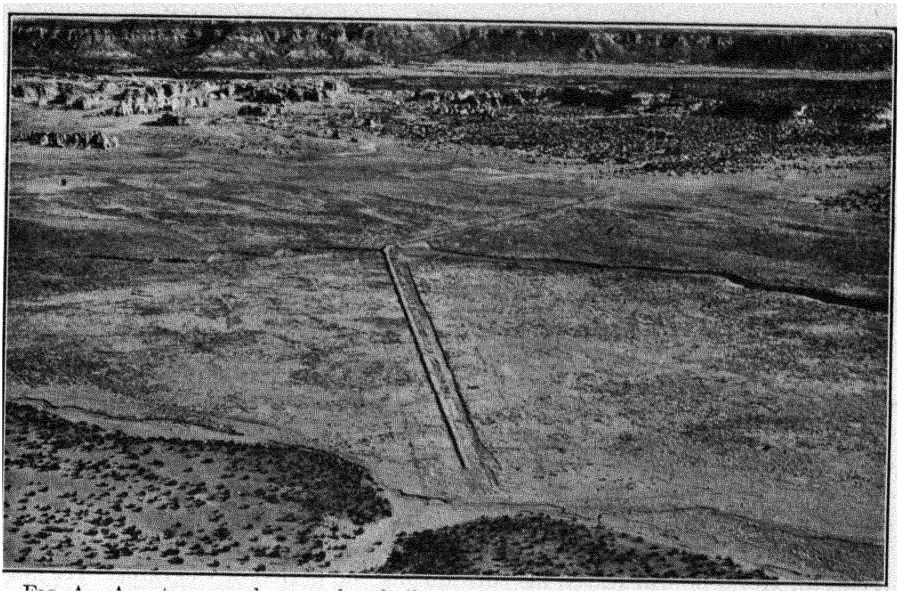

FIG. A. A water-spreader — a dam built across a valley to spread thundershower runoff floods over the whole surface of the valley by means of openings in the dam. Thus overpastured lands restore themselves. There is a record of 70 bu. of Hopi corn on an acre watered thus. Immediate foreground, juniper bushes, characteristic of the first tree growth as one goes upward. Background, perfect example of one of the things that they call a mesa in the Southwest. (Courtesy U.S. Soil Cons. Service)

interloping whites who have no right to be there. Life in this country is hard. Professor Gregory calls it heroic.[28]

THE HOPI AND HIS FARM

The Hopi people of the reservation still live in the fortress-homes built by their ancestors on the easily defended tops of the mesas. The situation afforded protection against the hungry raiding nomad tribes, probably Apache and Navajo. Here for many centuries two great treasures have been guarded with most solicitous care — the big jars of water and the piles of corn. These two treasures, if sufficient in quantity, would enable the walled village to live through any siege that men of bows and arrows (Stone Age) could maintain. The spring or water hole from which the water jars were filled was usually far away, perhaps a mile or even more, and often down hundreds or thousands of feet from the lofty village. The cliff-dwellers worked hard in carrying the jars of water on their heads or shoulders from the spring to the village, but in the jars was the issue of life.

To these people climate was, and is, fate. In their mythology, folklore,

[28] "To my mind the period of direct contact with nature is the true 'heroic age' of human history, an age in which heroic accomplishment and heroic endurance are parts of the daily routine. The activities of people in this stage of progress deserve a place among the cherished traditions of the human race." — *Ibid.*

and religion, water is ever uppermost. The snake dance is really a prayer for water. The dancers grasp the loose skin of live rattlesnakes with their teeth and carry the serpents around, importuning the snakes to tell the spirits of the underworld the needs of men.

The Hopis may be classed among the world's driest farmers. They have developed plants from which we shall yet profit greatly and devices that we will adopt if we ever adjust ourselves to the dry environment half as well as they have done. One of the Hopi's great sources of mirth is the occasional "expert" who comes out from Washington to tell him how to grow crops. The way a Hopi can make corn, beans, melons, and squashes grow in a sand dune is amazing. Most of the farming is irrigation farming — flood irrigation. Often to get water for his crops an Indian must go 10 or more miles from his village to his fields.

In May or June, a few weeks before the summer rains are due, he goes to some wash and there plants corn about 12 or 15 inches deep. There is sufficient moisture at that depth to sprout it, so that it will be well established before the season of July rains. Planting is a great Indian ceremonial. When the rains flood the wash, the corn gets one or two good soakings. If water runs too deep, the corn may be buried, or it may be washed away. So if he is a careful Hopi, he will watch his corn during the period of the rains. He may be seen wading around in the water, with shovel or stick or even with bare hand building little dams and opening little channels, and sticking in brush barriers so that the water may wet his corn but not bury it or wash it away. The remains of old dams to impound the water near the cliff dwellings indicate that a thousand years ago the Hopi ancestor raised his corn and cotton by the same methods. Some strains of the desert Indians' corn are little more than knee-high, but with good moisture yield 70 bushels an acre. This corn needs no great expanse of leaves in so dry a climate. Hopi corn has become a wonder by developing a long underground stem so that it can be planted deep for moisture and then sprout through three or four times as much earth as the corn of Illinois.

When the Spaniard came to the Indian's country, he brought great gifts — sheep, goats, cows, horses, and donkeys to a people who had only dogs and fowls. Sheep have been a boon to the Hopi, and even more of a boon to the nomad Navajo, the traditional enemy of the Hopi. Now the Navajo follows his flocks and herds from water hole to water hole, and derives from them his chief support by selling wool, lambs, cattle, hides, pelts, and blankets.[29] Many years ago the Navajos learned the art of weaving from the Pueblo Indians, and Navajo blankets today (as well as their cheaper imitations) are

[29] The movements of the Navajo Indians have been classified as follows:

1. Movements between summer and winter pastures
2. Seasonal moves controlled by temperature conditions
3. Temporary moves for summer farming, usually to river valleys
4. Winter moves to convenient fuel
5. Moves after showers for pasture in places recently moistened
6. Moves in search of water for domestic purposes and for animals
7. Autumn moves for piñon nuts and for peaches
8. Moves for social reasons

See J. W. Hoover, "Navajo Nomadism," *Geographical Review*, July, 1931, pp. 429–45.

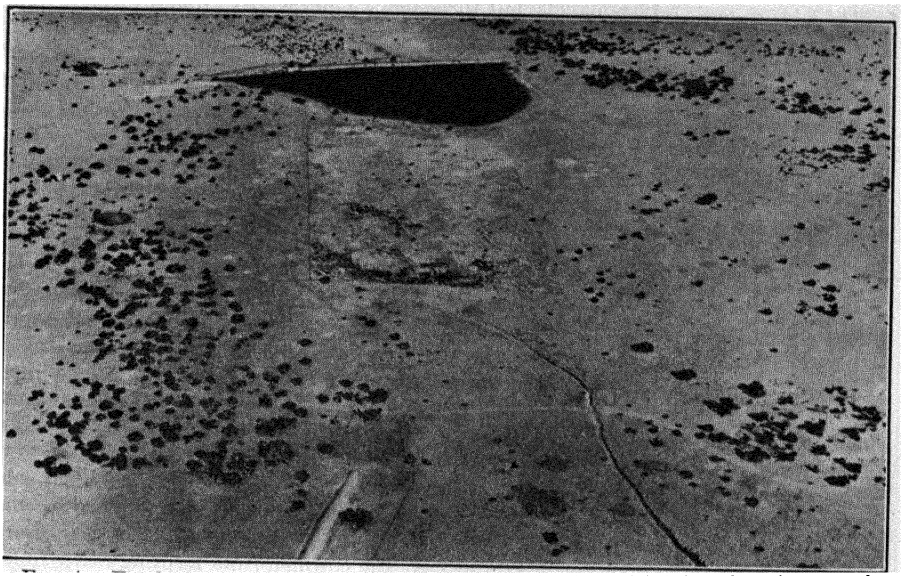

FIG. A. Earthen dam to store shower water for animals to drink in otherwise waterless upland pastures. Erosion from overpasturing (see gully at lower right) usually fills these reservoirs with earth in a short time. The square area above the reservoir was fenced and therefore not pastured. The grass stops the wash, as can be seen by the delta formation at the upper end of the free-growing grass. You there see the process by which nature stopped erosion, caught mountain silt, and turned valleys into wide, almost level, fertile grassy plains. Flood waters crept harmlessly through the grass or rushed across it, also harmlessly. (Courtesy M. E. Musgrave, Nat'l Resources Board)

famous. The Navajos learned a little about farming from the Hopis, and the United States Government Indian Service is trying to teach them better methods. In caring for their flocks and their patches of corn, beans, squashes, and melons, and in weaving their blankets, the Navajo men, women, and children lead a busy life.

LET THE INDIAN ALONE!

The two great hopes for these native people are that we shall not steal their land again and that we shall let them continue to be Indians and not force them too rapidly into the ways of the white man. While helping the Indians we should be very careful that we do not destroy their civilization and their very remarkable culture. It would be all too easy to destroy what they have developed — a fate that has happened to most of the primitive peoples of the world who have come in close contact with the white man.

The observation and recommendations of Theodore Roosevelt as he visited these people may well be quoted at length:

We dropped down from Buckskin Mountain, from the land of the pine and spruce and of cold, clear springs, into the grim desolation of the desert. We drove the pack-animals and loose horses, usually one of us taking the lead to keep the trail. It was a

land of wide spaces and few people, but those few we met were so friendly and helpful that we shall not soon forget them.

At noon of the first day we had come down the mountain-side, from the tall northern forest-trees at the summit, through the scattered, sprawling piñon and cedars of the side slopes, to the barren, treeless plain of sand and sagebrush and greasewood. At the foot of the mountain we stopped for a few minutes at an outlying cow-ranch. There was not a tree, not a bush more than knee-high, on the whole plain round about. The bare little ranch-house, of stone and timber, lay in the full glare of the sun; through the open door we saw the cluttered cooking utensils and the rolls of untidy bedding. The foreman, rough and kindly, greeted us from the door; spare and lean, his eyes bloodshot and his face like roughened oak from the pitiless sun, wind, and sand of the desert. After we had dismounted, our shabby ponies moped at the hitching-post as we stood talking. In the big corral a mob of half-broken horses were gathered, and two dust-grimed, hard-faced cow-punchers, lithe as panthers, were engaged in breaking a couple of wild ones. All round, dotted with stunted sagebrush and greasewood, the desert stretched, blinding white in the sunlight; across its surface the dust-clouds moved in pillars, and in the distance the heat-waves danced and wavered.

During the afternoon we jogged steadily across the plain. . . . On the other side of the plain, two or three miles from a high wall of vermilion cliffs, we stopped for the night at a little stone rest-house, built as a station by a cow outfit. Here there were big corrals, and a pool of water piped down by the cowmen from a spring many miles distant. On the sand grew the usual desert plants, and on some of the ridges a sparse growth of grass, sufficient for the night-feed of the hardy horses. The little stone house and the corrals stood out, bare and desolate, on the empty plain. Soon after we reached there a sand-storm rose and blew so violently that we took refuge inside the house. Then the wind died down; and as the sun sank towards the horizon we sauntered off through the hot, still evening. There were many sidewinder rattlesnakes. We killed several of the gray, flat-headed, venomous things; as we slept on the ground, we were glad to kill as many as possible. Except this baleful life there was little save the sand and the harsh, scanty vegetation. Across the lonely wastes the sun went down. The sharply channeled cliffs turned crimson in the dying light; all the heavens flamed ruby-red, and faded to a hundred dim hues of opal, beryl and amber, pale turquoise and delicate emerald; and then night fell and darkness shrouded the desert.

The landscape had become one of incredible wildness, of tremendous and desolate majesty. No one could paint or describe it save one of the great masters of imaginative art or literature -- a Turner or Browning or Poe. The sullen rock walls towered hundreds of feet aloft, with something about their grim savagery that suggested both the terrible and the grotesque. All life was absent, both from them and from the fantastic barrenness of the boulder-strewn land at their bases. The ground was burned out or washed bare. In one place a little stream trickled forth at the bottom of a ravine, but even here no grass grew — only little clusters of a coarse weed with flaring white flowers that looked as if it throve on poisoned soil. In the still heat "we saw the silences move by and beckon." The cliffs were channeled into myriad forms — battlements, spires, pillars, buttressed towers, flying arches; they looked like the ruined castles and temples of the monstrous devil-deities of some vanished race. All were ruins — ruins vaster than those of any structures ever reared by the hands of men.

There were little water-holes, usually more or less alkaline, ten or fifteen miles apart. At these the Navajos were watering their big flocks of sheep and goats, their horses and donkeys, and their few cattle. They are very interesting Indians. They live scattered out, each family by itself, or two or three families together; not in villages

like their neighbors the Hopis. They are pastoral Indians, but they are agriculturists also, as far as the desert permits. Here and there, where there was a little seepage of water, we saw their meager fields of corn, beans, squashes, and melons. All were mounted; the men usually on horses, the women and children often on donkeys. They were clad in white man's garb; at least the men wore both shirts and trousers and the women bodices and skirts; but the skirts were often green or red or saffron or bright blue; their long hair was knotted at the back of the head, and they usually wore moccasins. The well-to-do carried much jewelry of their own make.

This northern Arizona desert was less attractive than the southern desert along the road to the Roosevelt Dam and near Mesa, for instance; for in the south the cactus growth is infinitely varied in size and in fantastic shape.

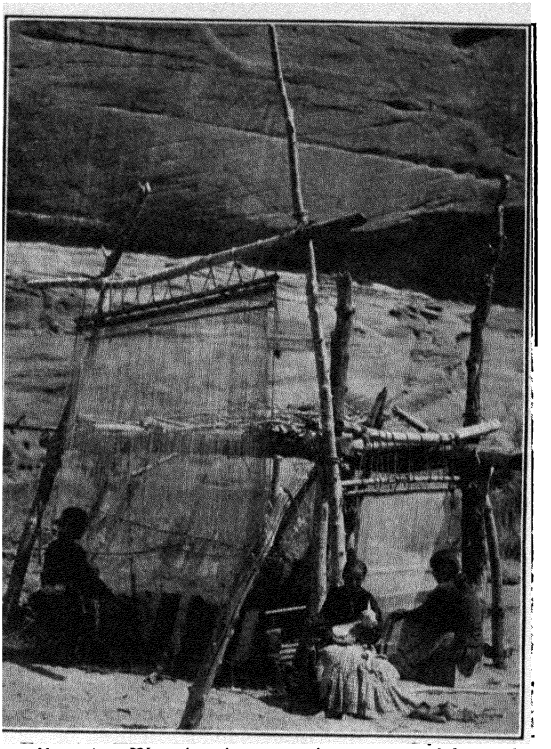

FIG. A. Weaving is an ancient art, and here the Navajo blanket-weavers in the Canyon de Chelly, Arizona, are weaving their good blankets in the ancient way, but the dress of the woman holding the kid pays tribute to the speed of the white man's mechanical loom. (Courtesy Atchison, Topeka & Santa Fe R.R.)

Soon afterwards a Navajo family passed camp; they were traveling in a wagon drawn by a mule and a horse, and the boys of the family were driving a big herd of sheep and goats. The incident merely illustrated the real progress the Indians are making, and how far they already are from pure savagery.[30]

Next day at noon we climbed the steep, narrow rock-ridge on whose summit rise the three Hopi towns, at one of which, Walpi, the snake-dance was to be held. The clustered rock villages stood in bold outline, on the cliff-top, against the blue sky. In all America there is no more strikingly picturesque sight. We walked up the precipitous cliff-trails to the mesa-top, and visited the three villages thereon. We were received with friendly courtesy — perhaps partly because we endeavored to show good manners ourselves, which, I am sorry to say, is not invariably the case with tourists. The houses were colored red or white; and the houses individually, and the villages as villages, compared favorably with the average dwelling or village in many of the southern portions of Mediterranean Europe. Contrary to what we had seen in the Hopi village near Tuba, most of the houses were scrupulously clean; although the condition of the streets — while not worse than in the Mediterranean villages above referred to — showed urgent need of a crusade for sanitation and elementary

[30] We regret that the hero of San Juan Hill used that word of ignorance. We think that he was in a hurry.

hygiene. The men and women were well dressed, in clothes quite as picturesque, and quite as near our own garb, as the dress of many European peasants of a good type. There were several rooms in each house; and the furniture included stoves, sewing-machines, chairs, window-panes of glass, and sometimes window-curtains. There were wagons in one or two places, for a wagon-road has been built to one end of the mesa; and we saw donkeys laden with fagots or water — another south-European analogy.

Altogether, the predominant impression made by the sight of the ordinary life was that of a reasonably advanced, and still advancing, semi-civilization; not savagery at all. There is big room for improvement; but so there is among whites; and while the improvement should be along the lines of gradual assimilation to the life of the best whites, it should unquestionably be so shaped as to preserve and develop the very real element of native culture possessed by these Indians — which, as I have already said, if thus preserved and developed, may in the end become an important contribution to American cultural life. . . . The effort should be to develop the existing art — whether in silver-making, pottery-making, blanket and basket weaving, or lace-knitting — and not to replace it by servile and mechanical copying. This is only to apply to the Indian a principle which ought to be recognized among all of our people. A great art must be living, must spring from the soul of the people; if it represents merely a copying, an imitation, and if it is confined to a small caste, it cannot be great.

Of course all Indians should not be forced into the same mold. Some can be made farmers; others mechanics; yet others have the soul of the artist. Let us try to give each his chance to develop what is best in him. Moreover, let us be wary of interfering overmuch with either his work or his play. It is mere tyranny, for instance, to stop all Indian dances. Some which are obscene, or which are dangerous on other grounds, must be prohibited. Others should be permitted, and many of them encouraged. Nothing that tells for the joy of life, in any community, should be lightly touched.

As an example, take the case of these Hopi mesa towns, perched in such boldly picturesque fashion on high, sheer-walled rock-ridges. Many good people wish to force the Hopis to desert these towns, and live in isolated families in nice tin-roofed houses on the plains below. I believe that this would be a mistake from the standpoint of the Indians — not to mention depriving our country of something as notable and as attractive as the castles that have helped to make the Rhine beautiful and famous. . . . Our own ancestors lived in villages as filthy not three centuries ago. The breezy coolness of the rocky mesa-top and the magnificent outlook would make it to me personally a far more attractive dwelling-place than the hot, dusty plains. Moreover, the present Hopi house, with its thick roof, is cooler and pleasanter than a tin-roofed house. . . . Give him a chance to utilize his own inherent sense of beauty in making over his own village for himself. Give him a chance to lead his own life as he ought to; and realize that he has something to teach us as well as to learn from us.

Arizona and New Mexico hold a wealth of attraction for the archaeologist, the anthropologist, and the lover of what is strange and striking and beautiful in nature. More and more they will attract visitors and students and holiday-makers.[31]

Since former President Theodore Roosevelt wrote about it so graphically, this land has changed but little except for the worse. White man's cultural gifts to the Navajo of cattle, sheep, goats, horses, and donkeys have been of questionable ultimate benefit. Unfortunately the Indian does not seem to have been more intelligent in his conduct of pastures than the white men

[31] "Across the Navajo Desert," *Outlook*, October, 1913, pp. 309–17.

have been. That habit of animals toward geometric increase has caused the Navajo herds of sheep and goats to outgrow the range. This has been grossly overpastured, and swift ruin by erosion has begun. It is threatened with ruin as swift and sure and deadly as that described on the upper Rio Grande.

In 1934–35 the United States Government bought nearly 300,000 sheep and goats from the Navajos to reduce soil erosion. The Soil Conservation Service has set out to teach them better methods. We hope they succeed. The *possibilities* of salvation for the pastures of the region are good. The soil, like that of all arid lands, is worked but little and therefore relatively fertile. Mr. M. E. Musgrave of the United States Soil Conservation Service, with whom I have traveled the highlands of New Mexico and Arizona, avers, after many years of study, that in all this Intermountain Plateau Region, natural vegetation will stop injurious erosion if men and beasts will give it a chance. Along with this will come increased pasturage for much of the area.

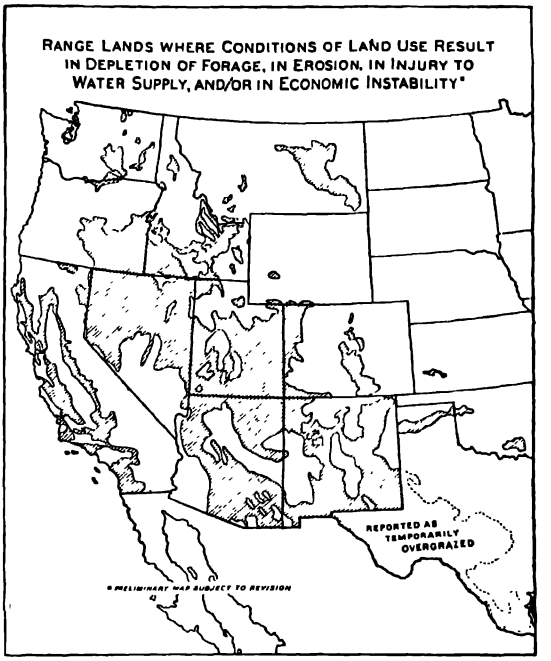

FIG. A. This one of the alarming maps published by the Nat'l Resources Board. It shows the wide reach of destruction illustrated by some of the pictures in this chapter. (Courtesy Nat'l Resources Board)

A LITTLE-KNOWN LAND

It is not surprising that the canyon country of the Colorado drainage is the least-known part of the United States, and that in some of the remote sections the wild stallion still gallops at the head of his bunch of mares. In the '50's and '60's many exploring parties were sent through the country looking for railroad routes to the Pacific Coast. None was found here amid the steep-walled canyons, the greatest barrier to transport in the United States. Railroads, those lovers of the plains, have scrupulously avoided crossing this region. The Santa Fe skirts its southern edge, the Denver and Rio Grande its northern edge. North of Flagstaff, Arizona, there is no railroad for 300 miles, nor is there likely to be one in any predictable time. The country is too profoundly broken and cut up. It was only in 1909 that the white man first saw the greatest natural bridge in the world, the Rainbow Bridge in southwestern Utah, so difficult is the saddle journey to it.

MODERNIZATION

Most of the Colorado Plateau must continue as now, either as the Indian's or as the white man's ranch — a ranch of low productivity. Wide-reaching national forests cover the western and southwestern edge of the Colorado Plateau (Figs. 285 A and 536 A).

Here the elevation contrast, produced by the sudden rise from lower lands, wrings enough moisture from the southwest winds to make large areas of open forest. The prevailing type of tree is Western yellow pine, and this plateau forest of Arizona and New Mexico is said to be the largest pine forest in North America. It lies in the most accessible part of the region.

The first impression one receives is that this land, so nearly devoid of minerals, should be left for national forests, parks, and Indians. But it has resources also for gigantic enterprises of the age of scientific engineering. The rock walls of the canyon are perfect sites for reservoirs in which to impound water for irrigation and power. Some of the water of Boulder Dam may eventually turn wheels a time or two before it gets that far down. Some parts of the upper valleys of the streams in New Mexico and Colorado, Wyoming and Utah, are level enough for irrigation, and ultimately hundreds of thousands of acres within this region may be used for irrigation.

THE ARIZONA HIGHLANDS

The Colorado Plateau is a plateau because the rocks are high above sea level and almost horizontal. Lower than the Colorado Plateau and to the south and southwest of it, where the rocks have been broken into blocks and tipped at considerable angles, we find a different kind of country called the Arizona Highlands. Here the steep faces of the blocks of rock, miles in length, face the plateau, and the gently sloping faces are toward the Pacific. The country resembles the Trans-Pecos Highlands. This land of sharp mountains and valleys of mountain wash is drained by the Gila River and its branches. It is a land of heat, drought, and ranches where many acres are needed for a cow. Some of the lowlands are thick with cactus, while better grass and bushes grow up on the slopes of the mountains and near 4000 feet of altitude good grass studded with oak trees covers the landscape after summer rains. Some of the mountains are high enough to have bits of isolated pine and even spruce upon their crests. At their western edge these highlands merge into the Arizona Desert (see the next chapter), where only isolated mountaintops stick up above the plains of sand and clay which the torrential rains have washed down from the highlands.

These Arizona Highlands have one feature which the Colorado Plateaus do not have — towns, mining towns. Here are Globe, Bisbee, Douglas, and other towns, thriving when copper is high, depressed when copper is low, dead when the copper is gone — such is the fate of the mining-town.[32] Already in

[32] The town of Tombstone is an interesting example. In the '80's it was riotous with metal, and with miners full of money and full of wickedness. Most of the mine shafts are now silent, and the golden days of both money and vice are past. The town has shriveled

this district railroads have been pulled up and sold for old iron, and in some sections the number of abandoned holes the miners have left makes one think of a gigantic abandoned prairie-dog town.

FUTURE TREE-CROP AGRICULTURE

The greatest possibility of increased agricultural production in the Southwestern Plateaus, after irrigable areas are used, is in tree crops, which may be capable of a greater product than that which can come by irrigation. This development is a long way in the future, awaiting increased demand, and improvements in technique, land values, and point of view. It should be pointed out that this region has already made a start in both crop and technique. The piñon pine grows almost everywhere that any tree will grow. It is the first tree at the dry timber line. It grows wild in the drier edge of all forest belts from central Mexico to Utah and Colorado. It is one of nature's great gifts to man. For an indefinite time it has been an important source of food supply in this region. Piñon nuts are coming into world trade, and shipments from New Mexico to Eastern city markets amount to from 1,000,000 to 2,000,000 lbs. annually, 5,000,000 lbs. having been shipped in the peak year of 1915. Most of these nuts were gathered by Indian women and children. Large quantities went to waste or supported myriads of squirrels. Like most of the other fruit- and nut-yielding trees, the piñon is almost certainly capable of great improvement.

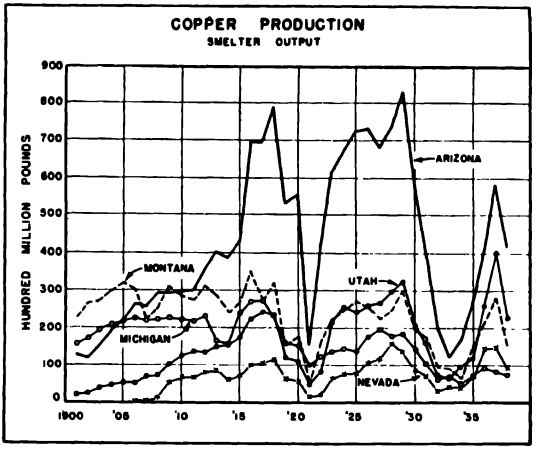

FIG. A. This graph shows that Arizona has become the giant in copper production. It also shows how low the giant can fall when building ceases. Copper is an equipment material. Copper production has moved westward. In 1938 Arizona and Utah produced 58% of the nation's copper. Observe the place of Michigan and Montana — ancient lords of copper. (Courtesy *U.S. Minerals Yearbook*)

The process of flood irrigation developed and practiced for ages by the cliff-dwellers and now practiced by Hopi, Navajo, and the people of the Mexican Plateau in regard to corn, has much greater possibilities when ap-

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to a shadow of its former self. Empty stores and empty houses line the streets, but its last days are not marked by any repentant suburban soft stuff, as in the Colorado Rockies (see page 541). Tombstone elects to die with its boots on, boasting of how tough it used to be, showing its cemetery of notorious gunmen, harlots, dive-keepers. Its people even instituted an annual revival called Helldorado, in which they pretended at least to revive all the ancient vices for a day or two. But alas for Helldorado! After a few years it failed. It was said long ago that "the wages of sin is death," and it seems that in Tombstone the wages of artificial sin was a deficit, which for festivals is about the same thing. Pathetic to relate, the chief sight for visitors other than the above-mentioned cemetery is a *rosebush* of gigantic proportions.

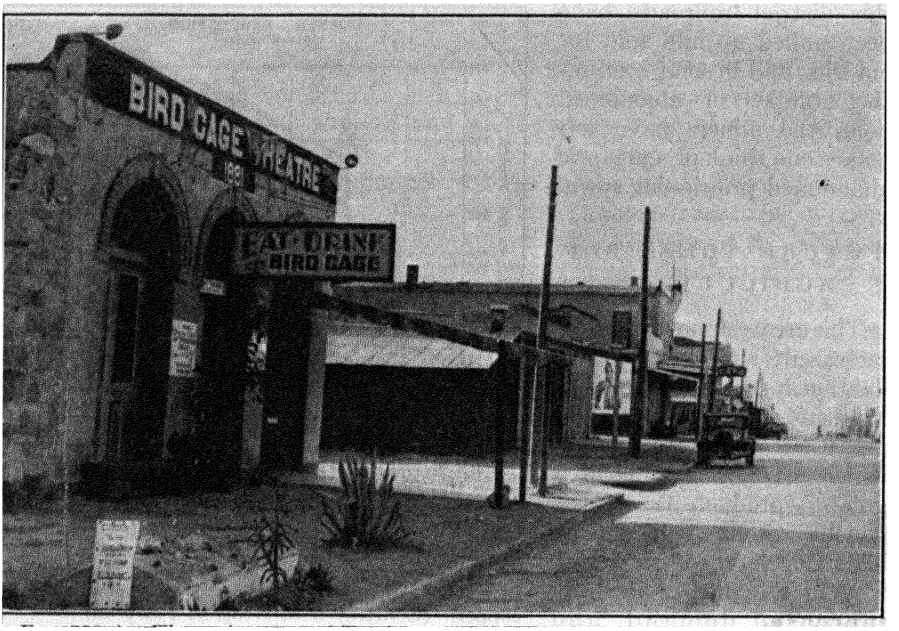


FIG. 580 A. The main street of Tombstone, Ariz., which claimed 10,000 people in 1885, in the wild days of fights and gunmen. In 1938 it claimed only 750 — all tame and safe. In the left foreground is a cement tomb built by a local wag. Imbedded in one side is a beer bottle, in the other, a whisky bottle. It is surrounded by local cacti, and the cardboard headstone bears the legend "1880–85. To the Unknown Dead — too slow on the draw." (Photo by J. Russell Smith)

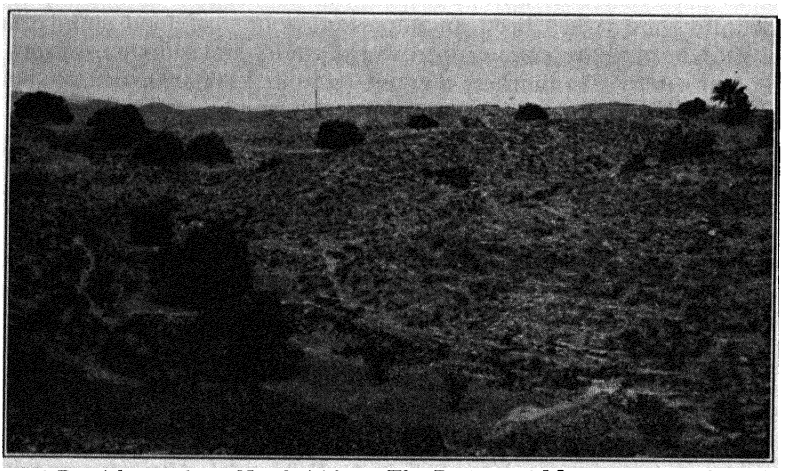
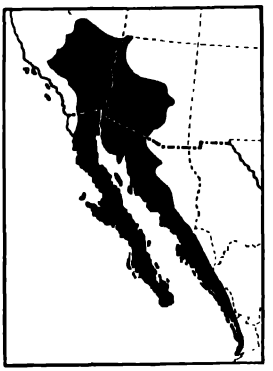


FIG. 580 B. A lesson from North Africa. The Berbers of Matmata, central Tunis, build loose stone dams across gullies (arroyos), which hold rich soil, to be soaked by every rain that makes the gullies run. This supports olive trees of great vigor in a section having rainfall of 10 in. or less. A few centuries after these "primitives" did this, our U.S. Soil Conservation Service is trying to persuade us to do it. (Photo by J. Russell Smith)

plied to tree crops. Plant the trees in the gulches, build loose dams to catch the fertile silt so that summer showers must saturate the earth in which the tree roots stand, and we have the possibilities of tens of millions of crop-yielding trees. This differs but little from the water-spreading now being pushed by the Soil Conservation Service (Chapter 24). A few years ago this might have been called a "pipe dream," but it has been going on for centuries. I have seen it among the Matmata of central Tunis. These Berber tribesmen have worked out by this means an agriculture in a limestone plateau where the rainfall, which comes only in the winter season, is about 7 or 8 inches. Their main crops are olives and dates, scattered up their gulches. The natural conditions seem far less favorable than that produced by the summer rain of our Southwestern Plateaus.

What the possible crops are is now quite unknown. There are native candidates in piñon, mesquite, screw bean, honey locust. Search and investigation alone can tell, but certainly my observation of the splendid, big, prosperous-looking olive trees in the earth collected above loose rock dams in the gulches of Matmata makes me quite sure that there might some day be many millions of fruitful nut, fruit, or bean trees fed and watered by runoff from the showers of our Southwestern Plateaus.

Chapter 28. THE GREAT AMERICAN DESERT



FOR the last hundred years American maps have been showing the Great American Desert in retreat. On great-grandfather's map, the desert made a bold stand almost as far east as the Mississippi Valley. When men learned that Kansas grasslands would grow corn and that Colorado brushlands would feed sheep, maps were changed to accord with the newer knowledge. The Great American Desert has retreated toward the west and southwest, shrinking as it went. Unfortunately, this retreat will not result in an evacuation, for the desert has made a last stand, and we have made the painful discovery that in addition to retreating it can also advance — for a time, at least. The United States Geological Survey maps show it as covering a wide triangle, with its western edge following up the Sierra Nevada to central Oregon, and with its eastern edge passing through Salt Lake City and Santa Fe southward to the mouth of the Pecos River.

Most of this desert area has a rainfall of less than 10 inches per year and is therefore of little value, although most of it is more or less used for pasture. However, one part is even more unproductive than the rest; this area of 60,000 or 70,000 square miles, with Yuma, Arizona, roughly in its center, is so dry and so hot that it is not pastured, except along the streams and in high mountains, or if it is pastured at all, it is for a short period or in a season of unusual rain. This chapter discusses this unpastured, or almost unpastured, region, which extends far down into Mexico and may truly be called a desert. The pastured part we call semiarid, although the inhabitants often call parts of it desert.[1]

The hottest temperatures in America, 115° to 120° F. in the shade, prevail for days and weeks at a time near the mouth of the Colorado. This place has more sunshine (90 per cent) than any other part of the United States, "the sunshine capital of the United States."

This Great American Desert has many names. Northeast of Los Angeles it is called the Mojave Desert; northwest of Yuma, the Colorado Desert; east of Yuma, the Arizona Desert; east of the Gulf of California, the Sonoran Desert. Lower California is also properly included in it.

[1] Tucson, Ariz., is just within the semiarid region on our map. A typical area there was pastured in 1938, about one cow to the square mile, and even then the poor beasts were sometimes forced to eat cactus. The inhabitants called it desert, and it was well supplied with that glorious and lordly saguaro, or giant cactus (see Fig. 584 A). The saguaro may live two centuries, weighing 4 or 5 tons and attaining a height of 50 or 60 ft. The Saguaro National Monument (63,360 acres) is near Tucson. During a few short weeks in early summer this cactus forest springs into riotous bloom, rivaling any botanical garden.

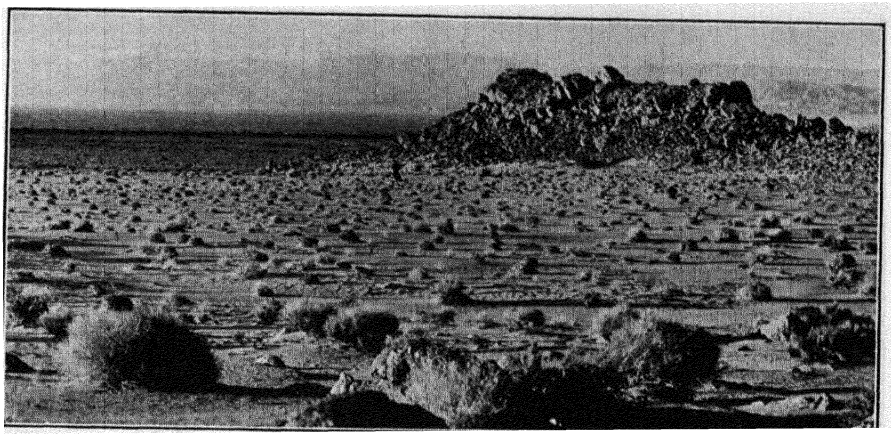


FIG. A. One of the landscapes of the Great American Desert at low elevation, with the bones of the earth sticking out because wind and raindrops carry loose particles away. If the climate here should become the same as that of the southern Appalachians, vegetation would climb up the slopes of this rocky mass, hold the pieces of earth material as they weathered loose, and finally clothe it in a mantle of earth, bushes, and eventually forest, as is the case in the southern Appalachians with similar geologic formations. (Courtesy U.S. Geol. Survey)

WATER WORK IN THE DESERT

Most of this desert is lowland with a mountain rim to the east and a mountain rim to the west, and many mountains also within its area — steep pinnacles of naked rock, standing above the wide stretches of rock waste. The mountains on the western rim shut out the rain winds from the moisture-giving sea. Many people think of a desert as being entirely without rain, but this is a mistake. Yuma, Arizona, has a rain record extending over sixty-two years. The record for the year having the minimum rainfall (1928) was .47 inch; maximum (1905), 11.41 inches; average, 3.44 inches. An entire year with less than 1 inch is common over a wide area. At Tule Tank on Camino del Diablo (well named "The Devil's Highway") in Arizona near the Mexican boundary, longitude 113° 40′, a record by six-month periods showed 1.15 inches, 6.2, 1.26, 0, .70, 0. Nearly all of the 6.2 inches fell in one rain. In this desert region rain comes in two seasons, about half of it in the winter and half in July and August, when the great heat of desert earth makes the air above so hot that it expands and rises to such heights that clouds form and rain falls.

From river bottom to upland rim the rainfall increases to as much as 10 inches in higher places. In the southwestern section, elevations above 6000 feet are forest-clad and appear as green plant islands in a brown waste. If we should start from the Arizona Plateau or from the mountains behind Los Angeles and travel for a day down toward the floor of the valley, we should see a striking contrast. There is good forest of pine at the top, which soon gives way to smaller pines and cedars; then comes the bunch grass, the yucca; and suddenly the giant cactus, like a beheaded tree, rises by the road-

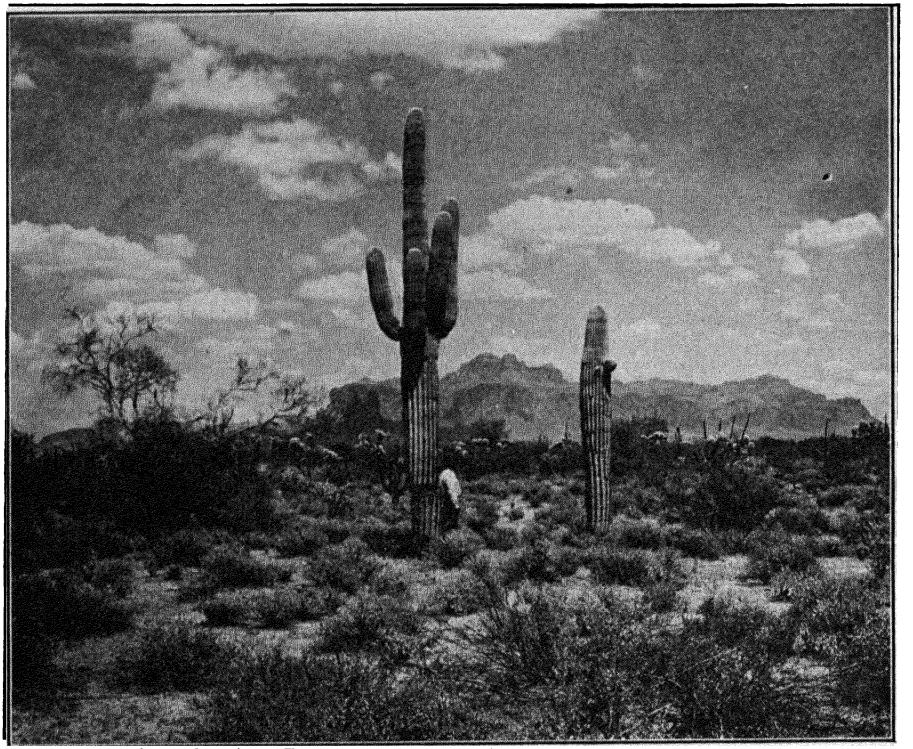


FIG. A. The Salt River Desert of Arizona, elevation from 1000 to 2000 ft. Rainfall, about 10 inches. To the left, a smoke tree. In the foreground, greasewood. In the center, giant cactus and many of its smaller brethren. The jagged skyline of the background shows the naked rock of the desert mountains. This land looks prosperous, but let it not deceive you. Measured specimens of the giant cactus have been known to grow less than 1 in. a year, and in an area similar to this the record is that it supports one cow to the square mile, and not so very well. (Courtesy U.S. Reclamation Service)

side, the sentinel outpost of the desert. Along with it are sagebrush, mesquite, and other low desert bushes which spread themselves ever farther and farther apart as we descend into the land of lesser rain and greater heat.

Since but few plants can grow where the rainfall is so scanty and irregular, there are but few roots in the desert earth, and they are often large rather than fibrous. Having no plant roots to hold it in place, the desert soil is easily moved, and locally disappearing.

The wind, blowing away particles of dust, leaves the heavier, coarser pieces, so that wide stretches appear to be solid gravel bed. In reality the gravel is only a thin layer that keeps a bed of fine soil beneath from blowing away. At other places the surface is bare rock from which every movable particle has been washed away, blown away, shaved off by the wind-blown sand and by gravel, scraping over it at the time of torrential rains. The mountains are mostly bare, and nature breaks them up rapidly with winter frost and summer heat. Summer temperatures of 130° or 140° F. by day and from 40° to 60°

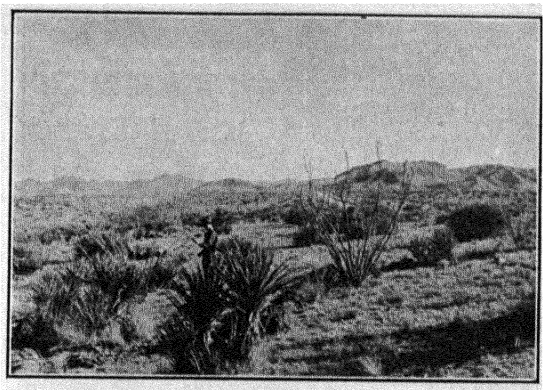


FIG. A. As one goes up from the Salt River Valley, this is a typical landscape at 3200 ft. near Tucson, Ariz. The central naked bush, the ocotillo, beats out the desert by raising a considerable crop of leaves as though it were in a humid land and then dropping them as soon as the water of one shower fails. It has been known to make eight crops of leaves a year. This land has some pasture value. (Photo by J. Russell Smith)

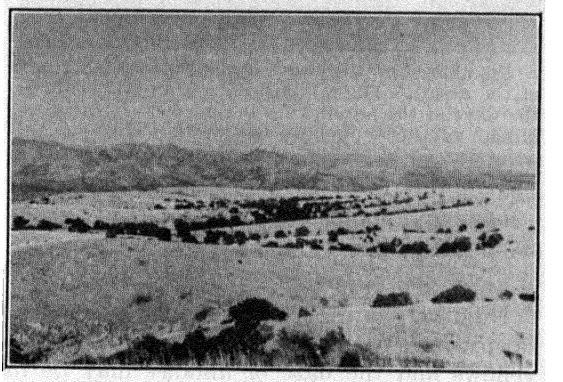


FIG. B. At 4000 ft. elevation, about 10 miles from the preceding picture. The white of the landscape is the yellow grass of the dry season (January). Oak trees in the ravines. The whole becomes green and luxuriant with the July rains. Good pasture! (Photo by J. Russell Smith)

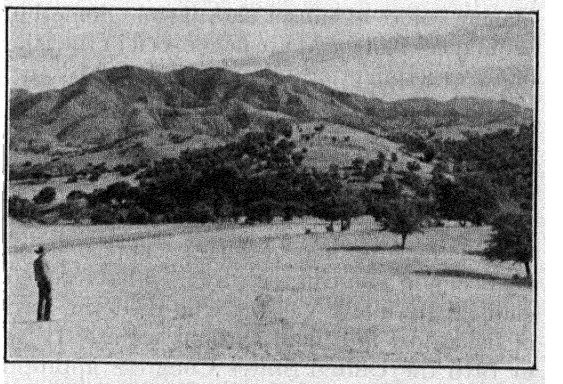


FIG. C. Ten miles beyond the last picture is the oak and grass landscape, at 5000 ft. elevation. Oaks grow best on the cooler and therefore moister north slope and on moist flats. The mountains are almost bare, and red or brown in color. At 7000 ft. the pine trees make saw logs, and the higher mountains are forested from there southward to Mexico City. (Photo by J. Russell Smith)

at night cause alternate surface expansion and contraction, which cracks the rocks so that sometimes the surface breaks off in flakes or even sizable layers. But as there is little or no vegetation to hold the soil, wind and water carry the mountain waste away, and it is never made into clay soil, rocky but rich, like the granite formations in the eastern United States. The work of wind and rain on desert mountains weathers their bare forms into weird and picturesque shapes. Throughout this desert region, sprinkled

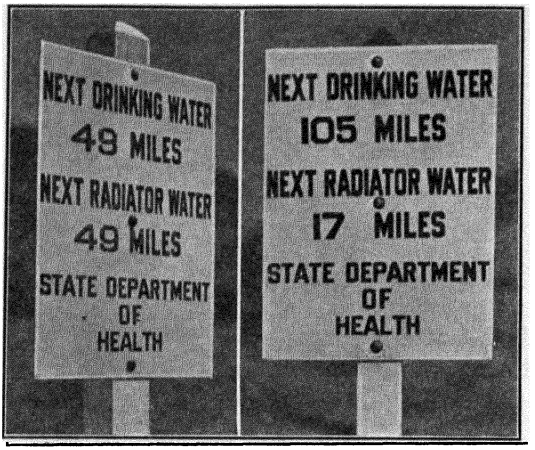


FIG. A. Two road signs in the United States part of the desert. These distances are not so deadly in the days of the automobile as they were in the days of man and horse, but deaths from desert thirst still occur occasionally when someone gets lost. Many a radiator boils over, and it's often a long distance between drinks. (Courtesy *New York Times*)

with old mountains buried hundreds of feet in rock waste, fantastic remains of weather-beaten mountains appear as pinnacles, spires, round-topped haystacks, or sharp jagged chains, whose crests remind one of an alligator's spiny back. To survive in this dry land the traveler who ventures far from the highway must know which rock it is that hides one of the few drinking-places. He must be able to follow a dim trail to the next water hole, and the next; if he does not know these things, he will succumb to the ever present menace of the desert — death from thirst, which has claimed many a victim.

THE DESERT CHARM

No other landscape affords such a wealth of color. Brown and yellow and tawny reds predominate, touched up with black and gray. The reds and yellows and the haze of midday may be followed by almost unbelievable blazing colors at sunset and dawn. Something in the desert sunrise and sunset makes colors that are never seen in the lands of plentiful rain. Occasionally one sees a quivering mirage, produced by the vibration of the air, warmed as in an oven. Look across the desert landscape and it draws you. You want to go out into it. You want to go back to it when you have left it. I yearn for more days in this land of the giant cactus, more Arizona sunsets. This quality is not peculiar to the American deserts alone. I found that the people of Algeria feel that way toward the Sahara.

Add the lure of gold with its appeal to our deep-set instinct for taking a chance, and you can see why men have gone to the desert, even though it has claimed its many victims who died the terrible death of thirst — the price of being lost in a land without water. It was therefore a humane act when in 1916 the United States Congress appropriated money to provide for the survey of the wells and springs of the desert and for marking the highways with signs so that travelers could find the nearest drinking-place. The survey of 60,000 square miles of this region has been completed, and the results have been published in bulletins of the United States Geological Survey.[2]

[2] John S. Brown, *The Salton Sea Region, California, Water Supply Paper* 497, 1923; Clyde P. Ross, *The Lower Gila Region, Arizona, Water Supply Paper* 498, 1923; Kirk Bryan, *The Papago Country, Arizona, Water Supply Paper* 499, 1925; David G. Thompson, *The Mohave Desert Region, California, Water Supply Paper* 578, 1929.

SURFACE AND STREAMS

Only a small proportion of the surface of this desert is made up of areas of entirely bare sand, bare gravel, bare clay, bare rock, or is so poisoned with alkali that no plant can grow. Indeed it has a most surprising, though economically useless, scattered vegetation. Near Yuma there are 140 species of plants and 75 varieties of cactus, the most conspicuous being the tall giant cactus. When some spot has the fortune to be wet by a shower or two of rain, the annual plants, such as grasses and flowering herbs, spring up quickly, bloom with amazing suddenness in the fearful heat, ripen their seed, and in a few weeks again resume the brown of winter. The bushes which live through often have a large development of root to seize and hold moisture when opportunity offers. This fact, in combination with the greater rainfall of the mountains, makes the inhabitants tell the Easterners that this is a country of contraries. For example, "We have to dig for wood and climb for water" — the wood of roots, the water of a mountain spring that flows a few feet and sinks into sand or gravel.

Many of these little mountain streams start down toward the desert only to be promptly swallowed by the sands and coarse soil at the base of the mountains. It is easy to understand this when we consider how rain falls in a desert. It falls as showers, almost cloudbursts, very irregular in times and amounts. Sometimes, after a year or two years almost without rain, there may come a torrential downpour — a cloudburst. The sky seems fairly to pour water, almost to dump it. A wash that has been dry for years becomes, for the moment, a rushing river. Often a mountain torrent will gather up great masses of rock and mud and carry them along for a short distance like a rolling wall. But even a torrent cannot carry such heavy material very long, so, as the water spreads, it begins to drop the heavier parts of its load. Soon pieces of rock, some as big as barrels, are dropped; the water rushes on, dropping more of its load as it goes, and finally carrying only the smaller particles forward to the master river. By this process a loose soil of great porosity is spread out like a fan at the foot of the mountains. Any small flow, like that from a spring, on reaching this porous wash sinks quickly out of sight and works along through subterranean channels.

Water for irrigation purposes is frequently raised from dry river beds by piling rocks and brush in the stream bed so as to compress the underlying sand and thus bring the water to the surface so that it can be led away in ditches. The amount of water brought to the surface in this way is sometimes surprising.

Along streams that may be without surface water for months at a time there is often a strip of tree growth fed by the seeping underground water. The stream bank is often brilliant with the light-green foliage of the cottonwood, one of the most rapid-growing trees and one of great value in such a country. Only five permanent streams cross the 700 miles of the international boundary between the Rio Grande and the Pacific Ocean. Some say there is only one. In the rolling Piedmont area of Pennsylvania and Virginia one would have difficulty in traveling 5 miles in any direction without crossing

five streams. On the east coast of the Gulf of California, between the Colorado and the Yaqui, a distance of 500 miles, there is no living stream, and the west side of the Gulf is no better. Indeed, only one or two living streams come down from the one snow-capped mountain in the peninsula.

The subterranean streams of the desert often support agriculture. The Coachella Valley, to the northwest of the Salton Sea, has developed a substantial agriculture solely by artesian water, some flowing, some pumped from many wells fed by the Whitewater River from the slope of the San Bernardino Mountains.[3]

The wide valley in which lies Tucson, a health resort and a university town, has two rivers on its map, but most of the time no surface water, yet pumping produces many thousands of acres of crops. A new factor has entered. Thousands of little dams built by the Soil Conservation Service hold shower water, permit it to soak into the ground, and have caused the appearance of new water holes.

Now that the tractor and road-making machinery permit us to bulldoze the earth as we never did before, it is possible that this technique may give some increase to desert productivity and greatly forward the possibility of tree crops standing by these little dams and watered by them.

Only a small part of the desert drains into the master stream, the Colorado, which lives by the rain of more distant and more humid regions. Most of the desert is a series of inland basins where there is not enough water to fill them and overflow to the sea. Some of these basins, now dry, tell of greater rainfall in the past, for they show unmistakable signs of being old lake beds with the usual desert-lake remains of common salt, soda, borax, alkalies, and other salts. One of these valleys, the one nearest the Sierra, with mountains towering 10,000 feet above it, is a kind of aristocrat among desert valleys because it contains Owens Lake, a fine body of water fed by the melting snows of the Sierra and wasting its vapors into desert air; at least, that is what it did until the city of Los Angeles, in order to double its population, bought water rights, built the longest aqueduct in the world to divert the water from Owens River and carry it for a distance of 240 miles by concrete aqueduct, tunnels, and steel siphons. In time Owens Lake, with its water supply diverted to good works, will doubtless become a dry bed like most of the others.

A little farther to the east is the famous Death Valley, properly named because of the fate of the expedition of forty-niners who got lost in it. While it has high mountains upon its edges, the valley itself goes down to 276 feet below sea level. It is at this point that the United States strikes bottom. There is a rainfall of 2 or 3 inches per year, which, falling in the winter season, leaves it indeed desert.[4] But such is the ability of plants to adapt themselves to environment that even here there is vegetation. Death Valley is so nearly

[3] And, as usual, the supply has been overpumped.

[4] "League upon league the infinite reaches of dazzling white alkali laid themselves out like an immeasurable scroll unrolled from horizon to horizon; not a bush, not a twig relieved that horrible monotony. Even the sand of the desert would have been a welcome sight; a single clump of sagebrush would have fascinated the eye; but this was worse than the desert. It was abominable, this hideous sink of alkali, this bed of some primeval lake lying so far below the level of the ocean." — Frank Norris, *McTeague*, Doubleday, Page & Co., 1899, pp. 424–25.

without water that many miners have died there of thirst while seeking its fabled gold. There is a story of one miner who knew of a secret spring, perhaps one little spot behind a rock, where he could drink. He thus lived while picking over ores in some secret ledge. It was the secret spring that enabled him to sneak away without being seen and then to appear from time to time with enviable stocks of gold.

There is now one ranch, with some date trees, but the chief crop is tourists, now that the automobile lets us get even to Death Valley with ease and safety.

DESERT LAKES

One of the old lakes, Searles Lake, is now a plain of salt crystal, but if you take up a shovelful, the crystals are found to be lying in liquor, the remnant of a lake saturated with borax and potash, estimated at about 30,000,000 tons each. This basin was the site of one of our feverish war industries (1918), when we tried to reclaim the potash, but in normal times it cannot compete with the vast and solid layers of potash salts that can be so easily dug up in Germany, in Alsace, and in New Mexico.

Another of these old lake beds is called Borax Lake. For many years there was a desolate camp upon its arid shore. Men lived there and shoveled up borax that was hauled for several days across the desert in great wagons drawn by many spans of mules. It was advertised as Twenty Mule Team Borax. The national supply of borax and a surplus for export are produced from a number of lakes in this desert region.

RESOURCES

This region is by no means devoid of natural resources or human activity. It contains prosperous cities, fertile agricultural districts, forest-clad mountains, a large aggregate number of watering-places, some rich mines and an unknown wealth of mineral deposits. But the localities that have water supplies are widely separated oases in a vast expanse of silent, changeless, unproductive desert, whose most impressive feature is its great distances and whose chief evidences of human occupation are the long roads that lead from one watering place to another.[5]

In a country so dry as this, chances for a living are indeed small, and Bowman in his *Forest Physiography* points out that there are not 100 permanent inhabitants in a strip of land 20 miles each side of the boundary, 600 miles long, save for the oases of irrigation and the more or less temporary settlements of the mining camp. And it will be a long time before there are many more, unless the devices of the Soil Conservation Service let them come.

But for the rivers that flow into the desert from the mountains and the plateaus beyond its rim, the record of human activities upon its surface would be short indeed, limited to a few small oases and to mining enterprises which sooner or later result in abandoned towns, like Tumco, north of Yuma. There $12,000,000 worth of gold was dug out, and 3000 people drank water

[5] J. S. Brown, *Routes to Desert Watering-Places in the Salton Sea Region, California*, U.S. Geol. Survey, *Water Supply Paper* 490–A, 1920, p. 1.

from a pipe line extending 30 miles to the Colorado, and hauled their food and wood many miles. Before the year 1900, the working ceased to pay and the people vanished to the last man. Then came the scavengers, hauling away the lumber of the shanties and digging up the floors of the cabins, looking for buried gold. Of the town nothing now remains in good order except the graveyard. Grass does not grow over desert graves, and even a wooden cross is long immune to decay in the dry air.

IRRIGATION

But for the rivers this land indeed would be much like the edges of the Sahara; and as in the Sahara the River Nile carries the water which sustains kingdoms, so into the Great American Desert flows the water of the Colorado and the Gila. Long ago the Indians seized upon these waters as a source of life; they developed irrigation to a high degree of perfection and practiced it for unknown centuries. We can still see their ruined canals extending for scores of miles. In the Salt River Valley alone there are 150 miles of these ancient canals still visible, enough to have irrigated 250,000 acres, although there is no evidence that they were all used at one time.[6] On the Pima Indian Reservation there still stand the remnants of a four-story adobe fortress-granary that is thought to be twelve hundred years old. It was built for the defense of grain and man against nomad raids.[7]

After hunting for gold for half a century, about the beginning of the twentieth century the white man invaded this region with plans for large-scale engineering irrigation. The Salt River Valley was picked out as one of the

[6] Of the 150 miles, 40 miles are now incorporated in the present irrigation system, for our engineers were unable to improve upon the survey of the ancients.

[7] It was a tribute to the virtues of the desert mud as a desert building material, with walls about 4 feet thick at the base. It is supposed to have been abandoned about five hundred years ago. "The history of the rise and fall of the civilization which built and inhabited the Casa Grande ruins is only conjectural but the ruins themselves present much interesting material to the student. Undoubtedly when these people came into the valley they were nomads, but the opportunities for a settled life devoted to agricultural pursuits must have appealed to them. Their first step was the construction of an irrigation system, the remains of which are still plainly visible. Then came the problem of housing and finally the need of defensive construction for protection from their enemies. The multistory house, of which the Casa Grande is the highest development, was probably evolved as a defensive measure. As a watch-tower, it must have proved a good investment, for from its top a guard could cover the country within a radius of 10 miles. This was a great advantage, for if the enemy could be sighted at 10 miles, he, being on foot — the horse was not yet on the American Continent — would need nearly two hours to get to the village, which gave time to get runners out into the fields and gather forces for the defense.

"When the valley people were at their most prosperous stage there were probably between 8,000 and 15,000 of them in the Gila and Salt River Valleys. They farmed extensively, raising cotton and corn, made baskets and pottery of a good quality, used stone, wood, and bone tools, used sea shells for decorations and ceremonies, and in general may be said to have lived in the late stages of the Stone Age. No useful metal implements have been found.

"It is probable that raiding Apaches became too strong for the valley dwellers, and year after year they lost a larger percentage of their crops and a larger number of warriors than they could afford to lose, until they at last decided to abandon the country. This began possibly 700 or 800 years ago. The improvement in wall construction, as indicated by the ruins, was probably developed over a period of not less than 1200 years, so that the beginning of this civilization may antedate Christianity." — U.S. National Park Service, *Glimpses of Our National Monuments*, 1930, pp. 9–10.

units to be developed under the Reclamation Act of 1902, and by 1920 it was pointed out as the one really successful enterprise of the many that have been built under the law. Its success was due largely to the high value of water to irrigators in a place where there can be no dry farming to produce forage for range cattle, where alfalfa can be cut four, five, or sometimes six times a year, and where the long, warm season permits subtropic agriculture.

Few rivers have given man a plainer call to come and control them than has the Salt River. Here was a wide, rich valley with hundreds of thousands of acres of level, water-borne soil, rich with the unleached fertility of arid lands. For ages streams coming down from the mountains have been filling the valley with rich soil which in some places has no rock for at least 1200 feet. Dr. Willard Smith of Phoenix states that a good piece of pine was brought up from a depth of 702 feet from a well at Glendale, near Phoenix.

THE SALT RIVER VALLEY AND THE ROOSEVELT DAM

With rich soil, continuous heat, and sunshine, only water was lacking, and there was the Gila-Salt River, with a wide channel, which was sometimes almost dry and sometimes turbulent with an appalling and uncrossable flood. In the year 1903, the Gila River discharged at Yuma 60,000 acre-feet of water, and in 1905, sixty times that much. In some years a single rain would send down more water than all of the rain in the low year (1903). If only the flow would be regular! Then the reclamation engineers, climbing around the defiles of the mountains in the Arizona Plateau, found an ideal site for a reservoir in a rock-tight gorge along the Salt River about 75 miles above Phoenix. Here stands the now well-known Roosevelt Dam, which can store so much floodwater that the rains of 1950 will feed the crops of 1952 on many thousands of acres of land many miles away downstream.

The creation of the Roosevelt Dam is one of the spectacular stories of the development of the West. There was no natural road leading to the site, so for 20 miles the road was built through waterless desert; then for 40 miles the road was blasted through rock walls of canyons at a cost of $423,000. The hundreds of thousands of barrels of cement needed were made in a cement plant that was built for the purpose. Power with which to quarry, lift, and haul cement material and dam material was produced by a temporary hydroelectric plant built for the purpose. The plant received its water through a 19-mile canal. For many months the 3000 people connected with this enterprise toiled; finally, in 1911 they completed the huge structure of solid masonry that can last for generations. The total cost was $3,890,000.

The Roosevelt Dam and three auxiliary dams downstream form a string of lakes 60 miles long with a total storage of 2,000,000 acre-feet of water. The Salt River Project has 1325 miles of canals that make water available to about 242,700 acres, and in 1937, 229,500 acres were under cultivation. In addition, water is usually available for 93,000 acres of land outside the project, 74,800 acres of nonproject land being under cultivation in 1937. The project has 8 hydroelectric power plants, with an aggregate capacity of 115,000

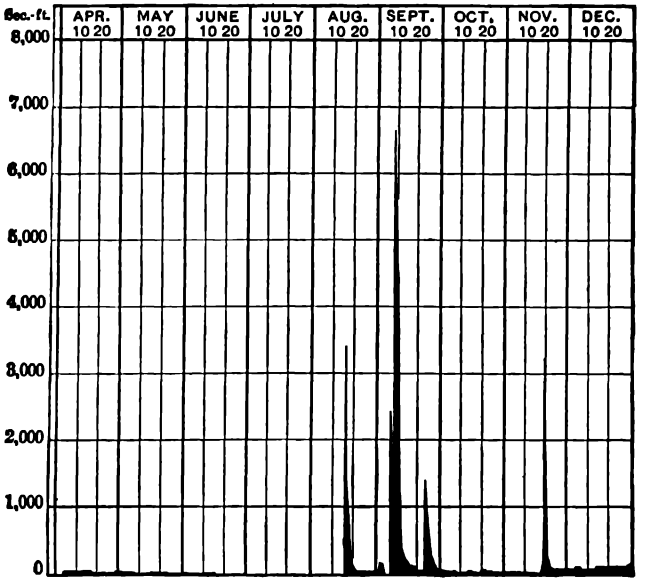


FIG. A. This graph of the flow of the Gila River gives a view of one of the problems of irrigation, and the imperative necessity of water storage. It explains why the crop of 1952 may be grown with the water of 1951 or even possibly of 1950. (Courtesy U.S. Geol. Survey)

horse power. The river falls 836 feet, and the water wheels use 729 feet of it at Roosevelt and other dams along the river. Four other plants use an aggregate fall of 200 feet along the main canals. The electricity is sold to the city of Phoenix (pop. 48,000) and to the people throughout the valley, which claims to have nearly doubled its population in a decade. There is no spoilage of land by alkali on this project, because 170 electric pumps keep the water table from rising too high; the water that is pumped from the ground can be used for irrigation.

From the beginning, the project has been managed by the Salt River Valley Water Users Association, which has been so successful that it has been able to repay the Government for the dams and other improvements and to reduce from time to time the operating assessments against project landowners. The irrigation farmer in this "Valley of the Sun," as it is called, has obvious advantages. The soil is fertile, the water supply can be regulated with precision, and the sun shines 84 per cent of the possible time. The one great disadvantage is location. The Imperial Valley and other projects are nearer to the markets of the Pacific Coast, and it is a long, long haul to the markets of the East. Railway rates are high, and so are land values. The big problem is to find crops that will cover all costs, including transportation to the market, and still yield a profit. Consequently there have been many shifts in crop combinations, and even now the project has not fully settled down to an established type of agriculture with more or less fixed rotation, such as that which we find in the Eastern states or the Corn Belt.

In this land of sunshine, alfalfa can be cut four or five times a year, and in prewar years the farmers developed a specialty of feeding their alfalfa to dairy cattle, sheep, and beef cattle and shipping the concentrated products, butter, wool, and meat, to the market. The number of dairy herds increased rapidly. Then came the war, with the unheard-of prices of 50 cents, 75 cents, and even $1 a pound for long-staple cotton. Experiments with Egyptian cotton had shown that the African resemblances held true here also, and that long-staple Egyptian cotton, so highly prized by automobile-tire manufacturers, could be grown as well in the Salt River Valley as in any other Egypt. An Arizona variety, called the Pima, with a staple of about $1\frac{5}{8}$ inches was developed by careful selection. Visions of wealth from cotton crops picked by cheap Mexican labor began to fill the minds of men. By comparison the steady income and unending labor of the dairy looked small and prosaic. Cows by thousands were dumped upon the market, and cotton fields rose where the alfalfa had been. The $600,000 creamery owned by Armour & Co. was shut down. Two large crops of cotton were sold at high prices. In 1920 there was a great acreage of cotton produced at a cost of 40 cents and 50 cents a pound, but it sold for only half that much. Tire-manufacturers developed a technique enabling them to use a larger proportion of short-staple cotton in their tires, and the demand for Pima dwindled almost overnight. Despondency filled the valley. By 1922 the farmers were beginning again to build up their dairy herds. In that year considerable acreages of young oranges were being planted in one part of the valley near Phoenix, where a high granite mountain called the Camel Back protected groves from the north winds and permitted them to bear crops, while orchards on similar slopes and soil 5 miles away, but unprotected by the Camel Back, were frozen out. Between 1929 and 1934 Pima cotton found favor with manufacturers of women's dresses and men's shirtings, resulting in a new demand for about 10,000 to 30,000 bales annually.

In 1937 the crops of the Salt River Valley were worth about $20,000,000, or nearly $90 per acre. The leading crops are alfalfa, cotton, winter lettuce, cantaloupes, and citrus fruit. About 100,000 bales of cotton are grown annually, and the valley ships 8000 to 10,000 carloads of lettuce, 5000 carloads of cantaloupes, and about 1000 carloads of citrus fruit. In 1939 grapefruit and orange trees occupied about 22,000 acres, about two-thirds of the acreage being in grapefruit. In addition, there were about 185 acres of lemons, 60 acres of tangerines, and 17 acres of limes. In 1938 the Arizona Citrus Exchange was organized. Better marketing methods and increased canning of grapefruit juice will lead, it is hoped, to a greater market for Arizona citrus fruit. Good, it certainly is.

The promoters in Phoenix are making their place a winter resort for people from the East. They say that Phoenix is much more delightful than southern California, because it is almost rainless, with bright sunshine and crisp and invigorating air. They admit, however, that for four months in summer "the climate hasn't much edge on hell" (the words of a leading citizen). When I was there in July some years ago, it was not particularly hot — for Phoenix — but the bed burnt my body, and sleep seemed only possible by

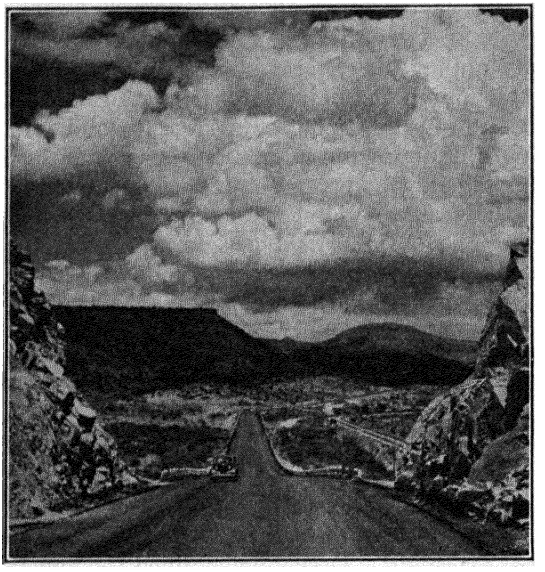


FIG. A. The desert has roads, some good ones. Consider the work required to make this cut in solid rock and the double-track railroad. Both are built not by the desert but by those from beyond the desert who wish to cross it. The automobile enables thousands to see what only scores saw intimately in the horse-and-buggy days. A winter home in the desert is quite the rage in Southern California. (Courtesy Standard Oil Co. of Calif.)

the breeze of an electric fan. Today air-conditioning is to be found in almost all public and commercial buildings. In the streets of Phoenix no gentleman needs to wear a collar; propriety permits him to seek comfort by rolling in the neckband of his shirt and giving himself some approach to the comfort of the costume of women.

THE COLORADO RIVER AND BOULDER DAM

The Colorado River, the greatest source of life in all this region, drains nearly 250,000 square miles. The Colorado is 1750 miles long, coming from the high Wyoming valleys where there is freezing weather every month of the year, and flooding the hot, subtropic delta where vegetation grows twelve months of the year. Eighty-five per cent of the water of this stream comes from the snow-fed tributaries in the Rocky Mountains of Colorado and Wyoming and the Wasatch Mountains of Utah. For 600 miles in its lower course it has few branches except the Gila.[8] It has been best known for the Grand Canyon, one of the marvels of geology and one of the wonders of the world. And who has not seen pictures of Boulder Dam?

Above Yuma the river loses the last vestige of the canyon form. Indeed it flowed into the Gulf of California at that point but yesterday, geologically speaking. But the river that has made itself world-famous by cutting the deepest of gorges also, and for that reason, holds the world's record as the greatest carrier of mud and sand in proportion to its bulk.[9]

[8] Is the Gila a river? As I sat in the train, looking at the distant pinnacles of bare rock and estimating the width of the bare stretches between desert bushes, I saw a sand stretch that was wider than most. Just then a dust storm clouded the view, there was a roar, and bridgework began to dash past the car windows. It was a long bridge; we were crossing the Gila. The sand stretch was the dry bed of the Gila, near its mouth — if a dry river has a mouth!

[9] W. E. Packard, in *Agriculture in the Imperial Valley,* University of California College of Agriculture, *Circular* 159, 1917, says the river carried sediments to the extent of 3.2% of its volume, but D. T. McDougal, director of the Carnegie Institution's Desert Station at Tucson, says in "A Decade of the Salton Sea," *Geographical Review,* June, 1917, p. 372, in speaking of the Salton Sink: "The silt-laden water of the Colorado River deposits about 6% of its volume as dried soil."

What did the canyon-cutter do with all the mud and sand that it dug out of the plateau? It dumped this into the Gulf of California and built a delta that reached across the Gulf, a huge dam that shut off the upper end completely. Across this delta, which appears to be flat, the river, with many channels, twisted and wound its uncertain way, filling up old channels and cutting new ones, and leaving ponds, sloughs, or empty channels. When the river chanced to turn to the northwest, it flowed into the end cut off by this delta and filled it up so that it overflowed across the delta. This high level is marked by a clear-cut beach about 40 feet above sea level. When the river turned to the southeast after some flood, it flowed to the Gulf. While this was happening, the water of the part cut off by the delta, now called the Salton Sea, dried away. When the white man first found it, it was a salt-encrusted lake of small area. Back of the Salton station on the Southern Pacific R.R., 80 old beaches are clearly marked, one having been made every time the lake remained at one level and the waves beat its shore.

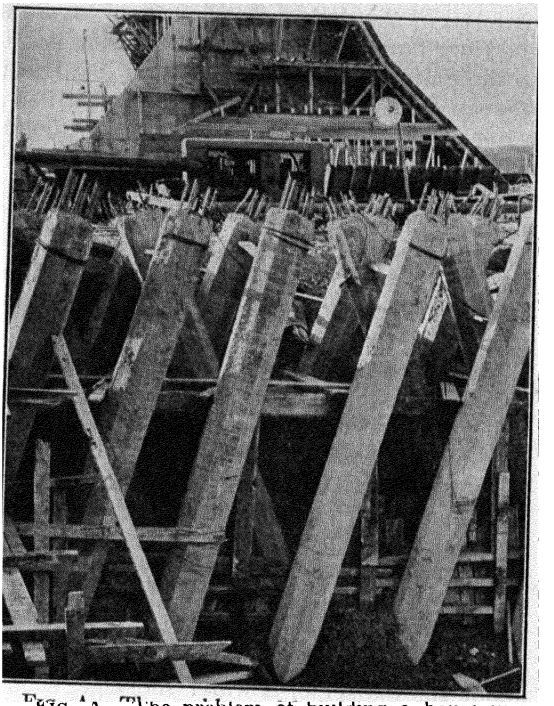


FIG. A. The problem of building a house upon the sand, or on its foundation equivalent of silt, is now met in the water-control works on the Colorado delta by this system of concrete pilings beneath foundations. (Courtesy U.S. Reclamation Service)

Fortunately for man, the river has for a long time been flowing into the Gulf. White settlers found the Salton Sink almost dry. Thus several hundred square miles of the richest soil were below sea level, but dry and offering one of the most productive opportunities in the world for irrigation. In the year 1900 not a single civilized person lived in this valley. Then a company of enterprising Americans dug a canal carrying water from the southeast corner of California through part of Mexico, to irrigate the rich lands of the old sea bottom southeast of Salton Sink, known as Imperial Valley. The through line of the Southern Pacific R.R. was already there. Settlers flocked in. They planted and tended crops, which grew prodigiously in a climate that boasted of eleven months of summer and one month of late spring. The boom was on. More water was needed, so the promoters made a new irrigation canal. This was the beginning of tragedy, because the river was higher than the Salton Sink, and flowing in one of those temporary channels which the river has been for ages making and unmaking in the porous, light, river-borne

material of the delta. As a result of severe floods in the winter of 1904-05, the river flowed into the canal, turning it into a raging river. The descent to the Salton Sea was steeper than the descent to the Gulf of California, so the canal cut deeper and deeper until it had at one time 87 per cent of the water of the river. The Salton Sea rose, flooded the railroad track, and compelled the relocation of the Southern Pacific. Another flood in the following winter made the task of closing the breach seem hopeless, and only after most desperate labors and the expenditure of $2,000,000 was the break stopped and the river sent back in its old course toward the Gulf.[10] By this time, 1907, the Salton Sea had increased from about 200 square miles to 450 square miles. Ten years later it had shrunk to 300 square miles. Today its area is about 270 square miles.

Under the Reclamation Act the United States Government created the Yuma Irrigation Unit on the Arizona side of the Colorado, and the Imperial Valley Unit on the California side. There are few places in the world where it is more necessary for man to live by his wits, his large-scale wits, than in this region of Colorado waters. From the episode of the runaway river in 1906 until the completion of Boulder Dam thirty years later the farmers of the Imperial Valley and the Yuma district lived in the shadow of increasing terrors. In order to prevent overflow, both the Colorado and the Gila in their lower courses are strait-jacketed with dikes. For years the farmers worried lest a flood might come, break the dikes, submerge the land, and perhaps develop into another runaway episode.[11] On the other hand, they worried about the danger of a water shortage, such as happened in 1915 when the river got so low that much of the cropland could not be irrigated. Another worry was the problem of silt. Four acre-feet of irrigation water leaves $\frac{1}{4}$ inch of silt. Free fertility was a welcome gift, but waters from the world's greatest canyon-cutter also left sand in the ditches. Dredges, tractors, and drags were used to pull out the sand, but many ditch banks got so high that there was no more room for the sand. Added to the worries of flood, water shortage, and silt was the worry about water diversion upstream. In Utah, Colorado, and Wyoming, water was being taken in increasing amounts from the Colorado and its tributaries, which increased the chance of a water shortage downstream. The problem of water diversion was partially solved by an interstate agreement, the Colorado River Compact, which was signed on November 22, 1922, by all seven states involved, except Arizona.[12] The major problem of the river, however, awaited the construction of the Boulder Dam.

Naturally there was great rejoicing when on December 21, 1928, President Hoover signed the bill that provided for the construction of a great dam in

[10] Epes Randolph, the engineer who did it, was venerated for the rest of his days.

[11] From the Mexican boundary the Colorado River flows 75 miles south to reach the Gulf, and from the same point it might flow 75 miles to the Imperial Valley. There is a 30-ft. fall down to the Gulf, but in the other direction there is a 250-ft. fall to the Imperial Valley. If a big flood came, the river would doubtless rush down the steeper grade, overwhelming the Imperial Valley, and some Yuma lands.

[12] "There are those living in Arizona who believe that the Colorado River is in a considerable degree our own property. There is a tendency on the part of Los Angeles to annex Chicago, New York, and London as suburbs." — A leading citizen of Arizona.

Black Canyon which, it was hoped, would stop floods by holding them back, would stop water shortages by letting the water out at the right time, would stop silt by catching it in the reservoir (until the reservoir got full of silt), and in addition would provide more water for irrigation and a vast amount of electric power. There was even greater rejoicing when Boulder Dam was completed on March 1, 1936. This giant dam, rising 727 feet above bedrock, is the highest dam in the world, and its construction required 4,400,000 cubic yards of concrete, about the same cubic yardage as the largest pyramid in Egypt. (It took 100,000 men twenty years to build the pyramid, but only 1000 men twenty months to pour Boulder's concrete!) Behind the dam is Lake Mead, the world's largest reservoir, with a capacity of 30,500,000 acre-feet of water, or over 5000 gallons for every man, woman, and child in the world. It is planned to use 16,000,000 acre-feet of water annually, which is an amount equal to the average flow of the Colorado River over a thirty-year period prior to the beginning of work on the dam.

The National Park Service operates Lake Mead (the reservoir of Boulder Dam) for recreational purposes, and the Bureau of Reclamation operates the dam and its outlet works, which feed the turbines in the power house and which empty directly into the river. The power house, which will have an installed capacity of 1,835,000 horse power, is operated by the City of Los Angeles and the Southern California Edison Company.[13] In 1937 the Commissioner of Reclamation estimated that present power contracts will return the entire investment in the dam ($70,600,000), with interest at 4 per cent, and will create a surplus within fifty years.

The act of Congress that provided for Boulder Dam also authorized the construction of an All-American Canal to carry water from Laguna Dam above Yuma for 80 miles through American territory to the Imperial Valley. Provision was also made that the canal should be extended, if necessary, to the Coachella Valley, the part of the old bottom of the Gulf of California that lies northwest of the Salton Sea, where it is proposed to irrigate 300,000 additional acres of land. For many years the Imperial Valley received its water from the Colorado River through the old Imperial Canal. This canal, which was built by an American company, followed the line of least topographical resistance, which happened to lead southward and westward from Laguna through more than 40 miles of Mexican territory and back into the United States. Gravity carries the water all the way from the river to the center of the Imperial Irrigation District. The new All-American Canal, which was completed in 1938, runs through the sand hills north of the border, and siphons (inverted) are needed at various points to carry the water across depressions. At its western terminus water has to be pumped out of the canal into laterals at a higher level that serve the West Mesa district. This expensive new canal was built by the Bureau of Reclamation, but eventually it will be paid for by those who use the water. In 1938 the new Imperial Dam with modern desilting devices was completed above Yuma; this diversion

[13] The power house is to be equipped with 15 generating units of 115,000 horse power each and 2 of 55,000 horse power. In 1938, 4 of the big generators and 1 of the smaller ones were in operation.



FIG. A. Date garden in the Coachella Valley, California. The open, feathery top of the palm permits enough light to come through to support an interplanting of grapefruit. Each bunch of dates is wrapped in paper to prevent wetting by a chance shower that might result in spoiling the crop. Even the little humidity of Yuma at the head of the Gulf interferes with satisfactory date-growing. (Courtesy Caterpillar Tractor Co.)

dam will replace the old Laguna Dam. In 1938 the Imperial Valley had about 450,000 acres under cultivation, and there are approximately 1,000,000 acres which can be ultimately irrigated from the All-American Canal and its various branches.

THE AMERICAN EGYPT

What will be grown in this American Egypt, this land which boasts a climate of eleven months of summer and one month of late spring; a land where the sun sometimes makes the water from a pipe buried in the earth so hot that one cannot bathe in it; a land where the farmers regularly forgo the August irrigation of the alfalfa for fear that a little water may be left standing in the field when the sun strikes it? When this last occurs, the alfalfa is cooked and completely killed.

If this land is properly used, all the heat, moisture, and fertility have great possibilities for production. These climatic conditions admirably suit the date, which the Arab says wants to have its feet in the water and its head in the fires of heaven. Date plantations of the Coachella Valley are said never

to have missed a crop, although the yield may vary from year to year.[14] In 1922 the harvest yielded 150 tons, and now the desert regions of California produce from 3000 to 4000 tons of dates annually. Here is doubtless enough date land, if fully utilized, to furnish all the dates we can use, perhaps many more.

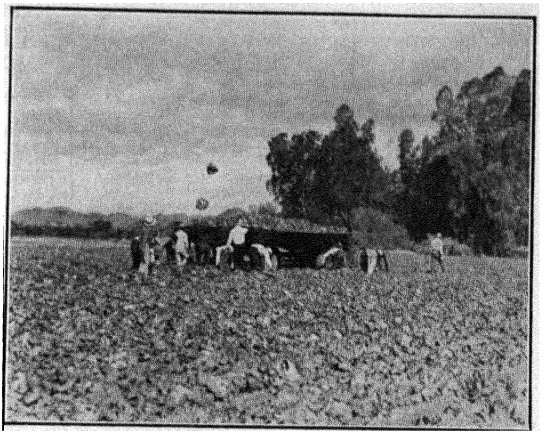


FIG. A. Mass production of lettuce near Yuma. The cutters throw the heads of lettuce into the truck. When ready to start to the packing house, the hinged sides are pulled up, tightening the mass so that it rides as though it were packed in crates. At the packing house the load is dumped onto belt conveyors, which carry the heads of lettuce to the trimmers; thence another belt takes it to the packers. The crate rides on a third belt to the car. (Courtesy McLaren Bros., Yuma, Ariz.)

The Imperial Valley and the Yuma district are well suited for the production of early crops. Lettuce is ready to ship in January, but sometimes the crops are too large for the demand and have to be plowed under. Lettuce can be followed by a crop of cantaloupes, which ripen from the tenth of May until the middle of June, but 500 to 600 cars a day from this source hold all the American market will consume during the short period of time, or "off season." Grapes ripen in July, but a few thousand acres easily supply the market. During the World War and postwar years this section went through the same cotton boom and depression that cursed the Salt River Valley.

Meanwhile the chief acreages are in stock food staples — alfalfa, barley, and some sorghum (Egyptian corn), the climate being too hot for American corn to fertilize its blossom. In this sunshine corner of the country alfalfa yields on the average six cuttings and 4 to 5 tons to the acre.[15] Much of this alfalfa is baled and sent to the cows in Los Angeles territory. Many carloads of manure are also sent there for the fertilizing of orange orchards. There will probably be worked out a safe balance between dairy acreage and vegetable acreage, with slowly increasing acreages of dates and fruit. Meanwhile the farmers here are developing their problems. To mature an acre of alfalfa hay from 300 to 1000 tons of water are required. Four acre-feet of water build up the level of the land $\frac{1}{4}$ inch. The muddy water carries fertility as does the Nile, but it also fills the irrigation ditches with sand.[16] The sand must be lifted out with big scrapers drawn by tractors. It is injurious to put

[14] The humidity at Yuma, nearer the Gulf, makes it a less desirable date location.

[15] W. E. Packard, *op. cit.*

[16] The analogy with Egypt here breaks down. We must shift to Mesopotamia. The Nile is ideal, with its thin coat of rich mud. The coarse stuff is caught in the sunken fault-block depressions into which the upper Nile flows. The unbroken persistence of agriculture on the Nile is due more to a wonderful fact of geography than to human virtue. The Tigris and the Colorado, fresh from the canyon, are ditch-chokers. See Marion I. Newbigin, *The Mediterranean Lands*, Alfred A. Knopf, 1924.

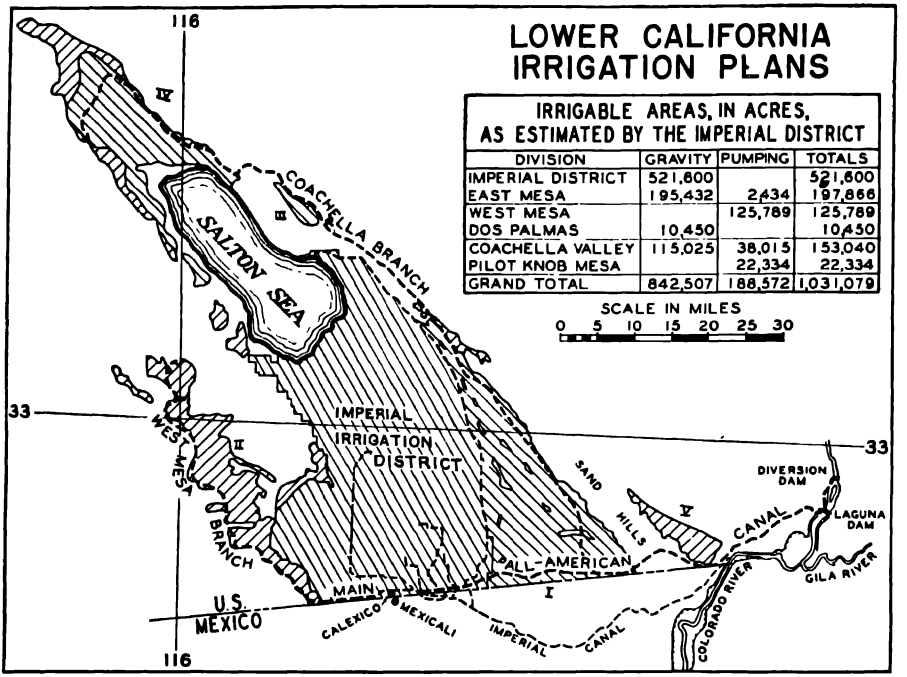


FIG. A. The American Egypt. Note the areas. The old Imperial Canal in Mexico irrigated by gravity the Imperial Irrigation District (center). The higher and very expensive new All-American Canal irrigates most of the East Mesa (north of I) by gravity, but water must be pumped into the West Mesa Branch Canal. In part of the Coachella Valley (IV, northwest of the Salton Sea) water is pumped. III: Dos Palmas, northeast of the Salton Sea. V: Pilot Knob Mesa. (Courtesy U.S. Reclamation Service)

it on the land, and it has made such piles on the banks that the scraper will no longer clean the ditches. The annual cost of cleaning the canals and laterals in the original Imperial Valley Irrigation District has varied from $800,000 to $1,000,000 annually. The desilting basins of the new irrigation works came just in time, but they will not stop it all. What next?

In some places the raising of the ground-water level is creating alkali soils, a common trouble in most irrigated places. This trouble shows that the great ditch cut by the runaway river of 1906 has benefited the lands near it because it furnishes them with drainage.

The international boundary cuts through the middle of the Imperial Valley lands, creating interesting but troublesome situations of a political origin. Arizona wants a port on the Gulf of California, but Mexico will not hear of selling the strip of land, and Arizona does not dare build a port in Mexico. Before the All-American Canal was built the economic lifeblood (water) of Imperial Valley flowed through Mexico. The fear of civil wars and trouble in or with Mexico was one motive for the construction of the expensive All-American Canal to the Imperial Valley. At the time when the international boundary was being surveyed for the first time, it is said that when the

American surveying party reached the east bank of the Colorado after many weeks in the desert they heard of a town only a few miles upstream. It was Yuma. Thither they went for a little vacation. When ready to resume work, someone said: "Oh, what's the use of going down the river? The country's no good anyhow. Let's go on from here." They did, and that accounts for the jog in the boundary at that point. To straighten the line now millions of dollars might be cheerfully paid. In the beginning it could have been done by a few hours' walking.

Boundary influence is curiously shown in one town which is divided by the boundary. The northern half is named Calexico, the southern half is Mexicali. All the store business is on the American side, because it is cheaper to carry into Mexico a basket of shopping than it is to buy at a Mexican store which has already paid the tariff and must include that in its prices. The managers of all the enterprises on the Mexican side live in Calexico. Mexicali is chiefly peopled by Japanese and Chinese who cannot be admitted into the United States.

The Mexicali district ranks second only to the Laguna district among Mexico's cotton-growing areas.[17] In 1912 long-staple cotton was introduced successfully in the area. Cotton production increased gradually, reaching a peak of 80,000 bales in 1926-27, and in recent years the crop has been about 60,000 bales a year. In 1936 approximately 100,000 acres were under cultivation, including about 60,000 acres of cotton, 16,000 acres of wheat, 12,000 acres of alfalfa, 5000 acres of barley, and 2500 acres of corn. The district does not produce enough corn to meet local requirements. Location in respect to the population centers and markets of Mexico is a heavy handicap in this region. Cotton destined for the Federal District and Puebla passes through the United States via Arizona and moves southward on the Mexican Southern Pacific R.R. or else is shipped to Veracruz by water through the American port of San Diego. On the other hand, if cotton production is expanded, this district should be favorably situated for shipments to Japan. Wheat and flour are exported through San Diego or the small Mexican port of Ensenada.

Until recently a large portion of the Mexicali district was owned by the Colorado Land Company, which controlled more than 600,000 acres but cultivated only a small part of its holdings. The remainder of this district was held by smaller land companies, and only a small area was in the hands of individual farmers. The Colorado Land Company operated its land like a great plantation, carefully supervising planting, cultivation, and irrigation, and advancing funds from time to time to the Chinese, Japanese, and Mexican share-croppers for tools, seed, and subsistence. In 1937 nearly all of the privately owned land was taken over by the Government and divided into ejidos of about 5000 acres each, with approximately 150 families per ejido. Can the Mexicans make it work á la ejido?

The future prosperity of the Mexicali area depends largely upon a single factor, namely, the amount of water available for irrigation. Water in this

[17] See Samuel N. Dicken, "Cotton Regions of Mexico," *Economic Geography*, October, 1938, pp. 363–71.

district is obtained almost entirely from the Imperial Canal, which is called the Alamo Canal south of the border. Since the treaty of 1906, it has been the policy of the United States to allow the Mexicali district about 750,000 acre-feet of water from this canal. The Mexicans are now greatly disturbed about the increased diversion of water from the Colorado River through the All-American Canal and at other points in American territory. In this area Mexico is in a weak bargaining position, since it controls only the mouth of the Colorado River. On the other hand, it is in a strong bargaining position in the Lower Rio Grande Valley, where 70 per cent of the water comes from Mexican tributaries. Mexico insists that any new agreement regarding water rights must take both rivers into consideration. Its strong position along the lower Rio Grande may enable it to get more water from the Colorado for its Mexicali district. How near will California and Texas come to blows over this?

It is a question who will live in this American Egypt a hundred years hence. At the present time there are more Indians, Mexicans, and Orientals than people of northern-European stock. Many of the Imperial Valley dwellers have come recently from Mexico or Japan. Which element in this diverse population will increase? It remains to be proved whether northern-European stock can hold its own for even a few generations in such a climate as this.[18] Perhaps we shall some day have to choose between letting a given acre-foot of water support Caucasian families in Wyoming or families of other races in the Colorado delta.

LOWER CALIFORNIA

Lower California, a peninsula 750 miles long and from 30 to 150 miles wide, is also a part of the Great American Desert. Most of it consists of high, bare mountains, very steep on the Gulf side, but sloping away more gently toward the Pacific. Upon the mountain heights are some pine forests, quite out of the reach of the lumberman, but sending down a few streams to water small oases of beans, garden stuff, and alfalfa, to feed a sparse population, mostly Indians, who live in this little-known part of the Great American Desert.[19] There seem to be possibilities for considerable water storage and irrigation of frost-free lands.

[18] According to Dr. Charles E. Woodruff in *Medical Ethnology* (C. K. Rebman, 1915), the population must at least be brunette, if not colored. The striking resemblance of climate to that of Egypt gives the Egyptian native a peculiar interest to us.

[19] This peninsula, like the rest of this desert region, has thrilling interests for the botanist. Desert plants are not primarily desert plants. They are adjusted forms of plants from adjacent regions that have been able to work their way in. Therefore this desert is particularly rich in modified flora, some of which is found in this desert only.

The northern part of this desert borders on the Mediterranean type of climate (see Chapter 31), winter rain and summer drought; the southern part merges into the tropic grassland type, winter drought and summer rain. On large areas these two rainfall types overlap, giving two rainy seasons, if such they might be called. Also a part of Lower California sometimes gets left out of rain entirely for two or three seasons. But desert plants live through it. The capacities of plants to endure drought are astounding.

The largest bit of agricultural land in the peninsula is at the southern end, where 3000 acres of tomatoes are grown for the California market, and a similar area of sugar cane for Mexican consumption. A few hundred acres of corn, beans, and vegetables complete the greatest of Lower California agricultural areas.

The census of 1930 showed that Lower California had only 95,000 people and that its largest city was the copper-mining town of Santa Rosalia, with a population of 9000. La Paz, the capital of the territory, had but 6000 people.

This long, lanky, barren peninsula, like the mountains of the mainland, is supposed to be rich in mineral wealth. At Santa Catarina on the southern end of the peninsula are the largest onyx quarries in the world, the onyx being shipped on tramp steamers from the little port of San José del Cabo. The outstanding mining enterprise is the Boleo Copper Company, a French concern that has operated copper mines at Santa Rosalia for many years with imported machinery, imported supplies, imported fuel, and even imported food at times for its labor force, which is Mexican. The company built its own narrow-gauge railroad up into the mountains and brings water down from the mountains through 23 miles of 6-inch pipe to support life in the sun-baked town. The copper ore is reduced to blister copper at Santa Rosalia before shipment, most of it being taken to the refineries at Tacoma, Washington. At one time the company employed as many as 3000 miners, but when the American duty of 4 cents a pound on copper became effective on July 20, 1932, mining operations and employment were reduced.

THE EASTERN COAST OF THE GULF OF CALIFORNIA

Far down the coast of the Gulf of California the desert fades away into a land of greater rainfall. As the Mexican mountains are higher here, the streams reach the sea, and some have so much water that there are several valleys in the state of Sonora and more in Sinaloa with considerable irrigation and greater possibilities to be attained when new storage projects now under construction, such as the one in the Yaqui Valley, are completed.[20] This country is chiefly inhabited by Indians, with a few Mexican and American enterprisers. The chief crops are corn, sugar, and chick peas (garbanzos), all of which are shipped to the interior of Mexico. Bananas grow from San Blas to Mazatlán. Some winter vegetables, especially tomatoes, are shipped from this section to the United States.

THE FUTURE OF THE GREAT AMERICAN DESERT

The big thing in this region is the Colorado irrigation. Next comes the irrigation along the eastern shore of the Gulf of California. There will be other irrigations, some of which have already been begun.

Interesting discoveries of water are being made in the Mojave Desert. Some of its basins are underlaid with artesian water.

At Richardson a well ran useless soda water. This was cut off, and farther down a smaller flow of sweet water was found — excellent for drinking-water or for irrigation. It is known that there are many of these artesian areas, and now the traveler may see from the car window the strange contrast of the

[20] In 1937 the Mexican Government spent 31,000,000 pesos on irrigation, about four and a half times as much money as was spent in 1927.

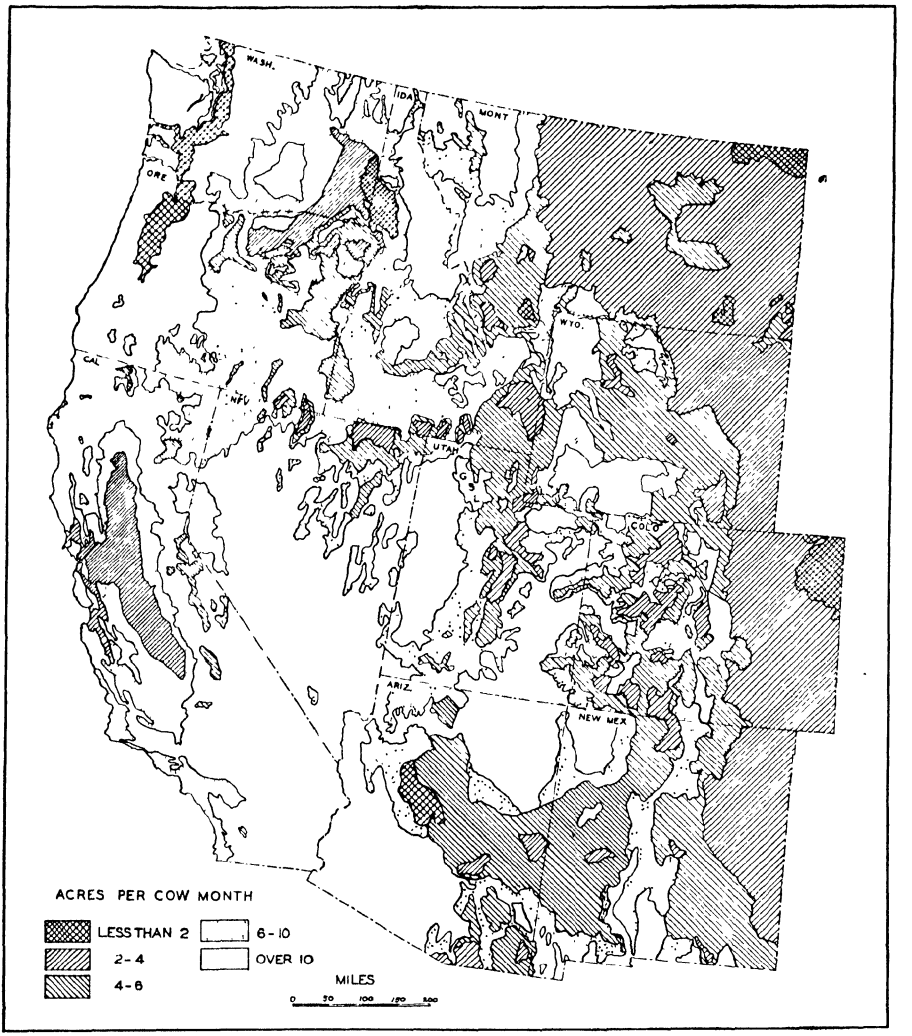
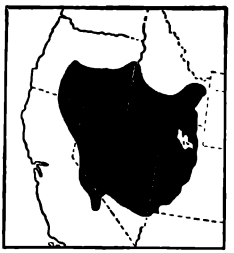


FIG. A. This is a very significant map. It presents nearly half the United States, and shows that nearly all the area here mapped requires more than 20 acres to pasture a cow for a year, and that a large part of it requires more than 120 acres. Of this latter, part is good forest, a larger part is desert. This might be called a map of limitations. (Courtesy Nat'l Resources Board, *Agricultural Land Requirements and Resources*, Part III, p. 48)

black-green foliage of a pear orchard standing trim and alone in the flat gray desert. Is there any reason to expect these people to be wiser with artesian water than their neighbors in Dakota?

Lastly, minerals. More careful exploration may be expected to reveal many mineral deposits that will give rise to temporary industries — lasting a year or a few generations.

Chapter 29. THE GREAT BASIN AND THE UPPER SNAKE VALLEY



THIS basin region comprises nearly all of Nevada, the western part of Utah, the southern part of Idaho, and southeastern Oregon. High mountains shut the rain winds away, therefore the rainfall is slight. Only the height of the land saves this region from being like its southern neighbor, the Great American Desert.

Because the surfaces of this region are higher and receive more rain than the desert to the south of them, most of the area can be, and is, pastured for some part of each year. Some 5,000,000 or 6,000,000 sheep and 2,000,000 cattle crop the scanty bunch grass and the sagebrush. But the poverty of the pasture is shown by the fact that the United Kingdom, with less than half the area, has about five times as many sheep and cattle. There are many stretches of land that are wholly desert and are so named by the people who live there; at best this region should be called semiarid, always remembering the rich oases at the mountain foot.

It differs also from the desert in having much of its area, rather than little of it, covered with mountains. The mountains, having more than desert rainfall, therefore produce enough vegetation for upland pasturage, although rarely enough for forests. It differs from the desert also in having no great inflowing master stream, no Nile (or Colorado). The nearest approach to such a stream is the Snake River, which flows across one corner of the region. Again it differs from the desert, its neighbor region, in having several small rivers that flow into its eastern and western margins, making possible considerable oases of irrigation, which in both regions is the chief basis of man's support.

Mountains on three sides and at many places within the interior; upland summer pastures for sheep and cattle; winter pastures on the lower plains and stacks of alfalfa in many scattered oases of irrigation — these, plus mining camps, are the main features of this region.

THE GREAT BASIN

The Great Basin, which includes a large part of the entire region, is very definitely a basin, or rather, many basins. In the rain shadow of the high Sierra Nevada there is so little rainfall that not enough water can gather to fill the valleys, so the water lies in the basin bottoms and never flows out to the sea. Shut off from the moisture-giving sea by the highest part of the



FIG. A. At the left, the Sierra Nevada have a steep face on the east. At the right, the Wasatch of Utah have a steep face on the west. In between are pieces of the same rock formations — fault-block mountains, great masses of rock that broke apart (faulted), settled unevenly, tipped up, and have been eroded. Between them are waste-filled plains, some of which have salt lakes at the lowest place and once had much more water than at present.

Sierra, a considerable area in northwestern Nevada has less than 5 inches of rainfall. Only in the California and Oregon part of this region, and in the higher lands of east-central Nevada, is the rainfall over 10 inches. More than half of Utah has less than 10 inches of rainfall and only 20 per cent of that state has more than 15 inches. The elevation is great enough to give plateau temperatures, especially the cool nights.

The arid lands have been vividly portrayed in fiction with tales of burning thirst, heroism, loss, and death in the desert. Man is continually striving to get water, to save water, to use water to the best advantage.

The Great Basin is the geologist's delight. The geologist is a kind of detective looking for clues. He can study a region and know what acts nature committed there millions of years ago with water, earth, and rock. Geologists have figured out an interesting story here. They tell us that apparently there was once a great arch extending from the Sierra Nevada to the Wasatch Mountains in central Utah. The middle parts of the arch have broken

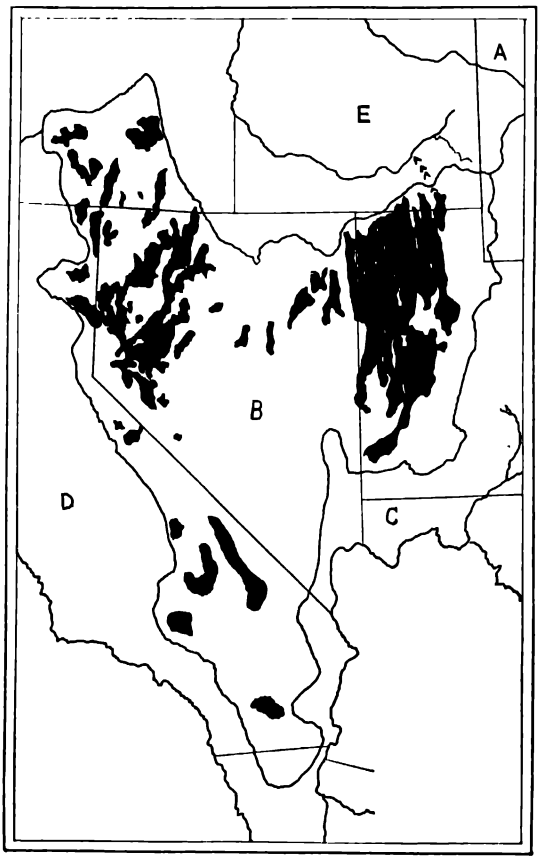


FIG. B. The Great Basin and surrounding areas. A (upper right), Atlantic drainage. B, Great Basin. C, Colorado drainage. D, Pacific Ocean. E, Snake River-Columbia. The black areas show the bounds of lakes in a wet era of the past. Lake Bonneville, large lake at the east. Large lake at the west with a large island, Lake Lahontan. The longest lake in southeastern California is the parent of Death Valley. If Lake Bonneville should fill up again, Salt Lake City and many other Utah cities would be under hundreds of feet of water; so would most of the state's farms. (For this map, much thanks to Professor Maurice W. Lee, Utah Agricultural College)

into many pieces and have fallen down in many positions. The two bases of the old arch, the Sierra on the west and the Wasatch Mountains on the east, stand with their steep fronts facing each other, from 400 to 500 miles apart. In the intervening space many parts of the original arch lie tipped so that the pieces become mountain ridges with one front, usually the eastern, steep while the other, usually the western, slopes gradually away as does the Sierra Nevada. Most of these ranges run north and south, and explain a name that is often used — basin-and-range country. Everywhere the ranges are much eroded, and since the streams have no outlet to the sea, the eroded material remains and fills the space between these basin mountains to great depths, often 1000, 2000, and 3000 feet.[1]

The waters that have filled these valleys with mountain washings, having no outlet to the sea, have spread out in shallow lakes. As the water in the lakes evaporated, ever increasing quantities of salt, alkali, and other materials that the water had dissolved from the earth collected in the bed of the lakes. Great Salt Lake is estimated to have 400,000,000 tons of common salt. The leachings of the volcanic soils of western Utah have produced a lake containing millions of tons of soda. Some of the basin lakes, however, are as fresh, pure, and clear as any other lakes, because they are up high enough to have outlets. Such are Utah Lake in Utah, and the beautiful Lake Tahoe on the western edge of the basin in the slopes of the Sierra.

It is the habit of desert-basin lakes to fill their beds so full of mud that they become almost level, having only the slightest curvature of bottom. Thus they become very large, and so very shallow that they dry up quickly. Then the sun bakes the salty mud of the bottom into a veritable pavement that resounds almost like metal beneath a horse's hoofs. These dry beds seamed with cracks are called playas. One of the playa lakes in southeastern Oregon is called Alvord Desert; it covers 50 or 60 square miles. In the spring its water is from a few inches to perhaps 2 feet deep. In the summer it is a dry, smooth, hard surface on which the mirages play. Black Rock Desert in northwestern Nevada becomes in the spring rain 450 square miles of lake only a few inches in depth. But soon it is shining white with the crystals of alkali that remain after the water has dried up, leaving a typical "alkali flat."

Even Great Salt Lake is approaching this stage, and its changing levels show how it, like every other desert-basin lake, fluctuates with the amount of rainfall. Its average depth is from 15 to 18 feet; its maximum depth is less than 50 feet. Its area in 1850 was 1750 square miles, but by 1869 this had increased to 2100 square miles. From 1900 to 1904 much of its bed became a salt desert, and it was feared that the lake would disappear entirely.[2] By 1924 the water level had risen to such an extent that large engineering works, such as the Lucin cutoff of the Southern Pacific and the roadbed of the Western Pacific, were endangered. In 1935 the lake reached an all-time low level, with an area of 1200 square miles. By 1939 the area had increased to 1500

[1] An artesian well-digger at Huxley, Nevada, on the Central Pacific R.R., brought up pieces of well-preserved redwood from a depth of 1900 feet. (U.S. Geol. Survey)

[2] The limitations of irrigation will prevent the drying up of the lake. (Willis T. Lee and others, *Guidebook to the Western United States; Part B: The Overland Route*, U.S. Geol. Survey, *Bulletin* 612, 1915, p. 96) Farmers cannot use all the water.

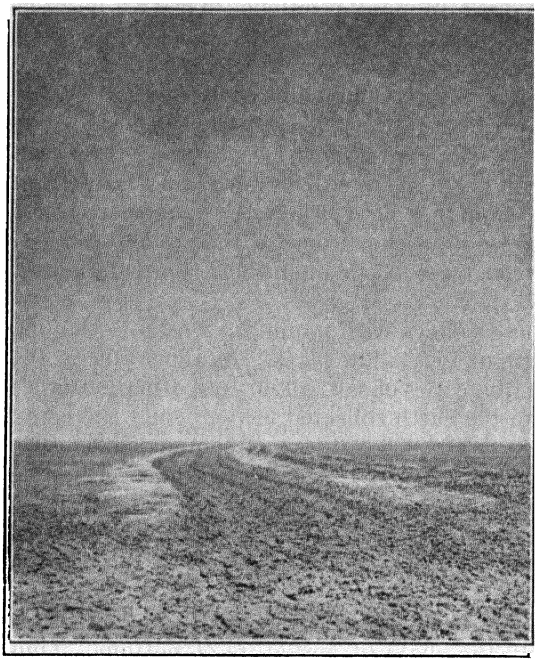


FIG. A. In the great droughts of the 1930's a large area of Goose Lake in southern Oregon dried up, and in the newly exposed bottom was this trail left by the wagon wheels of the forty-niners when they crossed it in a similar period of drought eighty years before. The trail had remained undisturbed beneath the water, but in a few seasons wind action removed it. (Courtesy Oregon Trail Ass'n, American Geographical Society, and Isaiah Bowman)

square miles, and in that year it was estimated that the lake was 25 per cent saline. In such a solution even the poorest swimmer can float like a cork!

During the heavy rains of the glacial epoch the Great Basin lakes rose to overflowing and expanded so that many basins became one, of huge size. The geologists call the expanded Nevada glacial lake Lake Lahontan; that of Utah they call Lake Bonneville. Great Salt Lake is now but a diminutive remainder of that great body of water. In its prime it was 1050 (now less than 50) feet deep and discharged through a notch in the divide between its basin and the Snake River Valley. Dr. Ellsworth Huntington says that if the rainfall of Nevada were doubled, we should again have Lake Lahontan, and he makes the appalling statement that Lake Bonneville may return. Man in arid countries wishes for an increased rainfall, but a heavy increase in rain would be a sickening catastrophe to the inhabitants of Utah; only a moderate increase of rainfall would turn the fertile irrigated areas and the adjacent deserts into a billowy inland sea.

Writing in 1911, Dr. Isaiah Bowman said:

> About the borders of the basin of Great Salt Lake may be seen shore features associated with the ancient lake levels and still in an almost perfect state of preservation. Upon the surrounding slopes and up to elevations of 1500 feet above the surface of Great Salt Lake are well-defined deltas, bars, beaches, spits, capes, cliffed promontories and bottom deposits, all formed by or associated with the ancient lakes whose waters once stood at these high levels.[3] (See page 613.)

Important changes are shown to have taken place in the outline of certain lakes in southern Oregon since the settlement of the country.

During the early emigrant days the trail crossed Goose Lake Valley farther south than at present, the place now being under several feet of water. In the early days of

[3] *Forest Physiography*, p. 14.

Lakeview (now about 6 miles from the lake) the name of the town was not a misnomer, for the lake then extended much farther north than at present. . . . Although before his reconnaissance in 1882 Silver Lake was not known to have gone dry, Russell inferred from its comparative freshness that it must have done so within recent years. . . . Therefore the fact that after the exceptionally dry season of 1887–88 the lake did dry up, its bed was taken up for farms, and one season's crops were gathered before the lake again filled, is of especial interest.[4]

One of the interesting episodes of the great droughts of the 1930's was the drying up of a lake in southeastern Oregon and the revelation of the wheel tracks of the wagons of the forty-niners that had been preserved for eighty years by the waters of the lake.

MINERAL WEALTH

Save for the Mormon settlement at Salt Lake City, this plateau region was of interest to white men first as a mining country. Mining has had its ups and downs. In 1859 the Comstock lode, one of the world's most famous mines, was discovered near Virginia City, Nevada. This mine was so hot (140° F.) that great expense for ventilation was necessary in order to make work at all possible, and three shifts of workers kept it going night and day. As they worked they drank ice water by the gallon and perspired almost beyond belief. The period 1860–64 was one of great speculation. The Comstock mine went down in the late '60's and rose to great prosperity again after new discoveries of ore were made in 1873. In the '70's mining operations were threatened by ground water, which poured into the shafts and threatened the galleries, but these difficulties were eliminated by the construction of a drainage tunnel 9 miles long, which was completed in 1878 at a cost of $4,500,000. During the period 1875–77 Nevada's production of gold and silver was greater than that of all the remaining United States, including California.

In 1877 the output of the Comstock mine was $36,000,000, and Virginia City was a thriving mining center. Its fate as the mines were worked out is indicated by the experience of a miner who was planning to go back to Iowa to live, but who wished to stay a couple of months after his job ended.[5] For these two months he bought for $32.50 a substantial two-story brick house that had once cost $2650. But even a good brick house in an abandoned town has small value. By 1900 the mines were virtually worked out, and Nevada's population was declining. Shortly after 1900 new discoveries were made elsewhere, and the boom returned. The fate of a region entirely dependent upon mines, as was the case in Nevada prior to the recent large-scale irrigation, is shown in the population of that state, which in 1860 was 7000; 1870, 42,000; 1880, 62,000; 1890, 47,000; 1900, 42,000; 1910, after the new discoveries, 82,000; 1920, 77,000; 1930, 91,000. Despite this small population, Nevada was admitted to the Union in 1864, with only a handful

[4] G. A. Waring, *Geology and Water Resources of a Portion of South-Central Oregon*, U.S. Geol. Survey, *Water Supply Paper* 220, 1908, p. 12.

[5] The peak of mining operations at Virginia City was reached in 1876–77. Population of the city: 1880, 10,900; 1890, 8500; 1900, 2700; 1910, 2250; 1920, 1200; 1930, 1210.

of people. Two more votes were needed to put some desired constructive legislation through the Senate of the United States. Nevada was the only chance, and President Lincoln is reported to have said sadly as he approved its admission, "It is either admit Nevada or raise another million men." Thus our most scantily peopled state came into being.

In the year 1900 gold and silver were found at Tonopah in southern Nevada near the California boundary. In two years the deposits yielded $7,000,000, and the desert settlement had 4000 more people. Two years later good deposits were found 24 miles south at Goldfield. In 1904 deposits were found at Bullfrog, 60 miles southeast of Goldfield. Although it was 100 miles from the railroad, in ninety days the town had an electric-light plant, an ice plant, and a hotel. These discoveries made Nevada boom as a gold-producer.

It is a great misfortune for the mining industry that in such a region railroads must be built to serve the mines alone, whereas in lands of rainfall there may be farm produce, timber, manufactures, and other freights for them to carry. When there is nothing at the end of 90 miles of railroad but a mine, it makes the mining expensive. Thus the construction of the Steptoe concentrator marked the expenditure of about $20,000,000 in placing the Nevada Consolidated and Cumberland Ely mines on a producing basis. This amount included the purchase of the mines and cost of development, the construction of the Nevada Northern R.R., the building of the immense plant at McGill, towns at the smelter and mine shafts. The railroad which joins these mines at Ely with the outside world joins the Southern Pacific at Cobre, a distance of 141 miles.[6]

While the western part of the Great Basin has been having its ups and downs in the mining industry, the eastern or Utah part has had a later start and has not yet reached the worked-out stage. The desert ranges of that state are rich in metals, and the great copper mines at Bingham are really a mountain to be scooped up by a steam shovel. The largest open-pit copper mine in North America is operated at Bingham, about 25 miles southwest of Salt Lake City. In 1937 the Bingham district led the country with 203,421 tons of copper, as compared with 143,879 tons at Butte, Montana. In 1936 Utah produced $23,000,000 worth of copper, $6,000,000 of lead, $8,000,000 of silver, $8,000,000 of gold, $4,000,000 of zinc.[7] Many of these deposits are of large extent and promise great output, though the quality of the ore is low-grade. The mineral industries are greatly aided by the fact that just across the edge of the Great Basin in the Colorado Plateaus of north-central Utah there are extensive coal fields in Carbon County, over

[6] More than 99% of its freight is from the mines. Another railroad, 86 miles long, and connecting with the Southern Pacific at Palisade, Nevada, cost the smelting company $1,500,000. "The first year this railroad operated it paid for itself and the second year the Mills Building was erected at 30 Broad Street, New York City, out of the profits made from the road." — From a private letter.

What profits it Nevada — or almost any other frontier — to have a great mine or a great industry? Answer: The frontier gets the wage roll; the profits go to Chicago, New York, London, Amsterdam, Miami, Bar Harbor, and the Riviera.

[7] In 1937 the mines of Utah ranked second in copper production with an output of 206,000 tons, second in silver with 12,700,000 fine oz., third in lead with 89,000 tons, fifth in gold with 312,000 fine oz., and sixth in zinc with 48,000 tons.

3,500,000 tons being produced in Utah in 1937. Already the United States Geological Survey reports at least 13,000 square miles of coal in this state, and the estimate is constantly enlarged. While but little of this coal is within the Great Basin proper, it is such a short distance away that it may be counted as one of the assets of the region. In Carbon County, Utah, large deposits of coking coal have been found, suitable for blast-furnace operation. The extreme southeastern part of the Great Basin in Iron County, Utah, has deposits of iron reported to be "almost inexhaustible." This must not be considered as the basis of an immediate industry, because iron-smelting requires a large population to furnish the necessary labor, and a large market easy of access to take the product. None of these conditions are to be found in the Great Basin, but it is a comfort to know that the iron is there waiting the day when we may have it manufactured with Rocky Mountain coal and carried to centers of population 2000 miles away.

CLIMATE AND SETTLEMENT

Aside from mining, how does this high dry land appeal to home-seeking man? The climate is so dry that the plains are treeless. Many of its northern and southern ridges are stark bare; only a few go above the dry timber line, and at best the forest growth is scattered and open, and the trees are of such slow growth that the timber is crooked, knotty, and of small value for lumber. The few trees are of several varieties of pine, with poplars or cottonwoods in the moister canyons. As is the case with all dry countries, the climate is subjected to great variations not only between day and night but also between winter and summer. In parts of the earth where there is moisture the land is kept warm by the moist atmosphere and particularly by blankets of clouds, neither of these conditions being present in dry lands. The blazing heat of the noonday sun radiates rapidly, and at night temperatures of 50° F. or even less follow a noonday temperature of more than 100°.

The climate of the Great Basin is further complicated by the fact that it has the elevation of a high plateau. Elevation alone tends to make the weather changeable, and the mountains cut off the ocean influence and aid in making continental changeability at no great distance from the ocean. Thus while flowers bloom every month of the year at Portland, Oregon, in the moist seaward part of the state, there is frost every month at Lakeview on the shores of Goose Lake, Oregon, in the Great Basin near the Nevada boundary. And at Truckee, California, 5800 feet altitude, near Lake Tahoe, temperatures of − 25° F. are met in winter, and summer temperatures above 100° are to be expected almost every year. Sparse population is inevitable in a region where such conditions prevail, but the climate is wholesome.

The first extended contact of the white man with this region was his attempt to cross it. It lay on the path of the forty-niners who tried to cross the continent to California by wagon, and who suffered so dreadfully and in some cases perished so terribly in these deserts. Crossing the Great Basin was made possible for many by the accidental fact that the longest river in it, the Humboldt, happens to flow (or furnish a string of water holes) nearly in an east-

west line almost on the line between Salt Lake and Reno, and most of the way across the basin.

The year before the forty-niners set out, the Mormons fled to this desert around the Great Salt Lake. By a remarkable journey across plains and mountains they had fled to be forever beyond the reach of the people of the United States, who had successively driven them out of various places in Illinois, Missouri, and Iowa.

THE BASIN LANDS AND IRRIGATION

The newly arrived Mormons diverted the mountain streams to the fertile plains at Salt Lake City, thus making themselves self-sustaining in the desert. Theirs was the first irrigation of any importance in the United States. The people from whom the Mormons had fled crossed the continent in the rush for gold in 1849. They were greatly aided in their project by being able to buy supplies from the thrifty Mormons. These people of Teutonic stock had farming well under way the first year, and they did a thriving business with their erstwhile persecutors.

From 1848 until the completion of the first transcontinental railway in 1869, the Salt Lake settlement was indeed buried in the wilderness, but buried in a land of agricultural plenty. By 1889, 260,000 acres were under cultivation. In the next decade the acreage was doubled. The chief extension of agriculture in this intermountain region has come since 1900, but unfortunately irrigation can never reclaim any large area here. It is a great misfortune for the race that the water supply is so scanty in a region where the valleys are so extensive. It is a fact that the land of the filled valleys which characterize the arid basins everywhere is peculiarly adapted to irrigation. There are several reasons for this. In the first place the stream-filled arid basin lands are almost level, so that it is easy to lead water, if there is any, to the desired spot. Also the soil is rich in these dry lands. It has not been robbed of fertility by the presence of plants or by the leaching action of water. The land is indeed suitable for irrigation. Only water, the great indispensable agent, is wanting in most of the Great Basin valleys. The lack is fatal. It should be noticed that the important irrigation enterprises of this area are immediately along the edges, where the snow water from the Sierra Nevada and the Wasatch Mountains may flow into them. A number of small irrigations are scattered about the bases of basin ranges, where small streams give water.

Utah has been accurately described as "an oasis at the foot of the Wasatch," [8] and in Nevada the railroads, chiefly built by outsiders for outsiders to cross the state, are as valuable as farms, towns, and livestock combined. The Wasatch Mountains, the steep western front of a high plateau, rise abruptly from 4000 to 6000 feet above the level plain in a precipice called Hurricane Ledge, which extends from near the Colorado River in Arizona far up into central Utah. In many places the Wasatch Mountains, 2 miles

[8] Mark Jefferson. This explains the small value of Great Basin agriculture.

back from the foot of the plain, are 1 mile high. Wherever this wall is cut by a canyon from which flows a mountain stream, there on the plain at the mouth of the gorge, living from its waters, is a settlement (oasis), such as Salt Lake City, Ogden, Provo. If there could be more water close to the irrigable land, the settlements could extend farther out into the desert.

The scarcity of water, the necessity of heavy engineering works, and the limitations of the Great Basin are well illustrated in the greatest Utah irrigation unit, that of Strawberry Valley, which was built by the United States Bureau of Reclamation. The engineers found that there was plenty of land suitable for irrigation around the town of Payson west of the Wasatch, but not enough water. East of the Wasatch was the Strawberry River Valley, with little level land but with plenty of water, especially during the spring freshets. So a great reservoir, storing 110,000 acre-feet of water, was built in the Strawberry Valley, and the water was conducted through a 19,000-foot tunnel under the crest of the mountains from the Colorado Basin over into the Great Basin. There it is poured into a branch of the Spanish Fork River and thus carried down to irrigate 60,000 acres of land on the plains around Utah Lake.[9] This water storage and others like it that have been, and may be, built will be a great help in

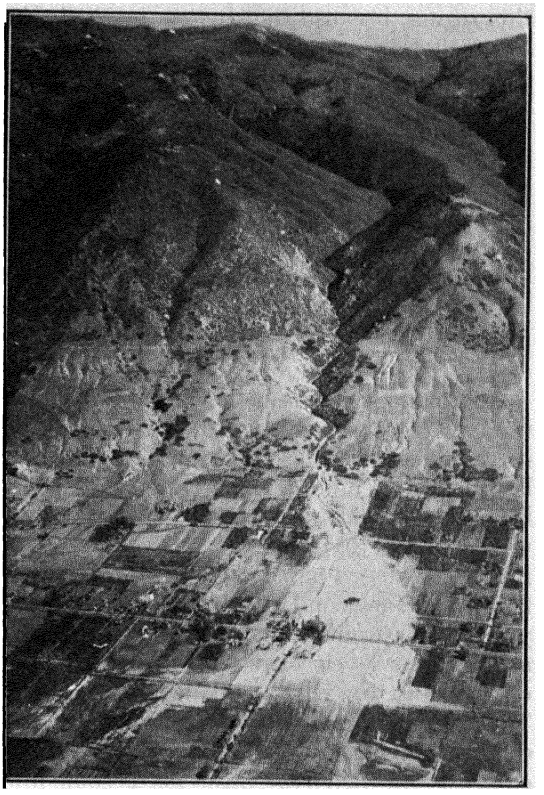


FIG. A. The Wasatch Mountain front 10 miles north of Salt Lake City. Heavy rains caused a mud-and-rock flow to spread itself over the white area in the center of the oasis that is irrigated by the stream flow from the canyon, which also brought destruction. Peach and cherry orchards on each side of the canyon mouth, valued at from $500 to $1000 an acre. The upper edge of the white strip on the lower mountain slope is the ancient water surface of Lake Bonneville. The elevation of this old water line is 5250 ft., the mountain crest 8600 ft., the schoolhouse in the middle of the white area 4300 ft.

Twelve out of thirteen canyons north of this one had had one or more destructive mud-and-rock flows between 1923 and 1937. Result, 50,000 acres added to the national-forest area on the mountain, and a special research laboratory established near by. (Courtesy U.S. Soil Cons. Service and Inter-Mountain Forest and Range Experiment Station, Ogden, Utah)

[9] In 1937 the Strawberry Valley Project had 61,000 irrigable acres, of which about 47,000 acres were under irrigation and in cultivation.

this region, because the streams reach their maximum before the crops need so much water. The flow in June is four times the flow in August, when the demand for water is greatest.

Two other large irrigation units have been established by the United States Government in the Great Basin; one at Klamath, Oregon-California, and one on the Truckee and Carson rivers, western Nevada, where water stored in Lake Tahoe (193 square miles) is carried by a 31-mile diversion canal from one river valley into another, there stored in an artificial reservoir, and finally turned out upon the plains around Carson City, where it is hoped that eventually 200,000 acres will be brought under irrigation.[10]

LAND INJURY BY ALKALI

One of the dangers of irrigation in basin regions of this character is that the land may be spoiled with alkali. The repeated evaporations of the lakes in their basins mean that the beds, for great depths down, are alternately layers of sand, mud, salt, and alkali. When water is poured on the surface for irrigation, it soaks to a considerable depth and dissolves salts. The salts rise to the surface by capillary attraction, and when the water evaporates they remain encrusted on the surface. Thus many a field that was promising and fruitful in the second or third years of irrigation has been ruined in succeeding years because alkali killed the plants. Also waters from irrigation canals along higher levels have come in and ruined many a lower-lying field. The only cure is to wash the alkali out. To do this, ditches are dug in the field. The field is flooded with water, which soaks down and flows out through the ditches, leaving the top part of the soil free of alkali. Thus every irrigation enterprise in the Great Basin needs some lower place into which to discharge its alkaline waters — a kind of agricultural sewage disposal. The playa lakes are well adapted for such service. It is quite conceivable that even a moderate increase in rainfall might cover these playas and the irrigated lands along their shores. Such a calamity would rival the flood of Noah, and its effects would last much longer.

CORN AND ALFALFA

Corn will not ripen well in the cool climate but, as in New England, it reaches a point where it is ready for the silo, and dairying is increasing. Seventy per cent of the farmers in the Newlands Reclamation Project, western Nevada, are dairymen. Alfalfa, wheat, melons, beans, sugar beets, potatoes, tomatoes, and other vegetables thrive. The yields of all crops are high, in large part owing to the fact that the soils are quite new, unleached, and very fertile. The early settlers of Truckee, 1906 and 1907, met an interesting, but to them alarming, illustration of the disturbance of the life balance due to the

[10] On the Newlands Reclamation Project, around Carson City, there were only 50,000 acres under cultivation in 1937. The general elevation of this project is about 4000 feet, and the temperature ranges from 0° F. to 105°. Late and early frosts are expected. Alfalfa is the major crop.

intrusion of man. When by irrigation man raised fine fields of alfalfa and potatoes, certain desert-burrowing mice found unexampled opportunities for food. They burrowed from potato plant to potato plant, eating and breeding as they went. The alfalfa fields were their delight. They ate the plants, tops, roots, and all, and attained numbers estimated at from 8000 to 12,000 per acre, utterly annihilating the crops. Man had further aided them, of course, by destroying hawk, shrike, snake, and above all fox and coyote, all of which had preyed upon the mice. The Government was appealed to. Experts studied the situation, and extensive enterprises were undertaken which finally left man a chance to harvest his own crops.

DRY FARMING

Much has been said in the agricultural press of the country about dry farming in Utah by the summer fallow system, but after all it is a limited resource. The low plains are too dry. Some of the highlands are too frosty. Sandy soil is too porous and dries out. Clay soil bakes. Only a sandy loam soil will do for dry farming, and it must be rich and deep. The area of such soil is limited to mountain slopes and mountain valleys. As long ago as 1917 nearly all such land was in use.[11]

This system of agriculture was tried as early as 1850, but without material success until 1890. It was not taken up as a deliberate series of experiments by agricultural experiment stations until 1913. The chief crop of this kind of farming is wheat. The reasons are two: It is the most valuable of the grains, and since 85 per cent of the rainfall in this region falls in winter, the area is perfectly adjusted to the needs of winter wheat.

THE SNAKE RIVER VALLEY, LAND OF LAVA SOILS

The Snake River country has an origin quite different from that of the Great Basin, and to understand its use by man we must first understand how it was made. To the geologist nature tells the following story very clearly in the walls of the banks of the Snake River: For more than 100 miles south of Lewiston, Idaho, this river has a gorge from 4000 to 6000 feet deep that is a worthy rival of the Grand Canyon of the Colorado. In one place the wall of this canyon shows the section of an old mountain with cliffs and sharp peaks reaching many hundred feet above the bottom of the canyon. Upon the top of the mountain are layer after layer of lava, then layers of sand and mud that were placed there in the bottoms of lakes, then more layers of lava, and layers of volcanic dust, until finally the old buried mountain has on its head 2000 feet or more of volcanic stuff and lake-bed stuff. These deposits make up the whole area of the upper Snake Valley. The surface of this valley is a series of gentle swells, each with its center over a vent from which lava has rolled and flowed away in all directions, making a gentle slope which

[11] J. W. Jones and A. F. Bracken, *Grains for the Utah Dry Lands*, U.S. Dept of Agr., *Farmers' Bulletin* 883, 1917, p. 3.

merges into the slopes from other vents. This lava contains much of the mineral augite, which melts at a very low temperature for minerals and therefore made the lava run almost like water. In several places 100 of these old flows can be seen, one upon the other, in canyon walls.

Such a flood of lava would dam a stream and turn it into a lake where sand and mud would collect before the next lava flow covered it up. An interesting sample of this process can now be seen in Harney Lake and Malheur Lake in southeastern Oregon. One of the most recent lava flows dammed two streams, whose waters collected to make these lakes now only 10 or 15 feet below the elevation of the lava dam. Before this occurred 400 square miles of land drained into the Snake. Now this area is a part of the Great Basin.

The volcanic processes were not limited to the Snake River Valley. Lava seems to have poured out of fissures at the base of the Cascades. Volcanos threw showers of dust and ashes into the air, and they were spread so thickly that much of Oregon is of volcanic origin. Some of it is so sandy and dusty that a considerable area (150 by 30 miles) bears the name Great Sandy Desert. This soil is so porous that no water lies on its surface, and there is no water fit to drink within the area. The winter rain, however, which is more than 10 inches, is sufficient to cause a good growth of grass, which is sometimes uneaten over large areas because no animals can come, owing to the lack of any opportunity to drink in that region.

Lava flows also cover large areas in the Columbia Basin. The total of this northwestern lava field amounts to about 250,000 square miles, making it the largest of its kind in the world. Lava flowed around old hills, leaving them as islands of older rock in a sea of basalt (solidified lava). Old ridges became capes and peninsulas, while the Blue Mountains, an outlying part of the Rocky Mountain system, stand now as a great island in a sea of basalt. Most of the basalt has weathered into soil, but some of it is still hard rock, being but a few hundred years old. The plains around the Blue Mountains are from 4000 to 6000 feet high. The mountains rise from 8000 to 9000 feet.

Lava dammed the streams that flowed away from the mountains and turned the mountain valleys into lakes. With time the lakes have become filled with sand and clay through which the streams wander as the Mississippi wanders on its mud plain. Where these streams reach the lava dams, they cut sharp gorges in the newer material.

SURFACE AND WATER

The Snake River Valley is much like the oasis strip of Utah except that it has more water, and a rich soil of volcanic origin rather than of mountain washings. On both sides of the Snake Valley are mountains. Those on the south afford rich summer pasture but no forests, while the great mass of the Salmon River Mountains, and the Bitter Root Mountains on the east, have forests above 5000 feet, and snow fields that melt just when the settlements below are in greatest need of water for irrigation.

The Snake River runs for more than 300 miles in a great curve across Idaho, but its valley, with all of its rich soil, suffers the misfortune of having the

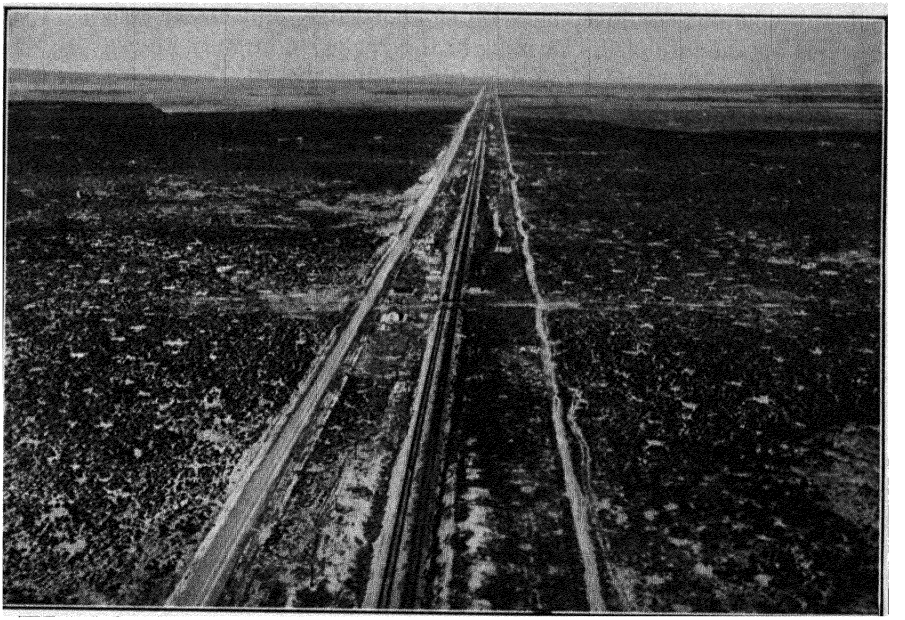


FIG. A. This is what the Great Basin looks like in southern Idaho. At the right, an early wagon trail, then the double-track railroad with station, and at the left, the last transport addition, a modern automobile road. (Photo by J. G. Adams, U.S. Soil Cons. Service)

river at the bottom of a sharp canyon from 400 to 1000 feet deep.[12] For 250 miles in the eastern part of the state there is no branch that reaches the river from the north. All the streams sink into the lava. This water difficulty is shown by the Minadoka irrigation unit, one of the first built by the United States Bureau of Reclamation. There it was necessary to pump water for all the land on the south side of the river, although gravity served to supply the lands on the north side with water from a branch of the Snake.

This irrigation unit on the Snake River illustrates in an interesting way some of the problems and unexpected things that happen where the maintenance of life depends upon irrigation. In most parts of the valley, farmers had to dig from 300 to 400 feet to find water, but it was different in a large part of the Minadoka unit. It so happened that there was an old lake bed with tight bottom 30 or 40 feet from the surface. Irrigation water was turned on, and in a few years the lake bed became so full that water came to the surface of the land. Then ditches had to be dug, at a cost of $18 an acre, to drain it.

On all sides of this unit is a sea of sagebrush which for a generation or two has been free range for flocks of sheep; but since laws have been passed which give the settler 320 acres or 640 acres of land for a farm, much of this has been homesteaded by the dry-farmers. Many fail and move away. Others stay

[12] There is no valley land for irrigation west of the mouth of the Malad River, 100 miles (on the east-west line) from the east boundary of Idaho.

and work, hoping for luck, increase of knowledge, and better prices. It is too soon for the fate of dry farming in this region to be fully known, but the price slumps after the World War and during the 1930's caused many to give up.

Taken all together, the Snake River Basin is indeed an irrigated empire. In 1935 it contained about 3,000,000 acres under irrigation development, one-third of which were located in the valley of the main stream.

THE LIVESTOCK INDUSTRY

The one sure thing in the Snake River Valley is the livestock industry. It thrives on the sagebrush plains and the mountain pastures and the alfalfa rick. Indeed, you would think it was an agricultural Eden to hear a valley irrigation farmer brag about how he makes his living turning on the water to irrigate his alfalfa. He sits on the porch two or three weeks waiting for alfalfa to grow, then he works busily for a week cutting and putting it in stacks, and irrigating the field again. Then some more weeks on the porch, then a second cutting and then a third. In the autumn come the sheep-owners to dicker for the alfalfa. They drive in their flocks, and the animals eat the alfalfa where it stands. Meanwhile the alfalfa-owner spends the winter in California or Florida, or gapes at the Great White Way, if prices are high enough — a big IF!

ELECTRICITY ON THE FARM

The use of electricity as a farm and household convenience has perhaps reached a higher development here than in any other part of the United States. Mountain streams whose waters finally irrigate the land have falls, and the United States Bureau of Reclamation has built power plants to make power for the use of the people in the irrigated land. In some cases power is used in the summer for pumping water. By one count 1000 out of 2200 farms have land so situated that water can be lifted a few feet from the main gravity ditch to irrigate their fields. In one case a man added 22 acres with a $900 pumping plant. It is common for the farmers to have co-operative power lines; a hundred or two of them living in a certain locality will have a line that taps the main transmission line. Since water for irrigation is not needed in winter, there is a surplus of power for sale, and it is used for heating houses at a price of less than .2 cent per kilowatt hour. In the towns of Rupert and Burley about half the houses are heated by electricity. The typical farm-house has an electric washer in the basement, and in the kitchen electric hot-water heater, ironer, vacuum cleaner, and range. Halfway between the house and the barn is a creamery heated by electricity, with the separator and the churn driven by electricity. The barn is lighted by electricity, and an electric pump with automatic control furnishes water supply for both house and barn.

This seems to be typical of a development which from now on is likely to take place with great speed throughout the more populous and progressive parts of the civilized world, where power resources promise henceforth to be



FIG. A. A farmer and a staff member of the extension service maintained by the Federal Government and the State of Nevada. A similar picture might have been taken in any one of forty other states. (Courtesy U.S. Dept Agr.)

not only one of the bases for manufacturing industry but also a factor in the development of agriculture and in improved living-conditions. It is merely an application of known technique, and the Rural Electrification Service of the Federal Government is pushing it along.

THE INFLUENCE OF FREIGHT RATES

The farmer of this region is far from markets. It is much more than 1000 miles to Chicago.[13] Therefore it is plain that he faces a high freight rate for his product. He is forced to produce concentrated products, of which meat and wool are excellent examples. The sugar-beet crop of this region is far more valuable than the wheat crop. The natural conditions for producing sugar are admirable.[14] The soil is deep and loamy in the one-time desert

[13] As there is not enough irrigable land to use all the water in the Snake, it promises to be permanently navigable from Pittsburg Landing, about 75 miles from the southeast corner of Washington State. This fact may play a large part in the future of Idaho, especially with the mighty phosphate beds, but it may not mean so much for the livestock farmer.

[14] While sugar beets are grown under a rather wide variety of climatic and soil conditions, optimum results are obtained where the soil is deep, friable, and well drained and where there are a moderately warm summer and a cool autumn. Young beets are easily frosted, but since they grow rapidly, planting can be delayed until the danger of a late spring frost is past. On the other hand, mature beets are very hardy and can withstand considerable frost. The 70° F. mean summer isotherm passes through the principal sugar-beet districts of the United States for a good reason — the beets let it.

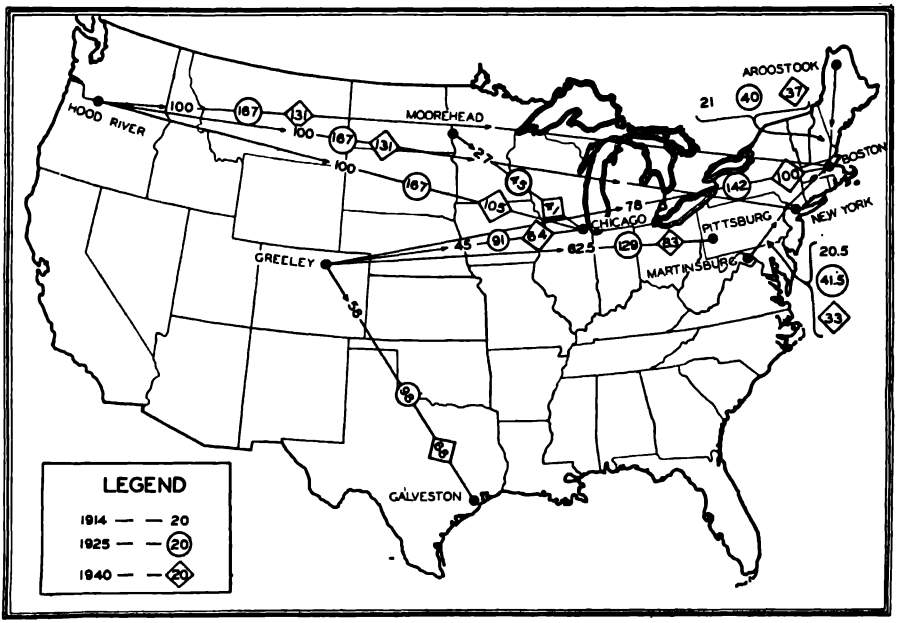


FIG. A. Freight rates per 100 lbs. from Aroostook, Moorhead, and Greeley on potatoes; from Oregon and West Virginia on apples.

valleys, a heavy crop is made possible by irrigation, and the comparatively high value of sugar in proportion to its bulk makes the freight rate seem small in comparison to that for wheat. Sugar-beet production requires a vast amount of manual labor, which in the West is provided largely by Mexicans. Without the protection afforded by the tariff, much of this industry would not survive.[15]

The necessity for concentrated products shows itself in the development of a dairy industry, for which the silo and the alfalfa stack are the great raw materials.

CITIES

Cool Salt Lake City, with a population of 140,000 (1930), the largest city between the Rockies and the Pacific ports, is larger than the next twelve cities of this region combined, yet it has no great manufactures except those to meet local needs.[16] Again consider freight rates. Salt Lake City serves as a distributing center for the sugar industry, for the farms and ranches over a wide territory, and for mines in both basin and mountain. Immediately above the city towers the Wasatch range, several thousand feet high, giving Alpine

[15] Western Congressmen and Senators voted overwhelmingly in favor of Philippine independence. One result is that Philippine sugar must pay the same duty as foreign sugar, whereas formerly it entered free, which gives our Western beet sugar a much stronger competitive position in our Pacific Coast markets.

[16] Chief cities (1930:40 pop.): Ogden, 40:44; Reno, 19:21; Provo, 15:18; and Logan, 10:12. The small growth suggests maturity of economic development.

scenery and an abundant supply of clear drinking-water. A few miles away is the Great Salt Lake, whose waters are so heavy with 25 per cent of salt that a person cannot sink in them. The salt water is evaporated in ponds beside the lake, and there is a salt industry with an annual output of about 75,000 tons.

The people of this city have unusual facilities for bathing, with the lake on one side and hot sulphur springs within city limits. These springs belong to the city, are much utilized for bathing purposes, and are a rather important source of income. Salt Lake City boasts that a quarter of its population is constantly in school and that education takes more money than all other city expenditures combined. The leadership of this territory in education for everybody is very striking in Ellsworth Huntington's map of civilization.[17]

THE FUTURE

The future of this arid region promises to be one in which for a time the great resources of minerals may give rise to a greater mining population, especially in periods of high prices. These people will continue to live, as now, in places which look to the tree-lover scarcely at all like home, for the desert mining settlement is usually without tree, grass, or flower, utterly shadeless, burning hot on summer days, severely cold in winter, wind-swept, dust-blown, desolate. Its delights are gold, humanity, and mechanism, unless the untouched desert, scrubby or bare, a hundred yards away happens also to be a delight; and for many the desert has great charm. The mining town, which can scarcely have a vegetable garden in its whole length, is an excellent market for the produce of irrigation settlements. However, the time must come when the mines will follow the fate of the first Nevada mine and be exhausted, leaving man to fall back on the scanty resources of pasture and the richness of the oases.

The pastures which have been injured by overgrazing may be improved a little with care. In the northern parts of the Great Basin the grass cannot now be used, because there is no water fit to drink, but animals might live there if a simple cistern were used. Such cisterns were used by the Romans, and ever since have been utilized in parts of Tunis where there is no surface drinking-water available and the wells are all alkaline.

It is plain that the chief economic basis for the future of the Great Basin is in irrigation, for which it seems reasonable to expect that man will eventually use almost every barrel of water that gets into the basin streams, thus causing most of the lakes to become dry. Water is more valuable in the irrigation ditch than in any other place. The Snake River Valley and the Great Salt Lake Basin apparently have more water resources than land that is suitable for irrigation, at present price levels.

The selection of plants for their resistance to alkalies, salt, and drought affords another interesting line of possible extension, but there is small reason to expect this region to support a population many times its present population, which is less than 1,000,000.

[17] See his *Civilization and Climate.*

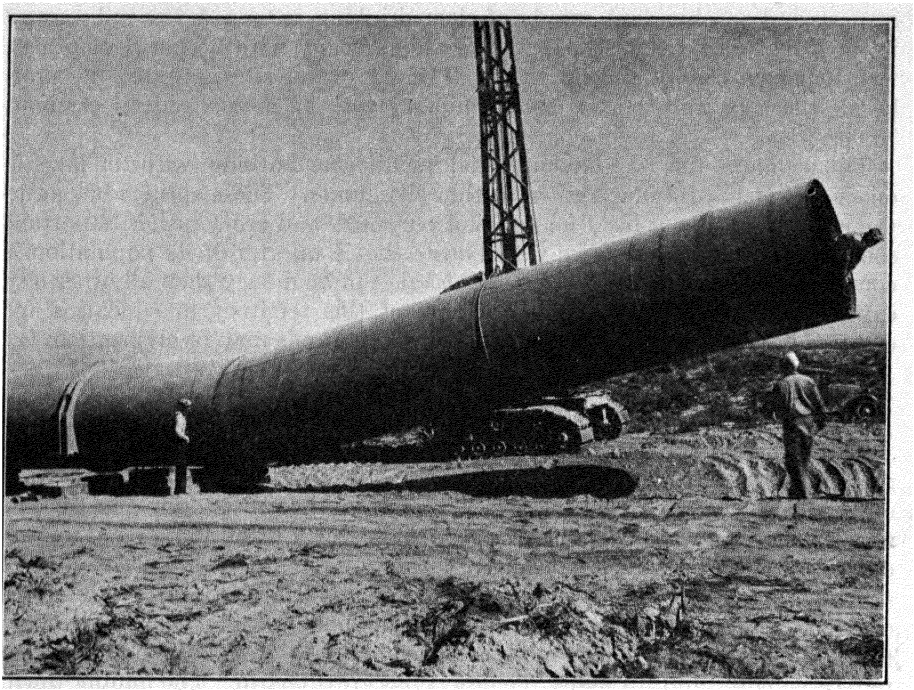


FIG. A. The Machine Age comes to the desert. Placing a section of 80-in. steel pipe in the Malheur River siphon on the Owyhee project in southern Oregon. This pipe will carry the water of the main canal of this project down one side of a valley, up the other, and across a range of hills. Note the small brush landscape in the background. (Courtesy U.S. Bureau of Reclamation)

The three states — Utah, Nevada, and Idaho — which make up the greater part of this region have three distinct flavors arising from their history. Utah was settled by Mormons, people who believe ardently that the best community is composed of landowning farmers. They shunned mining as much as possible, and made excellent laws for the distribution of water among the people. Nevada suffers in part because of the lack of scientific policy in the management of public lands. For example, the man who owns a spring may automatically have a monopoly on the pasture of thousands of acres of land because there is no other water within reach.

Idaho came quickly through the stages of the gold rush, sheep-ranching, and homesteading to the last stage of scientific, large-scale irrigation. This leaves a newness, a frontier spirit, not found in Utah. But one interesting point needs to be made. The low price for farm produce makes relatively low cost of living. Therefore on the *cost basis* the towns nestling at the mountain's foot in the wide open spaces of this large and healthful region might be the best place in the United States for the fabrication of light and costly articles. As yet there is no sign, but the land is young. There is much to be said (theoretically) for watchmaking in Utah and neighboring states rather than, say, in New England.

Chapter 30. THE COLUMBIA–FRASER BASINS



THE territory from the Blue Mountains (south of the Columbia River) northward to the northern part of the Fraser drainage basin, and between the Rocky Mountain system and the Pacific mountain system, is drained by two great rivers, the Columbia and the Fraser. These rivers manage to escape through the coast ranges to the sea through gorges so narrow that in them even road-making and railroad-building have been most difficult. They are *gates*, made into gateways by the expenditure of much labor and much capital.

The greatest handicap of this large region is the same as that of its southern neighbors, low rainfall. The Cascades and the Coast Ranges have squeezed out so much of the moisture from the rain-bearing west wind that the lowest lands along the rivers, except where irrigation is practiced, are arid expanses of sagebrush and poor pasture, with lakes of salt or alkaline water. Climbing upward from this dry bottom zone of poor pasture to altitudes of greater rainfall and less heat, we pass through zones of dry farming, humid farming, upland pasture, and finally forest. If the slope is gradual, as is sometimes the case, the zones of production grade insensibly into each other. The farming zones eastward from Pasco, Washington, to land of greater elevation are typical: 1. There is an area with soil so light and rainfall so scant that it has never been farmed. 2. Dry farming begins where a crop of wheat is grown every two years. The dry-farmer plows his land in the spring of the first year, tills it in the summer to conserve moisture and destroy weeds, and plants wheat in the autumn of the first year or the following spring. 3. A little farther to the east it has been the custom to raise two crops in three years. One year the land is summer-fallowed, the next year it is in wheat, the next in wheat, oats, or barley. Near the Idaho-Washington state line peas have been grown in a two-year rotation with wheat. In other localities less susceptible to frost, beans and wheat may form a two-year rotation, but the area adapted to beans is limited. Some farmers can grow three crops to one summer fallowing.

Above the dry timber line are the upland pasture and the forest zone. Here the greater rain of higher altitudes makes fine pasture, but the summer frost of high altitudes often cuts off crops before they can mature, so that even where the land is arable it can be used only for pasture.

Going upward from the master streams and along the slopes of elevations within these valleys, we find these zones in ever varying width. In a brief summary of the region, one more feature must be mentioned — the oases, where the farmer irrigates the drier lands by mountain waters. It is fortu-

nate that nature has given great allowance of streams to this region, where man's greatest physical problem is the watering of arid land.

THE COLUMBIA BASIN

The differences in rainfall between high and low elevation combined with increased distance from the sea and the influence of mountain ranges are well shown by the facts of rainfall eastward from the crest of the Cascades. At Lake Keechelus, Washington, altitude 2479 feet, on the eastern slope of the Cascades, the rainfall is 62 inches; 26 miles southeast, at Cle Elum, 1930 feet, the rainfall is 23 inches; and 20 miles farther southeast, at Ellensburg, 1571 feet, the rainfall is only 9 inches. Thus within the short span of 46 miles between Lake Keechelus and Ellensburg there is a drop of 908 feet in elevation and 53 inches of annual rainfall.[1] In one of the lowest parts of the Columbia Basin, at the mouth of the Snake River, the rainfall is but 7 inches. A large area in central Washington and adjacent parts of Oregon has less than 10 inches, and some parts are called deserts by the people who live near them. Increasing elevations to the east are accompanied by increasing rain.

The aridity of this central lowland is further shown by many little inland drainage basins.

> The central and eastern part of Washington is largely a great lava plateau . . . now dotted with literally hundreds of small inclosed basins, due primarily to inequalities in the lava surface. . . . Some of these depressions now carry permanent or intermittent lakes, most are slightly or moderately saline. . . . So far as known none drain an area of over a few square miles.[2]

Most of the rain of this region falls in the winter. At this season the cyclonic storms draw the moist Pacific winds inland with greater force than in summer, and as the land is then colder than the sea, it is natural that rain is most easily and therefore most abundantly produced in the autumn and winter seasons. This bit of meteorology explains the fact that all west coasts in these middle latitudes have most of their rain in the winter — witness the shores of the English Channel, south-central Chile, New Zealand.

In the winter the farmer can work out of doors most of the time. Temperatures of −20° F. come occasionally, but the cold waves of winter are of short duration, because the wind blows from the west (the warmer Pacific Ocean) most of the time. The warm chinook wind often comes over the mountains and eats up the snows almost as quickly as they fall. In April, May, and sometimes June, the healthy young wheat gets soaking rain. July and August are almost rainless, and temperatures above 100° are common at all lower elevations. This excellent wheat climate is one reason why Washington, a state with low rainfall, leads the major wheat-producing

[1] As the winds from the west descend the eastern slopes of the Cascades, the air is warmed and compressed and tends to *absorb* moisture. Hence the marked decrease in precipitation.

[2] E. E. Free, *The Topographic Features of the Desert Basins of the United States with Reference to the Possible Occurrence of Potash*, U.S. Dept of Agr., *Bulletin* 54, 1914, p. 55.



FIG. A. Most of the area of the Columbia-Fraser basins is neither irrigable nor sufficiently supplied with water for cropping without irrigation. Therefore this picture of water-holding furrows on a pasture range suggests a type of improvement that may cover the largest used area of this region. The furrows on contour catch rain water, hold it, and give the grass seed sown in the furrow a special opportunity to grow and reseed the rest of the area — if not overpastured. This mechanized form of one of the old devices of primitive agriculture has possibilities of being used over areas greater perhaps than all our present cropland. Great good may result in water supply. (Photo by J. G. James, U.S. Soil Cons. Service)

states in wheat yield per acre. In summer the plateau broils under a desert sun, but the inlander much prefers his dry, cold, sunny winter to the damp, foggy west coast.

Columbia Basin soil is also responsible for heavy wheat yields. Nearly all of the Columbia Basin is of the lava formation described in the preceding chapter. The lava flowed out from great fissures in the earth and remained in layers often to a depth of from 3000 to 4000 feet. Eight different flows can be recognized in the Yakima Valley. In most parts of the Columbia Basin the lava is old enough to be deeply decayed. There are often 60 feet of decomposed lava, rich soil, on top of basalt (solidified lava). The lava flowing from under the earth crust is fresh earth stuff, and mostly rich with the elements of plant food. The scanty Columbia Basin rainfall could not leach away much of its richness, to carry it off to the sea, so this fertile volcanic soil patiently waited, smiled when introduced to the plow, and responds annually with a golden harvest. Hence, despite the low rainfall, the rolling wheat fields of the Columbia Basin yield more per acre than those of any other important wheat-

growing area.[3] It is a great misfortune to man that so much of the Columbia Basin is too dry for wheat, so that its total production is much less than that of Kansas.

The largest block of wheatland, as the wheat map shows, is on the wide plains at the base of the Blue Mountains and on corresponding plains in east-central Washington, with Spokane as their metropolis. On the steeper slopes of the Cascades and the mountains of the northern part of Washington there is only a narrow belt of land with enough rain for dry farming or rotation farming, between the sagebrush pasture of low elevation and the rough land of the forest at high elevation.

The southeastern part of Washington, locally known as the Palouse, has a large area of hills that are thought to be of wind-blown formation. The prevalent southwest wind coming across the volcanic-dust areas of north-central Oregon and adjacent parts of Washington has picked up volcanic dust and fine particles of soil, drifted them along, mixed them with local soil, and built hills after the pattern of sand dunes, with gentler slopes (20° to 25°) toward the wind, and steeper slopes (of 40° sometimes even 50°) away from the wind.

Where the rainfall is sufficient, these hill lands are also in wheat. In the drier parts a column of dust sometimes marks the location of the plows and harrows long before they can be seen. Despite the steepness of these wind-blown hills, the largest harvesting machines on earth swing round and round their smooth slopes. This region was the first to turn to the extensive use of the "combine" — the combined reaper and thresher. The combine is especially well adapted to this region, since the wheat is always dry at harvest-time after the long rainless summer.[4] It is a question how long such erosive lands can last with wind, water, and soil-mining agriculture picking at them.

It is in this Columbia Basin that one of the interesting and suggestive triumphs of plant-breeding has been wrought. Because of the almost rainless summer, the farmers can let the wheat stand in the field for a month after it is ripe. The harvesting can accordingly be extended over a period of several weeks, and comparatively few men can thus take care of vast farms. But it was necessary to accommodate the wheat to this schedule. The wheat-

[3] WHEAT PRODUCTION AND YIELDS

	Washington		*Kansas*		*Minnesota*		*U. S.*	
	Million bu.	Bu. per acre	Million bu.	Bu. per acre	Million bu.	Bu. per acre	Million bu.	Bu. per acre
1937	48.7	21.5	158.1	12.0	35.8	16.6	874.0	13.6
10-year average 1924–33	42.5	18.9	142.2	13.3	23.5	14.5	804.0	14.2

[4] Tractor-drawn combines are used where the land is fairly level, but after some years of trial and error most of the larger wheat farms in the hilly lands have returned to the use of horse- or mule-drawn machinery, which has fewer accidents. On the great Drumheller wheat ranch near Walla Walla, 30 horses or more are needed to draw one of these great machines up and down the slopes.

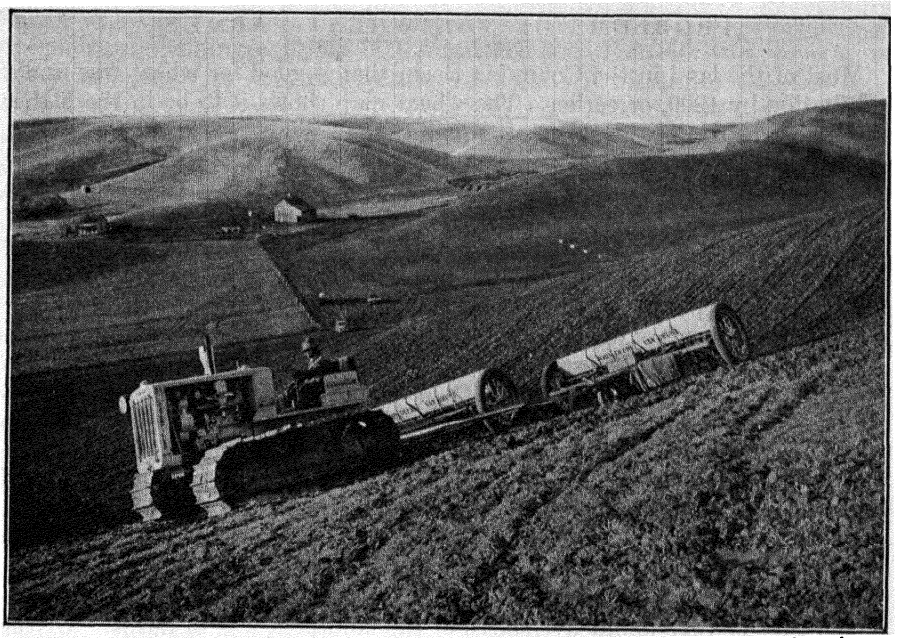


FIG. A. The marvelously rich wheatlands of southeastern Washington are thought to be of wind formation, with wind-blown soil, which helps to explain their fertility. Their slope shows how easily they may become victims of erosion, which will and must end the soil-mining type of wheat-growing in that area. (Courtesy Caterpillar Tractor Co.) For details see U.S. Dept Agr., *To Hold This Soil, Miscellaneous Pub.* 321.

breeding work was undertaken at the State College of Washington, about 1900. At that time some of the winter wheats yielded well, but their straw was so soft that when their yield was heavy, the straw would break down before becoming ripe. The grain would also shatter from the heads of these winter varieties soon after ripening. Some of the spring wheats had stiff straw and would hold the wheat kernels, but they yielded poorly, and if they were planted in the autumn, they would frequently winter-kill. A spring variety and a winter variety were crossed, and a new variety was developed that would yield well, hold the grain after becoming ripe, and would not winter-kill.[5] It also had a stiff straw that would stand up so that the harvesting season could be prolonged. With this new frost-resistant, grain-holding variety a large increase of wheat harvests was possible on the wide fertile lava lands of the Columbia Basin. This is merely an illustration of man's new-found ability to apply science to everyday affairs, which is destined to enrich every land in the world. The fairy tale has come true. Plant-breeding has really only begun. It is a great engine yet to be put to work. We can scarcely yet imagine the new wealth it may be made to create.

[5] Winter-killing is different from frosting. Frost injures the wheat when it is in bloom, damaging the future kernel. Winter-killing may be due to fall drought, intense cold, winter drought, soil-blowing, ice sheets, or alternate freezing and thawing which pulls the plants out of the ground.

PROBLEMS OF THE WHEAT FARMER

Most of the land in the Columbia Basin that is good for wheat was under cultivation by 1900, or earlier. The wheat map shows it to be in the higher southeastern part of the state, often called the Columbia Plateau.

On these Columbia wheatlands, as in all other wheat regions, the earliest grain farmers expected to raise a crop of wheat every year. Experience has shown, however, that where the rainfall is less than 18 inches a crop of wheat cannot be grown every year. In such places the farmer raises wheat by the fallow-year system previously mentioned.

Only a small portion of the wheatlands of the Columbia Plateau receive more than 18 inches of rainfall, and even here the farmer is not without problems. The plowing that prepares the earth for the planting of the wheat in the autumn also encourages the growth of various weeds. In time these weeds choke the wheat to such an extent that an occasional fallow year, when the ground is cultivated to sprout and kill the weeds, becomes common in the lands with more than 18 inches of rainfall. This expedient of the Columbia Basin farmers is but a temporary phase of the one-crop plantation system, which must eventually give way to crop rotation or, as fertility and yields decline, the land will revert to pasture if it does not erode away.

A study of the Columbia Plateau Wheat Region by Dr. O. E. Baker revealed that in 1929 about five-sixths of the land area was in farms.[6] Of the 15,200,000 acres of farm land, 4,100,000 acres were in crops harvested, 200,000 acres showed crop failure, 3,100,000 acres were lying fallow, 434,000 acres were plowable pasture, 6,000,000 acres were unplowable pasture, and 1,000,000 acres were woodland, most of which was pastured. Patently, there was little opportunity for the expansion of crop acreage except at the sacrifice of land in summer fallow. The study also showed that wheat occupied 80 per cent of the total crop acreage, and hay crops, 13 per cent. Two-thirds of the hay acreage was grain hay, chiefly wheat that was not worth threshing. Hence, wheat actually accounted for about seven-eighths of the total cropland.

In this land of superspecialization, Dr. Baker found a surprising amount of diversity. Nearly half of the farms in 1929 were cash-grain (wheat) farms, which had from a third to a half of their land lying idle as fallow. About a third were general farms, fruit farms, part-time farms, or dairy farms. This variation in rainfall helps to cause great variation in the size of farms. In the section of lowest rainfall, a stock ranch has about 4000 acres. In the Big Bend country, dairy farms and general farms have from 300 to 400 acres, with only a small portion of the land in crops. Fruit farms have only about 20 acres in crops (irrigated).

Smaller farms and greater diversification are found in the moister eastern section of the plateau and especially in Spokane County, the greatest urban center and market.

Specialization in wheat, the chief crop, and constant cultivation of the land for from forty-five to sixty years have reduced the organic matter in the

[6] See O. E. Baker, "Agricultural Regions of North America, Part XI, The Columbia Plateau Wheat Region," *Economic Geography*, April, 1933, pp. 167–97.

soil by at least 35 per cent and the nitrogen by 25 per cent. As a consequence, the moisture-holding capacity of the soil has been reduced, and the erosion is increasing. With declining fertility, the yield of wheat per acre has continued downward. Soil erosion by both water and wind has wrought increasing destruction. Fortunately the United States Soil Conservation Service has come to the rescue, for the time at least. Here's hoping that the farmers will save their land for the generations that will come after us. Where the average rainfall exceeds 18 inches in the eastern part of the plateau, the farmers have been urged to alternate leguminous crops (peas, beans, clover, alfalfa) with wheat in order to rebuild the organic and nitrogen content of the soil, but as yet only a few of the more progressive farmers have done so. In this section crop rotation and dairying offer a solution to the problem; there is nothing new about this kind of agricultural medicine, not even the fact that people hate to take it. In the drier sections to the west, where the acreage of wheat is twice as large as in the moister portion, Dr. Baker found that in 1929 there were practically no leguminous crops except alfalfa in the irrigated areas, and he laments that no leguminous crop has yet been discovered that can be grown successfully in rotation with wheat in the arid and semiarid counties within the Big Bend of the Columbia River.[7] This is an ominous fact, and it may spell the doom of wheat in the drier parts of the Columbia wheat region. May the gods of botany (the plant-breeders) bring them such a legume! It is not impossible.

In looking at the future of this land of dry-land wheat-farming, Dr. Baker observes:

> What is the next stage? Will man's conquest of nature continue and dairying extend, with the development of some drought-enduring leguminous crop, over the semiarid wheat fields, restoring their fertility? Or will the depletion of soil fertility by continuous grain culture ultimately justify the early cattlemen's opinion that most of the Plateau was a range country? Moreover, if the cities soon decline in population, as seems very likely in the absence of immigration from abroad, there may be a contracting market for the milk and the eggs and the fruit of the newer agriculture of the region, as well as for the wheat and beef of the older agriculture. Time alone can tell, but the next 50 years may see changes as great as those of the last half century.[8]

SKIMMING THE CREAM

It is plain that the Columbia Basin lands of Oregon and Washington have passed the cream-skimming stage. The declining fertility of the better agricultural lands — those which can produce a crop every year — is not unique. It is true of all lands that have passed the frontier stage.

Years ago a bulletin of the Washington experiment station told of declining yields in the dry-farming lands also.[9] It told of efforts at soil improvement by plowing in straw, which failed because there is not sufficient rainfall in these drier lands to cause straw to decay and mix satisfactorily with the earth.

[7] *Ibid.*, p. 188.
[8] *Ibid.*, p. 192.
[9] Washington Agricultural Experiment Station, *Twenty-ninth Annual Report, 1919, Bulletin* 155, 1920, p. 12.

This is, of course, also true of similar lands in Oregon. The investigators arrived at the depressing conclusion that this decline of fertility must continue (unless costly commercial fertilizers are used) until a maintenance level is reached. At this point, unless fertilizers are employed each crop must use the fertility produced by earth decomposition since the previous crop. Long-continued tests at the experiment station at Rothamstead, England (a land of satisfactory rainfall), showed the maintenance-level crop at that place to be about 10 bushels of wheat per year.

The cream-skimming aspect also appears in irrigated lands. Naturally the lands that could be most easily irrigated have been first used. Further irrigation will be more expensive than earlier enterprises. The usual waste of some irrigated land by "drowning out" and destruction by alkali has followed a few years of irrigation (see Chapter 27).

Long ago the ranges were overstocked. In 1905 a bulletin of the United States Department of Agriculture said that "owing to the greatly lowered carrying capacity of ranges in the State of Washington, investigations were begun in the spring of 1901." [10] The recommendations were essentially similar to those discussed in connection with the Great Plains and the Trans-Pecos Highlands, that is, to give the grass a chance to seed itself — simple medicine, but not so easy to take.

THE GRAND COULEE DAM

The biggest thing affecting the immediate future of the Columbia Basin is the Grand Coulee Dam, which is now being built as a part of the Columbia Basin Reclamation Project, by which it is planned to irrigate about 1,200,000 acres of arid and semiarid land, to regulate the flow of the mighty river for the benefit of power plants and navigation downstream, and to generate electricity that will be sold for general use throughout the region and to pump water that will irrigate the dry plateau lands above the river.[11]

The problem confronting Uncle Sam's engineers of the present day was laid out by nature millions of years ago when successive floods of basaltic lava poured out through fissures in the earth's crust and spread across the surface of central and eastern Washington, northeastern Oregon, and southwestern Idaho. This lava cooled and solidified to form horizontal strata of basalt. As the lava flows spread northward and westward, they gradually pushed the Columbia River out of its earlier course from the Colville Valley southward toward what is now the town of Pasco, thereby forcing the river to make a detour around the edge of the lava flows where they met the older igneous rocks of the rising Cascade Mountains and Okanogan Highlands. This circuitous detour caused the Big Bend of the Columbia River, and it is within the Big Bend section north and west of the mouth of the Snake River

[10] J. S. Cotton, *Range Management in the State of Washington*, U.S. Dept of Agr., Bureau of Plant Industry, *Bulletin* 75, 1905, p. 11.

[11] At Grand Coulee the river has a minimum flow of 17,000 second-feet and a runoff five times as great as that of the Colorado River at Boulder Dam. Because its source is high in a region of melting snows, the discharge of the Columbia, fed by winter rain and summer melt, is more continuous throughout the year than any large river in the country.

that Uncle Sam proposes to irrigate 1,200,000 acres of dry but fertile soil, which it is hoped will become farms supporting 40,000 American families.

In its position along the outer edge of the lava area the river cut for itself a canyon which in some places is 1600 feet deep and is sometimes bounded on one side by precipitous cliffs of lava and on the other by granite hills. At the site selected for the Grand Coulee Dam granite is exposed on both banks of the river. This forms abutments for the dam, and granite underlies its gigantic base. Back of the dam will be a storage reservoir 151 miles long covering an area of 82,000 acres, impounding about 10,000,000 acre-feet of water. The reservoir will extend up the Columbia River to the Canadian border, the elevation of which determined the height of the dam (550 feet), and up the Spokane River for 32 miles. When fully equipped, the power plant at the Grand Coulee Dam will be the largest in the world, with a generating capacity of 2,700,000 horse power.[12]

While nature provided a favorable site for a dam and reservoir along a mighty river, it both helped and hindered the engineer of the twentieth century in his job of getting water to the thirsty lands of the Big Bend district. Long after the last lava flow, during the Ice Age, a great glacier moved southward into northern Washington. A tongue of this glacier crossed and completely filled the gorge of the Columbia River at some point west of the present site of the Grand Coulee Dam, converting the upper gorge into a lake and diverting the river southward across the plateau. At one point, north of what is now Coulee City, the usually horizontal strata dip sharply to the southeast, forming an immense wrinkle in the plateau surface before they flatten out at a lower elevation. It is generally believed that the glacial river, flowing over this steep surface, initiated a waterfall that gradually cut its way northward and formed a trench 52 miles long, 1½ to 5 miles wide, and at places nearly 1000 feet deep — the Grand Coulee. Following the retreat of the glacier, the river returned to its old channel, and the coulee was left so dry that the small lakes in its base could not overflow to the river. Where the coulee intersects the south wall of the Columbia Valley, the coulee floor hangs about 500 feet above the level of the present river. Today this Grand Coulee, high above the river, will serve a very useful purpose. Engineers have constructed earthen dams 100 feet high at each end of the coulee, creating a balancing reservoir 27 miles long, covering 27,000 acres, and impounding about 1,150,000 acre-feet of water. To fill this balancing reservoir, 12 electric pumps, each with a capacity of 1600 cubic feet per second, will lift water about 300 feet from the main reservoir behind the dam. From the balancing reservoir water will be carried through a big canal southward for 10 miles to to the heads of the 150-mile east-side canal and the 100-mile west-side canal that will deliver the water to the great irrigation project. In 1937 the United States Bureau of Reclamation estimated that from twenty-five to fifty years

[12] Horse-power ratings of the world's largest power plants: Grand Coulee, 2,700,000; Boulder, 1,835,000; Dneprostroi (Russia), 746,000; Wilson (Muscle Shoals), 610,000; Conowingo, 594,000; Niagara (plants on American side), 452,000. The Grand Coulee Dam is the largest dam in volume in the world; 12,000,000 cubic yards of concrete were needed in its construction, or enough to build three Boulder Dams, or a Washington Monument covering six city blocks, or three pyramids the size of the Great Pyramid at Cheops.

may be required for the completion and settlement of the whole project.[13] (See the final chapter in this book.)

To the south of the Grand Coulee is the Lower Grand Coulee, another trench that was formed in a similar manner by retreating waterfalls, which originated in the vicinity of Soap Lake. With the retreat of the glacier, the river returned to its earlier channel and left behind a relic of its former might, the Dry Falls at the head of the Lower Grand Coulee. These ancient waterfalls of glacial times are more than 400 feet high and 3 miles wide; they are two and a half times as high and five times as wide as Niagara Falls, and it is said that they once had a volume of water a hundred times greater than that of the present Niagara Falls. Below this ancient cataract are two small lakes and an alkaline lake which becomes an alkaline flat in dry weather. Some of the lakes in this vicinity occasionally overflow into those toward the south end of the valley, so that the lakes in that direction become increasingly saline and alkaline. The last one is called Soap Lake because the waves beat its shores into masses of foam produced by the carbonates and sulphates of soda in the water. Think of the relief to mothers if all small boys could swim in that lake!

IRRIGATION AND THE FAMOUS APPLE VALLEYS

Of great importance to Columbia Basin farmers is the fact that the ancient glacier scooped out a series of mountain valleys. Then with the scoopings the glacier dammed up the lower ends of the valleys, so that today we have the beautiful glacial Lake Chelan and three other beautiful lakes in the upper Yakima. These Cascade lakes make admirable water-storage reservoirs for the irrigation of valley lands below.

The most extensive irrigation in the Columbia Basin (1940) is at the foot of the Cascade Mountains. Here are Yakima, Wenatchee, and Okanogan valleys, specializing in irrigated apple orchards, among the best-known fruit areas of their size in the United States. They became known through early advertising and later performance. These valleys are the land of the apple. The early successes of a few orchards which supplied near-by markets led to a great orchard boom. For several years before and after 1910 the populous centers east of the Rockies were flooded with the most beautiful prospectuses telling about fortunes to be made in Western apples. They were often put out by Eastern promoters, appealing to the teacher, the preacher, and other professional people of intelligence and limited income. These people were told that 5 or 10 acres of apple orchard in Washington, Oregon, or the Rocky Mountain states could be easily cared for by absentee management and would make them financially comfortable for the rest of their lives.[14] Most

[13] For an excellent description, see *The Grand Coulee Dam and the Columbia Basin Reclamation Project*, a pamphlet published by the U.S. Bureau of Reclamation, 1938. The dam will probably be completed in 1942.

[14] Dr. David Fairchild, the creator of the foreign-plant-introduction work of the U.S. Dept of Agr., has emphasized the fact that tree agriculture is one of the most natural and easy bases for the development of overenthusiastic hopes. It is so easy to find some

of these Western orchards that were sold to absentees in 5- or 10-acre units were not in the hands of the original purchasers at the end of a decade. Many trees were planted on unsuitable land. The difficulties of business administration of these faraway orchards were great. Apple prices had declined. Some orchards were pulled up. Others were united into larger ownerships.

The fate of particular investments should not be confused with that of the industry at large, for since 1927 the State of Washington has led the United States in apple-growing.[15] Irrigation aids in the production of heavy crops year after year, and the high sunshine of a naturally dry country gives attractive color. The apples are beautiful, but the Easterner says that this beauty has a resemblance to the ladies' complexion that comes out of a vanity box. Some people who deplore the flavor of Washington apples wax enthusiastic over the large meaty cherries of the Bing and Royal Anne varieties that are grown in the irrigated valleys, especially Yakima. However, the apples of the Northwest have captured Eastern markets through marketing enterprise vastly superior to that prevailing over any large area in the East. By early failures and losses the Northwestern farmers were forced to build centralized packing-plants. Each grower then handed his crop over for the central plant to pack, thereby removing himself from the temptation of making a poor pack and from the difficulties of making a good one. Centralized selling agencies were equally important.[16]

Another factor helping to explain the leadership of this region in the apple industry of the country is the fact that it was newly settled by a select population — the progressives from the East, who were not encumbered with local precedent or held back by "Father's way" or by their conservative brethren whom they had left 2000 or 3000 miles behind them.

The Hood River Valley of Oregon, in the eastern margin of the Cascades just south of the Columbia, is another famous apple valley. It has been through experiences very similar to those of its sister valleys to the north. Its water supply is derived from the natural storage of the perennial snow fields and glaciers on Mt. Hood. The land of this valley is not a level flood plain, but high ground, as rolling as the Piedmont of Virginia, several hundred feet above the Columbia. A great deal of work has been done to get the

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phenomenal tree, apply the processes of multiplication, and have a product that is unattainable in practice because the phenomenal tree is unusual and has unusual opportunities. The promoter selects an unusual, not an average, harvest from this tree, multiplies it by a number much greater than that of the trees which can be grown on the acre. There are no pests, no crop failures, and few costs in this paper crop for which there is always a good (paper) market. The result is wickedness compounding fraud.

About the time of the Western apple boom there was a similar pecan boom in the Southern states, with identical results. There will probably be others as agricultural science advances.

[15] In 1935–37 apple production in Washington averaged about 30,000,000 bu.; in New York, the second state, about 19,000,000 bu.

[16] In 1924 Washington State apple-growers combined to place a single order for 100 cars of apple-wrapping paper, $500,000 worth. In recent years shipments from Washington have averaged about 30,000 carloads, or 22,700,000 boxes, which required 226,800 bundles of wraps worth $1,020,600 and 124,740,000 board-feet of lumber to make the boxes, which were worth $2,721,000. In 1935 the Wenatchee-Okanogan Cooperative Federation alone shipped 1,498,000 boxes of apples.



FIG. A. Mt. Hood and the Hood River Valley. A giant snow mountain is a great neighbor. Amazing in its variety of beauties, it seems to say to man: "Admire me, respect me, be grateful to me, behold me with reverence, contemplate my grandeur with awe — but keep your distance. He who comes to my virgin snow does so with much labor and some risk of life."

The people who live in sight of Rainier, Hood, and the other snowy Cascade volcanoes now sleeping peacefully under snow mantles know also that the water from these mountain snows is almost life itself to the farms that make their irrigated valleys the homes of men. Most of the world's irrigation is a child of the mountains. It is natural that for ages many mountains have been held sacred and have often been worshiped by the men at their feet. (Courtesy Hood River Chamber of Commerce)

water by pipe, ditch, and flume over the hilly land and properly distributed to the trees.

If a man seeks a beautiful home in the country, the Hood River Valley offers him a site. Its rolling landscape, its well-kept orchards, are everywhere in the immediate foreground. Not far away to the west are the green slopes of the Cascades. To the south stands the towering snow-capped Mt. Hood. To the north, across the Columbia, is the similarly towering and similarly snow-capped Mt. Adams, and there are few landscapes that exceed the snow-capped mountain peak for variety of effect as the sun works around from the surprise of sunrise to the glow of sunset.

In the days of boom-beginning, the orchardists of the apple valleys expected to produce apples only, just as the cotton-grower of the South and the wheat-grower of Alberta and eastern Washington started with one crop. But experience has proved the unwisdom of a sole dependence on apples. Crop failure and flooded markets are the nightmares of the one-crop farmer.[17] Now

[17] The apple districts of the Columbia Basin are vitally dependent upon foreign markets, a development that was stimulated by the opening of the Panama Canal. Scores of refrigerator ships, locally called "reefers," enter the ports of Seattle and Portland and load apples for northwestern Europe. Strikes on the water front cause economic agony in the

everybody, from banker and railroad man to state experiment station expert, is advising the Columbia Basin farmer to diversify his crops.

UNUSED IRRIGABLE LAND

Irrigation is sure, but it is also costly. The balance of supply and demand is indicated by the land situation on the government reclamation units. A bulletin sent out from the United States Reclamation Service in 1923 advised settlers to bring with them in cash at least $5000, preferably $10,000. In 1937 the Government was prepared to supply water for 5300 acres on the Okanogan project, but only 3500 acres were under cultivation. The Yakima unit had 206,000 irrigable acres, but only 164,000 acres were under cultivation. These data indicate that much irrigable land could not be profitably farmed.[18] It is indeed a moot question whether or not farmers will be able to use profitably the 1,200,000 acres of the new Columbia River project, which will receive water from the Grand Coulee Dam.[19] Where is the market, in this world where scarcity is a business objective?

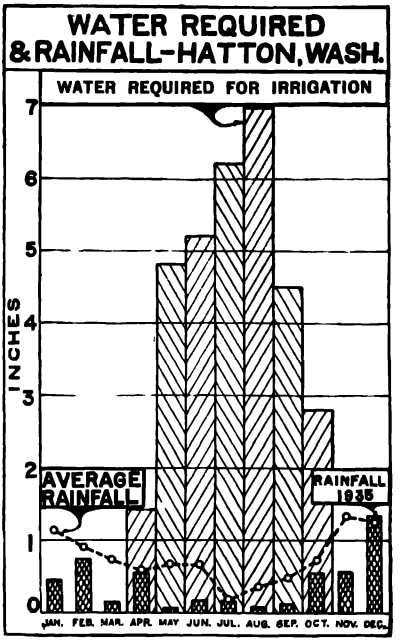


FIG. A. Hatton is in the drier part of the Columbia Basin. This graph shows the great difference between *average* rainfall and *actual* rainfall; also how irrigation requires that water be held from some previous time or brought from some other place. (Figures from U.S. Dept Agr.)

RESOURCES FOR MANUFACTURING

What are the possibilities of manufacturing? The Columbia Basin lacks coal and iron. It has no copper, no oil. It is a farming-ranching region. There are no great markets at hand. Plainly, it lacks the basis of a heavy industry. On the other hand, the basin is surrounded by a rim of forested

apple valleys, and at times apples from the Inland Empire have been routed via Vancouver and New Westminster for export. War calamity came to the apple valleys in 1939–40, for apples have been placed on the luxury list by some of the belligerent countries, resulting in the loss of valuable markets. Thus, the regional economy of the Inland Empire, like almost every other part of North America, is easily affected by world conditions.

[18] In contrast, the projects in the Southwest, where the climate is more arid and the growing-season is longer, have a larger proportion of irrigable land under cultivation. In 1937 the Salt River project, with 243,000 irrigable acres, had 229,000 acres under cultivation. The Yuma project, with 69,000 irrigable acres, had 60,000 acres under cultivation.

[19] A regional planning commission, with Professor Harlan H. Barrows as director, has been set up to co-ordinate the work of the state and county commissions and business organizations. This commission is concerned with long-range planning for settlement and human use. Studies are being made with reference to suitable crops, land use, city-planning, housing, education, and recreation. The economy of the irrigated lands is to be carefully planned, to avoid some of the mistakes of the past. This is perhaps the largest area of farm land ever thought of in this country for systematic, planned development.

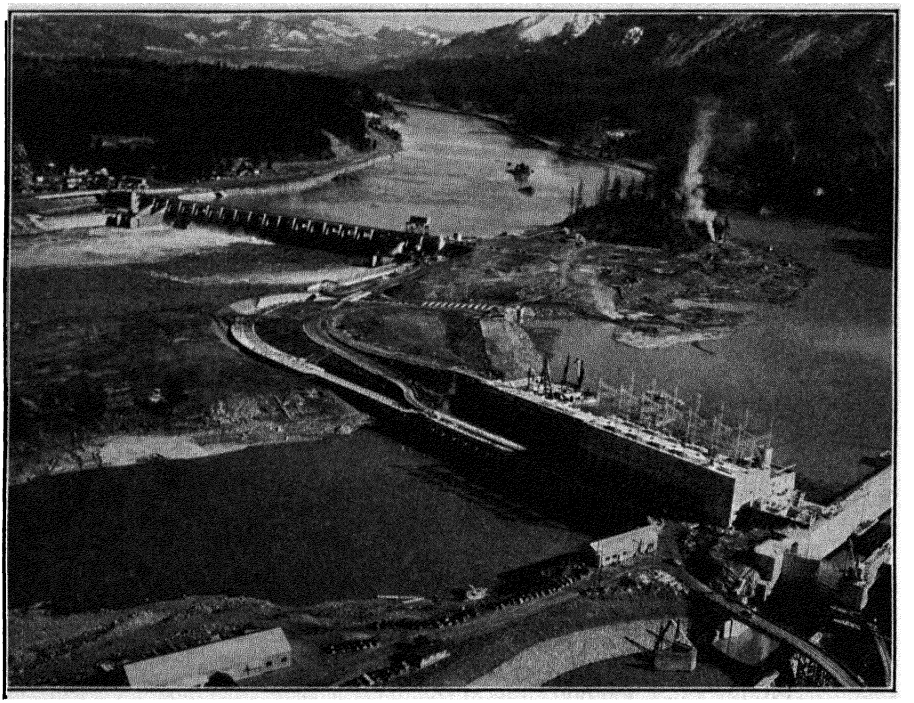


FIG. A. The Machine Age comes to the river — mass production of power. The era of big things is illustrated by this picture of Bonneville Dam in the Columbia River near the Cascade Mountains. This photograph taken from the Oregon side looking east shows the lock that will let vessels pass, the fishways to let salmon pass, the power plant, and the main dam. (Courtesy U.S. Army Air Corps)

mountains and therefore has large supplies of wood. Its wheat fields produce grain. Its ranches produce meat, wool, and hides. Power lines can easily carry cheap hydroelectric power from marginal mountain and central master stream to every square foot of the region, if it is wanted. It can be fairly deluged with power. There are many unused power sites in the Rockies to the east of it and millions of horse power in the Cascades to the west of it. Even the little River Deschutes, hard to find on the map, is said to have 1,000,000 horse power; it flows down east of the Cascades into the Columbia with a swift descent of 3000 feet and remarkably even flow. This even flow is produced by two factors — the slow melting of Cascade snows, and the natural water storage of porous volcanic-dust soil. The Columbia River system has 21,000,000 potential horse power, more than five times that of the Tennessee Valley, fourteen times that of the St. Lawrence, and about seventeen times that of the Colorado or the Niagara. Here, indeed, is the greatest potential power-shed on the North American continent. Will the power be used? If so, where?

The people in the American part of this region like to speak of it as the "Inland Empire." With its vast undeveloped resources, the greatest need

of the region is people.[20] Spokane is the region's economic capital, located close by a waterfall where the Spokane River leaves a wide-open valley and tumbles into a canyon en route to the Columbia. But Spokane shows no signs (nor does any other Columbia Basin city show any signs as yet) of extensive export of manufactures to other regions. Spokane commands the resources for factories, but its population is still scanty. In this respect it is much like Corn Belt cities west of the Mississippi. Other places have equal resources and more accessible locations.

Spokane (pop. 116,000) is about the same size as Erie, Pennsylvania. It is a distributing center for the wheat country, for the ranch country, for the lumber camps and mines in the mountains to the east of it. It is a railroad center, a natural place for railroad repair shops, but railroad freight costs tend to limit its factory market to the region near it. That region is not populous, nor does it show signs of multiplying manyfold in population. During the decade 1920–30 nine counties wholly or partly within the Columbia Basin lost population. Grant County at the western tip of the Big Bend lost 27 per cent of its people; adjacent Lincoln County lost 22 per cent. Spokane County to the east, with its many towns, gained less than 7 per cent. The word to emphasize is *inland*.[21]

In northeastern Oregon, not far from the place where the Columbia River reaches the boundary of that state, is the town of Pendleton, which has an unusual combination of industrial units. It is like a dozen other Western towns in being an important center for the supply of cattle and sheep. The unusual thing is that it has woolen mills, using the raw material from the near-by ranges. There are but few such places in the world.

THE FUTURE OF THE COLUMBIA BASIN

The future of the Columbia Basin is plain. Irrigation waters from the Grand Coulee can serve 1,200,000 acres, but this is less than one-tenth of the basin's area. Even after the great project is completed, most of the Columbia Basin must continue to be grassland, a land of ranches. Scablands, barren and worthless, cover large areas.[22] Fortunately, erosion is less rapid in the arid and semiarid grazing area than in tilled lands, but care must be taken to prevent overstocking the grass. Some of the region will continue to be dry-farming land, which has already entered the stage of declining fertility, and unless irrigated it will eventually revert to pasture. In the subhumid portion of the basin are several million acres that may be rotation-farming land, in which there can be great increase in intensity of cultivation and value of output of wheat, animal products, and fruit, if needed.

[20] The town of Walla Walla used to put out attractive booklets with the slogan "What Walla Walla Wants Is *You*."

[21] The Columbia Basin is commercially tributary to the ports of Seattle and Portland. Portland ships some wheat and Seattle, apples. When the people of the western part of the state wish to be polite, they refer to eastern Washington as the "Inland Empire," but when annoyed, they say "the cow counties"; eastern Washington reciprocates.

[22] See Nevin M. Fenemann, *Physiography of Western United States*, McGraw-Hill Company, 1931.

The semisubsistence farmers on small tracts in the various irrigation districts have been modestly successful. Less dependent upon distant markets than the commercial apple-growers and the bonanza wheat farmers, they have gone far toward working out a satisfactory farm economy. When prices are favorable, they sell some produce to local markets; when prices are low, they go neither hungry nor bankrupt. By a judicious mixture of horticulture and dairying, thousands of thrifty small farmers live in snug and comfortable farm homes in the better irrigated valleys, produce most of the food that they eat, and have solved their own agricultural problem. True, they pocket little cash from their crops, but they live comfortably and are happy.

Nature has long dared man to conquer the mighty Columbia River, and that dare has been taken. The Grand Coulee Dam and the Bonneville Dam 300 miles downstream are impressive evidence of man's ability to overcome some of the handicaps imposed by nature. As previously indicated, every drop of water that will eventually reach the thirsty lands of the Columbia Basin must be pumped from the great reservoir behind the Grand Coulee Dam to the balancing reservoir 300 feet above, and thence it will be led through an intricate system of canals, tunnels, viaducts, siphons, and head-gate structures to the irrigation ditches on the farms from 100 to 150 miles away. The engineering problems have been solved, but will the economic problems find as happy a solution? Will the irrigation farmer on the new project lands be able to produce crops that will cover all costs, including transportation to distant markets? Engineering problems at times seem simple in comparison with the problem of farm prices and agricultural surpluses. Material things and the forces of nature are usually not so obstreperous as human beings and price behavior in an era when the scarcity objective is one of the chief objectives of producers.

Perhaps the problem of surplus power is the greatest challenge of all. It may prove to be an economic nightmare or an Aladdin's wish come true. The power plants at Grand Coulee and Bonneville are to be connected with a 230,000-volt "backbone line." Their combined annual outputs will amount to 10,000,000,000 kilowatt-hours, or more than twice the present consumption of power in the area to be served. Both Grand Coulee and Bonneville plants are within economic transmission distance of the metropolitan areas along the Pacific seaboard, and it is probable that here, as in the Colorado Basin, most of the power will flow to the cities by the sea rather than to those of the great Inland Empire. Will cheap electricity attract industry on a large scale to the Pacific Northwest? [23] This indeed is a problem that challenges human enterprise.

It is interesting to speculate for a moment upon what might have happened if the Pacific mountains were absent (in the same latitude as Europe where there are fortunately no coast mountains), and if the mountains between central Colorado and latitude 55° could have lain east and west, as do the Alps. In that case the cyclonic rain-bearing storms would have swung into the Columbia-Fraser basins as they do into Europe, where in similar latitudes

[23] The Bonneville rate in August, 1939, was $2.25 per hundred kilowatt-hours. This is a tentative rate that will undoubtedly be lowered as sales increase.

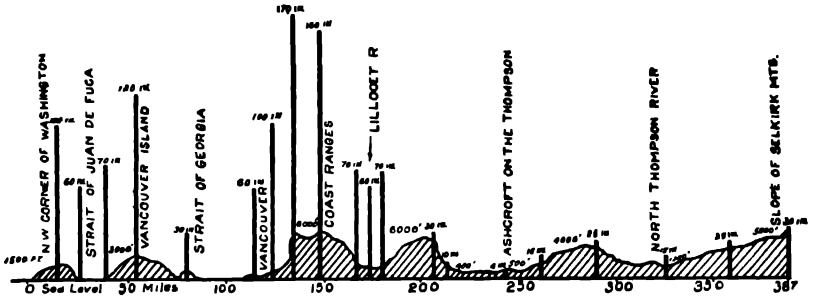


FIG. A. This graph is a wonderful exhibit of climate as influenced by topography. It shows rainfall and a generalized topographic profile along the straight line from the Pacific to the Selkirk Mountains and crossing a long series of heights and depressions. It would be interesting to add to this something showing the increase of temperature range between summer and winter along this same line. (Facts from U.S. Weather Bureau and Canadian Weather Bureau)

we find such magnificent agricultural lands and such human hives as the United Kingdom, France, Holland, Belgium, Germany, Switzerland, and northern Italy.

THE FRASER PLATEAUS

The Canadian geographers mark off on their maps an area of about 60,000 square miles of plateaus lying between the Rocky Mountain system and the Pacific mountains, and between the United States boundary and 55° N. Nearly all of this area is drained by the Fraser River, but the southern tip is drained by the Okanogan into the Columbia, and the northern tip sends its waters down the Skeena. The valleys within this plateau are not of large extent.

Like the Columbia Basin, the Fraser Basin is shut in by the Pacific mountains. Indeed, the Fraser Canyon through the Pacific mountains is so sharp that for many years the Canadian transcontinental automobile road had as one of its links a railroad haul for the motorcar through these mountains, where no suitable road had then been built.

Being thus shut away from the ocean by a high mountain mass, this area, like the Columbia Basin, has little rain at low elevations. Many of the lower parts have less than 10 inches. Near Basque, close to the Fraser River, there is a salt lake, somewhat like Searles Lake in California. It is covered with salt, and the liquor beneath contains Epsom salts.[24] In 1922, at the town of Kamloops, there was a poster in the shop windows telling about a picnic excursion "across the desert to Everett." The word "desert" was properly used, for in some years the rainfall at Kamloops has been less than 5 inches.

The Fraser Basin is connected with the Columbia Basin by the open valley of the Okanogan. The two areas are much alike save for two great exceptions: 1. The Fraser has no lava plains. 2. Most of the Fraser area is a plateau cut through by many long, rather narrow valleys. These valleys

[24] F. S. S. Johnson, "Epsom Salts Mined in Canada," U.S. Dept of Commerce, *Commerce Reports*, Nov. 11. 1919, p. 837.

have low (generally arid) areas of alluvial soil. Higher up in the valleys are many terraces or benchlands formed by the lakes of the glacial era. These benchlands have enough rainfall to permit some dry farming. Above the terraces are uplands with a great variety of soil, much of it glacial till (unstratified drift) marked by both fertility and stones.

Most of the higher land of the Fraser drainage area is covered with forest of mediocre quality; much of it is open forest with grass.[25]

As a result of surveys, the government of British Columbia reports many million acres of land suitable for agriculture, but most of it should be thought of as a land reserve to be used after more accessible and better lands of the eastern, southern, and central sections of the continent are in use and selling at higher price levels than at present.

A comparison of the State of Washington and the Province of British Columbia is not an exact comparison of the Columbia and Fraser basins. Each has a coast region with some agriculture, but the figures tell much, for the present at least. Here are some ratios, Washington: British Columbia: wheat 35:1, cows 3:1, horses $2\frac{1}{2}$:1, hogs 5:1, sheep 5:1, apples 7:1. These figures are startling. Spokane, the metropolis of the Columbia Basin, has 116,000 people. Kamloops, the metropolis of the Fraser, has but 6000.

The leading agricultural development of the Fraser Valley is apples, which are nearly all grown south of latitude 52° and chiefly along Okanogan Lake, a glacial lake 80 miles long and much like the glacial lakes of Washington. It is probable that the climate of this section is one of the best climates in the world for apples, because there are no midwinter thaws. British Columbia apples often win prizes in competition with those of Washington and Oregon.

To find the climatic counterpart of the Fraser Valley we must go to Europe. If one takes into consideration the many mountainlike plateaus, the valleys and slopes and ancient glaciers, and the temperature,[26] it is instructive to think of this section as another Switzerland, but it has no such large proportion of humid valley lands, it has no such tourist possibilities, and the location for commerce is not so good. It should always be kept in mind that the climate of the Fraser section, much like that of central Europe, is one of the best in the world for the production of energetic human beings.

Like Switzerland, the Fraser Basin is well supplied with water power. If the Fraser Basin is ever used as fully as Switzerland, it might with equal ease support from 50 to 75 people per square mile, but such efficient utilization of these plateaus and sharp-cut valleys will not come unless the United

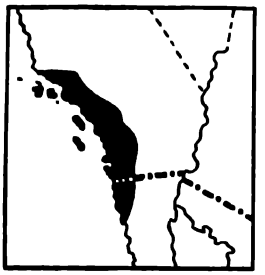
[25] Less than 5000 board-feet of lumber per acre. (H. N. Whitford and R. D. Craig, *Forests of British Columbia*, Ottawa, 1918)

[26] TEMPERATURE COMPARISON

	Jan. temp.	*July temp.*	*Annual temp.*
Kamloops (alt. 1193 ft.)	24.7	69.7	47.7
Lucerne, Switzerland (alt. 1480 ft.)	29.7	64.9	47.3

States and Canada have four or five times as many people as they now support. The area has advantages for manufacture similar to the Great Basin (page 622), but the present meager development of transportation here and the advantage of shore locations for manufacture are such that there will be a strong tendency, because of inland location, for the Fraser Valley to have but few more people than are needed to cultivate the land and extract the raw materials. When it comes to the full utilization of its agricultural lands, northwestern Europe probably shows the type of agriculture for most of it — barley, oats, clover, root crops, and fruit.

Chapter 31. THE LOS ANGELES BASIN AND THE COAST OF SOUTHERN CALIFORNIA



IF we consider the resources of the State of California for a moment, we see how impossible it is to say anything definite about the state *as a whole.* California faces a cool sea in a latitude of climatic transition. It has many mountains to furnish altitude for coolness and rain, and also to be barriers to block off the rain from land to the leeward of the mountains. At San Francisco one wishes to wear his overcoat every day, yet Death Valley is a close rival to the holder of the earthly heat record.

On one side of the Sierra Nevada stand the world-famous big trees. Near by, on the other side of the mountains, are the lifeless salt plains that make Death Valley's floor. In the northwestern part of the state the humid forest drips with moisture a good part of the year. The southeastern part of the state has miles of tawny sand dunes like those of the Sahara, and beside them the date palms of Saharalike oases.

Leave the date oases. Go over the mountains to the westward. A few hours in an automobile on excellent roads and you have passed bare rock and pine forest, and have come down into a paradise of gardens, orchards, villas, and the human hive of the Los Angeles Basin. This Southern California — this small but populous region, the most fully developed region in North America, this few thousand square miles of lovely land — lies close to the edge of 1,000,000 square miles of desert and semidesert which radiate from it in nearly all directions.

Southern California is rescued from the desert by the green wall of the San Bernardino, San Gabriel, and San Jacinto ranges, which reach up high enough to make clouds and snatch moisture from the passing wind. Rain makes possible the homes of man where otherwise there would be only jack rabbits, pastures, a little extensive farming, and a few small irrigated oases.

This bit of good land, walled off from the desert by the mountain arch, faces the sea, and the winds blow from this sea with great regularity, making the land warm in winter and cool (near the shore) in summer. A man in San Francisco, the rival of Los Angeles, says: "Half of it is wind, and the other half's water" — the "wind" being salesmanship, the "water" being irrigation. The two great California cities maintain a riotous and picturesque rivalry. A boom psychology seems to permeate the atmosphere in Los Angeles, which has grown so rapidly in the last three decades.

CLIMATE

Briefly, the climate of this part of California, and also of the central part of California, may be described as subtropic because it will grow oranges and lemons, and as semiarid because irrigation is needed for most crops. The climate is an example of the Mediterranean type, much like that of the Mediterranean shores where it was first described. In regions with this type of climate nearly all the rain falls in the winter, and the summer is virtually rainless. Because of its sharply defined character, we shall see that it sets hard limits to what man may do, and also gives strong urges as to what he should do. The residents call it the greatest resource of the region, and allow no traveler to overlook it.

STAGES OF INDUSTRY

Southern California, like the central part of the state, has had a most varied industrial history in a very short time, as human history goes. The Spaniards made their first real settlement when in 1769 they founded missions. By 1800 there were eighteen of these, and more were established later. The missions were really economic enterprises, as they had to be self-supporting in this far country. The Spanish friars transplanted the products of their Mediterranean homeland to the mission gardens in California, where there are still some famous specimens of ancient vines and orange, lemon, olive, cork-oak, carob, and other trees of the Mediterranean region. This early start with growing fruit was an invaluable guide and experiment in getting California's greatest industry — fruit — under way. On the valley floors the friars grew wheat and barley for their bread (getting crops in years of better rainfall). By 1834 they owned 420,000 head of cattle, which grazed in upland pastures. Herds of wild horses and wild donkeys were so plentiful as to be a veritable nuisance, as they still are in some parts of the western United States. At this time the hides were the chief basis of California trade. Yankee ships were gathering up hides at San Diego and other ports, as is described in Dana's classic, *Two Years before the Mast.* The old missions are now little more than carefully preserved historical curiosities and penny-catchers, like the well-preserved Revolutionary bullet holes of New England. The Spanish occupation left its mark in other ways. These people gave the Spanish names to the California settlements, and they helped to create a style of architecture very different from that of the eastern United States.

California may be said to have "found itself" architecturally, a thing not yet true of the East. Of course, it is impossible to say whether the current development in California is a fashion or an architectural style; it is to be hoped the latter, since climatic conditions, local materials and historic tradition alike point to the development of a school of architecture of southern characteristics. California, indeed the whole Southwest, requires heavy overhanging eaves as a protection against the sun; thick walls as insulation against the heat; comparatively small window areas because of the intense brightness of the air, and low-pitched roofs are rendered appropriate by the absence of snow. These requirements are identical with those which built up the

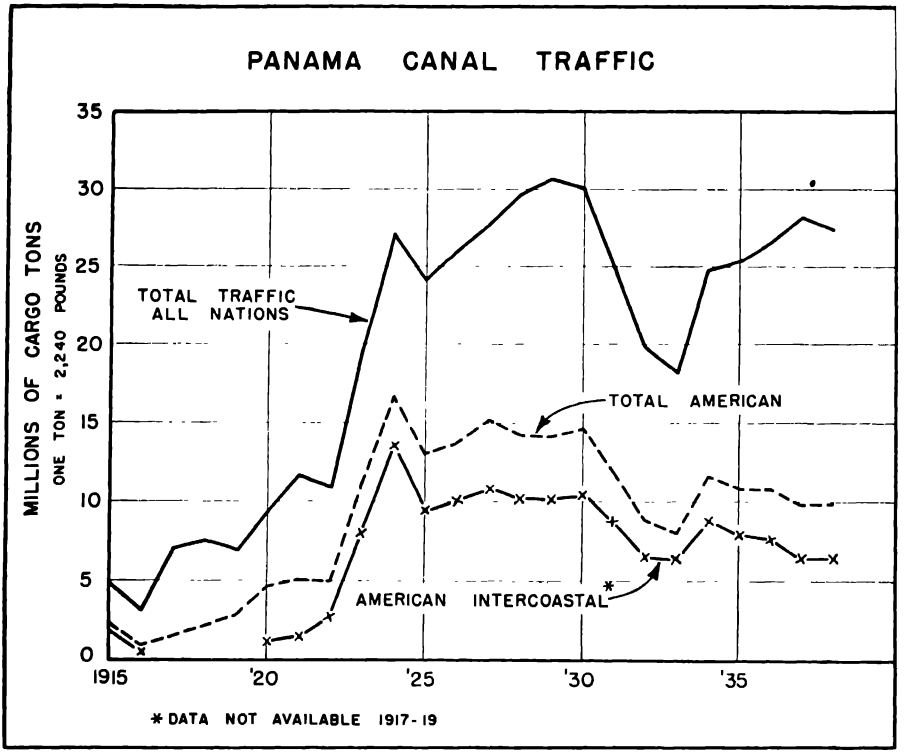


FIG A. It is difficult to measure the influence of the Panama Canal on the growth of population and industry on the Pacific Coast. It carries many cargoes of California oil and fruit, also grain and lumber from Oregon, Washington, and British Columbia. (Data from U.S. Maritime Comm'n)

Italian and Spanish country schools of architecture, and even had there been nothing to copy it would seem natural for such buildings to have been developed in the southwest, so that in principle the Italian type of building, which is generally out of place in the Eastern and Northern states, is eminently fitted for the Southwest.[1]

This is a clear recognition of environmental influence. Alas! we Americans *must* be in style. For many that means change, even if we change from good to bad. In the last ten years the style of architecture in this region has changed back to English and Early American designs with large window space. The widespread use of stucco is still a characteristic, but many streets now show a chaos of designs.

By 1860 the ranges had begun to suffer from overpasturing. Drought killed hundreds of thousands of cattle in the early '60's, and the people turned to raising sheep, which will survive on poorer pasture.

Between 1870 and 1890 California went through a period of bonanza

[1] Aymar Embury, "Modern American Country Houses," *Architectural Forum*, March, 1923, p. 85.

wheat-growing.[2] The treeless plains and foothills were easy to cultivate with machinery. Maximum acreage was reached in 1884, and for many years much wheat was exported in sailing vessels around Cape Horn to Great Britain. The twenty years from 1870 to 1890 were also a period of experiment in horticulture — the industry which helped to cause a decline in wheat, which in 1913 reached its lowest ebb, or about one-tenth of the acreage of 1884.[3]

Long before the American flag waved over California, the mission gardens had produced an abundance of grapes and other fruit, and they showed clearly the possibilities of great expansion if there were a market. But in that day marketing fruit in California was like marketing building-stone in the heart of a mountain. The opening of the first transcontinental railway in 1869 suggested a dim possibility, but it was only in 1876 that California sent its first car of oranges to market.

Since 1890 a very important horticultural industry has developed in Southern California, in the Great Valley, and also in the Coast Range valleys.[4] In Southern California there has been an even more remarkable economic development — the utilization of the climate as a dominating factor in business enterprises, a factor of greater economic value than that of the orchards and vineyards.

THE TOURIST ERA

We might call the period from 1890 to the present time the period of the boomers and builders. The resources utilized were the beauty of the country, the pleasant qualities of the climate, and the excellence and variety of subtropic crops. This land has great attractions for the traveler from the cold East and Middle West. Few persons, when they no longer enjoy coasting, really care very much for snow, blizzards, or a January thaw. These things are apt to happen from Montana to Tennessee and Maine, but meanwhile roses bloom in San Diego and Los Angeles, and people who live there can, with pleasure, be out of doors most of the time.

The landscape offers the varied charm that can be found only where sea and mountains are near neighbors. In Southern California you can within a few hours climb a mountain and take a dip in the ocean. The trees are the wonder and admiration of visitors from the East. The lovely drooping pepper tree, with its sweep of feathery foliage, and the beautiful eucalyptus are everywhere. The palms and the rich dark evergreen foliage of the orange trees offer contrast and great charm. The whole region is threaded by good roads which make traveling by automobile a joy, and there are enough elevations to give great opportunity to look up at mountains or down at distant landscapes.

[2] Its smaller area made Southern California but a small participant in this wheat fever, which was centered in the Great Valley of California.

[3] California wheat acreage: 1884, 3,360,000; 1913, 300,000; 1923, 748,000; 1937, 798,000.

[4] In 1937 California had approximately 5% of the population of the United States, produced 10% of the gross income from farm crops, paid 6% of the income tax, and had 9% of the automobiles. The 1930 census showed that per capita it had more homes wired with electricity than any other state.

In summer it is rarely hot near the sea, and even farther inland the dry climate usually makes a blanket necessary at night even though the day is very hot. But if the day is hot, it is also dry, and the heat is of a less wilting character than that of the land east of the Great Plains. San Diego boasts a temperature which for forty years did not go below freezing or for more than an hour above 90° F. No one will dispute San Diego's boast of having winters like Egypt and summers like Alaska.[5]

All these qualities are naturally attractive to the tourist and the vacationist, and the facts have been most diligently spread before the world by the activities of railroads seeking traffic, of businessmen's organizations wanting their towns to grow, and of land-boomers wishing to sell at a profit. In gathering information for this chapter, we have collected a pile of material two feet high, much of which is of an advertising character. In striking contrast, the material about the mighty and fully occupied Corn Belt contained almost nothing of the advertising sort. The West hustles to advertise. The complaint of an Eastern railroad traffic-manager illustrates Western hustle. In attempting to get Easterners to help him get up an exhibit for the New York Land Show of 1911, he complained that "the Western states, railroads, and business organizations have secured over four-fifths of all the available space."

Everyone will recall having seen much magazine advertising calling attention to a great variety of opportunities in Southern California, as well as in the rest of the state. The business opportunities in the Sunday edition of the *Washington Star*, August 19, 1923, contained this: "One acre will produce independence, immediate income and permanent prosperity in glorious California. Write for particulars. Pacific Homeseeker, Chamber of Commerce Building, Los Angeles, Calif." But that was in 1923. Only ten years later the nation was engulfed in the worst business depression in history, and California state police along the Arizona and Nevada borders were turning away thousands of the unemployed and home-seekers who had traveled across the continent in old jalopies, on freight trains, or by "thumbing a ride" in the hope of finding a fresh start in life. The person without a pocketbook was persona non grata. Free land and the old frontier are definitely a thing of the past. Today California's advertising is directed to the tourist class, to retired farmers and businessmen, to people with income — the ability to buy.

Many California counties maintain publicity departments under the direction of able men, and Chambers of Commerce have reached a degree of activity unknown in any other part of the world. That of Los Angeles claims the greatest membership in the country. Its various departments are run by able assistant secretaries. Are you interested in agriculture? You can get much carefully collected information from the man now in charge. Do you wish to write about Southern California? The Chamber of Commerce will get you the facts if it is possible to get them. The pictures you want will be taken. The things you want to see will be shown you by an officer of the chamber in an automobile of the chamber, or perhaps some leading citizen, *who really knows*, will take you out.

[5] The same is true to a lesser extent in places near San Francisco Bay.

As a result of this publicity we all hear of California before we get there, and hear of it continuously when we do get there. Indeed, the residents seem to think that you are stupid if you do not want to live there, once you come. They are partly right in assuming that once you come, you want to stay. Thousands have come for the journey, fallen in love with the country, and bought a home — some to live on their accumulations, some to try making a living. Said a man at Santa Ana, a few miles southeast of Los Angeles: "I jest got tired of crawnchin' through the snow back in Ohio, feedin' hawgs before daylight of winter mornings, so I am out here finishin' up my days raisin' alfalfa."

The people of Southern California make you welcome and try to make you feel at home. They take you to their picnics and parties in a wholehearted way that is not to be found in the older communities of the East. Perhaps the visitor may be pardoned if sometimes he wonders if the whole thing is a conspiracy to sell, and if everybody he meets isn't, to some degree at least, an assistant advertising agent. The people really do sell their climate as the Swiss sell their Alps.

For the ever increasing thousands who can make a tour, and as a place in which to live during years of retirement, Southern California is probably without a parallel in the United States. Why should the retired farmer stick in the black mud of Illinois or face the cold winds of Iowa, Minnesota, or Manitoba if he can spend the winter or his declining years in this land of gentle climate? [6] Indeed, many a Western bonanza farmer who has made a good crop has gone to California for the winter and returned home for the spring planting. Why should the retired schoolteacher or other person of small fixed income spend the years after he or she has retired from business in New York flats or in Chicago or Des Moines? Thousands of such people have gone to Southern California, where more people live without working than in any other part of the United States. People who go to Southern California from other states often form state societies.[7] Iowa state picnics are held in Southern California twice a year, and as many as 100,000 to 150,000 people have attended. Imagine trying to find a friend or a former neighbor from Webster City or Waterloo! Places are marked out for county grouping.

THE HEALTH-SEEKERS AND OVERPOPULATION

Then there are the health-seekers, especially those who have some pulmonary or respiratory trouble in the more rigorous or humid East. These people find that they can live more comfortably in Southern California.

Sometimes people who come for love of the country or from the necessity of ill-health are capitalists, and as a result of all these factors, outside capital has poured into this part of California as into no other part of the United States, indeed no other part of the world. Many who love the climate or

[6] Some prefer the more changeable and stimulating climate of the San Francisco region.

[7] There are 47 state societies with headquarters in Los Angeles. Hawaii and Alaska also have societies, and some states have more than one.

who must stay there on account of their health have a few acres of fruit as their means of partial or complete livelihood. In the San Fernando Valley near Los Angeles there is a settlement of 5-acre units covered with fruit, mostly apricots. The houses are buried in fruitful shade; each "ranch" in the northern and western parts of the valley has a large hennery with a thousand or two of White Leghorns, whose eggs are sold in New York at the top price through the co-operative egg-marketing associations. But in recent years most of the fruit district in the eastern part of the valley has been converted into a residential area, the homes of many movie stars being located near Toluca Lake.

As a result of all these things, Los Angeles and its vicinity grew between 1920 and 1930 as did no other part of the United States (see percentages given below).[8] And having boomed, and being mortgaged, the depression of the 1930's hit with staggering force. Tax delinquency rose to terrific heights.

Los Angeles is surrounded by suburbs or semisuburbs. The convenient little bungalow, bowered in vines, flowers, and shade trees, is more universally attractive than the small home in any other part of the country.

This is a new country, but it is no frontier. In many respects it is quite as up-to-date as New York or Chicago. Its newness is shown in the absence of social stratification and the ease of social mingling. Nevertheless, some of the characteristics of an old community are present, and of course they will grow with age. The labor market was somewhat depressed before the tragedy of 1929. Many who had gone to California seeking health or pleasure needed to supplement a small fixed income by additional earnings. So many entered the professions or the service industries, or took clerical jobs or part-time work, that the demand was more than supplied, and wages were lower for that kind of work than in many other parts of the United States. This would indicate a good place in which to start manufacturing,

[8] POPULATION GROWTH OF METROPOLITAN DISTRICTS CONTAINING NEARLY ONE-FIFTH OF ALL THE PEOPLE OF THE UNITED STATES

	1920	1930	*Per cent increase 1920 to 1930*	1940	*Per cent increase 1930 to 1940*
Greater New York and 9 near-by counties	8,456,000	10,743,000	27.0	11,511,000	7.1
Chicago district (5 counties)	3,422,000	4,551,000	33.0	4,695,000	3.2
Boston district (4 counties)	2,315,000	2,612,000	12.8	2,656,000	1.7
Philadelphia district (3 counties)	2,187,000	2,484,000	14.0	2,498,000	0.6
Detroit (Wayne County)	1,178,000	1,889,000	60.4	2,016,000	6.7
San Francisco district (5 counties)	1,042,000	1,410,000	35.3	1,535,000	8.9
Los Angeles district (Los Angeles, Riverside, Orange, San Bernardino, and San Diego counties)	1,234,000	2,752,000	123.0	3,472,000	26.2

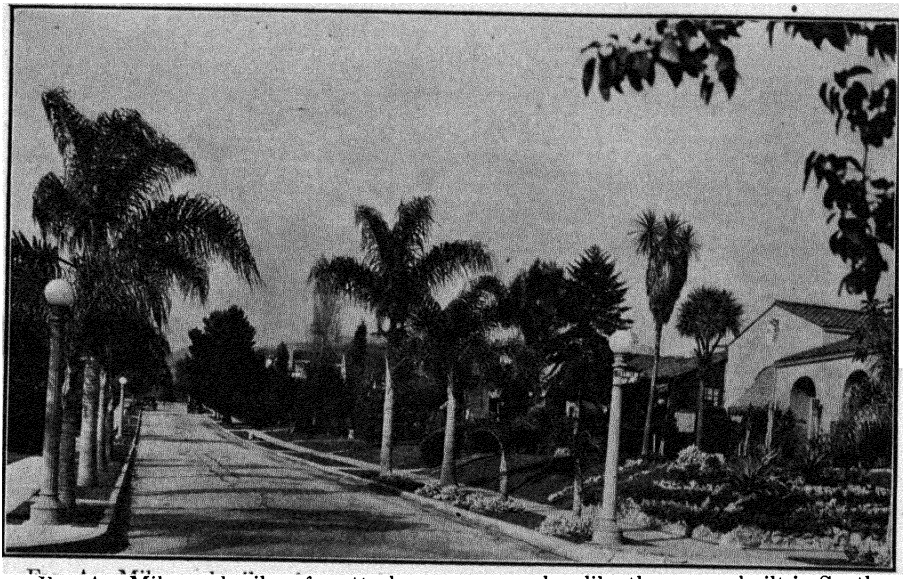


FIG. A. Miles and miles of pretty homes more or less like these were built in Southern California between 1900 and 1930. They are inhabited by people from all parts of the United States, and help to explain California's astonishing growth in population for the three decades — 60%, 44%, 65%. The support for most of these homes does not come from California. They are occupied by persons who have retired and live on income earned elsewhere. (Courtesy Los Angeles County Chamber of Commerce)

but thus far most cities are not much marred by smokestacks and big factory buildings.

AGRICULTURE

The agriculture of this region is marked by its intensive character. Los Angeles County leads all United States counties in value of farm produce and ranks third in number of farms.[9] The latter fact is true chiefly because the farms are small. The area has a large gross return per acre, partly because it has so many acres of oranges, lemons, walnuts, apricots, market gardens, and truck farms. Much of the produce is consumed by the local markets, and a great deal is sent to the East. In the wintertime, 3000 acres of cauliflower and 1700 acres of lettuce are cultivated. Riding south from Los Angeles toward San Diego, one rides much of the time through orchards.

The region is one of great variety of rainfall and frostiness or frost exemption, and therefore has great variety of crops in different places. San Diego has 9.7 inches of rain, Los Angeles has 15.0 inches, but on the mountain slopes the rainfall sometimes increases 10 inches in a single steep mile. Riverside, 850 feet elevation, has 10.8 inches of rainfall; San Bernardino, 10 miles

[9] In 1937 more than 13,000 farms in Los Angeles County produced crops worth $57,400,000 and livestock and products worth $35,200,000. Next among southern California counties was Orange County with $26,400,000 worth of crops and $4,300,000 worth of livestock and products.



FIG. A. Fruit figures are large in production records, but, after all, the pastured foothills occupy much more of California's area. (Courtesy Farm Security Adm.)

away, elevation 1050 feet, has 16.1 inches. On the mountain rim of the valleys the rainfall runs up to 30, 40, or even 50 inches.

The fact that rain falls chiefly in the winter makes one of the limitations of the region, and presents to man a great problem, that of storing the water for several months until it can be utilized for growing plants.[10] On the bare humid slopes the winter rain is sufficient to raise a crop of winter wheat and winter barley or barley hay. Certain coast districts have a peculiar combination of qualities that especially suit lima beans. The soil is mostly "doby," a heavy clay that holds water well. Where this soil is near the sea, it has the benefit of night fogs throughout much of the growing-season. Sometimes these fogs are so heavy that they not only stop all evaporation while present but wet the plants and even moisten the surface soil a little. These bean fields cover large stretches, and often between Los Angeles and San Diego one sees only a field of beans, wheat, or barley between the Pacific and the pastured hills.[11] The largest area devoted to lima beans is in the Santa Clara Valley northwest of Los Angeles.

Aside from barley, wheat, and beans, all important crops depend upon irrigation, which is here carried on with greater intensity than in any other part of the United States. The large income from orange, lemon, and other

[10] In San Diego County water is sometimes stored for several years.

[11] Irrigation improves the yield of beans, but large acreages are grown without it. They are even grown without rain after planting in land that is plowed in the autumn to make it hold all that is possible of winter rain. This, combined with summer tillage, is one of the best possible ways to destroy soil structure and then have the whole of it wash away.

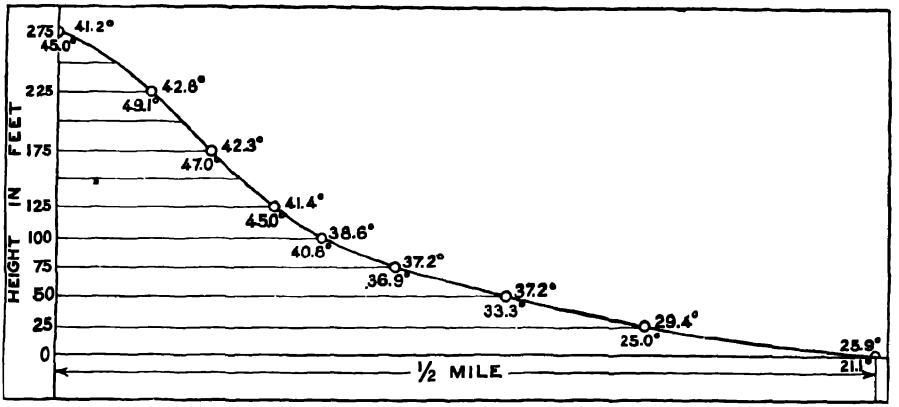


FIG. A. Profile of a slope in Southern California. At the left, elevations above the base point at the right. The figure above each station shows the average mean temperature (F.) for 45 clear nights during one winter. The figure below each station shows the lowest temperature of one cold night. This chart gives the facts explaining the well-known "thermal belts" of some mountainsides. In some California valleys the citrus orchards are arranged in a horseshoe pattern around both sides of the valley and across its head. There are no citrus orchards in the lower central locations. I have seen valley floors in Appalachia snow-white in October with hoarfrost; there was none on the hills 500 ft. above. (Courtesy U.S. Weather Bureau)

valuable crops makes man strive indefatigably for water. He uses canal, reservoir, wells (surprisingly deep), and even tunnels dug back into the hills to intercept ground waters.[12] To preserve this water supply, weeds are pulled and the ground is covered with earth mulch by repeated cultivation.

To take advantage of air drainage, the crops are laid out upon the sloping sides of valleys in zones or bands according to their ability to withstand frost. Differences in temperature on hillside and valley bottom on still nights are astonishing to those who have not considered them (Fig. 651 A). For this reason the lowlands of Southern California are in alfalfa, grain, and sugar beets, because these crops are little injured by frost. Farther up the slope come grapes and peaches; then the more sensitive orange; then the still more sensitive lemon and avocado; and in a few localities where the elevation is sufficient for the cooling effect of altitude to operate, there are orchards of apples. The irrigation ditch or pipe line that is the highest one on the slope divides the green of the irrigated lands from the brown of the unirrigated lands. This zonal distribution of crops is really remarkable in the region of San Bernardino, Redlands, and Riverside, and also at Pomona. The valley bottom is quite without orchards, while a few feet above it is a great horseshoe of rich, black-green orchards. Redlands, Riverside, Lindsay, Orange, and Porterville compete for the distinction of shipping more oranges than any other city in the world.

As Southern California is the least frosty part of California, it contains most of the 35,000 acres of lemons that are grown in the state and includes

[12] In this device we are tyros in comparison with the Persians, who have used this device (called "kanat") for thousands of years and with great effectiveness.

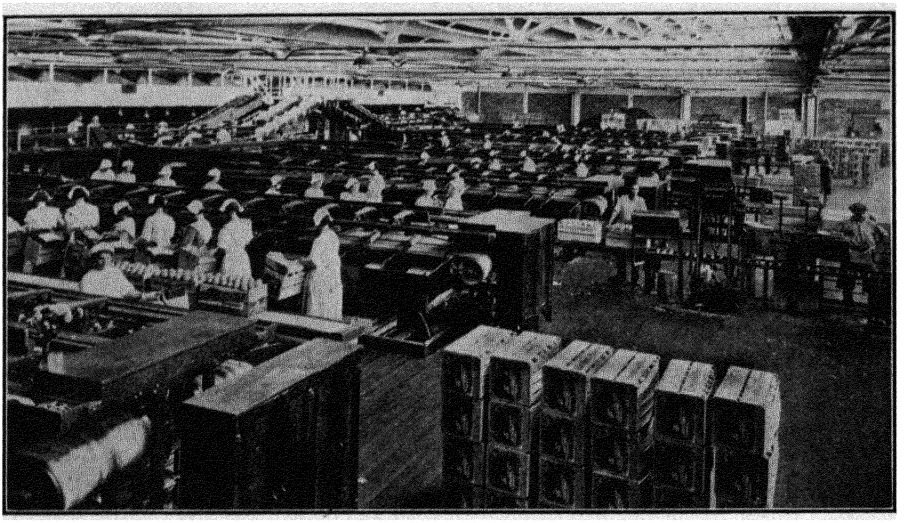


FIG. A. Orange packing plant. Belt conveyors bring the fruit to the girls who pack the boxes, and conveyors carry the boxes to the men at the right center, who nail up the boxes and put on labels. (Courtesy Los Angeles County Chamber of Commerce)

also more than three-fourths of the oranges.[13] The growth of the California citrus-fruit industry to the point where it is shipping in normal years more than 50,000 carloads of oranges and about one-fourth as many lemons is the result of much work in overcoming difficulties both of production and of marketing. After fighting frost and drought, another of the episodes of production is to fight to control certain bothersome insects which if left undisturbed greatly injure the trees and which the usual methods of spraying do not affect. Gangs of men with trucks and tents make regular rounds, throwing a high canvas tent over the orange tree and releasing under the tent the deadly fumes of hydrocyanic acid gas, which annihilates the insects on the tree, and holds their numbers in check for a time.

The marketing of the California orange is one of the finest examples of co-operative marketing. The co-operative packing house sends its crew of trained pickers to the orchard to pick the fruit, which is handled almost as carefully as eggs.[14] The central organization grades, packs, ships, advertises,

[13] Similar frost immunity is claimed by certain foothill sections on both sides of the Great Valley, such as Maxwell, where lemons are grown. Southern California has a destructive freeze about once every ten years. That of 1922 did $12,000,000 worth of damage. That of 1937 did $50,000,000 worth of damage, or about half the value of the crop.

For forty years San Diego had no temperature below freezing. Then in January, 1913, the thermometer dropped to 25° F. That one cold wave is estimated to have done $40,000,000 damage to oranges and other California crops. There is probably no escape from the occasional recurrence of such destruction, to which in some form every part of the world is heir.

[14] All pickers must wear gloves to avoid injuring the skin of the fruit with the fingernails. Each orange must be carefully clipped, not pulled, from the stem so that neither the skin nor the "button" on the stem end is cut, and care must be taken to prevent the branches of the tree from scratching the orange. The picker wears a canvas picking-sack over his shoulders. When it is full, it is laid in a field box and unbuttoned, which prevents injury to the skin of the oranges that would occur if they were simply poured out of the sack.

and sells his product for him. The progressiveness of the organization may be measured by the fact that several years before the World War it took an expert from the Department of Agriculture at Washington and paid him more than double his Washington salary for advice about the best methods of handling and shipping oranges. The expert was thought to have been an excellent investment. The development of co-operation among the California citrus-growers is far ahead of that among their Florida rivals. Why? Perhaps the answer is partly geographic (see Chapter 33).

Like nearly everybody else in California, the orange-growers are capitalizing California's sun; they give the name "Sunkist" to their oranges. Everywhere they advertise the superiority of their product. The organization selected test localities in which to advertise, and an increase in the consumption of oranges resulted. After that large sums of money were spent regularly to make us believe in and eat the Sunkist oranges. Another sales-promotion device was to put an orange-squeezer for the making of orangeade in thousands of drugstores. It is almost amusing to see the peculiar wrath of California people at the mention of the Florida orange — and vice versa.

The way natural factors control California crops is well shown by the absence of orange trees in front of the Cajon Pass, where the Santa Fe Railroad crosses from the Mojave Desert into the San Bernardino Valley. Cold winds sweep through the pass, bringing freezing weather in winter and beating the trees about in summer, so there is a break in the orange orchards opposite the pass. With all the care that can be observed, frost frequently injures the crops in small areas and sometimes does great damage even in the favored locations. At such times there is widespread use of fires, smudge pots, and orchard heaters (small metal stoves). The heaters burn low-grade oil, and scores to the acre are used on cold nights to keep away the frost. This is ultimately a poor dependence, uncertain, expensive, for what will be the future price of oil? [15]

The orange has been one of the baits by which many a green Easterner has been lured to California. Sometimes one sees a rascal hauling rich-looking dirt to cover up a barren piece of ground in which he has planted worthless seedling oranges merely in order to sell this worthless "bargain" to some Eastern greenhorn. This has been done over and over again.

One of the most expert orange-growers in this region says that the orange orchards of California may be divided into three groups. One-third of the orange trees produce from $3\frac{1}{2}$ to 4 boxes per tree per year, which is a profitable crop. One-third were worthless from the start because of poor soil, poor water supply, or frosty location. These trees were set out (often by nonresidents) to catch suckers, which they have done, often repeatedly. The other third have been neglected or mistreated by people who did not know or would not observe the proper rules for orange culture.

[15] When one considers the devastating effect of a bad frost, this industry may be said to be dependent upon fuel, oil fuel at that, because it alone is easy to use and to transport. And oil is apparently one of the ephemera. What then? But for the tariff, it is probable that the chief orange industry of the Pacific Coast would be located south of the frost zone in Mexico.

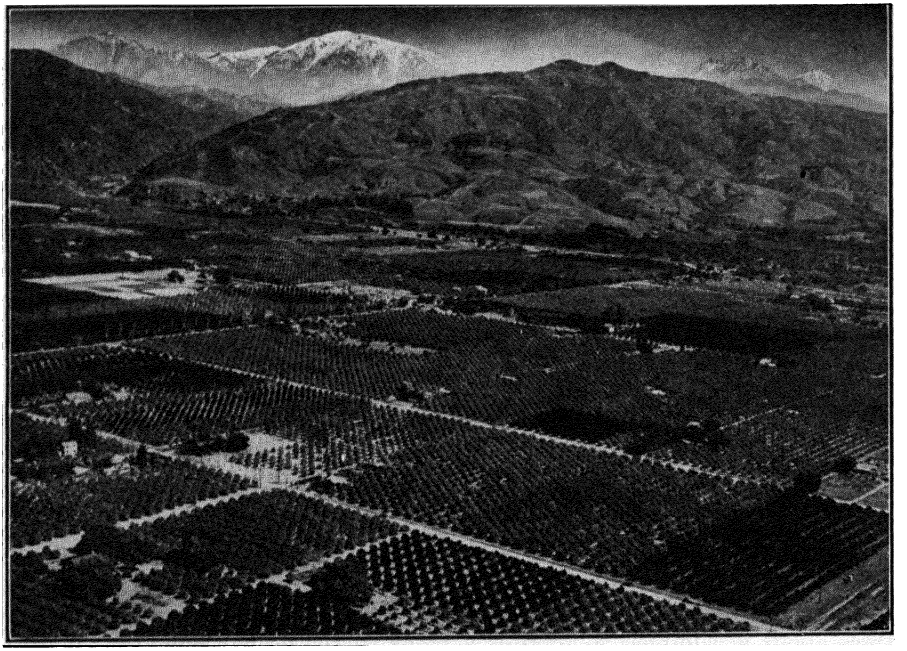


FIG. A. Intensive agriculture — a citrus area 25 miles east of Los Angeles on the compound alluvial fan sloping down from the mountain that bounds the valley of Southern California on the north. Dark foliage, orange tree; light foliage, lemon tree. Big trees by houses, oak or English walnut. Round-topped trees at the right, upper center, native oak. Tall trees, left upper center, eucalyptus. Bunchy-topped tall trees, left center, fan palms for supposed ornament along the road. Some irrigation from the canyon at the upper left; the water supply is inadequate. Pumping lowered the water table to the danger point; hence an urge from this locality to get Colorado River water. (Courtesy Pacific Rural Press)

THE INTENSIVENESS OF AGRICULTURE

Within 100 miles of Los Angeles live 2,712,000 people, a large and growing market that has been a powerful factor causing increased intensification of agriculture. Southern California has many earmarks of intensive farming. Farms are small, and land values and rentals are high. The value of crops and livestock products per acre is high.[16] Specialty crops and the use of commercial fertilizer are profitable. With increased urbanization, dairying, especially milk production, is increasing, but a greater portion of the butter and cheese is being imported from other regions over long distances.[17] Much labor per unit of land is expended in cultivation. The tourist who travels

[16] The U.S. Census of 1930 showed that Orange County ranked first in the United States with $181 worth of crops and livestock products per acre of farm land and that Los Angeles County was second with $172 per acre of farm land.

[17] In 1933 about one-third of the butter received in Los Angeles was produced in California; the rest of it came from other states, including such distant points as Texas, Kansas, and Montana. In that year 16,900,000 lbs. came from Idaho and 15,500,000 lbs. from California.

through the countryside is impressed by the absence of weeds in the fence rows, often by the absence of fences; by the cultivation of the ground right down to the edge of the road; by the rows of grafted English-walnut trees beside the road; and by the fact that the house often stands in the orchard and is shaded by fruit trees.

Nowhere in the United States is it more difficult to draw a line between city life, suburban life, and country life, because the farms are so small, the roads so good, and the automobile so universal that large numbers of people are making their living or a part of it by growing fruit, vegetables, and poultry on farms so small, and therefore so close together, that the farm area seems almost like an Eastern residential suburb. The small farm suffices because the regular climate, irrigation, and the high value of crops permit a small area to produce a great return. But shortage of irrigation water here is complete calamity.

The market-gardener has the advantage of a very long season because things grow for at least ten months in the year, and under irrigation he can get several crops from the same land.[18]

This condition of intensive agriculture and the small neat home, bowered in fruit trees and other shades, is not universal. There are still some of the old Spanish grants, and on the road between Los Angeles and San Diego the Santa Fe R.R. track runs for 20 miles through one estate which has 30 miles of ocean frontage and is much larger than the average county in the United States. Some of these big estates are rented, and the standardized, unkempt dwelling of the tenant plainly shows that he is a tenant. The mile-long stretches of sugar beets and lima beans or wheat offer, with their wide expanse, a great contrast to the bungalow areas of semisuburban orchards (Fig. 654 A).

THE FUTURE OF SOUTHERN CALIFORNIA AGRICULTURE

The agricultural future of this region depends upon the better use of resources of which the cream has been already taken.[19] Soil resources have been injured, and agriculture here is full of problems. There is some truth in the saying that "God never intended Southern California to be anything but a desert. Man has made it what it is." Man still has many adjustments to make before he can make full use of nature and get its aid without catastrophe. Instead of following the dictates of the science of agriculture, most people are still raising this and that, according to individual whims or in response to market reports. There is one possible extension of agriculture here. Considerable areas of salt marsh can be ditched and drained with tile — a start has already been made.

Dr. Coit, formerly professor of citriculture in the University of California,

[18] But here too the glutted market menaces. In April, 1921, half of the cabbage crop was abandoned; in 1931, more than one-fourth; in 1934, about one-seventh. This is but a type.

[19] If all farmers did as well as the best tenth, the acre yields of all crops would increase from 40% to 100%.

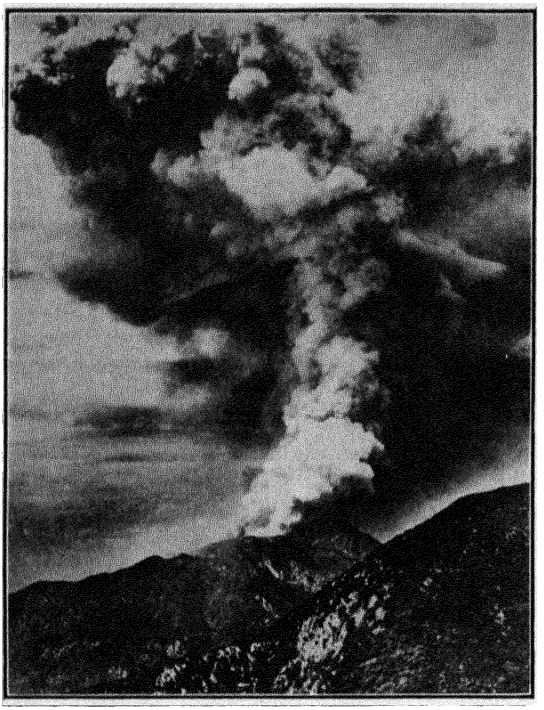


FIG. A. No, it isn't a volcano, merely a brush fire on a California mountain twenty minutes after it started. The brush fire is one of the serious problems in California's future. After fire comes flood, terrific erosion, covering of valley lands with sand, and wasting water needed for irrigation later in the year. The dry summer, combined with the great number of people and the easy travel of the automobile, greatly increases the number of fires that start. (Courtesy U.S. Forest Service)

believes that large areas of land situated above the possibility of irrigation and having as much as 12 inches of rain may be developed as possible residence sites, and also made to produce a valuable crop if planted to the carob tree. He thinks there are 500,000 acres of foothill land in Southern California suitable for this crop. Dr. Coit has found some seedling specimens of this tree in California which produced regular crops of beans to the amount of 600 to 700 lbs. per tree per year. For centuries these beans have been used in Europe as food for stock. The beans resemble corn in chemical analysis and in price. As yet carob trees are chiefly ornaments along city streets, and no commercial industry has been started, but the experiments and studies of the United States Soil Conservation Service may be expected to throw much light on this important but surprisingly neglected subject.

Much of this same land might grow the olive, but with the present prices of $200 a ton for the best pickling olives and $40 a ton for common oil olives, olive oil cannot be produced in the United States in competition with European olive oil or with other vegetable oils. Olives might be grown on much of the rough land near the heads of alluvial fans. There are a few orchards in such locations now, and the fact is suggestive. The carob and the olive are mentioned as types. There are probably many more crop trees that might be used.[20]

THE WATER SUPPLY AND SOCIAL CONTROL OF A VITAL RESOURCE

Wells and pumps are being used for irrigation in Southern California more than in any other part of the United States. The ground water is slow to

[20] For fuller discussion of this point, see J. Russell Smith, *Tree Crops*.

accumulate, but the electric pump works rapidly. As a result, in 1922, at the end of four dry years, the people of many localities were in a condition little short of panic. Near San Bernardino the water in some wells had gone down 60 feet, greatly increasing the cost of pumping and promising the complete exhaustion of wells which were really using up an accumulation. Some land had to be abandoned. The seriousness of this problem is shown by the following quotation:

> Most of the water supplies, whether used for domestic purposes or irrigation, are obtained wholly or in part from ground water. In 1905 Mendenhall estimated that two-thirds of the land at that time under irrigation in this region obtained its water from subterranean sources during the protracted period of low run-off then prevailing.[21]

Since that time much more land has been brought under irrigation, and by 1938 the proportion of land supplied with ground water had increased to nearly 90 per cent. The recent arrival of new water from the Colorado is somewhat like a fresh legacy to a young spendthrift who had wasted one inheritance.

There are two cures for this exhaustion of the ground water. One is to pump out less water; but the other, and better, cure is to get more water into the ground. Man can do this to some extent by diverting mountain streams at the foot of the mountain in such a

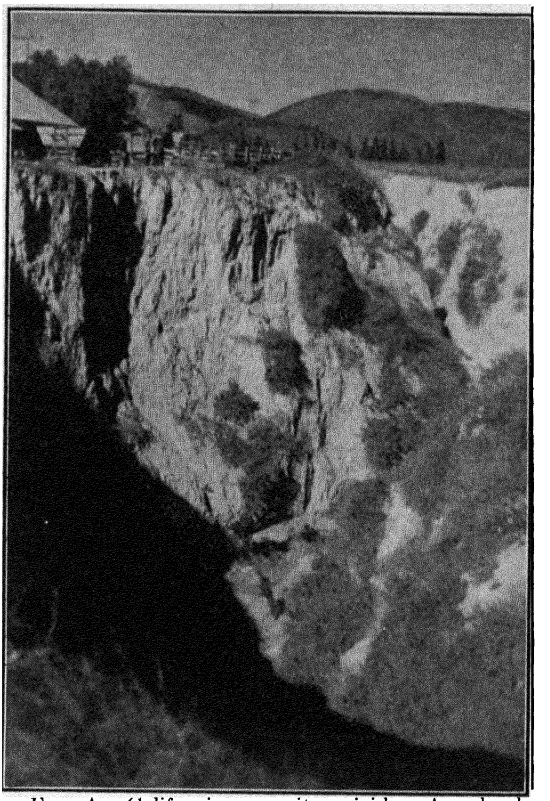


FIG. A. California commits suicide. Any landowner is free to kill a part of the state, as this man has done. The barn, truck, and automobile at the upper left give some idea of the depth of this gully, which has resulted in less than forty years from three plow furrows made to carry off water from a rich and level valley floor. From this start the neglected gully became this "canyon" several miles long. It is now developing branches which promise to eat up the whole valley — unless thousands of dollars are spent to stop it.

In this section of California, near Santa Paula, hills like those in the background are plowed each year and planted to lima beans, cultivated all summer, kept bare all winter, and of course erode terribly. The ownership of land should not be a right. It should be a privilege, because so few are fit to exercise it if our country is to live. "Nobody loves this land," said a representative of an old and cultured country as he viewed American gullies. (Photo by J. Russell Smith)

[21] F. C. Ebert, *Records of Water Levels in Wells in Southern California*, U.S. Geol. Survey, *Water Supply Paper* 468, 1921, p. 5.



FIG. A. California penance. These five monsters are pulling a plow that cuts a furrow 6 ft. deep and brings up the good valley soil to the top of the sand which was washed over the good soil by a flood from the Santa Ana River, the main stream of the Los Angeles Basin. Plainly this cannot be done many times in one place. Dr. W. C. Lowdermilk of the U.S. Soil Conservation Service says that in the terrible California flood of 1938 some streams carried more earth than water. (Courtesy Caterpillar Tractor Co.)

way that water will run into the ground. This is made possible by the geology of these valleys. They are made of mountain wash, brought down by the streams and spread out at the foot of the mountain. If a swift mountain stream strikes a valley, its speed slows up and the load begins to drop. The heaviest material drops first; the water spreads out the finer stuff in deltas or alluvial fans, as such formations are called. They are essentially like the desert basins and the Colorado delta already explained, the only difference being that the upper end of these fans is often of surprisingly coarse material. For example, on the upper end of the Mill Creek fan near San Bernardino there are hundreds of acres of rough bouldery land, composed of coarse sand, gravel, and stones, some of the latter as big as bushels, and gradually reducing in size with increases of distance from the foot of the canyon. But the fan extended 3 or 4 miles before the soil got fine enough for any kind of tillage, and then the fact that most of it was wasteland was shown by little patches here and there set to orange trees after the stones had been very laboriously picked up and the sandy soil thus made available. The journey down the fan showed increasing areas of tillable land, but it was several miles before one reached soil so fine that the whole of it was in farms, chiefly oranges. Down the center was a sandy watercourse, now dry, but spanned by a very wide bridge speaking effectively of winter floods and wasted waters.

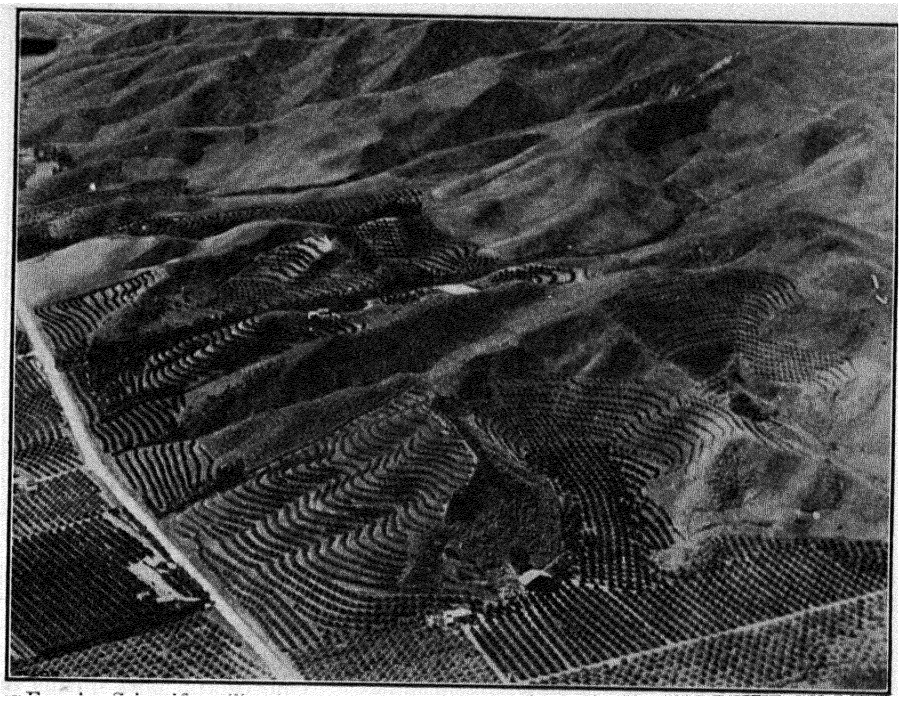


FIG. A. Scientific utilization of a hill near Santa Paula, Calif. Orange trees were planted along the face of the hill in rows that descended with a slight grade so that irrigation water in furrows above the trees would flow gently along between the rows. No terrace was made at the beginning, but all cultivation was on the horizontal between the trees. In ten years' time a distinct terrace had been made. Along the level bench at the top of the terrace was cultivation, irrigation furrows, and the hauling of the crop. The steep banks at the face of the terrace were mowed by scythe twice a year, the vegetation being allowed to stay where it fell.

There was almost no erosion, and while orchards in the flat land below were sometimes spending $75 per acre per year for orchard heating the hillsides required much less of it, often none. (See Fig. 651 A.) It costs $10 an acre to pump water up the hill to these orchards, but the lower cost of land and the relative frost immunity make the hillside orchard a very successful venture. Not a horse on the place. (Courtesy Harry F. Reddick, U.S. Soil Cons. Service)

The coarseness of the earth at the top of the fan allows water to soak into it very rapidly, a fact of great importance to the irrigators, who can pump it out months later, and perhaps at a place miles away down the slope. The stream is spread over the top of the fan by little dams and canals so that the water may sink into the earth. In one place in Southern California 800 acres are being used for spreading water on such land.

MOUNTAIN RESERVOIRS

In the winter raging torrents rush down channels which for ten or eleven months each year may be nothing more than dry white sand. Even parts of the city of Los Angeles have suffered heavily from floods in winter. Los Angeles has an average annual rainfall of but 15.2 inches, but in five days'

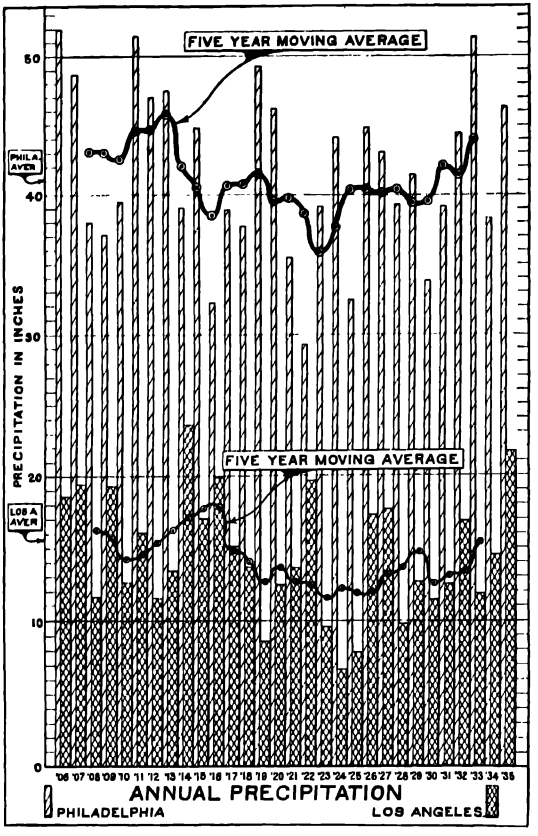


FIG. A. Compare the regularity of the rainfall in these two cities; the percentage of difference between highest and lowest in each city. In most regions of low rainfall the percentage of fluctuation from highest to lowest is much greater than in lands of heavier rain. (Courtesy U.S. Weather Bureau)

time, at the end of February and the beginning of March in 1938, the heavens opened and dropped 11 inches of rain. More than 30,000 square miles in Southern California suffered damage. Towns were marooned, highways and railroads were washed away, bridges collapsed, houses were undermined, and people fled to higher ground. For hours Los Angeles had no contact with the outside world except by radio, and even the movie studios stopped work to help fight the flood. Eighty-one people lost their lives, and property was damaged to the extent of $83,000,000. In the following June the War Department allocated $14,000,000 for flood-control work.[22]

One of the best means of controlling floods (and saving water for irrigation and for municipal use) is to construct reservoirs in the narrow mountain canyons. Such reservoirs have been built in the Pacoima, Tujunga, San Gabriel, San Dima, Dalton, and Santiago canyons, and others are under construction.[23]

The problem of the use of water, with its troubles of overpumping, alkali land, overirrigation, and failure of supply at critical times, requires handling in a large way, by the kind of social organization of which the twentieth century must work out many types if our efficiency in the use of resources is to pass 25 per cent or 50 per cent. In recent years mutual water companies have been organized for the purpose of combining individual wells for the benefit of all, which permits a more economic handling of reclamation. Most of those who use the water have less water than they need. Sometimes they wake up in the night from dreams of dry ditches, failing wells, and withering

[22] In 1924 Los Angeles County voted $30,000,000 for flood control. In 1934 the voters rejected a $26,000,000 bond issue for more flood control, and applications by the county for PWA and RFC assistance were also rejected.

[23] In 1937 the ten southern counties of California had 132 dams, representing an investment of $67,000,000, and impounding 1,408,000 acre-feet of water.



FIG. A. After 4 in. of rain in two days these little basins are two-thirds full, with no breakovers, and the subsoil will get the water. This system, called basin-listing, is one of the new methods of conserving both soil and water. (Courtesy U.S. Soil Cons. Service)

drought in alfalfa field, truck field, and orchard. The man who finds his well going dry is in a position to listen to reason and to be amenable to the idea of applying the law of eminent domain still further to water-supply and irrigation problems. The great need is to increase the supply and make its distribution and use more effective. This means less of our beloved American independence for the individual, but such sacrifice seems less terrible when it holds out the possibility of supplying the failing well with water from the top of an alluvial fan miles away, or bringing it by a new ditch from a reservoir not yet built, or pooling the water from a particular well. Any co-operative enterprise is confronted with a big and knotty problem of engineering, of agriculture, and above all of dealing with human nature. People should realize this truth: "It must become a crime to waste water."

These people are also deeply concerned about their forests. Places where a generation or two ago good forests stood have been burned down to the subsoil, almost to the rock, by repeated forest fires. There are much larger areas of hill and low mountain watersheds where a cover of brush (chaparral) naturally holds the earth and helps it to store water. Thousands of acres of this too have been burned, paving the way for flood destruction.

The north fork of the Yuba River in the Sierras of California is forest-covered, and the south fork has been denuded. The first has a watershed of 139 square miles, and the second a watershed of 120 square miles. The first, well covered with timber and brush, gives a minimum run-off of 113 cubic feet per second. The second should have given a minimum run-off of about 100 cubic feet per second, but it is said to be practically nothing for four months in the year.[24]

[24] Charles R. Van Hise, *The Conservation of Natural Resources in the United States*, p. 249.

The agricultural value of the water from a small effective watershed is astounding. In 1915 the San Antonio watershed in Southern California, with an area of only 24 square miles, furnished irrigation water for 25,750 acres devoted to citrus fruit, alfalfa, and sugar beets, and producing $5,400,000 worth.[25] The same year, the San Diego watershed, 18 square miles, watered 5800 acres of citrus fruits, with a crop value of $2,600,000.[26]

THE IMPORTED WATER SUPPLY

The availability of water has long been the greatest single factor affecting the economic development of Southern California. By 1900 it was realized that Los Angeles and vicinity could never pass 1,000,000 population while depending upon the water supply within the basin. It was William Mulholland, city engineer, who in 1908, carrying his levels over mountain and valley, figured out the route for a 225-mile aqueduct which brought the water from Owens Lake on the east side of the Sierra through a $25,000,000 structure of cement and steel. The precious fluid came through canal, siphon, and tunnel across desert and valley, and finally under the mountain, into the Los Angeles Basin.

As a consequence, the city of Los Angeles could take care of twice as many people, and was able to meet the demands of the Goodyear Rubber Company when it asked for a guarantee of 6,000,000 gallons of water per day, as a necessary basis for the founding of a $20,000,000 factory on the Pacific Coast.

One of the conditions of the contract whereby Los Angeles got the Owens Valley water was that the water must all be used in Los Angeles; so Los Angeles promptly enlarged itself to make use of the water. At a single sweep it took in over 50,000 acres of dry wheatland in the San Fernando Valley. This tract is now laid out with water mains sufficient for intensive irrigation of fruit and vegetables. In 1930 about 52,000 people were living in the San Fernando Valley section of Los Angeles, a kind of agricultural suburb of fruit and poultry farms within the city limits. Since then a large residential development has taken place, and the supply from Owens Lake has been supplemented by water from Mono Lake. Strange to say, it was found that the same amount of water will supply this land whether it is used for residence or for irrigated agriculture.

Today the people of Los Angeles are reaching again across the mountains for more water. After ten years of surveying and planning, work was begun in 1934 on the Colorado River Aqueduct, which will carry 1500 cubic feet of water per second from a diversion dam 18 miles north of Parker, Arizona, to the ultimate consumers in Los Angeles County nearly 300 miles away. To conduct the water through the mountain area it was necessary to dig 29 tunnels totaling 90 miles in length and to lift the water 1583 feet by pumps driven with electricity, generated chiefly at Boulder Dam. California hopes

[25] See U.S. Forest Service, *What the National Forests Mean to the Water User*, 1919.

[26] See *A Plan for American Forestry*, Senate Doc. 12, 73rd Cong., 1st sess., pp. 301, 317–18, 425–27.

that this new water supply, together with existing facilities, will meet the needs of 10,000,000 people and promote irrigation and industrial development — and bungalows, bungalows, bungalows for the millions who have retired *with income*.

The huge Cajalco Reservoir southeast of Corona and Riverside, at an elevation of about 1500 feet, receives and holds the water from the Colorado River Aqueduct in a strategic place, whence it can be permitted to flow to many localities. On January 20, 1940, the main Cajalco Reservoir had 25,000 acre-feet of water, but distribution to cities was not expected before January 1, 1941.

Anyone who is inclined to think that rugged individualism is a sufficient social philosophy will find much food for thought if he examines this Los Angeles water plan and its implications. It is an interesting example of the scope, method, and size of economic-social organization in the Machine Age, especially in a land of little rain.

As to scope, there are 242 miles of main aqueduct between the intake near the Colorado River and the main Cajalco Reservoir, on a hilltop not far from the crest of the western mountain wall of the Los Angeles plain. There are three reservoirs along the main aqueduct, and three others between the Cajalco Reservoir and the market.

As to method, the development began in 1924 with extensive investigations financed by a bond issue of the city of Los Angeles. Then followed a state law somewhat like the Ohio flood conservancy law (page 363). Under this law was organized a corporation spoken of as a "separate and independent political corporate entity." It has a board of directors of which there shall be one or more from each of the cities (now 13 in number) that form the Metropolitan Water District of Southern California. This corporation, created to sell water, has also the power to buy and sell land, and like a city, combines government and business. It can borrow money, levy taxes, and has the power of eminent domain. It is a nonprofit enterprise.

As to the time involved, they had got as far as organizing the Metropolitan Water District in 1928. In January, 1938, I spent a very pleasant afternoon studying a carob orchard that was in the shadows of the great masonry dam that was soon to retain the water of the Cajalco Reservoir, which would drown the orchard. As to cost, a $220,000,000 bond issue was authorized. By March 1, 1939, $208,500,000 of these bonds had been sold, chiefly to the RFC and the PWA.

Southern California will continue to be a desirable place of residence. It will continue to be a place for the health-seekers, and it has already become a manufacturing center.

POWER, MANUFACTURES, AND MARKETS

For a long time manufactures in Southern California were limited to local needs, with the great exception of moving-picture films. For many years manufacturing in this area was handicapped by a deficiency in fuel. With the exception of small deposits on Vancouver Island in British Columbia and

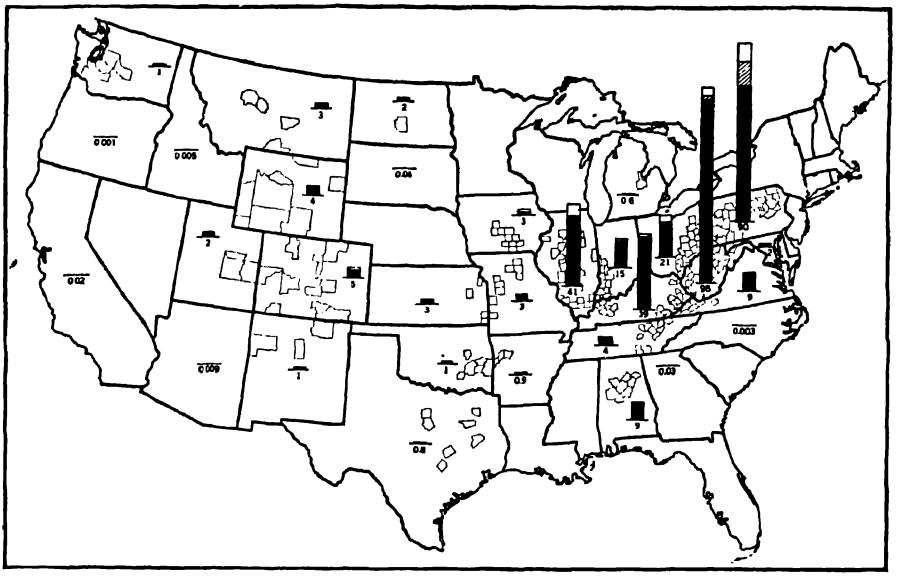


FIG. A. Production of bituminous coal by states, 1934. The height of the column represents total production; the black portion, shipments by rail, including railway fuel; the crosshatched portion, shipments by water; the white portion, truck shipments of local and colliery fuel; figures on the state, millions of tons of the total coal production. The counties producing coal are outlined, as well as the states.

The coal situation of the Pacific Coast as shown by this map emphasizes the importance of Pacific Coast oil and water power, and raises a huge question mark as to what will happen when the oil is gone. (Courtesy *U.S. Minerals Yearbook*, 1936)

those in interior Alaska, the entire Pacific Coast of North America lacked coal, which had to be imported from the eastern United States, Australia, Japan, and even Great Britain. Then came hydroelectric power from the Sierra and the discovery of oil and gas in and around Los Angeles.[27] With oil and gas came the stimulus of a great boom, with its few big, loudly yelled stories of fabulous fortunes and its many little whispered stories of lost hopes and savings. California's petroleum output increased from 4,300,000 barrels in 1900 to 262,900,000 barrels in 1923, when for a few years it led the nation. In 1938 the output was 249,700,000 barrels, about three-fourths of which was produced in Los Angeles and adjacent Kern and Orange counties. For several decades cheap oil has proved a great boon to the industry of the

[27] Oil wells were drilled within the city of Los Angeles, around Los Angeles, and even in the ocean near by. Petroleum engineers call an oil well "straight" if it is within 3° of perpendicular. So thick were the oil wells at Long Beach that they became tangled as they went down, and owners were often at law over subterranean trespass. Fortunately, along came H. John Eastman, who set up a derrick in 1932 at Huntington Beach and drilled a well that curved from the beach down and out under the sea. His discovery of "controlled directional drilling" disproved the previous notion that wells had to be drilled straight down into the earth, and has opened up new vistas for the oil industry. Who owns the oil under the sea — the individual with property along the shore, the state, or the Federal Government? That is now a burning legal question. See Upton Close, "More Oil from Crooked Wells," *Scientific American*, August, 1939, pp. 84–87.

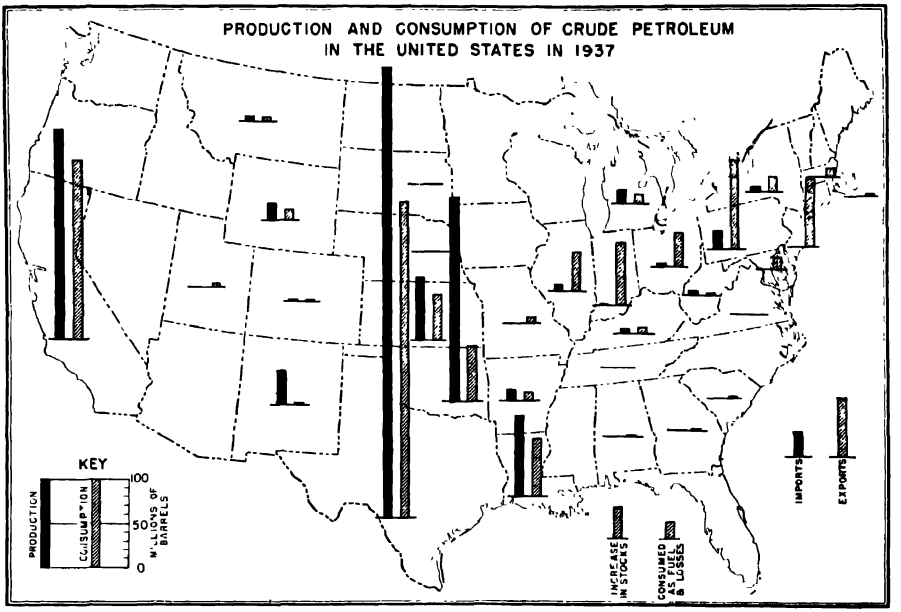


FIG. A. The second great factor of California's growth has been oil. The other, climate, produced fruit, tourists, and the retired. (Courtesy Nat'l Resources Committee)

Pacific Coast, and, for the time being, Southern California remains oil-rich. The latest development of power resources was inaugurated in 1936, when the giant generators at Boulder Dam (115,000 horse power each) were put into service and the transmission of electricity to the Los Angeles market 299 miles away was begun.

Largely as a result of the increased availability of power resources, manufacturing has increased, and today Los Angeles County is the leading industrial area west of Chicago. In 1937 the value of its manufactures was over $1,200,000,000, and its factories employed 42.7 per cent of the wage-earners in the state, paid 42.3 per cent of the wages, and produced 41.6 per cent of the total value of California's manufacturing industry. On the basis of value of output, Los Angeles County led the industrial areas of the nation in petroleum-refining, moving-picture production, airplane manufacture, and secondary assembling of automobiles; it ranked second in the manufacture of tires and tubes, fourth in furniture-making, and fourth in the production of women's clothing.

Within 150 miles of Los Angeles live 3,000,000 people, a large and growing market. The fact remains, however, that only three of Los Angeles' leading industries have markets that are truly national and international in extent, namely, petroleum-refining, moving-picture production, and aircraft manufacture.[28] Petroleum and its products are sold extensively along the Pacific

[28] In 1937 the value of leading manufactures in Los Angeles County in millions of dollars was as follows: petroleum-refining, 288; moving pictures (cost of production), 171; motor

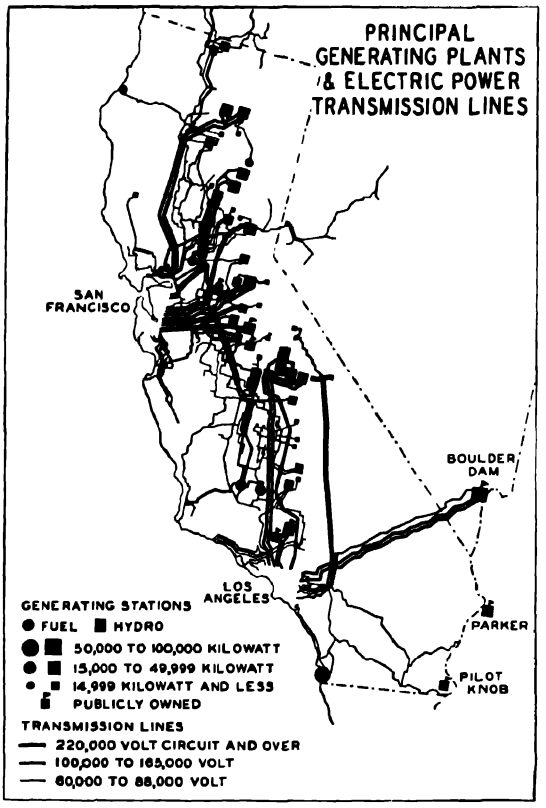


FIG. A. In more ways than one California is a child of the mountains. This map illustrates the power aspect of it. Note the long line from Boulder Dam. (Courtesy Nat'l Resources Board)

Coast of North and South America and are shipped in large quantities through the Panama Canal to our Atlantic seaboard; they are shipped to Japan, Australia, and Europe. Hollywood films, as everyone knows, are distributed to the four corners of the earth. The rapidly growing aircraft industry of Los Angeles accounts for nearly half of the nation's output, and the Douglas, Vultee, Lockheed, and North American companies have a large domestic and foreign market.[29] On the other hand, such leading industries as meat-packing, baking, and printing and publishing are distinctly local industries. Practically all the other industries produce goods that are destined for local or Pacific Coast markets. Certainly manufacturers in Southern California are at a disadvantage in reaching the nation's greatest market, the northeastern quarter of the United States.

THE MOVING-PICTURE INDUSTRY

In Los Angeles' internationally famous suburb, Hollywood, are produced two-thirds of all the moving pictures exhibited throughout the world.[30] More than $100,000,000 are invested in the 75 studios of this great industry, which in 1937 disbursed $140,000,000 in wages and salaries alone. On its pay roll were 34,600 persons, including 16,400 wage-earners; 15,000 persons were employed in auxiliary manufacturing and service industries. The surface and the climate of Southern California are the natural resources which have

vehicles, 95; meat-packing, 79; rubber tires and tubes, 65; printing and publishing, 54; machinery and machine-shop products, 46; bread and other bakery products, 42; aircraft, 40; women's clothing, 34; furniture and fixtures, 23; canned and cured fish, 19; planing-mill products, 17; electrical machinery, 16.

[29] Largely as a result of disturbed conditions in Europe, Los Angeles aircraft manufacturers had $100,000,000 worth of orders on hand at the beginning of 1939.

[30] In recent years the larger and newer plants have been located in the San Fernando Valley near Burbank, at Culver City, and in the western suburbs of Los Angeles.

been most instrumental in making it the moving-picture center of the United States and of the world. During most of the year the producers can stage an outdoor scene and photograph it without the intervention of unexpected showers. The dependable weather of the long, dry summer is a decided asset. Winter is mild enough for much outdoor work, and there is very little strong wind.

This locality offers wonderful settings for great varieties of pictures. Do the producers want seashore, mountain, plain, farm, village, city, orchard, palm, pine, sand dune, or rocky cliff? All are within easy reach of Hollywood and other California studios. Just a short trip by automobile takes the actors to the desired spot.

It is hard for persons from the uniform East, where both sides of a mountain are alike, to realize the contrast between the sea side of California mountains and the desert side of these same mountains — orange, pine, palm, dune, the dead desert.

As is usually the case with industry, that of moving pictures brought subsidiaries with it. If a scene with the period furniture of the time of Queen Victoria or Cleopatra is wanted, that can be hired from firms whose business it is to rent furniture for this purpose. If the hero wishes to wear the shoes of Charlemagne or Caesar, there are shoemakers who have the patterns and can make the shoes; he can hire clothing and uniforms for almost any country and any period of history. Does the story call for a bowl of bread dough to be smashed over the head of the hero? Behold a manufacturing plant that specializes in soft and friable pottery! Another plant makes furniture which breaks harmlessly when used. One of the studios even maintains a private zoo, with a chimpanzee, lions, and other animals awaiting the call. One morning 1000 gray-haired women were desired for a great scene. By noon they were assembled by the aid of a card catalogue — they were already on file. Ten thousand maidens can be obtained in a few hours, for nearly everybody wants to get into the movies. Los Angeles is forever having to deal with the penniless, deluded persons who without qualifications have come from the ends of the world to star in the movies. The unemployed population of Los Angeles furnishes plenty of material for mobs and supers.

To succeed in this industry, more is needed than an artistic temperament and a desire to act. Plenty of hard, careful work is necessary. One day a movie queen forgot to wear a locket that had a vital part in the plot. Not until the end of a day's work was the omission discovered. The whole day's work went for nothing; it had to be done again, although the actual cost of the complete staff of actors, supers, and photographers, and the cost of rentals, mounted to $10,000 a day. So thoroughly organized has the movie industry become that it is less dependent on California climate and scenery than it used to be. For many purposes, synthetic scenery now replaces nature. Buildings are being made in which players can enact scenes previously done out of doors. The industry seems to be more firmly established by these buildings than it was before they were built. Horrible to contemplate, it is probably true that Hollywood is the greatest single center of influence of thought for the average man. From this town come most of the films at

which 50,000,000 people spend an afternoon or evening each week in the United States alone.[31]

The moving-picture industry is in the control of a group of New York former clothing-dealers who have had the foresight to seize upon the picture industry. This is another example of the pouring of capital into Southern California. The films are made in Hollywood, but financed and distributed through New York.

THE PORT OF LOS ANGELES

Los Angeles is a hustling city. It boasts a greater expenditure per capita for schools than any other city in the country. The organized promoters are working for the third epoch of the city's industrial history. First, the city was an agricultural center; then it became a tourist and residential center; now it has become a manufacturing and commercial center. Los Angeles needed a harbor. The people reached out with comprehensive plans. There used to be a little place south of Los Angeles called San Pedro. It had a breakwater and a poor harbor. Los Angeles annexed San Pedro and converted its muddy creek into a good harbor. The port was only 10 per cent used in 1918, but Los Angeles persuaded 150 shipping lines to call there. Between 1916 and 1936 the total volume of traffic increased from 800,000 to 17,600,000 short tons. Exports are seven times as heavy as imports (mark of a raw-material region), and coastwise shipments are nearly twice the receipts, chiefly because of the heavy outbound traffic in petroleum. The intercoastal trade consists largely of outbound petroleum and inbound iron and steel and miscellaneous manufactures. In this timber-poor region much lumber is imported from Washington and Oregon. Los Angeles is making a strong bid for transpacific trade, and Japan is its principal foreign market, buying petroleum, cotton, and other goods from our Southwest. Los Angeles has also become to the trade of western Mexico what Seattle is to the trade of Alaska. Los Angeles boasts that when the señorita of Mazatlán steps forth on the street she looks like the models of the best Los Angeles stores, whence her clothing comes. Access to cheap ocean transportation, enhanced by the Panama Canal, has unquestionably been a strong factor in the remarkable economic development of Los Angeles.

HUMAN ENERGY

Granted mechanical energy, the final question for this region is whether it will continue to develop human energy. This point will be discussed in

[31] Many movies go to foreign lands, and what do they tell of the United States? Says the London *Evening News:* "It is inhabited in the East by unscrupulous but enormously successful business men, who devote their nights to squandering in cabarets their ill-gotten gains of the day before. In the West 'bad men' rob stagecoaches and banks and shoot sheriffs and their partners in crime and spend a good deal of time rolling on the ground in attempts to gouge each other's eyes out. The North is peopled by bearded scoundrels who go there to escape from the law, to steal mining claims and to menace lonely girls snowbound in log cabins. The South is notable for cacti and half-breeds. The last-named have no particular vice; they are just bad."

another chapter. The fact is that Southern California has thus far grown up on imported brains as well as imported capital. Most of the adults of this region were born in some other place. Most of its activities are being run by "a lot of imported Yankees still running with the energy that results from their having been wound up somewhere else." It is impossible to calculate the influence of a few dozen captains of industry who, having made themselves nervous wrecks somewhere east of the Rockies, came to Southern California to get well, and who then turned their unusual and unused talents to the development of the region. This territory has also a great advantage in that it has been settled by the progressives from other states. The "stick-in-the-mud" has stayed at home, so that he does not block the wheels of California progress — as yet. It is plain that Southern California has an assured future as long as it can keep on importing energetic human beings and money from elsewhere. Just how far it will go is an interesting question, which no one can answer today. It depends *so much* upon highly imaginative enterprises of large scale.

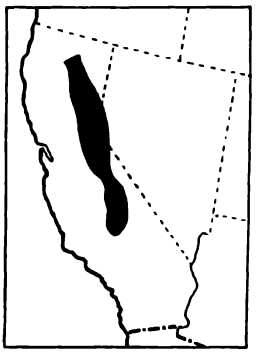
THE NORTH COAST STRIP

Three counties along the coast north of Los Angeles are commonly spoken of as being in Southern California. These counties, Ventura, Santa Barbara, and San Luis Obispo, have beautiful shore lines, cool climate, and picturesque mountains with scraggy forests on their tops and pastures on their slopes. Between the mountains are valleys — dry, narrow, meagerly supplied with water for irrigation. Fruit is grown in the valleys, and wheat and beans are grown along the shore and on unirrigated slopes, as they are in the similar area at the south end of this region toward San Diego.

This area is not included in the big water-borrowing scheme of Los Angeles, and its limited resources are shown by the small population of the counties, 150,000 in comparison with seventeen times that many in the four counties to the south, which gained twice as great a percentage in 1920–30.

Santa Barbara, with its shining harbor enclosed by beautiful hills, is backed by a mountain studded with villas and bungalows. Many consider it the most delightful of all California residence sections. Said the hotel clerk in answer to my question: "There are just two classes of people — the rich and the poor, the rich who have come here to live on their money and the poor who work for them. No manufacturing whatever — they don't allow it. It's just like Newport in the East, where rich people go to spend their summers. They come here to spend the winter."

Chapter 32. THE SIERRA NEVADA



ALONG the eastern side of the Great Valley of California is the Sierra Nevada, a great mountain chain 75 miles wide.[1] In an economic sense these mountains may be called the mother of the Great Valley, and also its nurse, for they give it both life and health. The prosperity of the valley lies in the lap of the mountains. From them it must draw great drafts of water, the life of its fields, water and water power for farm, town, and city. From the ridges, valleys, and lower peaks of the mountains also comes wood; and to an increasing extent the mountains furnish recreation for California vacation-seekers and attraction to draw tourists from afar.

But water is the chief product. The Sierra Nevada has a long gradual western slope and a short eastern slope. This is fortunate indeed for the Great Valley of California. The long western slope gives space for the wringing of much moisture from the moist west wind. The big resource of the mountains is precipitation, four or five times as much as occurs in the Great Valley a short distance to the west, and five or ten times as much as falls in the Great Basin east of the wind barrier of the Sierra.

The heaviest Sierra precipitation comes in the winter, and — fortunately for the farmer's summer crop — much of this winter precipitation is in the form of snow. These mountains are deluged with snow (Fig. 174 A). At Summit, on the Southern Pacific R.R., elevation 7017 feet, the record for forty-four years averaged 419 inches of snow. On March 10, 1911, snow at Summit lay 25 feet, 7 inches deep. At near-by Tamarack the record was 884 inches of snowfall during the winter of 1906–07. On March 2, 1936, many snowdrifts in Mondoc County were over 100 feet deep. Ten feet of snow is common over considerable areas of the Sierra Nevada. It often reaches the eaves of one-story buildings. Summer cabins are frequently crushed by the weight of the snow and more frequently still by avalanches. The higher regions of the Sierra have not been settled long enough for the "avalanche runs" to be definitely known, as they are in the Alps, where damage can be avoided by erecting structures only at safe places. The elaborate summer home which Wallace Beery, the movie star, erected on an island in June Lake, Mono County, was thus destroyed by an avalanche a few years ago.

[1] Physiographically, the Sierra and the Cascades end at the Feather River, so that Mount Lassen, the volcano, is in the Cascades. But this is an economic rather than a physiographic discussion, and this chapter deals with the mountains to the east of the Great Valley.

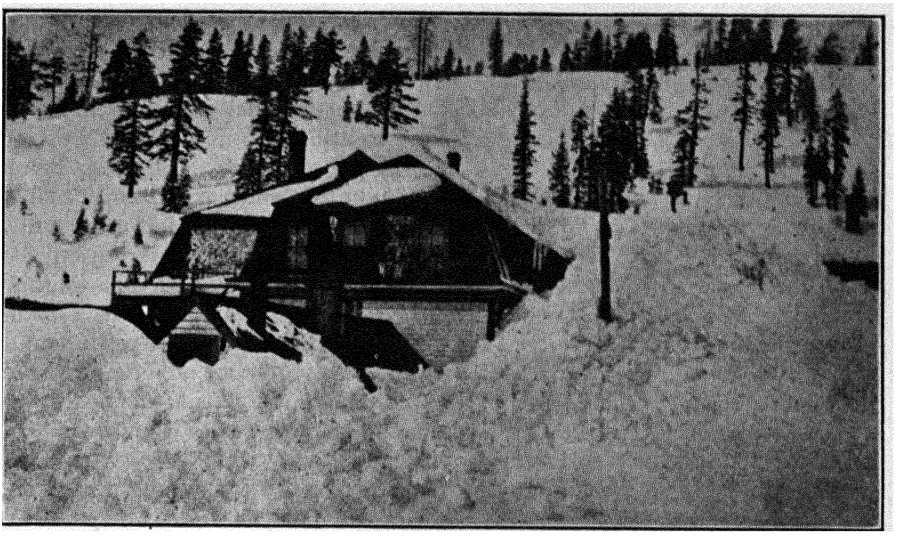


FIG. A. It snows in the Sierra, and this 26-ft. accumulation was a bit tough on the three-story Summit Hotel at Summit, Calif., but it was grand the next summer for the irrigators in the valley below. (Courtesy U.S. Weather Bureau)

Strangely enough, forests survive even in these areas of heavy snow. Broad-leaved trees are broken to pieces, but a few varieties of evergreen endure in a peculiar manner. Each winter the snow breaks off all side limbs of these hardy trees while they are small enough to be covered. Each summer the trees push on farther up until finally they are little spindling bare rods 15 feet long, with small bunches of foliage at their tops.

Such heavy snowfall offers a serious problem to railroad operation. To combat it the Southern Pacific R.R. on its Overland Route has 12 miles of main-line track in the Sierra covered with snow sheds, and has ready for instant service powerful snowplows and other equipment to keep the tracks clear. Only in rare instances has snow blocked the main line in more than sixty years, and traffic delays during the winter last but a few minutes, so well is the railroad equipped to handle the snow. When this route was completed in 1869, more than 30 miles of the main line was covered with snow sheds, which protected the line but shut out the view of some of America's grandest scenery. The development of snow-fighting equipment has made it possible to eliminate gradually more than half of this "longest house in the world." Sections of the sheds facing the canyons are hinged and may be opened in summer so that the passengers' view is not obstructed. Some sections of the wooden sheds have been replaced with reinforced concrete; other sections have been rebuilt many times. The wooden sheds cost $87,000 a mile for single track and $126,500 a mile for double track. The concrete sheds cost $442,500 a mile for single track and $595,500 a mile for double track. During the summer months fire trains are stationed at strategic points to protect the sheds against fire.

The valley dweller is so keenly interested in Sierra snow that it is news in California papers. Much snow on the mountain in March means much water for the valley in June, while little snow promises water famine. The snow supply is far from regular. Loose snow means quick melting and floods. Tight snow means slow melting and long irrigation.

In the winter of 1912–13 Summit had 284 inches of snow. Six years before there had been 602 inches.[2] At best the mountain snow has usually melted and run off through the soil and down the streams by the end of June. As a result, many an acre of Great Valley farmland gets a June watering but can have none in July. Plainly the farmers need water storage. The building of reservoirs in the mountains has already begun. In 1923 the Don Pedro Dam on the Tuolumne River was finished. It is 288 feet high and impounds 94,200,000,000 gallons of water for irrigation that give an all-summer water supply to thousands of acres which had often gone dry during the latter part of summer. The Hetch Hetchy Dam on the same river, now completed, is 430 feet high, storing 1,466,000,000,000 gallons of water; it provides additional water for San Francisco and also electric power. These are merely two of many dams, and there will doubtless be more.

Because people in the valley have such a vital interest in the amount of snow that falls in the mountains, a new science has been developed in recent years, the science of "snow surveying." In the winter of 1937–38 more than 30,000 exact measurements were taken of snow depth and water content at 682 different locations in the Rockies and the Sierra Nevada. This survey cost $100,000, but the accumulated knowledge made it possible to save millions of dollars to the many interests that wanted advance information regarding stream flow. To make the survey, more than 1000 men were sent into the mountains to shelter cabins high on the ranges. They worked in pairs or threes, traveling over the deep snows on skis or snowshoes and taking measurements. Their reports and similar reports made by the National Park Service, the Forest Service, power companies, and lumber companies were all coordinated by the United States Bureau of Agricultural Engineering into a single report for the entire mountain area from Mexico to Canada. As a consequence, people in the valleys and the plains learned how to plan for the most effective use of their water. Conservation stands to gain as a result of this new science of "snow surveying."

These mountains have for the valley another creative gift, without which the valley would lose its greatest industry — fruit. The fruit industry of the Great Valley thrives because the mountain wall shuts out from the warm valley the cold winds from the interior of the continent.

WATER POWER

In addition to furnishing life and protection and wood for the farmer, the Sierra also furnishes light and power to farmer and townsman alike. Hundreds of thousands of horse power are carried across the valley by wires from

[2] A. H. Palmer, "The Regions of Greatest Snowfall in the United States," U.S. Dept of Agr., *Monthly Weather Review*, May, 1915, p. 218.

mountain power plant to seacoast city. Man cannot lift himself by his bootstraps, but water is more agile. Water falling through a mountain power plant generates energy that may lift water from the same stream 100 miles away, or pump it from wells, put it on the land, and by so doing turn poor pasture into profitable cropland.

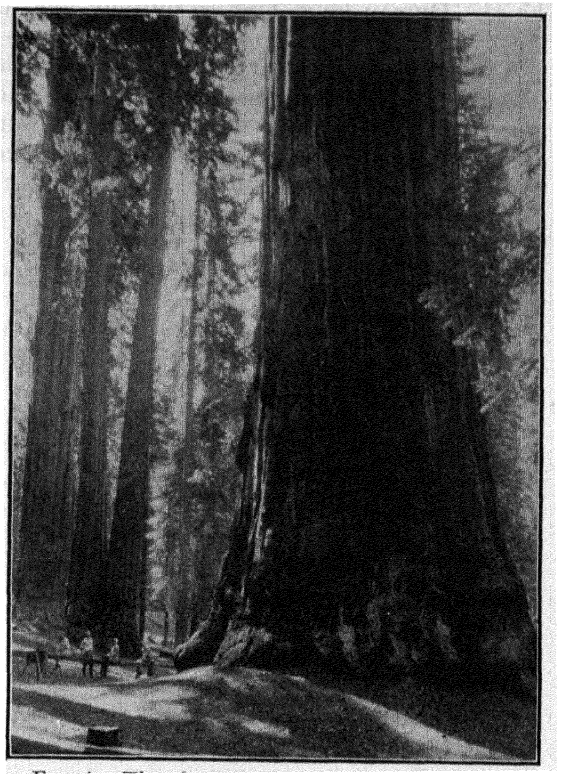


FIG. A. The pleasures of wonder. The tree called General Sherman and some of its younger neighbors in Sequoia National Park in the Sierra Nevada. So nearly indestructible is this redwood that you can see here in this picture how the old tree has resisted fire. It is said that logs have lain for centuries in the forest and then been cut for lumber. The small straight tree immediately to the left of the General would be the amazement of a state if it stood in an eastern forest. (Courtesy Atchison, Topeka & Santa Fe R.R.)

ZONES OF VEGETATION

The long western slope of the Sierra Nevada gives room for changes in temperatures and moisture to separate natural vegetation into clearly marked zones. The first zone, up to 1500 feet, includes the rounded foothills of the mountains, often grass-covered foothills because the low altitude means scanty rain. In the moister spots are scattered oak trees. In the forest transition zone, 1500 to 3000 feet, better rainfall encourages scattered trees, especially yellow pine, the drought-resister. Drenching rain between 3000 and 6000 feet makes a third zone of heavy timber, thick forest. The fourth zone, from 6000 to 8500 feet, has much rock surface, with here and there poorer forest stunted by the cold at the upper limit.

The high Sierra contains Mt. Whitney, 14,495 feet, the highest peak in the United States, reaching far above the timber line. The close relationship between rainfall and vegetation is clearly revealed. The tree line on the dry east side is much higher than on the wet west side of the mountains.

The heavy timber zone is the home of the sequoia. This may well be called the emperor of trees, for it makes the king of forests. Standing in the presence of these giants, you may be silent with a sense of awe and come to understand the meaning of the word "majesty" far better than by the view of

kings. Human kings look so pitifully like the rest of us, but the sequoia towers in a class alone.[3]

These trees attain their great size by a combination of qualities. They have a thick, spongy bark which holds water, rendering it almost fireproof. The wood is almost fireproof, insectproof, fungusproof. The trees stand in sheltered valleys where there can be no strong winds to break them down. Thus they can stand for millenniums and grow, and grow, and grow. The whole tree is not gigantic in proportions. The amount of foliage-bearing branches is no greater than that of many smaller trees. What they have actually done is to push their tops up higher and higher toward the light and add rings of growth on their trunks, century after century, and become great collections of wood — overgrown trunks, 20 or even 30 feet in diameter — which nature has not at that point been able to smash down, as it does in nearly all other parts of the world.

VOLCANIC ENERGY

This mountain barrier also contains Mt. Lassen, the only volcano in the United States, which awoke in 1914 after an unknown period of slumber and blew off a slight (for a volcano) eruption of steam which swept away forests of trees 6 feet in diameter with the same ease that a person can blow small bits of paper off a table.

In the locality of Mt. Lassen there are many hot springs. Here an expert fisherman could catch a trout in one stream and swing it into the boiling water of another pool without moving. Far more important, however, is the possibility of using this earth, hot with volcanic heat, as a means of boiling water, making steam, and running engines, as the Italians have done in Tuscany.

RECREATION

The Sierra Nevada has wonderful resources for the vacationist. Greatest of all these resources is the Yosemite Valley, although other Sierra canyons are almost as beautiful. These canyons are midway in the mountains, not in the foothills nor yet at the crest. They were dug out by the combined efforts of running water and gouging glacier ice. Some of them are half a mile deep. The Yosemite, such a puzzle to the nontechnical observer, was dug out of granite rocks. Granite usually has joint seams in it at short distances apart. Occasionally a place can be found where these seams are absent and the granite is just one solid piece. Such solid pieces are exceedingly resistant even to glacial digging. Scraped bare of all weathered material and rounded through glacial action, they form the many striking domes overlooking the Yosemite Valley. The latter, initiated by stream action in more jointed granite, acquired its inspiring precipitous walls through undercutting by glaciers. The filling of a postglacial lake, 5 miles in length, then transformed its bottom into a level plain now occupied by a beautiful, tree-dotted meadow

[3] Tree-lovers need to keep watch on legislation at Washington lest some of these groves be even yet handed over to private ownership — the ax of the plunderbund which never sleeps.

set strikingly in the midst of this area of bare cliffs, a combination which has made the Yosemite one of the most impressive of valleys.

The wonder of the visitor is increased by the waterfalls of great height and properly famed beauty, produced by branch streams plunging over the end of a "hanging valley" into the master valley below. The automobile has of course multiplied manyfold the number of people who can get into the Sierra during the summer.

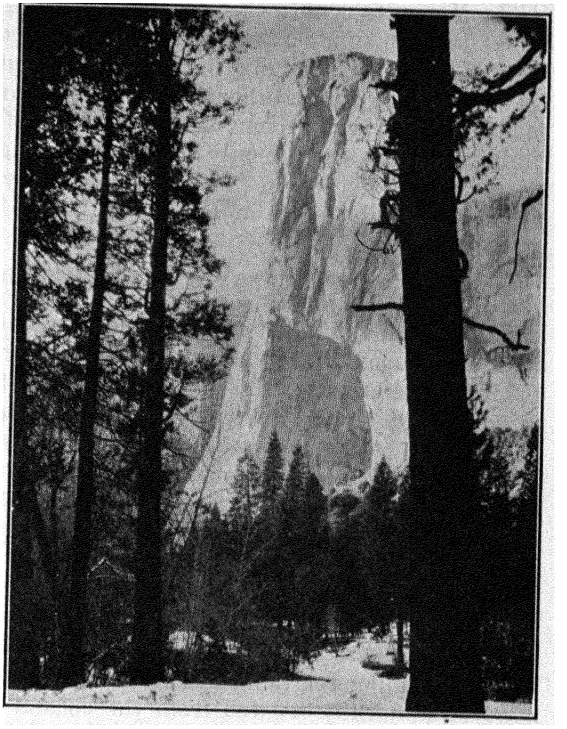


FIG. A. A winter picture of a Sierra scene that is well nigh one of the wonders of the world. The Yosemite Valley, now thronged with visitors since the automobile has put the nation on wheels. (Courtesy U.S. Dept Interior)

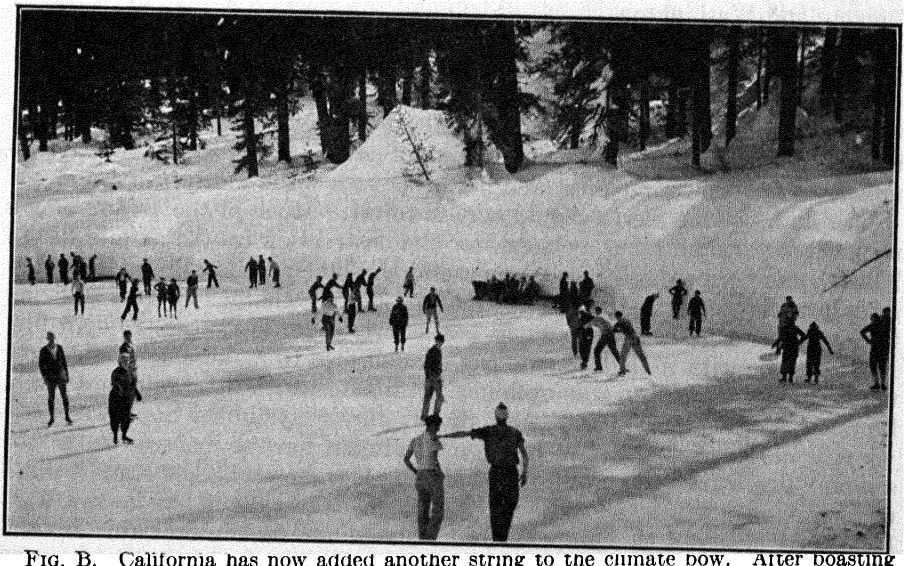


FIG. B. California has now added another string to the climate bow. After boasting for decades about their mild winters Californians have gone up into the mountains to another climatic realm and started winter sports after the fashion of the East. A rink in the Sierra. (Courtesy U.S. Dept Interior)

The Yosemite is only the most advertised of the Sierra valleys. Scores of others teem in summer with people seeking escape from the lowlands or the noise of cities by indulging in the peaceful pursuit of the trout which state hatcheries have put into the lakes and streams of the Sierra. Lake Tahoe, 200 square miles of water at an elevation of 6225 feet, is particularly favored by summer visitors, and a nearly continuous string of resorts, hotels, lodges, and camps follows its shores. Of late a constantly increasing number of ski enthusiasts visit the Sierra in winter.

MINING AND LUMBERING

The opinion of the old miners, "There's gold in them thar hills," still holds the imagination of Californians. Thousands of mining claims have been staked out in the nongranitic part of the Sierra. Workable bedrock mines, however, are restricted in the main to the mother lode, stretching from Mariposa to Nevada City in the western foothills of the range. The increased price of gold has stimulated development and has resulted in the production of lode gold worth between $20,000,000 and $30,000,000 a year. The mining of other metals, such as silver and copper, plays only a comparatively minor role.

The heavy timber zone of the northern half of the range is the source of lumber and the millions of packing boxes required to ship California's fruit and vegetables to the Eastern and foreign markets. A large part of the demand in lumber for the building industry of the coastal cities, however, is more economically secured from the coastal forests of northern California, Oregon, and Washington.

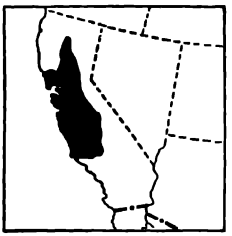
THE FUTURE OF THE SIERRA NEVADA

As population increases, or as the standard of consumption of a static population increases, the water resources of the Sierra Nevada will be more effectively used, as one gorge after another becomes a water-storage reservoir.

The slopes of the Sierra should stay in forest. Much of the area is now a national forest, and none too soon, for the destruction by the ax and fire of heedless lumbermen and of cattlemen and sheepmen, primarily interested in grass, was indeed frightful before the nation took charge. Forest destruction is bad enough now, despite the best efforts of forest rangers to fight fire. Nature alone with its lightning starts enough fires to make one wonder how there is any forest left. One cyclonic disturbance, with little rain and many lightning storms, started 700 forest fires in three days in the Southwest.

Some of the Sierra forests promise to remain forever inaccessible to the sawmill, under present conditions of moving logs, because they stand behind precipices over which the most ingenious American cannot handle saw logs. But what choice opportunities these isolated forests, untouchable by the lumberman, offer to the camper, with knapsack or burro train, who wishes to climb and camp in the forest primeval, to fish in rarely fished pools, and to be in the presence of untouched nature — if we can keep the fire away.

Chapter 33. CENTRAL CALIFORNIA



CENTRAL CALIFORNIA is Southern California's sister — little sister or big sister depending on which of them is doing the talking. There is great climatic similarity. Both have the Spanish past. They have had similar stages of economic development, but Central California, composed of the Great Valley and the Coast Ranges with their enclosed valleys, is much larger and has room for agriculture to assume a larger place — larger actually and proportionately.

Although Sir Francis Drake anchored near the Golden Gate in 1579, it was the Spanish governor, Don Gaspar de Portola, and his little band of adventurers coming over the hills from the south in 1769 that discovered San Francisco Bay, a body of water 540 square miles in extent that forms one of the finest landlocked harbors in the world. Six years later the ship *San Carlos*, in command of Don Juan Manuel Ayala, sailed through the Golden Gate and was the first to drop anchor in the bay. In 1776, while Americans were writing vows of independence on the eastern edge of the continent, a Spanish presidio (garrison) was established on the tip of the peninsula south of the Golden Gate, and a mission was founded in the same year in the hills to the south. Along the bay shore grew up a trading center called Yerba Buena, where visiting trading vessels anchored in a sheltered cove.

It was not until 1847 that the name of the little town was changed to San Francisco. In the following year, when California was ceded by Mexico to the United States, San Francisco had 820 people, 200 homes, 1 school, 1 newspaper, and 2 wharves. One day in May, 1848, a Mormon walked along the streets with a bottle of gold dust in his hand, shouting, "Gold! Gold! Gold from the American River!" People had paid little attention to previous reports, but the sight of gold caused an immediate exodus. Shops closed. Crews deserted their ships. The newspaper suspended operation because the typesetters had fled. By the end of the month there was scarcely an able-bodied man left in town.

Gold populated California with amazing speed. By the fall of 1849 San Francisco had 15,000 people gathered from everywhere, for the news of gold had spread like wildfire. California population jumped from 93,000 in 1850 to 380,000 a decade later. The life there at that time will probably be remembered as the world's classic gold rush. A city was built almost overnight, in a place where it was difficult to build and in spite of great shortage of supplies. In this land of cattle ranches, there had been just enough agriculture to feed the few people. Then suddenly came these thousands of interlopers, greedy for gold, and demanding to be fed, clothed, and housed.

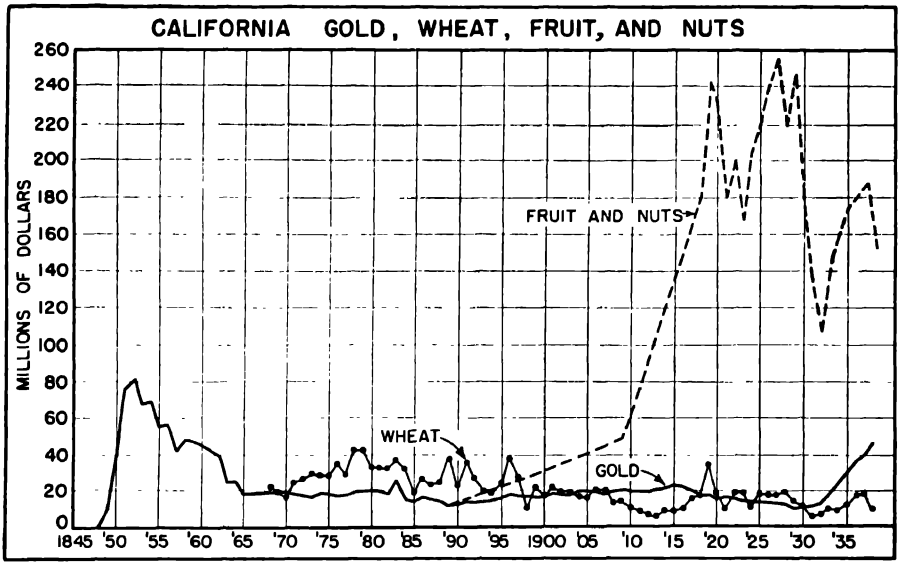


FIG. A. An interesting record of industrial history. The stream gold, open to any man with pick, shovel, and pan, soon ran low. More than a half-century later heavy machinery dug back into the mountains and the gold output went up again. Wheat takes the leadership, and then both wheat and gold become pygmies beside the products of horticulture. (Facts from U.S. Dept Agr.)

Ships rushed from various parts of the world with supplies, but no ship could unload in a day, and no contract could keep the sailor from dropping overboard at night and swimming for shore. There he could dig for gold and get $10 and $15 a day like the rest of the gold-seekers, including most of the United States Army garrison. This was indeed a golden age, not only of income but of independence, for the gold was stream gold, and to get it every miner had his chance. He took his pick, shovel, and pan and dug for himself. A few of the less adventurous took the more certain jobs of running restaurants and engaging in transportation. There are records of a man and a mule making $3000 a month. For a time three men ran a ferry across the San Joaquin River and made an income of from $500 to $1000 a day by charging $2 for passage for a man and horse. The price was reasonable enough where wages and earnings were from $10 to $15 a day, and ferries were few.

In San Francisco people lived in everything that could be lived in. They even made homes of piles of store boxes, boards around three sides of an enclosure, or a piece of canvas on four sticks. A tent 15 by 25 feet was rented by gamblers for $48,000 a year. Bayard Taylor, who visited the country about this time, said that the effort expended to build San Francisco and to house 15,000 people so far from supplies would have created a comfortable city for 100,000 people on the Atlantic seaboard.

By 1852 the gold output was $81,300,000. By 1857 it had gone down to $43,600,000, and thereafter the exhaustion of the stream gold was rapid. It was not many years later that California gold was chiefly derived from mines

of rich ore far back in the mountains where the mother lode had been found. In 1938 California produced $45,300,000 worth of gold, or about a fourth of the nation's output. Three-fifths of California's gold was derived from lodes, and the remainder was dredged from stream gravels.

THE COMING OF OIL AND FRUIT

Forty-four years after the gold, oil was found. In the southern end of the Great Valley around Bakersfield, there was all the intense excitement of striking oil. The value of the yield of oil exceeded, for a time, the value of gold when gold was at the peak. But the oil industry will never give California history the flavor of the famous gold rush. The oil is an important export and a great stimulus to manufacture in the coast cities, but it is not an enduring industry of the valley. Not oil, but vegetables, fruit, and cotton now symbolize the Great Valley, once famed for the gold of its foothills, and their value far outranks that of gold or oil at its height. Fruit and truck, though less romantic than gold or oil, are *permanent* industries. At no other place in the world is there so large an area that can be depended upon to produce such variety and quantity of fruit as Central California. California has had good reasons for boasting that it can grow anything that the temperate zone produces, and subtropic crops in addition. Consider this fact of great variety of product, the big trees, the climate, the great distances in California, the speed with which changes of industry have come, and we can see how it happened that someone said of California, "They cultivate, irrigate, exaggerate." [1] Nature set them the example of exaggeration.

California when it was an almost unsettled frontier was the world's greatest gold-producer. Now it is the greatest exporter of fruits and vegetables in the world. The change has indeed come with great speed. As I rode past the city of Modesto (San Joaquin Valley) in 1922, I looked out and saw a great factory which I thought from its size must be railroad repair shops. It was one of the several canning factories owned by a single company. An old man sitting by my side remarked: "I remember when that town was a wheat field. When I came here in 1867 I used to see herds of a hundred antelope on both sides of the river here, and elk as late as 1870. The whole country was a cattle ranch. Wheat began in 1868, and they sowed the grain after a chisel cultivator and harrowed it in and got good crops. Later they had to plow it. Then came the irrigation. Now that sandy land is worth $200 or $300 an acre. It will grow alfalfa, grapes, fruit, and cantaloupes." [2]

This Great Valley lies between the Coast Range and the Sierra Nevada and is entirely surrounded by mountains save at the Golden Gate. The

[1] Not even the great depression nonplused Californians. In 1932 one of them wrote to me: "Depression? We have no business depression, but I must admit that our boom is the worst we've had in years."

[2] Between 1900 and 1910 the San Joaquin Valley, where irrigation was increasing, gained in population more rapidly than the Sacramento Valley and the rest of the state. Since then the boomers of Southern California have made their section the most rapidly growing part of California — growth by becoming *home space*. The Great Valley is *sustenance space*.



FIG. A. The Machine Age starts toward the kitchen. Mass production of canned peaches. This is Sacramento Plant No. 11 of a California packing company. By the time you had walked through a few of these plants you would be ready to agree that the California fruit industry is beyond comprehension. The building of large cities has gone along with improved transport of food and improved *storage* of food. (Courtesy San Francisco Chamber of Commerce)

valley is 500 miles in length, 20 to 50 miles wide; it includes more than 17,000 square miles.

GREAT VALLEY CLIMATE

What makes the Great Valley a fruit and vegetable region, with such an amazing variety of product? It has a climate much like that of Southern California — a mild winter, winter rain, and summer drought. This is a wonderful climate for crops if water can be had. The remarkable feature about Great Valley climate is the amazingly mild winter, considering its latitude. The northern end, in the latitude of New York, is about as warm as the southern end, which is in the latitude of Cape Hatteras. This happens because of the tempering effect of the warm ocean to the west, and equally important are the protecting mountain walls to the north and east, which are much higher than the cross ranges and keep away the cold winds from the middle of the continent. As a result, oranges and olives grow in the northern part of the Sacramento Valley, in the latitude of New York. The city of Sacramento, in the latitude of Louisville, Kentucky, sometimes passes a whole winter without a frost. But after such a winter it once had a killing frost on May 7, showing that even here the weather is not absolutely reliable.

Sometimes the mildness of winter proves detrimental by preventing a winter rest in plant growth. Peaches, for instance, which tend to bloom very early in the spring and are vulnerable to late spring frosts, must be grown in the cooler parts of the Great Valley, such as the Sacramento Valley and the

Sierra foothills. Experience has demonstrated that the mild winters of the Coast Ranges, near the warm Pacific, are not at all suited for the growing of peaches.

The Coast Ranges keep away the sea breeze, and in summer the Great Valley is *hot*, hot from end to end. At times the summer temperatures may reach 100° F. anywhere at all. At Fresno the average of the hottest part of the days for July is 100°, although the minimum night average of 64° shows the cooling influence of the dry climate. Bakersfield is hotter than Fresno.

The rainfall increases from 5 inches at the south to 25 inches at the north, and the length of the rainy season also increases from south to north. Both increases are conditioned by a greater frequency of cyclonic disturbances in the northern part of the state. With such low rainfall, the country is treeless except along the streams, and in the southern part of the state grass and desert brush make the natural soil cover. Only wheat and barley can be grown without irrigation, as both are able to reach maturity before the summer drought sets in. These small grains suffer considerably in dry years in the San Joaquin Valley, but usually do very well in the Sacramento Valley.

The hot summer is not so humid as that of the Mississippi Valley, but the heat blocks this region from even thinking of itself as a residence region for the retired Easterner. It is to be the home of those who have business there; and this business is, and will continue to be, chiefly agriculture — an agriculture where the farmer has difficult problems both in production and in selling. The energetic people have set world examples in the solution of some of these difficulties.

On the production side the farmer's great problem is the struggle for water and the study of how to use it most effectively. In many parts of the Great Valley the first comer got first use of water, the second comer got the right to the leavings and the later comers got the right to further leavings if there were any. As a result there is much land that may or may not be irrigated, depending on the abundance of rain the previous winter. The total flow from the Sierra ranges amounts to about 12 inches for the whole of the valley surface. This is not enough. Most of it comes in the northern part of the valley, where the mountain rainfall is greater than in the south.[3] Fortunately the surface of the valley favors the farmer greatly in his problems of cultivation and irrigation.

SURFACE, SOIL, AND WATERS OF THE GREAT VALLEY

The Great Valley was once an arm of the sea, like the Gulf of California. It has been filled, all save San Francisco Bay, by alluvial fans, a multitude of them. To get an idea of the construction of the valley, lay your hands on the edge of a table, spread out your fingers, let the thumb of each hand touch the other thumb, and imagine a whole row of such hands. Think of

[3] From Kings River south, 5100 sq. mi. produce 3,000,000 acre-feet of water, while from the Kings River north 7500 sq. mi. of Sierra watershed give nearly three times as much, namely, 8,500,000 acre-feet.

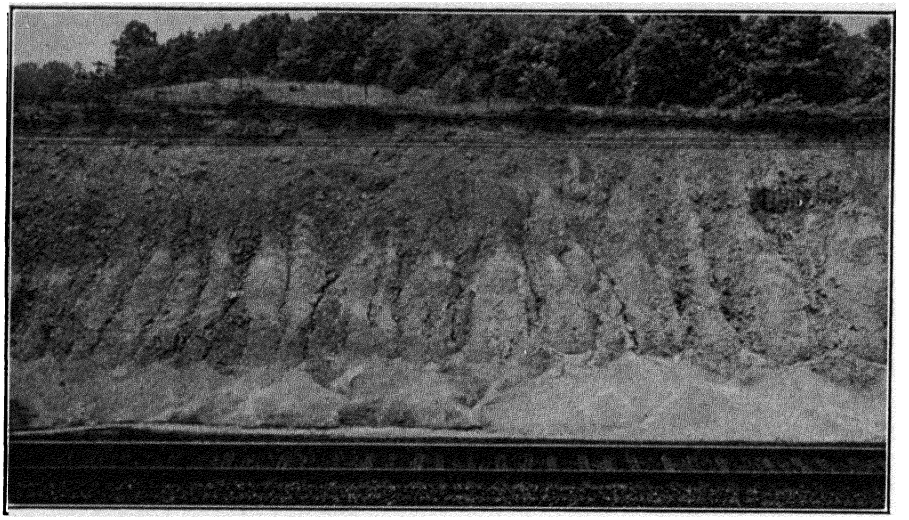


FIG. A. This set of little gullies and outwashes in a Maryland railroad bank is a perfect miniature of the process by which streams have cut canyons in the Sierra and spread the cuttings at their foot in that long series of compound alluvial fans which makes the soft soils and sloping sides of the Great Valley with its excellent air drainage. This physiographic process works itself out in all areas of steep slope and light rainfall. (Courtesy Mr. Edward B. Temple and the Pennsylvania R.R.)

the wrists as the mouths of canyons that have spread out their fans like the fingers of your hand, each fan merging into the fans next to it. This will be the east side of the valley. A row of child hands on the other side will represent the smaller alluvial fans on the west side, built by the smaller streams from the less humid Coast Ranges. Being water-borne, these fans are of soft, rich earth material, easily plowed. Being water-borne, they are of gentle slope, easily irrigated.

Near the master streams, San Joaquin and Sacramento, the ascent toward the mountains is only 5 or 6 feet to the mile in the lower valleys, steadily increasing to 20 or 30 feet near the mountain. The soils get finer and finer as the distance from the canyon mouth increases, because of the declining carrying power of the water. The work of fan-building and the natural overflow of the fan-building stream are sometimes unfortunate for the farmer. Go back to the simile of the outstretched hands. Let an extra big hand represent the fan of Kings River as it spreads out from the southern Sierra, and you have the explanation for Tulare Lake. The voluminous fan of Kings River prevents the drainage of the area to the south from reaching the San Joaquin River, impounding it in Tulare Lake. It is an inland basin. Sometimes it is a lake (1922), sometimes it is wheat fields (1918–21), depending upon the rainfall.[4] South of Tulare is another basin, formerly called Kern

[4] In normal years runoff is slow enough so that the irrigation systems in the valley of the Kings, Kern, and Tule rivers are able to use all the water, but in the seasons of heavy floods Lake Tulare returns. In November, 1939, it covered 112,000 acres, which were limited by reclamation levees that prevented its spread over three or four times as much

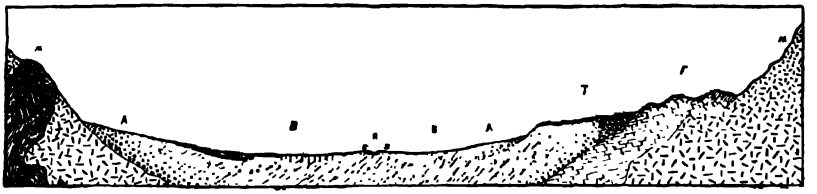


FIG. A. A University of California bulletin shows this cross-section to explain how the Great Valley was made. **MM**, mountains, old rocks; **F**, more recent sedimentary rocks, foothills; **T**, old terraces, parts of ancient fans now cut through by present streams; **AA**, upper slopes of fans now building; **BB**, flat lands near valley center; **R**, river; **SS**, natural levees which make river banks higher than **B**.

Lake. The waters which once supplied Kern Lake have been carried off to an irrigation reservoir, and that lake is permanently dry.

In the middle and lower Sacramento Valley the river, overflowing, has built natural levees, and its branches coming from the mountains have done the same, thus enclosing basins without outlets. These basins, naturally flooded by every big freshet, have been diked, ditched, and pumped to make available their rich alluvial lands. Such are the bottom lands of Sutter Basin, American River Basin, and Yolo Basin. In some places units as large as 50,000 acres have been reclaimed. The dikes have not always been able to retain the spring floods, and in some years vast areas of the three basins are under water. Not until flood control becomes more effective will these rich agricultural lands become safe for man and human use.

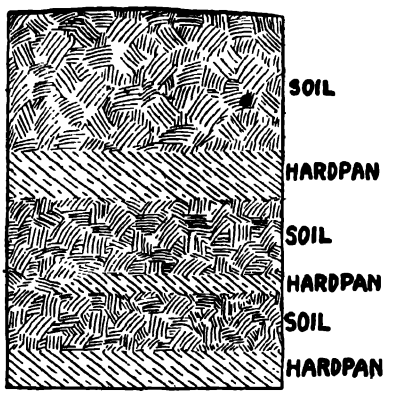


FIG. B. Flat alluvial lands of arid and semiarid regions often have a layer of hardpan that plant roots cannot get through. This drawing from a University of California bulletin shows the hardpan troubles of some California farmers. This is another example of climatic influence on soils.

An alluvial fan, with its layers of clay, layers of sand, and a water supply at the top, is a natural place for the accumulation of artesian waters. The San Joaquin Basin had about 4500 square miles of it. For a time it had flowing wells, but most of them ceased to flow years ago, and thousands of pumps were lifting water to the fields in 1923.

A layer of artesian water is really a river flowing along beneath the ground, and it must finally get somewhere. Usually, by way of pump and well, it gets to the irrigation ditch. But sometimes its disposal is not so useful. Where can artesian water go in the lower San Joaquin Valley, a great flat with a horseshoe of mountains around three sides? There it is easier for the water to come to the surface than to flow away underground. This slowly moving water

land. Farmers not affected by the flood regard such windfalls of water as a precious surplus, as they raise the ground-water table and can be pumped out and used to irrigate as wanted.

brings up with it the things it dissolved beneath the ground and they are left on the surface as the water evaporates, thus making "the great alkaline areas of the east slope of the valley trough." [5] Thus tens of thousands of acres are at present virtually worthless. Some of the land is spoiled by hardpan, an impervious layer of clay.

GREAT VALLEY AGRICULTURE

This valley of warm climate, low rainfall, alluvial fans, and artesian waters has not yet settled to a standard agriculture. Traveling through the Great Valley reveals a varied agricultural landscape. The railroad from Los Angeles climbs northward from the Mojave Desert and enters the valley through the Tehachapi Pass. Near the summit of the pass, the valley which the railroad follows widens, and small mountain streams and wells irrigate pear orchards. Then for 3000 feet of descent to the San Joaquin Valley not a drop of summer water is to be seen. The train finally rushes out beside a sandy stream bed into a flat plain. The bright sun-glare on yellow, dead grass, almost blinding, stretches away for miles. Even up to the pasture foothills stretches the dead and usually closely grazed-off grass. But far out in the valley a dark green streak is seen. It is the green of irrigated orchards. There are miles and miles of orchards, then miles of wheat stubble, more miles of orchards, and so on and on through county after county. A forest of oil derricks bristles in the glaring landscape about Bakersfield. There are stretches of wheatland sometimes as far as one can see, with ranch houses very far apart; stretches of alfalfa land; marks of the dairy industry; stretches of orchard land with houses close together, the mark of intensive agriculture; stretches of fields of cotton, a rich and promising crop in the southern part of the valley; and stretches of pasture land show where the land is of low value or where old estates still hold together against the pressure of increasing population. Northward without a break the San Joaquin Valley merges into the Sacramento Valley with its miles of wheat and barley fields and the green areas of irrigated rice, alfalfa, and orchards. On clear days the mountains are in view on both sides. From the center of the valley in summer one often sees beyond the low, dry valley bottom low, rounded foothills, frequently somewhat gullied and brownish-yellow with stubble of barley or dry grass. The more distant foothills are cut by streams. Not so dry as the valley bottom, they are sharply topped with light, grayish earth, dotted with the black-green of bushes. Back of the foothills is the third horizon, dark-green with forest. Across the country a column of yellow dust sometimes marches along in the center of a whirlwind or a band of sheep, blending with the yellow of the wheat and strangely contrasting with the bright green of the irrigated fields.

The lack of uniformity in the use and in the degree of intensity of use of the Great Valley agricultural lands results partly from the curse of big estates, a misfortune inherited from the days of Spanish settlement. Immense distances from markets, coupled with long dry summers, made the country appear to be fit only for the pasturing of cattle and sheep. As hides, tallow, and

[5] U. S. Geol. Survey, *Water Supply Paper* 222, p. 26.



FIG. A. Mass production of cotton on the flat floor of the San Joaquin Valley. The hot summer climate here is favorable for long-staple Egyptian cotton. (Courtesy Caterpillar Tractor Co.)

wool were the only commodities that could stand the cost of transportation on the long voyage around Cape Horn, grazing had to be undertaken on a very large scale in order to support the landowner. Recognizing this fact, Spain and then Mexico made very liberal grants of land, measuring thousands of acres, to the few citizens to venture settlement in this far-off province.[6] In this manner most of the land of Southern California and the Coast Ranges passed into private ownership. During the Mexican regime only a few of these large land grants were made in the Great Valley, as settlement had not developed very far from the coast. It was the careless land policy of the Federal Government and the young State of California which recognized little value in these dry acres and permitted the acquisition of land in large blocks. Large grants were given to the railroad companies as a reward for building their pioneer lines, and the railroads in turn sold land to settlers. Much land was classed as swamp and overflow land and sold in large blocks for a nominal fee. Improvements in transportation and the development of irrigation eventually made possible a more intensive use of the land, and

[6] This is very different from the democratic ideal that has dominated the American Congress in its attempt (supposedly) to give away homesteads of 640 acres each to support one family.

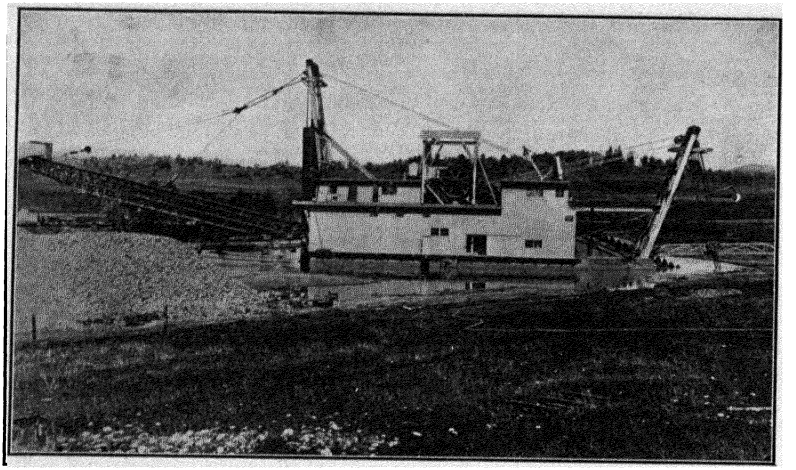


FIG. A. Killing the goose that laid the golden egg. Personal gain now *vs* the nation's future! This gold-mining dredge floats in a pond. It scoops up the meadow in front of it, runs the earth through sluices as in placer mining (see Fig. 356 A), gets the gold, and drops the earth out behind it — *stones on top.* This ruins the meadow, and the process has been forbidden by law. People had to choose between one crop of gold and a hundred or a thousand crops of farm or orchard produce. Placer mining in the hills was about as bad, because it loaded the streams with sand and gravel which they carried down and spread upon the valleys. It too has had to be prohibited in California. It goes on in Alaska, where there are so few to bother. (Courtesy of Bucyrus-Erie Co.)

settlers in vast numbers arrived from every state in the Union, and from abroad, to develop the land. Many of the remaining estates, especially along the foothills of the Sierra, have finally succumbed to the pressure of high land values and have been subdivided into small farms, a process that has yielded great fortunes to the holders of the big estates.

Particularly conspicuous among these large estates is that of Miller and Lux. These men (now dead) were cattle kings of the early days. They were men of energy, ability, and prophetic foresight. They obtained old Spanish land grants when land was cheap, got large tracts cheaply by reclaiming swamp and overflow land, and bought soldiers' scrip after the Civil War. This soldiers' scrip entitled the holder to land, which Miller and Lux added to their holdings. So great was their accumulation of land that it is said that cattle could start at Bakersfield to march into San Francisco and sleep each night on Miller and Lux lands. In one case these estates included the banks of the San Joaquin for 60 miles. The foresighted Miller and Lux dammed the river and turned the whole of its waters onto their grazing-land, pretending thereby to irrigate, and by that process tried to establish a claim to the whole river. As late as 1922 their assumption caused whole counties to pause in their development because, while the county needed irrigated land, and the water was in the river, the Miller and Lux claim (now Miller and Lux, Inc.) might finally get the water and thereby ruin any irrigation works that others should build. In 1922 a method of utilizing the river was finally agreed upon.

To complicate matters for irrigators this Spanish doctrine of the right to appropriation of water had to contend with the English doctrine of riparian rights, which guarantees the right to an undiminished stream flow. This latter viewpoint, introduced with the American law, would have prevented all irrigation. For scores of years litigation went on between the contenders of the two opposing doctrines, represented by fruit-growers on one side and the cattle-ranchers on the other, the courts deciding at one time in favor of appropriation, at another time in favor of undiminished natural stream flow, at another, trying to compromise between the two extremes. It is only since 1928 that either doctrine has been supplanted by the new principle of "most beneficial use," clearly in favor of irrigation. However, there still exist quite chaotic conditions of claims to water, concerning amounts claimed and the time of year when the water may be withdrawn. The humid-land (English) concept and the semiarid-land (Spanish) concept give a neat example of environmental origin of laws.

As these vast ownerships were usually much easier to operate as cattle ranges or wheat farms than they were under more intensive agriculture, large areas which might be irrigated are still being dry-farmed to wheat and barley. Some land was plowed for the first time in the 1920's, and large areas are still in cattle ranches, which are often overpastured.[7] It is probable, however, that much of the land in the San Joaquin Valley, where the water resources are limited, will have to remain in small grains or pasture.

The artesian waters beneath the valley floor and the waters of many mountain streams flowing into the valley have made it feasible to irrigate a portion of the Great Valley. As a whole, California increased its irrigated area by 58.7 per cent between 1909 and 1919 and by 12.5 per cent between 1919 and 1929.[8] Much of this increase of irrigated land was in the Great Valley.

THE MARKETING PROBLEM

Farmers in California and also in the East, having succeeded in producing crops, have another and often a more difficult problem in marketing the produce. The program of the Counties Convention of the California Development Board held at San Diego, November 12 and 13, 1915, started as follows: "The grower can produce almost anything in California and in unlimited quantities; but he cannot sell it at a fair price, and in some cases cannot sell it at all." Unfortunately that statement has much perennial truth in it, especially for the growers of fruits and vegetables, there and elsewhere.

[7] The condition of these overpastured lands and much of the foothill country is such that they are thought to be capable of about 25% improvement. The University of California has recognized this problem by including in its curriculum courses in range management and courses in land utilization. The university also co-operates with the U. S. Forest Service in operating an experimental range of 3500 acres near Madera, Calif. "Probably no grazing region in the world needs the rehabilitating influence of a sound and far-sighted range-management policy quite so much as the 'blistered' foothills of California." — G. Cecil Alter, *National Wool Grower*, June, 1922.

[8] In 1929 approximately 30% of the area of irrigation enterprises that could be supplied with water was not irrigated. Thus in California, as elsewhere, the big problem is whether the farmer can irrigate and sell his crops at a profit.

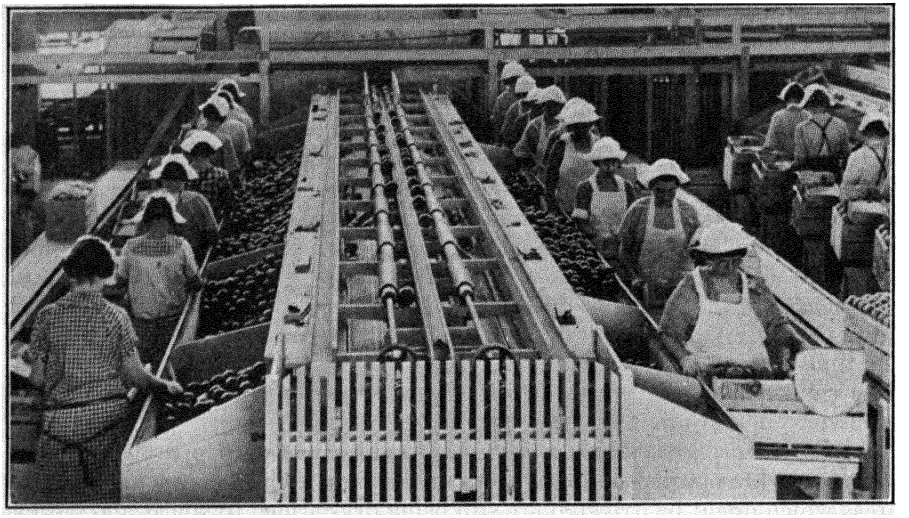


FIG. A. The physicist breaks machinery down into seven elements of mechanics. By the same process standardization becomes one of the elements of mass production. Here we see fruits carried by machinery between these rollers. The space between each roller and its guide is a little wider than the preceding one. Thus the fruits separate themselves into size groups by falling through apertures of given size. (Courtesy California Fruit Growers Exchange)

Considering the problem of marketing in the Great Valley of California before the year 1900 — and to some extent the facts still hold — it might be said that there is nobody (less than 1 per cent of the population of the United States) between the Sierra Nevada and the Rocky Mountains, so produce cannot be sold there; there is "nobody" in the Rocky Mountains; there is "nobody" in the Great Plains Region. So California, during its early history, was obliged to disregard its excellent agricultural opportunities and export hides, gold, wool, and wheat. The horticulture of the last epoch could be developed only after a great struggle to overcome the difficulties of marketing bulky and somewhat perishable produce in places from 2000 to 10,000 miles distant.

Because of these marketing difficulties the California fruit and vegetable business has been developed in specialized centers. Around Fresno the greater part of all the raisin grapes of California are grown. Melons will grow nicely in many parts of the valley, but Turlock is the center of most of the acreage. Freestone peaches are grown in one place; clingstone peaches are grown in another place. Prune plums dominate the Santa Clara Valley. Most of the lettuce is grown around Watsonville. The cool ocean water makes a cool summer, permitting lettuce to be shipped from late March until early December, one of the longest shipping-seasons of any place in the United States. This centralization gives the grower the advantage of trained labor, for everyone knows how to work on the one crop of the neighborhood and the town near by carries supplies. Every man has the stimulus of keeping up with his neighbor, and the growers can get together and exchange information



FIG. A. For heavy crops to support intensive populations man turns to fruit. Some grapes are grown in Southern California, but the bulk of the state's crop is in the Great Valley. (Courtesy Los Angeles County Chamber of Commerce)

and ideas, for agriculture is scientific and the "shop talk" is interesting. Above all, the compact group of growers has the great advantage of selling through co-operative associations, which alone have brought the fruit industry of California from chaos to the highest degree of development to be found anywhere.[9]

The raisin industry may serve as a type of Great Valley horticultural localization and marketing methods. Within the San Joaquin Valley is a district extending through Stockton, Fresno, and Bakersfield that produces almost the entire American supply of raisins, the output having increased from 40,000 tons in 1895 to 200,000 tons in 1939. The center of heaviest production is Fresno County, one of the richest agricultural counties in the United States. This single county produces about half of the nation's raisins, and Fresno, the county seat, is justly famous as the capital of the raisin world.

Twenty years ago a trip through Fresno County was a voyage through

[9] Without any doubt, California leads the nation in the development of co-operative marketing of farm products, some 600 associations being engaged in business in 1937. Among the more prominent associations, together with an estimate of the percentage of the total state output that is handled by each, are the following: California Almond Growers Exchange, San Francisco, 70%; California Fruit Growers Exchange, Los Angeles, 75% of oranges and 90% of lemons; California Fruit Exchange, Sacramento, 50% of fresh fruit; California Turkey Growers Exchange, San Francisco, 25%; California Walnut Growers Association, Los Angeles, 80%; Challenge Cream and Butter Association, Los Angeles, 50%; Mutual Orange Distributors, Redlands, 15%; Poultry Producers of Central California, San Francisco, 30% of eggs; Prune and Apricot Growers Association, San Jose, 30% to 40% of combined volume of prunes, dried apricots, figs, and pears; Sun-Maid Raisin Growers Association, Fresno, between 25% and 50%.

a veritable ocean of grapes, but since then considerable diversification has occurred. In 1938 the county had 165,000 acres in raisin, wine, and table grapes that sold for $11,000,000. About seven-eighths of the grape crop are raisin grapes, chiefly Muscat, Thompson Seedless, and Sultana. These white grapes are rich in sugar, very tender-skinned, and take on a reddish-brown color when dried in the sun. Other important crops in 1938 were 135,000 acres of grain, 81,000 acres of cotton, 55,000 acres of alfalfa, 18,000 acres of fig trees, 12,000 acres of flax, and 10,000 acres of sugar beets.[10] In that year the farmers of Fresno County sold dairy products worth $3,000,000 and poultry and eggs worth $1,000,000. Some of the vineyards are fifty years old, and are being pulled up and renewed. Such continuous cultivation has resulted in declining yields and low humus content of the soil. Eventually, more land may be planted in alfalfa to feed dairy cows and make manure to fertilize grapes.

For the present time some of the raisin-growers have developed a fertilization method which permits 100 per cent of the land of the farm to support grapes. If there is water enough, every alternate space between the rows of vines is planted to sweet clover, a diligent gatherer of nitrogen and maker of humus. The other spaces between the grape rows are cultivated, and trays filled with grapes are laid there to dry. The following year the spaces reverse their occupations, and the mat of fertilizing clover is plowed under. This looks like permanent agriculture.

Grapes will live and yield without irrigation, but irrigation will double the crop, so the grape area has many canals and pumps. Pumps are needed because the surface water is exhausted early in summer, after the melting of the snows.

Here, as in many other places in California and elsewhere in the United States, water is often shamefully wasted because the proprietor can get it by an old claim without paying for it, and lets too much run onto the land, often spoiling the soil by bringing up alkali.[11]

Since the grape is an Old World industry, Fresno County has attracted many foreigners. It is indeed a veritable melting-pot, if variety of races makes a melting-pot. Thirty-three different nationalities with more than 100 of each nationality were in that one county in 1930. Russians led with 10,100, followed by 9800 Mexicans, 6200 Italians, 5300 Japanese, 4400 Germans, 4400 Armenians, and 4200 Danes. Less than half of the total population consisted of white people that were born in this country of native parents.

The most conspicuous thing about the raisin industry is the work of the Raisin Growers Association. It was formed when 50,000 tons of raisins were overstocking the market and making low prices and unprofitable farming. Then the growers began to standardize and to advertise. Who has not heard of Sun-Maid Raisins? Who has not seen the bright-red boxes that are sold

[10] 1938 value of principal farm products in millions of dollars: grapes and raisins, 11; cotton and seed, 7; dairy produce, 3; alfalfa hay, 2; livestock products, 2; figs, 1; poultry and eggs, 1; vegetables and melons, .8; sugar beets, .7; peaches, .7.

[11] "What's the proper amount of irrigation water to use?" "Up to the first board on the fence," says the bumptious owner of an unlimited water right.

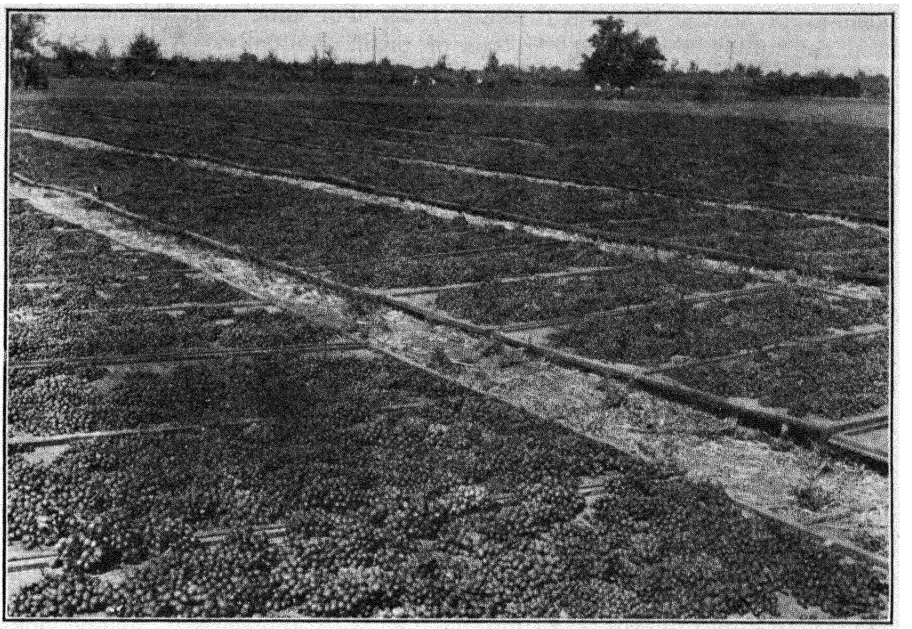


FIG. A. The rainless summer doing its duty turning acres of seedless grapes into raisins. (Courtesy Southern Pacific R.R.)

throughout the country and are exported even to China? The association membership fluctuates from year to year. In 1922 the association had enrolled 85 per cent of the raisin-growers of the state; in 1935, about 35 per cent.

Each member of the association dries his own grapes in the vineyard beside the vines. He brings or ships them to the Sun-Maid Raisin plant in Fresno, the largest dried-fruit packing plant in the world. This building has every mechanical convenience. The raisins are never lifted by human hands from the time the lug box is lifted out of the truck or car in the receiving shed until the raisins go into the final package. The use of elevators, conveyors, and specialized machinery is amazing. Men worked for years to develop a seeding machine, which takes raisins and, by a process similar to that of the cotton gin, puts the sticky raisin in one place and the seed in another place. Today the raisins are automatically graded, stemmed, seeded, processed, and packed by machinery.

Co-operative marketing is by no means a cure-all for the problems of production and selling. The co-operative sometimes achieves many benefits, such as the elimination of cutthroat competition among growers, improvement of quality and standardization of product, stimulation of demand through more extensive and intensive sales promotion, and miscellaneous economies of large-scale operation. But the co-operative marketing association frequently is unable to cope with the problem of surpluses. It cannot create indefinite increases in demand, such as the one that caused the trebling of

raisin-grape acreage between 1919 and 1922. For some years the nation has been consuming about 200,000 tons of raisins annually. Apparently the saturation point is at hand. When a bumper crop comes along (it has been 300,000 tons) and the price declines, resulting in a loss to producers, how can the association convince members that it is profitable to renew their membership for another year? Sometimes the independents are able to get a higher price, and association members, being human, become dissatisfied and refuse to renew their contracts. At such times the association has great difficulty in keeping its organization together, and the officers find it even more difficult to sell the idea of co-operation to producers than to sell the product to consumers.

THE TRUCK INDUSTRY

The newest, the lowest, and the flattest land in the valley has been laid down by the Sacramento and San Joaquin rivers where they flow into the bay. Indeed, most of this land, called tule land, was swamp a few years ago, flooded in the season of melting snow and covered with grass and reeds the rest of the year. This swampland was a haunt of waterfowl which divided their time between it and Alaska. The soil is black loam, often peaty, and of excellent quality for truck crops. Nearly 250,000 acres have been diked, drained by pumps, and laid out in some of the largest fields of celery, asparagus, spinach, and other vegetable crops to be found anywhere in the world.[12] As one looks down the straight rows it seems that they reach almost to infinity.

Raise your eyes in the streetcars of Eastern cities and brightly colored advertisements will invite you to eat Del Monte canned peaches, Del Monte this and Del Monte that, including Del Monte asparagus tips. This branding and advertising is not a co-operative enterprise. It is the work of a private commercial corporation which has the advantage of growing fruit and vegetables on large areas of uniform soil. The result is standardized agricultural output on a large scale — large enough to make national advertising pay, as it does in the case of Sunkist oranges and Sun-Maid raisins.

The centralization of Great Valley agricultural production applies even to rice, which has had a meteoric career in this territory. Successful cultivation, using Louisiana methods, began only in 1912. By 1920, 162,000 acres were grown, almost entirely in the Sacramento Valley. The acreage planted in rice fluctuates considerably from year to year; in 1935 it amounted to 99,000 acres, and in 1937, 145,000 acres. The rapid rise of rice-growing here may be partly explained by the high yield, 70 bushels per acre in 1937 in comparison with 48.5 bushels for the United States.

Most of the vegetable growers are tenants — Japanese, Mexicans, and other foreigners. A few years ago, Portuguese were renting alfalfa land from the Miller and Lux estate and other estates, sometimes paying from $25 to $35 per acre a year, and Japanese at Turlock were paying from $45 to $60 an acre per year for cantaloupe land. But during the business depression of the 1930's most renting was on a share basis, the tenant getting half of the alfalfa

[12] In the spring a little irrigation is sometimes needed. This is had by siphoning water over the dike.

crop, one-third of the bean crop and the melon crop, and from one-quarter to one-third of the dry-farmed grain. Large areas of vegetable land are worked with cheap Filipino and Mexican labor.

LABOR AND IMMIGRATION

It is easy to see how the immigration problem first assumed acute forms in California. The Oriental, willing to work longer hours than we, willing to live on less, could pay more for the land which he bought or leased. What race, what culture, shall own California? Shall it be the economically efficient Mongolian or the less economically efficient Caucasian? This question pressed for an answer. Since self-preservation is the first law of all nature, the answer is perfectly plain. It carries with it the explanation of the movement for the exclusion of the Chinese and Japanese, largely at the insistence of California and other Pacific states. It should be noted that the same feeling against the admission of foreign peoples whose standards of living are low has finally seized upon the whole country. The result has been the limitation of immigrants to the number and type which we feel that we can absorb into the mass of our people with the hope that they will adopt our culture.

The fruit and vegetable industries of California have joined the lumber camps of the mountain in making manifest another social problem — that of floater labor. The grape-grower, the peach-grower, the cotton farmer, or the pea-grower who has no hired man at all for most of the year may need five or six helpers at harvesttime. He is very glad to see the floater or "itinerant" coming along in his decrepit flivver. He also, of necessity, welcomes the Indian, the Mexican, and the bum who beats his way on the freight train. These floaters are not particularly good for the social life of the rural community, where they are much more conspicuous than in the lumber camp far away in the forest, or in the segregation of city slums.

This transitory labor is a necessity for the California fruit and vegetable industry, and the supply is greatly aided by the length of the season, which begins with lettuce in midwinter at Yuma and lasts right through the year, ending with cotton in the late fall. Families move with the harvest, and schools move with the families.

For years the supply of labor was set somewhat by demand, and filled by submissive and frugal foreigners, Filipinos and Mexicans, who disappeared into the slums of the large cities during the slack winter season. Then in the 1930's the depression, the drought east of the Rocky Mountains, the dust storms, and the replacement of share-croppers by tractors in the cotton lands of Oklahoma and Texas sent tens of thousands of bankrupt families scurrying — whither they scarcely knew, but they sought some kind of sustenance.

Naturally the superadvertising of California began to bring a new kind of fruit, namely, the bankrupt seeking not settlement, but even temporary labor, in a market that was already supplied. To relieve the situation, large numbers of Filipinos, and especially of Mexicans, were repatriated, but an ever increasing stream of "blown-out and tractored-out" Americans more than refilled the ranks. Disliking the life in the cities, they remain with

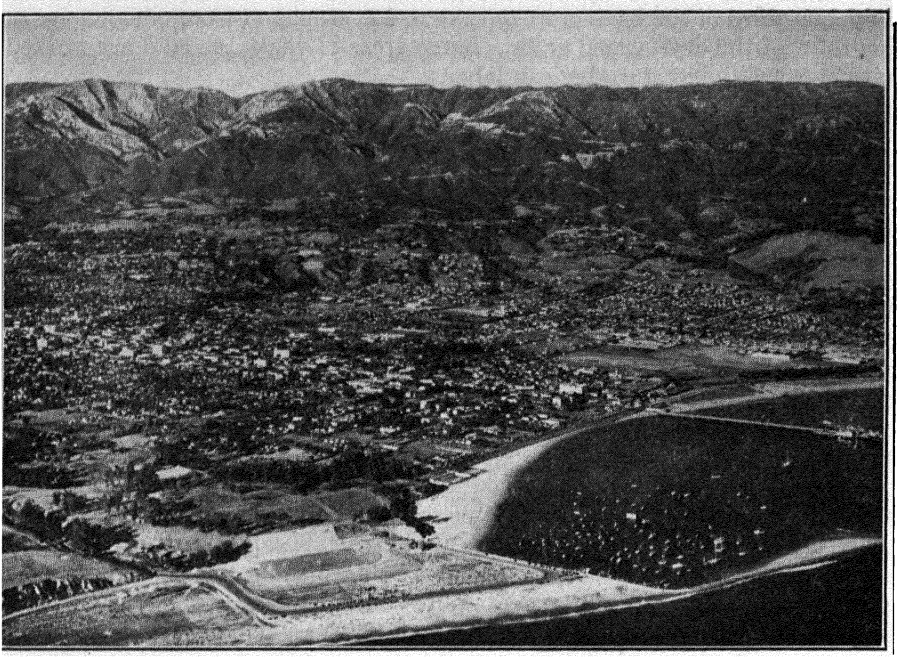


FIG. A. Santa Barbara, nestling between the sea and the first of the Coast Ranges, is one of the most prized residence spots in California. "What goes on here?" I asked a hotel clerk. He answered, "There are just two classes of people in Santa Barbara — the rich people and the others who wait upon them." (Courtesy Santa Barbara Chamber of Commerce)

their large families in the agricultural counties, which hardly know how to cope with them. The absorption of this new American element into California life is beyond doubt one of the most acute problems facing American culture in this moment of the ending of the frontier, challenging mind and soul of county, state, and nation.

THE CENTRAL COAST AND THE COAST RANGE VALLEYS

Between the Great Valley and the Pacific are several ranges of mountains (the Coast Ranges), and among these ranges are several small valleys, notably the Santa Clara and Salinas valleys, south of San Francisco, and the Napa and Santa Rosa (sometimes called Russian River) valleys, north of San Francisco. These smaller valleys have more rain than the Great Valley because of their higher elevation and nearness to the sea. For the same reason they have less heat, at least in some parts, and several very pronounced agricultural adjustments result. For example, most varieties of grapes do not do so well in the cooler air, and their yield is less than in the Great Valley, so the grape crop is unimportant in the immediate vicinity of the sea. At some distance from the sea, however, grapes again become a profitable

crop, as in the Santa Rosa, Napa, and Livermore valleys. Grown without irrigation and under a less scorching sun, they are especially suited for dry wines. German, French, and Italian vintners in these valleys have helped to establish the fame of California wines.

The artichoke loves the cool salt air and the sea breeze. It is therefore a coast crop, almost the entire American crop being grown in two sea-coast counties. Watsonville, about 10 miles from Monterey Bay, and Sebastopol near by make by far the greatest apple center in California, because the coolness of sea air makes an ideal apple climate, which is rather rare in California. Likewise, the cool sea air favors lettuce in the Salinas Valley. The apple orchards are pruned until the trees look almost as much alike as automobiles of the same make.

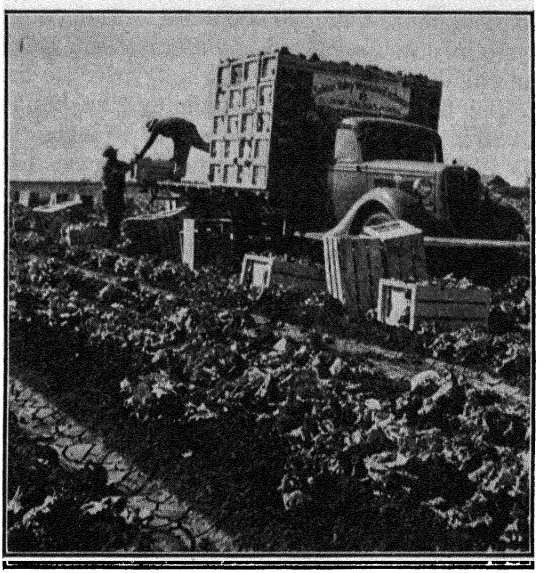


FIG. A. The Salinas Valley is close to the Pacific Ocean a short distance south of San Francisco. An ocean current comes down from the north, one warm enough to prevent much freezing in winter, cool enough to make the summer of the shore districts another climatic world from that which is to be found on the land side of the Coast Range away from this cool water. This coolness suits lettuce, and therefore the Salinas Valley has about the longest lettuce shipping-season of any section of the country. It has given severe competition to the midsummer crop of Rocky Mountain valleys. (See Chapter 26.)

Note the mud cracks in the irrigation trenches. This is one of the crops that is worked by the migrant farm worker, driven out of the center of the country by dust, drought, and depression — ("tractored out," many of them say). (Photo by Lange, Farm Security Adm.)

The Santa Clara Valley, which is really the southward extension of an arm of San Francisco Bay, is the most productive of the Coast Range valleys. It is near enough to the sea to have a summer temperature that rarely goes above 90° F. and winter temperature that rarely brings frosts. It seems to be a kind of fruit paradise, as is proved by the great quantity and great variety of products.[13] Of the 168,000 acres under cultivation in Santa Clara County

[13] SANTA CLARA ACREAGE, 1932

(showing the variety of crops)

Apples	898	Plums	1,610
Apricots	19,331	Almonds	223
Cherries	2,957	Walnuts	6,329
Grapes	6,749	Olives	28
Peaches	1,955	Lemons	12
Pears	7,821	Oranges	10
Prunes	69,547	Figs	91
		Total	117,561

in 1938, more than 120,000 acres were devoted to fruit orchards; 25,000 acres were in vegetables, and the remainder largely in vineyards, berries, walnuts, and alfalfa.

The floor of Santa Clara Valley has about 15 inches of rainfall, increasing to 25 inches in the foothills and to 40 inches in the mountains near by. With 15 inches of rainfall, valley orchards can live without irrigation, but small applications of water are so profitable that everywhere the pump is busy. Prune and apricot orchards dominate this valley very much as vineyards dominate the plain around Fresno. The people of the county frankly say that the young man of Santa Clara who desires to grow prunes must buy an orchard or go elsewhere; there is no more room in the valley for more orchards. Indeed, by 1934 it was worse than that. Electric pumps sucking out the ground water of the valley were hastening a day of reckoning. In twenty years' time water in Santa Clara Valley had gone down 116 feet, and on January 1, 1934, the water in over half of the wells in the valley was standing below sea level, with the grave danger that irrigation would be ruined by the seepage of sea water. Fortunately, at the time there was enough floodwater from the surrounding mountains going to waste in winter to replace the deficit. In great haste a special election was held in 1934 to approve loans and to get the United States Government to help build dams and diversions to enable winter floodwater to be stored in the alluvial fans.

The automobile journey from San Francisco to San Jose, the valley metropolis, leads for a number of miles through suburban lands where there is no water for irrigation and which are therefore but little used for agriculture. It is a beautiful locality, with its parklike expanses of oak trees. Then, within a space of 2 or 3 miles, orchards suddenly increase until the good cement road extends between solid masses of prune and apricot trees, often with a row of grafted English (Persian) walnut trees by the roadside for ornament. Many roadside stands sell fresh fruit, so that one need not be hungry if he has small change.

Ordinarily the weather is perfect for drying prunes.[14] The fruit ripens fully, falls to the ground, is dried on the trays of the grower, and then taken to the central plant to be sorted, graded, packed, and sold by the association. Our prune export of about 200,000,000 lbs. per year is a marvel for a country which imported most of its supply a generation or so ago. Some years ago there was a heavy rain in this valley before the prunes were picked. It was a calamity. The whole valley became a stench of rotting prunes.

San Jose, the center of the Santa Clara Valley, is one of the leading fruit cities of the world. Its canneries, driers, and packing plants have developed to such an extent that carloads of peaches and other fruit are hauled to San Jose from points as much as 200 miles distant. At the unloading platforms trucks and trains are disgorging thousands of boxes of fresh fruit, which are

[14] In recent years Old Sol has begun to suffer from "technological unemployment." Many gas dehydrators have been installed in the Santa Clara Valley, and it has been found that natural gas will dry prunes and apricots in from 14 to 30 hours, depending upon the size of the fruit, whereas sun-drying requires from 10 to 20 days. The use of dehydrators is much cleaner, as they are free from dust and rain; it also prevents the loss of weight through fermentation.

rolled into the factory door in quantities that seem truly appalling. Hundreds of men and women are busy paring, cutting, skinning, scalding, and packing.

Walking through the storeroom of one of these factories, one wonders where on earth the people can be who eat so much canned fruit. Cases of it are piled tier on tier, and the trucks roll in more from the factory alongside. There is even an industry which thrives by manufacturing charcoal from the hulls of peach seeds, after the kernels have been used for the manufacture of oil.

In the process of making us eat their fruit and vegetables, the Californians have gone after us so systematically that we can scarcely open a national journal or lift our eyes in a trolley car without seeing "Sun-Maid," "Sunkist," "Del Monte," or some other California trademark which has become so thoroughly standardized that we can know what we buy without looking into the can. The Santa Clara Valley people make us long for "Sunsweet" prunes. The Californians certainly make the sun do the work.

Opening into Monterey Bay south of San Francisco is the Salinas Valley, 100 miles long and from 6 to 10 miles wide, with alluvial land at the bottom and rolling hills at the sides. Fruit, truck, and alfalfa grow on the easily irrigated lowlands, grain on the slopes, and pasture on the hills.

The Russian River Valley, north of San Francisco, like the Santa Clara Valley, is much given to fruit, but the town of Petaluma has developed a world's record with the standardized hen. The business of this town and its environs is as thoroughly dominated by chickens as the environs of San Jose are dominated by prunes. There are literally millions of single-comb White Leghorn hens, all alike, laying eggs that are all alike, which the association sells in New York at prices much above the average.

The handicap of scanty water resources of the Coast Ranges limits irrigation in these Coast Range valleys, but in Santa Barbara, Monterey, and Santa Cruz counties small areas of land yield a very valuable harvest of flower seeds, 90 per cent of the American supply. On 1000 acres one company grows 2400 kinds of flower seeds.

THE LIVESTOCK INDUSTRY

The abundance of pasture lands which occupy more than half of the farmed area in the Central Valley and over two-thirds in the Coast Ranges, the large areas of barley and wheat stubble, and the thousands of acres of alfalfa hay serve an important livestock industry.

The raising of beef cattle and sheep has continued since the days of the Spaniards, when hides, tallow, and wool were prime articles of export. Today emphasis is placed on the production of dairy products, beef, lamb, and wool. The better pastures of the Coast Ranges and the Sierra foothills are devoted to the raising of beef cattle, while the poorer pastures of the San Joaquin and the stubble fields of the Sacramento are devoted to the raising of sheep. The mild winters permit an advance of the lambing season into midwinter, so that California spring lambs can reach the market in April and May when prices are highest. Proximity to towns, and especially to

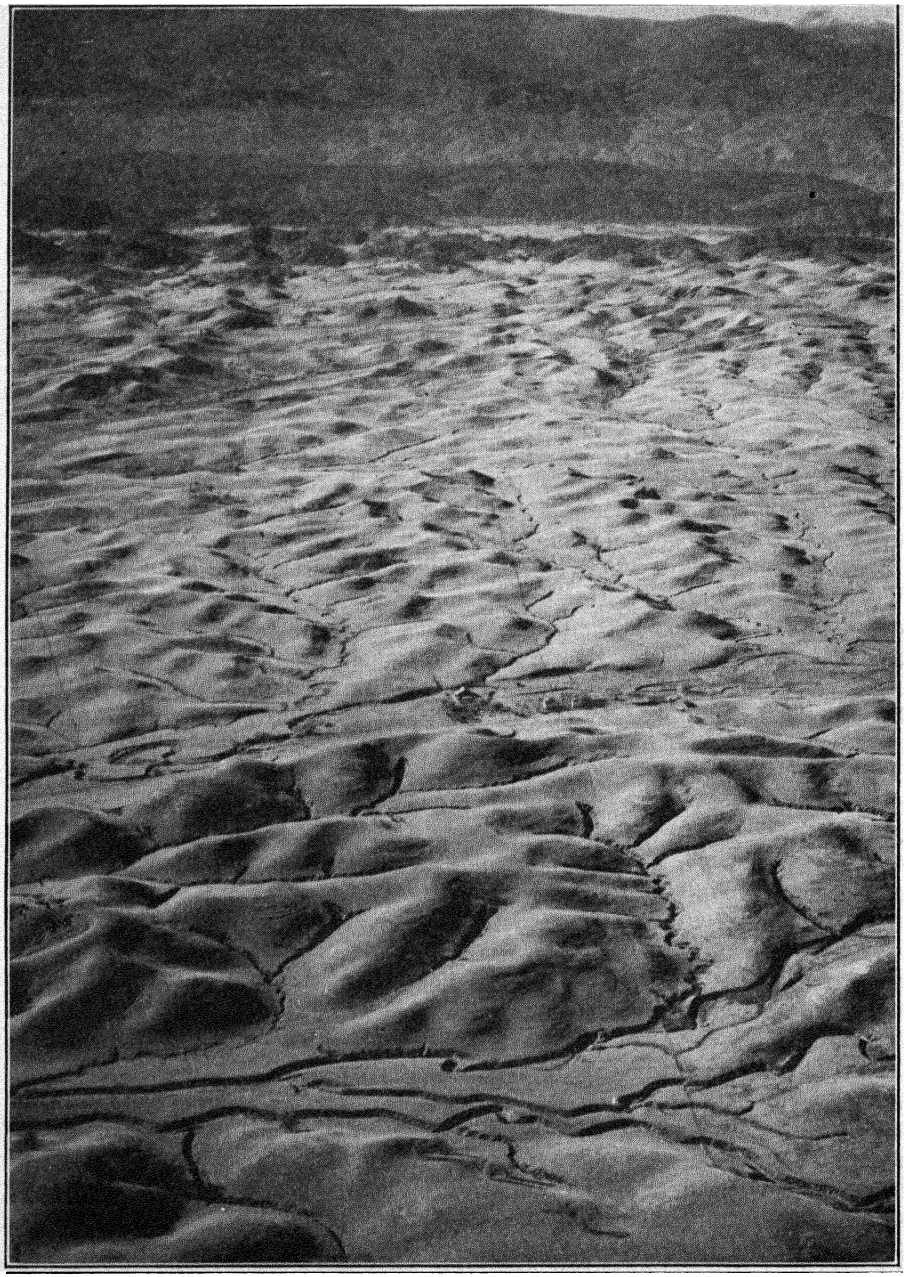


FIG. 698 A. Overgrazed foothills in the upper Sacramento Valley. This bald and perishing landscape raises the question: Under what conditions should a person be permitted to destroy the United States for that person's own gain of the moment? The comparative size of houses and gullies shows how much good soil is leaving the valley and going down to choke navigation, fill up the harbor. (Courtesy U.S. Soil Cons. Service)

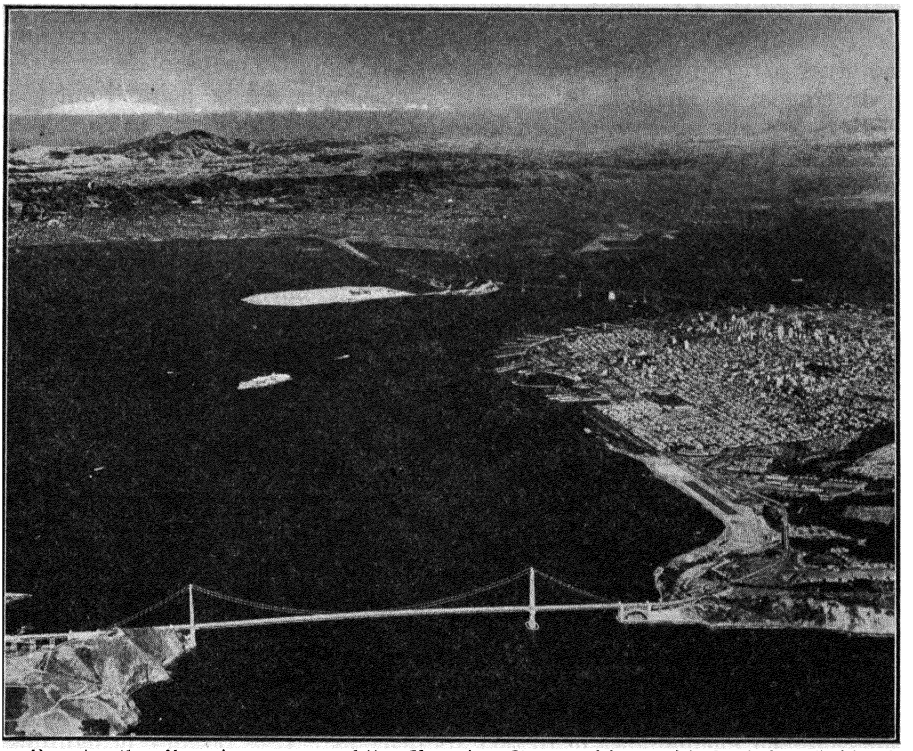


FIG. A. San Francisco, a part of San Francisco Bay, and beyond it Berkeley, Oakland, and Alameda; beyond them Coast Range. Beyond that, beneath the haze, lies the Great Valley.

In the foreground one of the world's master bridges spans the famed Golden Gate. A longer bridge connects San Francisco with Berkeley. The two of them give to the city on the peninsula outlets much needed in the age of the automobile. The white island in the center is largely man-made for the use of the San Francisco Exposition of 1939. The small white island at the left center is Alcatraz, where the U.S. Government keeps its most hardened and desperate criminals. (Courtesy San Francisco Chamber of Commerce)

the metropolitan markets of San Francisco and Los Angeles, has encouraged the raising of dairy cattle. Milk, cream, condensed milk, and dried milk are the major dairy products, cheese being quite unimportant.

SAN FRANCISCO

The gateway of all these Central California valleys is San Francisco. It was once the unrivaled city of the Pacific Coast, but in 1920 it was surpassed in population by Los Angeles, and in 1935 the value of manufactures in the San Francisco-Oakland industrial area was exceeded by that of the Los Angeles area. So keen is the rivalry between these two cities, each the metropolis and the publicity center of its region, that hard indeed is the way of the Californian politician, for if he pleases Southern California, he almost automatically displeases Northern California. Jest has it that there was

once a movement to divide the state into two parts, the northern part to be called California and the southern part to be called Cafeteria. Certainly no other part of the world has better earned the latter name.

In comparing Los Angeles and San Francisco it can be pointed out that both lack coal and depend upon the same imported supply. Los Angeles is nearer to the California oil fields than is San Francisco, but this difference of accessibility is unimportant, since pipe lines deliver oil cheaply to both cities. Both depend upon distant mountain water, and both have spent vast sums of money to bring water from the Sierra Nevada, Los Angeles recently being forced to reach across the mountains to the Colorado River for its newest supply. Both cities depend upon distant sources of electric power. San Francisco is nearer to the water power of the Sierra, but Los Angeles has access to the vast power resources of Boulder Dam. Some observers declare that Los Angeles is outhustling and outdoing San Francisco.[15] This is perhaps the natural result of the greater ability of Los Angeles to import outside talent, for there is no question that Los Angeles has the more pleasant climate with which to attract the tourist and the health-and pleasure-seeker.

San Francisco has a most amazing climate. For some reason cold water comes to the surface near this part of the Pacific Coast during the summer. The ocean water is then actually colder off San Francisco than it is off Alaska. The ocean is much warmer 100 miles from the coast than at the Golden Gate, so that sea air, blowing toward the land, is cooled near the seashore enough to make it foggy. In the Great Valley the tropical heat of summer days makes the air over the valley expand and become light, and the cold foggy air from the Pacific flows in to take its place as it rises because of lightness. On hot days in summer the valley suction often makes the Pacific wind rip through the Golden Gate at the rate of 30 miles an hour. When the valley cools at night the speed of the wind drops down to 3 or 4 miles per hour. This cool sea wind gives to San Francisco a July average temperature of 59° F. San Francisco is a summer resort for the people of the Great Valley. Hotels in Los Angeles are comparatively empty in summer, but in San Francisco they are full of people fleeing from the 100° thermometer. The San Francisco advertising booklet very properly says: "Bring your wraps. You will need them evenings, those stimulating San Francisco evenings." Indeed in San Francisco you will want an overcoat every night in most years. Yet the city often passes winters without a single freezing day, so even is the temperature of the sea wind. This chilly sea wind of summer is loaded with fog, morning and evening — the "soothing fog," a San Francisco lady called it.

The influence of the cool wind makes rice-growing impossible on the low-

[15] To such observations, San Franciscans reply (1939) that among Pacific Coast cities San Francisco ranks first in water-borne commerce, first as a financial center and security market, first in wholesale trade, and first in per capita development. They also claim that among the larger cities of the United States San Francisco has the highest percentage of gainfully employed people, the highest percentage of office-building occupancy, the highest percentage of recovery in rents, the highest telephone density, the lowest percentage of mortgage debt in relation to property value, the lowest city and county tax rates, and the lowest percentage of tax delinquency. If it be true that Los Angeles is outhustling San Francisco, certainly the San Franciscans are not slow.

lands opposite the Golden Gate, but this cold climate extends only a very short distance inland. The transition from the cold breeze of the sea to the hot sunshine of the valley is made so suddenly that it is like going from a cold cellar into a hot oven.

This cool climate, limited to the small area in the immediate vicinity of San Francisco, is claimed by San Franciscans as an industrial and intellectual asset, because it is a good temperature in which to work. It is better, they say, for mind and body than the more even and warmer climate of Los Angeles.[16] Such forces can work their full result only over a long period of time. They are constant, like the pressure of water.[17]

A special correspondent reported in the *New York Times* of January 14, 1940, that winter sports were greatly on the increase in California; that there were 100,000 skiers in the state that winter, that snow trains were leaving San Francisco on Friday and Saturday, and that from end to end the Sierra was alive with excitement over skiing, ice hockey, snowshoe races, and other winter sports. People were reported as beginning to save one week of their vacations for winter sports.

Like Los Angeles, San Francisco is trying hard to develop its manufactures. In 1937 the value of manufactures in the San Francisco-Oakland industrial area was $1,052,000,000.[18] On the basis of value of output, the leading industries of this area were petroleum-refining; canning of fruits and vegetables; meat-packing; printing and publishing; baking bread and other products; manufacture of tin cans and tinware, paints and varnishes, iron and steel products, electrical apparatus, and machinery; shipbuilding. With the exception of petroleum, canned fruits and vegetables, and ships, practically the entire industrial output of this area was destined for local and Pacific Coast markets. San Francisco, like all Pacific Coast cities, lacks the iron, coal, and large industrial markets needed for a heavy industry. The canning of fruits and vegetables and the manufacture of tin cans reflect the agricultural character of the hinterland. The lighter, more movable types of manufactures will undoubtedly continue to establish themselves in and around San Francisco, which, with its cool, stimulating climate and its larger and more productive hinterland, seems to have greater potential resources than Los Angeles for industrial development. But we should not forget the almost by-product labor supply produced by the *residence* aspect of Southern California.

San Francisco has long been the great citadel of commerce along the Pa-

[16] Much evidence to support this claim is presented by Ellsworth Huntington in *Civilization and Climate.*

[17] In 1906 San Francisco had the great misfortune to be wrecked by an earthquake which destroyed the waterworks, set the city on fire, and burned most of the business section. With characteristic hustle San Francisco was quickly rebuilt, and became a much finer city than before the catastrophe. Unfortunately earthquakes are a habit of nature much less subject to control than fires. The fault (fracture in the rocks) that made this earthquake is still there, and it and others extend into Southern California, providing Los Angeles also with its rightful share of earthquakes. There was a major earthquake at Long Beach in 1933.

[18] This area includes Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties. In 1937 there were 3261 manufacturing establishments that employed a total of 88,414 wage earners, and paid $122,916,000 in wages.

cific Coast. Of all Pacific ports, it has the largest and best natural harbor, and its hinterland is the Great Valley of California, with its productive farms and ranches and its growing towns and cities. In contrast to Los Angeles, the weight of inbound cargo exceeds that of outbound cargo. This is due largely to two facts. San Francisco has a much larger hinterland, which requires a greater volume of imports. Petroleum, the chief item of bulk and value, does not dominate the outbound traffic of San Francisco as it does the outbound trade of Los Angeles.[19]

THE FUTURE OF THE GREAT VALLEY

The greatest factor in the future of the Great Valley, and probably also of San Francisco, is the question of water supply for valley irrigation and for municipal use. By the year 1921 troubles with the water supply in the Great Valley had become so acute that the state started making a serious study of the problem. Here were some of the troubles. Crops were being lost for want of water for irrigation in summer. The greatest rainfall came in winter, but the water was wanted in summer, six months or more in the future. The greatest need for water was in the southern San Joaquin Valley, while the greatest water supply was in the upper Sacramento Valley, some hundreds of miles distant. While the Sacramento River actually had disastrous spring floods, the use of water for irrigation made that river so low in summer as to stop navigation over most of its length, and so little water flowed into the bay that the channels in the tule lands were filled with salt water from the sea instead of being filled with fresh water from the river, and the irrigated vegetable fields of the delta area were unable to siphon water from the river. Thus 500,000 acres of excellent farm land were menaced with ruin. In dry years the lack of water for irrigation here has spoiled millions of dollars' worth of crops, and the manufacturing districts on Suisun Bay also suffered because of the salt water.

For twelve years this problem was studied. Twenty-five reports were issued; $2,000,000 was spent merely on investigation. Why so much time and money? First, they had to know how much water there was, and a great many streams were studied. "The total runoff (in California streams) fluctuates in successive seasons between limits, one seven times the other, and the value of any season lies at random between them." [20]

While it takes years of study to see how much water there is, it also requires a vast amount of work to see how much land there is. Exactly what land in each little valley can be irrigated? How much water will be required to irrigate the land? Where can water be had for this particular valley? What will the construction cost? Will the crops pay for the construction?

After a study of these and other questions, the engineers recommended

[19] Value of leading exports from San Francisco in 1938 in millions of dollars: bulk oil shipments, 26.9; dried fruit, 25.3; canned and preserved fruit, 16.0; raw cotton, 8.9. Value of leading imports in millions of dollars: coffee, 13.9; copra, 3.9; tung oil, 2.9; burlap, 2.7. Total exports, 134.6; imports, 57.9.

[20] California Department of Public Works, Division of Engineering and Irrigation, *Water Resources of California, Bulletin* 4, 1923, p. 30.

that a huge reservoir be built at Kennett on the upper Sacramento that would store 3,000,000 acre-feet of water, 500,000 acre-feet of the capacity to be held in reserve to catch dangerous floods; and that the water should be released when needed most. Fortunately, irrigation, navigation, the keeping out of salt water, and the demand for the greatest use of power (pumping) all come at the same time. At the base of this dam is to be a power plant sending power 200 miles to the San Francisco district. Second, the engineers recommended that Sacramento water be used to irrigate the lower San Joaquin Valley. A series of dams will be built in the lower San Joaquin River, and 3000 cubic feet a second of Sacramento water will be pumped from dam to dam, and made to back upstream as far as Mendota, from which point it will be distributed to the fields of the lower San Joaquin Valley. Third, it was recommended that San Joaquin Valley flood waters be held in a large reservoir, Friant Dam, near Fresno. Since the lower San Joaquin Valley will be supplied with water from the Sacramento, the water from the Friant Dam will be sent on into the thirsty land to the southward through a canal 157 miles long, while another canal 35 miles long will carry some of the water northward at high levels. The engineers claim that if this plan is not completed, a declining water supply, chiefly from excessive pumping of ground waters, will cause the abandonment of hundreds of thousands of

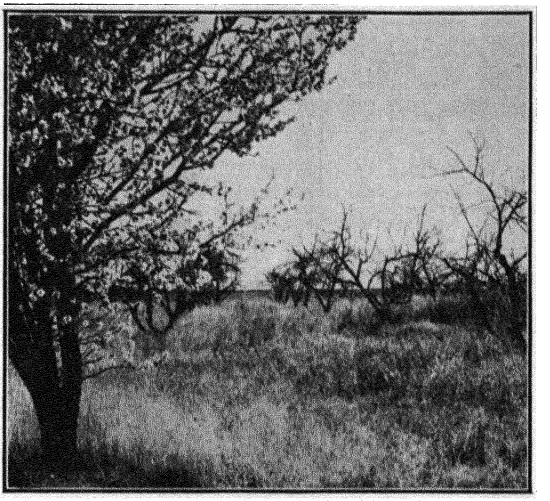


FIG. A. Silent yet eloquent is this call for water. The one blooming tree was watered from the next farm. The dead peach trees were a part of thousands of acres of orchards that perished as the ground water went lower and lower and enforced the argument for the great Central Valley project (see the next picture). (Courtesy U.S. Bureau of Reclamation)

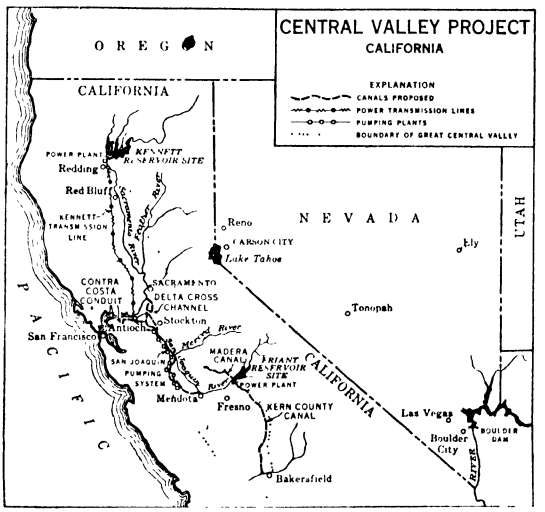


FIG. B. The Machine Age goes after water. The text explains this map. (Courtesy U.S. Reclamation Service)

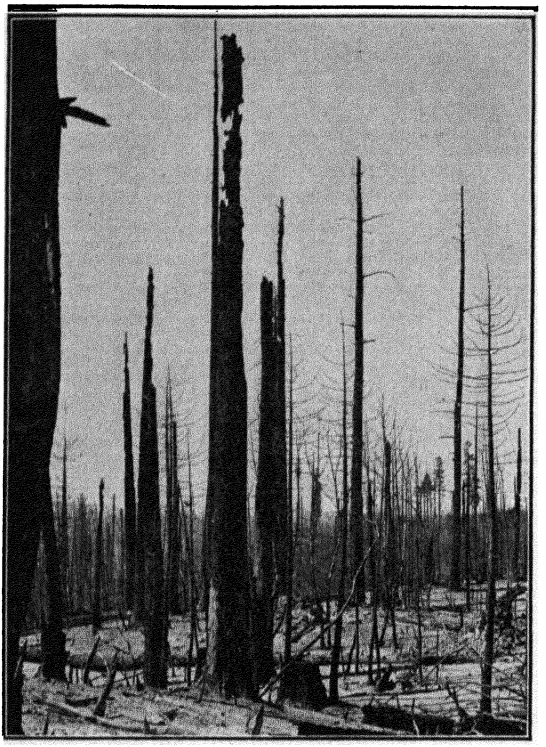


FIG. A. A part of 12,000 acres of forest destroyed by one fire in Santa Cruz County, Coast Range near (south of) San Francisco. If the welfare of the human race were considered, the memory of the man who invented matches would be buried deep and the production of matches would be prohibited or guarded more closely than strychnine or concealed weapons — which indeed they are. (Courtesy U.S. Soil Cons. Service)

irrigated areas in the San Joaquin Valley, and the loss of $100,000,000 in property.

The state created the Water Project Authority of the State of California, a corporation much like the Tennessee Valley Authority. This California corporation is authorized to sell bonds, raise money, and with the funds to build the works named and operate them. It expects to sell power to pay for one-half the cost and to sell water to pay for the other half, the total cost being estimated at from $165,000,000 to $170,000,000. At the time of writing (early 1940) the work on the Kennett and Friant dams had started; 1943 may see their completion. The usefulness of these reservoirs is greatly dependent upon the forest cover on the mountains from which the drainage comes. Will they fill up with water or with sand? Ask the forester and the fire warden.

What is regional planning? For an answer consider this central-valley water project and the enterprises clustering around Boulder Dam. It would be difficult to find more convincing examples of the necessity of far-reaching planning to get the best out of this continent.

The water problem of the West lends a bit of credence to the slightly figurative generalization "If the United States had been settled on the Pacific Coast first, it would by now have been a socialistic state, and New England wouldn't have been settled yet." (Author unknown.)

The water problem of Central California is an engineering problem, and its solution is near at hand. The greatest problem confronting this region is to sell what it has, not that of growing more. This is an economic problem, and unfortunately the problem of farm surpluses is not solved as easily as engineering problems.[21] Geography makes the problem of California farm

[21] The large carry-over of canned goods in the season of 1922 caused California canners to make a mid-July reduction of prices for best-grade clingstone peaches from $40 to $30

surpluses particularly acute, since Californians depend upon the ability of people in distant places to buy their specialized products. Subsidizing farmers to restrict their output at the expense of the taxpaying public is at best a hazardous and temporary solution. One of the greatest tasks facing America today is to find some way to reward the group that produces plenty instead of the group that produces scarcity, and coupled with that task is the problem of putting purchasing power into the hands of millions of Americans who are ill-fed, ill-housed, and ill-clothed, who want to work and can't find jobs in the richest country under the sun. In the meantime, California producers and their co-operative marketing associations will continue to face the double gamble of the weather (bumper crop or shortage) and the market price.

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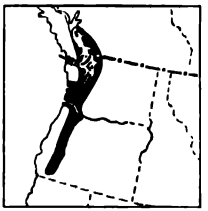
per ton; of freestone from $35 to $25 per ton. In the middle of August the failure of wholesalers and jobbers to place orders caused canners to stop buying even at these low prices. (U.S. Dept Agr., *Weather, Crops and Markets*, Oct. 6, 1923.)

Some of the results of this are shown in the following quotation from a personal letter from near San Jose, California, Sept. 5, 1923: "Your father has been helping John haul truckloads of the nice cling peaches from a neighbor's ranch to feed the hogs. It seems such a shame to see them go to waste, but it was the same way with apricots. Price was so low it did not pay to pick them. Labor is so high they have nothing left." This sounds like the New York or almost any other fruit district at times. Markets for farm produce may be classified as depressible and gluttable. Meat, grain, and cotton are depressible, but fruit and vegetables are gluttable. California depends upon gluttables to a perilous extent.

Chapter 34. THE PUGET SOUND–WILLAMETTE VALLEY



A GLANCE at the physical map reveals the fact that the mountain ranges of California, Oregon, and Washington form a huge, rough letter H. The Coast Ranges on the west form one arm of this H, the Sierra Nevada and the Cascades on the east form the other arm, and the sprawling Klamath Mountains of southern Oregon and northern California form the bridge or connecting link between the two great arms. To the south of the Klamath range is the Great Valley of California, with its master streams, the Sacramento and the San Joaquin, flowing into San Francisco Bay. To the north of the Klamath Mountains is another great lowland, drained by a series of streams with valleys that connect like those which merge to form the great Appalachian Valley (see pages 233-34).

As one travels on the railroad running north to Seattle, the train descends from the Klamath foothills into the long Willamette Valley, and goes on to the junction of that stream with the lower Columbia River, which it follows for about 40 miles. Then the train ascends the Cowlitz Valley, crosses a low divide into the upper Chehalis Valley and then another low divide into the drowned valley of Puget Sound. The valleys of the Willamette and Puget Sound are the master valleys that form the bulk of this lowland region. The Puget Sound Valley, being farther north and more exposed to the sea, is more humid than the Willamette, and the latter is more humid than the Great Valley of California.[1]

THE WILLAMETTE VALLEY

For most of a summer day you may ride in an express train through the Great Valley of California. All day you will be looking at a brown and yellow landscape with green patches on it — brown pastures, yellow wheat stubble, green irrigated alfalfa and still greener rice fields and orchards, and perhaps occasional whirling columns of dust. The next day, as the train goes north, you look from the car window upon a green landscape. The train has entered the Willamette Valley. This is a region of farms and also of trees. It may indeed be called a vale of spires, so numerous are the beautiful, sharp-pointed fir trees. They shade the homes of the valley, mark the fence rows, and stand

[1] For convenience in discussion, we make the term Puget Sound Valley cover all the land between the Puget Sound and the Columbia River. Although a part of it is drained by the Cowlitz flowing into the Columbia, and a part by the Chehalis flowing into the Pacific, it is in reality one valley. In this it resembles the great Appalachian Valley. It takes close observation to tell when you pass from one drainage system into the next.

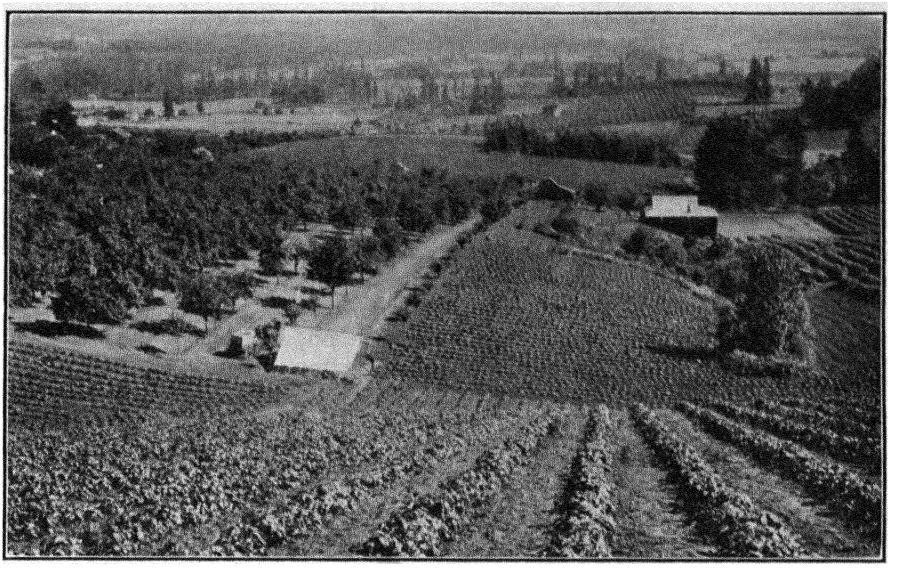


FIG. A. The vale of spires — the sharp-topped conifers to be seen in all directions in many parts of the fruitful Willamette Valley. (Courtesy Portland Chamber of Commerce)

in clumps at such frequent intervals that one has the impression of being in the center of a clearing a few miles in extent and surrounded by the firs. Such is the result of a climate that is more humid and less hot than that of the Sacramento Valley. You see other signs of moisture in the ferns by the roadside, moss on house roofs, fields of potatoes, stream beds with water in them (see the general map).

GOOD FOR THE EARLY SETTLER AND THE GENERAL FARM

The Willamette Valley is a good country for general farming, a much better country for the pioneer farmer than was the Valley of California. In its early history, the Valley of California had ranches and bonanza wheat, both of which required export markets. In the Oregon Valley the settler from Missouri, Illinois, Kentucky, found a land that reminded him of his home country and invited him to general farming.[2] The floor of the valley was flat, much of it unforested or parklike — smooth, rich, easy to settle. The settler could grow wheat, clover, potatoes.

[2] When Hollywood movie producers looked around in 1939 for a place to film *Abe Lincoln in Illinois*, they finally found it in the Willamette Valley. After traveling for weeks around California, a "location man" finally played a hunch. Why were there so many places in Oregon named like Illinois towns — Salem, Springfield, Monmouth? He flew to the Willamette Valley and compared it with pictures of Illinois in his portfolio. Not far from the little town of Springfield, Oregon, he found his "Illinois prairie," complete even to the great maples and cottonwoods. There the replica village of New Salem was hastily constructed, with log houses, a sawmill, and a gristmill beside a winding stream.

In the frontier days this Willamette Valley was the goal of the Oregon Trail, the longest of the overland emigrant trails. The trail started from Kansas City or Omaha and went up the North Platte to Fort Laramie, across the South Pass, down the Snake Valley, down the Columbia Valley, through the Columbia Gorge in the Cascades, and on to the good lands of the Willamette. The journey by wagon took five months. In 1842, 100 settlers covered this route, under Elijah White, but they could not get their wagons through with them. The next year 1000 went through, cutting down thickets, chopping trees, filling gullies, making the rough semblance of a road over which they could with care take their wagons and drive their cattle. In 1844, 1400 adventurous souls made the journey; in 1845–47 there were 9700.

These people were driven by many motives, one of which was patriotism. They wanted to settle and get possession of Oregon. Britain claimed it, and the popular cry in America at that time was "54° 40′ or fight." Some were Abolitionists getting away from slave neighborhoods. Some were the usual landless farmers seeking farms in the land of luck that is "yonder." Luck was with these fortune-seekers. The country was good for wheat, so the settlers planted and sold wheat, to the Russians of Alaska, to the fur-traders, and to the Hawaiians. Then came the California gold rush and the people of the Willamette Valley rivaled the Californians in reaping the fruits of California gold. About half of the Willamette farmers sailed down the coast to California or rode down the old fur trail through the mountains. Those who remained got even richer by selling produce to the Californians. They had a 10,000-mile advantage over their nearest competitors, the farmers of the Atlantic Coast. Fifty cents for an apple and prices of other crops on the same scale made fortunes for farmers in a year or two. This agricultural prosperity arising from its excellence for the all-round farm gave the Willamette Valley an early agricultural advantage over the Great Valley, which it maintained until the rise of the fruit industry in California.

ALL-ROUND AGRICULTURE AND FRUIT

But this valley of all-round excellence is no longer the giant of the Pacific Coast. It was good for the early settler, and is still good for general farming. The people boast that they can grow as great a variety of products as any part of the temperate zone, but actually the farming is of the Corn Belt type with the corn left out — general grain, grass, hay, and livestock farming. But in this agriculture there is no great staple which appeals to the world market as does California fruit. But now the Willamette Valley is competing with California with fruit industries that are increasing in importance. Prunes and cherries grow well in the Willamette Valley, although at rare intervals the greater rains of this valley may cause the prunes to burst upon the trees, and the cherries to rot before they are picked. The prunes are dried in artificial evaporators, in which temperature, humidity, and circulation of the air are controlled, thus ensuring a uniform product. The cherries are usually canned — an industry of increasing importance. The Puget Sound cities get the best prune plums, peaches, and apricots from eastern Washington.

Because of its cool, moist summer the Puget Sound-Willamette Valley is a leading producer of loganberries, dewberries, raspberries, strawberries, and blackberries, and other small fruits. The greatest centers of production of these fruits are scattered from Eugene, Oregon, at the south to Vancouver, British Columbia, at the north. Many factories prepare jam, preserves, and fruit juices, and from Oregon to British Columbia the industry is growing.[3] Many of these factories are putting California labels on the produce, which is then sold through California marketing organizations — a tribute to California leadership in the fruit industries.

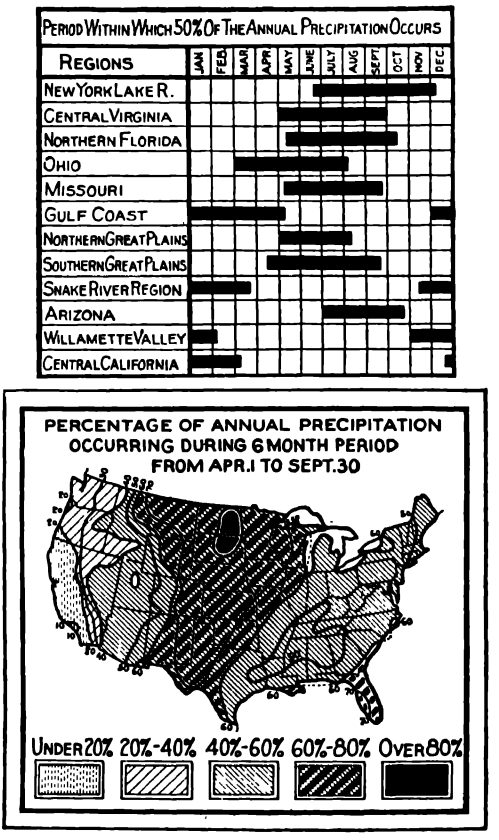


FIG. A. This map and the graph yield much information if studied. (Courtesy U.S. Weather Bureau)

Unfortunately for this northern valley, these small fruits for which it has a natural advantage are not great staples, like the raisin, the prune, the canned peach, or the dried apricot. In the spring of 1922 the loganberry-growers from British Columbia to central Oregon met in Portland to devise ways and means to find a market for the 14,000-ton crop they expected that year, and they formed a co-operative association after the California model. In 1936, when the farm price of loganberries got down to about 3 cents a pound, loganberry-growers in Oregon combined to form a loganberry control board, which through production control was able to raise the price to $5\frac{1}{2}$ cents per pound. They are all grown in a small area.

THE PUGET SOUND VALLEY

North of the Columbia River seems to be another world, the land of the gutted forest. Here the slightly greater rainfall of summer and the slightly cooler weather enabled the forest to take much fuller possession of the valley floor, and the farmer has conquered only a part of the land. From Port-

[3] Loganberry, youngberry, and boysenberry are hybrids produced by artificial crosses of the blackberry with various other berries. All are grown here, but their future is not yet clearly indicated.

land to Seattle and on to Vancouver, the railroad is always in sight of forest, often running through the forest for half a mile or a mile at a stretch. Everywhere the forest flaunts itself or is flaunted at you — at the stations, sawmills; in the Cowlitz River, logs floating down to mills; on the railroad sidings, cars loaded with great logs that have come down from the mountains to the sawmills in the valley towns; beside the track, old, abandoned sawmills tumbling to decay; in the fields, stumps — big stumps of the primeval forest, small stumps of the second-growth forest, rotting logs of various sizes; and everywhere at some point on the horizon the burnt snags left by the fire that has finished up the wreckage left by the lumberman who culled the valley first before he went to the mountains. The dampness is so great that fire is not final and the forest tries to grow again. One sees young forest of every size — knee-high, house-high, and higher. Some of the second growth is big enough to be a saw log back East, but on the Pacific Coast it is still a contemptible small cull stick, for the lumberman there can still mine the mountain-forest accumulation of past centuries. What a contrasting view one gets in the forested regions of western Europe! There clean lumbering, reproducing forests, and full use of everything are the rule and a forest fire is as rare as a city fire.

DIFFICULTIES OF LAND CLEARANCE AND LAND USE

In the Puget Sound and Cowlitz valleys the fields are often full of ferns and give the appearance of half-abandoned New England. Stumps, ferny pastures, and strangely unused stretches of land are the rule, although there are some fully developed areas not far from the railroad, with dairy farms, poultry farms, and berry farms of great excellence. Near Puget Sound there are a few areas of well-cultivated land, but this land is nearly all easily farmed, recent alluvium, the recent filling of the Sound, and only a few feet above tidewater. Some of this extra-good rich land is even below tidewater and has been reclaimed by dikes. On this flat, rich alluvium is an intensive agriculture of berry farms, fruit farms, and dairy farms for the supply of the Sound cities. But just above these lands, on the bluffs, stand the sickening, burnt snags of the original forest. Struggling among the snags is the upshooting young forest growth, often fire-wrecked in its beautiful youth, in this land of the standing dead, in this valley of the would-be forest.

Why is much of this valley land so little used? Briefly, it may be said that the chief obstacles to land utilization are stumps and leaching. In the Puget Sound area the task of changing land from forest to farm is no small job. When the forest is gone, the land is by no means clear. A host of stumps remains. To dig and blast them out and fill up the holes takes labor, dynamite, time, and money. The estimated cost of clearing an acre of forest land is $40 in the Corn Belt, $20 in North Carolina, $10 in Mississippi. But in the great Northwest, land of gigantic forests and gigantic stumps, the cost of clearing an acre is about $200. On Vancouver Island a few years ago uncleared land had a sale value of $50 an acre, but cleared land was worth

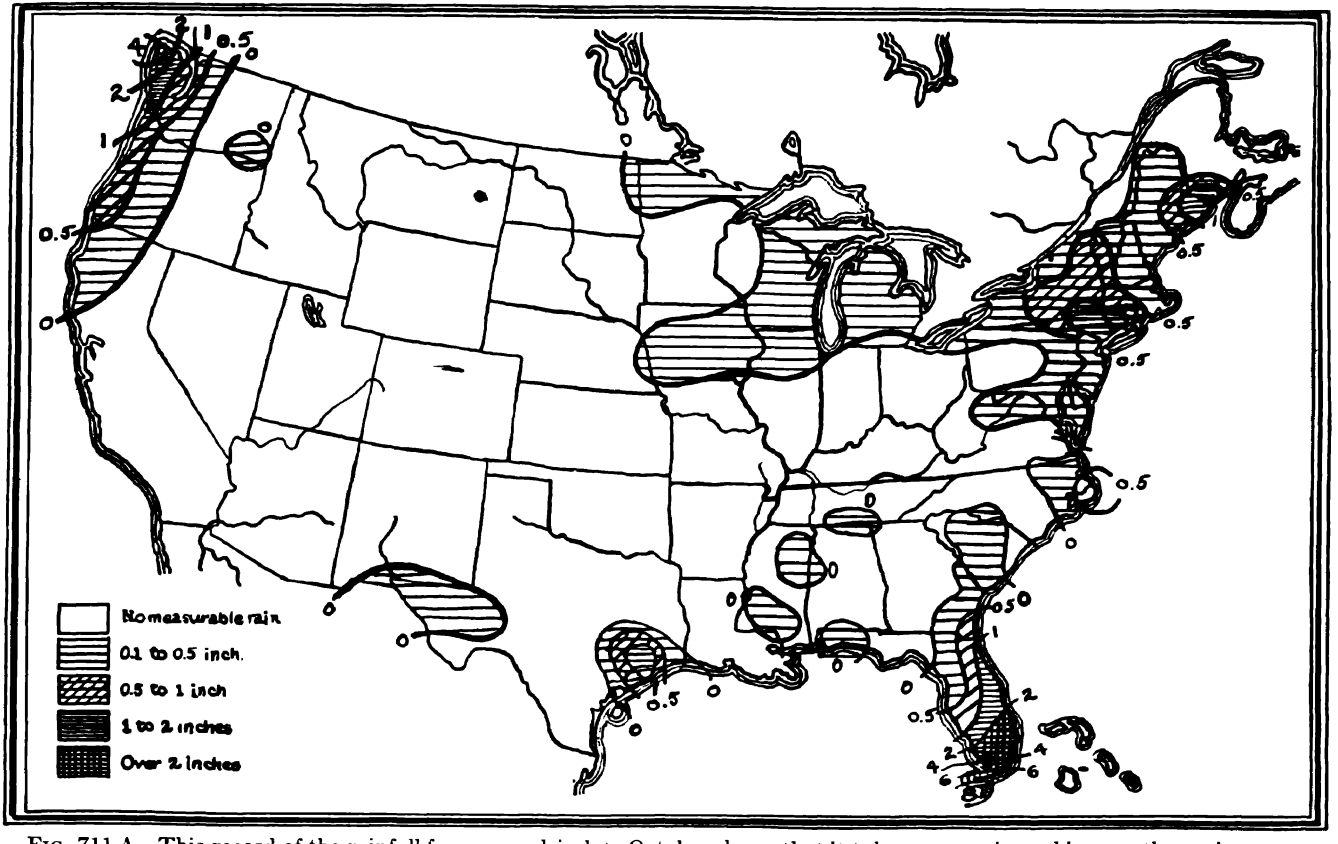


FIG. 711 A. This record of the rainfall for one week in late October shows that it takes many rain-making weather units to cause rain on the whole United States. It also makes clear why stationary units or a continuous series in one place will give drought or flood. (Courtesy U.S. Weather Bureau)

$250. If a farmer should pay himself wages for clearing, it would often cost him as much as $400 or $500 an acre. Therefore he does not clear much land, and he does that in odd times.

Because it is so difficult and so expensive to clear land, settlers on Vancouver Island in the midst of the forest that stands on potentially good agricultural soil clear only a little land, and at once turn to the intensive crops of cheese, butter, and berries for the jam factory. These enable a man to support his family on little land, if only he works hard. As an evidence of this intensive agriculture, one of the most conspicuous successes in the Puget Sound Valley agriculture has been in poultry farming, with co-operative egg-selling, after the model of Petaluma, California. It will take time to conquer the Puget Sound Valley stump lands, and the task will not be extensively undertaken except under the pressure of greater need and desire for land. The United States has not yet reached that point. When the time comes that we need land as the people of Europe need land, the Puget Sound Valley, like the Willamette Valley, can become a rich agricultural district — a very rich and very productive district.

There are yet other handicaps to agriculture in the Puget Sound sections of the valley. The land has been subjected to heavy rain for ages. Modern soil science shows that too much rain is bad for soils, from the standpoint of usefulness to man — very bad. It soaks out the plant food. In unleached desert soils it accumulates until soils become too saline. In rainfall, as in so many other things, a middle ground (of temperance?) is most useful to man.

In the Puget Sound Valley too much potash and lime are leached out,[4] and the nitrogen content is low. Much of the soil surface was carried to it by glacial streams that spread gravel instead of fine soil. Then too, many of the clays, which are potentially rich, need a great deal of care in handling.[5] This expense and difficulty of starting the farm is in great contrast to the ease of starting on the spring-wheat plains of Minnesota and Alberta, the newly irrigated lands of California, or the Columbia Basin land. But when once conditioned, the Puget Sound lands have great productivity. In 1915 a 15-acre field in Island County, Washington, yielded (the national record) 117 bushels of wheat per acre.

In certain parts of maritime Washington there is now unmistakable evidence that garden farmers are following in the footsteps of their cousins in the rainy lowlands surrounding the North Sea. Dairying, a mark of intensification, is increasing, and poultry-raising is successful in many areas. Lettuce is grown around Kent, and there are thriving bulb industries near Blaine and Puyallup, chiefly tulips and daffodils.

The little town of Kent in the White River Valley has developed into a

[4] See Chapter 13 for leaching of soils in lands of heavy rain.

[5] "Such soils are likely to prove of high and very permanent fertility if properly tilled, but are generally very difficult to cultivate. They require large amounts of humus to keep the fertility in available form, to make the clay able to absorb and hold moisture, and to prevent puddling when wet and baking when dry." — Washington Agricultural Experiment Station, *Popular Bulletin* 7. How different is this, how very different, from the continuous cropping that the first and second generation of Corn Belt farmers could do on the grand soils of the prairie. Which will be better in 2040, 2140, 2240 A.D.?



FIG. A. The close resemblance of the climate of this region to that of its European analogue, the shores of the English Channel, is shown by the copying of the Dutch bulb and flower industry. In the background is the debated mountain that Tacoma still sometimes calls "Tacoma." It has 20 ft. of snow in June at 5500 ft. altitude. (Courtesy Puyallup, Wash., Chamber of Commerce)

heavy shipper of lettuce to Eastern markets. Kent has an annual lettuce festival, selects a lettuce queen, and modestly bills itself as the "Lettuce Capital of the World" — Salinas Valley, California, please note!

Dutch-type daffodils are grown in the rich black soil of the Puyallup Valley. Many Hollanders live in this valley and grow bulbs, which is a year-round business. After the soil has been plowed and harrowed, bulbs are planted in August, September, and October. In December and January, when they sprout, more fieldwork and careful cultivation are required. When the flowers are in full bloom in April, the Puyallup Valley has a daffodil festival. The flowers, which are cut to save the strength of the bulbs, are sold or given away. In July and August the bulbs are dug and shipped, chiefly to Eastern florists to be grown in winter under glass. Commercial bulb-growing requires much labor and machinery, and is indeed intensive use of the land. The State of Washington now grows more than half of all the daffodil bulbs grown in the United States. The resemblance of this industry and this land to Holland is striking, and Dutchmen are important in the business they brought with them.

The leading producers of cabbage seed in the United States are King and Skagit counties, Washington. This specialty of intensive agriculture with a product easily carried to any market is suggestive of more that may perhaps be developed.

The British Columbia part of this region has very small areas of good agricultural land.[6]

THE CLIMATE AND EXAMPLE OF ENGLAND

This Puget Sound Valley (the climatic duplicate of England) may some day rival England in wheat yield, and the English wheat yield is more than double that of the United States. In this future day of intensive use, the large yields of wheat will be only one of the crop series in a rich agriculture of the northwestern-European type. Barley, oats, potatoes, vegetables, beets, and other root crops (which are the European counterparts of corn silage, and which are recommended for this valley), in addition to fruits, will thrive and will support a dense farm population. Pastures in the wetter sections now outyield any pasture land in America except irrigated alfalfa lands, and support a thriving dairy industry. The same is true of the Willamette Valley, which, however, resembles western France more than it does England. In summer and winter temperatures Seattle is almost the twin of London, and Portland that of Paris.[7]

CITIES IN THE PUGET SOUND-WILLAMETTE VALLEY

Even if it attains a full agricultural development, this Puget Sound-Willamette Valley is to be primarily a land of cities rather than one of rural population. Already it has nearly as large a proportion of city people as the State of Connecticut, and the city population is increasing much more rapidly than the farm population. Few places in the world offer better opportunities for the development of cities. The Puget Sound, a drowned valley, reaches 100 miles inland. It furnishes a wealth of deep and sheltered harbors on which there is already a city population of more than 800,000.[8] Portland (pop. 302,000), not favored quite so much by nature, has improved the Columbia and the lower Willamette so that its harbor is a rival to the harbors of the Sound.

Puget Sound is the natural place for the Alaskan steamers to meet the freight cars of the American railroads. There is much Alaska talk and trade in Seattle. There is also much Oriental talk and trade, for this harbor, from one to three days nearer the Orient than San Francisco, has several important

[6] In 1937 the whole of British Columbia produced 5,224,000 lbs. of creamery butter and 2,778,000 lbs. of dairy butter; in both types it was surpassed by all other Canadian provinces except Prince Edward Island. In that year it produced 244,000 lbs. of factory cheese, being surpassed by all other provinces except Nova Scotia. Its farm-cheese output amounted to 76,000 lbs., which was exceeded by all other Canadian provinces except Prince Edward Island, New Brunswick, and Nova Scotia.

[7] The housewife who has come from the East and is accustomed to high-priced green vegetables during the winter season, and a greatly restricted choice, is delighted with Puget Sound markets and their profusion of vegetables every month of the year. Local market gardeners, most of them Japanese, manage to operate in this mild and moist climate throughout most of the year.

[8] Population 1930:40 (thousands): Seattle 366:368, Everett 31:30, Bellingham 31:29, Tacoma 107:109, Bremerton 10:15; Vancouver (1931) 247, Victoria (1931) 39.

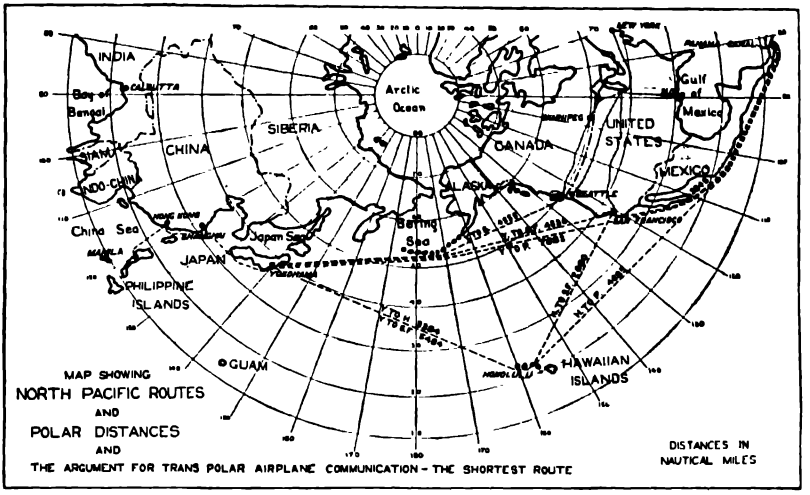


FIG. A. Flat wall maps with center at low latitudes have difficulty in showing high latitudes in their proper relations. Therefore this map of the northern Pacific routes is likely to have surprises about transpacific distances and direct lines connecting familiar points. It also shows the argument for the transpolar air routes.

steamship lines in the Asia trade. The route is shorter than more southerly routes, because the spherical shape of the earth makes the northern Great Circle routes shorter than those which go to the south. When the price of silk was high, raw silk, because of its very high value in proportion to its bulk, was rushed across the northern Pacific on the fastest liners to Seattle and Vancouver and thence by fast train to the silk mills of the East. In recent years, however, most of this traffic has been taken over by Japanese ships operating between Japan and New York via the Panama Canal.

In Seattle, more than in any other Pacific city, one can feel commerce. From the city, on a high hill, you can look down at the Sound, which spreads out at your feet like a map. Vessels and ferryboats can be seen coming and going. The harbor is so deep that ships could not anchor on the bottom, and anchoring buoys had to be installed. There is also ample room for future expansion of the water front.

In 1939, 60 steamship lines maintained 70 regular services between Seattle and other ports, and many tramps call there for full cargoes of lumber and grain. Port facilities are good, some of the piers and warehouses being operated by the Port of Seattle Commission, a municipally owned corporation. A publicly owned belt-line railway around the port would reduce the cost, and facilitate the transshipment of goods between rail and ocean carriers. In general, it may be said that foreign and intercoastal trade now play second fiddle in Seattle shipping. In 1938 the city's total water-borne commerce amounted to 6,071,000 short tons, worth $350,000,000, two-thirds of which was coastal trade. Its foreign commerce of 581,000 tons, worth $57,500,000, was only slightly greater than its trade with Alaska.

Portland was for many years little more than a river port, because the



FIG. A. The Willamette River at Portland, Ore., an excellent view of a river harbor showing ocean steamers, freight sheds, railway tracks, and freight yards, and the immediate connections between the same. (Courtesy Portland Chamber of Commerce)

bars at the mouth of the Columbia prevented large ships from entering the river. During this time, Seattle took a long lead in ocean trade. At last Portland became so desirous of being a seaport that it spent $4,500,000 to deepen the river and build wing dams to keep it deep, while the United States Government spent $16,000,000 to build two jetties at the mouth of the river. The jetties caused the Columbia to dig a 40-foot channel through its bars. The port now has 27 miles of deep water frontage lined with up-to-date terminal facilities, and 48 steamship companies make Portland a regular port of call. Like Seattle, Portland is an important port for tramp ships, which carry away full cargoes of grain and lumber.

Portland looks forward to a bright commercial future, for it enjoys two prime advantages of location. Situated about 100 miles from the sea at the confluence of the deep-channeled Columbia and Willamette rivers, Portland for years has been the commercial focus of the north-south valleys that lie between the Cascades and the Coast Ranges. Of greater importance to Portland's future development is the fact that the Columbia River provides it with the only water-level route through the Cascade mountain wall to the east. Until recently the rapids in the Columbia Gorge above Portland were an effective obstacle to navigation, but the recently completed Bonneville Dam, with

the largest single-lift ship lock in the world, has opened the river to commerce. In 1939 Portland had river-steamer connections with points as far east as Attalia, Washington, and an extension of freight service to Lewiston, Idaho (on the Snake River), was being planned. Portland hopes that ere long river steamers will bring to its docks for transshipment overseas millions of bushels of wheat from the Columbia Plateau, thousands of boxes of glistening Hood River and Yakima apples, giant spars of Douglas fir and Englemann spruce from the mountains, and thousands of cases of salmon from the river.[9] If these dreams come true, Portland's transshipping trade will flourish, together with increased manufacture and processing of foodstuffs and raw materials with cheap electric power from the great Bonneville Dam near by.

It is difficult to say how far traffic will come to this Columbia gateway. Small shipments of Utah copper and phosphate rock suggest the possibility that in decades to come millions of tons every year of this necessity of the land-wasteful modern agriculture will go out to the world through this natural gateway. Portland is the outlet for the Union Pacific system, through the Oregon Short Line, and it is also served by the Great Northern, Northern Pacific, and Southern Pacific railroad systems. Seattle is the outlet for the Great Northern, the Northern Pacific, and the Chicago, Milwaukee & St. Paul. Vancouver, the second city of the Sound, is the outlet for the Canadian Pacific and, to some extent, the Canadian National. The Canadian trade will probably stay in Canadian territory, but now that Portland has good access to the sea and the interior there is no reason why the American trunk lines should continue to spend millions to haul so much export freight over the Cascades rather than down the Columbia Gorge to ocean-going ships at Portland.[10]

In 1938 ocean-going vessels brought in 3,117,000 tons of cargo to Portland docks and carried away 1,717,000 tons. The excess of inbound cargo was due almost entirely to petroleum imports, which amounted to 1,358,000 tons. Petroleum is carried by tankers, which enter with full cargoes and leave empty. It is clear, therefore, that the inbound and outbound traffic in dry cargo was quite well balanced. In addition to petroleum, the leading imports were cement, sugar, iron and steel, copra, canned goods, and chemicals. Lumber was the principal item of export, 694,000 tons being shipped in 1938, and was followed by wheat shipments of 317,000 tons. Other leading exports were paper, flour, canned goods, scrap metal, fresh pears, logs, and lead. On the basis of weight, about three-fourths of Portland's total sea-borne trade was coastwise trade, foreign commerce amounting to only one-sixth of the total.

The commerce of Vancouver and Victoria is essentially like that of Seattle,

[9] Every year countless salmon swim up the Columbia River to spawn. They could leap the rapids of the river, but not the Bonneville Dam. Hence the Government has provided graded fish ladders to accommodate the salmon and to preserve this important fishing industry. Perhaps it will succeed.

[10] In 1929 the Great Northern improved its crossing of the Cascade Mountains at a cost of $25,000,000, which included a new tunnel 7.8 miles long. The new crossing is 502 ft. lower than the old one, 8.9 miles shorter, and has less curvature and easier grades. Furthermore, the new crossing requires no snow sheds, whereas the old crossing needed 39,870 track feet of sheds.

Tacoma, and Portland. In 1924, Vancouver had a feverish boom of grain-elevator building. Cheap ocean freights and higher railroad freights had caused the export via Vancouver of 22,000,000 bushels of Alberta and Saskatchewan wheat of the crop of 1922. In 1932–33 grain shipments via Vancouver reached a peak of 94,000,000 bushels, but since then they have been much smaller.[11]

Vancouver now has first rank as an exporter of *Canadian* grain, but it seems unlikely that the volume of grain passing through this Pacific port can ever affect Montreal's position as Canada's leading port for *all* grain exports, and as the greatest grain-exporting port on the North American continent.[12]

The city of Victoria, the capital of British Columbia, on the southern tip of Vancouver Island, is said to be "less American than Vancouver, less Canadian than Winnipeg, less French than Montreal." It is also considered to be the most English city in Canada's "little bit of Old England on the Pacific Coast." Its climate is very much like that of London, and for this reason it is easy to duplicate here the rich, green grass and beautiful gardens so characteristic of old England.[13] The scenery among the islands of the Sound between Victoria and Vancouver is a vivid reminder of Scotch Loch Katrine and Loch Lomond, immortalized by Sir Walter Scott.

In one respect Victoria is American. As you approach the city by boat from Seattle you see columns of smoke and ask yourself if the city is on fire. Later you find that the smoke is only a characteristic sign of the valley cities, from the burners destroying the lumber-mill leavings, which endless-belt conveyors carry in endless streams to these tall furnaces.

City rivalries in this region are keen, as is usual between neighboring American cities. Seattle and Portland are hustling competitors, like San Francisco and Los Angeles. For decades Seattle and Tacoma boasted that each would outgrow the other. In spite of its many woodworking industries, furniture manufacture, and the largest copper-smelter on the Pacific Coast, the Tacoma slogan, "Watch Tacoma Grow," seems to have been meager in results (see the population figures). For a long time these two cities carried on a ludicrous contest as to the name of an extinct volcano visible from both. In Tacoma it was called Mt. Tacoma. In Seattle it was called Mt. Rainier, and every properly careful person called it by one of those two names in the respective towns. A heartless national board of geographic names officially ended the quarrel, but Tacoma fought on with a bill in Congress to name the mountain Tacoma. Someone had found out that Rainier was a British officer who fought in our Revolutionary War. A mountain in *Washington* for *him*? *Sacrilege*! But the bill failed, and in December, 1939, the Tacoma Chamber of Commerce capitulated when it passed a resolution to call the mountain Rainier, and urged all citizens to do likewise.

[11] In 1937–38 Pacific Coast elevators at Vancouver, Victoria, New Westminster, and Prince Rupert had an aggregate capacity of 22,109,000 bu. In that year Pacific elevators received 11,492,000 bu.

[12] Leah Stevens, "The Grain Trade of the Port of Vancouver, British Columbia," *Economic Geography*, April, 1936, p. 186. (See also Fig. 70 B.)

[13] "The day though cloudy and dull was fine." — English newspaper describing a social event. An Englishman now an American citizen said (a bit figuratively, perhaps), "That probably meant that it did not rain for more than five hours."

Seattle publicity interests revel in photographing the city so that Mt. Rainier, snow-capped, stands in the central background. Portland revels in having its picture taken with the cone of Mt. Hood in the background. Having been to both cities and seen neither mountain, I realize the importance of the photographs, because you can easily make a considerable sojourn in both cities and have the same experience. There is so much natural haze and cloud in winter and so much smoke from forest fires in summer that both mountains are often invisible for weeks. It is, however, an interesting fact of human psychology that a thing seen occasionally is more appreciated than something seen constantly. These peaks give magnificent views, of the kind rarely seen from large cities.

MANUFACTURING

For the most part, the industrial development of this region consists of simple manufacturing or processing of the products of forest and farm. Sawmill, pulp mill, paper mill, woodworking establishment, canning factory, preserving plant, and flour mill are typical enterprises, and their products are the leading manufactured exports of this region. Shipbuilding and airplane manufacture are more advanced forms of industrial development, but are somewhat of an exception to the general rule. The output of many establishments is destined for local consumption: machine shops, clothing factories, furniture factories, newspapers, bakeries, and the like. The great importance of sawmills shows that manufacturing is in an early stage. The land is so new that manufacturing has not yet got to the more mature stage that would be indicated if the people were making chemicals, textiles, or small machinery for export. Above all, this is the land of lumber.

In this part of the United States the logs are so large, and so much machinery is needed to handle them, that the larger mills are permanent, and often located on the sounds and harbors from which boats can carry away the export. The logs often come from the mountains by railroad and raft. The lumber mill on Puget Sound and other Pacific Coast lumber centers is a marvel of mechanical perfection.[14] Logs 6 feet in diameter are whisked up

[14] The scope of modern logging and lumbering enterprise is illustrated by the following. In January, 1922, Mr. Robert A. Long, a Kansas City lumberman, who had many mills in the South, and later in California, inspected a site at the junction of the Columbia and Cowlitz rivers. Twenty-two months later it had become the city of Longview, with 5000 inhabitants, a daily newspaper, 26 stores, 3 modern hotels, paved streets, a telephone exchange with capacity for 6000 phones. Work was nearly completed on the first unit of the lumber mill, covering 34 acres. Also, work was nearly completed on the first unit, 1400 feet long, of the docks in the Columbia for seagoing ships. Work was in progress on the 30-mile railroad from Longview to the company's 70,000 acres of timber. In 1930 the town had almost 11,000 people, dependent upon saw logs which they converted, with complete utilization of the product, into lumber, lath, window frames, floor blocks, refrigerator parts, birdhouses, wood pulp, chip fuel, and, finally, the sale of electric power from their wood-burning power plant. Prior to the depression it was the practice of the company to reforest each year by the planting of seedlings substantially equal to a normal year's cutting, but economic conditions became so bad that about 1931 this practice of reforestation had to be abandoned. The burden of property taxes on cutover land may prevent the company from renewing its practice of reforestation. Our forest-tax policy in most states is little short of idiotic!

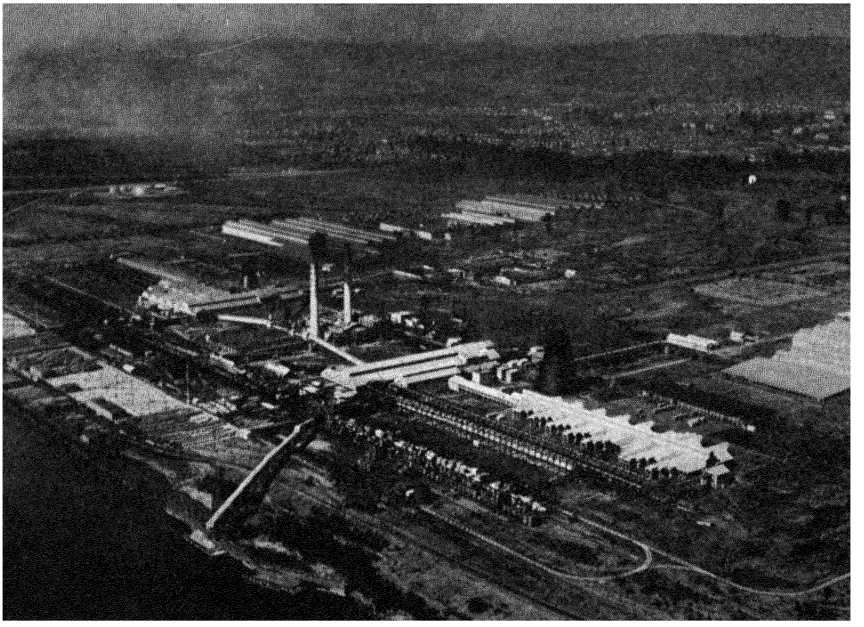


FIG. A. Mass production of lumber goes to the river. After going from state to state through the South, the Long-Bell Lumber Co. bought a large mill site at the junction of the Cowlitz and Columbia rivers, to make a permanent stand by planning to produce logs on its mountain lands as fast as it produced lumber at the riverside.

Directly over the nearer black conical trash-burner is a log pond at the end of a canal connected with the Cowlitz River. The storage of the logs in a pond reduces to a minimum the effort of moving them. Endless-chain carriers slide them from the pond to the sawmill. At the left are wharves for ocean steamers in the Columbia River. Total area of land in plant, 1737 acres; under roof, 76 acres. Normal annual production: 300,000,000 board-ft.; shingles enough to cover 9,000,000 sq. ft. of roof; lath, 25,000,000 pieces; mill employees, 1300. The plant has 35,000 automatic fire-protection sprinkler heads and a full-time motorized fire department. (Courtesy Long-Bell Lumber Co.)

into the mill by chains. Band saws, running on two wheels like a power belt, rip off slabs and planks of any desired width or thickness. These fall on rollers and glide away through the mill as though floating on swift water. Suddenly they begin to move sidewise, at right angles to their previous direction — they have been caught by another set of rollers and are being carried off into one of the wings of the mill. They are sawed and resawed. A single log makes many kinds of lumber, according to the size of the pieces — beams, wide boards, narrow boards, box material, lath, shingles, little pieces to fasten bundles of shingles together.

The mill is much like a Pittsburgh steel mill in that men pull levers which direct steam and electricity to do the work. For example, the man who cuts boards into box material sits on a raised platform, by a keyboard something like that of a big typewriter. Each key controls a unit in a battery of saws and rollers spread out in a row 40 feet long in front of him. Boards slide up

onto the rollers. The operator touches a key, and a circular saw, whirling on the end of a movable arm, drops on the board and cuts off a worthless end as quickly as an ax would chop a stick. At a touch of another key the cull end whirls away down the rolls toward the waste chute. Another key is touched and a whole row of saws falls upon the board, and changes it almost instantly into sidepieces for a dozen boxes. The pieces slide away to their particular piling-place, to be quickly followed by more and more and yet more as the man of quick eye and hand plays his keyboard, making the music of the saws.

On February 1, 1940, the Aluminum Company of America announced that it would build a $3,000,000 metal-producing plant at Vancouver, Washington. This town is just across the Columbia River from Portland, Oregon, and not far from the Bonneville Dam, from which it will receive power.

FOREST CREMATION

The lumber industry must continue its recent rapid development, because the whole United States is increasingly dependent upon the Pacific Coast as its source of supply. Lumber, lumber, lumber — the great visible resource, the great pride and boast of Oregon and Washington. When one sees their forests going up toward heaven in pillars of smoke, as every summer traveler sees them; when one sees the land for a thousand miles shrouded in a pall of smoke, with every distant view shut out; when one is told that Washington's lumber output had a fivefold increase between 1899 and 1923, and that nearly half of Washington's lumber is already gone,[15] one can think only of the pirates in Stevenson's *Treasure Island*, who ate their breakfast and threw the remaining bacon into the fire, although they were without a ship on an uninhabited island. A leading Oregon banker seemed to regard forest fires only as things which make the air hazy. He blandly remarked: "Burning helps it. The timber is as good at the end of three years burned as unburned, and easier to log. Dead cedar stands indefinitely. If fire follows lumbering immediately, the seed makes a good start after the fire; but if it waits two or three years, seeds start and the fire makes a clean kill." A Puget Sound sawmill operator whose plant I visited said, in discussing fires: "Oh, no! We only expect to get one crop. Ranchers come behind us and set fires to clear fields and their fires often get into the woods. It is all we can do to keep fires out of the green timber." [16]

[15] Production of lumber in Washington in billions of board feet: 1899, 1.4; 1909, 3.9; 1919, 5.0; 1929, 7.3; 1936, 4.6.

[16] Fortunately these men do not represent the general sentiment of the Northwest relative to forest fires. The fine new forest maps of Washington and Oregon now being published by the regional forestry office show all the burned-over areas of the Northwest in flaming and suggestive red. The terrible Tillamook burn of several years ago covers a large enough area on the Oregon map to impress even somewhat hardened timber men. The State of Washington spends thousands of dollars every year for fire prevention in forests. Educational campaigns for fire prevention are conducted through posters and the public press; laws have been enacted regulating the use of fire in timbered areas by campers, tourists, and others. Much has been done and much more will be done. It is needed — needed just as much by New York and Chicago as by Seattle, for New York uses Seattle lumber by the shipload and Chicago uses it by the trainload. Seattle has the largest community forest in the United States -- 66,000 acres.

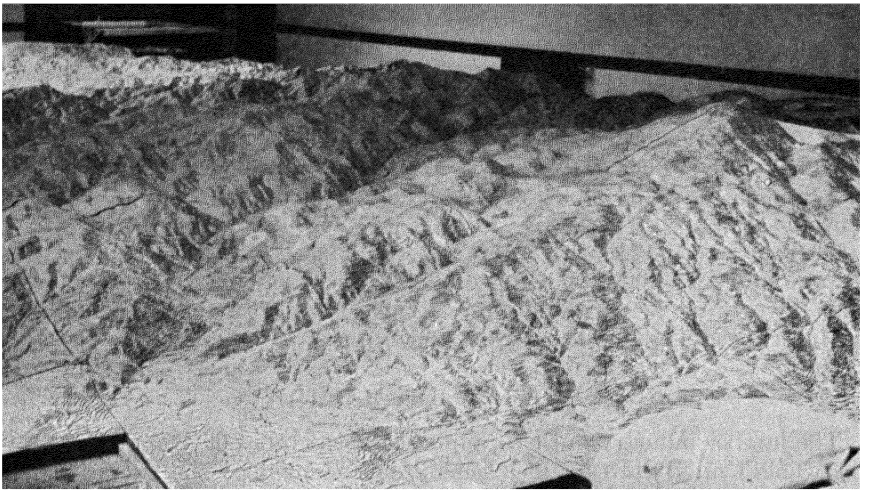


FIG. A. Close-up view of the relief map of Long-Bell timber holdings near Longview, Wash., showing the contour lines. The map was built in sections by using sheets of cardboard twenty-hundredths of an inch thick, which according to the scale equals 10 ft. in elevation. The highest elevation on the map is approximately 3500 ft., which is represented by 350 sheets of twenty-hundredths-inch cardboard. This point is shown at the extreme right in the photograph. With this map they can lay out a railroad without further field survey. Before the 1929 slump this company expected to produce logs as fast as it used them, but this can only be done if the price and demand for lumber give sufficient income. In the 1930's this condition did not exist. (Courtesy Long-Bell Lumber Co.)

"Only expect to get one crop," and the fire that follows the lumberman burns up the good soil as well as the fine young trees that would make timber in twenty, forty, or sixty years! Thus the last lumber reserve of the United States is going; the next crop is being killed in infancy by those who take today's profits; and the East is just beginning to draw upon the West for its lumber. The price of Douglas fir, f.o.b. sawmill, has increased from $8.67 per thousand board-feet in 1899 to $20.05 in 1929; in 1936 it was $17.67. What will it be in succeeding decades? We are now in a temporary period of exploitation, using our new timber at least twice as fast as it grows.[17]

Here we have a clear case where the individual sees and secures dividends of this year so much more surely than the group (nation, state, or city) can see and prepare for its future dividends. The whole world will suffer from this lumber destruction, but the valley cities that depend upon the industry will be the worst sufferers. The recent achievement of cheap waterproof glue has opened up a wide new field for plywood. This will permit closer use of small pieces that are now wasted, and will give a new line of side products.

[17] The total drain on our total timber resources is estimated to be about twice the current annual growth. The Pacific states account for only about one-seventh of the country's annual growth of timber, and less than one-fourth of the growth of saw timber. These low figures are due to the fact that the West is covered with overmature timber that is making little or no net growth and that a large portion of the remaining forest land is either deforested or covered with small reproduction. See U.S. Forest Service, *A National Plan for American Forestry*, 2 vols., 1933, pp. 208, 221 (Sen. Doc. 12, 73d Cong., 1st sess.).

The climate that gave this region and its adjacent mountains the greatest forests in the world should give this region a permanent log supply for the city industries, if man will take care of his forests.

A LAND OF CITIES

This region promises to become increasingly a land of cities, because it has the resources of wood, water, commercial location, mechanical energy (water power), and human energy (muscle and brain). On the other hand, this region is mineral-poor, lacking the coal and iron that have given rise to a truly great industrial civilization in the northeastern United States and northwestern Europe. For the time being, it is population-poor, lacking the great markets needed for intensive industrialization.

As for the wood, great mountain areas can have no other rational use; they belong permanently in timber. As to water, there is no need for far-flung aqueducts such as those of Los Angeles and San Francisco. The Cascades and the Coast Ranges, with snows, glaciers, glacial lakes, and 100 inches of rain per year in some places, produce within easy reach of the valley water supply sufficient for many millions of city dwellers.

The commercial location is not so good as that of England, because the Puget Sound-Willamette Valley does not have a cheap open road to populous hinterlands. Vast stretches of mountain and plain, or a long ocean route, lie between the Northwest and the populous East. However, the Orient with more people than Europe has great trade possibilities and ocean freights are cheap, very cheap.

As to electrical energy, few people realize the great riches in water power within reach of this lowland. The Cascades and the Coast Ranges, along with the Rockies, which are now within commercial reach, give the cities between Portland and Vancouver access to many million horse power of hydroelectric energy.[18] There is no location for power resource in Europe or

[18] DEVELOPED AND POTENTIAL WATER-POWER, 1938
(in millions)

	Developed horse power	*Potential horse power*
Washington	1,254	8,768
Oregon	367	4,361
Idaho	364	2,706
Montana	431	1,306
Total U.S.A.	17,284	42,753
British Columbia	783	1,931
Total Canada	8,191	20,347

Note: The data for potential power in the United States represent water power available 90% of the time; in Canada, available 24-hour power at 80% efficiency at ordinary minimum flow. Estimates that include power resources that are available only 50% of the time are much larger; on this basis Canada has 33,617,000 potential h. p. and the United States, 57,184,000 h. p. Canadian data in the above table are as of Jan. 1, 1939, American data of Jan. 1, 1938.

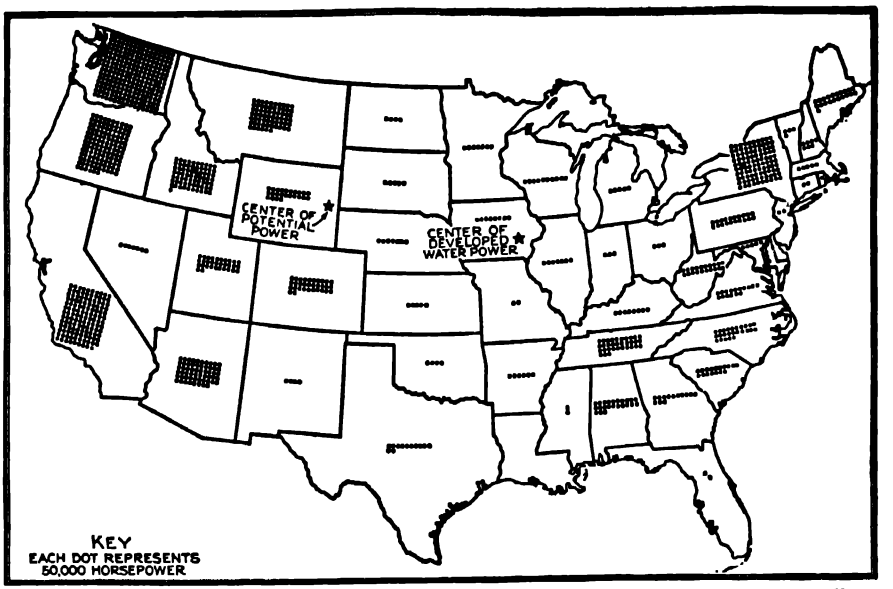


FIG. 724 A. Water-power resources. If you compare these two maps, they will tell you something about the next half-century in your own state. (Courtesy U.S. Dept Agr.)

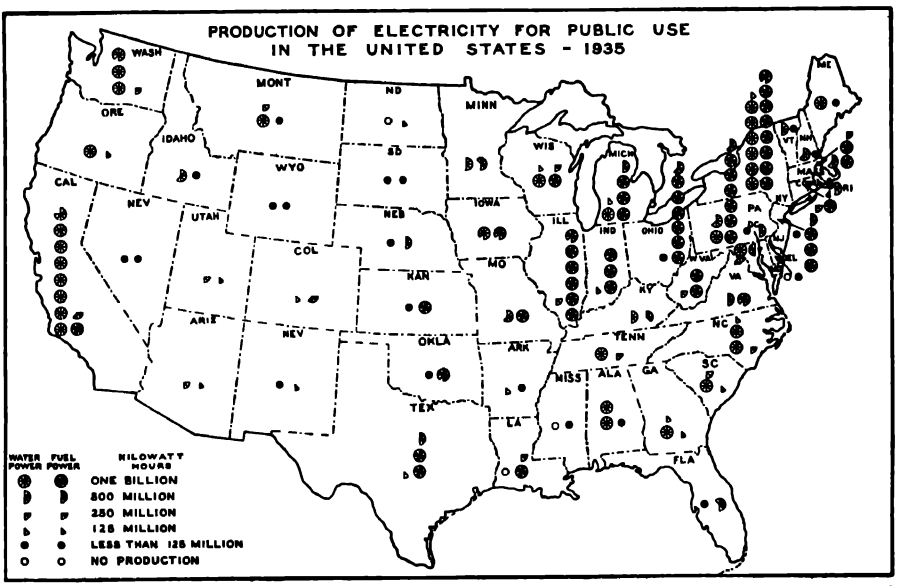


FIG. 724 B. If you want to check your economic geography, explain the situation in each state. (Courtesy Carter Goodrich and others, *Migration and Economic Opportunity*)

even in the eastern United States to rival it. With the advent of power from the Bonneville and Grand Coulee dams, the rich water-power resources of the great Northwest at long last are being harnessed and put to work. In August, 1939, the first Bonneville power was sold to the near-by town of Cascade Locks. It is hoped to reduce the present tentative rate of $2.25 per 100 kilowatt-hours to about $1.39. The Government is now selling electricity to any organization, public or private, that is asking for it in good faith, and already 25 People's Utility Districts have been organized in Washington with the avowed purpose of acquiring local power companies through purchase or condemnation and selling the electricity to the ultimate consumers at the lowest possible cost. Bonneville is now (1939) producing 86,400 kilowatts, and it is expected to increase the installed capacity to 504,000 kilowatts by 1945. The mighty Grand Coulee, when completed, will produce 1,900,000 kilowatts. This tremendous supply of cheap electric power should prove to be a powerful stimulus to the development of manufacturing in this region, which already is fortunate in so many respects.

MINERALS

It is indeed fortunate that this region has the magnificent water power of its mountains, for it lacks the oil which has given California a boom, and the coal supplies of this coast are small and poor. Long after California has used its last barrel of oil and has experienced the troubles that come with its ending, the water powers of Washington, Oregon, and British Columbia can still be whirling on.

There is a possibility of an important new mineral industry. A new discovery in electrical smelting was reported from the laboratories of the State College of Washington at Pullman in 1939 by which manganese, now selling for 40 cents a pound, could be made for about 10 cents a pound. It is claimed that there are supplies of 300,000,000 tons on the Olympic Peninsula. If these good things work out, this will be very important for the United States, for manganese is an increasingly important material in metallurgical industries, especially steel, and thus far our production has been negligible.

HUMAN ENERGY

A city requires many material factors, including location. Also it takes brain and brawn, imagination and pushing power, to build a city. In other words, it depends upon people, not only upon large numbers, but upon people having brains and energy. In the latter respect this region stands at the fore. The race is on between the two theories of energy, the cause of civilization. Professor Ellsworth Huntington of Yale, betting on the thermometer, says that civilization depends upon certain temperatures. Professor E. V. McCollum of Johns Hopkins, betting on the milk bottle, says that civilization depends upon the amount of milk people drink. In either case, the cities in this region are likely to win. The climate in this region is admirable

for dairy products.[19] If this region cannot supply enough, it is but a short haul from the Columbia Basin or the Fraser Basin, where farmers crave markets and land awaits irrigation.

Dr. Huntington's point about the climatic basis of civilization (explained at length in his epoch-making *Civilization and Climate*) is essentially as follows: A man feels more inclined to be active and he will do more physical work at a temperature of about 60° F. (55° to 70°) than when it is either colder or warmer. The second part of Huntington's theory is that a man's brain works best when the outdoor temperature is about 40°. This region has this temperature in winter. Look at the average temperatures for Seattle and notice that in winter the temperature is right for the maximum of mental activity; in summer it is right for the maximum of physical activity.[20] Third, Dr. Huntington says also that man needs a moist as well as a cool climate. This climate is moist.

There is a fourth point to the Huntington findings; namely, man produces energy best if there comes every few days a change in weather, either to warmer or cooler, provided it does not run to extremes. Changes in temperature wake men up and make them want to do things. No one need suffer from monotonous weather in this region, because it is close to the path of the constantly moving cyclones which give it rainy or cloudy weather every few days, followed by clearer and cooler weather.[21]

If Huntington's theory of climate ran contrary to the experiences of common men we might look at it askance, but everything that we know about history, including the industrial history of this and many other regions, confirms this theory. Shipbuilding offers an unusual opportunity to compare output in various parts of the United States. The whole nation strove to build ships with all possible speed during the World War. What did this effort show? The yards of the Pacific Northwest took more pennants (awards) than those of any other section — in general shipbuilding (both steel and wood), in riveting, in welding, in framing wooden ships, in bolting. At Philadelphia the sun, shining upon the men and also upon the metal ships on which they worked, produced so much heat that the men had to stop work at times. The *Emergency Fleet News*, September 19, 1918, devoted much space to accounts of sunstroke and heat stroke in Eastern yards. Heat did not interrupt work on Puget Sound.

In a winter number of the *Emergency Fleet News* there were articles about special quilted clothing for shipyard workers; the journal discussed the trouble Eastern yards had to keep their men from going to Southern and

[19] The American milk record of 38,000 + lbs. of milk per cow year comes from a Holstein cow near Seattle. The world's record of 43,000 + lbs. was produced in *England* by a Shorthorn cow. The average cow produces only about 5200 lbs. of milk per year.

J. Sidney Cates, in the *Country Gentleman*, April, 1939, and November, 1939, shows that the cow (bos domesticus) slows down in hot weather as much as Huntington claims that man does.

[20] See the table of temperatures, page 751, and maps of January temperature and July temperature for North America.

[21] The evenness of the oceanic climate is shown by extreme temperatures. Seattle extremes are 0° F. and less than 100°. Over the mountains at Yakima they are −24° and 106°.

Pacific Coast yards. Freezing weather is very rare at Portland, Seattle, and Victoria. Snow blockades, so bothersome from Chicago eastward, are unknown. Therefore, since shipbuilding is an out-of-door industry, it seems but natural that this region should have won the shipbuilding records in competition with the rest of the United States, which it most emphatically did.

In 1940, with a new world war on the horizon, Tacoma and Bremerton were making plans to increase their shipbuilding activities greatly.

We regard these Pacific Coast shipbuilding records as highly significant of a manufacturing future for the northern Pacific Coast. It should be noticed that the Southern states and Southern California are not mentioned in these championship shipbuilding quotations. That too may be regarded as significant. The Puget Sound-Willamette Valley is undoubtedly less desirable than Southern California for fruit, recreation, and rest; it is certainly less sought by the tourist and by those who have retired, and for good reasons. But it promises to be a work center. The large and small cities that may be expected to arise along the water fronts in the Puget Sound-Willamette Valley promise to be more important work centers than the smaller cool spots around San Francisco or the delightful region of Los Angeles. Work on Puget Sound — and retire to Los Angeles.

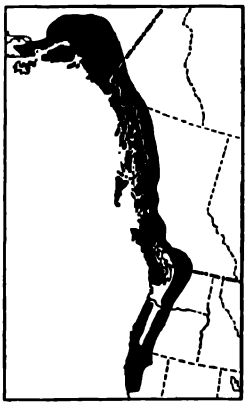
In pointing out the energy advantages of this type of climate, both the authors of this book are fully aware of the unpleasant character of fog, drizzle, and clouds, and the rest of British and Irish weather (with its gloom).[22] Neither of us would elect this climate for the pleasures of existence. Neither do most boys elect the invaluable training of chores. The location of the people on this continent and others shows that, in this period at least, man goes where there are jobs, even if there is substantial inconvenience.

It is conceivable that machinery may be developed to the point where it will tend to reduce the relative advantage of regions producing human energy, but that has small prospect of happening until mechanical progress has stopped. Mechanical progress depends upon brains *and the willingness and ability to work them.* Here the record of northwestern Europe suggests that all places having that type of climate will have an economic advantage for a long time to come. A great gulf promises to separate two groups of human beings if one has an impulse to get up and do something, regardless of mean weather, and the other has an impulse to sit and enjoy good weather.

The facts of the weather, the theories about the weather, and the facts of recent history all agree in pointing to northwestern Europe as the land which this region will tend to duplicate.

[22] A press dispatch of Dec. 27, 1939, told of 40 traffic accidents in a single day in Tacoma due to fog that at times froze on the windshields of motorcars. Fogs are so frequent in the maritime Northwest that a number of cities have found it worth while to install sodium-vapor fog lights, which have proved to be remarkably effective.

Chapter 35. THE NORTH PACIFIC COAST AND MOUNTAINS



MOUNTAINS clothed with evergreen forest rise close to the seashore at almost all points between the Golden Gate and Kodiak Island. They often rise so sharply from the ocean that waves beat at the foot of a cliff where there is not room for a road, or even for a man to stand on the shore. These mountains are very often dripping with rain from the wet west winds. They are frequently wrapped in fog and cloud, and in the northern part are heavy with snow in winter, and the mountaintops are also heavy with snow in summer. In brief, this coast region might be called a long string of mountains, a long string of forest, a long string of fish, and a long strip of mines, with a few spots of grass in the southern part.

The North Pacific Coast has many surprises. The Japanese Current, bringing warm water into the northern Pacific, warms the air above it. The prevailing west winds blow this warm air over the land. Therefore southern Alaska is warmer in winter than Washington, D.C., and at sea level it has less snow. But the summer is quite different. To match the summer climate we must go to Scotland (see page 751). Indeed, Kodiak Island, in the far northern Pacific, has a January temperature of 30° F., the same as St. Louis, Pittsburgh, and New York City, and a summer temperature of 54°, only a few degrees cooler than the summer temperature on the west coast of Scotland.

There is much rain along the coast, sometimes as much as from 80 to 100 inches a year, so that there are many rainy days. At low elevations are dripping forests; at high elevations, snow.[1]

The forest on the mountains of the Pacific Coast shows interesting adjustments to two of its enemies, cold and dryness. South of San Francisco Bay, the dry timber line is ever ascending, and the forests are pushed higher and ever higher up the sides of the mountains. From San Francisco Bay northward, the rainfall permits forests at sea level, but the cold of high altitudes makes the upper limit of the forest creep slowly down the mountainsides. The ever descending cold timber line is 7000 feet in western Washington; 4000 feet at the south boundary of Alaska; 2500 feet at Cross Sound (latitude 58°); 300 feet at Prince William Sound; and a short distance farther to the

[1] Rainfall varies greatly even within this narrow region. Each year 160 inches of rain fall at Ketchikan on the south coast, and also at Orca, at the foot of the Chugach Mountains behind Prince William Sound. At Copper Center, in the Copper River Valley behind these same Chugach Mountains, the rainfall is only 6 inches, the lowest recorded anywhere in Alaska.

west it reaches the ocean and the land is treeless at sea level. Thence around all the rest of the coast of Alaska, the northern shores of Canada, and down to Labrador, salt spray looks not up at the green trees.

THE SOUTHERN AGRICULTURAL VALLEYS

The warmer climate of the southern part permits agriculture in scattered mountain valleys. Agricultural valleys are chiefly in California and Oregon. By far the largest and most important valley of this region is the Puget Sound-Willamette Valley, which has already been described.

In California the Coast Range has many parallel ridges, with valleys between. Some of these valleys (Ukiah, Scott, Hay Fork, Trinity, etc.) widen out to considerable stretches of level land. These valleys have climates of great variety. If the mountains that stand between the valleys and the sea happen to be low, there may be enough rain in the valleys for agriculture without irrigation. If the ridges are higher, the valley floor needs irrigation, for which mountain streams will furnish the water. These little strips of agricultural land, usually from 1 to 3 miles long, are little islands of farm land more completely isolated in a sea of mountains than islands are isolated in the sea. These isolated communities are chiefly busy with the Middle Western type of agriculture — grain and cattle. The valley farmers pasture their cattle for part of the year in the near-by forests.[2]

A number of these stretches of bottom lands in all three states have rich pastures and a thriving dairy industry. As the small areas of level land are nearly all in use, it is fitting that extensions of agriculture here should be of the mountain type, which is well illustrated by the agriculture of Tillamook County, a seaboard county in northwestern Oregon that is almost entirely covered by the Coast Range. Here the annual rainfall of 95 inches makes splendid pasture, and an acre of ground or less will support a cow. Freezing temperature occurs less than twenty days each winter, so open grazing is possible from the first of March until late in November. This is not a land of corn, for the climate is too cool, so the farmers make hay of oats and vetch and grow turnips for winter cow feed. Ninety-five per cent of the milk of Tillamook goes to the 18 co-operative cheese factories. Many mountain and coastal valleys here have developed a thriving dairy industry like that of Tillamook. It resembles the Swiss mountain dairy industry in its dependence on summer milk, which in turn depends to a high degree on *grass*.

[2] "But there were men in these mountains, like lice on mammoths' hides, fighting them stubbornly, now with hyraulic 'monitors,' now with drill and dynamite, boring into the vitals of them, or tearing away great yellow gravelly scars in the flanks of them, sucking their blood, extracting gold.

"Here and there at long distances upon the cañon sides rises the headgear of a mine, surrounded with its few unpainted houses, and topped by its never-failing feather of black smoke. On near approach one heard the prolonged thunder of the stamp-mill, the crusher, the insatiable monster, gnashing the rocks to powder with its long iron teeth, vomiting them out again in a thin stream of wet gray mud. Its enormous maw, fed night and day with the carboys' loads, gorged itself with gravel, and spat out the gold, grinding the rocks between its jaws, glutted, as it were, with the very entrails of the earth, and growling over its endless meal, like some savage animal, some legendary dragon, some fabulous beast, symbol of inordinate and monstrous gluttony." — Frank Norris, *McTeague*, pp. 379–80.

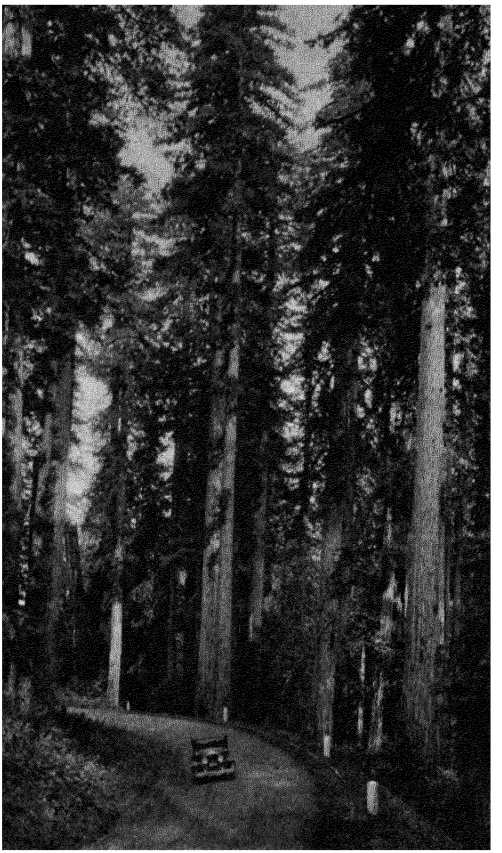


FIG. A. The redwood highways in the coast mountains of northern California are lined by the world's oldest and tallest trees, the *Sequoia sempervirens*. Such a landscape as this produces different emotions in poet, artist, botanist, and lumberman. (Courtesy Californians, Inc.)

When the grass is gone, they try to put the cow on lower-cost subsistence rations.

KLAMATH MOUNTAINS

Between the Sacramento and the Willamette valleys lie 300 miles of rugged territory called the Klamath Mountains. This area is really an old plateau tipped up at an angle so that it is 2000 feet high on the sea side and 5000 feet high at the base of the Cascades. The old plateau has been carved into a labyrinth of valleys by three rivers, Klamath, Rogue, and Umpqua, and their branches, which drain it and flow through almost impassable canyons, as they approach the sea.

Much land in the upper valleys of these rivers is arable, but most of it needs irrigation. For this the water from mountain streams is near at hand. In the valley bottoms there are many dairy farms. On the rolling slopes are wheat fields and cattle ranches. In the Rogue Valley an important fruit center has been developed, with specialties of pears, apples, and peaches. These valleys, at an elevation of 1000 feet or more, have a pleasantly cool summer climate. Medford, the center of the Rogue fruit district, has a July average of 53° F.

THE COAST RANGE

In much of Oregon and Washington the Coast Range presents a bold front to the sea. In some places the cliffs rise from the beach. The west winds, blowing against these slopes, produce from 130 to 140 inches of rain per year at less than 1000 feet. One hundred and fifty inches per year is estimated to fall higher up, although no observations have been recorded there.

Most of the rain falls on the Coast Range in winter, but some falls in sum-

mer also. The air is constantly damp, and the weather often cloudy. This wetness makes the forest almost impenetrable with undergrowth, and trees 6, 8, 10, 12, and even 15 feet in diameter stand thickly in the lower elevations where the higher temperatures prevail. Indeed, the Olympic Mountains, which raise snow-capped tops 8000 feet in elevation in plain sight of Seattle, have not been completely explored, so thick is the forest, so damp the air, so drenching are the days. The same is true of Vancouver Island and the mainland north of it.

Little agricultural land is found near the shore except around Coos and Tillamook bays, where the heavy rain and the open winter make rich pastures and important dairy centers. Such heavy rain is a handicap to agriculture, and it is therefore easy to see why agriculture has made small headway here. The lower lands at the west side of the Coast Range resemble western Brittany, Wales, Ireland, and Scotland. These European pasture lands, with less rainfall than western Washington, are almost without plow agriculture at the end of millenniums of occupation by the white races. In the west of England I have seen dairy farms that had no plow.

THE CASCADES

The Cascade Mountains, east of the Coast Range and north of the Sierra Nevada, extend from the Klamath Mountains to the Fraser River in southern British Columbia. Like the Klamath Mountains, they are really a kind of wide plateau, from 75 to 90 miles broad, in which many deep valleys have been worn. Unfortunately, the mountains give little water to the irrigation farmer, because most of the streams drain to the west, where water is not needed. Very short streams with a sharp descent flow into the Great Basin and the Columbia Basin. Great is the climatic (rain) contrast between the east and the west sides of these mountains. On the west side there is a solid covering of the moisture-loving Douglas fir. On the east the dry timber line is high and the forest above it is chiefly Western yellow pine, the tree of cool, dry land. The traveler can easily see this contrast at the Columbia Gorge, where, in the course of an hour or two with an automobile, one passes from the western to the eastern slope of the Cascades. One sees thick forests of tall fir trees standing beside green fields on the western slope, but only brown mountains covered with low shrubs on the eastern slope, and no fields at all except a few which depend upon irrigation. I went through the Columbia Gorge on an August afternoon when the western mouth of the gorge was drenched by heavy rain, driven by the west wind. In the middle of the gorge there were showers, but the eastern end was dusty. The gorge is not wide enough to let much rain through. In winter, however, it lets enough Arctic air come out of the interior to lower the temperature for twenty miles around the western end, and injure tender fruits.

The people of Portland properly regard this gorge as a great treasure, both economic and scenic. It is indeed one of the earth's great sights, with its peaks, precipices, waterfalls, forested slopes, winding river, cloud effects, and excellent automobile road.

Much of the Cascade surface is of volcanic dust, some of it so recent that in the territory around Mt. Lassen dead forests stand buried in volcanic sand while live green trees grow in the top of the deposit. A string of extinct volcanoes several score in number reaches northward from the Sierra into Canada. Many of them are perfect cones, greatly beloved for their beauty, such as Mt. Rainier, 14,300 feet; Mt. Hood, 11,200 feet; Mt. Jefferson, 10,500 feet; Mt. Adams, 12,500 feet.

One of these cones has performed an interesting geologic feat. Its top has collapsed, leaving a wide crater which is filled with melted-snow water, crystal-clear and marvelously blue. This beautiful lake, called Crater Lake, is the gem of the Crater Lake National Park.

Equally beautiful but different in character is Lake Chelan on the eastern slope of the Cascades in Washington. There a great glacier dug out a valley bottom to a depth below sea level and then dammed up the lower end of it with gravel. Thus a lake much like the famous Italian lakes filled the valley bottom. One end is deep in mountain gorges, and the other end overhangs the Columbia River.

The Cascades and the Coast Range of Oregon and Washington are the homes of but few people, but they contain many camps where loggers are cutting the mighty trees for sawmills on tidewater. The great logs were formerly handled by donkey engines from which long cables were drawn out into the woods, so that the puffing little iron beast could drag its prey up to the side of the temporary railway. As timber operations have climbed gradually from the valleys into the mountains, logging methods have changed. Some of the great logging camps with their donkey engines, bunkhouses, and cook shacks are still carrying on the old style of timber-cutting. In recent years, however, a new type of timber worker has entered the field — the so-called cat logger, who operates with a powerful caterpillar tractor and hoisting cradle. After a tree is cut and trimmed, this unit hoists the end of the log up into the cradle and drags it along a narrow "cat trail". At the logging-station the tree is hoisted on board a pickup train, which whisks its great load of logs off to the tidewater mills.

Every night trainloads of giant logs from the mountains are unloaded in Seattle, Portland, Tacoma, Everett, Bellingham, Coos Bay, and other deep-water terminals. Shipment of logs directly to seaboard has left many sawmill towns in the interior practically without mills. These towns are now dependent upon logging operations in the woods rather than upon millwork.

Cat-logging has many advantages. It is a mobile type of operation that can be done by small crews, who are often part-time farmers with homes of their own and who may commute 15 or 20 miles between farm and forest. Cat-logging permits operations to be spread over wider areas. Conservationists point out that mature timber can be removed with a minimum of destruction to the immature stands, which can be left until their future harvest day. The former use of dragline and donkey engine was a prolific source of injury to young growth. In short, cat-logging is the most flexible system yet devised for selective logging, a boon to scientific forestry.

Parts of the Cascades have witnessed an influx of mountaineers from the

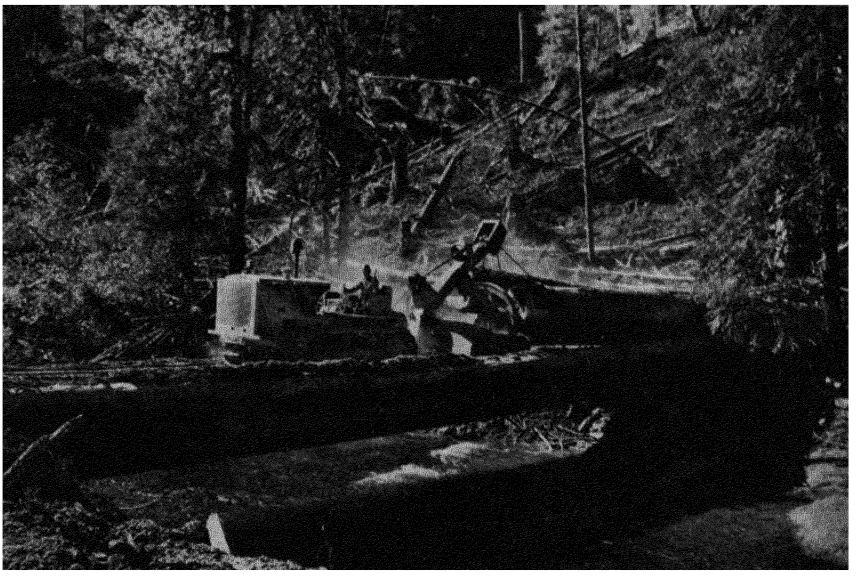


FIG. A. The Machine Age goes to the woods. The caterpillar tractor is perhaps our most marvelous beast of burden. It's almost as sure-footed as a mule. It doesn't slip, doesn't sink into the mud, can almost climb a tree. A cable is hooked around the end of the logs, the engine lifts them from the ground by pulley work; one set of caterpillar tracks supports the arch, and away the thing goes through the woods. It has banished from the forest the half-mile or so of cable that a donkey engine used to wind up drawing its log to trainside on logging railroad. (Courtesy Caterpillar Tractor Co.)

southern Appalachians, and two distinct groups of these highlanders are to be found in the upper Cowlitz Valley and the upper Skagit in Washington.[3] In addition to logging and mountain farming, these highlanders have developed a profitable range of minor forest products, which include ferns and forest greens that are shipped to the florist shops of the East, huckleberries, cascara bark, and special hardwoods such as bird's-eye maple. Many of their customs and crafts reveal a direct culture transfer from their former mountain homes in Kentucky, West Virginia, and North Carolina.

All of this mountain region should remain permanently in forest. It now contains over half of the rapidly vanishing saw-lumber reserves of the United States. Fortunately, thanks to the foresighted action of Presidents Grover Cleveland and Theodore Roosevelt, and to a lesser extent of other Presidents since 1890, much of the area has been set apart as national forests and parks. This indeed happened none too soon to save this region from destruction by fire. In 1933, 834 forest fires on state and privately owned land burned over about 3 per cent of the total state and private forest-area in Oregon.[4] When

[3] See Woodrow R. Clevinger, "Appalachian Mountaineers in the Upper Cowlitz Basin," *Pacific Northwest Quarterly*, April, 1938.

[4] Many of these fires are due to the careless tourist from other sections, often from the Eastern part of the country, who is careless with his campfires and cigarettes, or who has

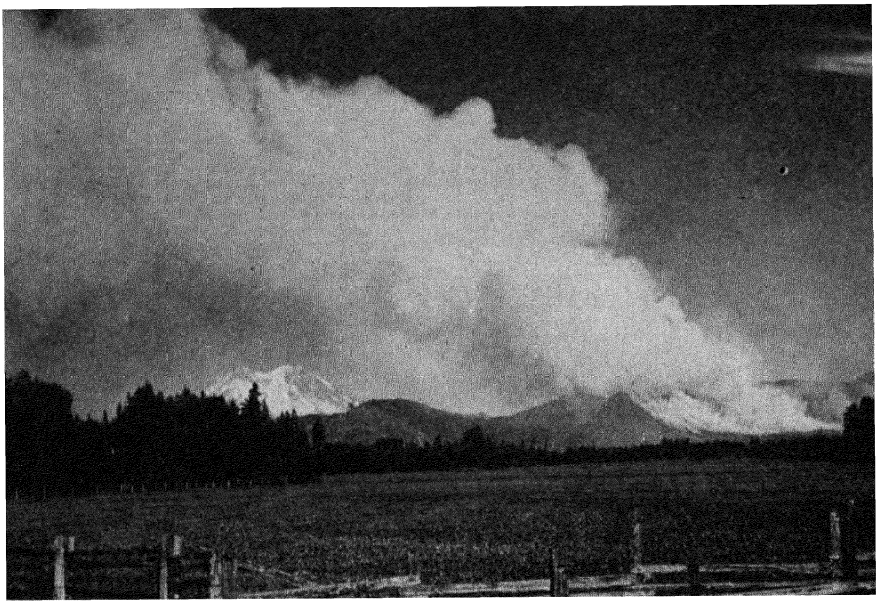


FIG. A. The devil of fire takes a walk in the woods. In a short time this smoke will hide beautiful Mt. Rainier. (Photo by Ranger McCullough, U.S. Forest Service)

we appreciate the fact that a saw log is from one to three hundred years old, a little figuring will show what this destruction means. By letting its forests burn at the rate of 3 per cent every year, Oregon might have them all burned every thirty-three years — before they have had time to produce a saw log. Some areas may escape. Other sections may be repeatedly burned — one of the surest processes for making desert, the green desert (see page 250).[5] It is indeed a pathetic fact that even in an age of rapid settlement the forest fire usually reaches the forest of the frontier one or more generations before man needs to use the forest products. Canada reports that about one-third of its total stand of timber is in its section of the Pacific mountains and that the amount thus far used for lumber is but one-seventeenth of the amount destroyed in the same period by fires.

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no conception of what devastation may result from such small beginnings. When fire prevention is preached everywhere, so that it becomes a religion and is generally observed by the public, we shall have made great headway in reforestation. Within the last decade much progress has been made in providing fire protection on Federal forest land and, to a less extent, on state-owned land. The most pressing need is protection for the privately owned forests. It is estimated that in 1937 about 485,000,000 acres had fire protection in the United States and that not less than 183,000,000 acres were unprotected. In that year only 1,344,000 acres were burned on the protected land, but 20,637,000 acres were burned on the unprotected land. The record speaks for itself. One of the many splendid achievements of the Civilian Conservation Corps between 1933 and 1939 was to reduce fire hazards on about 2,000,000 acres of forest land.

[5] In drier sections it is the red or brown desert of bare earth, witness many sickening miles of burnt land at low elevations throughout the wide area west of the Great Plains.

WATER POWER AND VACATIONS

The heavy rainfall and the deep snow fields give the mountains of northern California, Oregon, Washington, and southern British Columbia a high position in the contest for the greatest production of power per square mile of drainage area.

This water resource of the mountains becomes the greatest material asset of the near-by cities, not only for power but also for limitless supplies of good water.

These city populations also have riches of vacation land in the mountains, where large areas are fortunately set aside as national forests and parks. In spite of the anguished protests of the lumber companies, the new Olympic National Park has been enlarged to include some of the finest forest stands of Douglas fir and cedar still left on the Olympic Peninsula.

THE FIORD COAST

From the north coast of Washington to the Gulf of Alaska the Pacific Coast is steep and broken. Instead of having agricultural valleys, the coast is deeply indented by many long arms of the sea called fiords, a Norwegian word descriptive of the Norwegian coast. These fiords were made by the gouging of glaciers and the sinking of the North Pacific coast. Puget Sound, the first of these indentations, is just a valley into which the sea flowed after the land sank. Thus the Coast Range of Washington, broken by the Strait of Juan de Fuca, reappears as Vancouver Island, and again in the Queen Charlotte Islands. So much has the land sunk that some of these fiords are 2500 feet deep and have walls that rise steeply from the sea. There are so many islands (the tops of sunken mountains) along this coast that the steamers bound from Seattle to south Alaska ports can take the sheltering route of an inside passage for almost the whole of the 1000 miles.

This coast, with green forest below and snow fields above, with cliffs from 2000 to 5000 feet high, fiords 100 or 200 miles long, is a rival in scenery of the famous fiord coast of Norway. It has even one thing the Norwegian fiords lack — glaciers — but it lacks Norwegians and things Norwegian.

The Pacific mountains, higher than the Norwegian mountains, have larger areas of snow field, which pour vast ice streams, millions of tons a year, down the mountain valleys and into the heads of some of the fiords, where they break off as icebergs. In some cases the ice wall stands 300 feet above the water, and ships cannot go too close for fear of being smashed or upset by the fall of a newborn iceberg. The greater icework of the glacial epoch is supposed to have helped to make the fiords.

Northwestward from Cross Sound, the Mt. St. Elias Range, 50 to 100 miles wide, comes so close to the sea that streams from melting snows upon its slope plunge from the precipices and almost fall into the sea. When ships skirt the coast of this region, one may stand on deck and look upon mountain walls that rise abruptly from the sea to a height of from 10,000 to 12,000 feet. Such a coast is not to be found elsewhere in the world.

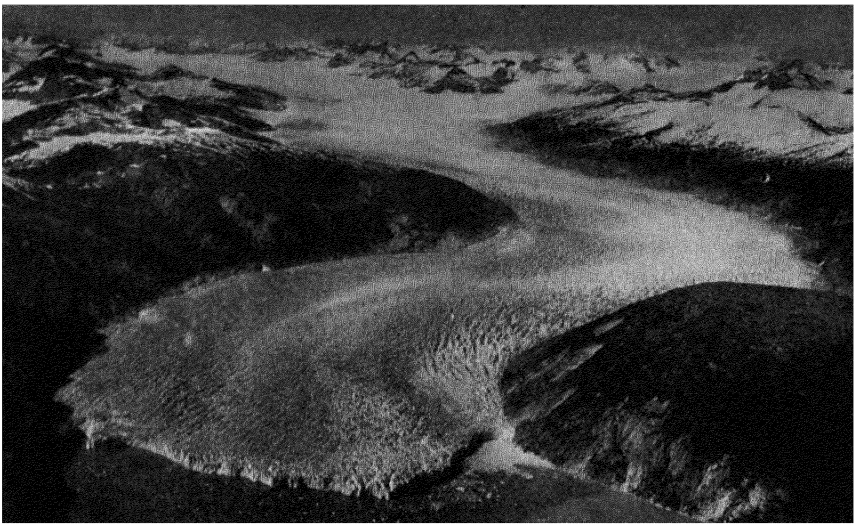


FIG. A. The airplane lets us see glaciers in a way that walking man can never see them. A river of ice — Taku Glacier, Alaska, lat. 58° 27′ N., long. 134° 5′ W. Altitude of the right foreground 2400 ft.; width of ice front, 1½ miles; average height of front, 120 ft. Note snow fields and small forest growth. The measure of our knowledge of Alaskan mountains is indicated by the recently reported discovery of a valley 25 miles wide between two mountain ranges that had previously been seen only at a considerable distance from opposite sides and were supposed to be one range. (Courtesy U.S. Forest Service)

The fiord walls of southern Alaska are so steep, and level land is so scarce, that even little towns of 4000 people, like Juneau, the capital, have difficulty in finding room for their houses. Fiord harbors possess the advantage of quiet waters and deep penetration of the coast, but their access to the interior is usually handicapped by the steep and rocky coast, and little land is available for a port site and for the development of a town. Sometimes, as the town grows, wharves and even streets are built on piles driven into the water. Indeed, the water is often too deep for convenient anchorage. Many difficulties were encountered in building the port of Prince Rupert, British Columbia, a boom town that did not grow much. Thousands of tons of rock had to be blasted from the cliffs along the water front and dumped into the fiord to provide a little belt of level land for port facilities, warehouses, factories, and railroad yards. The builders of Prince Rupert were confident that its location 520 miles nearer to Yokohama than Vancouver, coupled with the advantage of a relatively easy transmountain route to the prairie provinces, would soon make the town a flourishing port. High were the hopes of the builders when the first through train arrived on April 9, 1914, for Prince Rupert was specially designed to function as the western terminus of the new Grand Trunk Pacific R.R. Six years later the railroad became bankrupt and was taken over by the Government. Today Prince Rupert is a fishing port known for its halibut, but is no great gateway of commerce, no



FIG. A. The site of Juneau, the largest town in Alaska, shows physical limitations of the fiord coast for townsites or other land use. The pile of buildings at the right suggests the capital requirements of modern equipment for mining low-grade ores. The low timber line indicates a high latitude. (Courtesy Standard Oil Co. of Calif.)

industrial center. Prime reasons for its failure were the failure of Canadian-Oriental trade to flow through it, a poor location for overseas trade with the great markets of western Europe and eastern North America, failure of the immediate coastal hinterland to attract settlers, and the routing of wheat from the prairie provinces through the more accessible and better-equipped port of Vancouver.[6] City-planners and promoters ought to study geography.

METLAKATLA AND MATANUSKA

Twice during the period of half a century the Federal Government actively encouraged settlements in Alaska.[7] The first occasion was in 1887, when a group of 800 Indians, victims of petty religious persecution in Canada, sent Father Duncan as their representative to Washington to ask for permission to settle in Alaska. President Grover Cleveland and his Secretaries of State and the Interior assured Father Duncan that he and his Indians were free to choose a home in Alaska if they would select an island suitable for their purposes. On August 7, 1887, Father Duncan and his exploring party of

[6] See John Q. Adams, "Prince Rupert, British Columbia." *Economic Geography*, April, 1938, pp. 167–83.

[7] Every student of applied geography should read *The Problem of Alaskan Development*, a stimulating mimeographed report to the Secretary of the Interior prepared by Harry Slattery, the Under Secretary, July, 1939. For a comprehensive survey of Alaska, see National Resources Committee *Regional Planning, Part VII — Alaska, Its Resources and Development*, 1938.

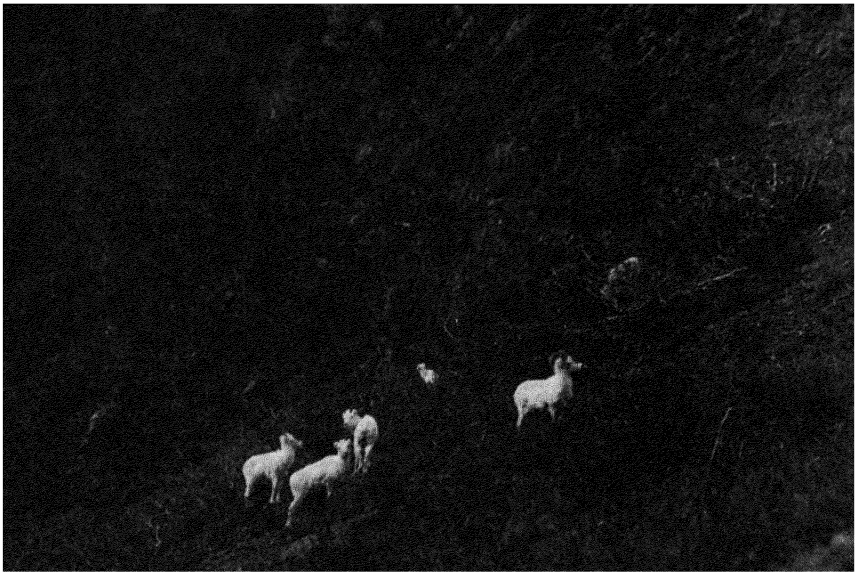


FIG. A. These wild mountain sheep in Mt. McKinley National Park, Alaska, suggest the pasture possibilities of a large area. (Courtesy U.S. Dept Interior)

Indians landed on Annette Island and hoisted the American flag. Tents were set up, and one of their number was sent back to bring the women and children and others who had remained behind. When the Indians left their home in British Columbia, they had only the few things that they could carry in their canoes. They were not permitted to take away the looms that they had bought and paid for, the saws and other tools of their sawmills, or even the windows and doors of their own homes. Upon their arrival at their Alaskan home, no houses, no barns, no subsidies, no squads of WPA labor, awaited them. Like Robinson Crusoe, they started from scratch. In 1891 Congress recognized their rights by setting aside the Annette Islands in the Alexander Archipelago (southeast of Sitka) as a reservation for the Metlakatla Indians.

In 1939 this Indian colony, launched without any government subsidy, was one of the most prosperous municipalities in Alaska. During the preceding five years the town of Metlakatla had made a net profit of $400,000, chiefly from the town salmon-cannery. Most of the natives own motorboats valued at from $2000 to $20,000. Nearly every family owns a comfortable home. One home out of four has a piano or an organ. Standards of education, health, and morality are high. The Metlakatla Indians have utilized all available natural resources — wood, fish, furs, and hydroelectric power — and they have produced boats, furniture, barrels, canned fish, clothing, soap, and many other salable commodities.

Nearly a half-century after the arrival of the Metlakatla Indians another migration took place. In 1935 the Federal Government transplanted 200

American families who had been on relief rolls in Michigan, Minnesota, and Wisconsin to the Matanuska Valley, north of Seward. For each family the Government provided a 40-acre farm, a comfortable house, a good barn, farming equipment, and stock. For the first year each family was given credit for the purchase of clothing, food, fuel, furniture, and other necessities. The Government also provided a school, a hospital, roads, and public buildings. The roads and buildings were constructed largely with WPA labor. In spite of all this governmental aid, some of the families quit Alaska and returned to the States. Most of the 165 families that remained in 1939 were making a comfortable living.[8] Some of the colonists received a gross income as high as $6000 a year on their sale of fresh vegetables, canned products, meat, butter, and eggs, which were sold locally along the railroad that runs from Seward to Fairbanks. One man was reported to have made a gross income of $11,000 in 1936-37 from his sale of tomatoes, turnips, potatoes, and cabbages. Like goldfish in a bowl, the Matanuska settlers were subject to glaring and continuous publicity from the very beginning, and the value of the settlement was subject to great debate. The final answer of climate is not yet in. That takes many years. Will they have summer freezes? In any case, the Matanuska Valley, with a high mountain wall to the north for protection, is small, and these few farmers are supplying a *small* local market.

What a contrast between pioneering "in the raw" and the subsidized 1935 de-luxe model![9] At Metlakatla the Government provided the land and, later, an education for the Indians, and that was all. At Matanuska the Government provided almost everything. The Indians came because of persecution in their homeland; the "reliefers" came because the Government told them to go and made all the plans. Once established, no hardship was great enough to induce the Indians to return to the land from which they had fled. At Matanuska the slightest hardship caused many a colonist to consider returning to the States, and some did return. The Indians had a common cultural background; the Matanuskans had little in common except

[8] In 1937 the Matanuska colonists proved the producing capacity of the land to be as follows:

	Average yield per acre	*Maximum yield per acre*
Carrots	4 tons	6 tons
Turnips	15 tons	16 tons
Potatoes	200 bu.	350 bu.
Oats and pea (or vetch) hay	2 tons	3½ tons
Oats	40 bu.	60 bu.
Barley	28 bu.	35 bu.
Wheat	20 bu.	28 bu.

[9] On January 13, 1940, the farmers' co-operative signed final contracts with the Alaska Rural Rehabilitation Corporation to take over units in the "civic center," the last business stronghold of the Government in the Matanuskan colony. A hospital, a garage, a hatchery, a dormitory, and a water system were deeded to the co-operative, which had previously acquired the colony trading-post, warehouse, creamery, and produce and meat departments. Thus, the colony is gradually achieving self-reliance. (*New York Times*, Jan. 14, 1940) We will know more about it in twenty years.

that they had been out of luck and on relief. The Indians were guided by a vigorous leader to a region that was similar to the one they had left; the Matanuska colonists felt that they were being sent to a foreign land, which was indeed different from their homeland. At Metlakatla a prosperous community with a diversified economy was the result of individual enterprise, hard work, and intense faith. At Matanuska a subsidized agricultural community was the result, a settlement that is still considered by many to be an "experiment."[10]

THE ALEUTIAN ISLANDS AND THE ALASKAN PENINSULA

The Aleutian Islands, the string of volcanoes which ends this Pacific mountain system, comprise the world's greatest volcanic laboratory. Unfortunately for those who wish to watch the processes, a mantle of fog hangs almost continuously over the scene. On one side of the islands is the Bering Sea, whose waters are almost ice-cold, and on the other side is the Pacific, made warm by the Japanese Current. The contact of the warm and cold waters, similar to that off the Grand Banks of Newfoundland, wraps the Aleutian Islands in fog.[11] Ships may pass a certain island ten times and get only one good view of it. Some of the views are said to be marvelous, such as that of the Shushaldin volcano, an almost perfect cone, snow-clad, standing 9000 feet out of the sea and brilliant in the rare sunlight.

It is said that the world's record for recent volcano activity is held by the eruption of Mt. Katmai, one of the many volcanoes of the Alaskan peninsula. The mountains of this peninsula continue as the great arc of the Aleutian Islands.[12]

FISHERIES

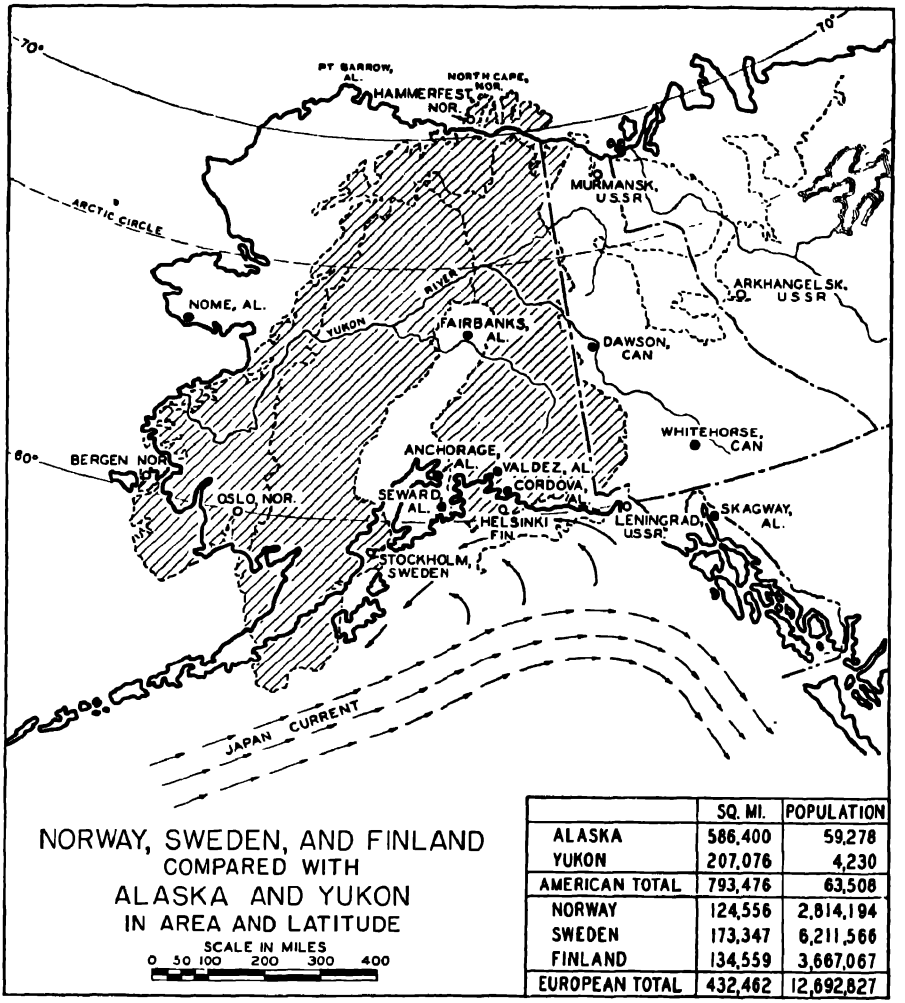
Before the white man came, the Indians of the Alaska coast lived chiefly upon fish, in which the waters are rich, very rich. Smoked salmon from the annual run has been to them as much of a mainstay as corn to the Appalachian mountaineer. They even laid aside an annual supply of "butter," that is, the oil of a small fish rich in fat. The Indians tried out the fat of the fish by putting them with hot stones into vessels of water. When the hot stones boiled the water, the oil came to the surface.

The salmon is a remarkable fish. It has two habits that have made it an easy prey and a great resource to man. The first habit is that of being born in inland streams which have their sources in cold fresh water. The young

[10] The late Will Rogers stopped off at Matanuska on his last trip, and, comparing it with the 1897 gold rush, remarked, "Pioneering for gold is not like pioneering for spinach."

[11] The life of the keeper of the lighthouse marking the Unimak Pass from the Pacific into the Bering Sea at Cape Sarichef must require a remarkable psychology. He gets his supplies once a year by the supply ship from headquarters at Ketchikan, 1300 miles away. Sometimes it is ten months between those spells of calm weather in which the mail boats can drop his mail. Think what the radio means in such isolation.

[12] Fortunately, the absence of people prevented much or possibly any loss of life when millions, perhaps billions, of tons of ash covered the area of townships. See R. F. Griggs, *Valley of Ten Thousand Smokes*, National Geographic Society, 1922.



	SQ. MI.	POPULATION
ALASKA	586,400	59,278
YUKON	207,076	4,230
AMERICAN TOTAL	793,476	63,508
NORWAY	124,556	2,814,194
SWEDEN	173,347	6,211,566
FINLAND	134,559	3,667,067
EUROPEAN TOTAL	432,462	12,692,827

FIG. A. A map filled with interesting comparisons. Be sure that you see Europe on this map, the White Sea, the Gulf of Bothnia, and the Gulf of Finland. Perhaps locate on it some other Scandinavian points.

fish remain here for only a short time, then they go out to sea, where they stay until full-grown. The second habit which makes the salmon the easy prey of man is that of the adult fish, which returns to the same stream in which it was born to procreate, and then to die. For a long while there was a sharp controversy between fishermen and experts as to whether the salmon did or did not return to the same stream. Careful experiments, made by marking the young salmon with tiny metal tags in their tails, have established the fact that the fish usually does return to the stream of its birth after having spent several years in places entirely unknown, during which

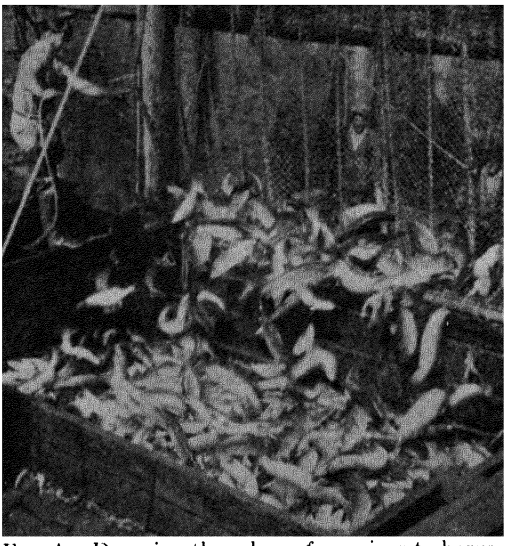


FIG. A. Dumping the salmon from river to barge. No wonder we caught them all from some rivers! (Courtesy Canadian Nat'l R.R.)

time the salmon has grown from the size of a lead pencil to a huge fish weighing 10, 20, even 50 pounds. The five species of salmon have different life cycles — two, three, four, and five years.

Salmon affairs could not be better arranged to give man the opportunity of gathering a rich harvest of these treasures of the deep. In returning to the streams of their birth they come in great schools, and, as though obeying a traffic officer, they even follow a given course year after year in and out among islands, deeps, and shallows. It is easy to catch these salmon, so easy that there is always danger of extermination. Salmon were once abundant in 26 rivers between New York and Canada. Now they ascend only a few streams, and in most of these their numbers are few.

The salmon on the North Pacific Coast of North America were many times as abundant as on the Atlantic Coast, and our handling of them is another of those perfect and sickening examples of what we have done with our natural resources. We began to can salmon on the Sacramento River in 1864. By 1882 the industry reached its peak of 200,000 cases and it has long since declined to nothing, partly due to the interference of power and irrigation dams. The small rivers of Washington, Oregon, and California north of San Francisco reached a peak of production in 250,000 cases in 1911; they sank to 29,000 in 1936. The Columbia River reached its peak of 634,000 cases in 1895, and since 1930 has been yielding only about half as much as in that year. It has held up so well by reducing one of the five species of salmon and then taking up another that is not so desirable. Puget Sound yielded over 1,000,000 cases per year between 1899 and 1919. Since that time production is down about half.

While these declines have gone on, the total industry has kept up by moving farther north. The first canneries on the coast of Alaska opened in 1878. By 1888 the Alaska output exceeded that of the Columbia. It reached a peak of 8,500,000 cases in 1936, then started to decline.

It is so easy to catch these marching cattle of the sea that unregulated individualism said truly, "If I don't catch them, somebody else will." On some Alaska streams they just caught them all, canned them, and abandoned

the canneries. At last in 1924 Congress passed a bill giving the regulation of the American salmon fisheries to the United States Bureau of Fisheries, with watchful officials to enforce rules that in every stream fishing should be done under certain regulated conditions and that one-half the salmon should be allowed to proceed upstream and perform their cosmic function.

The Fraser River has the disadvantage of requiring the action of two nations. Canada was willing to sign a regulatory treaty in 1907. The United States became willing in 1937.[13] A joint commission now has charge of the stream in which a maximum pack of 2,390,000 cases had sunk to 172,000. The new power dams on the Columbia River create a new problem (see Fig. 636 A).

Salmon have climbed around dams of 30 or 40 or 50 feet, by using elaborate arrangements of so-called fish ladders by which the water makes short falls from little basin to little basin in which the fish can rest between spurts. The Grand Coulee Dam is considered too high for fish ladders, and 1100 miles of good salmon breeding-places will know salmon no more unless the breeding fish are hauled around. The United States Government is making elaborate preparations to catch the salmon below the falls, strip the fish of eggs and milt, fertilize the eggs, hatch them, and raise the fingerlings.

The halibut has a life story quite different from that of the salmon. Halibut live on the sea bottom on banks, and are fished for with lines as much as 600 feet long. They breed at ten or twelve years and may live to be twenty-five years old. The halibut fisheries declined rapidly on the Atlantic Coast. Upon the opening of transcontinental railroads to the Puget Sound, fresh halibut went to Eastern markets, and now more than 90 per cent of the American catch comes from the Pacific. It was not long before the banks off the coast of northern California, Oregon, and Washington showed decline, but the supply kept up because fishermen went to Alaska, even out to the Aleutian Islands. Half of the world's halibut are caught between Cape Blanco, Oregon, and Dutch Harbor in the Aleutians. Seattle, with swift express service to Eastern markets, receives more than half of the North American total.

As a measure of the halibut decline, the catch on the southern grounds declined from 300 lbs. per year per fishing unit to 60 lbs. per unit. The unit is a "skate," a long line with many short lines attached, each carrying a hook baited with herring.

Study of the habits of the halibut showed that man could do nothing to increase the supply but let nature take its course. Then came congressional law, and a closed season which doubled the supply of these fish in certain areas between 1930 and 1937.

The commercial fisheries of the Pacific Coast have moved from species to species. Salmon came first. Then halibut, then mackerel, flounder, and herring (Alaska), then tuna and pilchard. The pilchard goes to the market under the name of sardine, the tuna under its own name. The chief centers of tuna-fishing are San Diego and Los Angeles, and the California tuna pack increased from 75,000 cases in 1912 to 2,600,000 cases in 1936.

[13] The near-extinction of the whale caused 26 countries to sign a whale protective agreement in 1931, to become effective Jan. 16, 1935.

The fishing industry affords one of the best examples of the appalling fact that we have skimmed the cream from this continent. Fisheries, however, are much more hopeful than most cases of declining resources in that they can be restored if we give them a chance. The sea is still there. We have not destroyed it, as we have destroyed the soil of cornfield, cotton field, and mountainside. Each female, laying thousands of eggs, has such powers of increase that it might be called supergeometric.

THE SEAL ISLANDS

From the Bering Sea part of this coast come nearly all of our fur-seal skins. The home of these seals, the Pribilof Islands, affords a splendid example of the free resources of the sea, their use, their abuse, their possibilities. In 1786, Gerasim Pribilof visited these islands (which were first sighted by Joan Synd in 1767) and discovered the fur-seal rookeries.

For ten months of the year these seals are at sea, sleeping on the waves and eating fish. The breeding-season approaches. Male fur seals crawl out upon the beach of the Pribilof Islands and begin to fight for beach-front space. Finally it is settled among them by force of tusk and many wounds that each seal has a certain bit of beach front. In a day or two the females, heavy with young, begin to arrive. The males meet them at the surf, grab them in their teeth, fling them over their shoulders to their own particular pieces of beach. This gives ownership to a harem. In a few days the young, called pups, are born. Then the females breed again.

For a number of weeks the young stay on the shore. They are mammals. The males do not eat during the breeding-season, but the mother must feed to be able to produce milk. She swims away into the sea to catch fish. Sometimes she stays five days. Owing to the three-mile limit in international law, the United States Government was unable to protect the seals farther than 3 miles from the Pribilof Islands, so a ring of seal ships surrounded the islands, just as the rum ships used to surround New York Harbor during the Prohibition era. Expert riflemen lay on their decks, shooting the mother seals as they swam out to sea. For every mother seal killed a pup starved to death on the beach. Of every six mother seals killed, five had enough energy after the deathblow to dive, never to rise. The United States Government kept the seal islands as a monopoly, but the Russian, Japanese, and Canadian sealers reduced the number of seals from 2,000,000 in 1873 to 127,000 in 1911 and threatened their extinction. Then the United States Government abandoned its monopoly concept, and made a treaty agreeing to divide proceeds with these nations if they would keep their subjects away from the seal islands. The treaty has been kept, with the result that the seals are increasing and giving a harvest of fur. In 1938 there were about 1,800,000 fur seals on the Pribilof Islands, from which were sold 58,000 sealskins worth more than $500,000.[14] Seals are polygamous; one male is sufficient for from fifteen to fifty females (cows). This ratio fits admirably into the needs of the fur-

[14] Chamber of Commerce of the United States, *Commerce and Economic Resources of Our Outlying Territories and Possessions*, 1939, p. 12.



FIG. A. Male fur seal with a small family (small for seals) of wives and stepchildren on the rocky shores of the Pribilof Islands. In the background we see a part of another family. (Courtesy U.S. Bureau of Biological Survey)

harvester. The young males or bachelors come back with their mothers and play around the interior of the island during the breeding-season — tame as kittens, the easiest possible prey. Only these surplus young males are killed, and they are killed before they have gashed up their pelts by fighting on the beach front.

There is an interesting by-product of the seal industry. When the seals are slaughtered for their skins, the guards on the islands feed the carcasses to blue foxes, and from the foxes 1000 or more pelts are sold each year. On one of the islands the foxes are so tame that the housekeeper has to watch out lest they leap through the kitchen window and carry off her dinner. In 1938 there were 325 licensed fur farms in Alaska, located largely on the islands and devoted chiefly to the raising of foxes — blue, white, silver, gray, and silver-black.[15] From these farms were shipped furs worth more than $2,000,000.

FUTURE FISHERIES

Alaska waters are remote from large centers of population, and for this reason most of Alaska's fishing resources remain undeveloped. The salmon industry alone has been developed to the fullest extent consistent with a policy of conservation. In 1938, of a total fish production worth $50,200,000, the value of salmon products accounted for $42,700,000.[16] Next in order of

[15] *Ibid.*

[16] U.S. Dept Interior, *The Problem of Alaskan Development*, 1939, p. 39.

commercial importance were halibut, cod, herring, clams, crabs, and shrimps. The 1938 herring catch was the largest in the history of the industry, amounting to 216,700,000 lbs., which brought the fishermen only $654,000. Ninety-nine per cent of the catch was ground up for the production of fish oil and herring meal. It is reported on good authority that the herring supplies rival in quantity those which support the great fisheries of England, Scotland, and Norway. There are also important resources of trout, sablefish, rockfish, flounder, "ling cod," pollock, greenlings, and whitefish.

FORESTS

Continuous dampness makes the coast of British Columbia and Alaska thick with trees and still thicker with undergrowth — some of it thorny, much of it yielding berries in great profusion — bush cranberries, wild raspberries, two or three varieties of huckleberries. Western British Columbia has much mountain forest similar to that of northern Washington. The province has a well-developed lumber industry, which in 1936 produced nearly two-thirds of all the sawed lumber in Canada. Two newsprint mills and a number of pulp mills do a successful business.

The forests of southern Alaska have the good fortune to belong to the United States Government: the Tongass National Forest in southeastern Alaska and the Chugach National Forest around Prince William Sound. These two reserves contain about 87,000,000,000 board-feet of timber, three-fourths of which is within 2½ miles of tidewater. About 73 per cent of the trees are Western hemlock, which makes excellent flooring material; 20 per cent, Sitka spruce; and 6 per cent, cedar. Both hemlock and spruce make excellent pulp, which some day may give rise to the manufacture of newsprint paper, rayon, cellophane, and various chemical cellulose derivatives. The Tongass Forest has far greater present and potential economic value than the Chugach Forest, because of the better quality and greater volume of its timber, a shorter haul to present markets, and much better water-power resources for timber-using industries. It is estimated that the Tongass Forest under scientific management can produce not less than 1,500,000 cords of pulpwood annually in perpetuity, which would yield 1,000,000 tons of newsprint paper, or one-fourth of the present annual requirements of the United States.[17] Here, indeed, is the foundation of a permanent industry, if wise use prevails.

MINING, UNDERPOPULATION, AND GOVERNMENT POLICY

In such country, almost without valleys or farm land, usable resources must be those of the sea, the river, the forest, and the mine. As a source of employment for man the mine has thus far been the chief rival of the fisheries. The Klondike gold rush of 1897–98 soon made the port of Skagway at the

[17] National Resources Committee, *Regional Planning, Part VII — Alaska, Its Resources and Development*, pp. 100–01.

head of Lynn Canal the terminus of a railroad which gave the shortest route to White Horse on the upper Yukon. The decline of the placer-gold output has caused a sad decline in the traffic to the boat landing on the upper Yukon, and Skagway is almost a deserted village.[18]

Gold-mining in the coast and mountain region is on a more permanent basis, for large corporations, using expensive equipment, control the major deposits. Unfortunately, a great resource of gold was lost by the wrecking of the Treadwell Mine, across the sound from Juneau. The yield of this enormous ore body was less than $2 per ton of ore, but it was a profitable business and promised to yield for decades to come. The mine was being worked below the sea level. Carelessness caused a break in the wall, and in rushed the Pacific Ocean, with every appearance of permanent possession.

Most Alaskan gold in this region comes from two centers, Juneau (58° N.) and Valdez (61° N.) on Prince William Sound. Mining operations around Valdez illustrate admirably the importance of the airplane in modern mining. One mine in this area can be reached only by dangerous trails over mud flats, up mountain gorges, zigzag across rock slopes, and finally across snow and glacier to a height of 5000 feet. To take freight over this trail by pack horse would cost from 20 to 35 cents a pound, but airplanes carry it for 4 cents a pound. In a week one airplane carried to a point 1 mile up and 9 miles distant a 16-ton mill, a crusher, machinery, fuel oil, coal, pipes, corrugated iron, celotex, lumber, dynamite, and groceries — a total of 18 tons. At another place the melting snow destroyed the landing-place for the season, but an airplane dropped dynamite, barrels of oil, and a Diesel engine in the snow. The engine was in four pieces wrapped in mattresses. The freight came down in parachutes which caused the pieces to land right side up.

West of Mt. St. Elias the Pacific-mountain region is supposed to contain great riches of copper, gold, and coal. The coast mountains of British Columbia also have important mines of gold, copper, lead, and zinc.

The great potential mineral resources of Alaska, like those of forest, sea, and soil, will some day achieve great commercial importance.[19] Alaska's greatest present need is people. In 1930 there were only 59,000 people in all Alaska. As a recent government survey discovered, underpopulation is a part of a vicious economic cycle.[20] The cycle runs as follows: 1. Underpopulation over a large area leads to excessively high transportation costs. 2. High transportation costs result in a high cost of living. 3. High living-costs result in high costs of production. 4. High costs of production and transportation make most industries unprofitable. 5. Lack of industrial development results in seasonal unemployment. 6. High living-costs and seasonal unemployment discourage immigration and encourage emigration. 7. All of this results in underpopulation. The ordinary immigrant, with

[18] Population of Skagway in 1897–98, about 15,000 people; in 1940, 634 people. See Edwin J. Foscue, "The Development and Decline of Skagway, Alaska," *Economic Geography*, October, 1934, pp. 419–28.

[19] In 1938 the mineral output of Alaska was worth $28,607,000, including 662,000 oz. of gold worth $23,170,000, 29,760 lbs. of copper worth $2,976,000, and 34,420 oz. of platinum metals worth $1,229,000. The coal output amounted to only 159,230 tons, worth $621,000. (Chamber of Commerce of the United States, *op. cit.*, p. 14.)

[20] U.S. Dept Interior, *The Problem of Alaskan Development*, p. 58.

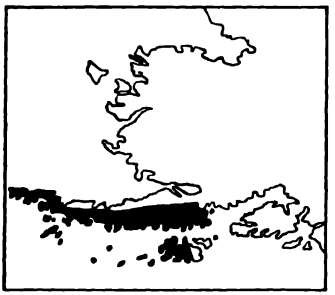
little capital, cannot buck this vicious cycle. An adequate plan of settlement obviously must combine both agricultural and industrial expansion, and such a program requires vast amounts of capital and long-range planning, which only the Federal Government can provide.[21] But why go to Alaska?

[21] The claims by some people that the Government has retarded development of resources can scarcely be well supported when one considers the Alaska government railroad. This railroad gives a sea outlet to Fairbanks, on navigable waters of the Yukon system in the heart of Alaska, a natural center for a possible future agricultural region. At present it is of much greater importance that this road passes through the copper, gold, and coal section of the Copper River and Susitna valleys, which lie in the Pacific mountains.

It would be an interesting story in the history of the Republic if one could know the full record of the lobbying and other political influences that resulted in the appropriation of $56,000,000 to build this railroad, which is 467 miles long. It was finished Feb. 5, 1922. The Government has even built a hotel midway along its line, where passengers may stay overnight. Perhaps enough big mines may be developed to make the railroad pay, but the usual history of mines is that they become worked out. Railroads have already been pulled up in the Colorado Rockies and elsewhere when mines were exhausted. To succeed, a road needs many people living along its line. Of this, the Alaska R.R. has small prospects for many years. The population of Alaska declined from 64,000 to 55,000 between 1910 and 1920 and rose to 59,000 in 1930. It may well be called a land of riches, but one almost without people.

Chapter 36. THE SOUTHWESTERN ALASKA GRASSLANDS AND ICELAND

SOUTHWESTERN ALASKA GRASSLANDS AND BRAIN LANDS



PERHAPS Iceland, Norway, Sweden, and the Shetland and Faroe islands of northern Scotland furnish the best object lessons for the ultimate future of the southwestern coast of Alaska, if men use this land wisely. Recall for a moment Huntington's point that brain energy is produced most abundantly at a temperature of about 40° F. Mr. Vilhjalmur Stefansson, the Arctic explorer, who is of Icelandic stock, insists that Iceland is the supreme example of Huntington's philosophy. Reykjavik, capital of Iceland, has an average winter temperature of 32° F. and a summer temperature of 48°, never far from the average of 40°. Dr. Stefansson says Iceland proves Huntington's theory, because the Icelander leads the world in intellectual activity and productivity, as measured by, first; complete absence of illiteracy; second, the reading habits of the people; third, literary creations of the people; fourth, production of men of genius.[1] Enter an Icelandic farmer's home and you are quite likely to see books in Danish, German, English, and French. The farmer can read these books, though probably he cannot speak the languages in which they are written. His choice of books seems to emphasize philosophy, history, science — material for thought rather than light fiction, which rarely provokes thought.

The thousand years of Iceland's history have given time enough for the good Norwegian stock to die out a dozen times if the climate were poor. Certainly Iceland's position in the world of intellect cannot be attributed to material riches. Iceland is almost completely of volcanic rock formations, largely basalt.[2] One-fourth of its total area of 40,000 square miles is sand and stone desert; one-eighth is continually covered with snow; and nearly another eighth is covered with lava.[3] Hence, one-half of the island is utterly unproductive. The other half has a vegetation that is chiefly grass. The island is without forests, without coal. Peat is the fuel. The very cool

[1] Taking the advice of Stefansson, Huntington visited and investigated Iceland, and found the conclusions above to be correct.

[2] Extensive hot springs are remnants of volcanic fervor. After serving as bathhouse and public laundry for generations, they now send water at 187° F. to heat the capital city at a saving of 1500 tons of coal per year, and there are plans to extend this saving to 35,000 tons a year.

[3] S. Axel Anderson, "Iceland's Industries," *Economic Geography*, July, 1931, p. 284.

summer temperature reduces agriculture to such a low figure that only .2 per cent of the total area is under cultivation — about half an acre per capita, and that chiefly in hay, potatoes, and a few turnips. There is not a field of grain, nor an orchard, for trees do not grow. The chief use of its land is for pasture. The people have about fourteen times as many sheep, about half as many cattle, about four times as many horses, and nearly three and a half times as much hay per capita as the United States. Iceland's chief export is fish, which is thirteen times as valuable as the sheep products. Yet on this slim basis great mental activity is and has been maintained.

Little Iceland, with 110,000 of the most intelligent and most uniformly educated people in the world, is an independent nation, although the king of Denmark is also the king of Iceland. The country enjoys democratic government, and is ruled by a parliament, the Althing, which first met in the year 930 A.D. Less than 2 per cent of the population are foreigners — chiefly Danes and Norwegians — and immigration is now prohibited. Iceland is an interesting and progressive little country, whose people are engaged chiefly in fishing and a pastoral type of farming, but modern manufacturing has begun, based on stupendous riches (per capita) of water power. The Norwegians catch 800 pounds of fish per capita per year, but the Icelanders hold the world's record by far with 5000 pounds per capita per year. The Icelanders' system of education for health, living, industry, and culture, their hospitals, their co-operative enterprises, put them on the topmost rung of most civilized peoples.

Southwestern Alaska (followed by western Europe) has the nearest approach in all the world to the brain-energizing climate of Iceland.[4] The table of temperatures shows that the Alaska stations have higher summer temperatures than Iceland, and therefore should produce more grass. If anyone is inclined to dismiss the Icelandic example as proof of climatic influence on brain power, he has but to look at the temperature facts and the achievements of Norwegians, Swedes, and Scots. The influence of these people in the world, past and present, is stupendous when compared to the influence of the same number of people in Egypt — and many other places that it might be invidious to mention.

The Alaska stations having the closest resemblance to Iceland are Cordova on the shore of Prince William Sound, and Kodiak on Kodiak Island. The results of this temperature likeness are shown in the treelessness of most of southwestern Alaska, where wild grass 6 feet high replaces the bushes and trees that clothe the coast from Cooks Inlet to San Francisco Bay.[5] Cattle have run wild and thrived on Kodiak Island and also on Kenai Peninsula, the southwestern part of the Alaska mainland. The United States Government has an agricultural experiment station at Kodiak Island. It has worked with considerable success at the problem of producing a good milk cow by crossing the fur-bearing (almost) Scotch Galloway breed with the heavy

[4] The late Alfred H. Brooks, Chief of the Alaska Division of the United States Geological Survey, stated that the Indians of the southern Alaska coast were good workmen and had a well-organized social order.

[5] C. V. Piper, *Grass Lands of the South Alaska Coast*, U.S. Bureau of Plant Industry, *Bulletin* 82, 1905.

TABLE SHOWING TEMPERATURES F. ON THE NORTH PACIFIC EASTERN COAST AND OF THE NORTH ATLANTIC EASTERN COAST

	Jan.	*July*		*Jan.*	*July*
San Diego	54.0°	63.0°	Lisbon	49.0°	66.0°
San Francisco	49.5	57.3	Bordeaux	40.0	68.0
Eureka, Calif.	46.0	55.0	London	38.7	62.0
Seattle	39.0	63.0	Paris	36.5	65.0
Astoria, northern Ore.	40.0	60.0	Edinburgh	38.2	58.0
Port Oxford, southern Ore.	46.0	55.0	Brussels	34.0	63.0
Portland, Ore.	38.0	67.0	Western Scotland	38.0	57.0
Western Vancouver I.	39.0	55.0	Bergen	34.0	57.9
Vancouver	35.0	63.0	Stockholm	26.6	62.0
Sitka, Alaska	33.0	53.0	Orkney	39.0	54.0
Cordova, Alaska	31.0	53.0	Reykjavik, Iceland	32.0	48.0
Valdez, Alaska	21.0	52.0			
Kodiak Island, Alaska	30.0	53.0			

milk-producing Holstein-Friesian. The crossbred cows are thrifty, maintaining the rustling qualities of the Galloways, and yield about 5000 pounds of milk a year containing from 4 to 4.8 per cent butterfat. These animals are pastured for six months, and in winter are fed on grass silage. Good hay or grass silage can be made, and potatoes, turnips, cabbage, and other vegetables will ripen there. Apparently, the makings of another Iceland are complete, especially when one considers the good fishing resources of the region.[6]

It is, therefore, possible that, as generations go by and the Western world settles down so that industries are more closely adjusted to natural resources, the North Pacific Coast, along with Scotland, Iceland, and Norway, may be a region where industries that require the greatest amount of brain power and continuous thought will concentrate, just as other classes of industries move toward cheap labor, or abundant fuel, or some other resource.

It must not be forgotten, however, that this land at the present time is almost unpeopled, and that no such development as is here indicated has yet made the first beginning. But resource is resource, and the most important of all resources are those that make men. It is very important in this age of science, machinery, and a changing society that man should have plenty of brain power. It is certainly of more relative importance than it is in primitive societies.

[6] In 1936 it was reported orally by the U.S. Biological Survey that a sheep industry was not thriving, although "the grass is luxuriant, the climate and all the physical conditions excellent for production of sheep, but lack of market, cost of transportation, etc., are not conducive to the industry." This industry was conducted on the capitalistic sheep-band basis of the American West rather than the humanistic family-farm basis of Iceland and many other Old World locations.

In the 1920's one or two permits were granted to start sheep farming here. One of them was with sheep of the Romney breed. These sheep were of New Zealand ancestry, the breed having been developed originally in the Romney marshes in England. Thence they spread to the wet, cool pastures of both hemispheres — New Zealand, Falkland, Alaska, etc. In 1928, 4000 sheep went to Umnak Island, longitude 168° W.

Chapter 37. THE YUKON VALLEY — THE AMERICAN FINLAND?



THE small scale we use in making maps of distant places often makes it difficult for us to appreciate the size of faraway lands. For example, the great arc of the Yukon Valley and Plateau is longer than the distance from New York to El Paso, from San Francisco to Little Rock, or from Minneapolis to Los Angeles. This vast area actually contains fewer people than are riding most of the time in the subways of New York City.

Along the streams and lowlands and part way up the slopes much of the land is tree-clad, but because it is so far north, the trees are often small, they lose heart as they climb the hills, dwindle first to bushes and then to brush, and finally they give way entirely to grass and herbaceous plants of the Alpine type, which often cover the slopes with red, white, blue, and yellow flowers. There are thousands, tens of thousands, of hilltops alternately snow-covered, grass-covered, and flower-decked throughout this great area of 350,000 square miles. The rolling hills and low mountains are interspersed with the lower valleys of the Yukon and its many branches. In some places these valleys widen out into large flatlands, some of which are several thousand square miles in extent. The largest, the Yukon Flats, is more than 100 miles long and about 40 to 100 miles wide.

In Europe similar lands in Sweden, Finland, and northern Russia are populous with farmers. Hence the name the American Finland, given by those who hope for an agricultural future for the Yukon Valley. In Asia similar lands with fairly similar climate, as in Siberia, have been the seats of the settlement of the farmer and the stock-grower, but the Yukon has produced little but gold, and a very large crop of printed romances (see Jack London, Rex Beach, Robert Service, and other writers of Alaska stories).

CLIMATE

The Pacific mountains shut the Yukon Valley away from the heat and moisture of Pacific winds, so the Yukon rainfall is light. The mountain barrier also makes the Yukon Valley a land with more heat in summer and more ice in winter than the Pacific shores, whose climate is tempered by the ocean. This region is so far north that the summer sun shines almost continuously; and north of the Arctic Circle it does shine continuously for days. This cumulative sun work has actually produced a temperature of 100° F.

in the shade at Fort Yukon, at the mouth of the Porcupine River. That is a very high temperature for a place north of the Arctic Circle. The great heat helps to bring forth the summer crop of mosquitoes, which make life in this region such a torment. The Arctic winter does not kill their eggs. The record of a bear killed by Alaska mosquitoes seems to be fairly well authenticated, but it is explained not by the size of the mosquitoes, but by the fact that they stung the bear's eyelids until the eyes swelled shut with inflammation; the poor blinded creature had no chance to recover, escape, or eat, and the mosquitoes pestered it to death.

The long day and the almost continuous daylight of summer are balanced by the long nights and the darkness or near-darkness of winter. The ground quickly freezes. Lakes freeze and become covered with snow. There is no stored heat of summer, no ocean current to modify the cold, and since so little heat comes from the sky, the thermometer goes down, down, and yet down. There are records of −76° F. at Tanana, −68° at Dawson, and −69° at White Horse in the Yukon Valley. Over the range still farther eastward, the little settlement of Good Hope on the Mackenzie River, just south of the Arctic Circle, holds the Canadian low temperature record of −78.5°.

The popular belief that extreme cold causes correspondingly heavy snowfall is incorrect. Parts of Pennsylvania have more snowfall than some parts of the Yukon Basin (Fig. 174 A), but Pennsylvania cannot rival Yukon cold. Fairbanks has 51 inches of snow. It is a common occurrence for Alaska streams to freeze to the bottom. Then the watercourse bursts out through some weak place and flows along the top of the stream, freezing and piling up great masses of ice and flowing about in devious ways to escape its own fortifications. When choked with ice, the stream constantly seeks new courses, somewhat like a river building up a delta. A prospector of my acquaintance while camping on the banks of a frozen river received an icy surprise. He had made camp high on the bank. When he had safely got his blankets all tucked in so that the 30° below zero bit him nowhere, he suddenly received notice while asleep of a change in the course of the river. The wandering ice water had flowed into his tent, soaked through his blankets, and struck his warm body with all the suddenness of a shot.

INDIANS AND FUR

Before the white man came, a few Indians and Eskimos occupied this country. They lived chiefly on the salmon, which they caught in the streams and smoked in the season of the summer run. The Indians cached the smoked salmon high up on poles, where dogs and wolves could not reach it; then they went off in search of berries to dry for winter food and to hunt moose and caribou. The meat of these animals furnished food, and their skins were necessary for clothing.

The respect that these natives had for the property of others is an interesting social response to an environmental fact. It is said that the Alaskan native would starve to death beneath the cache of dried fish belonging to some other, but absent, native. He would die thus because he firmly believed

that it would bring him the worst of bad luck to eat the fish. It should be noted that the whole structure of society would have been destroyed if dried fish placed upon poles were not safe in the absence of the owner.

The Yukon River may be called the great heart of this region. Its waters shaped the hills, carved some valleys and washed others full of soil. The river brought the Indian his salmon, and salmon was more indispensable to him than bread is to us.[1] When the white man invaded the region, the river carried his steamboat, which is as important to his existence as salmon was to the Indian's.

In the last decade of the nineteenth century an American trading company ran steamboats on the Yukon; the boats brought out the exports of the valley, a little gold and many furs. Apparently a trader could buy furs from the Indians, carry the load on his back to the bank of a stream, put it in his canoe, and paddle long distances. Perhaps he could go down the river with his furs or up the river and over the mountains to Skagway. But wait! The trading company with its freight monopoly effectively stopped other purchasers by the astonishing device of paying such ridiculous prices as $5 for a muskrat skin that was worth 25 cents, and $100 for a mink or marten skin that was worth $5. The man without a steamboat could offer no such fabulous prices for furs, and when he offered the Indian a fair price for pelts, he received only scorn. But there was another side to the affair. When the Indian needed supplies, he had to buy them from the trading company. The canoeist could carry only money, therefore he could not trade. The trading company put such big prices on everything — 25 cents for a cartridge, $20 for a cap — that it soon got back from the Indian all the big money that it had paid him for skins. The Indian was at the mercy of the trading company, because it had a freight monopoly with its boats and was the sole seller of things which the Indians wanted. Hence the Indians could trade with the company or not at all.

YUKON GOLD

The history of the Yukon country in the epoch of the white man has two periods — before the great gold rush, and after. In 1896 and 1897 the discoveries of gold in large quantities on the Klondike and other creeks of the Yukon system near Dawson City, Canada, created a close rival to the great California gold rush of '49. Tens of thousands of men, knowing little or nothing of the country, rushed to the Klondike by every route that they could find — up the river in boats, over the passes from Lynn Canal, up through British Columbia, across the Canadian plains from Calgary and Edmonton.

Most of these overland hikers could take no more supplies than they could carry on their backs. With unthinking recklessness they went into an unknown wilderness where there were few supplies, where the rivers freeze early and the winter is terribly cold. Many perished, as the unequipped must in such a country.

[1] In prewhite-man days the Indian also made much use of moose and caribou as winter sustenance, but he had to hunt for these. The salmon very kindly came to him.

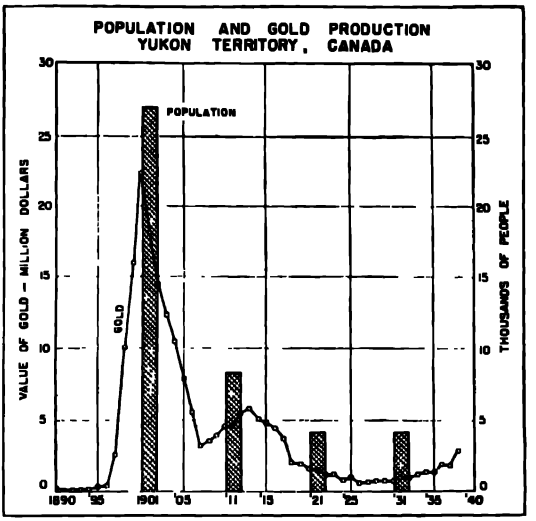


FIG. A. Herein lies the story of the famous Klondike gold rush. Golden sands are good for poetry and quick money, but not to support an enduring population.

The gold was stream gold; to get it no company need be formed, but the solitary miner with his pick, shovel, and pan could hunt where he chose. Klondike mining ran a swift course. The stream beds, easily visible, were soon reduced so that output was low. Then placer miners worked the old stream beds and gravel banks. Again the output declined in the Canadian Yukon, but new finds in the Alaska section have kept the total for that territory up near its maximum. The new high price for American gold has boomed production by placers and dredges — a shift from the miner with pick, shovel, and pan to the corporation with big machinery. This new high price, combined with wide unemployment, put new stimulus on the solitary worker, and many a small stream was being worked a little in the late 1930's.

Perhaps 1000 prospectors still wander up Alaska valleys and over Alaska hills, hoping to strike it rich. Does not every gambler expect the next deal of cards to bring him aces? Before the advent of the airplane the Alaska prospector led a life of which the labors might be called heroic. Staggering under a great burden of flour and bacon, beans and blankets, tent, ax, pick, frying-pan, and rifle, the prospector toiled on, hunting, digging, hunting, digging. As the days passed by, the scanty food supply diminished and had to be eked out with berries and game; then back he went for more supplies, and out again for more digging.

In the early years of this century such was the life of the Alaska prospector, the man for whom the settled life of town, farm, wife, children, and home had little appeal. His average pay was less than that of a bootblack. He was sustained by the gambler's hope. He called himself a "sourdough" after he had once seen the ice come and go on the Yukon. Before that he was merely a "cheechako," a tenderfoot.

If the lone miner struck it rich, he often took his lucky thousands to Seattle or Chicago or New York and indulged in a swift round of reckless expenditure, then back he went to Alaska to prowl once more in search of gold, a search which had become the whole of life. Tomorrow I may find it. Tomorrow!

There comes a time when the discoveries of the rule-of-thumb, uneducated prospector diminish, and the educated, especially trained man does the prospecting. This change is coming to pass in the Yukon region.

Two factors in recent years have stimulated gold-mining, one making gold more valuable and the other making it more accessible.[2] From 1837 until the advent of the New Deal the Treasury paid $20.67 per fine troy ounce for gold. In 1933 the price was raised, varying from time to time, and on January 31, 1934, the Government's price was definitely set at $35 per ounce. Obviously, the new gold-price policy meant increased profits for gold-miners, and permitted the working of poorer deposits. Second, there have been improvements in mining devices. The advent of the airplane has stimulated gold production. This new mode of transportation has made many deposits far more accessible, thereby increasing the miner's working year. Indeed, the airplane can carry a prospector and his outfit in an afternoon as far as he could go afoot in half a season. Instead of traveling fifty or sixty days out of ninety, he can fly for half a day, work eighty-nine days, and have the plane return for him at an appointed date. The airplane is not only of service to the lonely prospectors who are leaving "civilization" for the interior, but also of great service to the larger mining companies in carrying surprising amounts of heavy machinery and supplies to the big mines that are owned and operated by corporate interests. Great power dredges are now used at places near Fairbanks and Nome to rework the sands that once were panned for gold. Better mining machinery, as well as the airplane, has helped to make gold more accessible.

Mines, especially gold mines, make — while they produce — an enormous per capita trade. With gold, fish, and furs, Alaska at times has had the largest per capita trade of any region under statistical review. Most of the people there produce but one thing and buy everything else, and they need much material for their industries, and much to live on in that land of cold winter, low production of supplies, and high transport cost.

Gold-mining is an industry that takes out and carries away, and save for the gutted forests wrecked by ax and forest fire it scarcely leaves a trace; for after the miner moves on, Yukon shrubbery of willow, aspen, and young spruce covers up the scarred bank and hides the mouth of the abandoned shaft. The population figures for the Canadian territory of Yukon (4200 people in 1931) tell emphatically how poor is gold as the basis of community-building in the Arctic. If the Yukon Basin maintains a large population for long periods, it must depend upon the crops, farm crops.

AGRICULTURE

In some parts of the world the farmer builds up, and stays. Hence it is very natural that those departments of the United States Government most interested in the development of Alaska should have filled the newspaper offices of the United States with copy about the agricultural resources of Alaska. They have given out a great deal too much glowing copy. They have not compared Alaska with its rivals. Therefore they have perhaps pointed out as probabilities things that were only possibilities. It would be

[2] Alaskan gold production in thousands of fine ounces: 1920, 413; 1930, 407; 1932, 433; 1933, 457; 1937, 629. Remember the price change.



FIG. A. A cabbage field at Shungnak on the Kobuk River 25 miles above the Arctic Circle, long. 157° W. If there were just a world market for cabbage at a good price ——. (Courtesy Alaska Experiment Station)

poetic justice (but too cruel) to make these boomers of Alaska live there as farmers.

Agricultural experiment stations have been run for a number of years by the American and Canadian governments. This is good — good, for we need facts, but sometimes bad in the inferences that have been drawn from the facts.

The results at Rampart on the Yukon, and Fairbanks on the Tanana, have been very surprising to people who had thought of Alaska only as a land of snow and ice. The winter snow melts quickly in the long days of spring. Almost continuous sunshine makes plants jump. Peas grow with a rankness rarely found in the United States. Cabbages prosper, beets, radishes, carrots, parsnips, and the whole list of root crops, including potatoes, thrive exceedingly, and they become the chief dependence of the Northern farmer. Wheat, barley, rye, and oats have ripened grain of good quality.

The Canadian government experiment station at Dawson has reported experimental yields of 40, 50, and 60 bushels of wheat per acre, 72, 100, and 105 bushels of oats per acre, and also large yields of turnips and potatoes of excellent quality.[3]

If we may give credence to the estimate of the United States Government for the Alaskan Yukon and of the Canadian Government for the Canadian Yukon, the region has at least 100,000 square miles of land that is suitable

[3] For yields achieved in 1937 by Matanuskan colonists, see footnote 8, page 739.



FIG. 758 A. The reindeer comes to town, indicative of the hybrid culture, nomad and sedentary, Asiatic and American. The map at the end of this chapter and the three pictures you now see suggest that the new Arctic grazing industry is the most likely next phase for the Yukon country. (Courtesy U.S. Biological Survey)

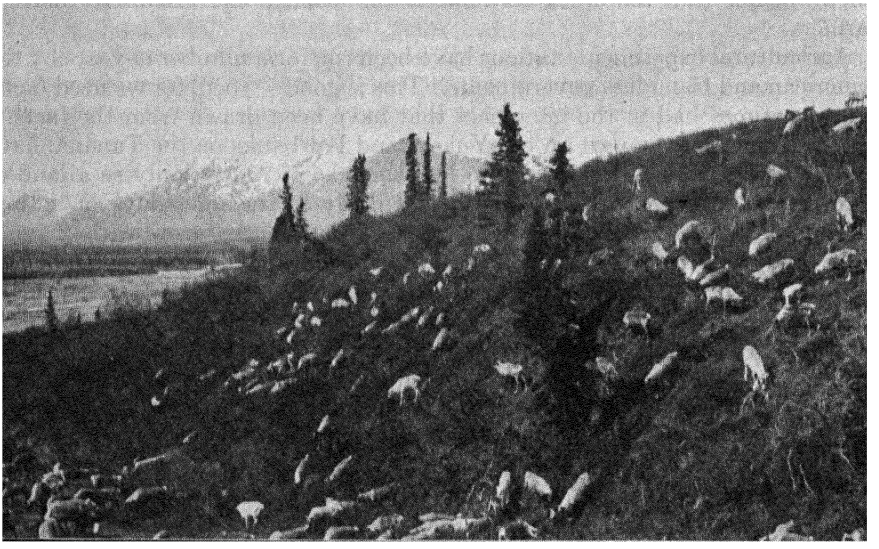


FIG. 758 B. Reindeer grazing on the Alaskan range of scrub forest.
(Courtesy U.S. Biological Survey)



FIG. A. The U.S. Government's experimental herd of musk oxen has a little fright and assumes its traditional military defensive formation, the hollow square. Note the ring of sharp horns pointing out. (Courtesy U.S. Bureau of Biological Survey)

for the plow or for the improved pasture field.[4] Government representatives of the United States, in attempting to appraise Alaska, point out its resemblances to Finland.[5]

The United States Soil Survey states that the soils of the two regions are similar. This may be expected, as soil is dependent upon climatic conditions to an extent not yet generally appreciated. If the Yukon, with 100,000 square miles (64,000,000 acres), is like Finland, it has unexpected possibilities as the home of man. Finland with 77,000,000 acres of forest and moor has only 7,000,000 acres in cultivation or improved meadow, but there are 100,000 farms of less than $7\frac{1}{2}$ acres and 170,000 farms of larger size. The total population is 3,800,000. The Finns are energetic, intelligent, and progressive in science, manufactures, education, government, and athletics. Finland has many surprises for the careful student. Its agricultural experiences may be of great value in working out the newer problems of Alaska if we ever need to work them out.

In considering Finland and Finnish agriculture it should be noted that the livestock is chiefly cattle and the chief agricultural exports are butter, eggs, hides and skins, cheese, and meats.[6]

It is probably true that a future development of agriculture in the Yukon

[4] The National Resources Board (1938) credits Alaska with 65,000 sq. mi. suitable for farming, and 35,000 available for grazing. Most of this is in the Yukon drainage area. Matanuska is but a small patch. The Alaskan peninsula is a claimant for a considerable part of the pasture land.

[5] See the table of temperatures, pages 760–61.

[6] In 1936 the Finns reported: 1,879,000 cattle; 1,023,000 sheep; 459,000 swine; 369,000 horses; 100,000 reindeer; 2,853,000 poultry.

MEAN MONTHLY AND ANNUAL TEMPERATURES

Station		Lat.	Long.	Jan.	Feb.	Mar.	Apr.	May
Oulu	Finland	65	25.5 E	14.4	12.6	18.9	32.9	45.0
Kuopio	Finland	63	27.5 E	14.7	13.5	20.3	34.3	46.9
Tampere	Finland	61.5	24 E	19.2	16.9	23.2	36.3	48.9
Helsinki	Finland	60	25 E	21.7	19.0	24.1	36.3	48.9
Blagoveschensk	Russia	50	127.5 E	−16.6	−4.7	13.6	35.1	48.7
Yakutsk	Russia	62	129.5 E	−45.0	−35.1	−10.7	14.7	40.1
Irkutsk	Russia	52	104 E	−4.9	2.1	16.9	36.3	48.6
Dawson	Canada	64	140 W	−19.2	−11.2	3.5	28.9	45.8
Carcross	Canada	60	134.5W	−3.5	4.2	13.6	29.8	41.2
Fort Yukon	Canada	67.5	145 W	−26.8	−15.0	1.1	20.3	41.9
Tanana	Alaska	65	152 W	−15.8	−4.5	6.0	23.9	44.1
Fairbanks	Alaska	65	147.5W	−15.3	−0.7	9.8	29.3	47.1

would have to be chiefly in dairy products, although seed farming promises more immediate results.[7] Yukon-grown seed would probably be superior to seed that was grown elsewhere.

When the people who boost Alaska compare the Yukon Valley with Finland, they do not point out that Finland is a forest country and that it really lives by its forests. It has more rain than the Yukon, and whereas dairy exports in 1936 were $8,500,000, exports of wood and articles manufactured from wood amounted to $129,200,000. The fact is that the Finnish small farmer has two jobs. He stays home in the summer and attends to his hay, oats, potatoes, turnips, and beets, and in winter he goes off to the woods or the factory while his wife and children feed and milk the cows. He is really a part-time farmer. That host of little farms proves it.

Present evidence seems to indicate that the forest resources of the Yukon Basin are inadequate to duplicate the Finnish example. When you have lost one leg . . . ? What will the Yukon farmer do in the winter, that long cold time when the cold Arctic sun has almost started back to bed before it gets up at nine or ten or eleven o'clock in the morning?[8] That is the real rub in Alaska.

The greatest handicap of all, however, is the location of the Yukon. Finland lies at the very doorstep of densely populated northwestern Europe, which provides a splendid market for Finnish wood and dairy products. The Yukon is a long, long way from any great market. The Pacific Coast cities of the United States have foodstuffs near at hand and, indeed, an abundance for export. Perhaps the future food exports of the Yukon will find their way to the teeming cities of Japan, as that country pursues its industrial path and more Japanese leave the farms to work in factories. Perhaps!

[7] The chances might be better if some enduring institution would start a fifty-year experiment in breeding heavy milking strains of animals native to that climate — reindeer or ovibos (musk ox). Such an experiment would not be very costly in comparison to possible results on so large an area.

[8] Perhaps the Yukon may adopt the old New England custom of bundling.

TEMPERATURES (F.) OF FINNISH, SIBERIAN, ALASKAN, AND CANADIAN STATIONS

June	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Year*
56.1°	61.3°	56.8°	46.9°	36.1°	26.6°	18.1°	35.6°
57.0	62.1	57.4	47.6	37.8	28.0	19.2	36.9
58.6	62.2	58.5	49.6	40.3	31.6	23.7	39.2
58.6	62.8	59.9	51.1	41.9	33.8	26.4	40.5
64.4	70.0	65.8	52.3	34.5	7.9	− 11.7	29.8
56.2	65.8	58.0	42.1	15.6	− 21.6	− 40.9	11.8
58.5	65.8	61.2	49.1	33.8	12.9	.7	31.8
56.0	59.3	53.6	42.4	24.8	0.6	− 11.7	22.9
50.2	54.4	51.3	45.4	33.5	17.4	4.2	29.2
58.5	62.7	54.0	39.9	18.8	− 10.8	− 19.2	18.9
57.3	58.9	53.3	40.0	22.0	− 1.9	− 11.3	22.7
58.5	60.8	54.9	43.0	25.3	1.1	− 7.1	25.7

At Fairbanks is the University of Alaska, with its Agricultural College and School of Mines, and an agricultural experiment station. Fairbanks is a terminus of the main Alaska R.R. and, with Tanana, is the center of what was expected to be an agricultural region. There were 289 farm-homestead entries (53,810 acres) there prior to December 31, 1934. Seventy-three of them had been abandoned at that date. Not more than 40 farms, however, were in actual operation, with most of the land being devoted to cereals, potatoes, and pasture.

Living-costs at Fairbanks are still high. In 1937 bread was selling at about 20 cents a loaf, butter at 55 cents a pound, eggs at 50 cents a dozen, fresh milk at 25 cents a quart, bacon at 50 cents a pound, beef at from 35 to 55 cents a pound, and pork at from 40 to 50 cents a pound. Imported baled timothy hay sold at $75 a ton, and local unbaled hay brought from $30 to $40 a ton — all of which tells a tale of what Alaska farming is not as yet.

When one thinks of producing in Alaska for export in competition with other parts of the world, it seems plain that for the present we should regard the Yukon as a reserve of low-quality farm land, to be used by future generations when North America approaches Europe's present fullness of development of agricultural resources. Most of the Yukon may become a ranch for reindeer herds in a few years. Open-range pasture of reindeer is a natural first step, and it promises to be a long wait before there is any other large land development.

GOVERNMENT AND MONOPOLY

So far as Alaska land is concerned, this generation of men has three tasks: (1) to prevent destruction, which means to keep out forest fires, and not to overpasture; (2) to prevent the establishment of unwise private ownership of a realm most of which still belongs to the Government, (3) to utilize the resources wisely.

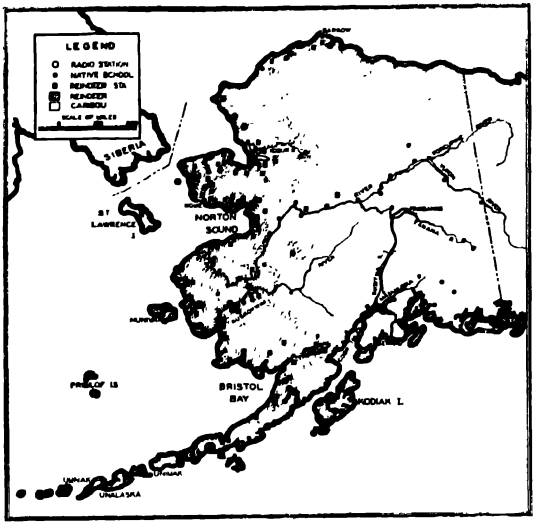


FIG. A. For the present, at least, the reindeer industry is being limited as shown by this map, the rest of the territory being left as range for the wild caribou. The U.S. Government is doing pretty well by the Alaskan native. It recently bought the reindeer of white men so that this industry may be a native industry only. With the start that has been made we may expect Indian and Eskimo to develop a hybrid culture of Laplander nomadism and frontier United States. (Courtesy U.S. Dept Interior, Office of Indian Affairs)

Private ownership (monopoly?) is out for water power, forests, oil, coal and other minerals, and ranch lands. The strong hand of Grab is not discriminating. It takes the earth. The plan to monopolize is constant, insidious, bipartisan, and farseeing. The Plunderbund strives for monopoly now or in the future. It is a most unequal fight. The Plunderbund never sleeps, yet the citizens of the democracy are not sitting up at night as much as they should be to keep waste and monopoly away from the resources in Alaska and elsewhere which they, their children, and their children's children will need. No educated person should ever forget the criminal wastes of oil and gas now going on in the United States, because our policy with regard to these most precious resources is on the bovine level of intelligence.

Alaska, so far away, so little known, is a particularly easy mark of the Plunderbund, which strives through all the maneuvers known to politics to get into office its bureau chief who administers the law; into Congress its man who makes the law; into the Cabinet the proper boss who has power over the resources in the care of the Government. And since government is the only way we have of doing an ever increasing proportion of our economic work, the citizen has no escape from the necessity of eternal vigilance or the alternative of resource folly.

Alaska's most pressing problem, however, is the problem that results from our present lack of knowledge of just what its resources are, and what they are good for at this time, with the technology and the markets available, and present needs. When such knowledge gets into the files at Washington, there is the question of how to get it to the right citizens in its true proportions. Uncle Sam's record as a real-estate agent leaves much to be desired.[9]

We had better regard the Yukon Valley as a resource for some distant future. In the meantime, it is a place to pasture reindeer, dig metals, and keep the agricultural experiment stations going so that we may learn.

[9] The Yukon, like all Alaska, suffers from the vicious economic cycle that causes underpopulation. See page 747.

Chapter 38. THE ARCTIC PASTURES

THE MYTH AND THE FACT



NORTHWARD beyond the tree limit is the land of endless cold, of eternal snow and ice—at least according to popular belief, and some textbooks still in use. But this story of eternal ice is only an interesting myth.[1] The facts of climate are quite different. The Arctic winter is indeed long, dark, cold, and snowy, but the actual number of inches of snowfall is often less than in northern Virginia, for example. The cold, therefore dry, air of the Arctic regions cannot produce much rainfall; in many places it is only 10 inches, or even less. The precipitation being light, the snow does not get very deep, and strong winds often clear the snow off large areas. Believers in the snow myth seem never to think of the intense heat of the Arctic summer, when the sun does double duty by shining also at night. At 60° N., the longest day has eighteen and a half hours of sunshine. At $66\frac{2}{3}$° N., at the Arctic Circle, the longest day has twenty-four hours of sunshine. At 70° north there are seventy-three days with continuous sunshine, unbroken save by clouds. At the North Pole, there are six months of continuous sunshine. Several hundred thousand square miles of Arctic America have more than thirty days of continuous sun, and this is preceded and followed by long periods of continuous daylight. Daylight has been defined as beginning when the sun rises to within 18° of the horizon and as closing when the sun sinks to 18° below the horizon. On this basis there is a touch of daylight every day at latitude 84°. It should be remembered also that many of the hours of sunshine are accompanied by clouds, especially along the coasts.

These long hours of sunshine soon melt the small accumulation of winter snow, so that all Arctic America outside of Greenland and a few high mountains is as snowless in summer as the State of Maine.

In the weeks of endless Arctic daylight the inhabitant does not know when to go to bed, save when he is sleepy, but the plants, since they do not sleep, get the full benefit of heat and light. Continuous light seems to have a kind of cumulative effect upon vegetation. Experiments with the radish show that if it is given seven hours of sunshine per day, it will extend its period of growth to a year. Give it twenty-two hours of sunshine per day, and it fairly leaps to maturity, ripening seed in a few days. Arctic plants, like those on the Alps and other high mountains, seize the fleeting opportunities

[1] For its origin see J. Russell Smith, "The Reindeer Industry in America — A Study of a New Industry, and Also of the Origins of Geographic Error," *Scottish Geographical Magazine*, March, 1924.



FIG. A. Summer on the tundra. Portaging a canoe from lake to lake in the Thelon Game Sanctuary. (Courtesy Dept of Mines and Resources, Northwest Territories)

for life by very rapid growth. Almost instantly after the snow melts they burst into leaf, bud, flower, and seed. Some have stored up energy in bulbous roots for a rush of growth such as we have all witnessed in crocuses, daffodils, bloodroot, and other quick spring bloomers of lower latitudes.

The wealth of plant life on the sunny Arctic plain is indeed astonishing to those who have always believed the continuous-snow myth. Botanists report at least 700 varieties of flowering plants. The Arctic plains are gay in places with poppies, daisies, buttercups, and many other showy flowers of bright color. The Arctic has 300 lichens, 200 mosses, and edible berries in great profusion.[2]

THE CARIBOU AND OTHER GAME

Wild animals are as much at home as the plants. The chief land animal of economic interest to man is the caribou, or wild reindeer. The caribou lives on the scrubby woodlands, but it seems to be especially at home on

[2] One of the industrial bulletins of the United States Government, the U.S. Dept Agr., *Bulletin* 1083, *The Reindeer in Alaska*, thoroughly explodes the Arctic myth. It gives "A List of the Range Forage Plants, Observed and Collected on the Reindeer Ranches of Alaska" (in the Arctic tundra). That list consists of:

17	grasses (3 kinds of blue grass)
25	grasslike plants (many sedges)
215	herbaceous plants
30	browse plants (woody — birch, willow, etc.)
9	ferns and fern allies
43	mosses
33	lichens
3	fungi
375	species of forage plants

The vegetation list from a botanist's sojourn in Greenland is even more impressive. It included the famous bluegrass of Kentucky, growing at Etah, western Greenland, 700 miles north of the Arctic Circle.

the tundra. Many migrate, wintering in woodland, summering in the north far beyond the limit of trees.[3]

The adjustment of the caribou to the land is one of the myriad responses of organism to environment. Its hair has air cells in it. This makes the pelt much warmer than most skins. A good coat of this thick hair makes a blizzard slide off a caribou as water slides off a duck's back. It has long, flat, sharp hoofs that are excellent snowshoes. When it comes to a snowbank, it can use its hoofs for snow shovels, and with them it can dig to the bottom of the snowbank to get grass. Caribou have been seen with only the tail showing above the top of the snow as they dug and ate. The caribou is not afraid to travel on ice if it is not glassy-smooth, so when the Arctic Ocean freezes it goes from island to island of the Arctic Archipelago north of the Canadian mainland. It is a good swimmer and its waterproof coat keeps it warm and the air cells buoy it while it swims for 2 or 3 miles in the icy sea. Yukon steamers have had to stop while multitudes of caribou in migration swam across their course.

Herds of caribou congregate into migrating bands in numbers that would create an international sensation if they should appear on the Great Plains. The late Maxwell Graham, Chief of the Wild Life Division at Ottawa, reported in a letter:

> The greatest menace to reindeer ranching is the presence on the ground of millions of small wild American reindeer or caribou. One of the reasons for canceling the lease granted to the North American Reindeer Company some years ago was that the lease on the mainland of the Northwest Territories granted this concern was liable, any year, to be overrun by countless caribou who would sweep away in their midst the few hundreds or even thousands of domesticated or semi-domesticated European reindeer to be placed thereon.[4]

Intensive hunting, however, has greatly reduced the number of caribou in recent years. In 1919 it was estimated that as many as 20,000,000 caribou, or even more, were roaming the Canadian Northland, but by 1930 the number had declined so far that some estimates placed the number at 3,000,000 or less. Such is the exterminating power of the rifle!

Following the herds of caribou stalks the wolf. When old age or carelessness causes a caribou to fall behind the herd, the wolf pack eats. Almost as widely distributed as the caribou and the wolf is the rabbit, with a white coat in winter to hide it on the snow and a brown coat in summer to hide it on the ground. The rabbit is followed by its Nemesis, the Arctic fox.

Perhaps the musk ox is the most remarkable animal in this astonishing land. It has a habit of defense that is excellent in combat with its natural

[3] In many parts of the Yukon country, chiefly those areas where there is tree growth, the moose renders greater service to the native than does the caribou. They are not so numerous, but they don't migrate, nor do they stay in great bands. Therefore, strange to say, it is easier to find one moose than it is to find 10,000 caribou. Moreover, the moose has more meat per animal.

[4] Exact descriptions of great herds of caribou may be seen in a report, "Reindeer and Muskox," Canada Dept of the Interior, pp. 30–31; also Canada Senate, Minutes of Evidence, *Report of Special Commission on Navigability and Fishery Resources of Hudson Bay and Straits;* testimony of Captain J. E. Bernier; also V. Stefansson, before a committee of the Canadian Parliament, 1919.

enemies but fatal to the musk ox when man appears. Musk oxen were early inventors of the famous military hollow square. When danger, namely, the wolf or the bear, appears, the musk-ox herd forms a circle, standing with heads out. Their sharp horns are usually an effective defense. When man appears, the herd forms for defense, standing there depending upon their horns. With his rifle man often kills the whole herd. The Eskimo or the Indian can rarely resist such an opportunity for slaughter. Thus the musk ox has been exterminated over large areas, even in the islands far to the north of the mainland. Fortunately a few thousand remain in Greenland, the archipelagoes to the west of it, and in northern Canada — a precious seed for domestication. The musk ox is a giver of milk, a close cousin to our cow, and a good beef animal; it has in addition an annual fleece of 10 or 15 pounds of wool. This wool has been tested and found to be good for making cloth. Vilhjalmur Stefansson, the chief literary protagonist of the utilization of the Arctic, prefers to call this animal ovibos, because he thinks the market will not respond well to "musk-ox meat," because "musk" like "rat" does not sound appetizing, although it tells nothing about the meat. The flesh of the ovibos is good food.

THE GRAZING INDUSTRY

If due consideration be given to environmental facts, especially the facts of location, climate, and vegetation, it seems reasonably clear that erelong this vast Northern tundra will witness a considerable development of the grazing industry. In the best of Alaska and in the Mackenzie Valley agriculture for years will certainly be confined to the raising of short-season crops for local consumption, but the Arctic pastures may well become the Great Plains of the North, supporting millions of livestock.

One peculiar environmental asset is the fact that most of the tundra is underlain by perennially frozen ground, and as it thaws during summer weather the moisture supply for pasture is unique in its unfailing quality. Unless man wastes this natural resource by overgrazing, the supply of vegetation is therefore dependable. When one considers the devastating effect of drought and dust in dry-land pastures, it will be seen that here is an element of no mean importance for the dependable support of a grazing industry.

Already the transition to a pastoral economy is under way, and the time approaches when "civilized man" will no longer regard the Eskimos as "God's frozen children" eking out an existence by fishing and hunting, but rather as the "shepherds of the Northland" driving their herds from pasture to pasture. There is a possibility, perhaps a probability, that several animals will compete for the use of the pasture: the native caribou (wild reindeer), the Siberian reindeer, the ovibos (musk ox), the American buffalo (bison), and the Tibetan yak. In the Alaskan portion of the tundra the Siberian reindeer now has a strong lead in this pastoral Derby.[5]

In 1890 some Eskimos on the western coast of Alaska starved to death, for the coming of the white man and the use of the rifle had depleted the supply

[5] See U.S. Dept Agr., *Raising Reindeer in Alaska, Miscellaneous Publication* 207, 1934.

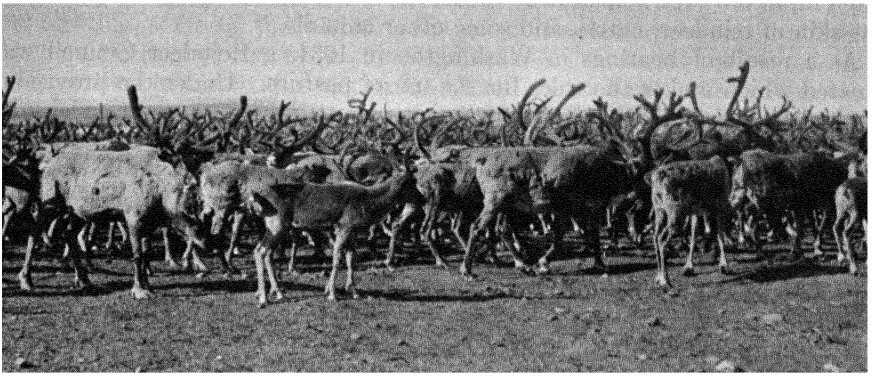


FIG. A. The migration of industry. The Asiatic reindeer introduced by Mr. Sheldon Jackson in the 1890's sojourned for forty years in the wilderness of Alaska and then at the invitation of the Canadian Government, and after several years of heroic labor in one of the greatest livestock treks in history, the Canadian Government's trial herd made the journey from the Bering seacoast to the eastern side of the Mackenzie River. This is a great story we haven't space to tell. The herd here is in a corral at Richards Island, Mackenzie delta. At Kittigazuit, on the Mackenzie delta, a group of Laplanders are keeping reindeer school for the native American subjects of His Imperial Majesty King George VI. (Courtesy Dept of Mines and Resources, Northwest Territories)

of game. Dr. Sheldon Jackson, superintendent of schools in Alaska, implored Congress to appropriate some money to enable him to introduce the reindeer industry. He failed to get governmental funds the first year, but he raised $2000 by private subscription. He went over to Siberia and brought back 10 reindeer in 1891. Congress then came to the rescue, and he imported 171 in 1892. Between 1891 and 1902, 1280 reindeer were carried across the Bering Sea and established on the Seward Peninsula. Laplanders were brought in to teach the Eskimos the principles and practices of reindeer management. The experiment has succeeded beyond expectation, and it was estimated that in 1934 Alaskan herds contained about 1,000,000 reindeer, which were scattered from Point Barrow on the north to Kodiak Island on the south and from the coastal belt on the Bering Sea and the Arctic Ocean to Ophir 200 miles east of the mouth of the Yukon. The heaviest concentration of reindeer is still to be found on the Seward Peninsula.

Reindeer-raising is now an established industry, and Eskimos own more than two-thirds of the stock. Some of them have made a quick change from hunters to pastoralists, and are doing it on the Old World social basis of the family unit, not like the capitalistic sheepherders of western United States who rove alone with their flocks.

Several cold-storage plants are in operation at points along the coast, and the meat is shipped to the United States under refrigeration. In 1930 about 2,500,000 lbs. of reindeer meat and 20,000 hides were exported. Reindeer hides make fine leather for the manufacture of kid gloves and leather jackets, and they are used locally for the making of winter garments, boots, parkas, mittens, leggings, trousers, and sleeping-bags. Unfortunately, the hides are

often injured by the holes left by the larvae of the warble fly, which live under the skin of reindeer, cattle, and some other animals.

As a result of hearings in Washington in 1931, a Reindeer Council was created which makes the rules for the use of pasture. Under the provisions of the Alaskan Grazing Act reindeer-owners must secure a permit or lease to use the range. Studies conducted by the Reindeer Experiment Station show that 33 acres is the average minimum year-long grazing area needed to support a reindeer, and that the wise reindeer-owner will divide his share of the range into four parts, one for each of the four seasons of the year. It has also been found that reindeer and caribou cannot exist together, and that it would be well to have certain areas definitely recognized as caribou range and to exclude the reindeer therefrom. Recent legislation has authorized the Government to buy reindeer from white men so as to make reindeer-raising a strictly native industry.

It is estimated that there are 350,000 square miles of grazing land in Alaska, of which 200,000 square miles are especially suited to reindeer. It is felt that this land should ultimately support approximately 4,000,000 reindeer, resulting in the production of about 1,000,000 hides and millions of pounds of meat annually. In March, 1935, the Lomen Reindeer Company at Nome completed the delivery of 2500 reindeer to the Canadian Reindeer Station and school at Kittigazuit on the shore of the Arctic Ocean just east of the Mackenzie River. The Canadian Government hopes to duplicate in Canada the successful American experiment, and newspaper reports in 1940 gave a record of successful progress. The first herd had doubled its numbers in three years, in addition to furnishing food and clothing for the herders and meat for others.

At one time the caribou roamed the tundra and thin woodlands from Bering Sea to Newfoundland, but in recent decades the number of caribou has declined greatly. Along the Bering Sea and the Arctic Ocean, where reindeer-raising has been developed, the caribou has practically disappeared. In central and eastern Alaska, however, there are thriving herds of caribou, and at present this section of the territory is set aside as caribou range. The largest numbers, however, are in northern Canada.

Latecomers to the Arctic pastures are the American buffalo and the yak, which hails from the cold, bleak plateau of Tibet. For some years a few yaks were kept at the Alaska Experiment Station at Fairbanks, and were later transferred to Matanuska. The experimentation with yak-raising was discontinued in 1932. The yak has long been domesticated in central Asia, is a good beef animal, and may some day do well in Alaska. A few years ago a small herd of bison (buffalo) was imported from Montana. About 200 bison are now grazing in the Big Delta country near McCarty, southeast of Fairbanks. On the other hand, the ovibos is an old-timer, a native son of the region. It used to roam the tundra from Hudson Bay to the Bering Sea and to the northernmost tip of Greenland. Unfortunately the ovibos has been exterminated over large areas. The small government herd on Nunivak Island (imported from eastern Greenland) is reported to be thriving.

While the reindeer has achieved the greatest commercial eminence in the

Northland in recent years, it is clear that it has potential rivals. It is possible that some of the varied types of environment between the Great Northern Forest and the Arctic shores will be best suited to the reindeer, some to the ovibos, some to the yak, some to the bison, and some to the wild reindeer (caribou).

There can be but little doubt that it will be more difficult to base an industry on the ovibos, the yak, or the bison than it has been to establish the reindeer industry. The reindeer industry was a simple transplantation of an animal that had been domesticated for a thousand years and had lived the while in an environment like that of northern North America. If the United States Biological Survey sticks to its experiments with the new animals for a few decades, something may happen, but there is no guessing what it will be.

BIRDS AND INSECTS

The summer thaws the tundra only a foot or two. The Arctic winter freezes it again. Because of the underlying mass of frozen earth (earth and ice), the soil in summer is always moist. There are many little pools of water, and there are many lakes and streams, furnishing breeding-places for countless millions of mosquitoes. Water, mosquitoes, and lush vegetation make the tundra a popular summer resort for waterfowl, ducks, geese, and loons, which eat mosquitoes and other insects and water plants, and raise their young in an almost uninhabited solitude. The summer haze of mosquitoes is to my mind an effective barrier to satisfactory life here, but it is true that man endures mosquitoes in many lands.[6]

Migratory waterfowl play an important part in the life of some of the Eskimos. They catch them in nets in the summer, dig holes in the frozen ground, bury them, cover them with ice, and keep them for winter, exactly as they store walrus meat in similar caches. Birds' eggs are also frozen solid and kept in the same way. This food supply flying in from a distant land is an interesting compensation by a rather hostile nature. The eggs are a good source of vitamins.

[6] "It is a wonderful place, this roof of Labrador. Ridge on ridge, some of it of considerable height, roll away seemingly to the world's end. In the valleys and cups of the hills lie thousands of nameless lakes. The winds, during the greater part of the year, rage over it. It is sheer desolation, abysmal and chaotic. Of dominant notes there are but two, the ivory-colored reindeer moss and the dark Laurentian stone. . . .

"While we were fishing the mosquitoes swarmed over us, nor as the sun rose higher did it bring relief from, but rather a reinforcement to, the hosts of Beelzebub, the Lord of Flies. We had grown used to them in the valley of the Fraser, and suffered as we then believed almost to the limit of endurance, but we had buoyed ourselves up with the hope that the wind and the chill of the high ground would rid us of the bloodthirsty battalions. Far from it. We soon discovered that the mosquitoes of the river valleys were but sluggish and incompetent as compared with the armies of these hardy mountaineers, whose vanguard stabbed us with red-hot needles sent well home. As to their numbers, I am hopeless of giving any idea of them. Suffice it to say that when Hardy put his military blanket out to air, phalanxes three or four deep settled upon it, until its color changed from brown to grey — a seething and loathsome mass of insects; and presently, as we moved about, above each of us rolled a pillar of mosquitoes, revolving and buzzing, and thousands strong. . . . The whole of the land-surface along the George River, near Indian House Lake, is seamed with the old trails of caribou that have pursued their age-long wanderings in this desolate region." — H. Hesketh Prichard, *Through Trackless Labrador.*

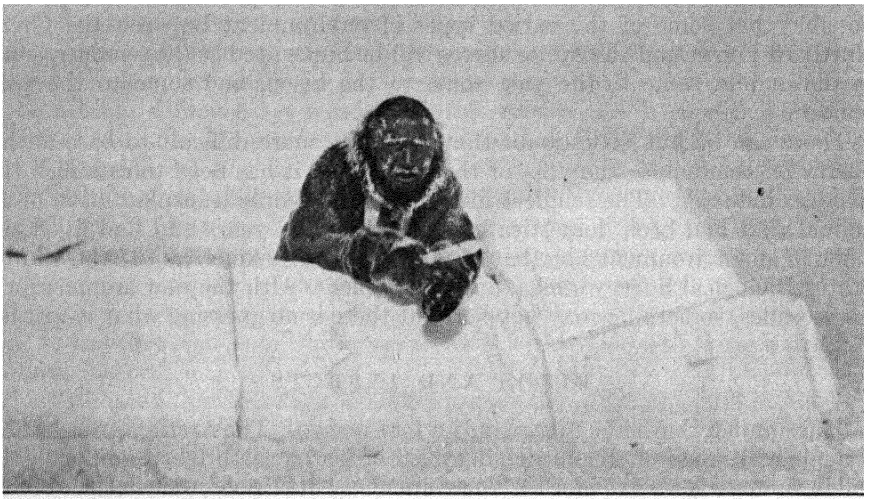


FIG. A. On a pleasant spring day in April, Ihpuakhuak rests a bit while building himself an igloo on the shores of Coronation Gulf in the Northwest Territories. (Courtesy Dept of Mines and Resources, Northwest Territories)

THE ESKIMO

The Eskimos have inhabited Arctic America for an unknown period. They live chiefly along the shores. The caribou has not made a satisfactory basis for life inland, because it is a migrant and a rover. The fact that caribou congregate in millions means that, for the time, large areas are without caribou. Therefore they are too uncertain for man's dependence. The sea is more dependable, with fish, seal, and the mighty walrus, whose huge carcass furnishes hundreds of pounds of edible meat and a splendid thick skin. The seal is to the Eskimo more than corn is to the Appalachian mountaineer, or the coconut palm to the South Sea Islander. Its flesh, both lean and fat, is food. In the cold winter a strip of seal blubber is a choice morsel to people who need much fat food. Surplus fat serves as fuel in the little lamp which also serves as stove. Sealskin makes clothing, tent, and bucket; it serves to cover the framework of the kayak, the Eskimo boat, which is one of the triumphs of mankind. If wood is not obtainable, the framework of the boat is made of walrus bones and whalebone, tied together with sinew. Over the frame watertight sealskin is sewed with sinew. The kayak carries one man. He sits in the boat with the bottom of his outer shirt, made of seal gut, tied around the opening of the boat. Thus man and boat are bound together and both are watertight. If the boat upsets, the operator can right it again and they can go on. What other race has made such a boat, and what other race has made one of such inhospitable materials? Eskimos also have larger boats for several persons. Sealskin is used here too for covering the framework. The verdict of the explorers is that they have no suggestions for improving Eskimo tackle with his materials.

The seals also furnish food for the dog, or husky, which is the only domestic animal the Eskimo has. The dog is the assistant in hunting. It is the draft animal and pulls the sled on winter journeys, bringing in the seal meat and walrus meat from distant places. Dog-harnessing in Alaska is in pairs, horse-fashion, since white men drive their dogs between trees in the Yukon and the Canadian forests. In treeless Greenland each dog has its own rope, and the team is spread out fanwise in front of the driver. The dogs are so attached to the sled that in time of danger a single jerk of a thong releases every dog.



FIG. A. Haiokok of the Copper Eskimos, wearing the complete native costume that is fast disappearing. Coronation Gulf, Northwest Territories. Mr. Sears Roebuck of the United States, friend of the frontiersman, and his Canadian cousin Mr. Hudson's Bay Company, are well-known heroes in surprising places. (Courtesy Dept of Mines and Resources, Northwest Territories)

The Eskimo snow house has been exploited for more than it is worth. Stefansson says that not more than one-tenth of the Eskimos live in snow houses. They usually prefer the stone hut, chinked with sods, or better yet, a structure made chiefly of driftwood. However, the snow house is a very efficient building, especially useful as an overnight camp or a semi-permanent dwelling when the family travels. Arctic snow is not loose and fluffy, like that of middle latitudes, but more like fine particles of ice. It sticks together, and so can be cut into chunks like bricks. The Eskimo housebuilder sets these chunks in a circle, on edge and leaning against each other arch-fashion. A little chinking with snow fills the cracks. A short time after a fire is made, the interior thaws a little, and the house starts to become a structure of solid ice. The igloo (as this type of house is called) in time may become so strong by solidifying that a man or even a bear can walk across the top of it without breaking through. Stefansson reports such an experience. The unpleasantness of dropping water is sometimes avoided by having a layer of skin under the snow top.

The igloo entrance is through a long tunnel. If possible, the tunnel is

made to ascend. This, aided by a fur curtain, keeps out cold, so that a small amount of fire, supplementing the warmth of human bodies in the small space, makes the temperature inside the igloo sometimes 80° or 90° F. The people are naked to the waist and sit perspiring, with a layer of ice and snow between them and 40° below zero.

In summer the Eskimo often takes a trip inland to hunt caribou and to pick berries, which are dried for winter use. This is also the season to catch waterfowl and hunt birds' eggs.

When we consider our sensations on gloomy, cloudy days, especially on the second day or third day when lights must be lit, we can begin to imagine the feeling of the Eskimo as days with a half-hour of sunshine pass into the days with no sunshine and those when there is only the faintest twilight. How he welcomes the returning sunshine! It is the signal for the greatest excitement and celebration of the year, although it means a busy season of much work after the dark vacation time of loafing and visiting.

THE ISOLATION OF THE CENTRAL TUNDRA

The Arctic Sea in and around the Arctic islands, north of the mainland of North America, is frozen or so full of floating ice as to be virtually impassable. One or two ships have worked their way through it in the course of two or three years, but this achievement of a northwest passage, which had been the object of mariners in the days of Columbus and all through the era of exploration, was first accomplished by Amundsen, the Norwegian, in 1906–07. This shows the difficulty of access to much of this country, save by an overland journey. A few years ago, when the United States Government imported some ovibos from eastern Greenland to start a herd in Alaska, the animals were shipped by steamer to New York, thence by rail to Seattle, by steamer to Seward, and finally by the Alaskan R.R. to Fairbanks. The long trip was made successfully. Later they were shipped to Nunivak Island, and it is reported that the musk oxen are doing well in their Alaskan home and that their number is increasing.

GREENLAND

With an area estimated at 1,250,000 square miles, Greenland is the world's largest island, but its interior is covered with an icecap, averaging 1000 feet deep, that is unfit for permanent human habitation. The coastal fringe, not more than one-tenth of the island's area, supports vegetation, and this narrow rim of coast line and offshore islands may be properly included in the region which we call "the tundra." Along the southern corner of Greenland, south of about 68° N., are bushes and shrubs, with willows and birch predominant, in addition to grasses, flowers, mosses, lichens, and heath. As one follows the shore line northward, the "trees" become dwarfed, especially the birches, and the vegetation shades into small willow copses, with infrequent and small bushes coupled with a dominance of lichens, grasses, mosses, and heath. Farther north the minuscule trees disappear entirely, and then the shrubs give way. Around the northern edge of the island only low forms of Arctic

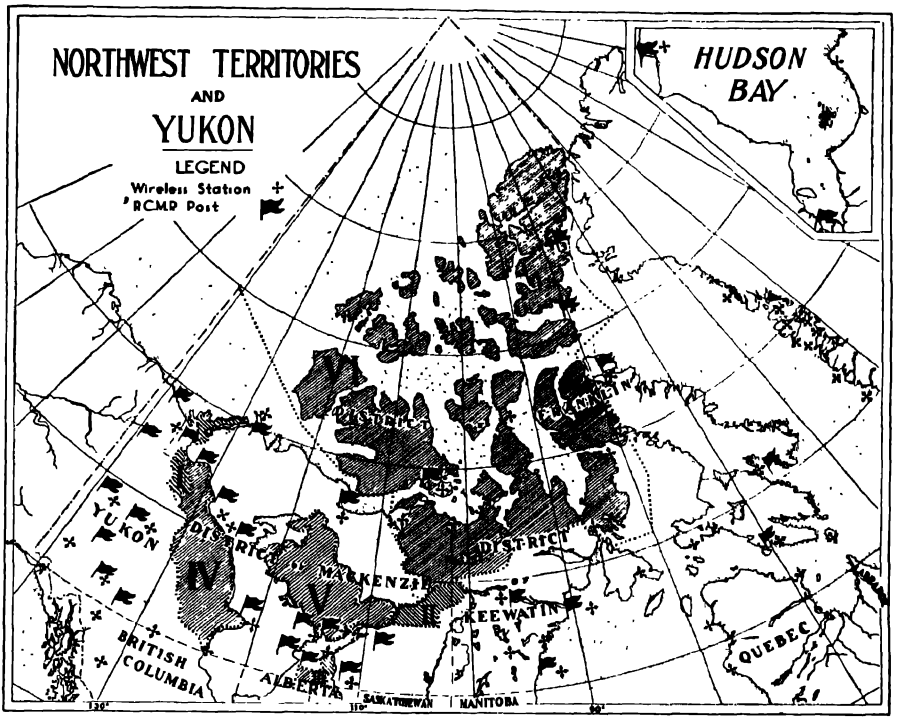


FIG. A. Canada gives the native man and beast a chance. I. Peel River Preserve, 7300 sq. mi. II. Thelon Game Sanctuary, 15,000 sq. mi. III. Woods Buffalo Park, 17,300 sq. mi. IV. Mackenzie Mountain Preserve, 69,440 sq. mi. V. Yellow Knife Preserve, 70,000 sq. mi. VI. Arctic Islands Preserve, 493,000 sq. mi.

In Numbers I, IV, V, and VI only native-born persons leading the lives of natives may hunt.

Number III has several thousand bison, which are allowed to go native.

Number II has the only important herd of musk oxen on the mainland, and no hunting by anyone of any animal is allowed except by special permission, to be granted only under exceptional circumstances.

The political maps show this area as British Empire red, but this map shows that there are but four stations of the Royal Canadian mounted police in 493,000 sq. mi. (Courtesy Canada, Dept of Mines and Resources, Lands, Parks and Forests Branch)

plants can exist in restricted and protected areas — grasses, mosses, and lichens. Thus there was some justification for the early Norsemen's calling this Arctic island "Greenland" when they first touched the southern shores in 996 A.D., although most of us today would say that Greenland and Iceland are geographic misnomers.

Eric the Red and his band of hardy Norsemen were the first Europeans known to settle in Greenland. It is interesting to note that the first pioneers were agriculturalists who settled on the most favorable part of the island, the southwestern portion between Julianehaab and Godthaab.[7] Settlement

[7] See Herman R. Friis, "Greenland: A Productive Arctic Colony," *Economic Geography*, January, 1937, pp. 75–92. This interesting article includes a series of excellent maps, with one on natural vegetation (see Figs. 778 A and 779 A).

was not confined to one or two fiords, but was spread out as farms or groups of farms on the flat, more fertile land at or near the heads of the deep, well-protected fiords and on the gently undulating uplands that slope away from the fiord walls. In Norwegian fashion, a farmstead often included separate areas of upland fields devoted to hay and forage crops that made possible the maintenance of livestock. Some attempt was made to manure the tun, or home field, and to raise garden vegetables. In view of the paucity of trees, buildings had to be constructed of stone with a mortar of earth and grass turf, most of them being low and square in shape. Here was the basis for the first European colonies in North America long before Columbus was born and centuries before the first cargo of Pilgrim ancestors arrived at Plymouth Rock. It is said that fourteen boats brought the first Norse colonists from Iceland to Greenland.

Other settlers followed Eric the Red, and there were soon more than 200 farms on the Greenland coast. For several centuries following there was active trade between Greenland, Iceland, and Norway. Then European disturbances caused loss of interest in Greenland, and in the year 1410 the last ship sailed for Europe. The colony was all but forgotten, and when it was revisited by the explorers of the seventeenth century, no trace of Norse settlers was found. The people seemed all to be Eskimos. There were legends of massacre, but our knowledge of eugenics gives good support to the theory that the Norse had disappeared by intermarriage. Cultural and legendary evidence supports this theory.

When white man in the modern era first reached Etah, latitude 78° N. on the west coast of Greenland, they found 700 Eskimos who called themselves "the people" and were greatly amazed to find that there were any other human beings in the world. In 1720 Greenland was effectively rediscovered by the arrival of a Danish missionary, and now these people are "civilized" and Christianized. There are some 400 Danes in residence, and about 16,000 natives. Rasmussen, one of the most famous and one of the most renowned scholars of Eskimo lore, is the son of a Danish missionary and an Eskimo mother.

The trade of Greenland has been a monopoly of the Danish Crown since 1776, a friendly monopoly, whose effort is to keep alcohol and disease and exploitation away from a native race. Godthaab, the capital, has only 1300 inhabitants. More than 200 small settlements, or *colonis*, dot the west coast of Greenland, while there are less than a dozen on the colder east coast. Many of these *colonis* are merely trading outposts and are occupied only part of the year. More than three-fourths of these settlements have a population of less than 70 people, the largest village, Julianehaab, having only 450 inhabitants. Only a few of the settlements are permanently inhabited by the Danes. Each *coloni* has a superintendent responsible to the inspector for his district, for Greenland is divided into two districts for governmental purposes. There is also usually a clergyman in the *coloni*, and sometimes a doctor or a teacher. There are gardens as far north as latitude 70°, where with care the cold-land farmers can grow good crops of broccoli, spinach, rhubarb, lettuce, carrots, and turnips. The natives live in the usual Eskimo

house of stones and turf, although the more prosperous are now building houses of wood, which must be imported, since there is no tree in Greenland taller than the few rare dwarf willows and birches, no higher than a man. While cultivation of the soil is restricted to garden crops, animal husbandry is being fostered. In 1929 the natives owned some 3000 Icelandic sheep, 700 goats, and about 70 head of horned cattle. Fishing and hunting, however, as in the days of yore, remain the principal means of subsistence.[8]

MINERALS

The Arctic tundra *may* become a land where there are cities, based not upon reindeer ranches, but upon minerals. Useful minerals are found in many geologic formations here, but the experience in the areas near the Great Lakes suggests high potential value for the old formations that have already yielded so much. Several hundred thousand square miles of old Archean rocks in the Great Northern Forest and the tundra region may be expected to produce much metal some day; there is no telling when or what. The copper that the Indians find and use is, however, suggestive of one great need that may be supplied from this lone and little-known land. In 1924 Donald B. MacMillan reported finding seams of coal 25 feet thick in Ellesmere Land within 9° of the Pole, and Vilhjalmur Stefansson reports that nearly all of the larger islands of northern Canada have large deposits of coal. There is much good coal in Alaska,[9] and traces of oil there and in the Mackenzie Valley. On the other hand, scientific investigation has pretty well exploded the idea that Greenland is rich in profitable mineral resources.[10] Greenland has the world's largest deposits of cryolite, which is used in aluminum production, but the voyage of one ship a year is adequate to handle its cryolite exports.

The chief point to emphasize in connection with minerals in northern North America is this: It is a vast land but little explored, with suggestions of great mineral wealth. When one considers the fact that an important iron-ore deposit has been discovered in Great Britain since the year 1900, it becomes evident that we really know but little as yet about this vast region lying between the Bering Sea, the coast of Labrador, the Arctic Ocean, and Lake Superior. Our knowledge is hampered by difficulty of access, by the mussing up of the surface by glacial action, by coverings of moss, by the sheer fact that we haven't been there yet. The fairly continuous discoveries of the last thirty years in parts of these two wide regions are very suggestive of a promising mineral future.

[8] The marine economy is revealed by the following exports in 1927–28: 750,000 kilograms blubber; 880,000 kgs. liver; 265 kgs. walrus hides; 235 kgs. eiderdown; 11,750 kgs. bird feathers; 2600 kgs. baleen; 165 kgs. narwhal and walrus tusks; 4,400,000 kgs. fish; 150 bearskins; 2072 blue foxskins; 1672 white foxskins; 8000 sealskins; 55 white whale hides; 15,700 sharkskins; 500 eider rugs. (*Ibid.*, p. 87)

[9] See U.S. Geol. Survey, *Bulletin* 815.

[10] About 300 tons of graphite are mined annually in Greenland and exported. The mining output includes about 2000 tons of coal, small amounts of copper, and small amounts of talc and asbestos, all for local use. (Herman R. Friis, *op. cit.*, pp. 89–90)

Chapter 39. THE ARCTIC SEA AND THE GREENLAND ICECAP

THE Arctic Sea is inhospitable to man, but not to some other animals. All winter it freezes, but every strong wind breaks up the ice and every change in the direction of the wind floats the ice away in a different direction. Thus the east wind may clear the western shore of an island so that only blue sea is visible. Two days later the west wind may bring back enough of the floe ice to cover the sea for 20 miles in all directions with ice cakes from 2 to 4 feet thick, a yard square, a rod square, a quarter of a mile square, as big as a farm. The hard wind will cause the ice cakes to grind together with a roaring noise. A storm increases the noise to a deafening roar and jams the masses together so that they rise up into ridges, called pressure ridges. Sometimes these ridges are as high as a house, and most difficult to cross with a sledge and dogs. It was with dog sleds across such ice fields that Peary reported that he reached the North Pole. Crossing the pressure ridges was one of his most difficult tasks. Another great obstacle to progress was the open spaces. Sometimes he would have to wait a day or two for fresh ice to form on open places between floes. At other times he would have to make detours of miles to get around the stretches of open sea.

LIFE IN THE ARCTIC SEA

The Arctic seas are full of life. This fact is a surprise to the people of middle latitudes, even when they have accepted the fact that the tundra is full of life. Is not the sea dotted with ice? And is not the water always cold? It is. It is difficult to understand, but it is none the less true that, cubic mile for cubic mile, cold oceans contain more life than warm oceans, although not so many species. This life is all based upon countless numbers of microscopic plants, floating in the ocean water, getting their sustenance from its limitless stores of salts in solution, the leachings of all the continents in all the ages. How do they survive in such a place? They do, and that is the economics of the story. These tiny plants are eaten by tiny animals, to be in turn eaten by larger and yet larger animals. Thus the codfish finds abundant food supply, and the herring on the Arctic coast of Alaska can be scooped up in great quantities, while the seal, the walrus, and the mighty whale find nourishment for their warm bodies in the ice-cold water. The seal's chief food is squid. Another important item of seal diet is the sealfish, or ghostfish; none has ever been found except in the stomach of a seal.

The whale, despite its great size, eats small-fry, which it catches wholesale by taking hundreds of tons of water through its mouth and spurting it out through the holes in the top of its head after straining out the food be-

tween the closely set slats which enter commerce as whalebone. Wherever men have been able to sail in the Arctic Ocean, it has proved itself to be the best of whaling areas.

THE BEAR-SEAL CYCLE

The seal and the polar bear make an interesting pair. The seal, though it often lives in the open sea, was originally a land animal and must come to the surface to breathe. Therefore, by much labor with its teeth, it maintains breathing-holes in the ice of the Arctic Sea. From time to time it rises and, sticking its head through its hole, draws a good big breath, which lasts it a long while. By these air holes its enemies wait for it — the polar bear and sometimes the Eskimo with his spear. But the seal, after it has fed, likes to take a nap in the sunshine, so it climbs out on the ice immediately beside its hole, turns and faces the entrance ready for an instant plunge, and takes a nap for about forty-five seconds. Then it rouses itself and looks carefully around in all directions, seeking polar bears. Then it takes another forty-five-second nap, and so on. All the seals that slept heavily were eaten long ago by polar bears. When a bear spies a seal napping far away, he carefully goes to leeward, for the slightest whiff of polar bear is a sure end of a seal's nap. Stealthily bear starts to crawl in seal's direction. The moment seal's head moves, white polar bear, lying flat on the white snow, remains motionless. When seal sleeps, bear again advances. Sometimes a final rush nets it one seal, before the wary swimmer can plunge beneath the ice. That is good hunting.

Since seal meat seems to be a perfect ration for the polar bear, and since seals live far and wide over the floe-covered sea, the bear, also an expert swimmer in ice water, travels freely from ice floe to ice floe, seeking seals. Sometimes it makes the mistake of getting on a Greenland iceberg, which floats it down into the mid-Atlantic and melts beneath it. Sometimes it takes an accidental ride from the east coast of Greenland to the Iceland shores, where it works sad havoc among sheep flocks. The Arctic west of the northern archipelagoes of Canada is a safer place for bears, because there is no current there to carry the floes to warm waters, save a very small one through the narrow Prince of Wales Strait west of Alaska.

The polar bear has a satellite, or rather a group of satellites. Wherever on the Arctic shores you find the track of polar bear, there are accompanying it almost certainly the tracks of from one to five or six Arctic foxes. Foxes are the scavengers, following the camp of the successful hunter of big game. The polar bear cannot eat all of a seal. Fifty or 60 lbs. makes him a full meal. The seal weighs about 100 lbs., and the bear does not save the leavings, although the refrigerator is perfect. The foxes know this, and they follow the bear. While it eats they sit at a respectful distance and most disrespectfully bark and scold and snarl. But they keep their distance, for they know that the might of angry bear-paw can crush a fox. When the bear has eaten its fill and gone upon its way, the foxes feast upon the scraps from the rich man's table and then take up the trail and walk and wait.

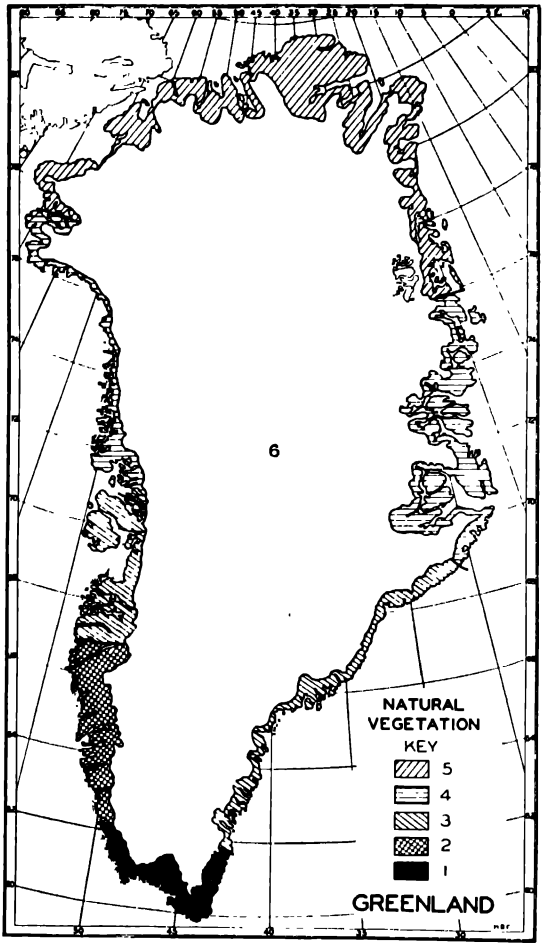


FIG. A. Distribution of the principal associations of natural vegetation in Greenland. Key to numerals: 1. Southern "forest," bush and shrub forms. Willows and birch are dominant, and in addition grasses, flowers, mosses, lichens, and heath. 2. Same as 1, but with greater limitation of area in plant cover, a dwarfing of trees, especially birch, and a decrease in bush formation. 3. Dwarfed willow copses, infrequent and small bush cover, and a dominance of grasses, mosses, and wild flowers. 4. Absence of tree growth, a few stunted shrubs, and a dominance of lichens, grasses, mosses, and heath. 5. High Arctic plants of low form — grasses, flowers, mosses, and lichens in restricted areas. 6. Botanically arid — ice-cap. (Courtesy Herman R. Friis and *Economic Geography*, Vol. XIII)

MR. STEFANSSON PLAYS BEAR

It remained for Vilhjalmur Stefansson to make use of this knowledge of the life habits of the Arctic Sea. He found that the Eskimos live for long periods of time on a meat diet, and he learned to do so himself. Then he concluded that he and his dogs would play the game of polar bear and fox. Accordingly, to the horror of native and white man alike, he launched himself into the Arctic Ocean from the north coast of Alaska with one dog sled loaded with equipment, including tent, rifle, ammunition, clothes, and cooking utensils. Like the polar bear, he stepped from ice field to ice field. Like the polar bear, when he saw a seal, he lay upon his stomach and crawled stealthily toward the seal. At 75 yards he killed his seal with a 30–30 bullet. Then he and his dogs could eat. The remainder of the seal was put upon the sledge and man and dogs traveled across the ice-clad sea. The orthodox mournfully predicted his death and sorrowfully reported him dead, but he came back months later hale and hearty. He reports that he never missed a meal nor lost a dog. This was a great achievement in natural history, applied science, and exploration. It has not yet resulted in any economic application, but it is certainly an interesting and dramatic story, and the knowledge may yet be useful.

THE GREENLAND ICECAP

Icebergs are great masses of ice that break off from glaciers which reach the sea. They are much larger than pieces of floe ice. They are not common in the Arctic Ocean. There are none north of Alaska, but there are many south of Greenland, because Greenland has a great store of glaciers to make icebergs. Australia is sometimes classified as a continent, which leaves Greenland as the world's largest island. It is about 1650 miles long and 700 miles wide at its greatest width. Of the area, about 46,000 square miles belong in the region of Arctic pastures, and about 715,000 square miles are one huge glacier of the kind that once overrode northern North America.[1] At its edges the ice slopes upward with an angle of about 1°. The slope becomes less and less until at the center it is horizontal. The elevation at the center is about 9000 or 10,000 feet, and the ice is supposed to be at least 6000 or 7000 feet deep, covering alike the mountains and the valleys of inner Greenland. Only near the edges of the icecap do a few mountains, called by the natives nunataks, stick up above this wide continent of ice with snow-white tops. In summer there are at times small lakes and streams upon its surface, but they soon plunge through cracks and flow beneath the ice.

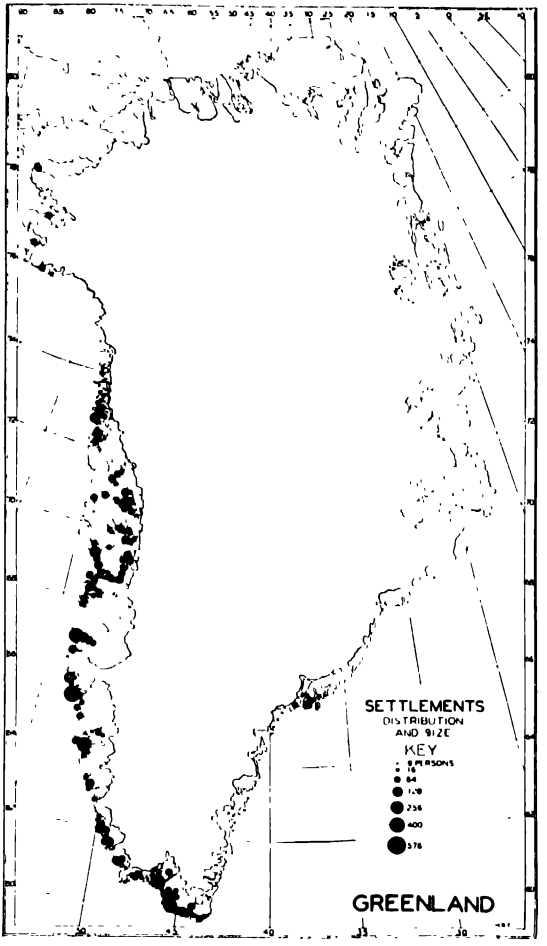


FIG. A. Distribution of population by settlements. Note the distinctly west-coast concentration, especially from Godthaab to Julianehaab. (Statistical data as of 1925–26. Principal source, *Meddelelser om Grønland*, Vols. 60–61, 1926. Courtesy Herman R. Friis and *Economic Geography*, Vol. XIII)

The shores of Greenland have the longest and deepest fiords known.[2] Into

[1] Much larger areas of both tundra and icecap are given by Herman R. Friis, *op. cit.*, p. 75.

[2] The process of fiord-making is partly indicated by the fate of houses built 400 years ago in western Greenland and now under the sea.

the heads of these fiords flow tongues of ice as the great glacier relieves itself of the surplus by pouring out that host of icebergs which float down Baffin Bay and Denmark Strait, past the coasts of Labrador and Iceland, to be melted in the Atlantic by the warmer waters of the Gulf Stream.

In addition to its utter absence of utility, it is quite possible that the Greenland icecap is the coldest place in North America, because of high elevation, from 9000 to 12,000 feet, combined with its high latitude and the reflection of nearly all heat from its white surface. The few explorers who have crossed it report that the storms upon its smooth snow surface are terrible indeed.

So far as one can see, this 700,000 square miles of ice (five times as large as the United Kingdom) has no present or prospective utility. No one wants to buy the ice. No one can get what is under it. I expect some day to get a prospectus inviting me to take stock in a reindeer company, but there can be no stock-selling scheme based upon the Greenland icecap unless some highly imaginative swindler conceives the notion of grafting the idea of a polar-bear farm onto the now growing idea of fur-farming.

The North Pole, crown of the Arctic, was reported by Peary to be merely a piece of the deep sea across which floe ice drifted back and forth. Greenland stops in latitude 84°, leaving nearly 500 miles of open sea across which it was necessary for Peary's sledges to travel for more than 500 miles. The North Pole would have been much more easily reached had it been surrounded by land. There is now little reason why airships should not make a polar journey a simple and reasonably safe enterprise, almost any summer, granted the necessary funds, and persons who desired to go.[3] But why go? The chief reason for going will be the fact, quickly shown by a 10-cent globe, that crossing the Arctic is the quickest way to get to the Eastern Hemisphere from the Western.

[3] See Anne Morrow Lindbergh, "Flying the North Atlantic," *National Geographic Magazine*, September, 1934, pp. 261–337.

Chapter 40. PEOPLES ON THE GULF AND THE CARIBBEAN

THE UNITY OF THE CARIBBEAN AREA

THE flags of sixteen different nations fly over the mainlands and islands that comprise what is known as Caribbean or "Middle" America. Twelve are the flags of independent republics [1] — Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Colombia,[2] Venezuela, Cuba, Haiti, and the Dominican Republic. The other four flags fly over possessions of the great colonial powers — the United States, Great Britain, France, and the Netherlands. One finds within this vast area a veritable museum, with specimens of many different kinds of people, government, customs, culture, ideals, and natural resources. Yet in spite of certain cultural and racial contrasts and differences, Caribbean America possesses a remarkable degree of geographical unity.

First and most obvious is the common factor of general location and climate. With the partial exception of Mexico, all parts of this large area lie within the tropics, although topography, as we shall see, is sometimes a modifier of tropical climate. Every country except El Salvador lies along the Caribbean Sea.[3] It is a sea, not the land, that for more than four centuries has linked the countries of Middle America with the outside world and with each other — if indeed they can be said to be linked together at all. Except for the railroad from Honduras into El Salvador, it is still a sea that opens the road between them. Before the days of the banana trade, the commerce of all Central America except Panama went by way of the Pacific, not the Caribbean.

The various countries of this area possess a high degree of climatic and topographic similarity. Observe that Mexico, Central America, and each of the larger islands have mountainous or high plateau land in the interior, which is characterized by a much cooler climate than is found along the seacoast. Here in the *tierra fría*, or cold land, as the Spaniards called it, are interesting and suggestive concentrations of population.[4] Excepting the northern two-thirds of Mexico, all of these countries lie in the path of the northeast trade winds. On the windward coastal strips of the West Indies,

[1] Although the word "republic" is used over and over again in this area of dictators, it is in many cases political blasphemy — if there is such a thing.

[2] Venezuela and Colombia are continentally a part of South America, and beyond the scope of this book. Political maps of forty years ago showed Panama as part of South America, for it belonged to Colombia then.

[3] Mexico adjoins the Caribbean and its great arm, the Gulf of Mexico.

[4] An exception is Panama, where the influence of the Panama Canal is paramount. Cuba, with no great mountain backbone, is another exception.

Central America, and the central and southern Gulf portion of Mexico, exposed to the trade winds, one finds a typical rainy, low-latitude type of climate. Here the temperature is 75° or 80° F. the year round, the diurnal range being greater than the difference between any two months of the year. Here the rainfall is heavy, 60, 70, or even 90 inches a year, and there is not much difference between the seasons. This is the land of the steaming jungle, unless man has cleared a garden patch or a great plantation. Population is sparse except in the recently developed seaports and recently developed plantations.

On the leeward side of the islands and along the Pacific Coast of the mainland, shut off from the full effects of the trade winds by the mountain backbone of the interior, is another land, where one finds two distinct seasons. From about the first of May until about the first of December, depending upon the locality, occurs the rainy season. Then comes the dry (or less wet) season of three or four months, during which period the total rainfall may be as low as 10 inches, or even less, depending upon the locality. Here one may find deciduous forests, grasslands, or scrubby bushes, according to the amount of rainfall, instead of the ever present, ever stifling jungle of the windward coasts. In general, population is sparse here also.

Caribbean America may also be said to possess commercial and economic unity. In this wide area of many countries, many colonies, many islands, and many kinds of land, there are five main ways of making a living. First, the city people make their living in much the same way as in urban centers throughout the world. Second, people live on haciendas, or large estates, producing crops that vary with the climate. Third, some people are primitive food-gatherers, who make their living by hunting and fishing and who have almost no trade with the white men or with other peoples. Fourth, large numbers work on the great commercial plantations, such as the sugar and banana plantations, owned by a rich individual or a great corporation, that produce one or two commodities for export. So important are these plantations that the prosperity of an entire nation may be tied to the apron strings of the price of a single commodity, such as sugar or coffee. And fifth, there is the *conucero*, or patch farmer, a primitive subsistence agriculturalist who lives by patch and thatch, since he grows nearly all of his supplies on a little patch of land and often lives in a little thatched house made from materials grown on his land. It may be noted that at one time or another all Caribbean countries have felt the effects of economic imperialism and capitalistic penetration from the Great Powers of the temperate zone. And in one more respect they possess commercial and economic unity, since all are dependent upon the sea as an avenue of commerce with the outside world.

In spite of the differences of races, two flavors of cultural unity prevail over the greater portion of the Caribbean area. In all of the independent republics except Haiti the customs, languages, and laws of the Spaniard have been superimposed upon red man, black man, and white man, in varying degree. These countries also possess a sort of political unity, in that each has had for over a century the trappings of democracy coupled with the existence of or need for a "strong-man" government.

When one travels through the Caribbean area, one cannot help realizing that the fabric — economic, social, and political — of the different countries and different peoples has a common geographical warp and woof. If you wish to see whether climate has played a major role in all this, ask yourself this question: If these isles and shores had been in the latitude of New York and New England, what would have been the present complexion of both skin and culture? Here we see clearly the tropic complexion of skin, of culture, of history — exotic, romantic, feverish, and in the past unusually piratical.

Fifteen men on the dead man's chest —
Yo-ho-ho, and a bottle of rum!
Drink and the devil had done for the rest —
Yo-ho-ho, and a bottle of rum!

By this verse in *Treasure Island*, Stevenson gives the atmosphere of the Caribbean in the eighteenth century, and indeed it still holds good to a large extent in the twentieth century. The buccaneers of former centuries are now gone, thanks to better navies, but the solid forts built for protection against them still stand over many a harbor entrance. They remind us that even now the Devil of Piracy, the enemy of government, is not dead, but is simply known by other names. At worst, he is a revolutionist, out with gun and cutlass to capture the customhouse, the presidential mansion, and the power to grant concessions. At best, he is the political adventurer or concession-hunter striving by diplomacy, persuasion, and graft to achieve the pirate's goal — something for nothing, though others may perish.

Stevenson's verse is suggestive of certain aspects of contemporary Caribbean life, especially that of the Americans and northern Europeans who have come to the tropics to live. The Devil of Drink, assisted by the Devil of Climate, is still "doing for" many of them — busily taking the white men to their doom. Alone and unaided except by social custom, the climate seems to be able to vanquish most of the white women unless they are of Spanish stock. Witness the anemic women passengers returning from the West Indies and the pale American wives from the Caribbean area who come back to the States for the vacation that they regard as so necessary for existence.

The Caribbean shores were settled early, often, even repeatedly, by the seed of many European nations, including Spanish, English, French, Dutch, and Danish. They all had colonies there through many generations of time. There is no doubt that these islands were colonized earlier and more thoroughly than the Atlantic shore of North America, but what do we find at the end of four centuries? We find that while in middle latitudes the white man throve and increased mightily and took possession of the earth, he has not made of the lands to the south a white man's land in any racial sense. Most countries on the Gulf and the Caribbean are now chiefly Indian and mestizo, or Negro and mulatto. In numbers the colored races are probably gaining on the white.

In a sense, the Caribbean might be called a land of racial annihilations. At the time of the first white settlements it was populous with Indians called

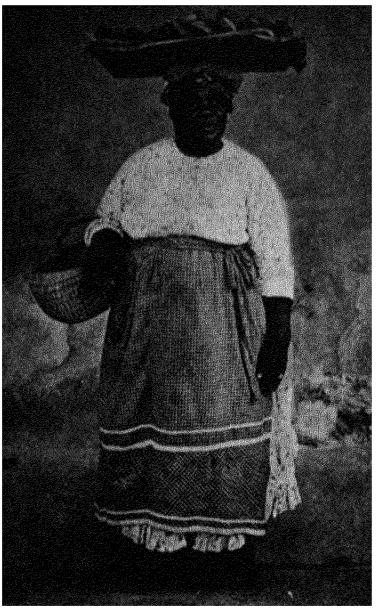


FIG. A. This is the complexion that prevails on the great majority of West Indian islands. The West Indian head *may* have been made to think with, but certainly it was made to carry burdens. The Barbadian sugar planter speaks of "heading out manure," i.e., carrying it in baskets from cart to cane plant. This woman is typical of almost any small West Indian isle and of parts of the larger ones. (Courtesy Otis P. Starkey)

Caribs. It is estimated that Haiti alone had 2,000,000 at that time. Now a Carib is a curiosity, so terrible were the results of the white man's effort to enslave the race.

NEGRO SLAVERY

When the white man found that the Carib could not be satisfactorily enslaved to work his plantations, he brought in the Negro.[5] While the Negro throve in the southern United States and has given the white race close competition for numbers there, he has outnumbered the white man 10 or even 20 to 1 in many West Indian islands. Only the Spanish in Cuba and Puerto Rico and parts of the Dominican Republic have maintained, through the generations, any substantial numbers of white or nearly white people. The superiority of the Negro race over the Indian and the white man in the ability to live, labor, and bring up children in the tropics has worked out its full fruition in these four hundred years. The native is exterminated, the white man is decimated in most of this area and driven back to live by his wits at superintendence, as in slave days.[6]

This failure of the white race to increase or even to remain numerically static in the West Indies may be put down to tropic influences. There are several elements in this influence, one of which is that of tropic diseases.

The findings of Grenfell Price (see page 787) need to be weighed well. They suggest that the tropic climate has been somewhat overworked by students who fail to give sufficient credit to simple violations of hygiene.

[5] "It has been estimated that from 1680 to 1786 there was imported into the British West Indian Islands a total of 2,130,000 negroes. No one was too exalted or noble to refrain from profiting in this traffic. Shares of Guinea and West Indian stock were held by royalty, by ministers of the Gospel, as well as by ministers of State, alike by merchant princes and university professors. The widow invested her mite and the capitalist his surplus. An important result of this trade on its European side was that big business entered into alliance with government, was indeed often an integral part of government. The result in the West Indies was the rise of a class of capitalist planters, a class so influential that as early as the middle of the seventeenth century it broached the plan of sending representatives to the British Parliament." — Waldemar Westergaard, "American Interest in the West Indies," *History Teachers' Magazine*, October, 1917.

[6] Scan the figures of the *Statesman's Year-Book* for details. Some of the islands have only Negro population.

TROPIC DISEASES

Yellow fever raged without ceasing for centuries in many tropical American localities. Dysentery was almost as destructive of life, malaria was nearly everywhere present on lowlands, and there were many other tropical diseases, all of which have kept down the numbers of the white race in the tropics. The discovery of the germ theory of disease, particularly its effect on the conquest of yellow fever and the hookworm, and the partial conquest of malaria, opened new possibilities for developing the tropics, but probably it is still true that the white man is maintaining his numbers in many localities only by constant replenishment from the lands of frost. It is startling to see how many of the important business positions in the tropics are filled by men born north of latitude 30°.

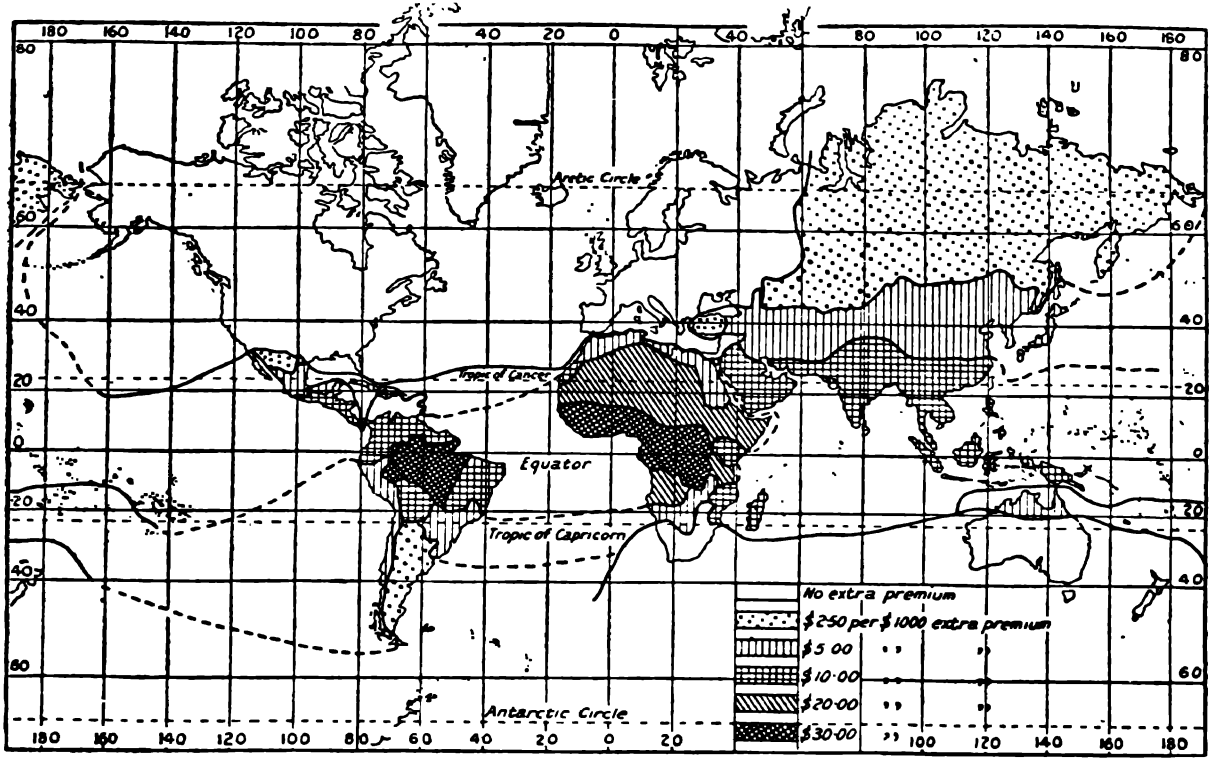
TROPIC CLIMATE

Perhaps the most important factor of all is that of climate. Among other things, tropic climate produces anemia. The high humidity of trade-wind shores prevents satisfactory perspiration, especially from the people of northern stock. Impurities in the blood stream which should get out through the skin are thrown back on the lungs, the intestines, and the kidneys, and intestinal disorders often result. Water which should have been eliminated from the system through perspiration remains in the blood to thin it. The blood count for red corpuscles becomes low. The blood as a stream of nutrition is inefficient. It therefore fails to build up the body as fast as would a supply of good red blood. As a result the white man finds, after a few months of New England hard work in the tropics, that he runs down in energy, becomes pale, loses weight, becomes anemic. His horse power is reduced, he cannot do what he did in the North, and if he spurs himself to action and works hard, he breaks down, and illness may follow.

There is a saying in Puerto Rico, where many Americans have lived, that the first year the American woman is there she loses her good looks, and the second year she loses her health, for in addition to the previously mentioned troubles the even temperature and damp air often produce a relaxation of tissues which causes abnormal loss of blood through increased menstrual flow, which is often prolonged and sometimes increased in frequency. As a result of these particular hardships on women, the English people in the West Indies regard it as a family calamity if a girl cannot be in England for the two or three years during which she passes puberty.

There is also a widely held belief, which we share, that the white people do not give themselves a fair chance. They are not willing to make the necessary adjustment of food, clothing, and habits to keep themselves fit. Keeping fit is a task at best. For example, the West Indian heat makes physical exercise unpleasant except when taken very early or very late in the day. As a consequence the average well-to-do white woman from the North gets almost no exercise. This point is emphasized in the recent important study by an Englishman now resident in Australia.[7] He makes the

[7] A. Grenfell Price, *White Settlers in the Tropics*, American Geographical Society, 1939.



EXTRA PREMIUMS CHARGED BY THE NEW YORK LIFE INSURANCE COMPANY, 1928.

FIG. 786 A. This map partially answers the question "Why are most of the people of the West Indies Negroes?" It is also a kind of statistical measure of the handicap of tropical climate. It is not a full statistical measure, because so many of the white people there expect to spend a part of their lives in better climes. To get a percentage measure of this handicap, note that at the age of twenty-five the cost of insurance in this company is $21.49 per $1000. (Courtesy New York Life Insurance Co.)

common point that good vigorous physical work such as the Negro and the Indian woman do in their gardens and little houses is a much more important factor in maintaining health of the body in the tropics than it is in the temperate zone. Dr. Price almost makes it a requisite for survival. This sounds simple, but — enter Mrs. Grundy! The question of *status* comes in here. If a woman works in the field, who is she? What is her place in society? Here an aristocratic convention does much to annihilate the white, and the absence of this convention in certain white West Indian populations is very suggestive as an explanation of their survival.

There is another point that has often been confused with climate, namely, standard of living. The Negro is willing to get along on less than the northern European. Therefore he works for a lower wage, crowds out the northern European exactly as the Chinese were crowding us out in California until we shut them out. If Australia is able to continue a rigid exclusion of the black from its tropic lands for a century or two, we may know more about the ability of the white man to survive en masse in the tropics.

The West Indian climate is often called the trade-wind climate. The wind blows nearly all the time, and nearly always it blows from the east or the northeast. The air is warm, almost always warm. It lacks the bracing coolness that comes in the United States with the passing cyclones and anticyclones. People who wish to praise this region point to the fact that New York and Chicago get hotter than Havana, San Juan, or Kingston. This is true, so far as thermometers are concerned, but if I may trust my own skin, I note a difference. In the swelter of New York I feel that my skin is hot, but that under it I have energy to push myself along. In the West Indian port I feel that my whole flesh is hot, and that I must sit down for lack of energy. Perhaps this explains the boast about there being so little sunstroke in tropics. A man sits down, instead of pushing on. Thus the sitstroke prevents the heatstroke.

The monotony of this climate, particularly to the man of the North, accustomed to the bracing changes of weather, makes him long for a stimulant such as climatic changes bring in the North. Climate refuses to bring this stimulant, but the gasping Northerner may temper the trade-wind monotony by a drink of alcohol. So he takes a drink — often after years of abstinence in the land of frost.

There is another reason why the Northerner often spends the entire evening drinking with a group of friends. He says there is nothing else to do in a strange land. So drink is slaying the white man in the tropics more than it is in the North, and more than it slays the tropical natives. "Yo-ho-ho, and a bottle of rum!" W. S. Whitford, former professor of tropic forestry at Yale University, says that according to his observation, covering many years, alcohol is killing more Northern men in the tropics than die from all the tropical diseases combined. My much smaller observations concur.

As a result of these climatic influences, direct and indirect, the white race has not increased in proportion with the Negro race. The Negro is, of course, a native of the tropic climate, but his increase of numbers is possibly due as much to superior birth rate as to superior ability to withstand the climate.

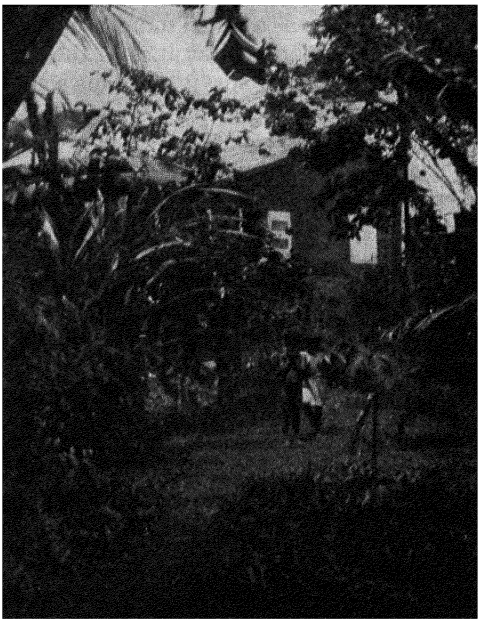


FIG. A. A picture taken in the back yard of a house in a north-coast Puerto Rican village to show how Puerto Rico supports so many people. It is evident that shoes and clothing are not a heavy expense. The house and yard are bowered with trees, with an undergrowth of shrubbery and a carpet of creeping things — bearing something edible, every one of them: coconuts, plantain, banana, coffee, cane, beans, greens, and flavorings. While I was focusing my camera, the heir apparent of the family entered the scene and thoughtfully paused to contemplate and suck his thumb. It should be observed that he did not put his hands in his pockets, as careless little boys in America so often do. (Photo by J. Russell Smith)

The high birth rate is due partly to the large family per woman, and partly to the plurality of families, which is very common throughout the West Indies.

EASE OF LIVING AND THE TROPIC GARDEN

It is easy to provide for a family in the Caribbean countries, especially where the rainfall is regular and the standard of living is low. In these sections there still prevails in many localities a very slight modification of the primitive and world-wide tropical agriculture. Here is the home unit. It begins with making a clearing in the woods, and this is sometimes done with a single implement, the long knife, or machete. As an American in the Dominican Republic put it, these people can take a butcher knife and raise as good a crop of corn as you can in Illinois, but only a little patch of it. With the machete and an ax the small trees of the forest are cut down and burned in the season of least rain. Larger trees, if not cut down, may be killed by fire or girdled, and a patch of ground, often not more than a fraction of an acre, is ready for planting. The loose, grainy soil of the forest floor is filled with humus. It has no sod upon it and it does not need to be plowed. Only a sharp stick or possibly a hoe is required for planting the little clearing with shoots of the banana to be eaten raw, with shoots of the plantain, a big banana to be eaten cooked, and with sugar cane for homemade sticks of candy. There will also be sweet potatoes, yams, corn, many beans, pumpkin, and manioc (or cassava, often called yucca in the West Indies). The plant of the manioc grows 5 or 6 feet high, and its roots are as big as one's forearm. From the standpoint of nutrition cassava has about the same value as a potato, and it is a great staple food of the moist tropics in both hemispheres.

The great stand-bys of these gardens are bananas, plantains, and beans.

A few tobacco plants will produce their solace without cost and at a minimum of effort. Many of these people rarely eat meat, since their livestock is often limited to a family or two of chickens and perhaps a goat or two. Occasionally they may catch some game or buy a little meat. If they are planning a long stay, lime, orange, and coffee trees may be planted, and in any case such royal-palm trees as grow there are likely to be carefully saved for their fruit and for roof material.

There is rarely any order about the tropic garden. The plants are not set in rows, but helter-skelter, in a way that looks crazy to us of the land of plows and straight rows. Pumpkins and sweet potatoes are on the ground, and growing above them in free and apparently aimless sociability are corn, sugar cane, cassava, and bananas.[8] No plow comes through this garden. It is cultivated by the machete, which the native slips along through the ground just below the surface to cut off weeds and shoots. One hand wields the machete while the other hand gathers the weeds. The garden thus gets a kind of clean shave. It is astonishing to observe the rapidity with which the native makes his simple tool do its work. Perhaps the agriculturalist of the machine-using North will be inclined to belittle such inefficiency of equipment, but after having seen many of these little machete-kept gardens I am bound to confess that there were more weeds in my own American garden, well equipped with varied tools, than I saw in 40 of the little West Indian *conucos* cleaned with the machete.

THE NATIVE HOUSE AND FURNITURE

The native house is as home-grown as the food. Poles are stuck into the earth and cross poles are tied to them with palm fiber. Rafters and braces are tied to the cross poles with more palm fiber, and poles to serve as laths are tied to the rafters with palm fiber. The framework is now ready for the roof, which is commonly of palm leaves. The palm leaf is not the soft-leaf stuff of our Northern trees, as an examination of a palm-leaf fan will prove. The wall may be made of palm leaves (tied on) or of the great boardlike sheaths that grow at the base of the leaf of the royal palm. These sheaths, almost like boards, are from 3 to 6 feet long and from 2 to 4 feet wide, and, like the roof of leaves, will last for many years.

If the dirt floor is not considered sufficient, a floor will be made of the outer surface of the trunk of the royal palm. This is sometimes used as weatherboarding in more pretentious houses. The gourd tree furnishes buckets, bowls, and other containers, unless the people choose to make such things

[8] Mr. A. B. Ross, of Narberth, Pa., an experimenter of unusual originality, has worked out a system of hand gardening by which he plants two or three crops on the same ground at the same time. In his garden the first peas have young corn beneath them. The first corn has a second crop of corn at its knees. Beans and tomatoes on poles and corn set far apart can stand over beets and cabbage and other low-growing plants and thus divide up the light, which Mr. Ross says is the deciding factor. Altogether he claimed to make between four and five crops per year in Pennsylvania on each square foot of his garden. The point of peculiar interest is the close relationship that his discovery bears to the age-old practice in the forest garden of the so-called African "savage." (*Big Crops from Little Gardens*).

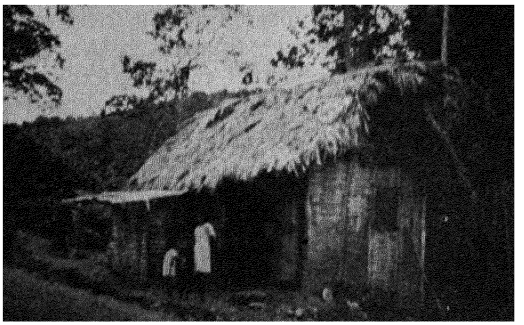


FIG. A. A Hindu family is building its home in the edge of the forest in Trinidad. The palm-thatched roof has a wide overhang to keep rain off the mud plastering that will soon be applied to the wicker-work (wattle) wall, which is plainly visible. (Photo by J. Russell Smith)

of wood. Palm fiber, an ever present tropic help, is used for making hats, baskets, rope, and hammocks. It is said that the hammock is a West Indian invention. Thus far in the creation of field, food supply, and house, no foreign implements save the machete and possibly the ax have been used. It is therefore not surprising that a disappointed German, seeking trade, coined the term *verdammte Bedürfnisslosigkeit* (damned wantlessness) to describe the economic completeness of these people who supplied their own wants without buying the wares of the disappointed trader.

Other needs are few. Just a pot in which to boil the cassava or sweet potatoes and a skillet in which to fry the plantain are the necessary cooking utensils. Many do not sit down at a table but eat out of the hand, and therefore dishes are not necessary. Clothing an entire family costs but little. Children often run naked in their earlier years, even in the streets of the town. Blue overalls and factory shirts and homemade cotton dresses partially cover the older people. Shoes are seldom necessary and usually are absent. Thus the cash income needed by the family is small indeed. If they live near the town, a few loads (woman-, donkey-, or perhaps manloads) of produce sold in the market will supply it. Sometimes a part of the ground planted to coffee, cacao, or tobacco will yield a few hundredweight to bring in the needed funds. So will a few days' work on some plantation.

THE SIMPLE LIFE AND THE POPULATION PROBLEM

This simplicity of existence has a profound influence on the population question. A woman can support the family if she has to, and the family solidarity that is so necessary to send children through high school and college in the United States and Europe is not needed; hence a different concept of family life has arisen — or perhaps one had better say, survived. The husband is not a necessity save for his company's sake, and that is often about all that the uneducated West Indian wife ever gets from her husband except for short periods. She supports the family, and if she wants to exchange husbands, why not? And if sometimes, in this process of swapping, the man gets two or three wives, it is merely an incident in the system. The more generous he is with his earnings, the more wives he can collect.[9] A big

[9] A story has it that a West Indian planter's wife was approached by a manservant who told her that his spouse had left him and gone to Bermuda. "Oh, my!" said the lady. "Whatever am I going to do for a washerwoman now?" "Don't worry, ma'am," he replied. "I'm courtin' ag'in and I courts rapid."

Negro stevedore who climbed upon a steamer at Turks Island in the Bahamas, a most orderly and well-governed British possession, said he had fourteen children by his proper wife and fourteen others by three other wives. He was scarcely a subject for criticism here, or indeed in any other West Indian island.

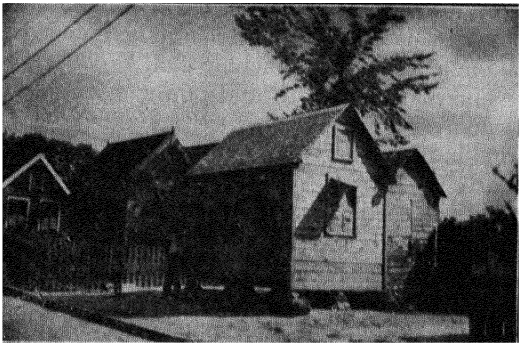


FIG. A. The house of a working-class Barbadian Negro 100 yards from Government House, Bridgetown. This is an extra-large house, being composed of two rooms rather than one. The rooms are respectively 9 by 12 and 9 by 11. It's the kind of house that the owner knocks to pieces and hauls to the next plantation if he moves. It has no wall but weatherboards. Pressure of man upon land in Barbados leaves no room for jungle and jungle-house material. (Photo by J. Russell Smith)

A Dominican woman who was being chidden for her third shift of mates answered, "Life is too short to live alone." An employer in Puerto Rico complained that if a man of the working class gets more money, it often results not in a rise in the standard of living for the family, but in a second wife.[10] Consequently, the increase is in population instead of in the standard of living, and parts of the West Indies are on the verge of tragedy from overpopulation — malnutrition, approaching starvation.

There is a rather famous case of a cacao planter in Santo Domingo. Large cacao plantations are rare, but this planter had a very large one because of his system of management. Every time he got a new piece of cacao plantation started, he built a house in it and installed another wife. She looked after his interests in that part of the plantation. I heard of him three times, and each time the number of his wives varied. Some said he had eight, others, nineteen, and yet others, twenty-nine. When the American Marines took possession of the island in 1916, one of their first acts was to disarm the natives; but the cacao planter of many wives sent a friend down to the

[10] "What does a countryman do if he gets some money?" a gentleman in the interior of the Dominican Republic was asked. "He buys a bright-colored sash that goes from shoulder to opposite hip, he buys a new machete, and he gets another wife" — a statement that is slightly figurative, but strongly savors of truth.

Anyone who is inclined to be critical of other peoples should remember that morals are a code of action agreed upon by a group of people who live together, and that immorality is a violation of this code. An American woman newly come to the Virgin Islands, and burgeoning with Puritan standards of ethics, was much shocked that her cook had not yet been married (ceremonially), although she had "husband," baby, and prospects of another heir. The mistress busied herself in persuading the couple to be married before the arrival of infant number two, but here she ran into other customs, and she was shocked at the expense that her insistence entailed. By the time this young couple had made necessary expenditures for new clothes, for hiring a hall, for a bride's cake, for a groom's cake, for purchases of luxury food to feed a multitude, their surplus earnings were heavily mortgaged. That was the difference between *legal* and *conventional* marriage and *common-law* marriage. Legal marriage is a luxury to the poor in many lands. It is almost a kind of display, like an expensive ball, which indeed it resembles — as does the United States wedding reception.

capital to plead for the return of his gun on the ground that he really needed it. To this the officer in charge is reported to have answered, "Yes, I think he ought to have a machine gun."

The man of wealth and power often succumbs to the ancient temptation of many wives (which figures so largely in the stories of the Old Testament). This is particularly true of the dictators. Zelaya, who ruled Nicaragua for nearly a score of years, admitted the paternity of fifty children. Gómez, the unmarried dictator of Venezuela, who died in 1935, had more than eighty children. No shotgun, or the man to wield it, in all of Venezuela was big enough to escort Gómez to the altar. At times it has been true that these military dictators who had absolute power (life and death and confiscation) over everything within reach would throw a man in prison and add his wife or daughter to their harems.

When I was in Puerto Rico in 1923, the estate of a wealthy native of Spanish stock was being settled. The gentleman had left money to each of sixty children and had given them his name. The incident did not seem to be considered extraordinary. On the contrary, he was praised for his honorable action in thus setting these young people square with the world.

The results of this more or less informal polygamy are two — first, the rapid increase and great density of population in many localities; and, second, the increase of the ablest element. This more rapid increase of the able may account for the good looks of the people. A Chicago woman, a graduate of the University of Wisconsin, living in Puerto Plata, Dominican Republic, averred that she did not know there were so many Othellos alive as can be seen in the streets of that town. And the senior author will testify to the good looks of the women.

THE VARIETIES OF PEOPLES, AND THEIR CONDITION

There are wide areas in the United States where all the people are very much alike. Compared to these, the region of the Gulf and Caribbean seems like a veritable museum of people and peoples.

The Caribbean mixture of races is amazing. The English classification used in the *Stateman's Year-Book* for Jamaica admirably describes that particular island — white, colored, black, East Indian, Chinese. For Central America it should be white, Indian, mestizo (mixed white and Indian), Negro, mulatto, zambo (mixed Indian and Negro). Some islands, like the American Virgin Islands, are almost pure Negro, while parts of Cuba, Puerto Rico, and Costa Rica are pure white. Others, like Nicaragua, are almost completely mestizo. A few thousand Chinese have straggled in, and then, as if to add to the variety, the British Government has permitted planters to import thousands of East Indian coolies to work the plantations of Jamaica and Trinidad.

Accessibility and inaccessibility have a marked influence on man in this area, affecting alike the race and its condition. Islands may be counted as accessible when ships are a part of their environment. Ships connect the inhabitants of these overcrowded islands with other lands and other men.

Where ships come, there are jobs, or at least the chance to go and get jobs. Out from a black mass of deck hands or stevedores on a West Indian steamship, jabbering a mongrel French and Spanish, comes a surprising note, the good English of a native of St. Thomas or a British island. An unexpected and really unwarranted feeling of relationship rises within you for an instant. Hundreds and thousands of these men have worked abroad — as sailors, as laborers on sugar plantations, or on banana plantations in Central America, as elevator boys, waiters, and domestic servants in New York City, the great Mecca whither go so many ships, and so many people searching for jobs.

The inaccessibility of parts of Mexico and Central America profoundly affects the lives and condition of its people. There are some native tribes living in the deep forest, many days' journey from steamship, railroad, wagon road, or city. They have almost no dealings with white men and show no discernible cultural influences of the white man's existence except that they have knives and cotton goods and a few other results of barter.

The mixed peoples of the Caribbean and the Gulf have lived under very different types of government, giving great variation in opportunities for individuals. For many years the great masses in Mexico and Central America were untutored Indians, many of whom speak only the native dialect. Until recently they had no chance of schooling of any sort outside the native instruction of children by parents. Educational reform has begun, especially in Mexico, but it is just getting started. In contrast to this, the British have long conducted free schools on all their islands, with the result that many shiny black Negroes speak with a perfection of grammar which would be an unintentional reproof to the generation of college students whom we teach, and which by the very elegance of its diction exceeds that of any faculty of which we have been members.

Directly across the straits from this Jamaica of free schools and Negro education is Haiti, with a great mass of uneducated Negroes who since they threw off their French masters in the Napoleonic period have unquestionably degenerated in what we call civilization. Only a few years ago rumors of cannibalism were current in Haiti.[11]

The white people of the Gulf and the Caribbean are almost as varied as are the other races. It is the cosmopolitan financiers of New York, Chicago, Paris, London, Edinburgh, Amsterdam, and Hamburg who keep the wheels of commerce moving. The wheels of machinery in the oil fields and mining camps are kept moving by a remarkable collection of gamblers, ex-revolutionists, ex-convicts, fugitives from justice, "down-and-outs," and half-down-

[11] In 1921 the American government of Haiti had in prison at Port-au-Prince an old woman whose offense was reported as "eating three children." A chunky-looking young Negro in prison was shown to my friend Lieutenant Gebhard as the survivor of four who had made soup of an American aviator who had been forced to land. "Fat soup it was," he told Gebhard. An engineer of my acquaintance who has worked for months among the Haitians firmly believes that children are eaten. Being a lover of children, he got acquainted with all the youngsters of the little village and used to play games with them. Then one night there was a great beating of drums in the forest and nearly everybody was away. In the morning five children were missing. He was greatly excited by this. Parents only shrugged their shoulders. He tried to get up a posse to hunt them. People only grinned and took no interest. Several times this happened; drums were beating in the forest all night and children were missing in the morning — a religious festival.



FIG. 794 A. The big Barbadian social event is the Friday market day, when planters and plantation workers alike visit town to shop and gossip — the economicosocial event of the week. Such markets occur in varying sizes in most parts of West Indies, Central America, and Mexico, and most of the wares are usually displayed upon the pavement. (Courtesy Otis P. Starkey)

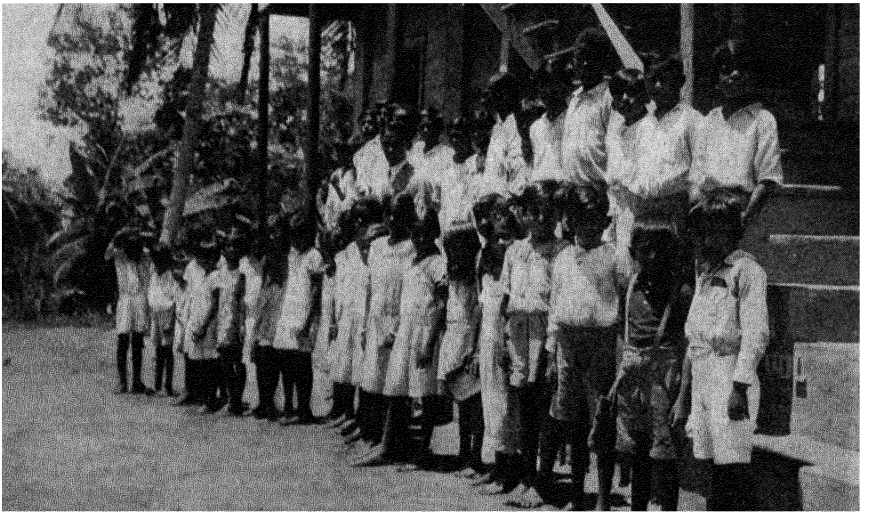


FIG. 794 B. A school with a Hindu teacher in the Hindu section of Trinidad turned out to have its picture taken when a foreigner visited the school. See banana plant and coconut trees in the background. The school is only a few miles from the asphalt lake. (Photo by J. Russell Smith)

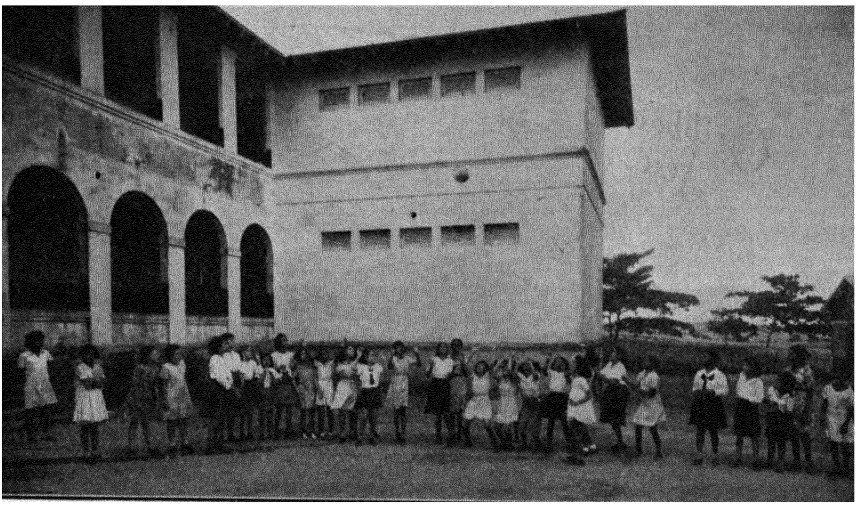


FIG. A. Children playing in a Puerto Rican school yard. There is little doubt that the colonial possessions in Middle America have more and better schools than the independent countries. Some persons also ask the question "What's the use of educating people up to abilities that they cannot use and desires that they cannot fulfill?" (Courtesy U.S. Dept Interior)

and-outs, along with a certain number of expert geologists, engineers, and administrators and a goodly mixture of lovers of adventure and victims of wanderlust.

The great plantations have their experts in technique and administration, for he who ventures largely into tropical agriculture must be among the intelligent of the earth.[12] The saying that it takes all kinds to make a world is herein exemplified.

The Spanish stock of Cuba, Puerto Rico, and the Dominican Republic ranges from the simplest peasant to the noble and royal stock descended from Spanish governors and generals. Chance meetings with one man in an Apennine village, with another in a date garden of the Sahara, and with others in West Indian towns have convinced me that a real gentleman is not to be hidden by mere difference in complexion, language, culture, or costume. The stock of Spanish nobility is here.

The great variety of landscapes and cultures makes the Lesser Antilles a most interesting area to visit. In this region there is a clash of cultures — that of the abrupt, hustling, and businesslike Yankee and that of the suave, polite, leisurely, and chivalrous Spaniard. Spain's past has produced a culture in which the gentleman must be a man of leisure, engaged in the law, medicine, literature, or government service — above all, an army officer. This Spaniard uses much form to communicate an idea, especially an unpleasant idea. You come to him for something he cannot grant and he says, "Come to-

[12] See the account of sugar plantations in Chapter 42 and also of banana plantations in Chapter 45.

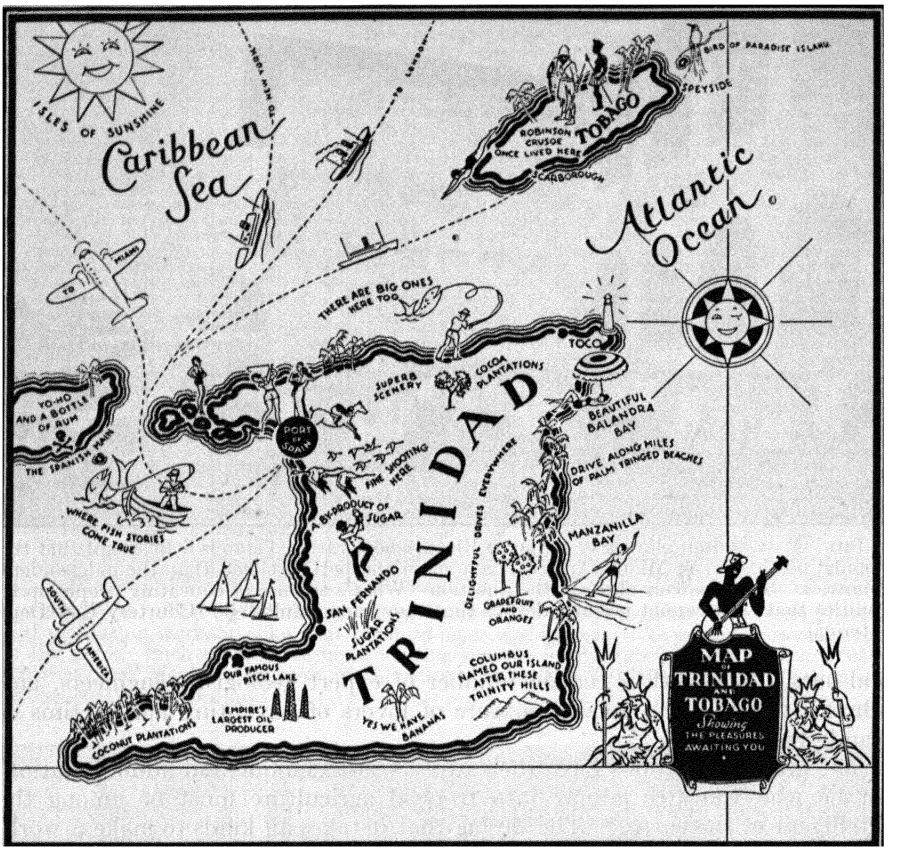


FIG. A. Trinidad is a very interesting island, and this map is a presentation of that fact to attract the visitors. (Courtesy Furness West Indies Line)

morrow (*mañana*)," and yet again *mañana*. If you push him for an answer he will say, "No," but it is not his nature to do it that way.

An educated Puerto Rican, addressing a conference of educators in Washington, said: "How I wish my fellow-countrymen could see you, so that they might know that there were Americans other than those who come to rule us or to sell us something!" Upon the whole, the American in Caribbean countries is disliked, and quite properly disliked, by the intelligent natives. They have seen our power, the advance of our empire, our financial domination, our insulting foreign policy of the past, and the unpardonable manners and execrable display of wealth on the part of many American tourists. They remark that we annexed three-fifths of the area of Mexico, all of Puerto Rico, and at times have "taken over" Haiti, the Dominican Republic, Cuba, Nicaragua, and so on. Our manners are quite the opposite of the manners of the Spaniard. We are most frank, most outspoken, and sometimes most rude, especially from the standpoint of one reared in the Spanish culture.

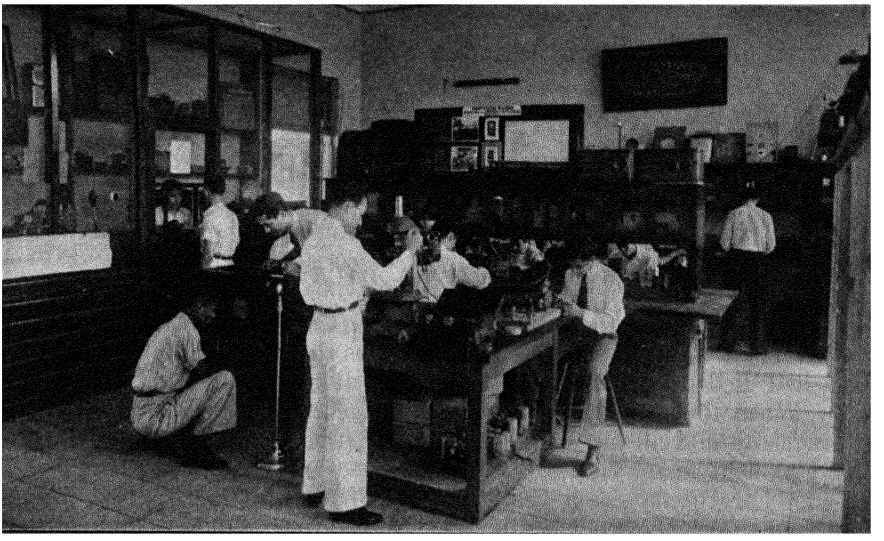


FIG. A. Radio workshop, University of Puerto Rico. (Courtesy U.S. Dept Interior)

We are sure that we come from "God's country," from the land of "progress." We are sure that all that differs from our things and our ways is inferior, and we let the fact be freely known. And then there is the dark sunburned skin. Sometimes some Americans even go so far as to use the word "nigger" to or about people of pure Caucasian blood.

If Americans traveling and sojourning in the Caribbean lands should adhere to rigid rules of common politeness, and at the same time make a consistent attempt to understand the point of view of these people, many desirable things might easily come to pass. A great human opportunity is being overlooked in our contact with these tropic peoples. And in lack of courtesy and understanding there is no gain whatever, except the gratification of a trampling egoism.

Chapter 41. GOVERNMENT ON THE GULF AND THE CARIBBEAN

A REPRESENTATIVE DICTATORSHIP

SO MANY times had the story come down to Caracas that Gómez was dead that for hours nobody would believe the news that the old dictator of Venezuela had died peacefully in bed of uremia at 11:45 P.M. on December 17, 1935. When they laid him out in the village church at Maracay with his general's cap and all his medals beside him, there was no denying the fact that President Juan Vicente Gómez, aged seventy-eight, was actually deceased. For twenty-seven years this man had ruled his country with an iron hand. Nobody was ever fooled at the end of a Gómez administration when a new President was "elected" according to law or "provisionally appointed" to succeed him. Gómez was always the boss. Few Caribbean republics have had a dictator last as long as Gómez. His regime was second in duration only to that of Diaz of Mexico (1876-1911), who established the record. Since "strong-man" governments with the trappings of democracy are still in the majority in Caribbean America, the story of Gómez is worth telling.

It was back in 1892 that this son of a cattleman came tearing out of the Andean foothills along with his neighbor, Señor Castro, at the head of a hard-riding, quick-shooting band of Gauchos to help support the government of President Andueza Palacios during one of the country's frequent revolutions. Castro and Gómez guessed wrong, and were deported. Seven years later another revolution succeeded, landing Castro in the Presidency, with Gómez as Vice-President and Minister of War. When Castro was stricken with liver trouble in 1908 and left for Germany to consult a specialist, Gómez and his henchmen took over the country. From that time on, no would-be revolution has ever succeeded in Venezuela.

Near the end of the first Gómez administration in 1915 the time had come for an election. The afternoon daily of Caracas kept remarking that this was the year of the presidential election and it was about time for the candidates to appear. This statement was repeated several times. Then one day President Gómez issued a manifesto with picturesque and resounding eloquence reannouncing the freedom of the press; whereupon the next afternoon the Caracas daily announced that its candidate for the Presidency was Señor So-and-So. In the United States such journalistic support would have been sufficient honor to make any citizen feel proud for months to come, and it would be told and retold by his children and grandchildren. In Venezuela it struck terror into the heart of the man named. He feared for his life, and under cover of the early tropic darkness he fled to the sea, chartered a

launch, and before the sun rose was out of Venezuelan jurisdiction and safe in Curaçao, the Dutch island to which so many Venezuelans have been glad to escape.[1]

It was a mere formality when a Gómez henchman was allowed to assume the Presidency, for Gómez then became Minister of War and retained control of the army. The modern German Gestapo and Russian Ogpu are notable organizations, but their methods of suppressing opposition in their respective countries seem quite elementary compared to the drastic methods employed by the Gómez secret police. Following the assassination of his brother in 1923, Gómez avoided the capital as much as possible, but it is said that he kept twelve spies on his pay roll to watch each policeman in Caracas.[2]

As has been noted, during the course of a busy lifetime Gómez is said to have sired more than eighty children. Indeed, by 1924 he had admitted the paternity of seventy-eight. Nepotism ran rampant, for nearly all of the males of this Solomonic brood held government "jobs," but rendered no particular service. In 1923 a story was current that Gómez felt that he was getting old and ought to enhance his respectability by marrying ceremonially the favorite of his common-law spouses. As this would have given a favored position to one woman's children, other sons conveyed the word to Gómez that the day of his marriage would be his last on earth. The great dictator never married. Only a week before his death, one of his sons, Gonzalo, was shot while attempting to arrange a deathbed marriage between the ailing Gómez and his mother.

During his later years Gómez governed the country from his huge ranch, Las Delicias, only 27 miles from Caracas. For hours *El Benemerito* (The Meritorious One, as he was officially titled by the Congress) would sit under a large rubber tree, feeding peanuts to his pet elephant, beaming benignly upon his numerous children and their offspring, and making executive decisions for the country. Luxury was his, for he had amassed a personal fortune worth more than $100,000,000. The secret of his financial success was oil. He never interfered with foreign exploitation of Venezuelan oil resources so long as his personal "cut" was paid. Patriotically, he reinvested most of his loot in domestic enterprises, Gómez plantations, Gómez hotels, and so on, but if they did not pay profits, he might "sell" them to the Government. No record is known of any large Gómez losses.

From the oil industry Venezuelan day laborers got some wages, the Government got some taxes, the country got some modern improvements, Gómez got his "cut," and foreign corporations got the oil.[3]

[1] The fate of this presidential possibility was better than that of the editor of a paper in Maracaibo, Venezuela. One day in the summer of 1923, he stated in his paper that the Venezuelan minister to the United States had protested to the American Government against the continuance in the United States of propaganda against the Gómez government in Venezuela. For this the paper was suppressed and the editor thrown into the dreaded San Carlos prison on the Lake of Maracaibo. Six weeks later the paper was still suppressed, and the editor was still in jail.

[2] See "Death of a Dictator," *Time*, Dec. 30, 1935, pp. 14–15.

[3] During the quarter of a century of Gómez' rule, more than $80,000,000 was budgeted for the physical habilitation of the country, including some excellent highways. The value of Venezuelan crude petroleum shipped to foreign lands in a single year (1935) was $152,000,000. Foreign capitalists have often praised Venezuelan oil laws as being nearly ideal.

It is true that Gómez lived in Venezuela, but the story of a dictator with local variations has been written into the history of every Caribbean republic over and over again — a story of the exploitation of human and natural resources by a small, wealthy group, white or nearly white, and by the great foreign corporation. The dictatorship was made to order for such a situation.[4] At best the maintenance of stable government was often difficult, for the ignorant, poverty-stricken masses were a very large proportion of the population, and at times rebellious. Climate has had a big part in this. It has kept the white man down in numbers and made the man of color predominant — a fact of profound import.

Furthermore, fatigue is now known as the mother of irascibility and bad temper. Tropic lassitude is, therefore, a destroyer of that judicial calm so necessary for good government. It is an axiom of the tropical oil fields that the North American is abusive as he approaches a nervous breakdown, and the resort to violence is much more natural than it would be in the good bracing climate of England.[5]

It is well known that in the United States a period of business depression usually throws out the party in power. The droughts and irregularities of tropic rainfall, combined with overspecialization and bad prices for the one or two main exports that characterize most Latin American countries, repeatedly produce hard times, and the tendency is to blame the party in power. The business depression beginning in 1929 slew Latin American administrations just as it slew mushroom corporations in Wall Street and the administration in Washington — each after its usual manner.

Government is one of the most difficult problems faced by mankind. The objects of government — the attainment of the "inalienable" rights of "life, liberty, and the pursuit of happiness" — are strangely elusive. Like every other nation upon earth, we are prone to think of ourselves as a model of good government, but anyone who has read our newspapers intelligently for a few years can make an appalling list of the lapses of government in the United States from its ideals, even the ideal of form — decision by the will of the people expressed by the orderly casting of ballots and the arrest of offenders by the representatives of the law and their prompt and fair trial by honorable courts. The ancient institution of graft is still in our midst; elections are sometimes carried by the improper use of money; the forces that control some of our legislation would be an amazement to the honest voter. It is often disquieting to contemplate the men who are elected to office and much more disquieting to see who can be re-elected, especially in our cities. A recognition of the difficulties and shortcomings of government in our own country should make it easy for us to sympathize with and under-

[4] It seems almost ludicrous that the people of the United States should be so shocked at totalitarianism in the Europe of 1940 when they have been living beside dictatorships for a century, and through the Monroe Doctrine guaranteeing their continuance. However, there is this difference — the Latin American dictator always talks about "liberation" (from the previous dictator) and "freedom." The European variety frankly praises dictatorship and scoffs at democracy and liberty.

[5] "But," says a critic from Texas, "you don't work in the tropics, and therefore your reasoning is bad. If you worked in the tropics . . ."

stand the greater problems and difficulties that beset government in the countries to the south of us.

In contrast to the self-governing Caribbean countries, there have been the colonial establishments of British Honduras and the British, French, and Dutch West Indies, and through most of the time since their discovery, the Danish and Spanish West Indies. Since 1898, the United States West Indies have been added to the list, and Spain is gone.

BRYCE'S CONDITIONS FOR DEMOCRACY

Failure, failure even to keep the peace at home, has been the outstanding fact of government in the independent countries of Caribbean America. Nor are the reasons far to seek. The sympathetic Viscount Bryce in his book *South America* (Chapter XV) states the conditions under which democracy can be effective, or indeed even exist.

First, democracy must have racial unity. This is completely lacking in every independent Caribbean country and every large West Indian island.

Second, there must be a middle class of small property-owners, like the middle class of England, who have something to gain by good government and much to lose by bad government. No country on the Gulf or the Caribbean has such a middle class.

Third, the country must have such geographical conditions that there is easy communication of persons and ideas from one part to another, so that public opinion may have the means of becoming focused. This, too, has been absent in every independent country, save possibly El Salvador. El Salvador is larger than Maryland and has 375 miles of railroad.

Fourth, as Bryce points out, the Latin Americans lacked the experience in self-government which the people of the United States had had as colonists. When the Constitution of the United States was written, it was largely composed from selections of the experiments in government which had been tried in the colonies and found to have worked. As most of the new things in the Constitution had not been tried, they did not work as expected, notably our Electoral College, which has been from the very first a complete and lamentable caricature, of about as much value as the vermiform appendix. In contrast to the independence of action in the British colonies in America before 1776, every Spanish colony had a colonial history devoid of experience in self-government. The Spanish viceroy ruled. He made laws, administered them, and judged the offender. The people obeyed or endured the tyrannous consequences.

Fifth, at the beginning of independent government the people of the American states were, because of their experience, in a position to discuss principles and to have political parties. A political party with principles is a late refinement and the result of order and intelligent discussion. The Spanish American had not reached that degree of experience in order and stability. The newly emancipated colonies of Spain, from Chile to Mexico, had only military leaders. The newly emancipated Latin American voter had known governors, but he knew nothing of government. Therefore he was for General

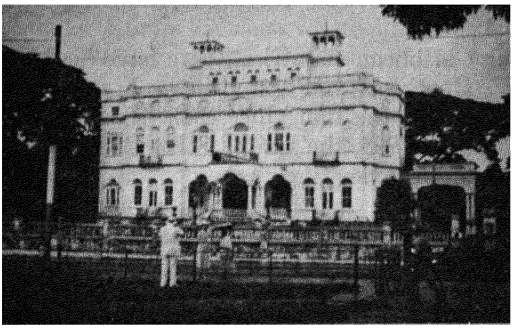


FIG. A. Second only to the Governor's palace and not far from it is this residence of a fugitive "general" from Venezuela. Apparently the profession of arms is lucrative in Venezuela, even when there are no wars. Upon the death of Gómez this "general" fled to the safe protection of the British colony of Trinidad not far away. There are many Latin American "generals" residing away from home, hoping, scheming, planning for a return in power.

A young American attending a dance in a Latin American country declined the invitation to take a drink given by a young native of the country who was the son of a general in the army. The young man thought the refusal was because the American did not wish to subject his friend to the expense. "Oh," he said, "come on and drink with me! I've got *lots* of money, because my father robs the government!" (Photo by J. Russell Smith)

This or General That. When the general wanted office he called upon his followers, who took up arms and fought for him. Having conquered, the general could reward his friends.

Bryce might with propriety have laid more emphasis on education as a vital necessity for democracy. Democracy has little chance with a mass of people as unlettered and as unversed in political knowledge as those of the countries between the Rio Grande and Panama. Fortunately, this handicap can be overcome. In recent years Mexico, in particular, has made much progress in education.

The newly emancipated colonies of Spain in America copied as far as they could the one shining example of an independent democracy. To make their governments like ours they took our Constitution, saying that it was theirs. An Australian Bushman or a Sudanese fuzzy-wuzzy might just as well put on a Prince Albert coat and silk hat and say he was a legislator, competent to make laws for the British Empire. The Constitution of the United States is a terrible misfit for an illiterate Caribbean populace.

LATIN AMERICAN CIVIL WARS — THE MONROE DOCTRINE

In a short time the civil wars between General This and General That began. European rights were ruthlessly violated, but at the first sign of restoration of European rule there appeared Monroe's pronouncement, in 1823, that any advance of the political systems of Europe in this hemisphere was (is) "dangerous to our peace and safety," and "unfriendly." This amounted to a threat of war by the United States. But for this Monroe Doctrine there would not now be one square foot of independent soil remaining upon the American continent south of the United States. Of this I am as sure as of anything that cannot be subjected to definite demonstration, although predictions of what might have been are by their very nature risky. In this case, however, the risk is very slight. The fate of Asia and of Africa is suggestive. So is the history of the North American continent. No sooner

had the United States become engrossed in civil war than the French Napoleon III set up a satellite empire in Mexico under Maximilian, an Austrian prince. It failed after French support was withdrawn, and French support was withdrawn only after strong diplomatic presentations from Washington, and after General Philip Sheridan was sent to Texas at the close of the Civil War with an army, the most experienced then on this globe.[6] At that moment the United States also had the only fleet of ironclad war vessels. At the same time Spain had retaken possession of Chile and of Santo Domingo. One of the constant cares of the United States Government after 1914 was to prevent the landing of troops from foreign war vessels in Caribbean waters, or to get the forces to re-embark after landing had been made.

The Monroe Doctrine has kept Europe away from America; therefore the countries of South America, Central America, and Mexico have been free to do the best they could about government. In Central America and Mexico there have been dictatorships, which have usually used the forms of a constitution, although the methods of constitutional amendment show that constitutions have often been literally scraps of paper on which the writing changed at the fiat of General This or General That.

GOVERNMENT IN MEXICO

For thirty-five years Mexico was cited as an example of good government among Latin American countries. This was due solely to the work of one man, Porfirio Diaz. From 1823 to 1876, Mexico had had an almost unending series of civil wars. Often two or three generals were in the field at once, and rarely was there a period of more than three years of peace. This ferment was stopped in 1876 by the successful revolution of Diaz, who was able to retain his power. He was called President of the Mexican Republic. In fact this man, whose face showed his Indian blood, was an emperor, and belongs in the class with Caesar. The two rulers were alike in their ruthlessness, their exercise of individual authority, and the maintenance of the forms of a democracy, although Caesar had the more democratic forms.[7] Caesar and Diaz were also alike in the centralization of their governments.

Diaz killed freely and out of hand. One of my students, an American, returning from years in Mexico, told me of some riots in a mining town — a little drunken disorder and some shooting and threats against property. Thirty-two men were arrested, put into a boxcar, taken a few stations down the railroad, taken out into the bushes beside the track, and shot by the rurales (police). There was no pretense of a trial. This episode explains how Diaz stayed on top in Mexico.

Diaz was an exploiter of resources and of men. The resources of the nation were given by the Government (Diaz) to Mexican friends and foreign capi-

[6] General Sheridan was the postwar military governor of Texas. He is reputed to have said, "If I owned Texas and hell, I would rent Texas and live in hell." The General would probably feel different about it today.

[7] The Romans of Caesar's day thought they had a republic. A widely told jest had it that in the palmy days of Diaz there had been an election in Mexico and seven votes were cast. Two of them were against Diaz, resulting in much search for the two men who voted against the government.

talists in princely units. The foreign investment and investor were protected. Foreign capital flowed into Mexico by the hundreds of millions of dollars. In a few years the citizens of the United States alone invested $500,000,000, largely in mining property. Mexican industries and trade grew, and the material prosperity of the country was the talk of the financial papers in every financial center in Europe and America.

Diaz was an exploiter of men because his system of taxation bore upon the poor and skipped the rich, and because of the compulsory labor he forced upon the people. Did the foreign mine-operator want some natives to work his mine? The jefe, or local magistrate, if properly bribed, would often arrest a few harmless Indian farmers and fine them. Being unable to pay their fines, they were thrown into jail, but the mine-owner could pay their fines and get them out. Then they were in debt to the mine-owner. Here the system of peonage appears. The debtor cannot stop working for the lender until his debt is paid. The lender then falsifies the accounts, so that the worker appears to be always in debt. Some years ago an American told me, as though it were smart, that on his Mexican plantation he kept the accounts of individual men. The system was amazing in its simplicity and also in its other qualities. At the top of each column on each page he had written out 1899, that being the year of the accounts. On every page he added up the driblets of money that had been given the men, plus $18.99. Every time the employer turned a page he stole $18.99, so there was no difficulty in keeping the poor devil constantly in debt, chained to his job. There has been much complaint about the inefficiency of the Mexican laborer, but why should he work hard? He could not get away. Hundreds of thousands, perhaps millions, were thus chained. They could not get away; they could not get ahead.

As Diaz grew old, a high-minded Mexican named Madero commenced to talk reform. He promised land to the landless, and war began. Diaz fled to Spain, but Madero found it was easier to promise land than to give it. Riddled with bullets, Madero soon joined the former Mexican Presidents in the cemetery.[8] Mexico had a rapid succession of conspicuous figures, all at the head of armies. Diaz, Madero (the younger), Huerta, Villa, Zapata, Carranza,[9] and Obregón.

[8] Iturbide, Mexico's first ruler after its independence, was executed. Since the days of Iturbide many Mexican Presidents have met violent deaths at home, some have escaped from the country in a hurry, and a few, such as Calles, have been politely deported.

[9] Conditions in Mexican oil fields near the end of Carranza's rule were instructive. Carranza was President. His official army of occupation of the oil fields was ragged and unpaid and living on the country. In the same locality was the army of Villa, the so-called rebel leader. This army was much better supplied with arms and money than Carranza's, but neither group had uniforms, and the difference between them and undisguised bandits was sometimes quite impossible to discern. Either party would ride into the camp of a mining company any time of day or night and call for food and get it. An officer of Carranza's army would walk up to the manager of the mining company and call for cans of milk, rolls of roofing, sacks of oats, saying that the goods were "requisitioned," and he would get them. No one had any idea that they would be paid for, nor were they. Upon the completion of a bungalow for the oil company's foremen, the "general" requisitioned it for some of his officers. On Saturday afternoons the soldiers would go riding into towns, firing revolvers in the air as cowboys do in "Westerns." Then would follow drunken orgies, with details much too sordid to relate here.

After the fall of Diaz, these years of civil war destroyed millions of dollars' worth of property and hundreds of thousands of lives in Mexico. Mine buildings were burned, the mules driven away, and the men forced into the armies. Trains were robbed, derailed, and burnt. Tunnels and bridges were dynamited, and herds of cattle and sheep were driven away from the ranches. Even magnificent churches, centuries old, were dynamited. Killing was fairly free; scores of Americans were shot, and it was stated that some Mexican states lost half their people. All this upheaval shut off the production of hundreds of millions of dollars of exports, crippled national resources until Mexican bonds had almost ceased to have value, and the country relapsed, almost to the condition where it was before Diaz enforced order for a time.

The torch of revolution, lighted by the ill-fated Madero, still burns brightly in Mexico, but its flame is no longer a bloody red. Since 1920, when General Alvaro Obregón came into power, Mexico has had greater stability of government. While it is true that there have been civil uprisings, such as the Escobar rebellion in 1929, no government has been overthrown by force.[10] True, since 1920 the Mexican Government has been dominated by strong men, Obregón, Calles, and Cárdenas, and each in turn has improved the lot of the masses. True, Obregón was assassinated in 1928 before he could enter a second term of office, and former President Plutarco Elías Calles, the "big boss," was shipped out of the country in an airplane in 1936 after he had begun to oppose further social reform. This was a great improvement (for Calles) over the more common cemetery method.

Perhaps this grant of safety to Calles marks the beginning of a new era. It is true that Mexico is not yet a democracy, for the dominant National Revolutionary party so far has had no effective opposition. But for the first time in the history of the nation, Mexico has a "dictator," President Lázaro Cárdenas, a Tarascan Indian who commands the genuine support of the great majority of the governed. He is an odd sort of dictator, for he permits the newspapers to criticize his policies. He is probably the only Mexican politician who never carries a gun. He mingles freely with the populace and encourages people to send him telegrams collect if there is anything wrong with their local governments. His sympathies align him with the worker against the employer and with the landless peasant against the landowner. He has promised the country a free presidential election at the end of his term in 1940, and if such a miracle occurs, Mexico will take a long step toward true democracy — one step, and the road is long.

The paymaster of a particular oil company had orders not to fraternize with the "generals" of either "army." One of the American oil-company officials had tried this by accepting a present of a horse from a Mexican "general." Of course, this present required a return. An account was kept, and it was found that the "general" made it very clear that he expected certain presents, and he got them to the value of $2000, about forty times the value of the horse. Thereafter, the Americans "handed out" when necessary, but with a dignified reserve that did not claim friendship.

[10] The Escobar rebellion was crushed within two months by former President Calles, who was temporarily appointed Minister of War by President Portes Gil. As a consequence of the rebellion, 52 deputies were expelled from the Congress, and 44 generals were deprived of their rank. The Government spent $7,500,000 to crush the rebellion. Railways incurred $6,500,000 worth of damage, and other property losses amounted to about $10,000,000.

Most Americans do not realize that a great social revolution is now in progress in Mexico, a revolution that may mean much more to the Mexican people than the old-style revolutions with bullets and battles, a revolution that is actually trying to bring about fundamental political, economic, and social changes that are aimed to benefit the masses of the people. Virtually every President after the overthrow of Diaz promised to promote nationalism, political democracy, land reform, labor organization, popular education, and limitation of the wealth and power of the Roman Catholic Church. Every President found that such promises were easy to make and difficult to keep, and at times the social revolution proceeded at a snail's pace. Under Calles, Gil, Rubio, and Rodriguez it picked up speed, but Cárdenas's Six Year Plan positively shifted the social revolution into high gear.[11] This plan, begun in 1934, involved the "Mexicanization" of industry; government ownership of public utilities and other vital industries; government control of exports and imports; more and better schools; construction of model homes, extension of public works, especially the construction of highways and irrigation projects; reform of co-operatives; and an acceleration of land distribution among the poor. Actually, this program has been carried out to a remarkable degree, as American oil companies that have had their lands expropriated know only too well.[12]

One of the most hopeful aspects of the social revolution has been the rapid progress in education in recent years. In 1937 Mexico had 13,600 rural schools, and it is in the rural areas that education is most needed. As illiteracy declines, government in Mexico should become increasingly a government *of* the people and *by* the people, for under Cárdenas it has already become (for a time at least) a government *for* the people. If the social revolution fails, Mexico will probably tumble back into the abyss of civil warfare and exploitation from which it is trying desperately to emerge. In general, it may be said that the Cárdenas "dictatorship" has been one of benevolent paternalism, strikingly similar to the rule of a tribal chieftain, for the great masses of the people look directly to him for leadership.

GOVERNMENT IN HAITI

On the other hand, Haiti has been a classic example of bad government. Revolution in Haiti was a business: you captured the customhouse, then you collected the tariff. There is a report of an importer who paid the import duty one evening on a shipment, but failed to take it away. The next morning a revolution had placed another party in power, and he had to pay another duty on the same shipment.

The United States took possession of Haiti in 1915 after peculiar acts of violence. A deposed President fled to the French Embassy. By international law he was in French territory. This is a common expedient in

[11] See Charles A. Thomson, "Mexico's Social Revolution," *Foreign Policy Reports*, Aug. 1, 1937.

[12] See *Idem*, "The Mexican Oil Dispute," *Foreign Policy Reports*, Aug. 15, 1938; and "Mexico's Challenge to Foreign Capital," *ibid.*, Aug. 15, 1937.

Latin America. The deposed ruler, not having time to reach the boundary, flees to an embassy or a consulate. His enemies camp outside to wait for him. Sometimes they camp for months, but legally he is in a foreign land. When he steps into the street, he is back in the country of his enemies; therefore he delays stepping into the street until chances for his getaway look good. In this case, however, the enemies of the deposed President would not wait, nor be gainsaid.[13] They entered the French Embassy and took out the deposed President. They threw His Excellency over the fence to the crowd, and the mob cut him into pieces and carried the pieces through the streets. In all international decency France should have been compelled to deal with Haiti or get off the diplomatic earth. We dealt with Haiti instead, by taking charge of the country. We did a thorough job of governmental housecleaning and reorganization, unfortunately marred by some needless killing. The American troops withdrew from Haiti in 1934, but an American official still supervises the collection of customs and makes sure that the Haitian Government makes prompt and regular payments on the debt it owes to foreign banks.[14]

FOREIGN TROUBLEMAKERS

We should not blame the Latin American peoples alone for the hundreds of armed uprisings and successful revolutions in the various Latin American countries. Foreigners, including North Americans, have often started, financed, or carried on the revolutions. For example, I am credibly informed that a certain American, head of an important American enterprise in a Central American country, was the right-hand man in a would-be revolution. He went to an American port and secured the arms. He shipped the arms into the country. The enterprise was a failure. The leader was killed; the American barely escaped with his life. If the revolution had been successful, the American was to be commander in chief of the army at $75,000 a year. Was he fundamentally different from Captain Kidd, except that Kidd succeeded for a time? In 1856 an American, William Walker, desired to duplicate the operation by which Americans went into the Mexican territory of Texas, settled, revolted, and then declared Texas part of the United States. Walker raised an armed force, usurped power in Nicaragua, and in 1860 invaded Honduras. There he was captured and executed. It is often asserted that

[13] The particular offense was grievous. One T. Simon Sam, a big Negro, President by right of revolution, was looked down upon by the better elements of Port-au-Prince as a roughneck and a cutthroat. An uprising against his rule was in progress and was being maneuvered by the better people of the city. To stop them, Sam arrested 170 of the young men and women of the best families in the city, put them in prison, and announced that he would kill them if the revolution did not subside. The palace was surrounded. Sam sent word to the commander of the jail to carry out the order for execution, and 168 young men and women were butchered. The city rose in a fury, but Sam succeeded in getting to the French Embassy, where the American consul and other foreigners had taken refuge. The American consul got word to an American war vessel thirty hours away, and as it steamed into the harbor the populace, realizing that they had to move quickly to get Sam if they got him at all, stormed the embassy.

[14] It may be true that the hand that rocks the cradle rules the world, but in Caribbean lands, those small nonindustrialized raw-material-producing states, the people do not use cradles. The hand that collects the customs . . .

foreign financial interests furnish the money for revolution and get their reward in concessions, and there are many men in whom the zest for adventure is so strong that they will gladly help in such enterprises.[15]

The first prize for high-pressure dollar diplomacy, however, goes not to an oil company, mining corporation, a New York bank, or some other private concessionaire, but to the United States Government for the part it played in the Panama revolution and the rapid sequence of events that gave us the right to build the Panama Canal. This sordid chapter in American history is the sort of thing that has made Latin Americans distrust *los Yanquis* (the Yankees, as they call us) and fear the great Colossus of the North.

At the turn of the century there was much talk about building a canal at Panama. De Lesseps, the man who dug a ditch across the sands of Suez, had tried to pierce the rocks at Panama and had failed; he might have succeeded if he had only first learned to swat the mosquito. After much investigation, the United States Congress decided in favor of Panama over Nicaragua for the new canal. It authorized President Theodore Roosevelt to buy out the De Lesseps company, to secure a canal site 6 miles wide at Panama from the Republic of Colombia, and to pay Colombia $10,000,000 cash for the site, plus an annual rental of $250,000. A treaty was drawn up embodying these terms, but the Colombian Congress adjourned on October 31, 1903, without ratifying the treaty. Colombia wanted more money from rich Uncle Sam. The people of the State of Panama were deeply disappointed at the treaty's failure, and two distinguished citizens decided to organize a "quiet" revolution. The revolt occurred on November 3, and American warships were on hand "to protect American lives and property" and also with instructions to prevent the landing of Colombian armed forces. Indeed, the Acting Secretary of State cabled to Commander Ehrman at Panama for information about the reported revolution two hours and twenty minutes *before* the revolution took place. On November 4 the Republic of Panama was organized; two days later its independence was recognized by the United States; and on November 18 a treaty was signed with Panama, guaranteeing its political integrity and giving it the $10,000,000 in cash and the annual rental for the canal site which Colombia had failed to accept. This was indeed a speed record for the American State Department. Like the great Disraeli, Theodore Roosevelt acted first and explained afterward. Finally,

[15] The newspaper account of the career of General Lee Christmas, a native of Louisiana, is suggestive: "The entrance of Christmas into the upheavals of Central America was incident to a revolution in Honduras in 1897. At that time he was a locomotive engineer in Honduras and on one of his trips ran into a revolutionist stronghold. The revolutionists piled aboard his train and ordered him to run it to a point where the federal forces were concentrated. When the fighting began, Christmas was obliged in self-defense to take a rifle and pitch in. The battle was won by the revolutionists, who made him a captain on the spot. From that time until 1911, when he assisted in overthrowing the government of President Davila in Honduras and reinstating that of General Bonilla, Christmas spent the greater part of his time fighting or planning to fight. Nicaragua, Salvador, Honduras and Guatemala were the scenes of most of his fighting and, in a large measure, he was instrumental in placing five presidents in office by revolutionary tactics. Christmas was the original of the character 'Clay,' hero of Richard Harding Davis's novel, *Soldiers of Fortune*, and he and the novelist were fast friends until the death of Davis." — *North American*, Philadelphia, Jan. 22, 1924.

in 1921 the United States Government paid Colombia a sum of $25,000,000, a sort of conscience fund for damage done — but we had the canal.

THE TYPICAL REVOLUTION

The Panama revolution was very unusual in the breadth of its influence because of the close relation of the United States Government. The usual revolution[16] has been much more nearly a personal or small-group matter. Usually there have been real grievances to encourage the revolutionists, but rarely indeed have grievances been righted after they have with much rhetoric and eloquence been made the pretext of an uprising. The revolution has seldom been an affair of justice. In many cases it would be more accurate to say that piracy and banditry have chosen the mask of government and the forms of taxation because it was safer and more profitable than exploitation on a smaller and less respectable scale. Sometimes a more or less benevolent despot would provide a period of brilliant rule, with many good aspects of government, like that of the Medicean rule in Florence.

The revolution business has caused much trouble for the American State Department because, by the Monroe Doctrine, we are in a sense standing back of these Latin American countries. Innumerable offenses have been committed against the property and persons of European citizens living in the Caribbean countries. For many of these offenses, if committed in Africa or Asia, the policy of the home governments would have been to take amends in the form of occupation of ports and annexation of territory. But foreign governments have been forced to remember that behind affairs in Mexico, or Haiti, or Guatemala was the Monroe Doctrine and the great power of the United States Government. It was partly to prevent such landings for the purpose of settling property claims that we stepped into the Dominican Republic in 1904 and took financial control of the country. For years the United States Government has collected the Dominican customs and made payments to foreign creditors. As a result of this receivership Europe ceased to push its claims, and we had a new semicolonial venture on our hands. For a number of years the United States Marines occupied the country. When they withdrew, a less responsible native military dictatorship appeared in that none too happy isle.

THE QUESTION OF IMPERIALISM

This whole question of the Monroe Doctrine and the action of independent countries in Latin America brings forcibly to our consideration the fundamental question upon which people seem born to differ: "Is it better for a

[16] One of the pet pieces of bombast of some badly governed parts of Latin America is the statement, backed up by statute, that education is free and compulsory. The only drawback is that there are no schools. In the Dominican Republic only 20% of the people can read and write; in Guatemala, 20%; in Honduras, 33%; in Cuba, 61%. To see the real farce, we should observe the way General So-and-So promulgates a constitution, abolishes a constitution, declares martial law, combines 27 states into 9 provinces, separates them again, grants concessions, and builds government railroads to his own town or his own land.

country to have order by outside authority and force or to remain independent and in a state of chronic disorder?" Aside from countries protected by the Monroe Doctrine, or other "big-brother" influences, this question seems to be largely theoretical. The weaker peoples have rarely been allowed to remain in their maze of confusion. The way of the world has been conquest, if conquest was not too difficult. Thus the white man in America has taken the lands of the Indian, and Europe has taken almost all of Africa and Asia. This is not only modern practice, it is as old as history. Egyptians, Medes, Persians, Chinese, and many others had conquered empires for themselves before the time of Christ. Modern land-grabbing is not exclusively a European and Caucasian game. The Japanese have also gone out, like Europe, rough-handed and red-handed, to grasp and build an empire. But for the Monroe Doctrine all Latin America would long ago have been covered with European flags, which would have maintained a far higher degree of order and fostered a vastly greater business, commercial, and educational development than now exists.

The United States has been in a peculiar position, in that we would neither let Europe rule Latin America nor go there ourselves.[17] Our reluctance to interfere or rule is due partly to our faith in the democratic ideal and partly to the fact that we had protested against European influence or possession. But despite all our protestations we took more possessions between 1898 and 1918 than any other nation. During that time no empire grew so fast as the possessions of the United States. We annexed Hawaii, Guam, and the Philippines, and advanced into the Caribbean like a glacier. All Presidents and all parties had the same policy. We annexed Puerto Rico, for years we maintained a protectorate over Cuba, and at times we have taken military possession of Haiti, the Dominican Republic, and Nicaragua. If we compare Puerto Rico at the end of eighteen years of American rule with its neighbor the Dominican Republic, we observe a striking contrast between the effects of good outside colonial rule and poor independent rule. In 1916, when we took the Dominican Republic, Puerto Rico had a universal system of free schools; the Dominican Republic had a very much smaller number of schools. One country had good roads and much prosperity; the other had mule trails and little prosperity. One had considerable sanitation; the other had almost none at all. The external evidence looks favorable for outside rule, but it does not prove that the Puerto Ricans or the Dominicans prefer outside rule. To Europeans all this seems merely a copy of their own economic imperialism and deceptive diplomacy. In an article on "Dollar Diplomacy," Pierre Arthuys says:

The American trusts, the pathfinders of Yankee Imperialism, march ahead of the Great Republic; they bribe, they buy, they seize. Usually the American govern-

[17] Of one thing we can rest assured — whatever the Monroe Doctrine has done in deciding who shall rule or who shall be free, it has brought us no Latin American love. In a statement given to the Buenos Aires *Nacion*, Dr. José Leon Suarez, an Argentine authority on international law, says that "with the course of time the Monroe Doctrine has become an elastic theory protecting exclusively the interests of the United States, and it is subject to such arbitrary interpretations and applications as circumstances may warrant whenever the Washington administration sees fit to make use of Monroe's name."

ment remains in the background for a time, until a convenient occasion comes to indorse their operations — even though these have been scrupulously ignored and even disavowed previously. . . . In Central America, "civilizing capital" has practically monopolized the natural resources of the little republics, making the local governments its tools.[18]

THE GOOD NEIGHBOR POLICY

Fortunately for all concerned, American imperialism seems to have run its course, and in its stead a new era of co-operative Pan-Americanism is now in evolution.[19] The "Big Stick" policy of the past has given way to the "Good Neighbor" policy of the present day, a policy that has already done much to improve our relationships with the Latin American countries. On December 28, 1933, President Franklin D. Roosevelt announced that "the definite policy of the United States from now on is one opposed to armed intervention." Already this country has implemented its new policy with concrete acts of friendship.

In the political field, the new policy means that we have abandoned our old ideas regarding intervention, that we shall no longer appoint ourselves as the policemen of the New World, and that we shall treat the Latin American republics as our equals through co-operative action to maintain peace. Our good faith has been demonstrated by the withdrawal of the marines from Nicaragua in 1933 and from Haiti in 1934, the abrogation of the Platt Amendment whereby we gave up the right to intervene in Cuban affairs, and the signing of a treaty with Panama settling certain disputes and renouncing our prerogative of intervention there.[20] We collaborated with Argentina, Brazil, Chile, Peru, and Uruguay in the Chaco Peace Conference at Buenos Aires which led to the signing of peace between Paraguay and Bolivia and to a settlement of their dispute over the Gran Chaco area. And in 1939, following the outbreak of war in Europe, we joined hands with our Latin American neighbors in adopting a common policy of neutrality and mutual protection.

In the economic field, the Roosevelt administration has endeavored to promote international trade by lowering tariff barriers. This has been accomplished by signing reciprocal trade agreements with foreign countries, including many Latin American nations. Furthermore, this administration has taken a conciliatory attitude toward Latin American debt defaults, and it has used its good offices to bring about satisfactory agreements between

[18] *La revue universelle*, Sept. 15, 1923.

[19] See Charles A. Thomson, "Toward a New Pan-Americanism," *Foreign Policy Reports*, Nov. 1, 1936.

[20] The Platt Amendment was an amendment to an army appropriation bill in 1901. It directed the President to withdraw the American Army from Cuba as soon as the Cuban constitution provided: (1) that no foreign power should ever effect a lodgment in the island or establish control over it; (2) that Cuba should contract no debt for which the revenues were inadequate; (3) that the United States might intervene to preserve independence, order, and republican government, and to see that Cuba discharged its obligations to other nations; (4) that Cuba approve the acts of the military government of the island and continue the sanitary reforms there; and (5) that the United States retain the Isle of Pines, and naval stations subject to future settlement. The Cuban constitutional convention accepted these stipulations, which were put in an amendment. Cuba now owns the Isle of Pines, but we still retain a naval base at Guantanamo Bay.

those governments that have defaulted on their bonds and the various bondholders' protective committees in this country.[21] This stands in sharp contrast to former days, when we were prone to collect our debts by armed force and to obtain special tariff concessions from weaker nations by intimidation.[22]

Patently, the Good Neighbor policy is a great improvement in our relationships with Latin America. The chief thorn in the side of the new policy is the present dispute (1940) between the Government of Mexico and the American and other foreign owners of property that has been expropriated by the Mexican Government. It should be noted that expropriation is not confiscation, indeed not even revolutionary, if a government promptly pays a fair price for such property as determined by some disinterested, arbitrating body. To date the Mexican Government has been very slow about working out a reasonable plan for settling the claims of foreigners. On the other hand, the foreign interests, especially the oil companies, have assumed a very truculent attitude regarding any form of negotiation whatsoever. If Mexico is permitted to confiscate these properties without reasonable restitution to the owners, then a bad precedent will have been set, which other Latin American nations might follow, thereby jeopardizing our investments of $3,500,000,000 in Latin America and making a farce of the Good Neighbor policy. Certainly, there is no good reason why an economic problem of this type should not be submitted to arbitration. Implicit in the Good Neighbor policy is the concept that bad neighbors must be induced to change their ways,[23] and this calls for collective action on the part of disinterested third parties — or? The Good Neighbor policy of the United States has not had time to be followed by a succession of administrations, or for dictators to show what they will dare to do if the Big Stick is really withdrawn. The lust for power is the worst of human lusts, and unlike other human lusts, it knows no satiety and grows by its gratifications. It is one of the congenital enemies of the Good Neighbor policy.

THE WEST INDIAN COLONIAL GOVERNMENTS

The West Indies afford a great variety of types of colonial government. Let us look at a British example. As one sails to Haiti, Caicos Island appears, white lime and sand shining through a thin cover of light-green bush. No tree, no house for miles. Then on an eminence of 30 feet a two-story frame house, shadeless, but with lighthouse and flagpole beside it — the seat of government, residence of the Commissioner. We drop anchor, a boat full

[21] Out of a total of $1,538,431,980 outstanding in publicly offered foreign dollar bonds on Dec. 31, 1935, about 80% were in default. It should be noted that the inane American tariff policy, culminating with the Smoot-Hawley tariff of 1930, was a large factor in causing the default of these bonds, since our high tariff made it difficult for foreign nations to ship their wares to this country, which was their chief (almost only) means of making payments on their debts to us.

[22] For almost twenty years prior to 1923 we forced Brazil to give special tariff preference to certain imports from the United States by threatening to impose a penalty duty on coffee, Brazil's one great export. See William S. Culbertson, *International Economic Policies*, D. Appleton & Co., 1925, pp. 108–14.

[23] See Nicholas Roosevelt, *Wanted; Good Neighbors — The Need for Closer Ties with Latin America*, National Foreign Trade Council, 1939.



FIG. A. The Government holds out its hand in the little British island of Grenada, although there is not much traffic to stop. Native police under a European chief is the usual West Indian practice. The tree in the yard (top center) is the fruitful papaya. (Photo by J. Russell Smith)

of black deck laborers starts out from the island and then turns back. It must wait for government. Government, British government, appears in a rowboat with a crew of three black oarsmen. The captain of this blue-denim crew shows his superiority by wearing a pair of old canvas shoes. The shoes are out at the heel and without laces, but nonetheless he is the captain of a barefoot crew of two oarsmen. Government itself is represented by two persons, one a handsome mulatto of forty-five — a customs consul — with cap and blue uniform, and the air and tone of authority. Beside him in the rowboat is his chief, the customs officer, a young white man with a thoroughly English accent. He wears a white suit, white shoes, white helmet, white collar, neat tie, and is unobtrusive, with little show of authority.

"All well?" he asks, in a low tone, looking at us. "All well," answers the purser. The people may now mingle without danger of contagion, and the boatload of Negroes again approaches the steamer. A rope is thrown over, and one after another 27 men and boys, clad in shirts, overalls, and straw hats, climb hand over hand up the rope, walking with bare feet up the side of the steamer, which they proceed to help unload.

On the wharf, faultlessly dressed and receiving his mail, is the ruler of the settlement, the Commissioner or Governor, as we would call him. It is evident that here is a man of ability, ruler of 600 blacks and 40 whites on Caicos, a coral strand with saltworks and sponge fisheries.

Caicos and Grand Turk are dependencies of Jamaica, governed from Jamaica, where most of the laws for these islands are made. The government is administered by a Commissioner, assisted by a Legislative Board of seven

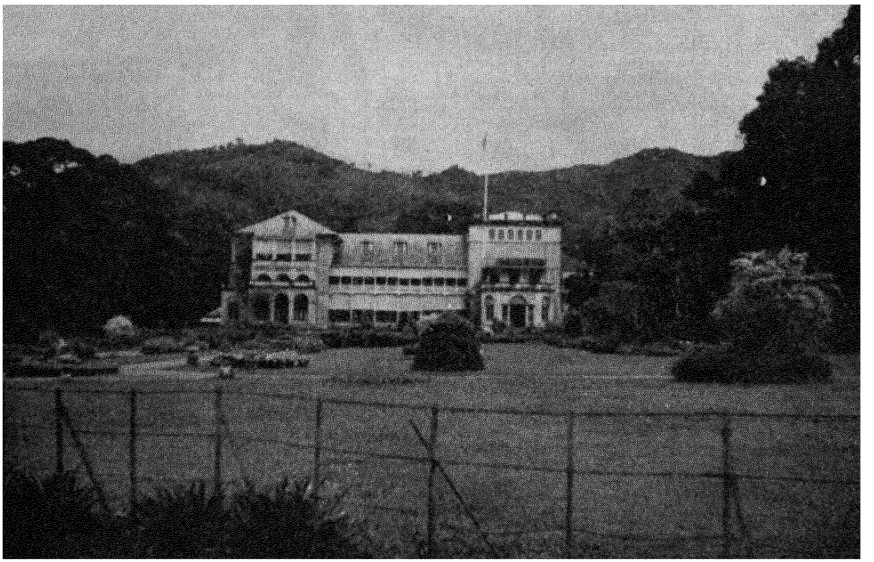


FIG. A. The official residence of the British Governor of Trinidad, located in a beautiful garden at the foot of a mountain in a suburb of the capital city, Port-of-Spain. Thus does Britain provide stately and pleasant places in many parts of the world for the scions of the right (Right?) families. (Photo by J. Russell Smith)

members, all of whom are appointed by the Crown. The Governor of Jamaica has a supervising power over the local government of the islands. The natives consider it a great honor to sit on the Council and to write J.P. or M.L.C. (commonly) after their names, yet one of them told me that they pass only the laws that they are told to pass, and receive no pay for doing it. It is plain that the government of Caicos and Grand Turk comes like the rain, from above, and is of no concern to the people themselves. It is one of the best of colonial governments in that it weighs lightly upon the people, affords them a reasonable degree of justice, and gives them enough education to meet their needs. Disturbances of the peace are few, and the memory of man runneth not to the time when there was murder in the islands.

This government from above (and a good government it is) may be considered an example of the British West Indian type of government. The Jamaican organization shows its essence admirably. The Governor, appointed by the Foreign Office in London, is assisted by a Council of 29 members. Of these 5 are ex-officio members by virtue of being (appointed) members of the Governor's cabinet. Ten are appointed, theoretically, by the King of England, really by the Governor, or the Foreign Office in case of a contest. In addition to these 15 appointees there are 14 members of the Council elected by the people of Jamaica on restricted suffrage. The Council therefore has access to the opinion and knowledge of the natives of Jamaica in regard to local affairs. But while the native members may bring information of local needs, their relative number shows where the final power lies. On an actual



FIG. A. Two members of the staff of the Trinidad Agricultural Experiment Station walking down a path through one of the few artificial plantings of mahogany that exist in the world today. They are much gratified with the success of the venture, which symbolizes much experimental work carried on by various governments, chiefly colonial, in the West Indian area. (Photo by J. Russell Smith)

showdown the elected natives have 14 votes, the appointing power has 15 votes and the chairman, and England rules. Is there any dispute about the vote? Will the natives rise in rebellion? In the harbor lies a warship, and in other not very far distant harbors lie other warships, so a military insurrection can be crushed almost as quickly as if it happened in one of the counties of England. Thus Jamaica has had centuries of peace and order and a government which maintains a relatively good system of schools. It also maintains courts wherein justice is quite as sure as in the courts of the United States, and furthermore it is quicker, cheaper, and freer from entangling technicalities.[24]

The government of Puerto Rico also has the essential element of the Jamaican government — outside control. Only the machinery differs. The Governor, the judiciary, the Attorney General, the Commissioner of Education, and the Auditor are appointed by the President of the United States. The Puerto Ricans elect members to their own Senate and their House of Representatives, but the laws passed by the Puerto Rican Congress can be vetoed by the United States Congress. The island elects a Resident Commissioner, who represents Puerto Rico in Washington; he has a voice but no vote in our House of Representatives. The insular legislature raises and

[24] This colonial government has less of that great curse of government in the United States, government by lawyers. Civilization is greatly handicapped in our country by the fact that the lawyer, whose profession looks backward, is the only person who can make money honestly by being a legislator. His position advertises him.

disburses all insular revenues; it enacts its own revenue laws, including income-tax and inheritance-tax laws. All taxes, including import duties, go to the insular treasury.

The United States Government has done an excellent job in the physical rehabilitation of the island, providing it with schools, highways, hospitals, and modern sanitation. In general, however, it must be admitted that the administration of our possessions and territories does not equal the excellence achieved by the British and the Dutch. In the case of Puerto Rico, we have done a wretched job in helping the Puerto Ricans to solve their economic problems. The island suffers from overpopulation, extensive unemployment, low standards of living, concentration of land ownership by absentees, exploitation by American corporations, and the domination of agriculture by a few export commodities, especially sugar. In recent years there has been much malnutrition, discontent, and even bloodshed in the island. Puerto Rico buys more goods from the United States than any Latin American republic. It deserves better treatment than that given to an unwelcome stepchild.[25]

The French and Dutch colonies are governed in much the same way, except that in the Dutch colonies all the members of the Council are appointed.

The governmental setup of Cuba during the first third of the twentieth century becomes especially interesting, when one considers:

1. The Latin American record of government by corporation puppets
2. Government by sheer military adventurers of the Oriental-despot type
3. The astounding upswing of dictators in Europe of the 1930's
4. The ease of gang control by machine gun
5. The growing recognition that nations are living in anarchy and that international anarchy must cease

If one thinks of the Cuban *people*, that government which they had in the past may perhaps have been called the real Good Neighbor government. Compare it with those of Jamaica or Puerto Rico. These latter have governments reasonably good by most tests, but sustained by foreigners. When will foreign rule end? In theory, probably never. Cuba has been independent, except for the Platt Amendment, which until recently let the United States take charge of Cuba's foreign affairs and gave us the right to intervene in *periods of disorder*. In 1906 the United States did intervene; it established military government for a time, put Cuba on its feet, and then withdrew to let it take care of itself. This is an admirable theory, if we accept its basic assumption, that Cuba has or can develop the power of governing itself in a way that is satisfactory to civilization.

In 1922 the United States intervened in Cuba again — a remarkable kind of intervention. One man in white duck clothing went to Cuba — General Enoch H. Crowder, of the American Army, the special representative of the President of the United States. All that he did was to confer with the Cuban

[25] See Victor S. Clark and associates, *Porto Rico and Its Problems*, The Brookings Institution, 1930; and Earle K. James, "Puerto Rico at the Crossroads," *Foreign Policy Reports*, Oct. 15, 1937.

administration. He made no pronouncements, he led no army, but everybody in Cuba knew that behind this single white-clad figure was the power of the United States of America. Cuban politicians made a great clamor, for to them General Crowder was a most unwelcome visitor. They had four men in office where one was needed. The savings to Cuban revenue which General Crowder made by eliminating offices were splendid for the Cuban taxpayer, but appalling to the Cuban political ring, which loved office as dearly as any other political ring, and was proceeding rapidly to ruin Cuba, by the same process that brought about the drowning of seven Brazilian admirals when one small Brazilian warship sank some years ago.

Perhaps the most reasonable governmental hope for many Caribbean peoples during the next hundred years is that their governments may have Platt Amendments attached, but with the difference that the General Crowders are not to be sent by any *one* government at its discretion, but by some association of governments or peoples. Compare that with conditions in the state in which you live and in the United States Government.

In its final outcome governmental feeding of the populace may turn out to have been one of the most perilous West Indian governmental ventures. It is easy to start, but the record of its satisfactory stopping is not full of shining examples.

A novel, *The Star Spangled Virgin*, by DuBose Heyward (Farrar & Rinehart, 1939) gives an interesting presentation of this and the West Indian Negro attitude toward marriage. It might be called a historical novel during the period of a benevolent, opulent, distant, mythical hero named Noodeal.

Chapter 42. THE WEST INDIES— TRADE-WIND ISLES

TRADE-WIND CLIMATE



THE West Indies stand in a warm sea, and the trade winds, warmed and moistened by this sea, blow across all of them. These are the two great primary geographic facts about this group of islands whose area is but little larger than that of Great Britain.

These trade winds, always warm, but nevertheless refreshing sea breezes, blow mostly from the east or the northeast. Thus one side of every island is windward, and the other side is leeward. The third great geographical fact about these islands is that most of them are mountainous, giving to the windward sides much more rain than the leeward sides receive. This makes great differences in climate within short distances, a thing quite unknown in the eastern half of the United States, where our slowly whirling cyclonic winds blow in quick succession from all directions upon every spot of territory. Thus both sides of the Appalachian Mountains are nearly alike in their rainfall, forest growth, and productive possibilities. On the contrary, the West Indian mountains have different worlds on their opposite slopes. The eastern or windward side, cloud-bathed and eternally showered upon, is damp and dripping. There are jungles with velvety green ferns, and forests with huge trees. The rainbow is a prominent feature of the tropic landscape. On the windward side one receives a striking impression of lush vegetation. On the leeward side of the very same ridge and only a few miles distant there is another kind of world, the world of scanty rainfall, with all its devastating consequences to vegetation. A fourth great geographic fact is the division of these islands into two great arcs, an outer arc of limestone and an inner arc of volcanic islands. The limestone areas are low. The volcanic areas are from moderately high to very high. Some islands have both the limestone and the volcanic features.

On the Jamaica mountains, with summits more than 7000 feet in height, the rainfall contrast ranges from 200 inches on the windward side to 15 inches on the leeward plains. Puerto Rico mountains are only 3000 feet high, but the rainfall ranges from 130 inches to less than 40. Often there is a ring of cloud around a trade-wind mountain. This cloud is formed by the cooling that results from the moist trade wind being forced upward in crossing the mountain. The cloud cap is almost as much a part of the elevated trade-wind isle as is the forest itself. It streams away to leeward from the crest like a

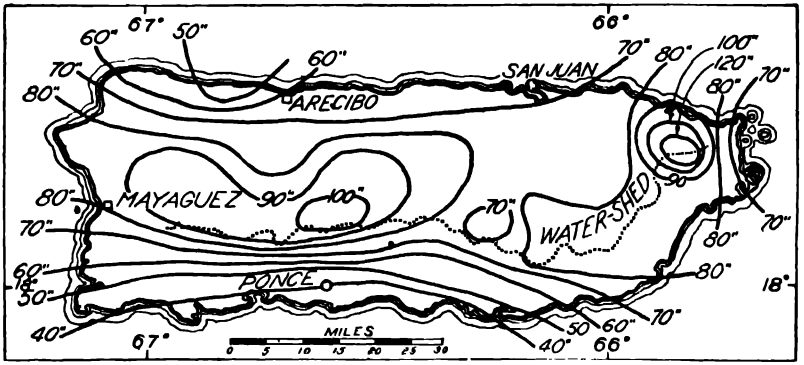


FIG. A. This map of annual average rainfall is typical of a trade-wind island. If the mountains had been higher, the contrast would have been greater, as is the case in Hispaniola, where salt lakes are to be found on the lee side. (From Dr. O. L. Fassig's manuscript map)

flag. As the cloud mass floats from the land it becomes smaller and less dense, and finally fades entirely by evaporation.

In the summer months the greater heat of the sun makes the larger islands somewhat hotter than the adjacent sea. This causes the air over the islands to become heated and therefore to expand and air rushes in from the sea to fill its place as it rises. The rising air cools and condenses the moisture, which falls to earth in the tropical shower. Often the rain is accompanied by thunder and lightning and usually it comes in the afternoon or the early hours of the night. This type of rain (convection rain) comes to all sides of the islands, but chiefly on the windward side.

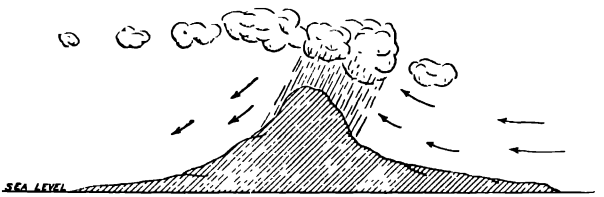


FIG. B. Cross-section of one of the trade-wind islands, showing the flag of clouds that hangs over their tops and the rain which so often drenches the top and lets places a mile away stay in sunshine.

Most trade-wind lands have, broadly speaking, a rainy season and a dry season. On the windward side the dry season is not really dry at all, it is merely less wet; but on the leeward side there is a pronounced dry season. This is characteristic of the south shores of Jamaica and Puerto Rico, of most of the area of Cuba and Haiti, and of the interior and leeward areas of Central America and tropical Mexico.

One more thing, a deadly thing, must be told about this climate. For reasons not fully understood, trade-wind rainfall is less regular than the cyclonic rainfall of the eastern United States. Therefore the tropic isles are subject to drought and all the hardship that drought brings. The figures of rainfall average may look promising for two given months. Then there comes a year when the islands are rainless during these two months.

At intervals, fortunately rather rare, the heavy tropical cyclones, called hurricanes, sweep through the West Indies.[1] These hurricanes are like the cyclones of the United States, but stronger. They sometimes smash down banana plantations, uproot trees, and destroy buildings and ships.

These variants of the West Indian rainfall — rainy and dry seasons; differences in altitude affecting the amount of rainfall; the stubborn fact of occasional devastating drought — combine to make corresponding variations in forest growth. The heavy, continuous rains of the windward slope make the *rain forest*.[2] This is the forest of tall, large trees, through which one can pass readily because the high foliage is so thick that the undergrowth is smothered. In other places where rain is less abundant and where there is a dry season we see the real jungle — a forest of small trees all tied together with creepers and vines, and often so matted as to be impassable until a path is chopped. Where the rainy season is short and the dry season is long, there are scattered trees and thickets of scrub, which give way to the savanna — grassland with occasional trees — as rainfall becomes scantier and the dry season more pronounced. Where the rainy season lasts only a few weeks, the hard life conditions produce only cactus, grass, and scattered bushes, many of them thorny. Considerable areas of such land are to be found in the southwestern part of the Dominican Republic and adjacent parts of Haiti, where three mountain ranges running northeast and southwest cut off the trade winds from the interior and southern plains. One result is a lake in the southwestern Dominican Republic that has no outlet — one of the sure signs of little rain.

The influence of the mountains in making rain is most marked, as any rainfall map will show. One day in July, 1923, I climbed halfway up the mountain at the east end of Puerto Rico, where the rainfall is more than 100 inches per year. San Juan, at sea level, had been suffering for many months from drought, and on the day of my journey the city lay under bright sunshine. Twenty miles away, at an elevation of about 1000 feet, which I reached at eleven o'clock, there was a succession of clouds driven by the northeast wind. The clouds became larger and thicker, and in two hours' time I had passed through seven showers, none of which was heavy. The rain would fall for a minute or two, and instantly the sun would shine, if indeed it did not happen to be shining while the rain fell from some small cloud. The native manager of the estate to which I was going met me dripping wet. He did not take the trouble to change his clothes as he went into the forest with me. There was a reason why he should not, for in half an hour the sky, alternating sunshine and cloud, seemed to open and pour water down upon that mountainside for perhaps fifteen minutes. But the return journey showed that it had not rained at all 2 miles away and a few hundred feet lower down. The rain that fell above the 1000-foot level might be called mountain-made.

[1] For a description, see Salisbury's *Physiography* or any text on meteorology. For emotional description, see *Typhoon* by Joseph Conrad, master painter of the tropics.

[2] The edge of a tract of rain forest is impenetrable unless one chops a path. When it is cut, the impassable jungle springs up to fill its place. If left alone long enough, the process of growing and smothering again restores the open rain forest.

PUERTO RICO

TYPICAL MOUNTAINOUS TRADE-WIND ISLAND

A mountainous trade-wind island like Puerto Rico shows clearly the many contrasting influences of elevation on the windward and leeward sides. The eastern plain of Puerto Rico is so wet that the sugar planters have to make expensive artificial drainage ditches, putting in tile drains, and ridging up the fields so the cane may have enough dry earth to stand in and not be drowned out. On the south shore, quite to the contrary, great efforts are expended to get water to the cane field, for irrigation is necessary there. For this purpose some of the water is brought from the too-abundant supply of the windward side. The people have gone so far as to make reservoirs near the summit of the mountains on the rainy northeast; then they dig tunnels under the mountain backbone of the island to carry water to the more arid southwest. Thus in two places this fairly common trade-wind-isle device of making the rainy windward section supply water for the drier south side is utilized in Puerto Rico.[3]

On the south side of the island one sees rivers on the map. But at the end of the dry season the automobile swings down through the gravelly stream beds, bone-dry. The road is dusty. There are but few trees. The country creates a shadeless impression. To the Yankee the villages look hot and unhomelike, resembling Spain, whence the people came.

There are wide expanses of silver-green sugar cane where there is water for irrigation, but beyond the last irrigation ditch is the brown and empty land, much like Southern California's summer landscapes above the irrigation line. The forest fire I saw in the scanty open forest above heightened the resemblance to California, which is also maintained by the large areas of pasture land, with a cactus here and there, where the big herds of oxen were resting after the arduous harvest.

Going from Ponce up the south side of the mountains affords a great contrast to the green journey up from San Juan. The first 3 miles of plain and low hills are almost treeless, with close-cropped grass. Where there is forest the trees stand apart and one can see well between them, as in the foothill forest of Southern California or Majorca. The few houses along the dry stream bed look hot and desolate. There are no cottages on the hills, only pasture, but as one looks up the valley into the higher zone of greater rain, toward the backbone of the mountain, each headland projecting into the valley is greener than the one below it, and the final distance is very green. The road climbs steadily, and 6 miles from Ponce the northeast (moister) side of a hill has a patch of very thin corn and some banana plants, so small that they almost resemble corn. As the automobile sped along, the corn patches quickly became greener and the banana plants larger and more numerous. At 8 miles it was raining a little, the mountain forest was thicker,

[3] This method, very common in Hawaii, was used in Madeira more than two centuries ago, and the masonry conduits built by the slaves of that day to carry northeastern streams to southwestern slopes are still in good working order.

plantain leaves overhung the road, the road itself was strewn with ripe mangoes, and big pumpkin vines climbed down the banks from the gardens above. At 12 miles ferns hung over the bank by the roadside, and the rain came down in torrents. At 18 miles, just before we crossed the divide at 2000 feet, wild caladiums and wild canna grew beside the road in a riot of wet tropical greenness.

As we entered the banana belt, houses began to line the roadside and the neighboring ravine, but there were not so many of them as there were on the north side of the island. The north slopes, from bottom to top, are almost everywhere dotted with the thatched houses standing in the midst of the little machete-made farms described in Chapter 40. Steepness seemed no barrier. Even after seeing the terraces of the Apennines and the shores of Lake Garda I had not dreamed that men could live and grow crops (other than tree crops) on such steep lands. Transportation by wagon is unthinkable; even by donkey it is very difficult. The footpath and the man pack are the common types.

Puerto Rico has rich soils. The backbone of the mountain is of volcanic origin, and was pushed up out of the sea with much limestone on its slopes. That is a rich combination. The name of the country, meaning Rich Port, came naturally.

TROPIC ABUNDANCE

This land that has always the warm trade winds, twelve months of rain, the palm tree, and rich soil naturally gives the impression of tropic abundance. But the oft-made statement that the tropics will grow everything is quite misleading. Perhaps they *might*, but practically they will not, as the newly arrived Yankees promptly discovered. The newcomer plants a garden of New Jersey vegetable seed bought from a New York seedsman. The ants eat up most of the seed. The next time he plants his seeds in boxes, and transplants the young seedlings, only to find shortly that the beetles have cut off most of his plants at the top of the ground.

Tropic abundance applies to the enemies of plants as well as to the speed of plant growth. When it comes down to practical edible plants now available and capable of surviving, their variety in the tropical garden is smaller than the variety in a Northern garden. If I want a good and varied garden, I will go to the United States, not to the middle of the West Indies. After scanning many West Indian markets in midsummer I found that my own United States garden was richer in variety, and there is a plethora in the American city market as compared with those of San Juan and Ponce. What is worse, most of the tropical stuff is flat and insipid in flavor in comparison with our own. These handicaps, in combination with the tropical inhibitions on labor, cause the diet to be very restricted and monotonous. Rice and beans are the great staples of Puerto Rican diet for all classes of people, who live by the proceeds of trade rather than from the produce of their own gardens. With the Americans I met who had been there as long as a month and were eating at Puerto Rican tables, I found it difficult to keep the conversation away from food, so vociferous was their state of rebellion against

rice and beans. Both rice and beans are imported, although the island might produce plenty of beans if it did not grow so much sugar.

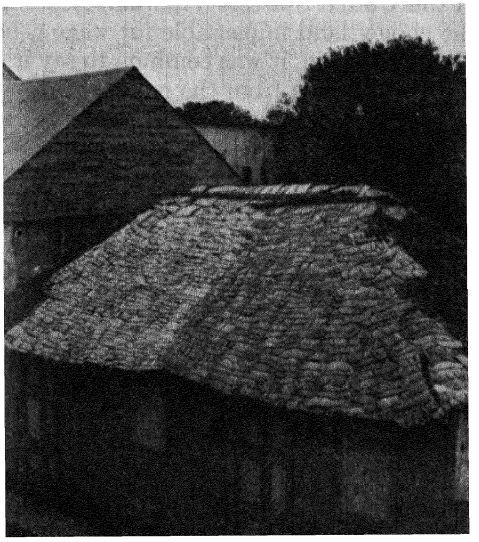


FIG. A. The sheath at the base of the leaf of the royal palm is 3, 4, or 5 ft. long, a foot or two wide, spreads out flat, and is used for shingles, making such roofs as this. On Hispaniola they say that these shingles are good for twenty years — one of the factors of life without commerce. (Photo by J. Russell Smith)

AMERICAN RULE

When the Americans took possession of Puerto Rico in 1898, it was a populous region. Under the Spanish dominion it had been chiefly valued for the sugar plantations of the plains, which were then producing about 50,000 tons a year. Coffee was the rival product, produced by the machete farmers of the plateau and brought down mountain paths on man-back and muleback to the ports. Spain did nothing to encourage the coffee, but it was the only thing the natives could grow in the hills and sell overseas.

The government of Puerto Rico by the United States has brought two great changes into the economic life of the island. These are a policy of tariff assimilation and a physical rehabilitation of the island. American occupation has meant modern sanitation, hospitals, schools, and excellent highways. The American tariff policy has meant that complete freedom of trade exists between the island and the United States, but that foreign goods entering Puerto Rico must pay the import duties prescribed in American tariff schedules.[4] The tariff policy has led to a great increase in trade between the two countries and, in particular, has stimulated the island's sugar exports to the United States. The island has come to be extremely dependent upon this country as a market for its goods and as a source of imports. In 1937 about 98.5 per cent of Puerto Rican exports were sold in the United States, and about 91 per cent of the imports were bought in this country.

As for the roads, they required so much work and money, and offered so good an opportunity for graft, that the Spanish colonial government did not bother with them. In four centuries Spain had constructed 275 kilometers of good road in Puerto Rico. In eight years the United States had made 800 kilometers. There is now a good system of roads, going around the island and crossing it several times and connecting all the main points. The roads are as good as any similar mileage that can be found in a similar area of the United States. Roads are perhaps more necessary in the West Indies than

[4] The import duties are one source of income for the insular treasury.

in the United States. The rainy season, with its daily soaking, often makes the clayey land impassable for wagon, beast, or man. When the Americans took possession, it was common to say it cost more to get coffee 20 miles down to the port than from the port to Europe. Twelve oxen have been known to be stuck in the mud with nothing but an empty two-wheeled cart attached to them.

The opening of the American market to Puerto Rican produce without tariff charges has caused the merchandise exports from the island to increase from $8,600,000 in 1901 to a peak of $175,000,000 in 1920. In 1937 Puerto Rican exports amounted to $106,000,000; its imports, $99,000,000. During the later years of Spanish rule sugar exports varied from 40,000 to 60,000 tons annually, but since American occupation they have grown by leaps and bounds, amounting to 68,000 tons in 1901 and 910,000 tons in 1937. Between 1901 and 1937 the value of tobacco exports increased from $684,000 to $9,500,000, but coffee exports worth $811,000 in 1937 amounted to only half that value in 1901. Maximum coffee shipments of 58,000,000 lbs., worth $8,900,000, were made in 1896, and this peak has never been equaled under American rule. As soon as the Americans took over the island, Spain raised its tariff on coffee, and the coffee-growers of Puerto Rico have never been able to develop a comparable demand for their coffee in the United States. The excellent quality of this "mild" coffee has not yet become generally known to us, and it is expensive in comparison with Brazilian coffee. It is a slow process to create a new market for coffee. Most of the island crop is sold in Europe.

The dominance of the sugar industry in the commercial economy of the island is indicated by the fact that raw sugar, refined sugar, rum, and molasses account for 70 per cent of the total exports. In 1937 the value of leading exports in millions of dollars was as follows: raw sugar, 55.4; cotton wearing apparel, 11.9; refined sugar, 10.7; leaf tobacco, 8.4; rum, 3.1; cotton handkerchiefs, 1.6; molasses, 1.2; pineapples, 1.2; silk dresses and underwear, 1.0; and coffee, 0.8. While the island is predominantly agricultural, there has been a steady growth of manufactures in recent years. Much clothing is cut out in New York and sewed by the low-paid women of this warm isle.

SUGAR

Sugar cane, coffee, and tobacco dominate the agricultural economy of the island, for in 1935 about 58 per cent of all the farms in Puerto Rico had one of these three crops as the chief source of income. Indeed, these farms represented 77 per cent of the total farm area, 83 per cent of the cultivated acreage, and 82 per cent of the total investment in farm land and buildings. In that year they employed more than 175,000 agricultural workers, or 72 per cent of all persons employed in agriculture in Puerto Rico.[5]

It is in sugar that the influence of the Yankee occupation has made itself

[5] See Rafael Picó, "Land Tenure in the Leading Types of Farming of Puerto Rico," *Economic Geography*, April, 1939, pp. 135–45; and Puerto Rico Reconstruction Administration, *Census of Puerto Rico, 1935*, Washington, 1937.

most felt. The tariff advantage of a cent or two a pound is an enormous incentive. Eighty thousand acres of semiarid land have been made available for cane culture under irrigation systems in the southern half of the island. The crop is not expensive to raise and a planting will last seven years, sometimes longer. One may simply grow cane and sell it to the nearest "central." To establish a modern central (sugar mill) is quite another matter. The industry, with its huge mills, is capitalistic, and therefore tempts the men of Wall Street to organize it. Large areas of Puerto Rican sugar lands have passed into their hands, and extensive investment in sugar mills and sugar estates has been made. Much hilly land that was in forest or in coffee plantations in the days of Spanish rule has been cleared and put to cane (and gully washing). In 1935 sugar-cane farms occupied two-fifths of the total farm area and gave employment to about half of the agricultural laborers.

Sugar makes much commerce. Most of the new mills are made of structural steel covered with corrugated iron. Plows, harness, and wagons must be supplied from the United States. Even coal must be sent for the little tram trains that run about the plantation on miniature railroads. The sugar industry employs from 80,000 to 90,000 laborers in the fields, and there are many others working at the mills, on the tramroads, and driving oxcarts.

The common method of growing cane is still by hand labor. The process is somewhat as follows: The ground is plowed and harrowed with ox teams. The shoots of cane are planted, and men with hoes keep down the weeds, some of which they pull by hand. In a day, eight or ten men will clean an acre of young cane. This is done two or three times before the cane plants are large enough to shade the earth completely and keep down the rival growth. After this, the cane is let alone for several months until it is ripe. Then the great labor of the sugar harvest begins. The cane is hauled to the mills by ox teams and temporary railroads, and the field is left littered with cane leaves. After the cane is once established, it is allowed to grow up for second, third, or even fourth cuttings — sometimes even more. The leaves that remain after cutting are piled in every alternate space between rows. They cover the ground so effectively that only the clear rows need to be cultivated after the first crop has left its mulch of leaves.

The predominance of hand labor is shown by the fact that in a morning's journey 175 field laborers were seen, while only 5 oxen were drawing cultivators, and most of these had a boy leading them as well as a man guiding the cultivator. For his hot hard work in the tropic sun, the average field worker receives $3.75 per week.

The sugar worker is nearly always a landless man, often living in the villages on company land, without gardens, and depending upon the store for his food supply. In such a store the most conspicuous things were a row of open boxes of rice, dried peas, dried beans in two varieties, dried chick-peas, a box of salted pigs' feet, pigs' ears at 8 cents a pound, and a box of dried codfish, all standing out in the open, exposed to flies and the humidity, but keeping perfectly because they were salted or dried.

The typical sugar plantation in Puerto Rico covers a large area, 500 acres or more. In 1935 these large holdings belonged to about 100 independent

farmers and to 41 sugar mills. The sugar mills were owned by 30 individual and corporate owners, who controlled about half of the land devoted to sugar cane in Puerto Rico. About 30 per cent of the island's total sugar output was produced on the land belonging to 4 corporations, and the mills belonging to these corporations ground about 45 per cent of all the cane on the island. Most impartial observers feel that the big sugar corporation is much more interested in profits than in wages, social conditions, and the unemployment that may ensue from a decline in the price of sugar. Concentration of much of the best land on the island in the hands of absentee corporate owners is one of the big problems confronting Puerto Rico today.[6]

TOBACCO

Tobacco is grown chiefly in the mountain valleys and slopes of the northward-draining interior, where it is the staple crop. It is commonly planted in November and harvested in February and March. After the tobacco harvest the ground is planted to what are called minor crops — corn, with beans in the corn, and sweet potatoes for the local food supply. After harvest in May and June the ground is plowed in July, and through July, August, September, and October it is limed and harrowed repeatedly to make it fine, mellow, and rich for the great event of the year, the planting of tobacco in November. If the rainfall were a little more regular, a crop might be grown in the time between the minor crops and tobacco. The farmers, however, do not take the risk of drought.

Much of the Puerto Rican tobacco is grown under cheesecloth, which keeps away beetles and wind, and increases the humidity and the fineness of the leaf, thus making it more valuable for cigar wrappers. These ghostly-looking, white-covered fields are expensive to operate. The cloth can be used not more than four times, and this phase of tobacco-growing is only practiced by corporations, mostly with American capital. The tobacco barns are striking in appearance, with their huge bulks spread thickly over the landscape.

In contrast with sugar-cane production, tobacco-growing is an individualistic, small-scale enterprise. About 47 per cent of the tobacco-growers own their farms, and about 31 per cent are tenants on the land belonging to other farmers. In this branch of agriculture one finds virtually no absentee owner-

[6] The United States Government has made one attempt to solve the problem. In 1935, the Puerto Rico Reconstruction Administration, a Federal agency, bought the Lafayette sugar mill and lands from French interests, involving about 10,000 acres owned by the mill and about 8000 acres controlled under lease. The purpose of this government project is to divide the land into units of less than 500 acres, to be operated by the cane workers themselves united in a number of co-operatives. Eight land co-operatives, involving a total of 3000 acres, had been organized by June, 1937. The Puerto Rican Government has also sought a remedy by bringing legal action against one of the corporations. Since May, 1900, corporations operating in Puerto Rico have been prohibited by act of Congress to control over 500 acres of land. Throughout this century this limitation has been violated or evaded by some of the sugar corporations. Only a few years ago did the insular Government decide to enforce the law, and the insular Attorney General brought proceedings against some of the corporations. The first case was decided in favor of the Government (August, 1938) in the Supreme Court of Puerto Rico. The defendants appealed to the Federal District Court of Boston. (See Rafael Picó, *op. cit.*, p. 145.) In March, 1940, this case was decided in favor of Puerto Rico by the Supreme Court of the United States.



FIG. A. A Puerto Rico tobacco field shaded by thin cotton cloth. This is plainly a capitalistic type of industry. The workers are selecting seedlings for field planting. (Courtesy Tobacco Institute of Puerto Rico)

ship of the land.[7] The typical tobacco farm is small, even the larger ones averaging only 63 acres in size. Although tobacco yields 90 per cent of the cash income, only about one-fourth of the average tobacco farm is planted in tobacco at one time, for tobacco is an intertilled crop that requires a vast amount of labor. In Puerto Rico the tobacco field often yields a crop of corn, which is planted in the spring after the tobacco has been harvested. In addition to his cash crop, the tobacco farmer usually raises bananas, plantains, yautias, beans, and sweet potatoes. In 1935 about one-fourth of all Puerto Rican farms received their chief income from the sale of tobacco. There is no question that free trade with the United States has proved a great boon to the Puerto Rican tobacco industry, for the island supplies this country with about 40 per cent of its cigar-filler requirements.

While wrapper tobacco is grown under the shade of cheesecloth, filler tobacco for cigars is grown in the open. The mild subtropical temperatures and protective mists of the mountain valleys make possible the production of a high grade of filler tobacco. The trade winds bring light rains of the sprinkle type in the early part of the winter, and a less humid late winter facilitates the tobacco harvest. Tobacco soils in Puerto Rico are usually slightly heavy in texture, but the drainage is excellent, since the crop is grown on steep slopes or on terraces. It is clear that soil, climate, cheap labor, and free access to the American market combine to make tobacco an important cash crop on this densely populated isle.

[7] In 1935 the Puerto Rican Reconstruction Administration bought 4322 acres from a corporation that had attempted to produce wrapper-leaf tobacco and had failed. This property is being subdivided into small homesteads of from 5 to 10 acres in size. In June, 1937, 271 homesteads were already occupied. (*Ibid.*, p. 143)



FIG. A. This Dominican scene appears to be a forest, and so perhaps it is, a modified forest. The low growth is coffee; the trees above furnish the desired shade. (Courtesy Robert S. Platt)

COFFEE

Coffee is grown on the higher, steeper, wetter mountain slopes between 400 and 3000 feet in elevation. In the rainy west-central mountains coffee dominates the use of the land at from 1300 to 3000 feet elevation. Here there is mile upon mile of steep hillside which appears from a distance to be forest. A nearer view reveals the feathery tops of a leguminous tree universally used to shade the coffee tree, and also to fertilize the coffee tree with the nitrogen from its roots. Beneath this open-topped shade are coffee bushes, 10 or 12 feet high, and often sticking out from among them are the great spearlike tops of the plantain. Coffee-picking is something in which an entire family can engage. After the coffee season is over the cane season begins, and many of the laborers migrate from the hills where coffee is raised to the cane fields below. Coffee berries are picked by hand as we pick cherries or currants. They are dried to get rid of the pulpy skin and then put through various machines for sorting and sizing. A wide pavement and a dry season of sunny days are important in coffee-curing. In open spaces by the roadside and in the villages in the mountain valleys the coffee-drying yard, with its cement floor, is the symbol of this industry, just as the tobacco-curing house is a sign of the tobacco industry and the tall smokestack and red roofs of the sugar mill are of the sugar industry.

The coffee-grower is quite different from the sugar worker in his relative dependence upon trade and upon the garden. Coffee is the crop of the independent mountaineer. Unlike the landless sugar laborer, a coffee-grower back in the hills usually has his *conuco* with plantains, corn, beans, sweet

potatoes, and often the caladium. A man with 2 acres can have ½ acre of coffee and keep his garden and goat roving around over the remaining 1½ acres. These gardens are often planted out, allowed to grow for two or three years, and then abandoned, giving a country a cutover appearance and causing a great scarcity of wood. It is fortunate that the gardens are abandoned, for otherwise their almost unbelievable steepness would cause them to be washed away. I climbed through a coffee-grower's garden that had been so recently abandoned that old cornstalks were still standing and a few sweet-potato plants were yet alive, but the stumps of the previously cut bushes were still there, and the wild growth was again holding the soil in place. The slope was so steep that I could climb down only with difficulty, and not in a straight line. Going back I was glad to avail myself of stumps and bushes to help me up the slope.[8] The near-by coffee plantation was on land a little less steep. Holes had been dug in the hillside to stop the wash. There were often six or eight to the square rod. Some of the holes would contain a barrel of water. When they were washed full of leaves and sediment, a coffee bush was planted in this accumulation of fertility and a fresh hole was dug. This combination of fertilizing and erosion control called *ahojado de mino* (hole of the mine) is said to be common in Puerto Rican and Central American coffee plantations. It is the best thing I saw as an aid for the continued presence of man on those slopes. The principle is capable of wide application, and is in use on Malayan rubber plantations.

Although coffee is locally regarded as a "small man's crop," most of the total output is produced on medium-sized farms of about 150 to 175 acres in size. On the average coffee farm, coffee usually occupies about one-third to one-half of the total area, but in between the coffee trees are often found shade trees, banana plants, and orange trees. Very little Puerto Rican coffee is sold in the United States, and the difficulties of selling the coffee in Europe have caused the coffee-grower to supplement his main crop with additional sources of income by producing limes, vanilla beans, citrons, and plantains. Considerable areas on the coffee farms are often in woodland and brush, which provide charcoal and cordwood for local sale. In spite of the difficulties of selling coffee abroad, about one-fifth of all Puerto Rican farms depend chiefly upon coffee for their cash income.[9]

THE POPULATION PROBLEM

The intensive utilization of steep land is one of the characteristic results of a population of 520 people to the square mile (about ten times that of Iowa) supporting themselves by agriculture in a land three-fourths of which is mountainous. Indeed, Puerto Rico has about 1500 people per cultivated square mile.

Nearly every rural Puerto Rican family, if able to afford the luxury, has

[8] Dr. W. C. Lowdermilk of the U.S. Soil Conservation Service tells of measuring a field that had a slope of 112% (112 ft. vertical to 100 ft. horizontal); the worker was kept in place by a rope held by a man at the top.

[9] Rafael Picó, *op. cit.*, p. 140.

a goat or two. The milk is used for children and for cheese, and the flesh is sold in the markets. Cows are not common. They eat too much.

The American rule of Puerto Rico has produced great increase of trade, but the accompanying rapid increase in population is creating a grave problem. Under the last twenty-two years of the Spanish regime, the population increased 1.37 per cent per year. Under American rule the average annual rate of increase in the population was 1.63 per cent between 1910 and 1920, 1.69 per cent between 1920 and 1930, and 1.95 per cent between 1930 and 1935. Small wonder that the legislature, in spite of opposition from organized religious groups, in 1937 withdrew legal restrictions on the dissemination of birth-control information, prohibited the marriage of those physically and mentally unfit, and created a Board of Eugenics to decree the sterilization of the mentally retarded. This approach to the problem of overpopulation will take time to produce results, and emigration offers no solution. Puerto Rico is a crowded island. Trade has accelerated the birth rate, and then the slump in sugar cut down income, and has left vast malnutrition. Former Governor Yager said:

> But, owing to their inherited improvidence, their racial characteristics, and perhaps to the tropical climate, those checks upon population which in colder climates seem adequate to keep the increase of people well within the limits of subsistence seem to be lacking among them. The birth-rate seems to bear no relation whatever to the conditions of industry and the opportunities for employment.[10]

The years since that statement was made have certainly shown its truth. To get a measure of this compare the *increase* per decade per square mile with the population of such states as Iowa, Virginia, or Georgia.

Intelligent Puerto Ricans are naturally concerned.[11] They see that the landless are increasing and that there are hundreds of thousands of them. They also know that hundreds of thousands of these people are absolutely dependent upon the continuance of the American tariff. If that preferential advantage should be swept away from Puerto Rico, it would have to grow sugar in competition with Cuba and other tropical areas where the natural resources are better; and it could not be done. This would create almost as much of a calamity as a great earthquake, for the standard of living is now low, and if the income of the people were cut down a third, many of them would face starvation. Even now they are living on rice and beans, or bananas and beans, or sweet potatoes and beans, with a little dried codfish, and meat once or twice a week.

One of their population problems is the *jibaro*. The word means "one escaped from civilization." When the Spaniards began to enslave the natives, some of them ran away to the interior. When the Spaniards brought Negro slaves, some of these also ran away to the interior. When they deported petty offenders to Puerto Rico, nearly all of them went to the interior. There the

[10] *Geographical Review*, March, 1916, p. 212.

[11] Judge Rodriguez-Sorra, of the district courts of Puerto Rico, says: "There is danger, too, in educating the people before there is work in Puerto Rico for educated people to do. Education serves no purpose among the poor and ragged population except to increase discontent."

three runaway strains have mingled, producing a carefree dweller in a thatched hut, but a man ill fitted by temperament to face the rigors of a steady job. As the struggle for existence becomes more industrial, extinction may be the fate of the *jibaro*.

The dense population of Puerto Rico is almost exclusively rural and agricultural. San Juan, the capital (pop. 137,000, 1935), has a location that was better for the days of pirates than it is for the present. It is on the tip of a narrow peninsula. Motorbusses flock up and down this peninsula, now a mass of growing suburbs. These busses are named like ships, and the names bespeak the mingled forces of the new Puerto Rico — *Popularidad*, *Perla de Caribe*, *Carmen María*, *Perla del Este*, *La Mía*, *La Campeona Montañesa*, *Ron Venerable*, *Snow White*, *General Electric*, *Seiberling*, and *Goodyear*. These last reflect the discovery that certain firms will paint a bus if they can name it.

We see another sign of dense population in the Puerto Rican needlework industry. This kind of household industry is an ill-paid source of income for women in many densely peopled lands. The skill of the women and girls is marked in making lace and drawnwork.

Another sign of population density is to be found in the export of such items as handkerchiefs, wearing apparel, silk dresses and underwear, and straw hats, all of which are the products of cheap labor.

The Puerto Rican straw hats that are sold in the American markets are made in the eastern end of the island. There the moisture-laden air encourages the palm to flourish, but even so there are not enough palm leaves to supply the demand for these popular hats, and quantities of prepared leaves are imported from the Dominican Republic. Local factories also purchase straw braid for hatmaking from dealers in the United States and Europe who have imported it from China and Japan. The hand weaving of straw hats is a household industry. Sometimes the old men help the women and girls. Traveling traders buy the hats and sell them to dealers, either for export or for local wear. In 1937, 62,410 dozen straw hats were exported.

The best index of population pressure, however, is the low wages that prevail in Puerto Rico. Consider the following actual average *weekly* earnings for adult men that were reported in 1935–36: fruit-packing, $2.10; tobacco cultivation, $2.18; fruit cultivation, $2.31; coffee cultivation, $2.33; sugar-cane cultivation, $3.75;[12] tobacco-stripping, $4.76; sugar mills, $6.78.[13] Women's earnings were much lower, and in the needlework industry, home-workers were reported to have received wages varying from 1 to 4 cents per hour.

Under American rule, the economic exploitation of Puerto Rico proceeded under a philosophy of laissez faire. Corporations were given a free hand, and little attention was given to social consequences. Until the advent of the New Deal program of regulation, reform, and relief,[14] it is probably true

[12] In Barbados the cane-field worker gets from 25 cents to 50 cents a day, the latter being very unusual. We see here the reason why the Barbadian is such a migrant.

[13] Earle K. James, "Puerto Rico at the Crossroads," *Foreign Policy Pamphlets*, Oct. 15, 1937, p. 184.

[14] Unfortunately, the story of increasing governmental regulation of corporations in the United States had a belated sequel in Puerto Rico. Under the New Deal large sums have

that this densely populated island contained the largest single group of destitute people under the American flag.[15]

The Puerto Rican record shows that as a ruling nation we have been master builders of bridges, highways, schools, hospitals, sewers, and the like. As social and economic engineers, however, we have much to learn. Our laissez-faire policy of the past has helped to create the problems of overpopulation, unemployment, underemployment, concentration of landownership, domination of agriculture by sugar, and low living-standards — the problems that now confront Puerto Rico.[16]

JAMAICA

Jamaica, with an area of 4450 square miles, is a close physical twin of its neighbor, Puerto Rico. The two islands are alike not only in shape but in character. Jamaica, like Puerto Rico, is mountainous. Its high mountain backbone runs from east to west, with valleys cutting into it on all sides. Much of this area is, in the English sense at least, uncultivable. The stretches of coastal plain, though they comprise only one-sixth of the area, are excellent for sugar and bananas. The Jamaican uplands are not volcanic and therefore are not so fertile as those of Puerto Rico, but, like Puerto Rico, the island has much limestone on its lower parts. Jamaica has many caves with interesting prehistoric remains.

The climates of the two islands are essentially alike. The population of Jamaica is only half as dense as the population of Puerto Rico. Jamaica has had better government, especially during the nineteenth century, than Puerto Rico. For two hundred years it has had the great colonial blessing of British rule. Through most of the time the island was of interest to the mother country through its products of sugar, molasses, and rum. Its long possession by the orderly and capitalistic British means that it is a well-equipped island. Although it is only 35 by 140 miles in extent, it has 210 miles of well-equipped standard-gauge railway, government-owned. One hundred and thirty-five miles of steam and electric tramway run around the island, 86 miles of mule tramway, and 4800 miles of motor highways, reaching all parts of the island. There are 3100 miles of telegraph and telephone lines.

The city of Kingston, which has one of the finest harbors in the world, is served by numerous steamship lines. Its location, opposite the strategic Windward Passage, places it on one of the greatest Caribbean trade routes. Local lines circumnavigate the island, which has many small outports. Proportionally, the United States cannot rival these facilities.

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been spent on relief. The Puerto Rican Reconstruction Administration has spent about $60,000,000 on general improvements, including the establishment of co-operative centrals. Benefit payments under the Jones-Costigan Act of 1934 and the Sugar Act of 1937 were made contingent upon the payment of fair and reasonable wages and also upon fair prices paid to the small producers of sugar cane. The insular Government has passed an eight-hour-day law, a minimum-wage law, a workmen's compensation law, and has made collective bargaining between the employers and employees compulsory.

[15] See Rafael Picó, *op. cit.*, and Earle K. James, *op. cit.*

[16] See Victor S. Clark and others, *op. cit.*

DIVERSIFIED INDUSTRY

Despite all these advantages, the island has had a slower development, with far less trade, than Puerto Rico. This is partly because the Negro population can emigrate to other tropical areas and do field labor much more easily than can the Puerto Rican whites. Another important reason is that until recently Jamaica has had no boon like the American tariff that gives Puerto Rico goods free access to a huge protected market. For over a century England was the classic home of free trade, and Jamaican goods sold in the mother country had to compete on an equal basis with those from all parts of the world. Consequently, the Jamaican sugar industry lingered along, as did that of Puerto Rico before American possession, exporting 30,000 or 40,000 tons a year. It boomed tremendously in the sugar famine of 1919 and 1920, and slumped so dreadfully immediately thereafter that the island government had to loan $2,000,000 to the sugar planters. When England gradually abandoned its century-old policy of free trade during the 1920's and adopted a protective tariff policy with preference to Empire goods, the Jamaican sugar industry was stimulated. Jamaican sugar exports increased from an average of 50,000 tons during 1925–29 to 78,000 tons in 1936. Nevertheless, there are still many ruinate sugar estates dating back to the days of slave prosperity. The industry is carelessly carried on, and there is unused land which might be productive if it were fertilized, although the expense would be considerable.

The only important industrial change that has taken place in Jamaica in the last fifty years has been the development of the banana business. From 15,000,000 to 20,000,000 bunches a year are now exported, bringing in about $10,000,000, about three times as much as the sugar. Most of the bananas go to Great Britain. This development is due almost entirely to North American enterprise — to the United Fruit Company of Boston, which has put on fast steamship lines that carry the fruit to England and Canada. The ruin of the crop by hurricanes for six-month periods three years in succession, 1915–17, shows some of the difficulties of trade-wind islands. This was an unusual frequency for a trouble that is a menace for several months every summer and autumn.

Because its trade is smaller than that of Puerto Rico, less than half as much per capita, Jamaica must depend more upon home supplies. The produce of the garden patch around the palm hut is spoken of in Jamaican statistics as "ground provisions." Thus the yam, in nutrition like the potato or bread, is a staple article of the Jamaican workman's diet.

The lack of any great all-absorbing staple like the sugar of Puerto Rico has caused the development in Jamaica of many minor industries. About 3000 tons of cacao beans are exported each year from the wetter areas on the eastern end of the island and in the mountain valleys. Most of the world's supply of allspice, or pimento, some 10,000,000 pounds, is gathered from the low, rounded trees that stand in Jamaican pastures. Often small boys climb the trees to gather the clusters of fruit while it is still immature. Or the clusters may be cut off with knives fastened to the end of poles. When

dried in the sun, or in driers, the fruit — then called spice — is ready for shipment. Most of the work in this industry is done by the women, for whom it is admirably suited.

From 30,000,000 to 40,000,000 coconuts are exported annually from this tropical island, and there are small shipments of lime juice, rum, logwood for dyestuffs, beeswax, and honey gathered from the blooms of logwood and lignum-vitae trees in the forest. Sometimes the bee products are worth as much as $1 per capita. There is also a growing industry in preserving fruit, especially guava, for which there is a demand in England. One of the best-known products of Jamaica is ginger. The underground stem of the plant is dried, and is of such superior quality that it brings double price.

Handmade hats called "panamas" are manufactured. They are made out of the leaf-stalk fibers of a palm called jipijapa, named from the canton in the province of Manabi on the coast of Ecuador where the finest of these hats are made. Those made in Jamaica commonly pass as a lower grade of the genuine article. It takes two or three days to make a hat of ordinary quality and ten to fifteen days to make a really fine one. It is worthy of note that this industry requires no equipment but skillful fingers, and it can be carried on in any hut. The results of a year's labor can be carried away under your arm.

POPULATION

The situation and prospects of Jamaica are best shown, however, by an analysis of its population. The blessings of nearly three centuries of British rule have produced an island with over 1,000,000 people, of whom the ruling, owning, controlling 2 per cent are white. About 2 per cent are East Indians who have been imported as contract laborers for the plantations. There is a sprinkling of Chinese, who carry on nearly all the small merchandise business. Then there are increasing hordes of Negroes, field laborers, about half of them illiterate, despite the many free schools maintained by the British Government.[17] The attitude toward education is well indicated by the complaint of a country schoolteacher in Jamaica over the loss of time of the pupils in their laundry. She said it took one day to wash, one day to dry the garment, and one day to iron it. When one considers the limited wardrobe required for this climate, the humor of the situation appears. This novel service of a piece of cheap cotton would doubtless appeal to the schoolboys of many lands.

It is interesting to see the people as they work around their thatched huts or wend their way to the town market place with bunches of bananas or baskets of yams or vegetables on the feminine head, but not for a moment on the masculine head. The traveler is at times startled by the apparently awful quarrels that he overhears. The deluge of dangerous words leads him to anticipate imminent murder, but nothing happens. The dangerous words of the childlike West Indian have a lighter specific gravity than those of New England or of Scotland.

The chief export of Jamaica might well be said to be young Negroes tempted by greater wages in lands of greater resources. They go chiefly to the cane

[17] Enrollment in 1935, 152,000; average attendance, 98,000.

fields of Cuba, the banana plantations of Central America, the mahogany camps of British Honduras, and to the United States. It was these Jamaica Negroes who did most of the manual labor in building the Panama Canal. We boasted not unjustly of this achievement, and the average reader might have thought that we of the United States actually did the digging. It is the West Indian Negro who mans the banana plantations of the United Fruit Company on the Caribbean shores of Central America. Nearly every freight steamer that enters the West Indies picks up at Jamaica or some other island of first call an extra crew of deck laborers who load and unload the vessel while in West Indian waters and leave the boat when it sails away. I have even found records of the Jamaica Negro building railroads in Paraguay and southern Brazil.

The action of the Rockefeller Institute in showing how to eradicate the hookworm, and the general advance of sanitation, are showing their results in a population increase for which there is little room. If humanitarianism is not blind, it perhaps has only one eye.

CUBA

THE SUGAR INDUSTRY

Cuba, the Pearl of the Antilles, is also the Great American Sugar Bowl.[18] Its area is 44,164 square miles, while all the other West Indian islands together have but 47,072. Not only is Cuba large, but its soils are rich and its surface is good for machine agriculture. In this respect it is superior, far superior, to Puerto Rico, Jamaica, and Hispaniola. Most of its surface is a rolling plain, like that of Kansas or Iowa, admirable for agriculture, especially for growing sugar cane. On two-thirds of its area, Cuba has limestone soil, the richest there is except the lavas. Some of its lands have been under cultivation for 400 years, and even yet but little fertilizer is used. Once sugar cane is planted, it is allowed to give seven or even more harvests before replanting, and 2 tons of sugar per acre is a common yield.

Cuba's location close to the United States, the world's greatest sugar market, makes its delivery costs on sugar only $\frac{1}{8}$ cent a pound. To cap the list of advantages, the climate is approximately perfect for the production of sugar cane, the great commercial dependence of Cuba. No other independent country has so great a dependence on one crop or one industry. For minor industries it has the world-renowned tobacco lands of western Cuba, ranches and frontier on the eastern plain, and lumber and mines in the mountains at the extreme east, but the characteristic Cuban landscape is a rolling plain, light green with sugar cane. The cane fields are sprinkled with the white trunks and dark-green tops of the royal palm, with here and there in the distance the smokestacks and red roofs of the sugar mills.

This island lacks the high central mountain range found in the other three large islands. The central water parting can scarcely be noticed. It is

[18] For an excellent article on Cuba, see that by R. H. Whitbeck, *Geographical Review*, April, 1922.

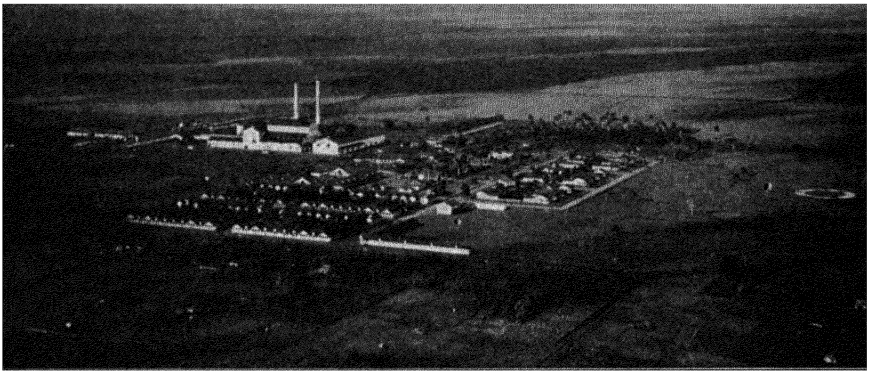


FIG. 836 A. The Machine Age goes to the tropics — mass production of sugar. Air view of a factory, part of a town, and surrounding cane fields — a panorama of the finest cane fields in the world. A large sugar plantation in mid-Cuba necessarily must be self-contained in manufacturing and in agriculture and in its provisions for the working population. This mill (Central Cunagua, Cuba, near the north shore) has 185,000 square ft. of floor space on the ground floor, plus galleries that surround the buildings on the inside and make a partial second story. The structure is of fireproof steel and concrete. The ground floor is reinforced concrete.

The engines are 11,124 horse power. Energy is supplied by burning refuse left from the cane after the juice is crushed out of it. When cane is not being crushed, 600-h.p. Diesel oil-burning engines supply minor power needs. The concrete smokestacks for the main boiler are 240 ft. high, 16 ft. in diameter on the inside. Adjoining the factory are warehouses, molasses tank station, locomotive house, railroad repair shops, carpenter shop, sawmill, foundry, lime station, ice plant, laundry, and railroad yards. In the foreground are baseball and football fields, a children's playground, and an open-air movie theater. Beyond are the blocks of homes for the families, staff, and single men. Each house has its own vegetable garden, in addition to the community vegetable gardens, fruit groves, and park. Hotel, cafés, stores, bakery, church, hospital, clinic, pharmacy, separate boys' and girls' schools, meat, milk, and fish services, water, light, and sewage systems — these supply the town provided by the "central." Extending from the town are lines of railroad leading to the cane loading-stations and to the *colonias* (cane farms), where there are houses and gardens, stores, and other facilities for the field labor. The townsite and thousands of acres of land were forest in March of one year. The forest was slaughtered, cane was planted. the factory was built. and sugarmaking was begun in December of the next year.

This is but one of two units owned and operated by the same American company. Together with Central Jaronu, about 40 miles away, there are cane fields about 160 sq. mi. in area and served by nearly 200 miles of standard-gauge railroad. The total population of the plantation is about 18,000. A sugar planter? What is he?

Such is the making of sugar in the present age of large machinery and the great corporation. It is now claimed that this stupendous Cuban enterprise is a back number in comparison to a new mill operating in the muck lands of Florida. This Florida enterprise claims that it can make sugar more cheaply than Cuba, because of the very high perfection of its technology. It is operating 40,000 acres, has 4,000,000 acres, and is held in leash by quotas — another example of the scarcity objective in Machine Age industry. At some places in the Caribbean area there can still be found the ancient muscle-driven unit consisting of one roller about 15 in. in diameter and two 8-in. rollers, all 10 in. long and operated by a horse, a mule, or an ox. These crush a few sticks of cane as a man feeds them in by hand. The juice drops into a kettle, and is boiled over an open fire; the sugar is just as sweet as and more charged with vitamins than the crystal-clear stuff that comes out of the great refineries. (Courtesy American Sugar Refining Co.)

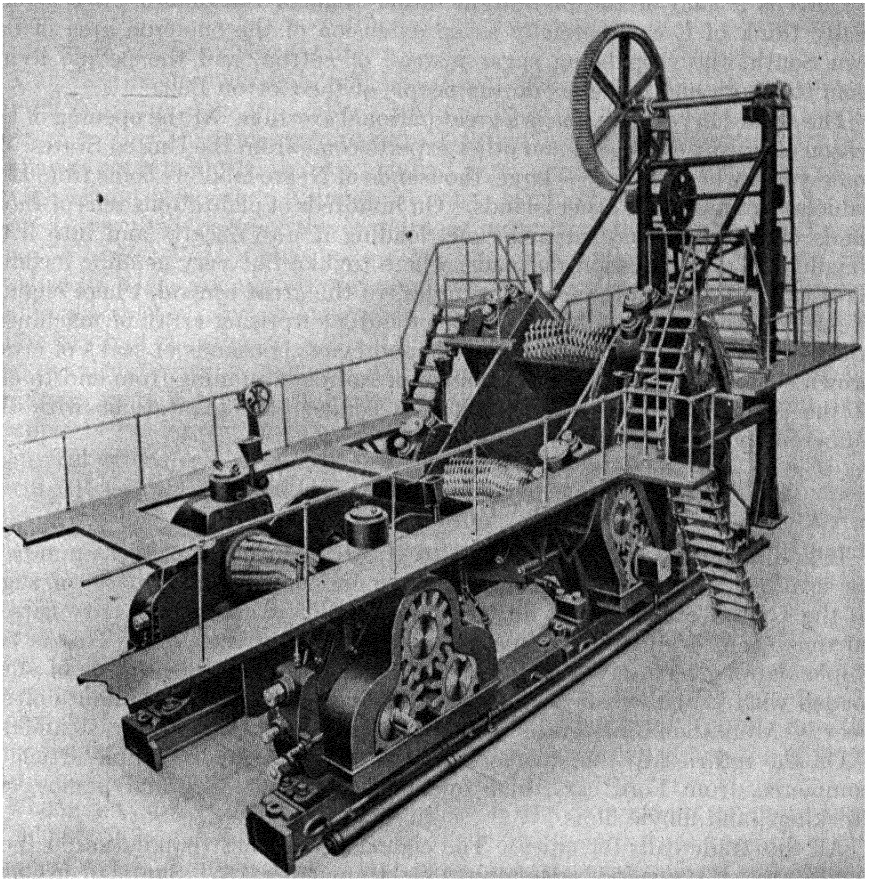


FIG. A. In this catalogue drawing, the steps of the stairway will enable us to appreciate the size of the cogwheels that operate the cane-crushers that are standard equipment in a modern sugar mill and use so much of its thousands of horse power. (Courtesy Fulton Iron Works)

followed by the trunk-line railroad of the island. This open plain has therefore fairly uniform rainfall. The amount is almost ideal for sugar, from 45 to 60 inches per year, with the rainy season in summer, when cane needs to grow, and the dry season in winter, when it is necessary to put sugar content into the cane. While the weather is wet the sugar content of the cane juice is low. As the dry season comes, the cane seems to pump the water out of the earth and exhale it into the dry air and concentrate sugar into itself. Then comes the harvest, for which a dry season is so desirable to keep the cane field from becoming a sea of mud.[19] The two-wheeled oxcart with giant wheels is a real necessity.

[19] Cane-sugar production was also discussed in the section on Puerto Rico.

Cuba is a land of the plantation rather than of the *conuco*. We should really think of it commercially as an extension of the one-crop area of our own South, the crop being sugar instead of cotton, and the people living from the store and trade, as do the people of the Cotton Belt.

The sugar harvest in Cuba is a great national exertion. At the opening of the season chemists, engineers, and other experts come from the United States. In some years when the crop is large, thousands of Negro laborers come from Hispaniola, Jamaica, and other islands. On hundreds of plantations tens of thousands of men are busy cutting cane, loading it into oxcarts and into little freight cars on plantation railroads, where toylike but very genuine locomotives carry it away, perhaps many miles, to the great central, where engines of large factory size run heavy crushers and a surprising array of machinery which turns out each day its hundreds and even thousands of sacks of crude brown sugar. Cuba has a good system of railroads running from end to end of the island, and many short railroads connect the plantations with the numerous ports where ships await the cargo.[20]

CUBAN TRADE

It is difficult for our imaginations to grasp the meaning of great numbers, for example, the size of this Cuban sugar industry. The exports of sugar to the United States would fill ten freight trains, each with twenty cars of 50 tons each, or 10,000 tons per day, every day in the year. This is two shiploads for every day in the year. Actually there are a number of ships loaded with Cuban sugar en route to the United States every minute of the year.[21] More than nine-tenths of all exports are shipped by tramp steamers.[22]

On the return trip the steamers carry almost every conceivable article of commerce, from Ford cars, blue overalls, and plows to grand pianos, silk stockings, and movie films.

All this trade calls for cities. The eight largest cities (population in thousands) are: Havana, 552; Holguin, 137; Camagüey, 135; Santiago de Cuba, 105; Santa Clara, 98; Marianao, 84; Morón, 83; Matanzas, 71 (estimated

[20] Cuba has 3080 miles of railroad privately owned. In 1935-36 the total freight traffic amounted to about 403,000,000 ton-miles, and the gross revenue from freight was $11,522,000, a tremendous business for an island of Cuba's size. In addition, the larger sugar plantations have 5600 miles of private railroad lines connecting them with the main lines. Cuba has over 2200 miles of highway, about 850 miles being first-class road. The new and impressive Central Highway, which was completed in 1931 at a cost of $101,000,000, spans the island from Pinar del Río to Santiago.

[21] It is perhaps worth pointing out that this greatest import of the United States, this staple which now makes up 20% of the calories of our diet, is quite an infant in the world's industry, and not at all a necessity of diet. With only the sugar produced by the bee, the human race produced Confucius, Moses, Aristotle and Plato, Caesar and Charlemagne, and the dietitians are wondering if we can keep on eating it as we do and keep on having health and good teeth.

[22] In contrast with the liner which is attached to a given route with a definite schedule of sailings, the tramp has a gypsylike existence, for it can go anywhere, compete for anything, cut into any trade, and carry its cargo to any destination. Tramps flock to the Cuban coast in large numbers during the sugar season to help move the crop to the American market. See *Report of the United States Maritime Commission on Tramp Shipping Service*, House Doc. 520, 75th Cong., 3d sess., 1938, p. 9 (a report that was written by the junior author when he served as Economic Adviser to the Maritime Commission in 1937).

Dec. 31, 1936). They contain one-fourth of the population of the island, which on the whole has a distinctly larger proportion of its population in cities than Maine or Kansas has.

Cuba's sunken coast line, which is over 2000 miles long, is remarkable for its large number of excellent harbors, most of which are pouch-shaped with a narrow entrance opening into a broad bay. Indeed, it is said that Cuban exports might leave by a hundred gateways.[23] The long, narrow shape of the island is another commercial asset, for it gives ready access to the sea. In very few parts of the island does sugar have to be transported more than 50 or 60 miles by rail.

Most of this commercial development has happened since 1898, when Cuba was blessed by emancipation from Spanish rule. Since that time Cuba has had the support and aid of the United States Government and an opportunity to make the best of itself. This American aid is one of the brightest spots in one of the darkest chapters of human history. That dark chapter is the foreign policy of nations, including our own. In this field man still often feels at liberty to be a savage and a devil, and he acts the parts. It was the fame of Cuba's good fortune (and that of the Philippines) that brought flocking to President Wilson's hotel in Paris in 1918–19 the representatives of the Armenians, the Azerbaijanese, the Poles, the Hungarians, and the other downtrodden peoples in such variety that it puzzled the best geographers in the world to locate them all on the map.

Since 1898 Cuba has shared the rapid economic development of Puerto Rico, but on a much richer basis. It has a population of but 92 people to the square mile. Its lands are largely arable rather than mountainous, and really it is a new agricultural frontier. This agricultural frontier awaited only the coming of capital and this followed the American guarantee of peace and reasonable order.

The great fact of Cuban economic life is the investment of more than $1,000,000,000 of American money in sugar plantations since the exit of the Spanish rulers. Some estimates place these holdings of cane land at 4,000,000 acres, about one-seventh of the island. In 1937 there were 147 sugar mills (centrals) in active operation, and virtually all of these mills were owned by corporations. The modern commercial central, with its huge capital investment, has a large overhead expense, and the great sugar corporations have found it expedient to buy land and to engage actively in the production of sugar cane in order to ensure a dependable supply of cane for their mills. One corporation owns 771,000 acres, a second owns 521,000 acres, and a third owns 281,000 acres. With the growth of corporate ownership of land, individual landholdings and the production of sugar cane by independent producers have declined.[24] Thus Cuba is confronted with an even larger problem of absentee landownership than is Puerto Rico.

[23] The large number of harbors prompted many big firms to build private ports for their own use. However, a law in 1923 restricted the handling of foreign commerce to 26 first-class ports, with the proviso that the sugar centrals and other interests which had constructed and used private ports prior to the enactment of the law could continue to use them for the same purpose.

[24] The number of farms in Cuba declined from 60,711 in 1899 to 38,105 in 1935.

While Jamaica and Puerto Rico buy fertilizer for old land, Cuban sugar plantations use very little. In a sense, as has been noted, the island of Cuba is still an agricultural frontier. The Cuban sugar industry has moved steadily eastward through the island to virgin lands exactly as the wheat industry of the United States moved westward and northwestward. There is still a large amount of uncleared land that could be devoted to sugar cane. It is in the eastern provinces of Oriente and Camagüey that most American investment has been made.[25]

While Cuban sugar does not have free access to the United States market like Puerto Rican sugar, it does have preferred access as compared with other foreign sugar. Since Cuban independence, the United States has always levied a lower rate of duty on Cuban sugar than that levied on sugar from other foreign countries. This tariff advantage has caused the great bulk of Cuban sugar exports to move to this market. Fertile soil, an ideal climate, and large-scale production combine to make low costs of production, which enable Cuban sugar to pay the duty and still leave a profit.[26]

THE WORLD WAR AND THE CUBAN SUGAR BOOM

Many industries were dislocated by the World War, but few of them received a harder and more permanent jolt than the Cuban sugar industry.[27] At the outbreak of the war Cuba was producing about 2,500,000 tons of sugar annually, continental Europe was largely self-sufficient with its output of 8,000,000 tons of beet sugar, and Great Britain was importing its entire supply from overseas. During the war there was a chronic shortage of sugar in almost every country, and rationing schemes had to be introduced. Production of beet sugar on the continent of Europe was curtailed drastically, and the Western world turned to Cuba for sugar. Indeed, Cuba was virtually the only country where a rapid expansion of sugar production could take place. It alone among the tropical producers had vast areas of fertile, level, unused land. Furthermore, its geographical location gave it a tremendous advantage over Java and Far Eastern producers at a time when ships were scarce and freight rates were high. Under the stimulus of wartime demand, Cuban production expanded. By 1918 it had reached 4,000,000 tons, whereas the European beet-sugar output had declined to about 2,500,000 tons. Between April, 1914, and November, 1918, the price of raw cane sugar in New York rose from 3 to 7.3 cents a pound, where it remained until November, 1919. Then the governmental restrictions on price were removed. Supply and demand had free play, and all nations were trying to replenish their sugar stocks at one time. The price of sugar spiraled upward from

[25] In 1937 the province of Oriente led with 39.2% of the island's total production, followed by Camagüey with 27.7%; Santa Clara, 17.2%; Matanzas, 9.4%; Havana, 4.9%; and Pinar del Río, 1.6%. (Helen M. Boyer, "Distribution of Sugar Cane Production in Cuba," *Economic Geography*, July, 1939, p. 313).

[26] The United States Tariff Commission found that in 1931–32 the cost of sugar, f.o.b. sugar mill, was 1.13 cents in Cuba, 1.74 cents in the Philippines, 2.29 cents in Puerto Rico, 2.38 cents in Hawaii, and 3.57 cents in Louisiana.

[27] See J. Russell Smith, *Influence of the Great War upon Shipping*, Oxford University Press, 1919, Chap. 4.

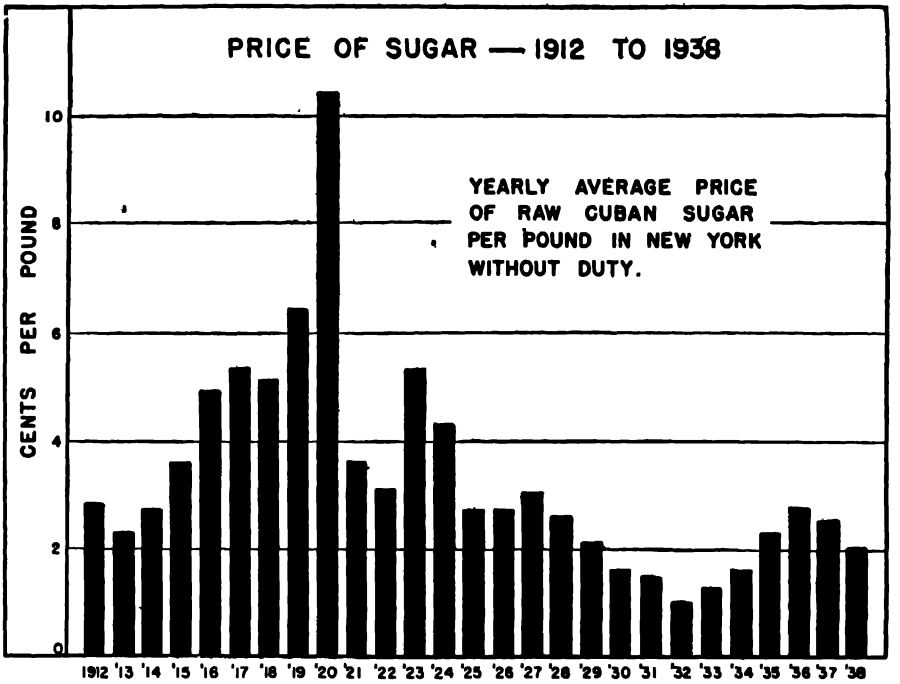


FIG. A. The high prices of sugar in 1919–20 brought wild extravagance to Cuba, resulting in panic and privation. The low prices of 1932–33 brought more privation and a series of world attempts at restriction of production. Woe to the country that depends too much upon the price of a single commodity! Especially in an age such as this, when technological improvement is so swift. (Facts from *Weekly Statistical Sugar Trade Journal*)

10.2 cents in December, 1919, to a peak of 20.8 cents in May, 1920. Quite naturally, Cuban sugar-cane acreage continued to expand.

During this orgy of high prices, the prosperity of Cuba knew no bounds. It was almost an intoxication. Speculation ran its course. Sugar plantations were sold and resold, land doubling and trebling in value as it did in our Corn Belt. The high price of land was capitalized as though it would last forever. On the north shore, near Havana, the new-rich sugar planters started to build their palaces, each trying to outdo his neighbor. One hundred thousand dollars, $200,000, $300,000, $400,000, $500,000, $750,000, $1,000,000, they cost, but before some of these structures were finished the sugar bubble burst, and for years thereafter the trade wind blew through the windows of unfinished palaces. The latter had a considerable resemblance to the grand hotels in Florida that were left unfinished when the 1926 real-estate bubble burst, and were used as bat roosts for years thereafter.

The inevitable collapse of the sugar market after the war was accompanied by a precipitous decline in the price. Between May and December, 1920, the New York price of raw cane sugar dropped from 20.8 to 5.3 cents a pound, and in April and May, 1932, it touched bottom at 2.6 cents. The effects



FIG. A. This scene is in Hawaii, but it has direct relation to the West Indies because it is a section of the Hawaiian Sugar Planters Association Experiment Station in Honolulu. A discovery in one sugar region soon makes changes in all the rest. The numbered pots contain soil from various plantations. Sudan grass is planted in them as an index crop. Careful weighing of plants shows the effect of different chemicals. It is significant in this age of running to the government for nearly everything that this is done by a private association of producers. (Courtesy Pan-Pacific Press Bureau)

upon Cuba were disastrous. Its purchases from abroad declined from $1,351,000,000 in 1920 to $632,000,000 in 1921, and to $506,000,000 in 1922. During the closing months of 1922 Cuba had to borrow $50,000,000 just to pay the running expenses of the Government, and, as already noted, General Enoch H. Crowder was sent from the United States to help untangle the nation's finances, during which process many useless jobholders were detached from the government pay roll. Fortunately, the depression was short, but this did not mean an end to Cuban sugar troubles.

As nearly everyone knows, the postwar era was marked by the rapid development of technological improvement and of economic nationalism in many countries, high tariffs and subsidies being used to protect and promote domestic industries regardless of cost to the consumer. Tariffs and subsidies caused the European beet-sugar industry to recover rapidly. In face of increasing competition, Cuba made various attempts to raise the market price by curtailing its production, but with no more success than that of the wheatgrowers and the cotton-growers of the United States or of good King Canute in his attempt to hold back the sea.[28] Throughout the 1920's American investors continued to invest heavily in sugar securities, and the companies, eager for profit, endeavored to maintain or expand their production. Toward the end

[28] For a concise account of control schemes in the sugar industry, see J. W. F. Rowe, *Markets and Men*, Macmillan Company, 1936, Chap. 4.

of the decade Java developed a new type of sugar cane that yielded about 30 per cent more sugar per acre, and this was soon adopted throughout the tropic world. Thus all forces moved toward overproduction, and with the Wall Street crash in October, 1929, the sugar industry was plunged into a severe depression, from which it has not yet recovered. During the 1931-32 season producers in Cuba were actually receiving less than ¾ cents a pound for their sugar.

Obviously, the problem of overproduction called for international cooperation, and in May, 1931, the producers of Cuba, Java, Peru, Belgium, Germany, Poland, Czechoslovakia, and Hungary signed an agreement, known as the Chadbourne Plan, restricting exports and providing for the gradual release of surplus sugar stocks over a period of five years. By this plan it was hoped to raise the price of sugar, but the plan failed, largely because the export quotas were too large and because nonsignatory countries continued to increase production. Again, in 1938 twenty-one nations signed an international sugar pact setting production quotas in the signatory countries.

For Cuba, the depression has meant ruinous prices and the reduction of its sugar output from 5,200,000 tons in 1928–29 to 2,000,000 tons in 1932–33, with a production of about 2,500,000 tons a year since then. The net result is that the Cuban sugar output is now back to the point from which it started before the World War. The depression has meant the collapse of the *colono* system, for many of the independent landowners became so hopelessly in debt to the sugar mills that the mills have bought them out. It has also meant hard times for the Cuban people, with a series of revolutions culminating in the present dictatorship of Colonel Batista. Perhaps the outbreak of the European war in 1939 will bring a (temporary) new prosperity to Cuban shores. In general, however, it must be concluded that unhappy is the lot of the one-crop country whose prosperity rises and falls with the price of a single commodity.[29]

CUBAN TOBACCO

Cuba is famed the world over for the aromatic quality of its cigars. The tobacco is all produced in a small territory 90 miles by 10 called the Vuelta Abajo, in western Cuba. The peculiar limestone soil imparts a flavor which cannot be explained, denied, or duplicated. Here the rich owner grows his acres under cheesecloth and produces the high-priced cigar wrapper, while the dweller in the thatched hut grows a little patch of cheap filler, under the open sky, exposed to all the irregularities, insects, and weather.

The Vuelta Abajo tobacco-growers are almost exclusively white and the laborers are largely natives (white) of the Canary Islands. So intensive, so perfect, so expensive is the cultivation and fertilization that 2 acres require the full time of a man. The land is worth $1000 an acre and a *good* crop is often worth that much, sometimes twice as much. It takes nearly a year of curing in sheds to develop the fine flavor of the best Havana tobacco.

[29] Many are the problems confronting Cuba. See *Problems of the New Cuba, Report of the Commission on Cuban Affairs*, Foreign Policy Association, 1935.

The manufacture of cigars, an industry requiring a small table, a sharp knife, and nimble fingers, is the leading manufacturing industry of Havana. The cigar workers have the wise habit of entertaining themselves by hiring a professional reader. This melodious-voiced individual sits on a platform above his audience. The day starts with the daily papers, then come the comic weeklies, of which Havana has a good supply, and finally, to finish out the day, hair-raising fiction.

Leaf tobacco and cigars rank next to raw and refined sugar among Cuba's leading exports. In 1937 Cuba exported 27,000,000 lbs. of tobacco worth about $11,000,000 and 36,000,000 cigars worth about $3,700,000. About half of the leaf tobacco but only one-twelfth of the number of cigars are exported to the United States, which shows the effectiveness of the American tariff as a protector of American cigar-manufacturers.

FRUITS AND VEGETABLES

Since Cuban independence there has been a gradual development of the fruit and vegetable industries. The banana plantations of a great American corporation are located on the northeastern side of the island. The value of banana exports, about $2,000,000 annually, exceeds the combined value of all other fruit exports, which include pineapples, grapefruit, and avocados. About $500,000 worth of tomatoes are exported annually and this is more than the combined value of all other vegetable exports, including eggplant, lima beans, potatoes, pimentos, and okra. Cuba's export of fresh fruits and vegetables arrives on the American market just ahead of the Florida crop. Most of the fruit and vegetable production, excepting bananas, is centered around Havana, this location having the advantage of nearness to a large urban market and good transportation facilities to the United States. American settlers on the Isle of Pines export grapefruit to the United States in August and September before the Florida grapefruit are ripe, and they have also developed an early-vegetable trade.

IRON ORE

Like America, Cuba has mountains of iron ore. Near Santiago, hematite is scooped up by the steam shovel of the Bethlehem Steel Company as the copper ores of Utah and the iron ores in the better mines of the Superior district are scooped up. It is but a short distance to the port of Santiago, where specially constructed ore vessels, belonging to the Bethlehem Steel Company, load the ore and carry it to the United States for the company's great steel plants in Baltimore and Bethlehem.

POPULATION AND PROSPECTS

For the next few generations, Cuba has an entirely different outlook from either Jamaica or Puerto Rico. If Puerto Rico can support 520 people to the square mile, Cuba can easily support twice as many, or 1040, whereas it has only 92. • The tobacco output can increase, the sugar output can in-

crease, and the production of fruits and vegetables for decades to come is limited solely by the demand. As a measure of the undeveloped resources of Cuba it should be pointed out that its bumper crops of over 5,000,000 tons of sugar have been produced on 5 per cent of its area, that nearly half of its land is excellent for the use of agricultural machinery, while 20 per cent or 30 per cent more is good for the *conuco*, or mountain garden farm. If it had the labor and the market, Cuba could grow all the sugar the world now uses. The location of its eastern and western mountain ranges, with their ends toward the trade winds, gives it almost no land to the leeward of mountain ranges and therefore too dry for good food production. There is no other such island.

Population is rushing forward to fill the void made by Cuba's empty lands. In the United States the center of population moved steadily westward; in Cuba it has moved eastward. In the United States it was the opportunity of homesteading on free land that lured the settlers westward; in Cuba it was good sugar land and plantation wages that drew the population eastward. In 1907 the easternmost province of Oriente ranked third in population; since 1919 it has ranked first. Since independence, Cuba's rapid economic development has been accompanied by a rapid increase in population. During the decade ending in 1907 the total population increased by 39 per cent; in the decade ending in 1931 it increased by 31 per cent. These high rates of population increase are in a class with the rapid growth of population in the United States during the early decades of its history.[30] Fortunately for Cuba, about 68 per cent of its population of about 4,000,000 is white.[31] But the question of who is white is often a subject of debate in tropic America.

Cuban towns are thoroughly Spanish. The country is Negro and mulatto, with people living in the ever present palm-thatched house, but the native spends no effort to ornament it. Often he has no garden, so great is his dependence upon the country store. He seems to prefer to work for wages rather than to grow his own food. Thus he shows his economic kinship with the people of the United States Cotton Belt.

Among the food products that are always imported from abroad in large quantities are wheat flour, meat, rice, lard and its substitutes, onions, and beans. Until recently corn, eggs, condensed milk, cheese, and butter have also been largely imported, but the decline of the sugar industry, lower purchasing power, and higher tariffs have combined to stimulate the domestic production of foodstuffs.

All Latin races are lovers of games of chance; certainly the Spaniard is not averse to them. In Cuba the lottery ticket is everywhere thrust in your face with the joint appeal to your own gambling instinct and your pity to buy from this little girl who needs the money, this old woman who needs

[30] INCREASES OF POPULATION IN THE UNITED STATES

1790–1800	35%	1830–1840	32.7%	1920–1930	16.1%
1820–1830	33.5	1910–1920	14.9	1930–1940	7.2

[31] It is perhaps ominous for Cuba's future that when a Cuban gets rich, he often claims to be a Spaniard.

the money, or this lame beggar who can eat if you buy. There is a cockpit in every town, and the ever present sportsman with a rooster under his arm, the rooster yearning to fight, the man yearning to watch and bet. If you wish to test your Spanish, follow the betting of the cockfight as the odds change with every lightning thrust of the alert contestants. If you can do this, you have indeed achieved the language.

Havana, with a population of 552,000, larger than that of New Orleans, is much the largest city of the West Indies. It shows the marks of a national capital. It is the commercial and financial center of the island as well as the legislative and administrative center of a centralized government. It has a terminal railroad station costing $3,000,000, with mosaic floors and interior finish of Italian marble. Almost unrestricted gambling and alcoholic drinks add (for some) to its natural winter charm. Cuba is a Mecca for American winter tourists.

The predominance of the English language in the business of the island has caused some of the schools to teach English. Indeed, the Americanization of the island has already gone so far that it is a much less interesting place to visit than most of the other West Indian islands. Aside from the American operation of the island, American store clothes, Ford cars, and the great trade with the United States, perhaps the best evidence of Americanization (but not necessarily of benefit) is furnished by the welcome given to a returned Cuban baseball player some years ago.[32] Baseball arrived with the American troops in '98, and has since developed into a popular Cuban sport. There are numerous school and professional teams throughout the island, and some of their better players have "graduated" to the big leagues of the U.S.A.

THE ISLAND OF HISPANIOLA

THE DOMINICAN REPUBLIC AND THE REPUBLIC OF HAITI

Shining shoes is the chief industry of the Dominican Republic. At least that is the impression I got from the number of times I was invited to have a shine, whether I needed it or not, in the towns of that country. I also resolved while there to buy some white duck suits, so that I might appear as well dressed as the pleasant and polite young mulattoes who carried my baggage and served me with good food in this land of the well-dressed cavalier.

[32] "No conquering hero returning to his native land could have received a more hearty welcome than did Adolfo Luque, the premier pitcher of the National League, when he arrived in Havana late today. Long before the steamer, *Governor Cobb*, came to her pier the wharves and near-by streets were jammed with thousands of admirers. The army, navy and city, and the professional, semi-professional and amateur baseball leagues were represented in the parade that escorted the Cincinnati twirler up to the office of 'El Diario de la Marina' where toasts were drunk to his health. Several bands were in the procession, and the people brought out every conceivable noise-making instrument to add to the din raised by the shouts of 'Viva Luque.' At times the baseball enthusiasts almost mobbed their idol's automobile in trying to reach it and pat Luque on the back or receive a handshake from him. Luque's face was wreathed in smiles as he responded to the welcome. He was showered with flowers along the route from the pier to the newspaper office." — Associated Press, Havana, Oct. 2, 1923.

THE PEOPLE OF HISPANIOLA

There has been much inaccuracy in speaking of Hispaniola as a Negro island. Haiti, the nation occupying the western and more populous third of the island, is a Negro land with a sprinkling of educated people who would pass for white, but the population of the Dominican Republic, the eastern two-thirds of the island, is very far from black. It is true that the official figures, giving 25 per cent white, 50 per cent mulatto, and 25 per cent Negro, lean much too strongly to the Caucasian side, but the proportion of the population that has no strain of Negro blood is very difficult to establish without the study of genealogy.[33] Granted a moderate amount of sunburn, the chances of distinguishing between an octoroon and a white person are not good. Often, indeed, it is impossible to make the distinction, and with the smaller fractions the difficulty increases, although occasionally a child is born who is much darker than the rest of the children and there is revealed an unexpected Negro strain.

Some, perhaps harshly critical, claim that there are only a few of the great families of the Dominican Republic entirely clear of any Negro strain. Observation of the people leads me to the belief that they have, on the average, more Caucasian blood than Negro blood, and the absence of a social color line certainly makes the island a haven for the mulatto. If I were one, I should certainly emigrate to that land. There is, however, a natural social grouping of complexions, so that the pure white and the pure black rarely meet in the same social gathering.

In the summer of 1923 I attended a dance in the Dominican Republic in company with a handful of Europeans. It was 10 miles out in the country from the city of Santiago, in the interior, whither a half-dozen of us rattled in a Ford. The host, a well-to-do landowner, had a frame bungalow lighted with acetylene gas. Careful scrutiny of the guests convinced me that some were pure Caucasian, that many others would have passed as such in New York, while some showed unquestionable signs of African blood. But none appeared to be more than one-eighth Negro, and I estimated the average blood of the audience to be at least 96 per cent Caucasian. A girl of much darker skin entered the room, but it was only for a moment. She was a servant taking a child to bed. There were no shooting affrays, no knives were drawn. There was no quarreling. A little warm beer was served, but it produced no hilarity — indeed, the first half of the dance proceeded from 10:30 to 1:30 with a perfection of propriety that could not have given the smallest possible offense to the most puritanical matrons of New England. I was told that the last half was equally proper. The hair, dress, and clothes were of New England, the dance of New England; indeed, this standardization of the world promises to make it a very drab and monotonous place.[34]

Only the music had the slightest sparkle of local color. It had a tang and

[33] The *Statesman's Year-Book* says: "The population contains some creoles of Spanish descent, but is mainly composed of a mixed race of European, African and Indian blood."

[34] This, of course, was before New England and the rest of the United States turned to Africa for its modern jazz-band music.

jingle of the jungle, for the orchestra of ten pieces averaged at least 56 per cent black. The combination of African and Spanish produces a much better appreciation of music than the Anglo-Saxon has. Every town in the Dominican Republic, almost every town in the West Indies, has a fine public square, with music every Sunday evening, and perhaps every evening in the week — good music at that.[35] On the square there is usually a fine church, often a cathedral, and during the hour of music the populace gathers to promenade in good clothes.

It will not do to dismiss the Dominicans as being either black or wholly uneducated. It is true that 80 per cent of the people are illiterate, whereas in Spain the proportion is only 57 per cent, but the wealthier Dominicans have long made a point of sending their sons and sometimes even their daughters abroad for education, often to the United States. "I am a graduate of Cornell," replied the Adonis whose beautiful English, as he served me in a store, caused me to inquire where he had learned it. And at every turn throughout the island I met men educated in the United States or Europe.

GOVERNMENT ON HISPANIOLA

This island of Hispaniola was the favorite land of Columbus. He called it La Isla Española — The Spanish Isle. He founded the city of Santo Domingo[36] promptly after the discovery, and the ceiba tree to which his ships were said to have been moored is still pointed out on the bank of the river there. The cathedral once held his bones. Yet this island is today less changed by man than any other in the West Indies. About 70 per cent of its area is still in forest. For forty years this was the center of Spain's empire in America, and the ruins of the palace fortress built by Diego, son of Christopher Columbus, still stand. Through its archways passed Cortés to the conquest of Mexico, Pizarro to the conquest of Peru, Balboa to the discovery of the Pacific, and various others of the terrible conquistadors and hardy explorers.

The native population, estimated (probably too high) at 2,000,000, promptly melted away under the Spanish enslavement and other cruelties and the diseases of the conquerors. A few survived in the mountains of the interior, but they are a negligible factor in the population. Then came the slave ship with the tougher population from Africa, able to endure labor and contact with the Spaniard. Thus at the end of four and a half centuries we find the so-called Republic of Haiti with most of its people black, very black, while most of those of the Dominican Republic are mulatto or white, many of them with thin lips and fine features, and some even with blond hair. The chief explanation of this difference lies in the terrible massacre and expulsion of the whites from Haiti at the hand of the Negroes at the time of the French Revolution.

[35] This appreciation of music, in combination with the scarcity of news, is shown by the double-column announcement of the coming of the Italian opera singer Titta Ruffo. For a week daily leading columns appeared about him in the papers of the capital city.

[36] In 1936 the city was renamed Ciudad Trujillo, in honor of the country's Dictator-President then in office, General Rafael Leonidas Trujillo Molina.

From the time of the French Revolution to 1844 the whole island was under the rule of the Haitians — a sad chapter of civil war, cruelty, and massacre. In 1844 the Dominican Republic succeeded in establishing its independence from Haiti and began a career of revolution on its own account. It is said that between that time and 1916, when the United States took control, only four Presidents either died in office or finished their term. The others passed out by violence. The rule was largely by bands or armed gangs. The foreigner who wished to run a sugar plantation made his peace with some particular band, which he subsidized. They in a measure policed his property, fought off would-be revolutionists, and perhaps did a little private killing upon request. It was an easy way to get land. During this era the common way of financing a revolution was for the organizer to borrow money from some man of means, the "general" giving in return an order remitting tariff duties to that amount after he had come into possession of the government. This remission of tariffs often became a kind of vested right by which many a fortune was built up. Thus a few big families, often of the finest Spanish blood, fomented revolution after revolution, and operated the country for several generations. The loser in one of these civil wars usually fled to some other West Indian island, to South America, the United States, or Europe, always planning and striving to get back. For generations New York and New Orleans have been sprinkled with colonies of Latin American expatriates — hoping to win a revolution.

The public debts created by these fly-by-night governments resulted in a "receivership" by the United States. This was done by treaty, one of the conditions of which was that until the Dominican Government paid all of its debts no more public debt should be created without the consent of the United States Government. In 1916 an admiral of the United States Navy issued a proclamation announcing that the treaty had been violated and that the country was under the military occupation of the United States.[37] So far as can be gathered by unofficial inquiry, it is generally believed that the real reason was the fear that Germany or some other European power would take possession of the Bay of Samaná at the east end of the island, a harbor with a narrow and easily defended entrance, and with enough deep and sheltered water to hold the navies of all the world. In 1939 an American Receiver General of Customs was still supervising the collection of customs and the payment of interest and amortization on Dominican bonds, and he will probably continue to do so until the bonds are repaid.

AMERICAN INTERVENTION IN THE DOMINICAN REPUBLIC

From 1916 to 1924 the Dominican Republic had its greatest period of peace and order — order enforced by the United States Marines with government by the naval officers.

There was one result of the occupation which, all parties agree, was good. It was the complete disarming of everybody, save for the possession of the

[37] The only violation was failure to pay government employees' salaries.

machete, the universal tool of agriculture. With the American zeal for reform we bowled over most of the existing government, but many Dominicans praise the work that we did for their schools under the leadership of Rufus H. Lane.

The greatest physical achievement of the early years of the American occupation was the building of roads. For four centuries the northern and southern sides of the island had been separated by a horseback journey of several days through the forests, or a sea journey (three days by steamer) around the east end of the island. There were two short railroads in the northern settlements, but it was then, as it is indeed today, the land of the man on horseback, for about 900 miles of first-class highway still leave most of the area untouched. In 1937 there were only 145 miles of railroad, 65 miles being owned by the Government; in addition, there were about 644 miles of private railroads on the larger sugar estates.

The government of occupation, that is to say the American Navy Department, began to build a national system of roads. In four years' time they had completed a line from the capital city (Ciudad Trujillo) at the south across the island to Santiago and on to Monte Cristi on the north coast. Branches were partly built, connecting most of the cities south and west as well as north and east with the ends of this trunk line. Great enthusiasm for roads prevailed. In some towns everybody turned out with pick and shovel to help, but most of the work was done by Haitian Negroes, quite black, imported for the purpose. They built themselves palm-roofed villages and made gardens in the forest along the road, where they worked for 60 cents a day. By 1937 the country boasted not only 900 miles of first-class highway, but also about 1400 miles of secondary roads. It is now possible to travel by motorbus from the Dominican capital of Ciudad Trujillo (late Santo Domingo) to the Haitian capital of Port-au-Prince in twelve hours.

In any case the roads can touch only a small portion of the total area. They can help no lumbering enterprise of the modern variety, and most of the forests are, as they were before the Americans came, difficult of access. It is not uncommon for mahogany, rosewood, and other tropical woods to be cut into pieces 24 by 18 by 9 inches, two of which are slung across the back of a mule or a donkey and carried for miles to port or railroad.

THE DOMINICAN NORTHERN RIDGE AND VALLEY

The island of Hispaniola has four mountain ranges, with three intervening valleys. The northernmost range is often close to the sea. As seen from Puerto Plata, the northern slope exposed to the trade winds shows the tangled jungle of a moist slope, sprinkled with the clearings and the palm huts of the primitive agriculturalist. Fortunately for the preservation of soil upon the mountainsides, the clearings of the roving agriculturalist are often abandoned while the logs of the forest still lie upon the ground and its roots still hold the earth.

The south side of the range, in the so-called rain shadow of the mountain, has the open forest and cactus indicative of its light rain.

The first long valley, running from Monte Cristi in the arid west to Samaná in the humid east, gives a vivid example of the variation of tropical climates within short distances. The eastern end of the valley is wet all the year because the trade wind blows into it. Here most of the Dominican yearly harvest of 30,000 tons of cacao beans is produced. Nearly all of it is grown by the small farmer, an acre or two along with the varied products of the *conuco*, which can here keep the same ground for generations because the land in this alluvial valley is as flat as Illinois, and as black and as rich. Here also is grown much of the tobacco export, some of the coffee being grown on the hills. The merchants in the towns who buy these products from the small farmer told me they could not buy land, hire men to grow tobacco, and make any money, because the peasant proprietor does not count his time, and really works as his own boss for a very small wage — smaller than he would accept as an employee. This is manifest in the prices — 3 cents or 4 cents a pound for leaf tobacco, the sum paid in 1923 by the merchant after the grower had hauled it many miles on muleback to the market town. Eighty per cent of these growers had borrowed money from the merchant while they were growing the crop, much after the fashion of our Southern cotton-grower. This eastern valley is famed throughout the West Indies as one of the garden spots of the American Mediterranean.[38] It was named by Columbus La Vega Real (The Royal Meadow), and is so known to this day.

In one of the most prosperous towns I called upon the local representative of the Department of Agriculture. He told me that about 4 acres was the average holding of these farmers, that to most of them the plow was unknown, and that their whole agriculture was performed with the ax and the machete; that he was trying to establish the great reform of having them use the mattock instead, and if I had come along half an hour earlier, I would have seen a peon in his garden using his mattock. I had in fact seen the said reformed peon. I should like to know how many weeks it would take him to dig up an acre of soft level dark earth at the rate I saw him working that hot July day.

The agricultural official told me that most of the people in this particular valley did not own even a donkey. When the local merchant bought from the people, he sent out donkeys to bring back the tobacco, cacao, and coffee. The people lived almost exclusively on boiled plantain, perhaps buying a bit of meat once or twice a week when they came to town.

A near-by garden showed the fecundity of the land. Within a space not over 25 yards square were a mango tree, a lime tree, an orange tree, a breadfruit tree, a cacao tree, a coconut tree. Corn, with sweet potatoes running through it, was planted beneath all these trees. In the back of the garden was a pigpen. My guide pointed out a new house with a young palm tree by it, saying, "He has planted palms and in a year or two he will have enough to roof all the outbuildings he wants." It is the rule of that country that a roof 5 by 10 yards in area can be built from 20 "horses" of the sheaths of

[38] "Among the most impressively fertile districts of the world." — Vaughan and others of U.S. Geological Survey.

palm leaves, a "horse" being 2 packages, 25 each, costing 10 cents per "horse" delivered. Five men make the roof in half a day. It lasts for twenty years, and makes a very pleasing roof to look at from within, with the regular rows of knots where the palm-fiber bindings fasten the long leaf sheaths to the poles.

SHARP CONTRASTS OF TROPIC CLIMATE

The part of the valley draining east is a land of the banana; the part draining west is the thorn forest. Yet there is no mountain range in the middle of this valley, though a mountain range walls it in from the sea along its north side. The water parting, altitude 209 meters, near Santiago, altitude 195 meters, is so gentle that the captain of the marines who kindly took me to ride in his automobile was quite sure that there was no water parting there. Yet the mere change of slope and a few feet of fall cause the country east of Santiago to be one of pasture. Eighteen miles west of Santiago and only 57 meters lower than the water parting there were wide expanses of scrub, heavily sprinkled with cactus 10 feet high, while at the end of the valley near Monte Cristi conditions are virtually desert, with a rainfall of less than 20 inches per year, falling in torrents, much of which runs away.[30] In the center of the valley near Santiago one passes in 10 miles over a gentle incline from pastures into a country where every foot is occupied with little farms covered with corn, bananas, plantains, then cacao and coconuts, until at a distance not more than 20 miles from the cactus one is in the full luxuriance of equatorial agriculture. Forty miles farther east, at Sánchez, where winds blow into this valley from the sea, the humidity is so great that it is common for people to put corn into their shoes at night to prevent their molding before morning.

In the west end of this valley, toward Monte Cristi, in the dry land, the houses had walls of basketwork or mere small poles, sometimes plastered, but more often not. The bleating of goats was a common sound, and goatskins are the chief product for sale.

The lower part of this valley appears to be one of the rich, unused agricultural opportunities of the world. There are tens of thousands of acres of alluvial soil, lying well for irrigation, not many feet above the river, fed by continuous rains in the high mountains at the center of the island. An enterprising Belgian engineer had a very prosperous rice plantation, proving the adaptability of the land for this produce, while its suitability for sugar is manifest, and it is probably excellent also for alfalfa. Why does it remain unused in this capitalistic epoch? Page the dictator!

In 1940 plans were on foot to colonize parts of the Dominican Republic with European political refugees. There is room for thousands.

[30] "The resemblance of this region to the arid plains of Lower California is very striking. The same dry soil covered with a scanty carpet of grass; the same low, straggling-limbed open-foliage acacia-trees; the same tall columnar cactus with its undergrowth of *opuntias;* even the same cloudless sky made the likeness complete." — W. M. Gabb, "On the Topography and Geology of Santo Domingo," *Transactions of the American Philosophical Society,* Vol. 15 (N.S.), 1872–80, pp. 49–259.

THE PINE FORESTS OF THE DOMINICAN REPUBLIC

The second ridge in from the sea is covered for 75 or 100 miles with pine forests. It is the opinion of botanists and foresters that the pine forest is purely the work of the *conuquero*, who by repeatedly cutting, burning, cropping, and returning nothing has reduced the fertility to the point where pine, noted for its ability to live on little, takes possession of the land.[40]

I had the fortune to meet two Alabama lumbermen who had just cruised this pine area thoroughly. They reported 5,000,000,000 board-feet of splendid pine, with tall trees that carried their size well. But because of the broken nature of the country, there was no known means of getting it out at a profit, and they were going home sorrowing. Throughout the forest area they reported coming to *conucos*, where they were hospitably received and well fed. The pine forest was sprinkled with mangoes, enough, they declared, to have made them millionaires if they could have sold them for 1 cent apiece in New York.

Most of the interior of the Dominican Republic can be classed as almost unsettled. Here and there is a village in the tropical woodland or grassland, far removed from transportation.

THE SOUTH COAST OF THE DOMINICAN REPUBLIC

The south coast, with its rainy and dry season, is the chief seat of the sugar industry. There are large areas of level soil underlaid by coral limestone, which weathers into a soil of great fertility. There is enough rain to turn it into jungle, tightly tied together with myriad vines. This makes difficult clearing, but I saw considerable areas of it being cut down and burnt and put into sugar cane. One company engaged in clearing the forest and planting employed 8000 men for many months. To carry cane from the fields across the river to the mill, a bridge costing $1,000,000 was built. The hand culture of the cane was proved by large logs that were lying in all directions among the growing cane. An American company with 100,000 acres in this region expected to clear, plant, and abandon the region in about six or seven years. "But isn't this wasteful in the long run?" someone asked the manager. "Oh, well," he replied, "we won't be here then." These Dominican sugar operations are good examples of financial internationalism. Capital is mostly American, management is mostly American, often with European assistant managers and technical experts. Much of the cane-field labor is done by Haitians. There is usually a marked darkening of the complexion as one goes from coffee, cacao, or tobacco lands to the cane fields. The lower officials, such as gang foremen, timekeepers, weighers, bookkeepers, and other clerical workers about the field and the factory, are often Puerto Ricans who have been educated in the public schools and come over to work for the sugar-grinding season and then return. These superior positions of the Puerto Ricans naturally produce jealousy, so that there is a saying in the Dominican Republic that the only good Puerto Ricans are the ones who walk over.

[40] See *Geographical Review*, April, 1922, p. 217.

The largest sugar estates are in the southern part of the country. In 1937 there were 21 sugar mills that were owned and operated chiefly by American companies, although very little sugar was sold to the United States. In recent years about 500,000 tons of raw sugar and 2000 tons of refined sugar have been exported annually.

THE ARID DOMINICAN SOUTHWEST

The southwestern part of the Dominican Republic is a land of marked aridity, as is evidenced by the salt Lake Enriquillo, which has dried up to such an extent that its surface is more than 100 feet below sea level. It lies in a plain with salt-encrusted areas sometimes square miles in extent and with little vegetation but cactus and thorn. Springs at the foot of the mountains on each side give a belt of tree growth at the foot of the hills, which are themselves in turn bare or bush-covered on the lower slopes. With increasing elevation increasing rain permits the growth of coffee, which is the chief export.

Except for the sugar enterprise started near the port of Barahona, this corner of the Dominican Republic is a very primitive region, as much Haitian as Dominican. It might produce much henequen, but it awaits the enterprise as well as the laborer.

Across this arid plain flows the second large river of the island, the Yaqui del Sur. On an alluvial plain near its mouth, not far from the port of Barahona, is one of the largest of the West Indian sugar enterprises, which had to add to all of the other labors the great task of making irrigation and drainage ditches. The drainage ditches were necessary to carry off the salt, which otherwise would come to the surface and kill the cane. Indeed the first crop of cane was ruined because of the high percentage of salt that it carried along with the sugar. The next crop, however, was good, and since then the company has done quite well. It has a great resource in virgin alluvial land and irrigation water and location close to the port, Barahona. Any such opportunities in Jamaica and Puerto Rico were used centuries ago.

THE DOMINICAN FUTURE

What is the future of the Dominican Republic? The first fact to keep in mind is its great undeveloped agricultural resources. It has a much larger percentage of level land than Puerto Rico, so that its population of 70 to the square mile is only one-eighth of what it might be if its resources were as heavily pressed as are those of Puerto Rico. With such a small population in such an Eden, it is not surprising that the people should not be keen to seek regular jobs laboring on the plantations of foreign capitalists. Hence the description given of them by an American official:

> As a rule, judged by Northern standards, the labor is not very satisfactory. In the country and in the vicinity of the towns, the men live upon their little patches of land with perhaps one-tenth of the exertion required in making a living in the United States. The small farmer plants his sugar-cane and has nothing to do in that

connection for the next twenty-five years except gather the crop. He plants a hundred or so banana or plantain sprouts, and he has food in abundance indefinitely. He plants his papaya trees and there is plenty of fruit. Squashes and melons come up where the seeds fall. The wild trees of the near-by woods give him coconuts, mangoes, nisperos, anóns, guanábanas, and other fruits. Wild bees give him honey. Sweet potatoes, once planted, keep on producing, while the yucca or "yamie" (cassava) grows wild and is a good substitute for potatoes. It requires little exertion to raise chickens, goats, cattle, or a few razorback hogs. Thus there is no necessity for sustained endeavor, and the average Dominican is not accustomed to it. He is not trained to obey orders and to work to the satisfaction of some one else. Not feeling necessities keenly, and not caring much for dress and the non-essentials of existence, he does not see any pressing reason for continued and strenuous application to a task.[41]

That statement is a bit strong in spots, but it savors largely of the truth. An American exporter writing about a long-promised shipment of mahogany said, "The man has promised to deliver your lumber very soon, but that means nothing here."

The greatest problem facing the Dominicans is the problem of social organization. Will they enter the age of regular work, science, sanitation, and education? Some years ago the investigators of the Rockefeller Foundation reported one-half the population to be suffering from hookworm, and in rural districts the percentage was sometimes higher than that. One need go no further to explain the lack of desire to work. If they are left to themselves, the social and industrial change will be slow. If they are properly aided by outside experts the change may be rapid. In 1924 the country was in a peculiar and sinister deadlock. The American State Department was definitely and actively trying to get out of the Dominican Republic, but the government of the country was in the hands of the Navy Department, with 2500 marines in charge.[42] The attitude of the marines was well characterized by their frequent statement that "it is a hell of a job to run this damned country." But they were very free with their predictions that they were never going to get out. Such remarks are often only too typical of military men acting as civil administrators. The marines were ordered out of the Dominican Republic in 1924, a new constitution having been adopted and

[41] U.S. Dept Commerce, *The West Indies as an Export Field, Special Agents Series* 141, 1917, p. 165.

[42] Meanwhile the official American plan was to re-establish the government and sail away. As a step toward this re-establishment and exit, the Navy Department had relinquished its military government, in large part, early in 1923, had persuaded the Dominican political parties to unite in establishing a provisional government, which was to hold office until an election could be held and the permanent government organized under the newly elected President and Congress. Meanwhile the election was postponed from month to month because one of the leading political parties refused to enter the field with candidates and prepare for an election. This party was bitterly upbraided by the other parties for its refusal to co-operate and thus help the Dominican Republic to escape from the hands of the foreign rulers.

This episode reflects the governmental weakness of the Spanish temperament, the lack of the larger loyalty, which often expresses itself in treachery and was here seen causing a party to take the position that they would rather have the Yankees continue to rule the country than have the government pass into the hands of the other party of their own countrymen. This, in its philosophy, is the same as the axiom of American politics that it is better to dominate a defeated political organization than to be beaten by the other wing of your own party. Example, the Republican party in the presidential campaign of 1912.

an election held before they left. Since then the marines have not returned, and they probably will not return if the Good Neighbor policy continues to prevail. The President of the republic is Dr. Jacinto B. Peynado (1939), but the country's boss is the former President, General Trujillo, commander of the army, the strong man who has preserved peace and order in recent years, with many charges of tyranny. In view of its turbulent past and difficult present, the country probably needs a "strong-man" type of government. The trappings of democracy are there, but there can be no democracy without a literate electorate. Perhaps the most hopeful aspect of the Dominican situation is the fact that there were 112,647 pupils enrolled in the Dominican schools on March 31, 1937. Public education and an approach to true democracy, of course, cannot be achieved in a day.

THE REPUBLIC OF HAITI

So far as mountains, valleys, soils, and climates are concerned, the Republic of Haiti is an extension of the Dominican Republic. The boundary cuts from the north shore to the south shore right across the mountains and valleys of the almost uninhabited center of the island.[43]

THE HISTORIC BACKGROUND OF HAITI

Haitian history from the end of the French dominion, 1791, to the beginning of the American occupation, 1915, may well be cited as a period of reversion to nature. In 1791 Haiti was one of the shining glories of slavery, if slavery may be said to have shining glories — luxurious palaces of the French owners of large estates, hundreds of thousands of slaves laboring under the task-masters and by their labors making great commercial prosperity. Then came the French Revolution. Its spirit of liberty fired the slaves to rebellion under the genius of Toussaint L'Ouverture, who is undoubtedly to be reckoned as one of the great men of his century. There followed terrible massacres of the French, and the flight to Cuba of 3000 of the other leaders of the people. For more than a century since this purging Haiti has very properly been called the land of the Negro. Anyone who is inclined to call the people "niggers" should have someone make an impartial appraisal of manners. A United States Government report describes them thus: "The Haitians are generally of an amiable disposition, polite and courteous to a degree, considerate of others, possessed of good manners; this is especially true of those who have had the advantages of 'instruction.'"

These people had an unfortunate start for their century of independence. They had been stolen from their own homes in Africa. Their own native culture and social organization were destroyed, and the only chance to absorb European civilization had been the contact with the oppressor who used them as work animals and concubines. Very properly it may be said that they

[43] The boundary between these diminutive republics, long in dispute, was resurveyed under a treaty signed in 1929, and a final adjustment of the dispute was concluded in March, 1936 — another hopeful sign of improved political relationships within the Caribbean area.

started with no culture save a sprinkling of French that remained after the furious expulsion of their rulers. Add to this complete independence the possession of firearms, and we have the beginnings of a century of civil war, oppression, rapine, and revolution.

It is said that in April, 1922, two Haitian Presidents met on friendly terms for the first time in history. Every previous President is said to have died by violence or to have sought safety in flight. It should at once be mentioned that these two peaceful Presidents were the first to have no real authority. Behind them stood ranks of United States Marines. One was the first dummy President going out of office, the other the second dummy President going into office under the United States administration.

In 1791, the last year of French control, 88,000 tons of sugar, worth $24,000,000, were exported. In 1915 just 17 tons were shipped, but none was reported for 1914, the last year before the arrival of United States Marines. The figures for cotton were respectively 38,000 tons, worth $3,500,000, at the beginning of the period, and 1600 tons at the end. Coffee fared much better, having shrunk only from 48,000 tons to 38,000 tons, and there was a new factor, namely, 3000 tons of cacao.

SUGAR, COFFEE, AND PEACE IN HAITI

Why did sugar disappear so completely and coffee hold its own so well? The answer is the relative fitness of these two industries to political chaos and primitive agriculture. The mansions of the old French sugar planters were vine-clad ruins; their old sugar mills were buried in new forest; the jungle had long since reclaimed their cane fields; and there was not a modern sugar mill in the whole island, for the sugar mill is an expensive, scientific, capitalistic enterprise, as has been fully explained, and political chaos is as fatal to it as it is to higher education.[44]

Coffee, on the other hand, is a bush that grows on almost any humid tropical hillside, and indeed it thrives so well in the damp West Indies that it grows wild over large areas in the interior of Haiti and the eastern part of the Dominican Republic. The natives go out and pick up the berries from the ground, so that the Haitian coffee, the chief export of the country, sometimes comes to market mixed with pebbles.

The small shipments of cotton were gathered from wild plants, for cotton here lives from year to year, not being killed by frost as in the United States. The native's mode of life varied little from that of his distant cousin in Africa. The palm hut, surrounded by plantains, yams, and cassava (cassava is a great staple); a few goats, picking up their living as they could, furnishing milk and skins to sell, and a few chickens, also picking up their living, furnishing some eggs and a bit of meat. Such has been the life in the Haitian forest. For decades the traveler in Haiti has been meeting men and women, especially women, walking to market 10, 20, 50 miles, carrying a sack of

[44] The collapse of Haiti is typical of the collapse that may come to any country of high organization when the destructive bonehead rules in the place of the creative brainhead — Babylon, Nineveh, Tyre, Carthage, and many more.

coffee or a bundle of logwood roots or a logwood stump. The more fortunate might be leading a donkey or two with added burdens, but the majority bore their burdens on their heads, trading at the towns for the barest necessities that such meager commerce could yield. So primitive was this life that two different foreigners who have traveled much on business in the interior of Haiti have told me that not many years ago they saw adult women as naked as the proverbial bird's egg and as unabashed as Eve before the episode of the apple.

THE HAITIANS AND THEIR CAPITAL CITY

The capital city, Port-au-Prince, is beautiful to behold as one approaches it from the sea, with its long, curved white beach, the blue mountains in the background, and the whitewashed buildings nestling in the palms. After one arrived in the native days, the sense of beauty was quickly lost in the stench that overpowered all the other impressions of the traveler who entered the city. One hundred thousand people with no sewage system whatever were crowded into a city on a flat, hot, humid, often breezeless tropical plain. The streets were littered with dirt, garbage, excrement, and every kind of waste. The experience was a shock to all peoples from lands where sanitation is a science. When the Americans landed in 1915, there were four automobiles in the capital, and most of the business of the city was in the hands of Syrians, comparative newcomers.

In a land where the soldier rules and the general was the top of the frequently changing heap, military pomp was naturally a conspicuous part of life.[45]

It should not be forgotten that there has always been in Haiti a small minority of intelligent, cultured, traveled people, educated in Europe, chiefly in France. The French drama has never ceased to flourish in Port-au-Prince. There have always been Haitian families whose inherent and cultivated qualities really fitted them to mingle in any society. Their political acumen has been high. Despite the century of disorder, the black and military rulers of Haiti should receive credit for their skill in keeping clear of foreign en-

[45] This was picturesquely described as follows by Mr. Dawson, an American traveler, about the time of the American occupation:

"Military service in Haiti is compulsory. The pay for the soldier trickles down through military channels, colonel to major to captain, in a gradually diminishing column, and disappears altogether long before it reaches the common soldier. It is not an uncommon sight to see the soldiers begging and soliciting money in the streets, and when one visits the President's palace the entire bodyguard lines up with hands outstretched begging for coppers.

"The Generals of Haiti are worthy of a chapter to themselves. 'General' among them is a title conferred for any sort of service to the state or to a political party at the moment in power, and does not necessarily mean that the bearer of this title has had any military experiences whatever. However, as soon as some big black politician receives his title he immediately buys himself a uniform of whatever color and style his fancy may dictate, to which he adds a collection of all sorts and kinds of medals. Thus arrayed, he mounts himself on one of the diminutive ponies of the island, and rides around in great pomp and splendor. The General shows to the best advantage in the military reviews which happen often in Port-au-Prince. Here he gallops around the parade ground and shouts orders to the soldiers, to his fellow generals, to the band, and to the admiring spectators, burying himself with dust and glory."

tanglements. For more than a century they succeeded in avoiding the entanglements of foreign debt much better than the statesmen of most Spanish American countries.

THE AMERICAN OCCUPATION OF HAITI

The coming of the American occupation merely brought one more revolution to Haiti, the first since 1791 that caused an actual revolution in conditions. It was not a diplomatic enterprise. The treaty which we forced the Haitians to sign provided that "the Government of the United States will by its good offices aid the Haitian Government in the proper and efficient development of its agricultural, mineral, and commercial resources and in the establishment of the finances of Haiti on a firm and solid basis." It went on to say that a military adviser would be appointed to organize the army and the police system, and that a sanitary officer would be appointed, with authority to clean things up. The cleaning-up began promptly. Water supplies were established. Irrigation works were built. Roads, bridges, railroads, telephones, telegraphs, hospitals, and free dispensaries were constructed. General vaccination took place. United States Marines in small groups took charge of squads of 50 or 100 natives and trained them to become the local police force (gendarmerie). The members of this force received free grammar-school instruction. In the prison, the death rate, which had been 65 per cent per year, dropped to less than 2 per cent, and the prisoners were taught trades.

The key words of the opening paragraph of the treaty, "development," "agricultural," "mineral," "commercial," "finances," are suggestive. There are possibilities of great economic development in Haiti. The resources are there. Columbus described the island to the Queen of Spain by crumpling up a piece of paper and throwing it on the table to indicate its mountainous surface. These mountains cause a great variety in climate, surface, and resources.[46] Among the mountains are many valleys with rich alluvial soil, and the more than 3,000,000 Negroes afford a very considerable labor supply that now finds partial employment in other lands. They were glad to go to work in 1916 for 20 cents gold each day, and went over to the Dominican Republic to build roads for 50 cents per day. Haitian valleys can produce hundreds of thousands of tons of sugar per year. Four large central plants were constructed within the first three or four years of the occupation. Many of the damp and sheltered valleys are also excellent for cacao. The hills can produce much more coffee than they are now producing, while much of the arid land to the southwest is well suited to henequen, of which the natives have long grown small quantities for the manufacture of cordage for local use.

In pursuance of our Good Neighbor policy, the United States Marines moved out and the Haitian Government took over control of the island on

[46] "There is hardly any country presenting a greater diversity of soil and climate, with all the varieties in such close proximity and each so nearly approaching perfection of its kind. There is need only for communication to make these natural advantages available and assured markets for the abundant produce that will then be brought forth."—U.S. Dept Commerce, *The West Indies as an Export Field.*

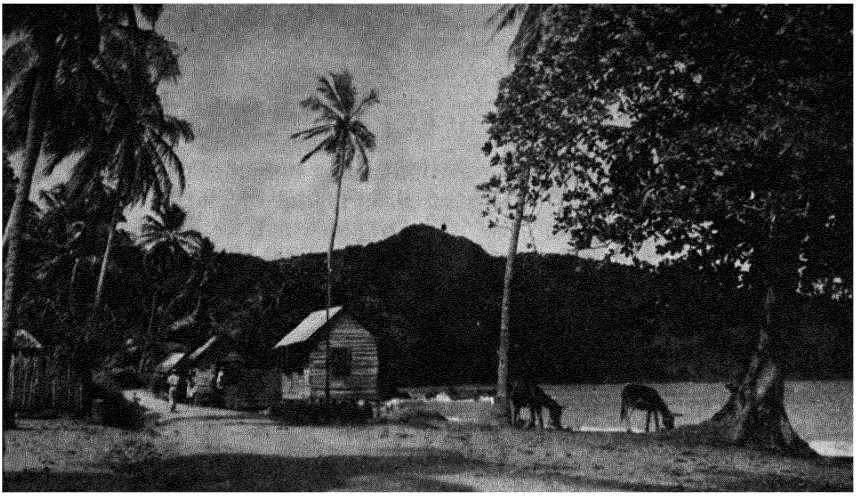


FIG. A. A hamlet on the shore of the island of Tobago. It is so typical that it might be almost anywhere in the volcanic Lesser Antilles, and you might find *conucos* on the almost impossibly steep slopes of the mountain in the background. (Courtesy Furness Steamship Line)

August 14, 1934. However, a fiscal representative appointed by the President of Haiti on recommendation of President Franklin D. Roosevelt remained to supervise the customs, so the foreign holders of Haitian bonds will not be obliged to "hold the bag," or to claim reasons for interfering.

Haiti has about 250 people per square mile, whereas the Dominican Republic has but 70. It is estimated that some 200,000 Haitians now live in the Dominican Republic, having moved there to work in the sugar-cane fields during boom days. Conflicts arose between the Haitian immigrants and the Dominican police when the Haitians refused to return to their country, and at least 10,000 Haitians were massacred with machetes and daggers near the border between October 1, 1937, and January 1, 1938. On January 31, 1938, the Dominican Republic agreed to pay $750,000 as indemnification to the families of the dead Haitians. Such an incident in previous years might easily have led to war.

THE LESSER ANTILLES

From the east end of Puerto Rico to the coast of Venezuela there is a great curve of islands 800 miles long. They are the Lesser Antilles. All save two, Barbados and Trinidad, are the tops of old volcanoes rimmed with coral limestone. Many of them rise sheer from the sea. Some are surrounded by coral reefs. A few have small areas of low plain built up by streams washing down their steep sides, but most of their area is upland, much of it steep and mountainous.

All are swept by the trade winds, which make the surf beat hard and cut

the cliffs to windward, while gentle sandy beaches sometimes form on lee shores. Differences in elevation, slope, and soil combine with this master climatic fact of the trade wind to cause a great variety in landscape and life conditions. Some of the islands are low, and because elevation is necessary to wring much water from the trade wind on a small island, these low islands are dry and treeless. In contrast to this is Martinique, a volcano (385 square miles) with its peaks generally hidden in clouds, drenched by the frequent passing trade-wind showers and looking at a distance like soft green velvet. A nearer view shows these velvet slopes to be a covering of tree ferns pierced with the spears of wild banana leaves.

Some of the islands have solid soil and many streams. Dominica boasts a stream for every day in the year. Other islands are of cracked tufa, or porous volcanic ash, or of coral limestone, full of cave passages. These islands are streamless. In some a well cannot even reach water, and the people depend upon catching rain water and storing it in cisterns. The town of St. Thomas (Charlotte Amalie) in the Virgin Islands has large areas covered with cement on the hills above, serving as catchments for rain water for domestic use. In times of drought these cistern islands must bring water in ships from some more favored isle. In such islands the pump at the well or cistern is as great a center of social life as it was in Biblical times, but alas! the 5-gallon kerosene can from the American refinery has completely replaced the shapely earthen water jar of the Orient. But the human form beneath the head-borne burden is still stately, and nothing sets it off better than a burden on the head.

As for the past, these isles are full of history. As for the present and presumably for the future, they are full of Negroes.

In the buccaneer-colonizing period, the sixteenth, seventeenth, and eighteenth centuries, the Lesser Antilles had a great attraction for European land-grabbers in search of sugar colonies. Here is the trail of every naval colonizing power of that period. At the end of every war they usually swapped a few islands. The almost unbelievable esteem in which these islands were held is shown by the difficulty that Benjamin Franklin had in persuading the British to take Canada instead of Guadeloupe in 1763 at the end of the Seven Years' War.[47] The high prestige of the Lesser Antilles in this period may be partially explained by the fact that *some* tropical land was greatly desired as a source of a great desideratum by each of the sexes — sugar and rum. In that day of uncontrolled fevers no other tropical lands were so healthy as these small wind-swept islands. Their ill-watered condition carried with it relative immunity from mosquitoes, now known to be the foster mother of much tropical death. The small island was easy to control, and it gave at least potential command of other shores. Thus the shore of the now useless English Harbor on the coast of Antigua still shows great harbor works that have come down from the last half of the eighteenth century, when Britain spent $125,000,000 fitting it up and fortifying it as a great naval base for the careening and fitting and sheltering of ships for the command of the coasts

[47] See Vilhjalmur Stefansson, *Northward Course of Empire*, where this champion of the North gives a choice collection of similar misappreciations of Northern lands.



FIG. A. Cane field in St. Kitts, east side. Such fields cover the plains and lower slopes of most of the Lesser Antilles. The small black objects in the center are ox teams hauling away the cane. (Photo by J. Russell Smith)

of the Americas. Beet sugar, the emancipation of the Negroes, and the opening of other tropical lands have greatly diminished the importance of the Lesser Antilles in the eyes of colonizing powers.

VARIETY OF CONDITIONS IN THE LESSER ANTILLES

Travel in the Lesser Antilles gives one a sense of variety in humanity as well as in landscape. A Sunday in Martinique opened with a busy sunrise of buying and selling in the public market. Then came mass in the solid old Roman Catholic cathedral. As the sun was now getting warm, the next event was a cockfight in a cool but crowded little amphitheater on a breezy hill. The event was marked by universal joy. The birds fought with unbelievable enthusiasm. They were unhappy only when separated, and sprang to their deaths with avidity; they were painted the color of blood, so that there would be no impression of gore to disturb the feelings of the audience. The betting in mongrel French was astonishing in its speed and fury. The stakes gave to the staid North American mind a new sense of the financial importance of the poultry industry.

At one o'clock came the great art event of this continental-Negro-trade-wind Sunday. The Latin and African cultures mingled in the production of the opera *Carmen*, sung in French in the open-air theater by a Negro cast. Thus did art and religion, sport and economics, give variety to the week end in the monotonous trade-wind climate.

Since emancipation removed the spur of slavery in the first third of the

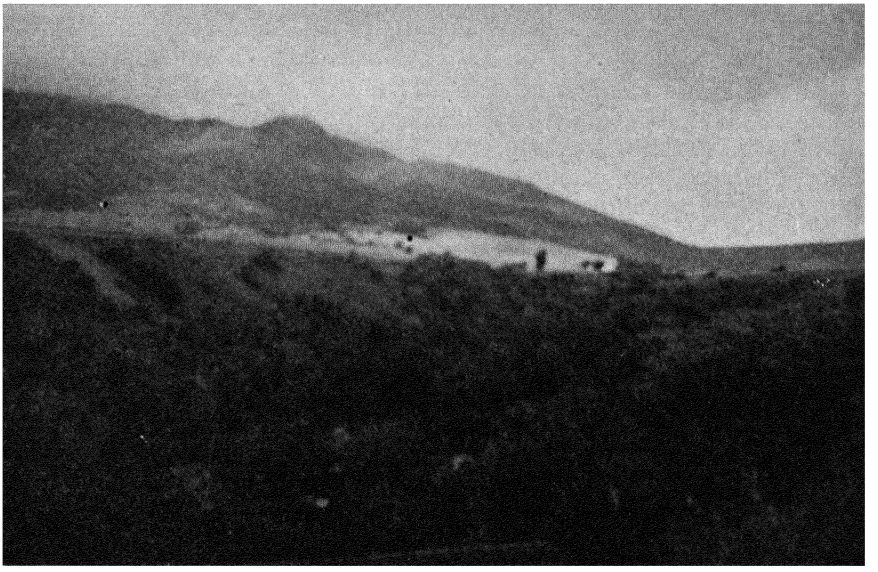


FIG. A. Good cane land is rarely wasted by being used as sites for laborers' cottages and gardens. This view in St. Kitts a quarter of a mile from the one on the opposite page shows a ravine. The road along its bottom is lined with the cabins of the Negroes who work the cane fields on the uplands 100 yards away. The sides of the ravine are almost a forest of mango trees, papaya trees, bananas, and plantain, while beneath them and around them are yams, sweet potatoes, peanuts — the "ground provisions" of West Indian English parlance. (Photo by J. Russell Smith)

nineteenth century, the Lesser Antilles, like other West Indian Islands, have produced more leisure and less exports (goods). Like the larger islands, some of them have many economic as well as historic ruins in the remains of fine old mansions, mills, and distilleries of the sugar planters.

Sugar, along with its children, molasses and rum, still remains the chief commercial product, but the varied conditions help to make a varied export. The island of St. Vincent grows about 400,000 lbs. of sea-island cotton, which the growers claim to be the best of its kind in the world, but the island's output of 7,000,000 pounds of arrowroot, worth more than $400,000, is now the chief export.

In the Dutch islands of Curaçao and Aruba, the largest oil-refineries in the world make use of Venezuelan oil. They are owned by Dutch, British, and American companies.[48]

In the humid valleys of Grenada a few hundred tons of nutmegs and cacao are grown for export. Limes are grown on the leeward side of Dominica and some of the other islands. In St. Lucia, British capitalists are growing cacao and sugar for the British market, and they are also extending the lime and coconut plantations.

[48] See Elizabeth Dunbar, "What Oil Did to Curaçao," *Journal of Geography*, December, 1934, pp. 340–45.

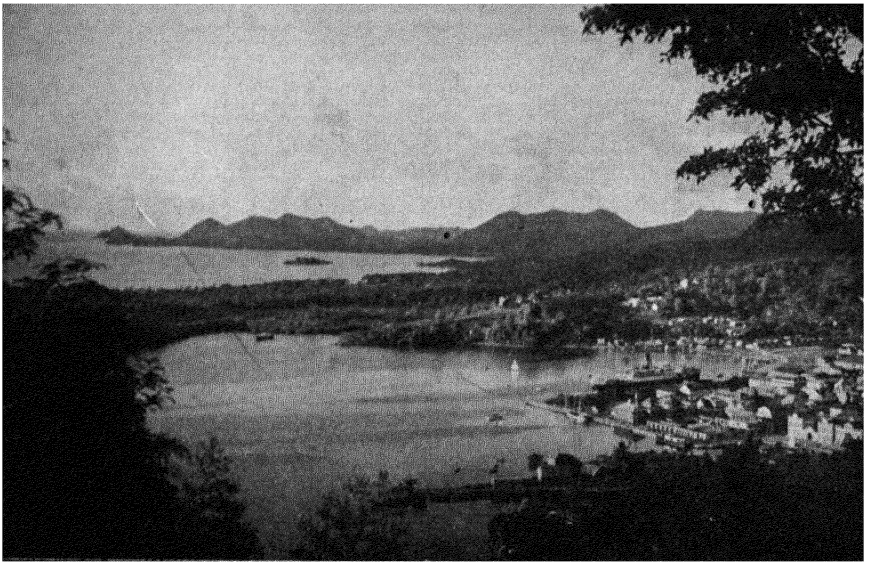


FIG. A. The harbor of Port Castries in the island of St. Lucia — a perfect example of the landlocked harbor. At sunset this is one of the beauty spots of the world — one of many beauty spots to be seen on a West Indian cruise. The harbor at St. Thomas (Charlotte Amalie) resembles this. You would be satisfied with it until you saw Castries. (Photo by J. Russell Smith)

Limitations of space prevent any detailed discussion of these islands, save three parts — the Virgin Islands of the United States, Barbados, and Trinidad — which are of especial interest.

THE VIRGIN ISLANDS OF THE UNITED STATES

The Virgin Islands command the chief gateway to the Caribbean and the Panama Canal. Hence they are a kind of Gibraltar, a kind of Singapore, a point of strategy coveted by the imperial mind as it contemplates Middle America.

In 1865, the United States negotiated a treaty providing for the payment of $7,500,000 for these islands. We were just out of the Civil War, during which period both Spain and France had made much headway in nullifying the Monroe Doctrine by establishing their military power in Mexico, the Dominican Republic, and Chile. Denmark ratified the treaty, but our Senate did not. In 1902, after we had taken Puerto Rico and while we were planning to begin the Panama Canal, we offered Denmark $5,000,000 but this time Denmark refused to ratify, owing, it is said, to German influence in the Danish parliament.[49] Prices had risen by 1917, when we paid $25,000,000, because we were afraid that Germany would buy the islands. It was a very high price to pay for a "bay-rum factory," some critics said, but it was not a

[49] See *Geographical Review*, November, 1917.

transaction in the economic sphere. It was partly a disinfecting process — getting rid of European bases or possible bases in the middle of America, and especially beside a much-used ship passage.

On the islands, much was expected to result from the American occupation, but, on the contrary, little but disappointment has followed. For years there was little economic rehabilitation. The government was left in the hands of the United States Navy Department, and the natives complained that it was undemocratic. One man acted at the same time in the varied and conflicting roles of attorney for the government, magistrate, chief of police, and member of the Board of Paroles and Pardons. Perhaps the terrors of this combination of powers are somewhat shown by the fact that the jail at the capital was so comfortable that it was sometimes necessary to drive prisoners away to get rid of them when their term was out. The food was better than at home.

Political reform was finally achieved in 1936, when President Roosevelt signed an act of Congress providing civil government for the Virgin Islands.[50] A Municipal Council of St. Thomas and St. John of 7 members, and a Municipal Council of St. Croix of 9 members, are now elected by the people. These councils pass laws for their respective jurisdictions, and in joint session once a year they comprise a colonial legislature, which enacts legislation applicable to the Virgin Islands as a whole. The Governor of the Virgin Islands has limited veto powers; he is appointed by the President of the United States and is directly responsible to the Secretary of the Interior. The judicial power is vested in the Circuit Court and in minor courts.

In St. Thomas, a town of 7000 on a beautiful harbor, one hears much of the golden age of shipping that has passed. This golden age had two epochs. The first epoch was in the days of the large sailing vessels, which unloaded many cargoes of goods a year at St. Thomas. The goods were distributed by small sailing vessels throughout the West Indies. This made much stevedoring and other business, which died down when steamships began to carry freight direct to many islands.

The second golden age was the bunker business. Being in the pathway of commerce, the islands furnished bunker coal to dozens of steamers each month. While this lasted, there was prosperity because of the pay roll for long lines of men and women carrying baskets of coal from dock to ship. But the oil-burner and the rerouting of steamships have almost ended this business, and the new government brought nothing in its place, so the native sighs for the good old days, and observers wonder how he lives until he learns of the relief and other payments of Uncle Sam. He tills the ground but little, and indeed his island of hills and droughts is not encouraging to tillage. The hills of St. Thomas are almost as bare as Arizona; drinking-water is scarce, and the gardener often grows his lettuce in tin cans to make the watering more effective.

[50] Congress conferred citizenship on the Virgin Islanders in 1927, and soon thereafter a civil governor replaced the naval-officer governor. The islanders do not vote in American national elections.

The 765 people on the Island of St. John derive their chief income from the distillation of the essential oil in the leaf of the bay tree. The leaves are crushed and soaked in distilled water. The bay oil is taken to St. Thomas, where it is manufactured into bay rum; a gallon of this oil turns 100 gallons of common rum into bay rum, 52,300 gallons of which were exported in 1937.

The Virgin Islands Negroes speak English because so many of them came from British islands. They are a very religious and much bechurched people. St. Croix alone has the old Danish state church, Lutheran; Roman Catholic; a very high Anglican church with confessional robes and incense, called "apist" by the Catholics; Seventh Day Adventists; "Christian Mission" (faith healer); Salvation Army; and much free and unorganized exhortation on the public square. With these gullible people any eloquent native returning from abroad can start almost anything he pleases. To these people the church seems to be matinee, concert, movie, radio, and baseball combined.

It is a real problem to know what can be done economically with the Virgin Islands. The population of these 133 square miles was 43,000 in 1835, 26,000 in 1917, and 22,000 in 1930. Two-thirds of the people live in cities. St. Croix, the largest and most fertile of the islands, produces about 7000 tons of sugar annually.[51] The rainfall is not quite sufficient for good cane crops, the time when rain may fall is uncertain, and there is no water for irrigation. Added to the calamities of nature is the fickleness of the sugar price. The production and sale of bay rum has obvious limitations. Some tomatoes have been shipped to New York, but too many places can grow tomatoes. The manufacture of rum was once a leading industry; we killed it with our Prohibition Amendment in 1920, and revived it in 1933 with the repeal of Prohibition. In 1937 the leading export was rum, worth $330,000. The Virgin Islanders cannot turn to minerals, forests, water power, or a reserve of good land that they do not have. Hence many people have emigrated, and much public relief has been necessary. President Hoover hurt the feelings of the islanders dreadfully by stating dreadful truth when he remarked, while visiting the island, that we had bought "a poorhouse."

The United States Government operates a hotel at St. Thomas in an attempt to stimulate the tourist industry, but not many tourists show up as customers. The Government has started a homesteading program by purchasing some of the sugar estates and dividing them up into 7-acre farms. A return to *conuco* farming with only a few items to be sold for cash may be the ultimate solution. There is much to be said for the security of thatch and patch. Other ways of bringing some measure of economic security to the Virgin Islanders may be worked out. We of the United States should feel the responsibility of doing so.

[51] In 1923, there were about equal numbers of men and women in the fields, getting 40 and 30 cents a day respectively, plus a house and a patch of ground, which they rarely cultivated. On government works favored men were getting 60 cents a day, but the naval officers in charge said the *cost* was as great as in the United States. These wages were then and are now high for the West Indies. The men looked big and strong, but when it came to lifting heavy things, they were much weaker than Americans. A newly arrived officer usually began with feverish efforts trying to make his gang hustle, but they wouldn't hustle, and in about two days the officer was tuckered out, and things went on as they had before he came — slowly.

BARBADOS, AN EXAMPLE OF FULL POPULATION



FIG. A. An old-fashioned mill for crushing sugar cane by trade-wind power in Barbados. A few are still in use. The stone towers, now unused, are to be seen standing in green pastures in many of the Lesser Antilles. (Courtesy Otis P. Starkey)

The island of Barbados has an interest far beyond that of its area — 166 square miles — or its population — 174,000, mostly black. Its great interest lies in the fact that so many people live on that little bit of land, furnishing an example of two things rarely met — a permanent agriculture and a fully populated land. Barbados should be of especial interest to persons who have swallowed Professor East's statement that the rapid increase of tropical population will shut off tropical food export because the tropical denizen will eat it all.[52] There is no sign of this in Barbados, Mr. East's best but neglected example of full population. Although it is true that the policy of the island is not made on any democratic basis, the facts of population surpass anything of like nature in the Western world:

POPULATION OF BARBADOS

Year	*Population*	*Density per sq. mi.*
1861	152,275	917
1871	161,594	973
1881	171,152	1030
1891	182,306	1096
1901	No census	taken
1911	171,983	1034
1921	156,512	940
1931	173,674	1046

The island seems to have reached its population saturation point. The white man, being able to pay the fare, has fled until his proportion is said to be 6 per cent, but that figure doubtless includes many who are not of pure

[52] Edward M. East, *Mankind at the Crossroads*, Charles Scribner's Sons, 1923.

Caucasian blood. The tropical development that has followed the conquest of yellow fever has created jobs for many Barbadians in Panama, the Central American banana plantations, and the Cuban sugar fields. Many, also, have found work in the United States, and many of these have had to return since 1929.

The heavy population has a small element of support in the increasing foreign travel, in the business of coaling ships, in the handling of an entrepôt trade that is half as great as the domestic trade. Another factor that should not be overlooked is the high degree of arability and the high fertility of Barbadian land. Out of a total area of 106,470 acres, about 34,000 are devoted to large-scale sugar production. Of the remaining 72,000, about 10,000 are in pasture, about 3000 are bare rock and sand dune, and the rest are devoted to food production — 18,000 holdings having less that 10 acres each. A 200-acre sugar estate is considered large, and most of the work is done by the owners of the small plots, often not over a half-acre in extent.

A factor that should be emphasized is the paucity of manufacture. Less than one-tenth of the people live in towns, and cottages are scattered over the countryside so thickly that it is hard to say where villages end.

According to one geological theory, the island itself has been pushed up from the sea by a series of geologic lifts and rests. During each rest a coral reef was built. After the next upheaval the coral reef became a ring of limestone cliffs supporting a great terrace. The island is now a series of terraces held in by the limestone cliffs, reaching up to an elevation of 1100 feet.

The surface is nearly level. Most of the island rests on porous coral limestone. Over most of the surface there is no erosion, a point of great importance, and the water finds its way to the sea through openings in the limestone and underground streams. These streams are tapped by wells with pumps that send water through an island-wide system of pipes that deliver water to every roadside hamlet. This has made a marked improvement in public health. These facts of drainage and good water, combined with the clean trade-wind breeze, make Barbados a health resort for the Caribbean and for the Brazilian coast. They also help to explain the early development of the island. More than a hundred years ago it was famed for its dense population. George Washington marveled at it in 1752 and described well their system of saving all cane refuse for its fertility value.

The level surface, the absence of erosion, and the fertility of limestone soil, plus careful fertilizing, have kept up the productivity of the soil to a high degree. This affords a great contrast to the wasteful exploitation still going on in all the Greater Antilles. One travels over Barbados on good roads, past neat cottages through a waving sea of sugar cane, enlivened by glimpses of the ocean. And when one has gone, one wants to return.

Nearly every plantation laborer has his patch of land planted to ground provisions: yams, cassava, bananas, plantain, breadfruit, beans, onions, and squashes. The trade-wind climate lets him grow food the year round unless there is an unusual drought, which causes crop failure and increases theft and the death rate. With the money earned in the cane field or the sugar

mill, the Barbadian buys fish, a little meat, flour if he can afford it, and clothing, chiefly cottons. Many others, poorer people, eat little but what they grow. This one-crop commercial agriculture produces a per capita foreign trade of about $110 per year, greater than that of the United States. This trade is made up on the export end of sugar, molasses, and rum. A scientific and very skillful Department of Science and Agriculture (largely English-operated) has made many experiments in an attempt to escape from the one-crop sugar economy.[53] Exports of bananas, melons, cassava, sea-island cotton, and ground provisions (yams, sweet potatoes, and other root crops) have been tried, but only the cotton and the ground provisions have found a market large enough to justify the change from sugar. Even these crops are insignificant in comparison with the universal cane, and the work done on alternative crops by the experiment station has produced small returns compared to its successes with sugar cane. Since 1880, largely due to the work of the Department of Science and Agriculture, the production of sugar has doubled without any increase in the sugar acreage. Sugar still is supreme on the limestone battlements of Barbados, where with every cane-planting the Negro's spade, digging in the cane trash and manure strewn over the surface, often turns over the whole soil mass, which may be only 16 inches deep.

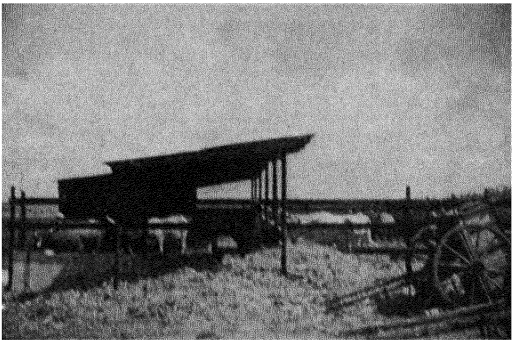


FIG. A. In this shed the Barbadian sugar planter is continuing a practice that George Washington described upon his visit to that island in the 1750's. The cattle are kept most of the time in the shed, fed on the leaves of sugar cane; the manure is carefully saved to be returned to the fields ("headed out"). (Photo by J. Russell Smith)

A rich field of investigation awaits the sociologist who will compare the Haitian Negro with his Barbadian brother, who considers himself the aristocrat of the West Indies. He boasts of the fact that Barbados has never been anything but a British possession, and he is proud of its nickname "Little England." He is proud of his small but neat home and of the crowded garden around it. Like the white planter, he grows some cane. Two-thirds of his children between the ages of five and fifteen are in school.

The Barbadian Negro is not contented with his lot, but he is contented with Barbados. His wage may be but a shilling or two a day (and he does not work every day), but he is satisfied, most of the time at least, that the wage is all the planter can afford. He shares the hardships of the planter, but has not shared the prosperity of the boom periods when, as from 1915 to

[53] The way of science in agriculture is not always smooth. The English imported the mongoose (see "Rikki-tikki-tavi" in *The Jungle Book* by Kipling) to eat snakes. He also ate lizards. The lizards therefore ceased to eat froghoppers, and the froghoppers increased greatly and made a pest of themselves by eating sugar cane.

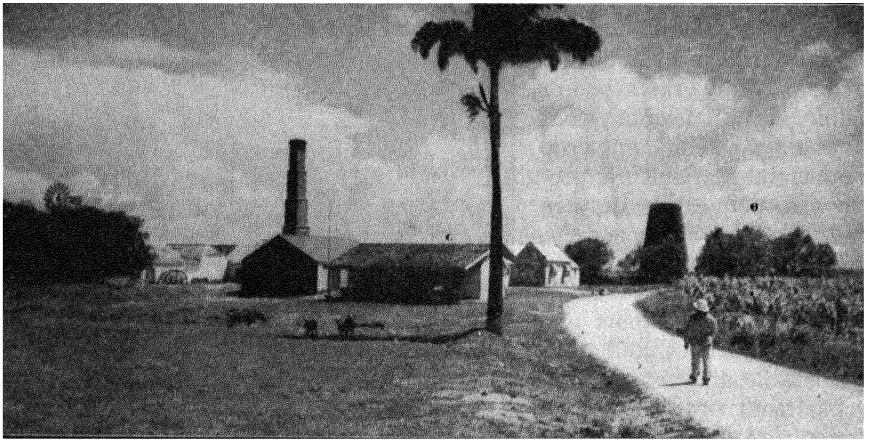


FIG. A. A sugar plantation in Barbados. The ruin of an old windmill, right. An abandoned steam mill that succeeded it and has in turn been succeeded by a more modern "central" some miles away. In the center is a royal palm. The space between the small shoots at the left and the cluster of leaves is the part which unfolds and becomes the roof material. (Photo by J. Russell Smith)

1919, the cost of living rose much faster than wages. Like his Jamaican brother, he emigrates to any place around the Caribbean where work is offered. When he returns, he brings back savings to buy a plot of land in Barbados -- often a part of a bankrupt estate — at an exorbitant price. The laborer who stays at home suffers from malnutrition; in fact, a Barbadian official committee stated that "many of the working people live on the verge of extreme poverty and semi-starvation."[54]

Dr. Otis P. Starkey, in his recent book *The Economic Geography of Barbados*,[55] makes the point that the droughts, pests, hurricanes, and other calamities have repeatedly disturbed the contentment of the planters and forced them to initiate progressive measures. The rapid improvement in methods of sugar production may be largely the result of the stimulus of Barbadian calamities.

TRINIDAD

Trinidad, whose fertile central plain is flanked by a mountain range to the north and by rolling or hilly land to the south, is more than ten times as large as Barbados, but has only slightly more than twice the population of Barbados. The climate is not so wholesome as that of Barbados, and the soil is not so marvelously tillable, but there is much good land. With an English government to protect and carry on scientific work, and English capital available for development, the agriculture of the island may be expected to develop if demand increases. At present sugar, cacao, copra, grapefruit, and coffee are the chief agricultural exports. The high price of tonka beans,

[54] *Barbados Official Gazette*, Oct. 7, 1937.
[55] Columbia University Press, 1939.

the seed of a tree, used in flavoring cigarettes, has started a boom in tonka-bean plantations. But that also will probably soon be overdone. It is a practice here to plant coconut palms in the cane fields and keep on growing cane for five years. Much of the Trinidadian agriculture is as completely hand agriculture as is that of the Negro clearings in the African forest. The Imperial College of Tropic Agriculture in Trinidad is famous throughout the world.



FIG. A. One of the most difficult tasks of the photographer is to get a picture of cacao-growing that shows very much. It is difficult to photograph a densely shaded thicket except from the outside. This cacao plantation in the shelter of the mountains of Trinidad has young cacao trees, of which we see one to the left of the boy with the hoe. They are overshadowed by a planting of bananas and cassava which will produce for a few seasons before the cacao tree is big enough to take possession of most of the soil. When they are full-grown, the cacao trees will be in turn shaded by a tall leguminous tree. Even on plantations of scientific English owners the hoe and the machete are often the only tools used in this productive and controlled jungle. (Photo by J. Russell Smith)

The asphalt lake of Trinidad, first described by Sir Walter Raleigh in 1595, is well known, and at one time asphalt was the chief export of the island. In 1936, 70,000 tons of asphalt, worth $960,000, were exported, but the value of this commodity was less than one-sixth of the value of sugar exports and less than one-third of the value of cacao.

The most exciting thing that has happened in Trinidad in recent years was the discovery of oil, and Trinidad is now the leading producer of petroleum within the British Empire. In 1936, 16 companies were operating in Trinidad, with a total output of over 13,000,000 barrels. Two large refineries use the local supply as well as oil from Venezuela. So, for the time being, Trinidad is oil-rich, and in 1936 its leading exports were fuel oil and gasoline, worth $7,900,000 and $7,100,000 respectively. This oil field is an example that the whole world might emulate. The oil belongs to the Government and therefore there are no dissipated quick-rich oil-land owners and no more wells than are needed to get the oil.

The contrast between this field and an American oil field is a humiliating contrast for the American. No gas wells wastefully flaring up to heaven, no burning streams, no overproduction, no injury of the field by premature loss of pressure. The wells were so few that I rode through the field without knowing it. And the taxes! Such a painless source!

If Trinidad is not a melting-pot, it certainly shows the signs of many people and cultures. It has a Portuguese Club, an Anglican cathedral, a Roman Catholic cathedral, a Christian Science church, Hindu temples, and Mohammedan mosques (Moslems from India) — the man in charge of one of them spoke his native Urdu, although English is the common language



FIG. A. This clearing is now about 8 ft. high with a jungle growth of cassava and bananas, which are the quick cash crops in a plantation of tonka-bean trees. Tonka bean is the 1940 agricultural boom crop in parts of the West Indies — used to flavor cigarettes. Hoe and machete culture prevail here, as with cacao. (Photo by J. Russell Smith)

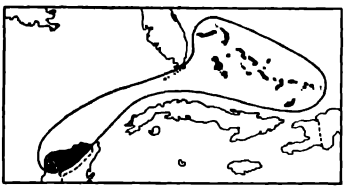
of the island. The place names on the map make the island seem to be a kind of historical museum.

1. San Juan, Manzanilla, Valencia, Rio Clara
2. Pointe-à-Pierre, Tête Bœuf, Grande Rivière, Sans Souci
3. Four Roads, Green Hill, Flanagin Town, Kelly Junction, Brechin Castle, Hardbargain — representing every British element
4. Calcutta Settlement, Chandernagore Settlement, Delhi, Coromandel, Hindustan
5. Fifth Company, Sixth Company, California — the last the oil-loading wharf of an American oil company

The white population is English, French, Spanish, and Portuguese, chiefly landowners, managers, and townspeople. Some stores still have signs in Spanish. I saw little Negro boys in white duck playing cricket under the coconut palms.

One-third of the population is East Indian, brought over to work the plantations. Aside from this, the population is made up much like that of Barbados. I regret that life has no such importance in store for many of us as that which seems to have descended upon the large and handsome Negroes, towers of self-esteem, who stand in the streets of Port-of-Spain (the capital) and tell the populace where to walk and how. These officers of the law are clad in spotless white and sometimes adorned with much gold lace. There is one white man on this police force — the chief — but he does not look particularly important.

Chapter 43. YUCATAN AND THE BAHAMAS — SUBHUMID TROPIC AND SUBTROPIC LIMESTONE PLAINS



A SHORT time ago, as the geologist counts time, the northwestern part of Yucatán, the Florida Keys, and the Bahama Islands were coral reefs slightly below sea level. Then the reefs were raised a few feet, or at most a few score feet, and became limestone plains. This slight elevation cannot cause a heavy rainfall from the moisture-bearing trade wind. The annual rainfall is about 30 or 40 inches, which sounds like Illinois or Iowa, yet the plains of Yucatán cannot grow a decent crop of corn, and a thirsty crop like sugar cane is usually out of the question. Instead, one finds the prickly henequen, a member of the agave family, a species of the same genus as the African sisal. Actually, the plains of Yucatán are almost semiarid. What is the answer to this climatic conundrum?

A number of factors combine to make the rainfall ineffective. The plains of Yucatán have a long dry season — more than three-fourths of the annual rainfall comes within five months, from June to October, inclusive. Under the intense heat of the tropic sun, evaporation is rapid, and hence much of the moisture escapes from the topsoil into the air. Furthermore, the soil is so thin, stony, and coarse that it fails to function as an earth sponge, the water sinking rapidly into the ground. Finally, it may be noted that the percolating water has developed numerous channels in the underlying limestone rock, and the water flows to the sea through these subterranean channels instead of on the surface as it does in most areas. In general, this is an area of Karst topography, with numerous limestone sinkholes dotting the landscape at points where the roofs of underground channels have fallen in. The water table is therefore low, and ground water has small effect as a support for vegetation.

Hence, in this ill-watered limestone plain the Maya Indian of Yucatán scratches around among the stones with hand tools and plants a hill of corn here and there in a hatful of soil, and there is just enough rain to enable him to get enough of a crop to keep soul and body together for a time. This sounds like slim pickings, and so it is. But mark! Even this appears to have proved better for man than the riotous forest that crowds the swampy Gulf and Caribbean coasts on both sides of this limestone plain. On three sides of this area the rainfall increases, the forest increases, and man decreases. This point is strikingly shown by completely uninhabited forest areas of



FIG. A. One of the ruins in the forests of Yucatán from a drawing made by an English traveler more than a hundred years ago. (Courtesy Carnegie Institution of Washington)

Quintana Roo, into which one may walk from Yucatán unimpeded by anything save jungle. There are but few mosquitoes on the plain of Yucatán, where nature produces savannas, scrub, and scanty forest, with no streams. Therefore many centuries ago, man and not the mosquito became the dominant animal. If the forest advanced or retreated with a fluctuating rainfall, man could always pick the zone that best suited his corn crop, for the flat peninsula is a transition area with rainfall grading from heavy on the west to light on the east. The gradation of vegetation from scrub to rain forest is complete. For centuries the plain has (for its resources) been peopled, heavily peopled, by the men (and their descendants) who reared the Maya civilization — a civilization which the more astounds us the more we learn of it.[1]

These people and their neighbors in Guatemala had palaces, temples, statuary, and large cities. They had an alphabet — one of the great mental achievements — and a calendar as good as ours or better. They had an astronomical society when there was none in England or Germany. The chapters of their wonders are far from complete, but they already fill volumes and create one of the interesting puzzles of history.[2]

[1] See Ellsworth Huntington, *Civilization and Climate.*

[2] See Ellsworth Huntington, "Guatemala and the Highest Native Civilization," *Proceedings of the American Philosophical Society,* Vol. 52, No. 211, 1913. For a fuller account see Sylvanus A. Morley, *The Inscriptions at Copan,* Carnegie Institution, 1920; Thomas Gann, *The History of the Maya,* Charles Scribner's Sons, 1931; John E. Thompson, *The Civilization of the Mayas, Anthropology Leaflet* 25, Field Museum of Natural History, Chicago, 1932; Theodore A. Willard, *The Lost Empires of the Itzaes and Mayas,* Arthur H. Clark Co., Glendale, California, 1933; and James Leslie Mitchell, *The Conquest of the Maya,* E. P. Dutton & Co., 1935.

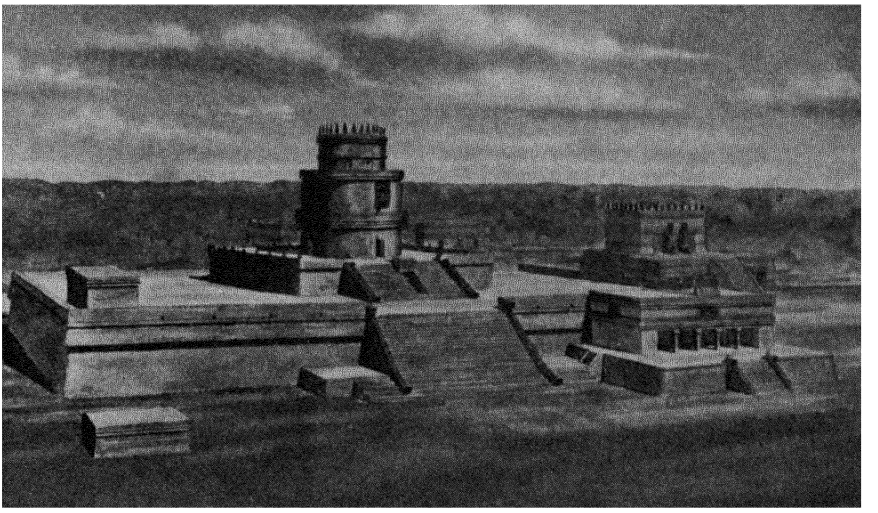


FIG. 875 A. After excavation and careful study Mr. John S. Boles, architect on the archaeological staff of the Carnegie Institution, made this drawing, which is probably a close representation of the Caracol (shown in the preceding picture) and its ancillary buildings as they appeared when this group of structures was at its perfection. (Courtesy Carnegie Institution of Washington)

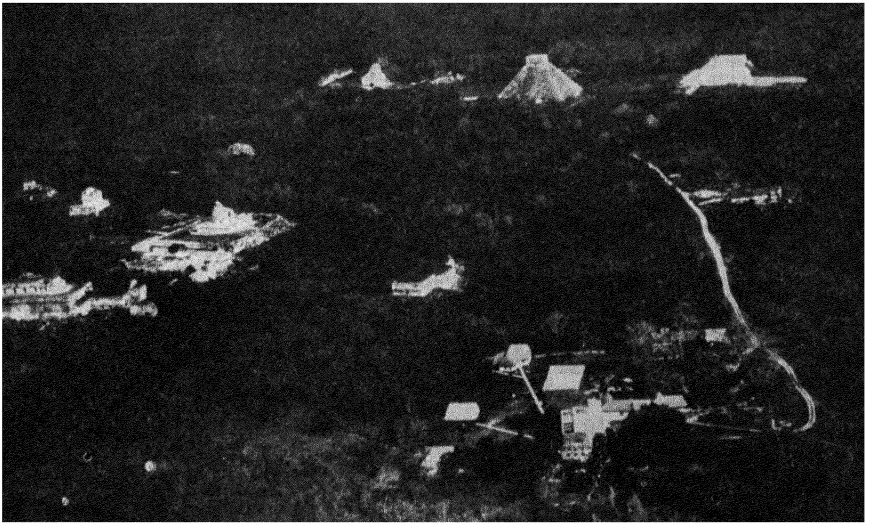


FIG. 875 B. Some of the hundreds of ruined structures that remain from the Maya civilization of Yucatán. At the left is the building shown in the two preceding pictures. (Courtesy Carnegie Institution of Washington)



FIG. A. A field of henequen plants from which the Yucatán of today gets the sisal fiber that is its chief basis of import purchase. (Courtesy Nat'l R.R. of Mexico)

HENEQUEN

The limestone areas of Yucatán turned from sustenance farming, chiefly corn, to capitalistic commercial production as the result of an American invention. The self-binding reaper caused a new demand for cheap twine about 1880. This article of commerce was obtained from the long, tough fiber in the thick, heavy leaves of the henequen plant, which grows wild over nearly all parts of this dry limestone plain. In a few decades Yucatán has become the commercial slave of henequen, just as Barbados is of sugar or Mississippi once was of cotton. Henequen fiber, called sisal, is not as good as manila hemp, but it is good enough for binder twine. Furthermore, sisal is cheaper.

This one product makes up from 95 per cent to 98 per cent of the export of Yucatán. During the World War, when there were no ships to bring the rival hemp from Manila, the henequen-dealers and the state government formed a trust and reaped a golden harvest by getting more than war profits. The state and federal governments participated by taking heavy export taxes, over 4 cents American gold per pound. The postwar slump was shown by exports of 1,192,000 bales in 1916, a war year, followed by 930,000 bales in 1920, 560,000 bales in 1921, 460,000 bales in 1922.[3] The export remained close to that figure from 1930 to 1936, inclusive. This means that henequen fields were abandoned, and the people who had come to depend on wages were no longer able to buy at the store and found themselves hungry and in want. The depression caused the people of Yucatán to start a vigorous policy of henequen utilization, and in a little while they were making nearly a hundred articles, including hats, neckties, belts, slippers, and baskets.

[3] Part of this was due to curtailment of production by the trust to enable the demand to catch up with the supply.



FIG. A. Sisal fiber drying in the sun of Yucatán. (Courtesy Nat'l R.R. of Mexico)

Henequen-growing on a commercial scale is a capitalistic enterprise. There is a wait of six or seven years before the first leaves can be cut. That wait requires capitalistic psychology. The young plants are expensive. Suckers are set out from 4 by 11 feet apart in handmade holes in the unplowed and usually unplowable rocky soil. This is the task of the Maya laborer of the henequen plantation. His machete keeps down the rival vegetation until the plants are grown. After this they yield from 10 to 15 leaves every six months for from ten to twenty years. If the rains are heavier than usual, the leaves mature more slowly, and the planter may get only three harvests, instead of four, in two years' time. Tramways are needed to carry the thick and heavy leaves to the engine-driven machines that tear out the 3 per cent (by weight) of fiber. This equipment calls for heavy expenditure of cash and capital. In its capital and organization, even down to the plantation tramway, the henequen industry bears more resemblance to sugar than to coffee.

In this streamless region the inhabitants are dependent upon the sinkholes and upon wells for their water supply. Some years ago the United States consul at Progreso imported a steel windmill from the United States and set it up at the consulate. Today Mérida, the capital (pop. 95,000), is said to have more windmills than all of Holland, and on each of the 400 or more plantations the windmill is a vital necessity. In 1936, in an effort to break up the peonage system, the State of Yucatán declared the henequen industry to be a "public utility," and the large corporate-owned plantations have been forced to sell part of their land to the government for redistribution among the landless peons, and also to rent their expensive machinery for cleaning fiber to the small, independent producers. Although the henequen acreage declined from about 318,000 acres in 1921–25 to about 211,000 acres in 1935, Yucatán finds that this cash crop is well suited to its environment, and this region still provides the world with about half of its supply of henequen.[4]

[4] See Alice Foster, "Sisal Production in the Semi-Arid Karst Country of Yucatan," *Journal of Geography*, January, 1930, pp. 16–25.

SUGAR AND CEREALS

The two sugar mills of Yucatán supply only one-third of the local demand, and while most of the corn needed for bread is home-grown, there is normally a cereal import.

THE FLORIDA KEYS AND THE BAHAMAS

The Florida Keys and the Bahamas, in about the same latitude as Yucatán, bathed by the same warm ocean currents, built of the same corals, differ from Yucatán in having a thinner soil covering and an Anglo-Saxon government. Their chief export arises from the labor of sponge divers, who go out in open boats, dive, and tear sponges from the still submerged coral reefs in the shallows that surround these islands.

It is probable that during the United States Prohibition era the chief export of the Bahamas was bootleg liquor, largely of European manufacture, smuggled across to near-by Florida. Between 1914 and 1921 the Bahamas' imports jumped from £376,000 to £1,096,000, but the official exports only increased from £223,000 to £378,000. What became of the difference is perhaps covered by the following joke from a Florida newspaper: "Temperance Speaker: 'I'd move heaven and earth to enforce the prohibition law.' Voice from Audience: 'Try something simpler. Move the Bahamas.'"

In recent years the value of Bahaman imports has been about seven times the value of exports. Therefore the total value of sponges,[5] tomatoes, sisal, lumber, and other exports does not begin to pay for the merchandise imports. Every year many American tourists stop at Nassau, and it is money earned from the tourist trade that enables the people of the Bahamas to pay for their imports. In spite of our tariff, the United States continues to remain the chief market for Bahaman exports.

The Bahaman population is mostly Negro, it is reported as very ignorant, and its birth rate is 32 per thousand. The Bahamas contain the islands first discovered by Columbus, and after all this time their population of 65,000 bespeaks the poverty of their 4404 square miles of rocky land. The islands have a warm and even climate, but there is no hope of irrigation, or any important soil or mineral resource. Except for their tourist trade, the Bahama Islands are not a land of promise.

THE SALT INDUSTRY

Turks Islands and Caicos, to the southeast of the Bahamas, are even more inhospitable. The rainfall is only 22 inches at Cockburn Harbor, and irregular at that. On this treeless and forsaken waste, the people say that when they want to get into the shade they put on a bigger hat, and this is not a mere figure of speech. Their chief income is from the sale of salt obtained by the

[5] See George S. Corfield, "Sponge Industry of the Caribbean Area," *Economic Geography*, April, 1938, pp. 201–06. In 1939 some mysterious disease was slaughtering Bahama sponges. The outcome cannot yet be told, but certainly it is a calamity to such a poor people.

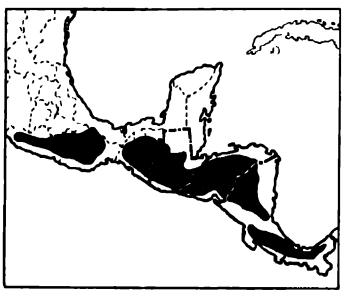
evaporation of sea water, which can be made to yield 5000 bushels of salt per acre of salt pans (drying-vats) per year, if the season is not too rainy. In some places the water can be caught at high tide. In other places it must be pumped into the pans. For this service the trade wind and a homemade windmill often suffice. The first concentration kills the vegetable matter, which is precipitated and thrown away. Further concentration causes the precipitation of carbonate of lime, which is also thrown away. Another concentration removes sulphate of lime. The water is then pumped or run into the salt pans. These are filled several times, until a fine thick crust of salt has settled. Then the remaining liquor is returned to the sea before its other contents are precipitated and the salt thereby spoiled. The chief exports are about $70,000 worth of salt and $12,000 worth of sponges. It is not surprising that the Turks Islander leaves his reef of sand and limestone, where everything (even sometimes water) must be bought. These people go to widely scattered places.

KEY WEST

Key West (pop. 13,000) is an interesting exotic. The whim of a Standard Oil multimillionaire gave it a railroad built for many miles on concrete arches over the shallow coral sea. No hope of profits lay behind this enterprise, which made Key West, the one frostless city of the United States, a railroad terminus for car ferries to Cuba. The whim of legislation, which put a high tariff on cigars, caused Cuban cigarmakers to move to Key West (and also to Tampa) by hundreds. Between Greek sponge divers and Spanish-speaking cigarmakers, Key West seemed like a foreign town. But, alas! the railroad has been pulled up because of hurricanes, the remaining causeway has been converted into a highway, the cigar business has moved away because of strikes, many of the citizens are on relief, and the town is almost in bankruptcy. Between 1920 and 1930 the population declined from 19,000 to 13,000. Key Westers hope to build up a tourist trade, but it can probably be said that here is a town that is "*non compos economicus.*"

Chapter 44. THE UPLANDS OF CENTRAL AMERICA AND OF CHIAPAS, OAXACA, AND GUERRERO IN MEXICO

RESEMBLANCE TO THE WEST INDIES



CENTRAL AMERICA and Lower Mexico, the lands between the plateau on which Mexico City stands and the mainland of South America, are trade-wind lands — a long mainland rather than a string of islands, as in the West Indies. Their climate comprises the same elements and factors — easterly winds bearing moisture and rain to easterly slopes; wet, forested eastern plains, made wetter by flooding rivers fed by heavy rain on the eastern mountains; dry places on the western sides of mountain ranges and behind the mountains; southwestern coasts that are dry like the southern coasts of Hispaniola and Puerto Rico; interior uplands like those of Puerto Rico and Jamaica, differing only in being higher and wider and blessed with richer soil, the recent gift of volcanoes.

The highland backbone divides the 1000 miles of land between the Isthmus of Tehuantepec and the Isthmus of Panama into three regions: the wet, forested, and unhealthy east coast, where there are few people; the less wet but also unhealthy west coast, where there are also few people; and the volcanic uplands in the interior, where most of the people live.[1] Few places in the world offer less excuse for the economic discussion of political units as such. Better understanding comes by considering human-use regions.

THE SURFACE OF THE HIGHLANDS

The upland region is one of nature's late works. Most of its surface is composed of material that has been poured out and blown out of many volcanoes. Guatemala alone has 30, of which 2 are still active. The slopes descending

[1] "It seems a curious reversal of what we are wont to call normal conditions, when one sees rich, fertile plains along the coast almost uninhabited, then finds the population fairly dense on steeply sloping, stony mountain-sides at altitudes of three to five thousand feet, and finally on the hilly plateau at 8000 feet see little thatched houses clustering thickly everywhere, and every available bit of land almost as carefully and industriously cultivated as in China." — Ellsworth Huntington, "Guatemala and the Highest Native American Civilization," *Proceedings of the American Philosophical Society*, September–October, 1913.

from this choice upland are often the precipitous walls of labyrinthine valleys or gorges. This upland interior has been not only volcanic in its formation, but also volcanic in its history.

A TROUBLED HISTORY

Central America has been a storm center of history. In its present state of organization it includes seven political divisions, one of them a colony: British Honduras, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama, all except British Honduras masquerading under the name of republic.[2] The very idea of a republic is virtually unknown, except perhaps in Costa Rica.

Since most of the people of Central America live in the upland, it is the upland that has dominated the history of these countries. Central America ended the brutal period of Spanish rule by beginning an equally brutal or even more brutal period. It was really a period of private wars dignified by the names of rebellions and revolutions. The five Latin countries north of Panama were originally five subdivisions of a Spanish province. Shortly after they became independent they were annexed for a year or two to Mexico. Next they tried independence for a few years, and promptly fell to warring among themselves and split into five pieces. Then from time to time they have been combined in twos, threes, fours, and fives, but never for very long at a time. In 1921 a new union of three of the subdivisions into a federation was announced, but it too perished within its first year, another example of the infant mortality of states. The history of these countries is something that has not yet reached our imagination. It is too difficult to believe — witness this passage from the *Encyclopaedia Britannica*, quoting F. Boyle:

> Of its [Nicaragua's] five earliest rulers, "the first had been a murderer; the second a murderer and rebel; the third murdered the second; the fourth was a forger; the fifth a murderer and rebel." Then came the hopeless revolts of the Indians against intolerable oppression.

To continue the quotation:

In 1823 Nicaragua joined the Federal Union of the five Central American states, which was dissolved in 1839. While it lasted Nicaragua was the scene of continual

[2] AREAS AND POPULATION OF CENTRAL AMERICA

Country	*Area in sq. mi.*	*Population*	*Population per sq. mi.*
Panama	32,380	510,000 (1934 est.)	15.8
Costa Rica	23,000	540,000 (1936 est.)	23.5
Nicaragua	49,500	830,000 (1935 est.)	16.8
El Salvador	13,176	1,632,000 (1936 est.)	123.9
Honduras	46,250	962,000 (1935 cen.)	20.8
Guatemala	48,290	2,420,000 (1936 est.)	50.1
British Honduras	8,598	55,000 (1935 est.)	6.4
Total	221,194	6,949,000	

Source: U.S. Dept Commerce, *Foreign Commerce Yearbook, 1937*, 1938, p. 367.

bloodshed, caused partly by its attempts to secede from the confederacy, partly by its wars with Costa Rica for the possession of the disputed territory of Guanacaste, between the great lake and the Gulf of Nicoya, partly also by the bitter rivalries of the Liberal and Conservative parties. During the brief existence of the Federal Union no fewer than 396 persons exercised the supreme power of the republic and the different states.[3]

Nor is all this chaos a matter of the past. In Honduras, politically the worst of all the states, there were thirty-three revolutionary outbreaks between February 1, 1920, and August, 1923. On these occasions, martial law was declared and machine guns swept the streets of the capital. Then the people held an election, but they could not elect anyone because the winner must have a majority. After this came real civil war and a dictator. As a result Honduras early in February found itself without laws, either statutory or constitutional, and with its commerce paralyzed, its industries stopped, its telegraph lines cut, all printing suspended, and life and property endangered. To obtain revenue the dictatorship resorted to the imposition of forced loans on natives and foreigners alike — and in the case of the latter in violation of treaties with foreign countries.

While much can be said against the United States policy of armed intervention in former years, certainly the provocation was great. Because of the Monroe Doctrine, no European power dared to intervene when the lives and property of foreigners were at stake. Hence it was up to Uncle Sam to play the role of self-appointed policeman, to step in and establish law and order whenever conditions became intolerable. Thus, "The marines have landed and have the situation well in hand!" came to be a common byword in times of trouble and stress.

Today we have the Good Neighbor policy, and the United States Marines have not set foot in Central America since their evacuation of Nicaragua on January 2, 1933. More and more the little republics are settling disputes among themselves by arbitration, sometimes, it is true, as a result of "peaceful persuasion" by the great Colossus of the North. But if history repeats itself, there will be more revolutions in Central America, and at such times the lives and property of foreigners will be endangered. If intervention is necessary in the future to make a bad neighbor act respectable, it is to be hoped that collective action by the American nations will solve the problem. There is no reason why a *community of nations* should have to tolerate a bad neighbor.

PEOPLE AND PRODUCTION

Since Central America has had so much war, it is easy to see why it should have poorly developed transportation and primitive industry, and why, like the uplands of Hispaniola and Puerto Rico, it should depend so largely on the valuable and easily exported coffee. Coffee is far and away the chief export of the uplands; it is here what cotton has been to the southern part of the United States.

Said a native Salvadorean: "We should erect a monument to the Brazilian

[3] *Encyclopaedia Britannica*, 11th ed., Vol. 19, p. 645.

schoolteacher who, in 1840, brought the coffee tree here from his own country. The day he planted that first tree in his garden, he laid the cornerstone of our national prosperity." That statement is certainly true not only of El Salvador but also of the upland areas of Guatemala, Nicaragua, and Costa Rica, where the coffee plant during the last half-century has been the chief source of income.[4] Honduras, however, produces much less coffee than these countries, whereas Panama produces almost none.[5] The area of intensive coffee production in all these countries is near the Pacific. Honduras has but little of this zone. As to Panama, its narrow upland did not attract the early Spanish settlers, and it is still an area of scanty population.

This highland extends from western Panama to the Isthmus of Tehuantepec, with only one short break at Lake Nicaragua. It has the great advantage of tropic uplands — coolness, moderate rain, and few mosquitoes. The soil produced by volcanic dust is very rich and enduring, so that these highlands were populous with natives when discovered by the white man. The conquering Spanish promptly and wisely made their settlements on the cool plateau, where to this day every capital city, save Panama, is located.

The upland region includes parts of many countries, but life is much the same in all. The greatest point of difference is in the racial make-up. In Central America and southern Mexico the Spaniards did not exterminate the Indian, as they did in the West Indies. Over most of the area, the Indian makes up the great bulk of the population. He lives by the primitive agriculture of machete and hoe described in Chapter 40 and in the section dealing with Puerto Rico. The traveler on the plateau trails is quite likely to meet a string of Indians with sacks of coffee on their backs, trudging toward the railroad station. The Indians wear homemade shirts and trousers of the cheapest undyed cotton cloth and homemade hats of palm-leaf fiber. They live in native villages of thatched houses, or frequently in stone houses at high elevations.

The little fields are set almost exclusively to corn, black beans, and squashes. The squash is much prized for making a stew, which is sometimes enlivened by a bit of meat. Around the village there may be trees of mangoes and avocados. The banana does not thrive because of the dry season, which lasts from November till April — the season for harvesting and drying the coffee. As the land is mostly steep and the population often is too dense for roving agriculture, the Indian farmers sometimes ridge the hillsides into little terraces to keep the soil from washing away.

Except for the few plantation-managers, the few white people of the coffee zone live exclusively in the towns. Some of these coffee plantations were started by the simple device of buying from the President a large tract of land, including an Indian village or two. By this process the villagers became the vassals of the white owner. By the laws of the country, the Indian could not run away from his village and the landowner had the right to con-

[4] See Louise Hearst, "Coffee Industry of Central America," *Economic Geography*, January, 1932, pp. 53–66.

[5] Coffee exports in 1936 in millions of pounds: Guatemala, 112.1; El Salvador, 110.4 (1935 data); Costa Rica, 47; Nicaragua, 28.9; Honduras, 3.4; Panama, .03. Panama's small production is located in the province of Chiriquí near the Costa Rican border.

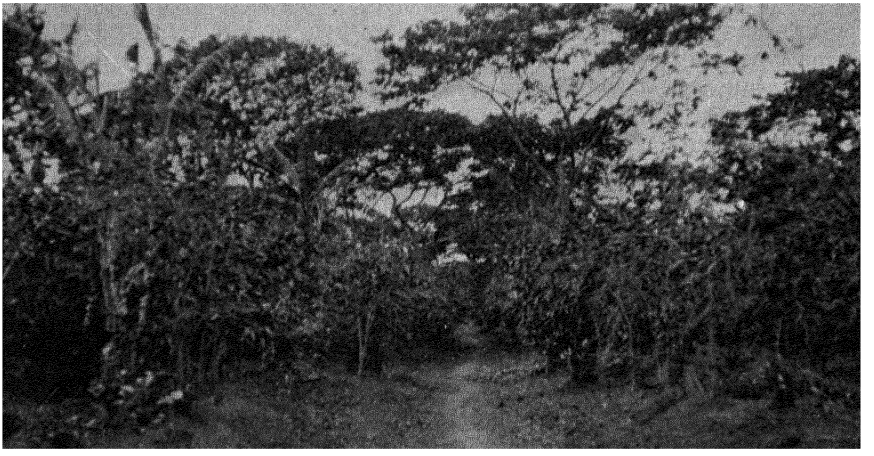


FIG. A. A grove of coffee trees on the central plateau of Costa Rica. Shade is furnished by leguminous trees and by the useful plantain, showing its long leaves at the left. (Courtesy Robert S. Platt)

script, for a certain number of days' work per year, the poor wretch who had inherited this land from ancestors who may have held it for centuries. These are the people who are seen along the roadsides bearing sacks of coffee on their heads. There is a saying that "God made the mule to give the Indian a rest."

Central America traded by way of the Pacific for three hundred years. There were good reasons for this. The Central American plateau is much nearer the Pacific shore than the Caribbean, and travel was so very difficult across the wet eastern plain in the prerailroad days that it was easier to sail around Cape Horn and climb up from a Pacific port. Every country in Central America has a Pacific port, but for three hundred years the journey from the seaport on the plain to the capital on the plateau was most laborious, being accomplished by mule and sometimes by oxcart

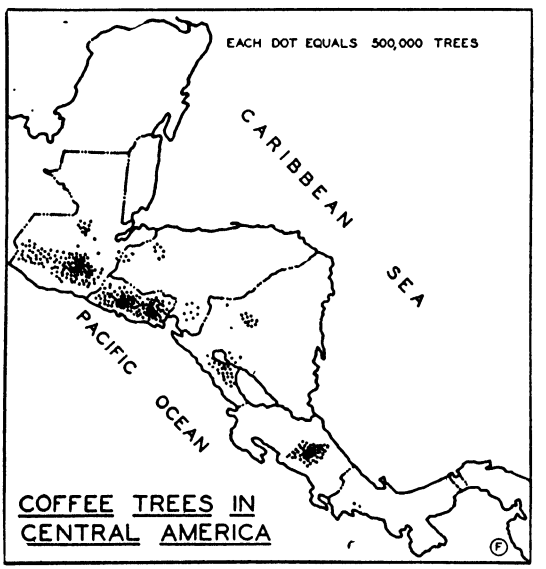


FIG. B. Coffee trees in Central America. Each dot equals 500,000 trees. This map bears an exceedingly close resemblance to the map of the distribution of population. (Courtesy Louise Hearst and *Economic Geography*)



FIG. A. A cart of primeval design used for hauling coffee from plantation to drying yard, central plateau of Costa Rica. (Courtesy Robert S. Platt)

over trails and gutted roads. The first railroads were on the shorter Pacific routes, bringing out the trade of Guatemala, El Salvador, and Nicaragua. Only Costa Rica had its first railroad to the Atlantic. To this day the chief centers of population of Honduras depend upon cart and automobile to connect the capital, Tegucigalpa, with ships at the port of San Lorenzo on the Gulf of Fonseca, a beautiful arm of the Pacific. Nicaragua is still hoping to build a railroad to the Atlantic, and El Salvador has no need of one now that the Panama Canal is in operation. Nicaragua also hopes for a canal, but the prospects are not bright.

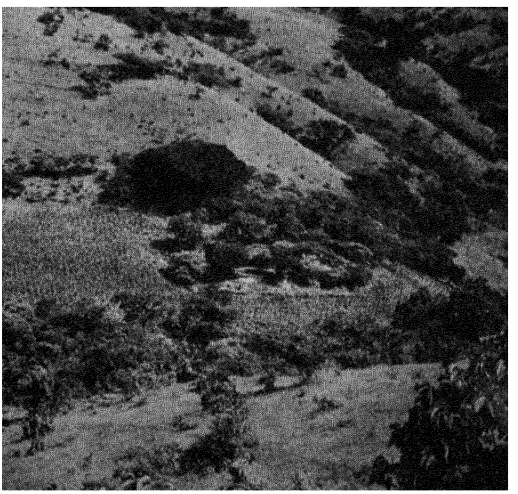


FIG. B. An example of isolated existence in the highlands of southern Mexico. "In every ravine back in the mountains are the huts of the Indians, surrounded by patches of corn and beans and garden truck. A few pigs, many chickens, a cow or two, and some burros complete the domestic economy." (Courtesy Ben F. Lemert)

The coffee plantations are scattered along the plateau from the Mexican State of Chiapas (where there is room for considerable extension of coffee-growing), and through the uplands of Guatemala, El Salvador, and Honduras, and the small upland section of

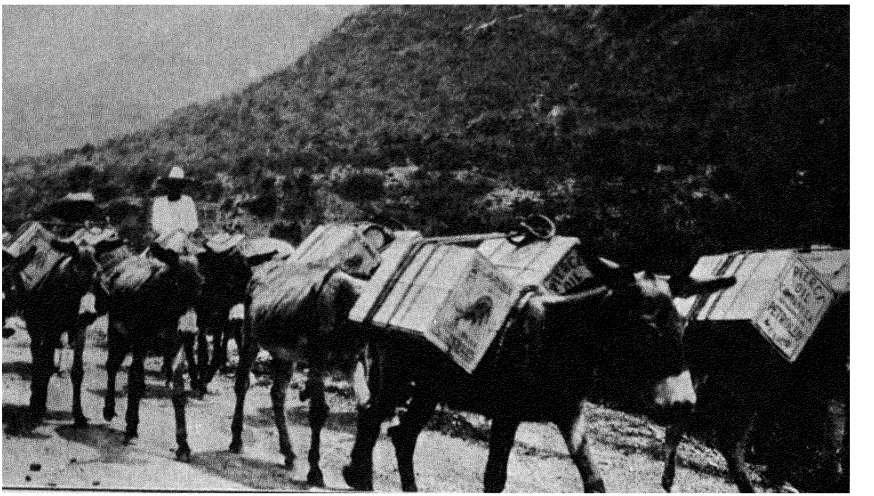


FIG. A. Thus did the Central American Spaniards on the plateau connect with the outside world for more than three centuries. These cargoes of kerosene are new, but the route and the method are old. (Courtesy Institute of Current World Affairs)

Nicaragua between Lake Nicaragua and the Honduran boundary. South of Lake Nicaragua, the Costa Rican plateau has the same dependence upon coffee, which is the chief claim upon the produce of foreign lands.[6]

El Salvador is the smallest and the most populous of the Central American countries, but it is no more populous than parts of Costa Rica or Guatemala. The point is that nearly all of its land is in the plateau region of coffee, beans, and corn.

The Costa Rican plateau is unique in that most of its population is largely white, many pure white of Spanish stock, being generally recognized by travelers as of better caliber than other people of Central America. They are better clothed and better shod, although they have the same agriculture and the same economic dependence upon the coffee export. In the very best parts of this undulating upland the small farms, with their stone-fenced fields of corn and potatoes, resemble New England. The houses have plastered walls and tiled roofs.[7] The capital city, San José, a beautiful white town, is very distinctly a center of European culture, but the isolation of the region is well shown by the fact that the 150 miles of motor road connecting it with some of the neighboring towns comprise the motor roads of the whole country, which is larger than Connecticut, New Hampshire, and Vermont combined, and has a population one-half larger than that of Vermont.

[6] The coffee crop of Central America is grown in quite well-defined and widely separated areas, which are found at definite levels on the interior plateaus and on mountain slopes facing the Pacific. The most important coffee areas are found at elevations of from 1500 to 5000 feet, although a few coffee plantations are found at elevations as low as 500 feet and as high as 6000 feet. (Louise Hearst, *op. cit.*, p. 53)

[7] An interesting series of articles by Robert S. Platt on Central America and the West Indies appeared in the *Journal of Geography*, 1923.

Eastward from the high plateau of the volcanic ranges there is in central Guatemala an upland section of many mountain ridges called Alta Verapaz. This is high enough to be healthful. It receives more rain than the plateau, and here not only coffee but the banana is at home. In this locality the Indian houses are surrounded by patches of bananas, which provide fruit for home use. As the population is scanty, the people practice the primitive roving tropical agriculture, cutting down the forest for a crop or two of bananas and corn, and letting it grow up while they clear another piece of ground.[8] Their money crop is coffee, which can reach the railroad only by being carried for two or three weeks on man-back or muleback.

On the eastern slopes of these uplands, forest, much of it pine, claims the land down to 2000 feet elevation, more or less, and soon gives way to the tropical jungle at lower altitudes. On the western slopes, which have less rain, the coffee, corn, and bean zone runs down to about 1000 feet elevation. In these intermediate forest slopes between the coffee zone and the lowland there are scattered cattle ranches, furnishing an export of hides and local production of meat for the more densely peopled coffee country just above them.

The Guatemalan and Costa Rican uplands go up to 7000 feet, and even higher, a height where frost is common.[9] Everywhere above 6000 feet wheat, barley, and potatoes are grown. The ground is prepared for wheat with a hoe; the crop is cut with a sickle, tramped out by the feet of animals, winnowed by the wind, and ground by hand, and it may be added that the resulting bread is much more wholesome than that from the finished flour that is made by the boasted American mills, for it has in it all the mineral salts and vitamins, as well as the very important roughage.

MINING

The boom literature of Latin America makes much talk of Central American mines, but the recent record of output is not impressive. True, the Spaniards in the early days worked thousands of natives to death in gold mines. There is some gold and lead produced in Guatemala. Despite much talk of mineral resources in Central America, until they are proved, it is far better not to count on them. There are no important mining industries. Those which exist are almost exclusively under foreign management, chiefly American, but in some cases English and German. Hand mining can be carried on almost

[8] Migratory agriculture of this type involves the clearing of forested lands by girdling or burning, followed by the planting of bananas or corn between the dead trees or stumps. Planting is done with hoes or sharp-pointed sticks. After a few years the forest is invaded by tough coarse grasses or by scrub, and the native is forced to move on to another part of the forest, where the clearing of land is, by comparison, easier. This primitive, migratory farming is known as milpa agriculture.

[9] In this part of the world the people speak of three zones. The first is the *tierra caliente*, the low, hot, humid land of bananas, coconuts, swamps, and malaria that is found along the Caribbean coast (see next chapter). Above 2000 feet is the *tierra templada*, or temperate zone, where coffee becomes the money crop, and the people live on their bananas, corn, beans, avocados, papayas, and other fruits. At about 6000 feet, above the coffee zone, the *tierra fria*, or cold land as it seems to the natives, begins, and here one finds such crops as wheat, barley, and potatoes.

anywhere, but scientific and efficient mining usually requires much heavy machinery. This calls for roads and transport, which most of Central America lacks. Think of the difficulty of operating a mine at the far end of a 150-mile oxcart road and mule trail. It is small wonder that Honduras is reported to be strewn with the wrecks of machinery and men.

THE FUTURE OF CENTRAL AMERICAN UPLANDS

The best lands in all this plateau have been taken. While there is much unused land, it is like the used land, hilly, often precipitous. Therefore it offers no possibility of an easy use of machinery and scientific mechanical prosecution of agriculture. At the present time some of the native fields have the almost unbelievable slope of 45°, which is much steeper than the common house roof. On such steep slopes soil erosion is a problem, for the land, once cleared, is exposed to the destructive force of tropical downpours, and much of the original, fertile topsoil has been lost. Fortunately, many of the upland volcanic soils are rich and deep, and the soil-forming processes are rapid. It is, however, difficult to see how this region can be expected to show great increase over its present production, and if it does, it will be along very much the present lines, with one or two products for export, presumably coffee, perhaps tobacco, possibly fruit. All the other produce will be eaten by the local population, which can double or treble quite as fast as products can, provided peace and sanitation give the present high birth rate a chance to function normally by producing grown-ups rather than infant funerals, as is now so often the case.

In Guatemala, which has much the largest population, there are large Indian populations, even on the highlands, which have thus far had but small Spanish influence. Some of these communities still own their land in common, as from time beyond the memory of man. The Indian who wishes to cultivate asks the headman to assign him a plot. In some of these communities cultivation is entirely by hand. The increase of population is bringing the people to the hunger line, and surplus population is moving off to seek labor on coffee plantations and in the towns. Also the Guatemalan Government (dictatorship of the right) is trying to break up the communal ownership (ejido) at the same time that the Mexican Government (sometimes called dictatorship of the left) is trying to restore it. The great problem of the southern countries of North America again arises — political stability. Can it be achieved under the Good Neighbor policy? Can these small countries maintain stability without outside intervention? Political stability often goes hand in hand with economic stability. Are most of the countries *too* dependent upon the market price of *one* commodity — coffee from the upland, bananas from the lowland?

Central America has also another problem of no mean proportions, a plague of earthquakes — a not uncommon accompaniment of volcanic activity. For generations cities have been shaken into ruins all over Central America, and the coming of the age of science has nothing to stop them or even tell when they will come. In December, 1917, and January, 1918, San

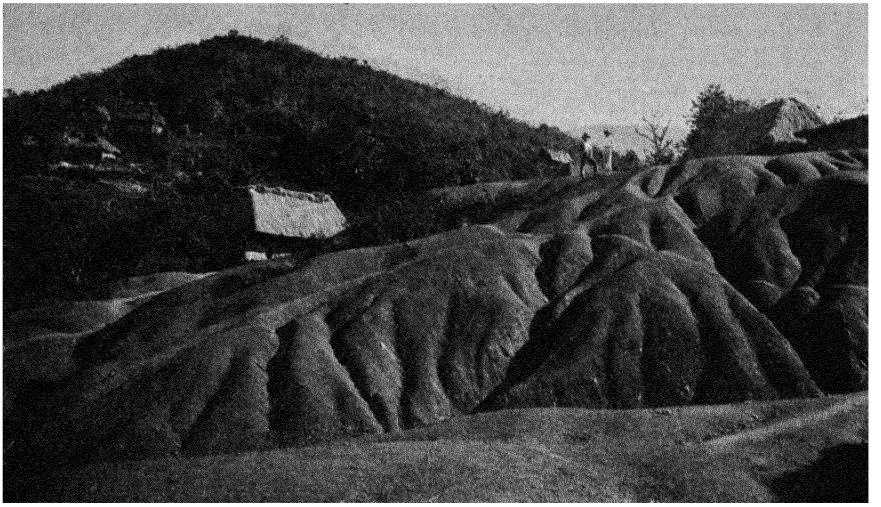


FIG. A. Corn cultivation works soil destruction on the uplands of Central America as well (badly) as in the other parts of the world, and steadily reduces the possibilities of the future. (Courtesy Ellsworth Huntington)

Salvador, capital of El Salvador, was destroyed, and Guatemala City, a city of 100,000 people, was almost completely demolished.[10] These same earthquakes destroyed the Costa Rican city of Cartago, and by an interesting irony of fate destroyed the Palace of Peace that had been built by Mr. Andrew Carnegie to celebrate and perpetuate one of the frequent unions of the warring Central American states. Further irony was furnished by the Government of the United States. One of the first decisions of the Court of International Justice which sat in this palace at Cartago was violated by the United States, because it interfered with our strong-hand Caribbean policy at the time.

THE MEXICAN UPLANDS OF CHIAPAS, OAXACA, AND GUERRERO

Chiapas is to Guatemala what New Brunswick is to Maine — an extension of the same thing, with an imaginary political line cutting across peoples, cultures, and industries. The uplands of Chiapas show a continuation of the Guatemalan corn, beans, and coffee plantations, and the same uneducated Indian farmers who have been there for centuries.

A few years ago the chief export of Chiapas was some 4000 to 5000 tons

[10] On March 31, 1931, Managua, the capital of Nicaragua, was almost completely destroyed by an earthquake and the fire that followed. The loss of life exceeded 2000, and property damage amounted to about $20,000,000. Over 30,000 people were made homeless, and 18,000 were fed daily in the relief work that was undertaken by the U.S. Marines and other interests. To get the staggering significance of these losses, they should be compared to the wealth and population of the whole country. Proportionally, it would have meant for the United States 5,000,000 homeless.



FIG. A. Panorama of a part of the town of Iguala in the highlands almost due south of Mexico City, not far from the Rio Balsas. Each garden is surrounded by a fence and an irrigation ditch, with trees along many of the ditches. Irrigation water sometimes makes the streets knee-deep with mud, but the town nevertheless has a picturesque plaza. (See Fig. 891 A.) (Courtesy Ben F. Lemert)

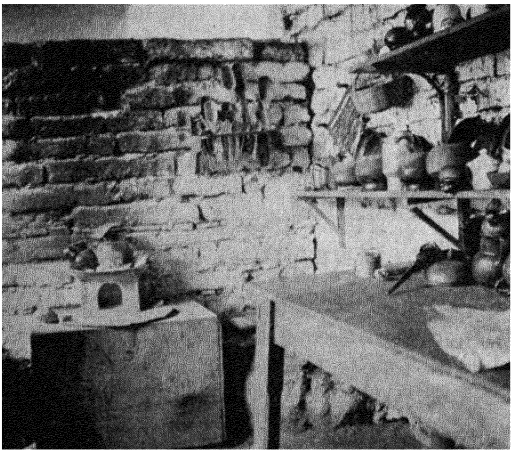


FIG. B. A kitchen in a home in Iguala. All the food is cooked on the little sheet-iron stove except the tortillas, which are baked on a disk of sheet iron over a small charcoal fire between three pieces of stone. (Courtesy Ben F. Lemert)

of coffee produced in the Soconusco district along the Pacific slope. In recent years, however, expropriation of plantation land by the Government has caused the coffee output to decline, and bananas have become the lead-

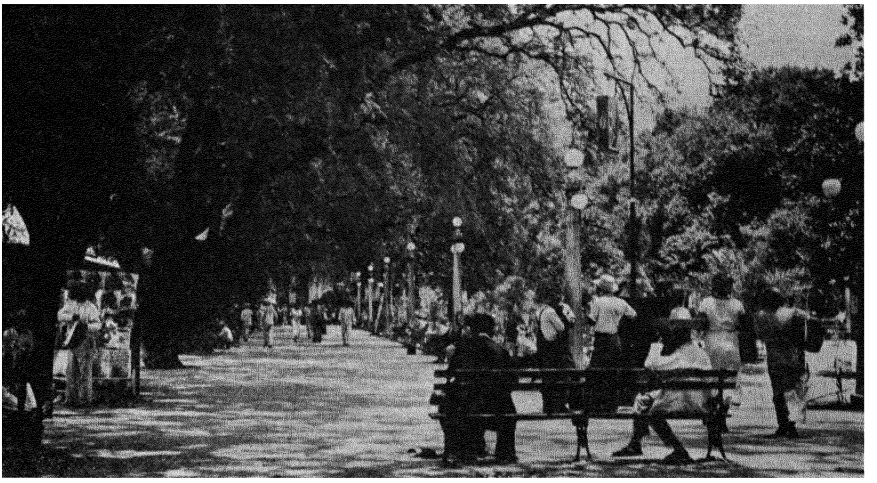


FIG. A. The plaza in Iguala. It is always cool under the tamarind trees, and rarely indeed does anyone hurry, but ice cream has been introduced. What the future holds is hard to predict. (Courtesy Ben F. Lemert)



FIG. B. As the automobile road cuts a path for swift communication through the Appalachians, the Ozarks, the Rockies, so this one cuts its path from Mexico City to Acapulco, and Acapulco becomes a seashore resort for people from the City of Mexico. Acapulco is beautiful, which is more than can be said for Veracruz. (Courtesy Ben F. Lemert)

ing export. Both coffee and bananas are shipped via the Tehuantepec R.R. to Puerto Mexico and Veracruz on the Gulf of Mexico, and thence by steamer to foreign markets. Chiapas has much unused land suitable for coffee production, and also savannas with good pasture.

Westward from Chiapas are the highlands of Oaxaca and Guerrero, cut off from Chiapas by the lowlands of the Isthmus of Tehuantepec and cut off

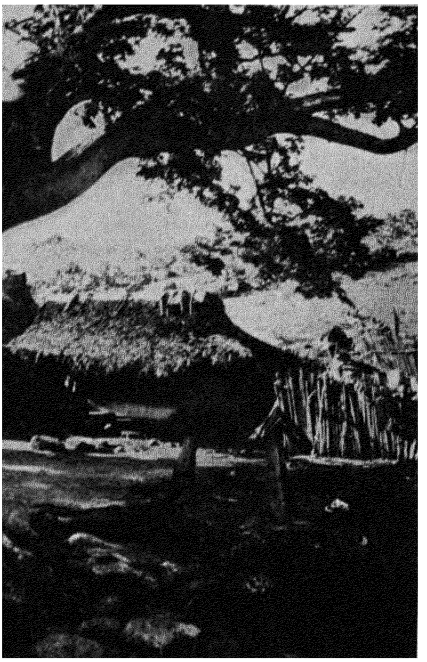


FIG. A. The house of a family that lives by patch and thatch on the road between Taxco, Guerrero, and Cuernavaca, Morelos. (Photo by M. Ogden Phillips)

from the main highlands of Mexico by the deep valley of the river Balsas. This plateau is not so high as the Central Plateau of Mexico. It resembles more the uplands of Chiapas, but there are two differences — rainfall and surface.

The uplands of Oaxaca and Guerrero have not been covered over recently with volcanic ash and lava to level up and enrich them. They are, on the contrary, an old land where the streams have had time to cut the terrain into a myriad of valleys, leaving little level upland at the top and making but little level valley land at the bottom. In these two respects they resemble the more rugged parts of the Allegheny Plateau.

It was from the little town of Taxco, nestled in the Guerrero mountains at an elevation of 5000 feet, that the first mined silver was shipped to Spain, and in colonial days it must have been a long and dangerous journey for the pack trains carrying silver to Mexico City, only 102 miles away. While Oaxaca and Guerrero are said to have considerable deposits of gold, silver, lead, and even iron and coal,[11] mineral production at the present time is almost negligible, a consequence primarily of topographic isolation. One does not have to go more than a few miles from the modern highways that now connect Mexico City with Acapulco and Oaxaca to find primitive Indian life that has been changed but little since the first days of Spanish domination. Professor Frank Tannenbaum tells of visiting communities where a wheeled vehicle had never been seen.

As a further handicap, the rainfall is light, and so variable as to make agriculture uncertain save in a few favored valleys that are wider than the rest and offer room for irrigation. Long ago these became the seats of crowded Indian populations, and in one of them is today the present state capital, Oaxaca, surrounded by a cluster of villages.

Until recently this was a region seldom visited by North Americans. In 1932 I visited Taxco, which at that time was unspoiled by a tourist trade. The bus was filled with Mexicans and one American, who instructed the driver in his best "collegiate" Spanish to be sure to stop at Taxco. Some time later, a mile or so beyond Taxco, the driver slammed on his brakes,

[11] See Jesús Galindo y Villa, *Geografía de Mexico*, Barcelona, 1930, pp. 117–18.

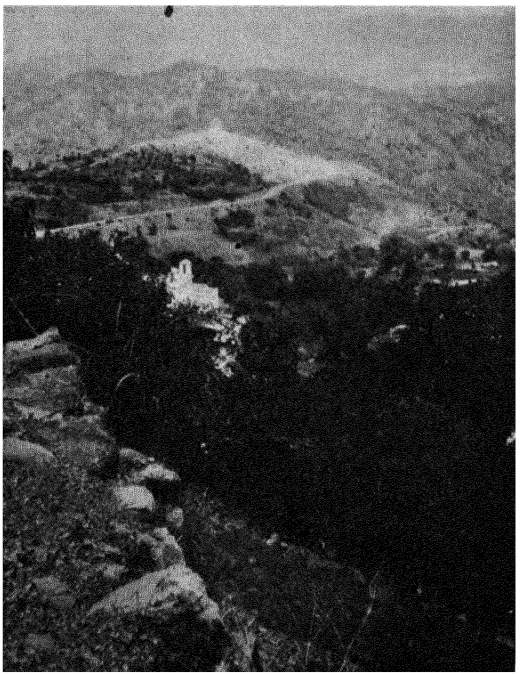


FIG. A. The mountains near Taxco, Guerrero, showing the lookout post of a silver-mine owner of the eighteenth century. In a country so broken as this it is easy to understand isolation, the necessity of economic self-sufficiency, and the restriction of exports to such valuable things as silver. (Photo by M. Ogden Phillips)

opened the door, and pointed back to the town in the distance with but a word of explanation, "*Allá!*" ("There!"). I found that a midday tropical sun can be exceedingly uncomfortable, even at a high elevation, as I trudged wearily back to my destination. But the trip was worth the trouble, for there was much to be seen: a beautiful cathedral erected in 1757 by the wealthy mine-owner Josef le Borda; the lookout point where Borda used to watch his pack trains, laden with silver, leave on their tortuous journey to the capital; the quaint native houses with their red-tiled roofs; the veritable maze of cobblestone streets, only one of them being wide enough to accommodate an automobile; a tranquil plaza that would be transformed into a noisy, commercial battlefield on market day; barefooted natives with typical sombreros and serapes — in short, an Indian village little changed since colonial times.

Chapter 45. MOIST EASTERN LOWLANDS OF CENTRAL AMERICA AND MEXICO

TROPICAL HEAT AND MOISTURE



WHEN one considers the almost uninhabited forests that make up much of the low plain of eastern Central America and Mexico and compares them to the populous islands of the West Indies, it seems to be a misfortune of nature that all the low-lying tropic lands could not have been islands, and not large islands, either. This idea is interestingly enforced by man's experience with three little islands called the Bay (Bahía) Islands about 30 miles off the Caribbean coast of Honduras.

One of these islands, Roatán, is composed of limestone formations honeycombed with caves into which all water runs, so that there is no stream, no swamp, no place for mosquitoes to breed. This island was settled early, and became full of people long ago. People from Roatán moved across to the neighboring island of Bonaca (Guawaja). This is composed of hills, streams, fertile valleys, swamps, and tight soils. Therefore it had the makings of mosquitoes. Repeatedly the population of Bonaca has been decimated by malaria. To escape mosquitoes, some people from Bonaca settled on a coral islet a short distance off the leeward shores of the island. Being on the leeward side of the island, this islet was protected from the full force of trade-wind surf and the heaviest storms; there was no place on it for mosquitoes to breed, and enough breeze to blow them away. People built their houses here, and went over to Bonaca by boat each day to grow and harvest their crops of coconuts, cacao, bananas, and vegetables, coming back at evening with their crops and drinking-water.

The population of the islet grew. Every house space was taken. People carried stones in boats to enlarge the island, and when this was no longer possible, some houses were built on piles. The immunity from mosquitoes has caused the islet to be a local health resort, people from the fever-infested mainland near by coming over to get a mosquito-free vacation in the crowded village upon the coral rock and the piles.

You might say that these Bay Islands are a geographical laboratory, whose findings tell a great tale of man's ups and downs in the tropics. This laboratory experiment goes far to explain Central America, composed as it is of a low, wide eastern plain, a high plateau, and a narrow western plain. The plateau is populous; the eastern plain below is not populous. The plateau is cool; the plain is hot. The plateau has moderate rain with a dry season; the

plain has much rain and no dry season, the one locally called the dry season being merely less wet than the rest. In eastern Guatemala the natives say it rains thirteen months in the year. The plateau is well drained; the plain is swampy. The atmosphere on the plain is so damp that at Colón it is a common practice to put shoes and clothes into a "dry closet" where a burning lamp keeps them from molding. It's the oppressive humidity that "gets" you, *not* the heat.

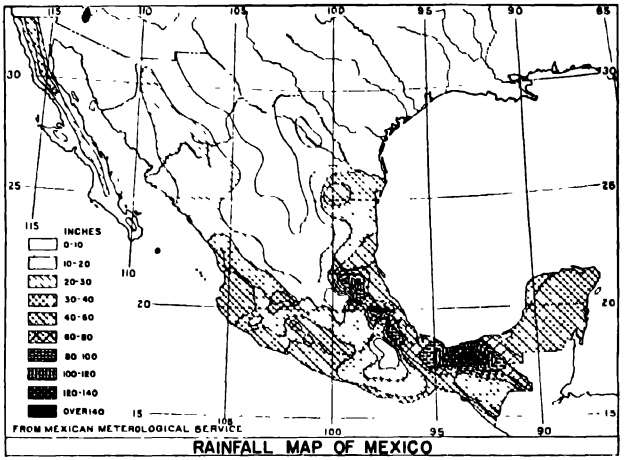


FIG. A. The significant thing to notice about the rainfall of Mexico is the great range and the large area with a low rainfall.

We of the North often have an exaggerated idea of the degree of tropic heat. At Puerto Barrios, on the Caribbean coast of Guatemala, in May, the hottest month, the average temperature is 81° F. (St. Louis has 79.1°), the average temperature in January is 74°. Many parts of the middle United States are hotter, if you ask the thermometer, but the trade-wind heat and humidity are continuous, day in, day out, month in, month out. Note the difference between the hottest and the coldest month, only seven degrees. There is more difference between day and night than between winter and summer. This is true of all shores against which the trade wind blows.

THE JUNGLE

The thick forest, often with much undergrowth, all tied together with creepers, is the result of this continuous heat and moisture. The jungle is not necessarily a sign of fertility. It is a sign of heat and moisture. The Northerner, seeing the palms and the thick vegetation, is prone to overestimate tropical fertility. Aside from fresh volcanic and the deeper limestone soils and alluvial lands, the soils of rainy tropic lands tend to be poor. The heavy rain has leached them, often to a low grade of fertility. They get no respite by a winter protection of freezing, as is the case in the North. Plant roots are ceaselessly sucking out fertility, and rain is continually leaching out the plant nutrients from the soil.

This east coast of Central America starts at the seaside with sandy beaches, often a long sandbar, like that on the New Jersey coast. Behind it are salt lagoons sometimes called lakes; then come swamps and large areas of sand interspersed with areas of good soil. The plateau soils, mostly volcanic, are on the whole much richer than the coastal-plain soils. Between the seacoast

and 2000 feet elevation is the natural home of mahogany, logwood, coconut, rubber tree, chicle tree, monkeys, parrots, jaguars, wild pigs, alligators, and turtles, and in addition the dominant animal, not man, but the mosquito — buzz! buzz! buzz! bite, bite!

THE LACK OF DEVELOPMENT EXPLAINED

All these difficulties explain why the east coast has remained almost unsettled and even in parts unexplored by white men, why it is still largely in the undisturbed possession of the few native Indians who manage to exist there.[1]

Until the coming of the railroads the east coast, for practical purposes, was as far away from the people on the plateau, and almost as little known, as the Pacific Coast was to the rest of the United States at the time of the Mexican War.

If anyone is inclined to say that the lack of development of the eastern plains is due to Spanish misgovernment, let him consider the facts and figures for British Honduras. At the end of generations of British rule the population averages about 6 people per square mile, mostly black, and the chief exports are chicle, mahogany, and bananas. Belize, the capital city (pop. 17,000), is the world metropolis for chicle, a gum used for the base of chewing gum and gathered as rubber is gathered, by tapping the tree in the dry season. Much of it is brought over the land boundaries of British Honduras from the back country by Negroes and Indians who now range the unsettled forests as hunters seek furs in the North Woods. Note that British rule and British capital have brought British Honduras only to the lowest stage of extractive or exploitation industry — gathering the free products of nature.

Hardwoods of the forest have been the main attraction of all this coast to the trading man. In 1638 Jamaican woodcutters landed on the coast and started to cut logwood. The Spanish attacked them, and the woodcutters drove them out and hoisted the British flag. It still waves, but to this day this British colony is almost unpeopled save for woodcutters, and they are not British. In Canada, woodcutters *are* British.

The man who gets mahogany is called a mahogany-hunter, a name which by implication tells much about the tropical forest. Rarely does this forest have solid stands of good timber, as do the forests of the temperate zone. The mahogany-hunter climbs a tall tree from which he can look over an expanse of thick forest. In the distance he sees mahogany trees towering above the level. He gets the location of one or two, climbs down the tree, and may have to take his machete and laboriously cut a path toward the located tree. If it is near a stream or a land that will be overflowed, all is well, very well. The tree can be cut down and wait there until the next rainy

[1] "For day after day, however, the traveler finds no inhabitants, and place after place which appears on the map as a village proves to have only two or three houses or to be merely an abandoned hut. Roads and even trails are almost non-existent, and in most places the machete must constantly be used to open up a pathway." — Ellsworth Huntington, "Guatemala and the Highest Native American Civilization," *loc. cit.*

season, when he returns to the place and the log is floating; but often the thicket will not let it float away. Laboriously, with machete and ax, the man, wading, splashing, canoeing, riding on the log, chops a pathway by which the logs can be floated through the forest to some stream and down the stream to some port. If the tree happens to stand on land that is not overflowed land, a roadway must be cleared through the forest for a heavy-wheeled cart to take the logs to some point where water can do the rest. Those who have seen mahogany logs on American wharves have noticed that they have been nearly always squared with axes. This is much work, but is done in the woods to reduce the labor of handling under such adverse circumstances.

Although the uplands of British Honduras are said to contain an extensive stand of pine forest, its softwood requirements are met chiefly by importation. The inaccessibility of local stands of softwood and high logging costs make it necessary for the colony to import its entire supply of dressed lumber and about half its supply of rough lumber, chiefly yellow pine from the southern United States and Douglas fir from British Columbia. In 1923 there was loud talk about an American company that was going to supply this from the pines of the interior, but — those pines still stand.

THE RUBBER EPOCH

The Castilla rubber tree grows in much of this forest country, and for a few decades there was a lively business in gathering the rubber from the wild trees, which were usually killed in the process; for who would leave a rubber tree alive for someone else to kill, when by killing it himself he could get rubber he would never otherwise see? The rubber product has disappeared for two good reasons: one, the almost complete extermination of available rubber trees, and the other, the cheap supply of plantation rubber in the Far East, where the abundant coolie labor in Ceylon and Malaysia produces at a cost that a Central American Indian can rarely afford to match.

The coconut grows wild along these shores, as it does on nearly all other tropic shores, and since it thrives well on sandy sea beaches, it is very accessible to the boatmen on the lagoons. It is of rising importance and value, being one of the chief exports of Honduras.

THE PANAMA CANAL AND TROPICAL SANITATION

Panama has long been a center of Isthmian transit, first by mule trail, then by wagon road, then by railroad, and finally by canal. The Panama Canal is the greatest thing that has happened in Central America since its settlement by the white man. It dominates not only economics but politics, for the creation of the Republic of Panama is generally recognized as an episode in the construction of the canal.

The early works in this region, namely, the Panama R.R., built in 1849–52, led to frightful loss of life because of the deadly climate, especially from yellow fever. It was finished only by the aid of Chinese, and it was often

said, figuratively of course, but with a sad basis in fact, that there was a dead Chinese for every tie in the 48 miles of railroad. Later the French, under De Lesseps, flushed with their success in building the Suez Canal through the desert, started to build the Panama Canal through swamp and jungle. They failed, partly because of graft but much more because of yellow fever and other diseases. I have talked with men who worked on this enterprise, and I know that the work was undertaken only by men in financial desperation, tempted by double or even quadruple salaries, and that they lived in haunting fear of early death. And the way that Europeans and Americans died on those works gave them abundant reason to fear for their lives.

In the short period of less than twenty years that intervened between the collapse of the French enterprise and the beginning of the work of the United States on the Panama Canal, the world had entered a new epoch, so far as the tropics were concerned. This new epoch was introduced by the advance of the germ theory of disease to the point where yellow fever was no longer a mystery. It was known to be carried from one man to the next by the female of one particular genus of mosquito, the *Stegomyia*. Malaria also was found to be mosquito-borne. These discoveries made a profound difference in the reputation of Panama under the two canal enterprises. Since the mosquito was the enemy, he was systematically fought. At the source of every stream near the canal works a barrel of crude petroleum was emptied, going in drop by drop to furnish a continuous skim of oil, which is fatal to the young mosquito as he thrusts his head above the water to breathe. Every marsh was drained or oil-coated. Trees were cut down and even tall grass was cut down, so that the wind, blowing from the sea, could comb the mosquitoes out and drive them back into the forests. Panama, which had had one of the highest death rates in the world, soon had one of the lowest.

This was no democracy where the Board of Health had to be elected or appointed by an elected mayor, and where the political pull of the owner decided what would be done about a nuisance. Sanitation was carried out by the United States Army. The sanitary policeman walked down the back street. Was there a hole in the mosquito netting? If so, a fine fell upon the unlucky owner, for he might have yellow fever, or malaria, and a mosquito might go through that hole, bite him and become infected, and go and bite someone else and infect that person. Was there a tomato can in the back yard? If so, a fine fell upon the careless owner, for a tomato can would be filled by the frequent rains and raise a few dozen mosquitoes. Thus by stringent measures the death rate became almost unbelievably low. Then a new member was added to the sanitary force, a small, easily domesticated fish, the gambusia, or top minnow. It will live in the rain barrel or cistern and eat the mosquito larvae. Its great trouble is prosperity, which sometimes gets it into the frying-pan when it ought to be on its beat.

The Panama experience shows the possibilities and also the limitations of sanitation in the wet tropics. When the canal was finished, some of the Negro workmen were granted permission to cultivate plots of land beyond the area subject to sanitary control by the United States Government. These

Negroes through carelessness bred malaria, which was carried back into the area of sanitation, resulting in some increase of this dread disease.

A BIT OF THE TROPICS PRIMEVAL

As the waters rose behind the Gatún Dam at the east end of the Panama Canal, a lake was formed, the Gatún Lake, and in the lake are some islands. The rising water cut off and walled off sections of forest, with all their denizens — a perfect botanic garden, a perfect zoo. One of these islands has been set apart as a place for the study of undisturbed tropical nature. It has on it lodges for the shelter of accredited visiting scientists. Paths are cut through it where observers can pass and study the plants and the animals, which carry on their life here undisturbed by man except as an inconspicuous observer. I have not had the opportunity to visit this reserve, but I am told that for a time at least a big baboon raced to the top of the highest tree and beat his breast in defiance at every passing airplane. Will the baboon be there to hurl defiance at man's last airplane?

THE BANANA INDUSTRY, A TYPE OF ORGANIZATION

The knowledge of tropical diseases and tropical sanitation worked out and demonstrated at Panama has since been applied with striking success to the production of bananas. In 1937 we imported 67,000,000 bunches of bananas, chiefly through the ports of New Orleans, New York, and Philadelphia, nearly all of them from the Caribbean shores, most of them from Central America. The banana industry is one of the most highly organized industries of the world.

First, good land, thousands of acres of it, must be obtained. It must have access to a harbor. Into the harbor sails a ship with a manager, various clerks and timekeepers, accountants, engineers, and hundreds of Negro laborers. One force builds a store, a hospital, and rows of houses with wooden walls and corrugated-steel roofs. Another force builds a railroad line back into the banana land, which needs 75 inches or more of rain, well distributed throughout the year. Ditches are cut to drain off the surplus rain water. With machete and ax the undergrowth is cut away so that only the big trees remain, making a parklike forest. The planting now occurs. Stakes are set about 18 by 24 feet apart. At each stake a 12-inch hole is dug, and the bud (underground shoot) from a banana stalk is carefully planted. Before this begins to grow, the great trees are cut down, acres of them, and left as they fall. They give the appearance of devastation, as though unbelievable tornadoes had leveled the forest. This is the time of danger. If this mass catches fire, the plantation is ruined. If a flood comes, the young shoots decay in the ground. If, however, all goes well, they grow, perfectly protected by the mulch of forest treetops. In three or four months the first cleaning begins. Men with machetes and axes cut their way through the mass, chopping down the shoots of young trees, chopping away enough branches to be sure that the sunshine reaches every young banana shoot.



FIG. A. The Machine Age takes rubber and chemistry into the tropic lowlands. The spraying of the banana plantations is now becoming almost as standard as is the spraying of apple orchards. (Courtesy Hardie Sprayer Co.)

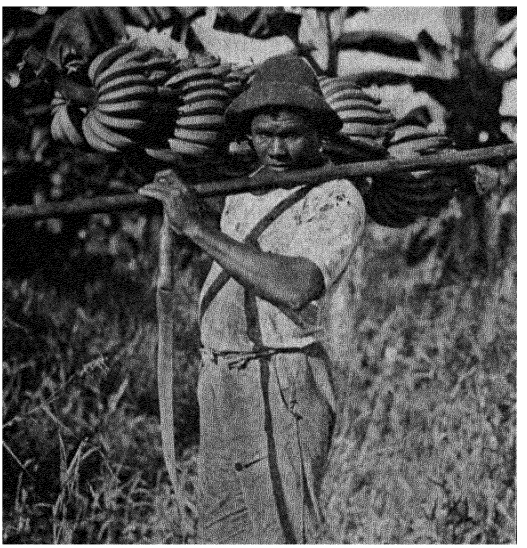


FIG. B. "Backing the bunch," Costa Rican lowland. The young Negro has cut the stem with his machete and eased the bunch down with the pole; now he is carrying the bunch to the tramline (mule or motor). (Courtesy United Fruit Co.)

This process is repeated every three or four months as long as there is a banana plantation. In many cases no plow is used, nothing but the machete to subdue rival vegetation. In the continuous humidity fungi riot, processes of decay are speedy, and the wood-eating white ant sometimes joins the forces of destruction. In a short time nothing remains but the big logs, and sometimes they are gone in a year.

If for any reason the work stops, the jungle promptly reclaims its own; therefore the cleaning must be continuous. The ditches need frequently to be reopened, and many little bridges by which the tramways cross them must be renewed. Occasional floods may wash out half of them.

At the end of fifteen months the banana plants are from 20 to 40 feet high, and the first bunches are ready. In the meantime tramlines have been laid all through the plantation, often only a few hundred yards apart. The land is too soft and mucky for a wagon, but a mule can trot along and pull a little tramcar through the plantation. The use of this draft animal also makes it necessary to provide clearings for pasture land. In many cases the mule has gone on vacation, because the automobile or the train does the work.

The harvesting crew has a foreman who decides what is

ready to cut. The cutter has a knife on a long pole with which he makes a cut in the side of the banana stem so that the bunch bends over and can be cut off. The backer takes it on his back, and trudges away to the tramcar, which in turn takes it to the wharf. Sometimes the mule carries bunches on its back to the tramcar.

When a banana stalk has produced one bunch, it dies, but in the meantime several new shoots have grown up around it. These are thinned out to the proper number, and a few months after the first harvest the banana plantation is in continuous production and must be cut every week or even twice a week.

The plantation office receives a radiogram that a steamer from New York, Philadelphia, Boston, or New Orleans will arrive at its wharf at a certain hour. Instructions go to the division superintendents, who start work at daylight and plan the work in such a way that there will be a continuous supply of bananas going by endless-belt conveyors into the hold of a ship, which loads 75,000 bunches in twelve or fifteen hours. In the hold of the ship the bunches are kept in place by board partitions, much like farm gates, and the hold of the ship is packed full except for necessary passageways. Refrigerator coils promptly reduce the temperature to prevent speedy ripening, and in three or four days' time the cargo will have passed from Honduras to New Orleans, or in a week from Costa Rica to Boston. There endless-belt conveyors are lowered into the hold, whence the bananas are lifted to the wharf, where continuous rows of longshoremen or traveling belts take them to freight cars waiting alongside. The freight car is iced in summer and warmed in winter, for the banana ripens too fast in hot weather and promptly turns black when exposed to a temperature less than 45° F.

All this process requires an almost endless amount of inspection: Inspection in the plantation to see that green bananas are picked. Inspection on the tramcar to see that they are not bruised. Inspection at the wharf to see that they are not too ripe. Inspection in the hold of the ship every six hours to see that they are keeping properly.[2] Inspection at the wharf of the unloading. Inspection in transit. Inspection at unloading. And finally, inspection in the ripening chamber in the ultimate wholesale market, where the proper temperature and humidity are maintained until the bananas are ready to go to the retail dealers.

It is natural that such speedy handling of a perishable product requiring so much special equipment should demand thorough organization. The banana-importers began by owning ships, but they found they could not depend on independent producers for regular supplies of bananas in large quantities to fill their ships, so they began to own plantations, which now produce a large proportion of the supply, although some are still privately

[2] The banana gives off large quantities of carbon-dioxide gas and large amounts of heat, and it absorbs oxygen. Hence pure, cooled, dry air is circulated through the holds of the ship, the used, humid air being drawn out by fans. The holds of banana ships are heavily insulated in order that the fruit may be carried at a constant temperature of 57° F. The time of arrival of the ship is radioed ahead to the port of entry so that men, unloading machines, and railway cars will be ready to receive the fruit. See Jesse T. Palmer, "The Banana in Caribbean Trade," *Economic Geography*, July, 1932, pp. 262–73.



FIG. A. This scene in the port of New York shows the bananas traveling off the ship by belt conveyor, a device that usually moves the bunch of bananas from the plantation freight car to its berth in the hold of the ship and thence to the door of the freight car in the United States. (Courtesy United Fruit Co.)

produced.[3] Owning ships and plantations, the importers had to own wharves and plantation railroads, also to control piers at United States ports, and then to develop special staffs to attend to speedy dispatch and proper cooling and heating of bananas, and special companies to sell them quickly before they spoiled.

With all this equipment and all these ships, the next step was to use the deck space for passenger cabins. This did not interfere with bananas in the hold. But passengers must be made comfortable in good hotels. Therefore the fruit company was driven to the next device, that of building fine hotels in the tropics. Few corporations have achieved industrial organization so far-reaching in its elements. As a kind of sideline the banana companies run sugar and cacao plantations, just like other plantations. Sugar and cacao are now important exports of this region.

It is probably in the realm of government that the most interesting work of this company is done. Indeed, an American fruit company is often accused playfully, though perhaps not entirely in jest, of operating governments and running elections and even revolutions. If, as has so often been said, American business corporations have been able to control year after year the councils of American cities and the legislatures of American states, why should not an equally great American corporation control so weak and often venal a thing as many a Central American government? When one considers the close approach that some of these governments bear to plain banditry, the question arises as to what would happen to a business enterprise that was not in some kind of well-established relations with the government. The draft, to raise an army, is one of the commonest of their devices, but it would mean devastation to the banana crop if the draft got its labor force.

The United Fruit Company is a classic example of "vertical integration of industry," controlling every step in production from the time that the

[3] In 1913 the United Fruit Company owned 44 ships aggregating 187,998 gross registered tons; in 1935, 89 ships, 407,459 gross tons. In 1913 the company chartered 49 tramp ships of 60,609 gross tons; in 1935, 9 tramp ships, 17,319 gross tons. Thus the company is much less dependent today upon the services of independent carriers.

fields are cleared and the plants are put in the ground until the bananas are delivered to the wholesalers in the great urban markets of the United States. To own and operate plantations, warehouses, radio stations, hospitals, wharves, steamship lines, refrigerator cars, and so on, obviously has called for the investment of many millions of dollars. Such large-scale enterprise has resulted in the regular delivery of much larger quantities of better and cheaper bananas than could possibly be produced and delivered by small-scale individual producers. The company's control of the banana industry in most of Central America is indeed monopolistic, which perhaps was inevitable in view of the great obstacles that had to be overcome in order to establish a smooth-working organization that would ensure the regular and dependable delivery of vast quantities of a perishable fruit to American and European markets.[4]

Three of the five short railroads of Honduras belong to the United Fruit Company. The fourth belongs to the Standard Fruit and Steamship Company, and the fifth belongs to the Government — and hauls bananas. Nearly all the railroads on the east coast of Central America are American-built, American-owned banana roads.

This banana industry of the Caribbean shores does not arise from the superiority of this region as a banana-producer. It arises as a kind of natural monopoly of location. This is the best place of the tropics near enough to send fresh bananas to the large American market. We see the true relationship of Central America to tropical industry in rubber and coconut oil, which are nonperishable articles of fairly high value, and can afford the freight charges of the long journeys. Central America is a natural place for both industries, but the heavy population and resulting abundant labor supply of the Far East and of the Pacific islands make these latter regions the center of rubber and coconut-oil production, while Central America and the West Indies send to the American markets the fresh coconuts, which also have a certain element of monopoly.

With all its organization and its absence of rivals, the fruit company has its troubles. A hurricane often beats the banana plantations of a whole district to shreds. In May and June, 1923, winds did $1,250,000 worth of damage to the plantations on the coast of Honduras. Then, since the small amount that escaped would not fill a ship, the service had to be discontinued until full production had been restored. This is frequently happening somewhere along the Caribbean. Therefore the company has plantations in Jamaica, Cuba, Colombia, Panama, Costa Rica, Nicaragua, Honduras, and Guatemala, so that no single hurricane can get them all. A severe hurricane in any one of these little countries is a national calamity, second only to the earthquakes that occur in the populous interior plateau.

[4] The story of the rise of the United Fruit Company, involving the elimination of its early competitors, its acquisition of power through concessions, its transportation tactics in Central America, its Great White Fleet, its political machinations, legal irregularities, and monopolistic practices, the plight of the private planters, labor troubles, and its apparent future, have been critically analyzed and described in a case study of economic imperialism. See Charles D. Kepner, Jr., and Jay H. Soothill, *The Banana Empire*, Vanguard Press, 1935.



FIG. A. The West Indian hurricane usually works complete annihilation of the banana crop. The producer must wait months before he has anything to sell. (Courtesy United Fruit Co.)

UNUSED LAND AND THE FUTURE — A PROBLEM IN SANITATION AND ORGANIZATION

The banana companies, like everything else in America, have begun with the cream. They have taken the best locations. Unfortunately, most of the Central American low plain is not good banana land. Bananas need rich soil, and the planters have thus far limited themselves largely to the alluvial fans and plains which the mountain streams have spread out toward the sea. The alluvial fan, of which Costa Rica has many, is indeed a prime banana patch. So are the flood plains of the Guatemalan rivers. Already railroads have been built, 75 miles long, to reach these few choice spots.

Disease has also ravaged the banana plantations. This is the usual accompaniment of the crowding of plants under conditions of domestication. A fungus, the banana wilt, has made it necessary to abandon certain locations, and this may work more damage.

When a banana plantation is used up by semiexhaustion of the soil or abandoned because of the wilt, it becomes apparent that no permanent settlement has been established. The company usually pulls up the railroad tracks; the managers, clerks, and Jamaica Negroes go to the next plantation,

and the jungle returns to its own. Notice that all this is nothing but African-jungle farming on a gigantic scale. There is no new technique except transport and export. Occasionally a plantation is planted in coconuts as the bananas go out.

What is the future of this jungle? Perhaps it is to remain a jungle. If it is to be permanently reclaimed, the attack upon it must be serious and the government may have to be the strong, despotic government that comes from some cool land, where the vigorous, energetic white man can enforce sanitary measures akin to those of Panama, akin to the management of a banana plantation. This aspect of the conquest of the tropics is discussed in the following quotation from Ellsworth Huntington:

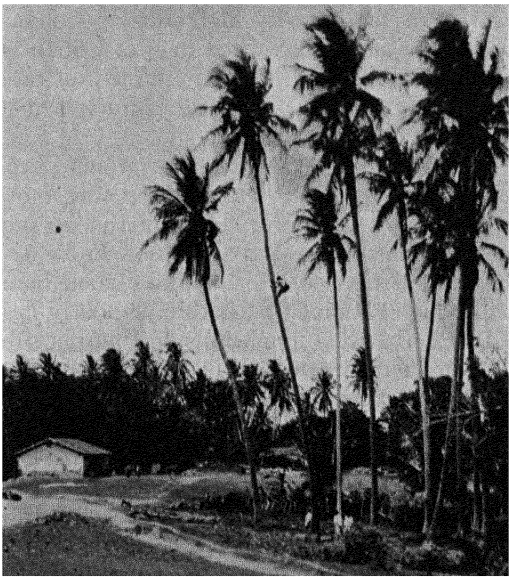


FIG. A. The coconut tree can grow in salty sand beside the tropic sea. Its marvelous productivity is by no means fully utilized. (Courtesy Institute of Current World Affairs)

> Only some powerful stimulus, like the demand of the United States for fruit, could cause such plantations to arise. The strictest supervision is necessary in order that the bushes may be cut every three months, for in a year the native vegetation grows ten feet or so, and if left to itself would soon choke the banana plants. Still more unremitting vigilance is necessary to keep both the white men and the natives in health. From the wages of every employee, whether he receives fifty cents or fifty dollars per day, the company takes 2% to pay for sanitary measures. Every plantation has its doctor and dispensary, and natives and foreigners are continually dosed with quinine. Yet even so, at certain seasons of the year, a single train may carry a score of staggering fever patients; the present hospitals are wholly inadequate, and in 1913 the company was erecting a new hospital at a cost of $125,000.00. Mr. Victor M. Cutter, manager [later president] of the Guatemala division of the United Fruit Company, states that about 90% of the people in his district, both natives and whites, suffer from malaria and its *sequelæ*. In spite of all precautions about 20% have the fever in a serious form.[5]

This statement may look old, but according to recent investigations it still serves to show the persistent conditions.

The great eastern province of Petén, west of British Honduras, making up about one-third of Guatemala, has about 7800 people, and 1400 live in one town. In the rainy season Petén is dotted with lakes. In all seasons it is plagued with malaria. About 1920, certain incursions of Mexican ban-

[5] Huntington, *op. cit.*

dits caused the Guatemalan Government to send into Petén contingents of men from the near-by highlands of Cobán. In a few months so many of them were dead that when men of Cobán were ordered to go to Petén they ran away, anywhere, even at the risk of their lives. The task of eliminating malaria from such a tropical plain is something that has not yet been attempted. Panama is but a spot.

The commercial banana plantations have chosen only the large blocks of land. It must be so. Aside from this, most of the plain of eastern Central America and the lower slopes of the uplands seems to be unsuited to commercial banana-growing as we now know it. There are many tracts of dense forest land that would not make good banana land. The soil may be too acid or too alkaline or too thin or poorly drained.

In Puerto Rico much hillside country subject to heavy rains, like that of eastern Central America, is densely peopled, and the banana is an important crop for the local food supply and the market of near-by cities. There is no reason why similar developments might not occur on the eastern slopes of Central America coming up from the lowlands along the Caribbean. If transportation to the seaboard is considered, it becomes evident at once that this is a second-class location. Getting fruit from here to the North American market would be much more expensive than getting it from the location described above. We of the United States have not yet been compelled to pay that much for bananas.

In future decades, greater stability of government in Central America may give the population a chance to increase to the point where the labor supply will be sufficient to turn much of the lowlands into plantations of sugar, coconut palms, oil palms,[6] bananas, and other tropical produce, while the hills might become populous, like the hills of Puerto Rico.[7]

The eventual exhaustion of gasoline and the possibility of the use of alcohol instead may someday entirely change the basis of tropical agriculture. It is now limited to food products and valuable raw materials. If alcohol can be made economically from some cheap, quick-growing plant, fields of alcohol material may quickly spread over tropic lands that are now receiving from the white race only the occasional visit of the botanist and the zoologist making collections for a museum, or the prospector in the endless quest for gold, or that scientific prospector, the geologist, looking for the mysterious traces of oil.

[6] The *Scientific American* reported (1922) that thousands of tons of cohune nuts waste annually in northern Guatemala. In 1929 an American company spent $700,000 in *preparatory* operations to grow cohune nuts, but the business depression shut off the supply of necessary capital before the enterprise got into production. Cohune nuts have an oil content of 65%, as compared to 42% for the African palm nuts of great commercial value.

[7] Dr. Robert Bowman, who read this manuscript, pointed out that Puerto Rico had 600 people per sq. mi. on some hill land, and were hungry even before the United States Government established sugar quotas. After that calamity, malnutrition and starvation stalked abroad in Puerto Rico. They had sugar mills running at half-capacity, people starving for jobs, and plenty of coconuts they could not sell. Therefore, said he, further development of Central American lands is not needed. The really bad part of the story is that Dr. Bowman was describing scarcity economics, which curses not only the Caribbean area, but the whole Western world. Our *great* need is to learn how to distribute what we now know so well how to produce. See the last chapter of this book.

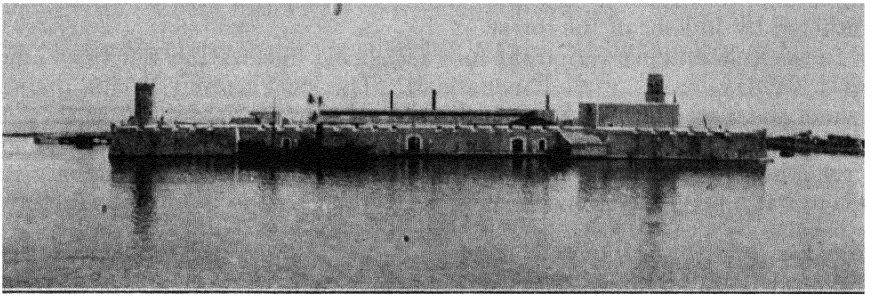


FIG. A. The old fortress of San Juan de Ulúa (Ulloa). Here Drake and Hawkins fought in 1568, and many others have fought since that day. (Photo M. Ogden Phillips)

THE LOWLANDS OF EASTERN MEXICO

The east coast of Mexico is an arc, wet in the middle and drier at the ends where it merges into the Yucatán plain and the Lower Rio Grande Region. In most of its length it is but a duplication of the east coast of Central America, sandy beaches, lagoons, meandering watercourses, swamps, in places dense forests, and the ever present mosquito and malaria. These are the reasons why Veracruz was for centuries known as the hotbed of yellow fever, dysentery, and other tropical diseases, and was called by the people of Mexico "The City of the Dead." If it had a climate like that of France, it would be a great city, for it would contain all those to whom it is advantageous to live in a good seaport. Actually, after the fashion of trade-wind shore ports, it contains only those who *have* to be there. Thus Veracruz has but 68,000 people, although it began as the first Spanish settlement in Mexico and is today the chief port of that country. In western Europe or California it would have 1,000,000 people if it had such a country as Mexico behind it.

It was the base for the Spaniards during their conquest of the Aztecs, and also for General Scott, commander in chief of the American Army, conquering the same places. The city was many times attacked and several times sacked by pirates, hence the great fortress San Juan de Ulloa (Ulúa), on an island in the mouth of the harbor. The harbor is naturally only a shallow lagoon, but jetties have been built, and the tidal current, thus narrowed, has cut out an excellent entrance to a good harbor.

The plain itself is only a dozen miles wide at Tampico, but at the most southern point it widens out, so that the Grijalva River, draining Chiapas, is navigable for 270 miles for small river boats, and the Usumacinta, which drains part of Guatemala, is navigable for 93 miles.

The rainfall in the Isthmus of Tehuantepec exceeds 120 inches per year; at Progreso it is only 18 inches because the low plain of Yucatán has no elevation to squeeze water out of the trade wind. The rainfall declines so rapidly east of Tehuantepec that there is some land along the bay of Campeche having a savanna landscape. Behind this, in the mountains, the rainfall is greater, the forests are dense, and logwood (the word Campeche means

logwood) has long been the chief export of Campeche. Here chicle is also gathered by Indians of the forest.

In the Tehuantepec region the forest is almost unclearable, but this humid, level country makes prime banana land. The local growers, seeing the success of the Sisal Trust in Yucatán, combined to raise the price, but they did not realize their helplessness until the ships ceased to call for the fruit. There were other bananas, and Tehuantepec is not now important in the industry. There was a little export in the days of Diaz. After the World War it started up again.

The hothouse climate of the dampest part of the Tehuantepec district is the ideal home of the vanilla-bean vine, and there is a considerable production of these beans. This industry is menaced by a synthetic vanillin from coal tar. Perhaps it will be annihilated by coal tar, as was its predecessor, the Mexican cochineal (dye) industry. Farther north near Veracruz declining rainfall makes good conditions for sugar plantations. For many years this section of Mexico has produced between one-third and one-half of the nation's sugar crop, about 75,000 tons in 1933–34. Even in the days of Diaz, Mexico was (and has been ever since) a small producer of sugar — an indication of its limited resources for tropical agriculture.

MEXICAN PETROLEUM

Twenty years ago the low plain of Mexico was almost as important in the world of oil as the low plain of Central America was in the world of bananas. Tampico oil fields have furnished the world's greatest gushers. In 1910 a column of oil spurted 600 feet into the air. The changing breezes blew it for miles in all directions, wetting everything and creating the greatest possible risk of a flash of flame that might have been the nearest approach to the Day of Judgment ever seen upon the earth. At the end of nine days the oil workers, at terrible risk of instant cremation, succeeded in harnessing the well, which gave a measured flow of 261,000 barrels in twenty-four hours. This is the world's sprint oil record, and the Tampico oil region also holds the world's long-distance record. When it started in 1910, the famous Potrero del Llano well yielded 100,000 barrels a day for months, averaged 27,000 barrels a day for ten years, and by 1933 had produced a grand total of over 115,000,000 barrels of oil. All this from *one* well! No wonder the term "striking oil" has become synonymous with sudden wealth.

MEXICAN OIL AND POLITICS

Consider also the possibilities for international embroilment and civil war, with a source of wealth like this in a semibandit country such as Mexico was at times. If any source of wealth has ever tempted men to fight, it was surely these oil wells. Suppose you knew of a tract of land on which oil seeps indicated the presence of a large pool of oil. Suppose a tottering Mexican Government would not grant it to you as a concession. Suppose you had a few million dollars of extra money. You could buy a few thousand rifles,

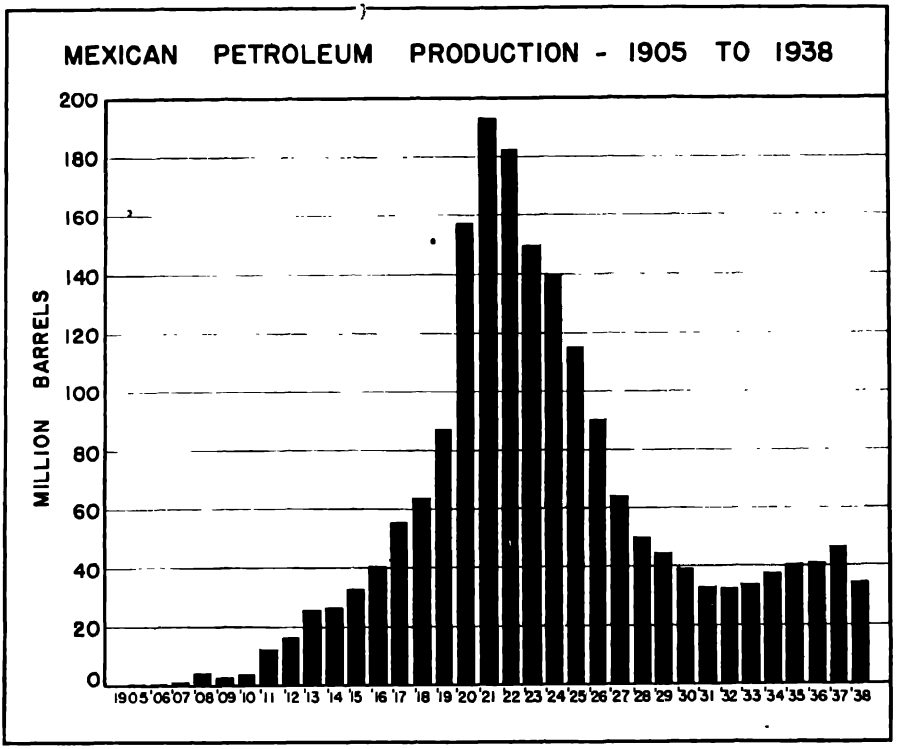


FIG. A. Petroleum prosperity hath wings, for it is a quickly exhaustible and entirely nonrenewable resource. Porfirio Diaz fled in 1911. See what a dictator's opportunity he missed! (Data from *U.S. Minerals Yearbook*)

a few dozen machine guns, and a few million cartridges for the rival general, and he would probably promise you almost anything in the line of laws or concessions after he got into power. It is openly alleged that such things did happen. It costs money to wage war — even a bushwhackers' war. Certainly someone, probably foreign interests, financed the long string of revolutions that followed the overthrow of Porfirio Diaz in 1911. The details of the whole sordid business would make interesting reading — if one knew them and dared print them.

The whole output of Mexican oil has come from an area of about 800,000 acres of land,[8] and since the first well was sunk in 1901 the total output has been over 1,300,000,000 barrels. Production reached a peak of 193,000,000 barrels in 1921, Mexico ranking second only to the United States. In 1938 Mexico ranked seventh among the oil-producing countries of the world with an output of only 35,000,000 barrels. Following a series of labor disputes during which the foreign companies refused to raise wages in compliance with a government order, the Mexican Government inaugurated in 1938 a large-scale expropriation of foreign-owned oil properties. The American com-

[8] In 1930 there were 1180 concessions, covering 31,000,000 acres.

panies, including the Standard Oil Company of New Jersey, the Standard Oil Company of California, and the Sinclair interests, were deprived of investments and concessions valued at $200,000,000, and the British companies, chiefly the Royal Dutch Shell, lost about $250,000,000. As yet (February, 1940) the Government and the companies have been unable to agree on a plan for reimbursing the companies.

THE WELLS, THE OIL, THE SHIPMENT

These Mexican oil wells had such a prodigious flow because of the peculiar rock formation. Most wells flow from porous sands, and one well drains only a small area. Some Mexican oils are in caves of old, hollowed limestone, really great underground tanks, where they can flow freely rather than by filtering slowly through the usual sand or sandstone.

Most American oils are driven out by the pressure of gas on top of the oil. The Mexican cave oils are on top of artesian water, salt water at that, so they have an enormous and steady pressure, averaging from 300 to 800 pounds per square inch, with a record of more than 1000 pounds. Thus they flow from first to last, whereas most American wells must be pumped after the gush of gas is over, and the last of some Mexican oil wells is the rising of salt water.

Mexican oil comes hot, sometimes as hot as 180° F., which is very fortunate, for the oil is so heavy and thick that when cold it does not flow easily. Some of it cannot be sent through pipe lines except for short distances under much pressure. Much of it is sent to sea in barges, for which the location could not be better, because the chief oil field is on both sides of the Panuco River, down which barges can carry it to Tampico, which is a deep, safe river harbor.

Forty miles south, the southern field, behind the port of Túxpan, has a different method of shipment. The oil can be made to flow short distances through pipe lines, which are carried a mile or so to sea, where vessels lying off the beach load from the end of a great rubber hose. These shipping pipes are scattered up and down the coast.

This Tampico oil field is an unwholesome place, unwholesome physiologically owing to malaria, unwholesome morally owing to its crowd of gamblers, with its free flow of drink, with its renegades from the United States and many other countries, with its colony of Mexican grafters, gamblers, and the usual flock of prostitutes. Then there are two other human types, the honest lover of adventure who likes to be in such a place where life is in the raw, and the experts — geologists, accountants, chemists, superintendents — who for the most part remain sober.

THE FUTURE OF THE MEXICAN OIL FIELD

Dr. G. O. Smith, Chief of the United States Geological Survey, estimated in 1920 that Mexican oil reserves were about 6,000,000,000 barrels, or forty-five times the export of the year 1920. Such estimates are, of course, un-

certain and, since the present tendency of oil estimates is to underrun, let us hope this will be the case in Mexico; in times of commercial peace it was an important source of supply to the consumers of the United States as well as the financial and commercial interests. The young industries of Mexico City are now using it, and its importance to a country with almost no coal is difficult to overestimate.

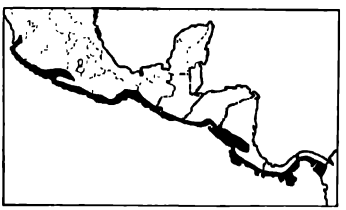
The Americans are the best oil-well drillers and operators in the world — witness the personnel of most foreign fields. It is said that every well in Mexico was drilled by an American. With oil lands leased to American companies, the wells operated by Americans, the business managed by Americans, the supplies coming from the United States, the oil going largely to the United States — with all these things in Tampico, it is no wonder that the Mexicans call it Gringolandia, "gringo" being Mexican slang for an American from the United States, somewhat as "greaser" is applied by Americans to the Mexican.

In twenty years Tampico grew from a squalid little town without sewers to a modernized, well-lighted city of 100,000 people, where seven- and eight-story steel and concrete office buildings stand beside ancient Mexican stone structures. In 1921 it was the first oil port in the world. For miles at sea the surface was often covered with petroleum, spilled overboard in the course of the day's work of loading the tank steamers which came from every important country.

Oil, unfortunately, is a fugitive and exhaustible resource, and petroleum prosperity has wings. With the decline of oil production, Tampico's population dropped to 68,000 in 1930, a loss of nearly one-third of its people in a decade. Business stagnated, buildings stood empty, and property values declined. Such is the fate of an oil field.

Chapter 46. THE PACIFIC COAST OF CENTRAL AMERICA AND SOUTHERN MEXICO

THE LEEWARD SIDE OF A TRADE-WIND LAND



FROM Panama to latitude 21° on the west coast of Mexico is one long, long monotony. Save where an occasional reach of mountain extends to the sea in the Mexican State of Oaxaca and in Costa Rica, there is only the white surf of the Pacific beating upon an almost unbroken white sandy beach. Behind this there is often a fringe of coconut trees growing wild, and often a lagoon; and behind the lagoon is a flat, bushy plain, sometimes swampy and always malarious.

Behind the swamp is a belt of grassland, often with clumps of trees and thickets of thorn forest. Jungle begins at from 500 to 1000 feet elevation, and as it ascends the slopes it changes into a real tropical forest at from 2000 to 3000 feet. Here grow mahogany and tree ferns. Farther up the mountains the growth changes to cool forests of pine. In some places, especially in Panama, where the continental divide is lower, the forest comes down to the sea.

RAINY SEASON — DRY SEASON — GRASSLAND

This is the lee side of a trade-wind land. While the east or windward side has rain most of the year, the leeward side has a short rainy season and a long dry season, hence grass and bush rather than forest. Only in summer does the land become warm enough to create a pressure contrast with the sea that causes air to rise from the land and the sea winds to blow in and bring moist air to this lee side. Then the great white cumulus clouds form in the afternoon, rise, and with further cooling and condensation result in a shower of rain. Next day it rains again, and the next, and the next, and the next.

At that season the streams, almost or quite dry a few weeks before, become rushing torrents; much of the flat land is flooded; in the hot humidity everything becomes green with rank, rapid growth. The grass shoots up knee-high, waist-high, even head-high. In the dry season the heat is great, the grass turns yellow, and the trees often shed their leaves, giving the appearance of a northern snowless winter, but this does not prevent the region from being cursed by malaria.

This is naturally the land for the cattle ranch, and much of the narrow coastal plain is used for pasture. But this calls for a very sparse population, for these ranchers are not tillers of the soil, builders of haystacks, or fillers of silos. They merely drive cattle from one grass tract to another. The cattle graze in the open throughout the year. Most of these rancheros are mestizos or Indians, ever astride the high-horned cowboy saddle on the back of a stunted pony of Spanish-Arabian descent, throwing their lariats over the long horns of mongrel cattle of neglected breeding and Spanish descent. The rancher's house commonly has a thatch roof, but his cattle pens often pay tribute to the steel mills of Pittsburgh, being built of barbed wire, which makes the cheapest fence, and has been a great boon to the cattle industry in all climes.

AN UNDEVELOPED LAND

In a few places mountain streams are diverted to irrigate sugar plantations. In the Mexican states of Colima and Guerrero there is some irrigation of rice, but the areas of these cultivated lands are small.

Since the urban markets along the west coast of the United States demand bananas, attempts have been made to supply them from irrigated spots along the Pacific Coast of Central America. The most promising of these attempts is the $10,000,000 enterprise established by the United Fruit Company along the shores of Charco Azul Bay on the south coast of Panama, longitude 82° 45′. One attempt along the Pacific Coast of Guatemala resulted in too many bruised bananas during the process of lightering the fruit through the surf from shore to ship; this fact, coupled with the expense of lighterage, caused the company to route its fruit overland by rail to Puerto Barrios and thence by steamer to markets in the eastern United States. In recent years, however, the export of bananas from western Guatemala has been resumed.

This is also the land where men gather the wild coconuts, which are important in some localities, especially in the Mexican section. Millions of them rot at many places along the shore, which has a very sparse population. There is no development of towns here except for the few unpleasant and unhealthy and often unsightly ports which handle the trade of the adjacent highlands. Harbors are few and far between, so that most of the cargo is carried in open boats to ships that lie offshore. The Gulf of Fonseca, beautiful with mountainous shores and wooded isles, affords a wonderful harbor. Here the United States Government has the concession for a naval base, which was obtained by treaty with Nicaragua in 1916, but the naval base has never been built.

Acapulco, Mexico, with a population of only 8000 people, is the largest city within this long coastal region. Its landlocked harbor, 5 miles long and 3 miles wide, is the finest water haven on the Pacific Coast of Mexico. The old Spanish fort commanding the harbor is a grim reminder of the prosperous trade of colonial days, when Acapulco ranked second only to Veracruz among Mexican ports. In that romantic era a procession of viceroys, dons, hidalgos, soldiers, merchants, monks, and humbler folk passed o'er the busy quays of Acapulco. Galleons laden with silks, jewels, ceramics, spices, and

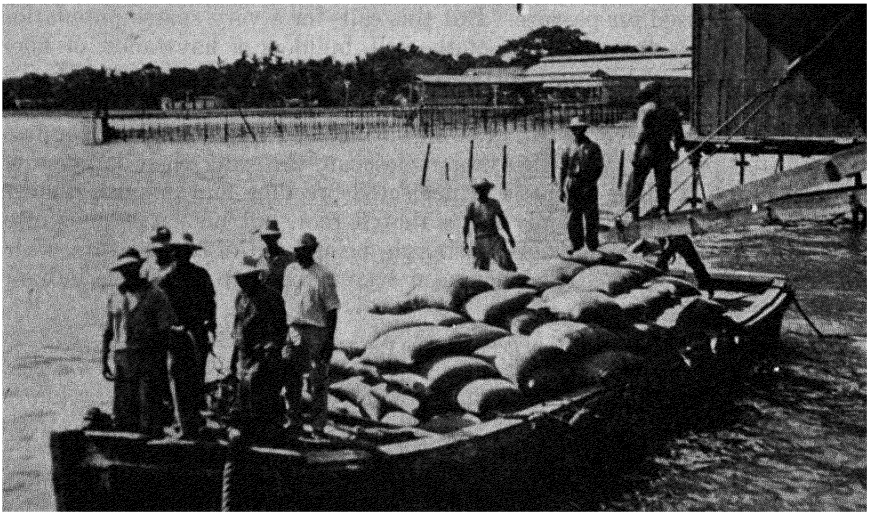


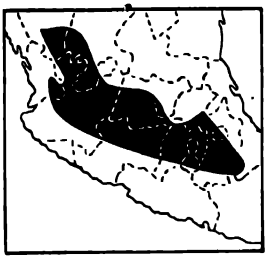
FIG. A. This lighter with sacks of coffee leaving the pier at Punta Arenas on the Pacific shore of Costa Rica illustrates the difficulties of handling freight on a harborless coast. It would be much worse on a windward coast. The building and enclosure in the background are for bathing. (Courtesy Robert S. Platt)

other precious Oriental goods discharged their cargoes at Acapulco for transshipment to old Spain via Mexico City and Veracruz. But alas! in modern times the trade of Acapulco has languished. No railroad connects it with the capital, and the prosaic commodities of modern commerce come not to Acapulco except for local consumption. Since the completion of a splendid highway connecting it with Mexico City, Acapulco has developed into a popular sea-bathing resort, and its tourist trade is growing.

As to the future of this west coast, the elimination of malaria and the coming of better government (two things hard to obtain and maintain) might easily result in a doubling of the population through the more intensive prosecution of the cattle industry. This might be brought about by using the plow in the production of forage crops, which would have several times the food value of the present wild grasses. Some cotton might be grown if the water from many small mountain streams were used as it is in similar latitudes in Peru.

Many of the drier sections are admirably suited to the production of sisal. A few plantations have been started in Honduras and El Salvador, and there is room for many more. Coconuts might be grown on an extensive scale.

Chapter 47. THE CENTRAL PLATEAU OF MEXICO



THE spider's solid body is held up in the center of a far-reaching circle of thin legs. Similarly the central plateau of Mexico, heavy with people, the center of population and government, looks out in all directions to thinly peopled corners of the country — empty Quintana Roo (now divided between Campeche and Yucatán), scanty Chiapas, desert Sonora, and Lower California, unexplored western Sierras, dusty Chihuahua, and Tamaulipas with its chaparral.

This part of Mexico, so small in area, is so large in its population because its plateau climate is cool enough to be healthful, its rainfall is small enough to keep most of the area free of swamps and large enough, though barely (20 to 30 inches), to permit the growth of food.[1] Here again, as in Yucatán, we see the advantage of meager rather than abundant rainfall. The northern boundary of this region is the northern limit of crops without irrigation.

The soil is rich and the long growing-season permits two crops a year. This favored region is also studded with rich mines to furnish jobs for city workers and a product for export.

The plateau dweller has two industrial worries: Will there be enough rain to make a good harvest? Will the price of silver, lead, or copper keep the mines going? Price and the weather are perpetual worries.

FORMATION OF THE PLATEAU

Once this land consisted of low mountains and wide valleys. Then it was lifted up several thousand feet and became the plateau. The entire plateau was pierced through with scores of volcanic cones, which proceeded to cover most of the surface with lava or volcanic ash. Therefore it is a rich land, like the Columbia Basin. This volcanic outpouring dammed up most of the streams and made the valleys into vast lakes. Here river-borne mud mixed itself with volcanic ash, which made wide expanses of the choicest kind of soil when the rivers had cut outlets and drained the lakes. The formation resembles that of the Red River Valley of Dakota, Minnesota, and Manitoba, but this northern valley had no volcanic ash to enrich the soil. The basin in which the City of Mexico stands, unlike the valleys of Puebla, Tlaxcala, Guanajuato, Querétaro, and Jalisco, has no outlet. As a result seasons of heavy rain caused floodwaters to back up into the city and

[1] Two-thirds of all the people in Mexico live at an elevation of over 1000 meters (3280 ft.). Of the 21 largest cities in 1930, as listed by the *Foreign Commerce Yearbook*, 13 have an elevation of 5000 ft. or more, and 16 have an elevation of 4000 ft. or more.



FIG. A. Cross-section to indicate how Mexican coastal plains, cordillera, and plateau were made. **AA**, sea level. The lined area represents old rock formation, the dotted area alluvial and volcanic filling of inland basins. The black is the lava cap that covers parts of the western cordillera.

remain. It took a long time for the water to evaporate, and a most unwholesome situation arose, which has been remedied at great cost by the digging of long tunnels to make an artificial drainage outlet to this rich and otherwise favored tract of land.

These old lake beds, like the flood plains of the Nile and the Euphrates, made farmers many centuries ago of the men who lived there. The climate helped to settle man down and encouraged him to till the soil.

CLIMATE

This Central Plateau is as remarkable in its climate as in its soil. The maps show it to be within the tropic latitude, but because of the elevation it does not have a tropical climate. The winter is cool, with occasional frosts and rare snow. The average January temperature of Mexico City is 54° F., the same as that of Yuma, Arizona. Its hottest month, May, before the beginning of the summer rains, has an average temperature of 65°, which is one degree lower than the hottest month in Quebec, and five degrees cooler than Montreal. Summer temperatures of 88° and 90° are rare. It is hot in the sun by day, but, as is the case in all arid lands, surprisingly cool in the shade, so that the sojourner needs a sunny room even in July. The nights are always so cool that one sleeps under blankets, and the summer traveler is advised to carry overcoat and wraps. Already this part of Mexico has become a center of summer travel, so comfortable are the temperatures in an interesting land.

This climate is so different from the tropics that the natives of the plateau perish in the hot and humid plains of lowland Mexico as quickly as, or even more quickly than, would the people of northern Europe or the northern United States. In the Diaz regime the banishment of offenders to the tropical forests was a common punishment dreaded by the people but little less than a direct sentence of death before the firing squad, which has been the fate of so many thousands of Mexicans.

The rainfall of the City of Mexico, typical of the plateau, 23 inches per year, is ideally distributed for growing crops. One-tenth of it falls in the winter, when the frost might injure crops. It rises in effective crescendo throughout the summer months: May, 1.9 inches; June, 3.9 inches; July, 4.1 inches; August, 4.7 inches; September, 4.1 inches; October, 1.8 inches.

This rainfall, with the hot sunshine, makes the plateau a land of wheat, barley, corn, and beans, especially corn and beans, the great staple foods of the Mexican populace. Mountain streams bring water which can be used for irrigation.

PEOPLE AND CIVILIZATIONS

Here Cortés found the rich Aztec Empire with a complex social organization and the unheard-of collections of precious metals which astounded Europe and roused the brutal Spanish conquistadors to an orgy of crime that should make the Caucasian race blush for the next thousand years.[2]

At that time the Indian farmers had this plateau in a high state of cultivation. For centuries they had been using mountain streams for irrigation, and their physical achievements, as shown by the ruins of palaces, pyramids, and works of art and craft, entitle them to much more respect than they have received. The Spanish conquerors took their empire and made their capital city the capital of the Spanish colony, which was rich in human material. Here in 1524 was the first European school in the New World, in 1536 the first printing press in the Americas, in 1693 the first newspaper of the New World. Today the City of Mexico is larger than any New World city south of Los Angeles and Philadelphia and north of Rio de Janeiro.

There is no Negro population here. Slaves from Africa were not needed because the Indian was accustomed to labor. Therefore he survived Spanish tyranny and abuse. The system of peonage previously described remained in full force here for centuries. The Spanish conqueror took the land, regarded the natives as work animals, and treated them accordingly. The Indian lived on the land in economic bondage under a modern survival of serfdom. Eventually land hunger gave rise to revolutions.

There was no social problem, no land problem, until toward the end of the regime of Diaz. The Indians were too completely beneath the dictator's heel. Then came Madero promising land to the landless. The organized-labor movement, with 800,000 members in 1923, was the first step in Mexico away from mere personal loyalty to a leader. It made common cause with the landless peon. Obregón and his successors have regarded themselves as disciples of Madero. In the early months of Obregón's rule it was said in Mexico City: "We have got to satisfy the Indians' land hunger or there will be another revolution. The Indians have destroyed four governments in ten years." Hundreds of big estates were divided up and the land given to the Indians who as peons, or before that as proprietors, had been on it for many centuries. Expropriation of land still proceeds, despite the wails of the landlords. The great attempts at social revolution, with its agrarian reform, that made such drastic steps under the leadership of President Cárdenas (1936–40) were described in earlier chapters.[3]

[2] *The Literary Digest*, July 12, 1924, reports the discovery near the City of Mexico of a library with books of carved stone estimated to be 7000 years old, perhaps 10,000 years old. They are the product of a "Mongoloid civilization," buried like ancient Pompeii in volcanic ash. This ash, in connection with lava flow, does much to aid in estimating the age. Many of the books deal with the stars.

[3] It is true that the peon, now that he owns the land, has often gone back to subsistence farming rather than to commercial production, and trade has fallen off. This seems to vindicate the West Indian observation that the man in the *conuco* is better off than when he goes to the plantation. The *conuco* (or milpa, as it is called in Central America) makes ease. The plantation makes trade. A great possibility of trouble in Mexico is that the liberated ones will grow what they need and let the large city populations whistle.

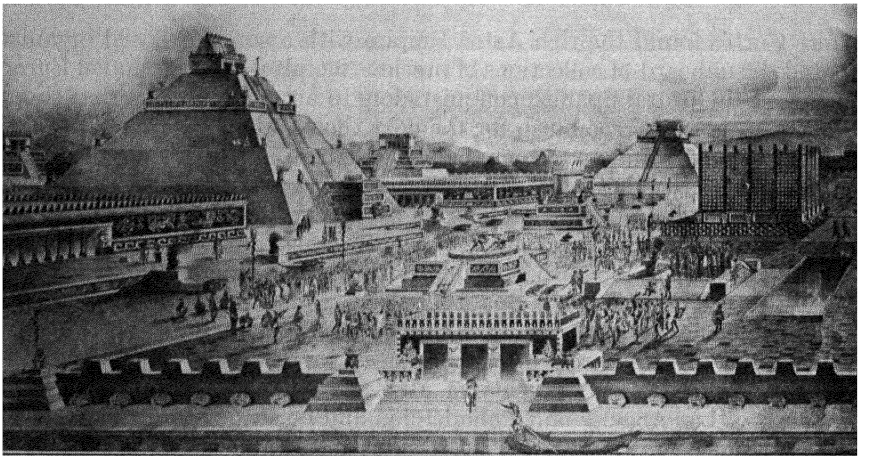


FIG. A. Photograph of a drawing made by archaeologists to be used as a guide in archaeological reconstruction. Panoramic view of the pre-Spanish Great Temple of the City of Mexico, in which were included 72 secondary temples. It should be noted that this was the work of the American Indian before he had come into contact with European — shall we call it culture? (Courtesy Dr. Manuel Gamio)

EDUCATION AND DIET

Following agitation of the land problem, there began in 1923 a national campaign of education in a land of illiteracy. A million primers were printed. Five hundred public libraries were opened. Money was scarce, so people gave up their jobs to help. It was a kind of crusade. Volunteer teachers turned out by the thousands to teach night schools bearing signs: "Entrance free. Learn how to read tonight." There was no entrance fee, no registration. The thirsty simply entered and drank at the fountain. Frank Tannenbaum found a school 60 miles from Mexico City where there was no book, paper, pencil, or desk, but there was a teacher with a black cloth and three pieces of chalk, and there were eager learners. This is the spirit of the new Mexico! Few countries in the world have made so much progress or showed such a determination to

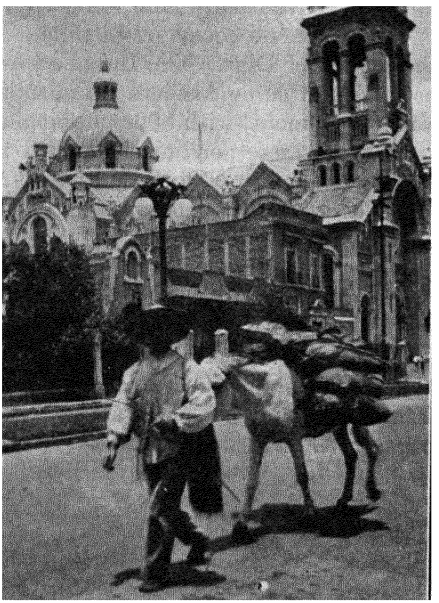


FIG. B. Spanish structures, which succeeded the native architecture and are still so conspicuous in Mexican cities. The charcoal-vendor's transport unit in the foreground is also typical. (Photo by M. Ogden Phillips)

learn in recent years.[4] As education gains ground, democracy *may* have a chance.

If the modern epoch is starting, it starts under great handicaps. The people of Spanish stock have the Castilian prejudice against work. In their social code it is degrading. Most of the people are Indians or mestizos, poor beyond belief and accustomed to the lowest possible standard of life. When railroads were first built in Mexico, one of the troubles was that the people would set up housekeeping under the freight cars and get run over.



FIG. A. The ability of the Mexican Indian as a bearer of physical burdens is a perpetual astonishment to the traveler from the North. (Photo by M. Ogden Phillips)

The common diet of the masses is corncakes and beans — tortillas and frijoles; soul and body cannot be kept together with less.[5] With a frying-pan and an open fire the kitchen is equipped, so that the freight car to keep off the rain and a blanket to wrap up in really do complete the necessities. In the morning, wrap up in the blanket, pick up the frying-pan, and the moving is complete. This is, of course, extreme, but it is real. It is this low diet of the peon

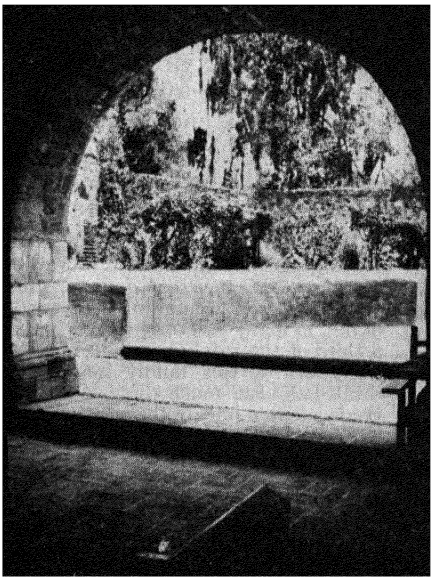


FIG. B. Inside the walled and bare exterior of Spanish-style Mexican homes there may sometimes be found a beautiful patio garden. (Photo by M. Ogden Phillips)

[4] The story of a red-haired son of an Irish father and a Mexican Indian mother shows how progress depends on *men*, and it shows what can be done by a man who has an idea and sticks to it. This red-haired Mexican started a school in an Indian village 100 or so miles from Mexico City. For about two years the pupils studied about nothing but water. At the end of that time the town had a good water supply and a good irrigation system. Then for a year or two they studied nothing but houses, at the end of which time everybody in the village had a new house, and better than those in any other villages for miles and miles. Then they studied food, with the result that they made a great improvement in their diet, and, owing to the cool, uniform plateau climate, they became prosperous from the year-round shipment of strawberries to the market in Mexico City. Too bad that redheads of that kind are so scarce!

[5] I have seen poor people cooking their supper over a charcoal fire on the curbstone of the streets in the nation's capital city.

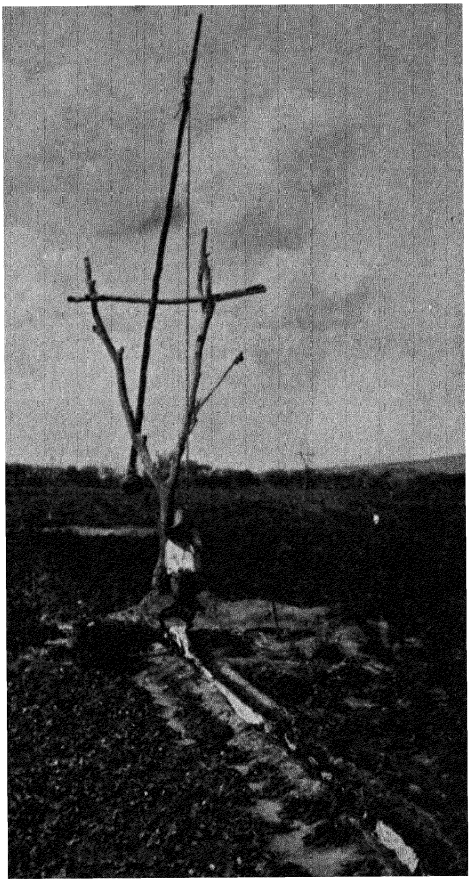


FIG. A. This primitive system of irrigation by lifting buckets of water by the balanced pole is very widely distributed in Asia and Africa. It is not used much in Mexico, but an interesting question arises: Will the redistribution of land to the Indians cause an increase or a decrease in its use? The Government of course is spending a lot of money in making large reservoirs and canals, but there is nearly always the need to get some water up from the canal. This method doesn't cost much, and the native in Mexico doesn't have much with which to equip himself. (Courtesy Pan American Union)

that enables the Central Plateau to support so many people and send corn, barley, and beans to other parts of Mexico.

CROPS AND LOCAL MARKETS

Large fields of corn and beans are conspicuous in many parts of the Central Plateau, especially in the lower lands. Some mountain, often a volcanic cone, is nearly always in sight, and the lower slopes, where it is too dry for corn or beans, may be covered with maguey, of which there are often wide expanses. It is from the juice of the maguey that the national drink, pulque, is made. Since it will keep only forty-eight hours, trains of pulque run into Mexico City as milk trains do to the cities of other lands. Although in recent years pulque has been found to possess valuable vitamins and other virtues, it would be interesting to compare the effects of milk and pulque on the death rate.[6]

On the higher mountains are forests, provided the forests have

[6] Mr. H. C. Lanks, who has done much geographical fieldwork in Mexico, reports: "The beverage, pulque, which seems to loom so large in their cost of living, in many cases represents nearly a third of the total cost. The brutalizing effect of this mildly intoxicating drink has been much discussed. It is the fermented juice of the maguey plant, and averages a low content of alcohol. It must be drunk in large quantities, therefore, to be intoxicating. For the present it seems to be the main relief from a miserable life at subsistence level. It was formerly thought by the Government that the lot of the Indian would be improved if the evil of pulque were removed. However, it has been found by scientific investigation that the drink is probably a vital necessity for some, with their unbalanced subsistence diet, for it has been found to contain vitamins A, B, and E, proteins, fats, yeast, and amino acids. It is doubtful if the race could have survived without this balancing food beverage." — H. C. Lanks, "Otomi Indians of Mezquital Valley, Hidalgo," *Economic Geography*, April, 1938, p. 193.

not been cut away. As this land has no coal and has been populous for many centuries, there has been a heavy drain upon the forests, and one of the sights of the roadside is the barefooted Indian charcoal merchant with his stock upon his donkey, coming from some distant charcoal-burner's camp, and making his way toward the town along with farmers and their donkeys loaded with farm produce. They all sit about the ever present public market square with goods spread out on the ground for the city dweller's inspection. Dickering for a sale is one of the events of life for them.

MINING AND THE FOREIGN CAPITALIST

Metals are the money crop of this plateau region. Fortunately the volcanoes did not cover all the surface of this area. A flat and fertile plain of volcanic ash will end abruptly against the rocks of an old mountain deeply cut by gulch and canyon, millions of years older than the soft showers of ashes that have partly buried it. In the old rocks are the metals dug by the men whom the farmers feed with crops grown on the new volcanic ash. Scores of towns and small cities cluster with their houses of adobe or stone around mines of silver, gold, lead, zinc, and copper. Many of the mines date back to the Spanish conquest. About 40 per cent of the world's silver is produced in Mexico.

Most of these mines succumbed to the later conqueror — the foreign capitalist. It takes money to equip a modern mine, lots of money. When a Mexican gets enough money to equip a mine, he sees Paris instead, sees it grandly. Industry is not for him. Thus the mines gravitate to the hands that can hold money. Nothing was more natural than that the Rocky Mountain mining promoter should have gone on over to Mexico, especially when a man like Diaz, wanting industries, gave concessions freely to those who would come with capital and manage the new enterprise.

Toward the end of the regime of Diaz the United States consul at Chihuahua estimated the wealth of Mexico at $2,434,000,000, of which Americans owned $1,058,000,000; Englishmen owned $321,000,000; Frenchmen owned $143,000,000; Mexicans owned $729,000,000. The United States Department of Commerce estimated that at the end of 1930 about $695,000,000 of American capital was invested in Mexico, of which $230,000,000 was in mining and smelting, $200,000,000 in the production and refining of petroleum, and $73,000,000 in railroads. British investments amounted to $937,000,000, about half in railroads; French investments were $290,000,000; Spanish, $190,000,000; and German, $75,000,000. In November, 1935, there were 16,659 foreign-owned mining concessions in operation. Of some 31,000 mining properties, fully 97 per cent were foreign-owned, and these properties produced more than nine-tenths of the nation's mineral output. As a part of the Six Year Plan of President Cárdenas, some of the foreign-owned mines have been expropriated, for this is a part of the Government's program to "Mexicanize" industry. In July, 1938, 15 mining properties, including 5 American-owned properties, were expropriated — a discouragement to new investments of foreign capital in Mexico — (see Fig. 922 A).

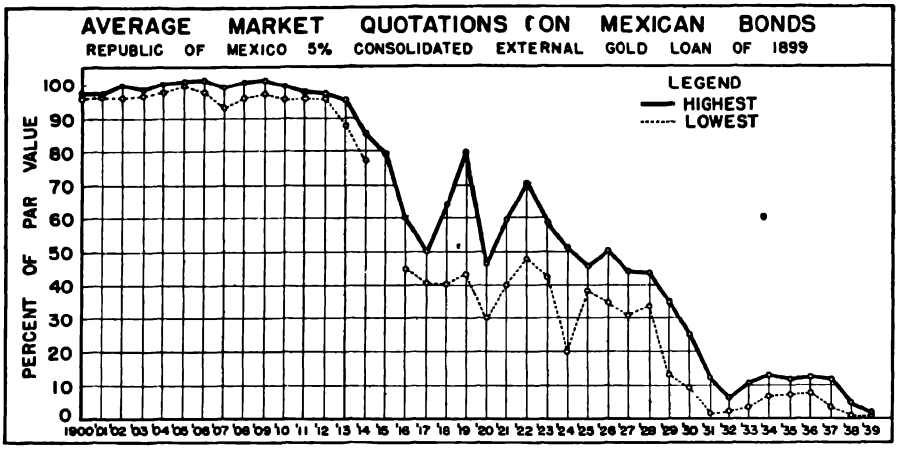


FIG. A. In 1911 Diaz fled to safety and his abundant funds in Europe. Then came years of civil war. At last we see the effect of the social revolution and the expropriation of private property with little or no payment.

CITIES AND MANUFACTURING

The outstanding human fact of this plateau is the City of Mexico. In 1776 it had three times as many people as any city in the United States. Within three decades its population has grown like an American boom town: 471,000 in 1910, 615,000 in 1920, and 1,029,000 in 1931.[7] The populous Central Plateau also contains Guadalajara, Mexico's second largest city, with a population of 176,000 people, Puebla (115,000), León (69,000), and Aguascalientes (62,000). Yet the City of Mexico towers like an overgrown giant above all Mexican cities, a true capital city. There it stands, sumptuous like Paris, with its broad avenues and beautiful buildings, a National University that was founded in 1554, a National Palace from which have flown the flags of four nations,[8] a National Museum that is an archaeologist's heaven, a National Library, a National Theater, a National Lottery, and even a National Pawnshop.[9] While there have been a number of American innovations in recent years, such as baseball games, football games, talking pictures in English with Spanish subscripts, traffic lights, and gas stations, yet here is a city with Spanish language, Spanish customs, and Spanish culture flavored with very old Mexican Indian. The Spanish bullfight remains the great national spectacle.

[7] The census of 1930 showed a population of 961,000, but in the following year some suburbs were annexed, which enabled the city to pass the million mark.

[8] These emblems were the castled and pillared flag of imperial Spain until 1821; the Stars and Stripes of the United States from 1847 to 1848, as a result of the Mexican War; the tricolor of France during the French intervention, between 1863 and 1867; and the eagle and serpent of the Republic of Mexico at all other times since independence was achieved in 1821.

[9] Established in 1775 by Pedro José Romero Terreros, a mining magnate who pitied the poor and who provided this establishment where they might obtain loans at low rates of interest. Official title of the pawnshop: Monte de Piedad (Mount of Mercy).

One wonders why this city towers above all the rest, and what supports so great a city on this high plateau. Four facts explain the large population of Mexico City. 1. It is the seat of the nation's government. 2. It is the greatest manufacturing center in the country. 3. It is the nation's greatest market, located in a densely populated, rich farming and mining area. 4. Its masses have a low standard of living, that is to say, its poverty permits a little to support a great many.

The industrial development of the City of Mexico and the Federal District presents a sharp contrast with the City of Washington and the District of Columbia, where there is almost no manufacturing and where all business depends upon the fact that Washington is the seat of the United States Government.[10] The first industrial census of the Republic of Mexico in 1930 showed that of the 463,323 persons who were gainfully employed in the Federal District, 27 per cent were engaged in manufacturing, the leading occupation.[11] Only 10 per cent were employed by the Mexican Government. The census clearly revealed the importance of the Federal District in the nation's industrial development. Located in that district were only 7.1 per cent of the total number of factories in the country, but these factories, representing 18.6 per cent of the capital invested in manufacturing, employed 19.2 per cent of the workers, paid 29.8 per cent of the manufacturing wage bill, and used 30.1 per cent of the raw materials and 16.2 per cent of all the fuel and electricity consumed in manufacturing in Mexico. These factories in the Federal District produced 27.3 per cent of the total value of the nation's manufactured products.

The Federal District is not only the greatest industrial zone in Mexico, but it is also the nation's greatest market, and the character of its industries bespeaks this fact. Here in a little area of only 573 square miles live about 1,250,000 people, or one-thirteenth of the nation's population. These people must be fed, clothed, and sheltered, and to this large urban market are brought large quantities of foodstuffs and raw materials for manufacture. Foreign capital, utilizing the abundant supply of local labor, has played a dominant role in the development of the Federal District's major industries. High Mexican tariffs have long served to stimulate domestic industry. Since coal is lacking, petroleum pumped from the Tampico fields and hydroelectric power from the near-by mountains are used as fuel. The 7000-foot descent of streams and greater precipitation in the mountains provide splendid water-power sites, one company with 13 plants supplying Mexico City and 30 towns around it. Since the Valley of Mexico and the surrounding mountains contain no iron, manufactures are of the lighter type.

Foodstuffs, textiles, printing, and tobacco are the Federal District's leading industries. Together, they employ over one-third of the factory labor and

[10] See M. Ogden Phillips, "Manufacturing in the Federal District, Mexico," *Economic Geography*, July, 1933, pp. 279–91, and his "La Industria Fabril en el Distrito Federal de México," *Boletín de la Unión Panamericana*, February, 1934, pp. 98–113.

[11] The distribution of gainfully employed persons was as follows: 124,831 in manufacturing, including handicraft industries; 69,226 in domestic service; 60,697 in trade; 46,997 in national government; 42,465 in agriculture, fishing, and hunting; 24,449 in transportation and communication; 14,993 in professional service; 611 in mining; 79,074 in miscellaneous industries.

produce about one-half of the total value of the manufactures that are sold in the domestic market. In this great urban area, the manufacture or processing of foodstuffs naturally ranks first, including such products as flour, cornmeal, bread, beer, and coffee. In the textile industry the Mexicans have learned their trade from British millmen, who are often employed as superintendents, and most of the mills are equipped with modern machinery from Lancashire. During the dry season humidifiers are kept working day and night. Printing is important, since there is a large publication of newspapers, documents, and books in the capital city. In the census year of 1930 the tobacco factories in the Federal District produced about 857,000 cigars and nearly 6,000,000,000 cigarettes. The cigarettes are made, packaged, labeled, and wrapped in cellophane with modern machines that operate with great spead and efficiency. However, about one-eighth of the cigarettes are produced in bulk to be sold singly to the poorer people who cannot afford to buy a package at a time.

The iron and steel industry of the Federal District is of peculiar interest to students of geography. In 1932 when I visited La Consolidada, the largest plant, I found no coal and no iron ore, yet the company had been doing business profitably for thirty-five years, turning out steel castings, tool steel, railway springs, bolts, nuts, rivets, and some commercial steel. Inside the plant were several small open-hearth furnaces using petroleum as fuel and several electric furnaces for the production of quality steel. Outside in the open yard were huge piles of scrap iron, undoubtedly the worn-out products from foreign countries or from Monterrey. Here, indeed, was a thriving parasitic industry, dependent upon junk for its basic raw material.

No discussion of manufacturing would be complete without mention of the handicraft industries for which Mexico is so famous. Here in a land which has the antiquity of Egypt the traveler is intrigued with the myriad products of manual skill that are offered for sale in the markets of Mexico City — the exquisite lace and embroidery, the brilliant serapes and blankets, the hand-tooled leather, the elaborate wood-carving, the hand-beaten silver, and the pottery that has been molded on a primitive potter's wheel.[12] Some of these products come from other sections of the country, but one does not have to look far to find many of them being made in the little shops throughout the city.

One more fact needs to be emphasized to explain the large population of this city. That fact is poverty, which causes little to support many. While it has the sumptuousness of Paris, the metropolis has all the beggardom of Naples, and little suffices for the poorer classes. Corn, beans, and pepper, a bit of charcoal for cooking, overalls, a cotton shirt, a blanket, and a cheap adobe house are necessities of life. Luxuries are few — a drink of pulque, an occasional game of chance. Such is the standard of living of the masses, and five or six Mexican families may be crowded together in a small dwelling

[12] The Mexican women do beautiful needlework, and Celaya is an especial center for drawnwork. At the car window the picturesque vendors offer you drawnwork, ropes, hats, shawls, and pottery of exquisite workmanship, but unless the buyer knows the goods, he is likely to discover later he has bought something made in Connecticut or Germany rather than in Guadalajara (pottery) or Celaya (drawnwork).

to live on the income of one American artisan.[13] While the standard of living is low in comparison with that of an American or English workman, it has been steadily improving in recent years, owing largely to the efforts of the labor unions and to the activities of the Cárdenas government. Indeed, the improvement of working-conditions and wages in the capital city has caused a considerable influx of poorer people from the rural sections of the country.

The city of Puebla to the southeast of Mexico City is near the waterfalls of the plateau's edge. Here many thousand cotton operators tend machinery run by hydroelectric power, and by engines fed with Tampico oil, and make manta, the cheapest of cotton cloth.

THE FUTURE OF THE MEXICAN CENTRAL PLATEAU

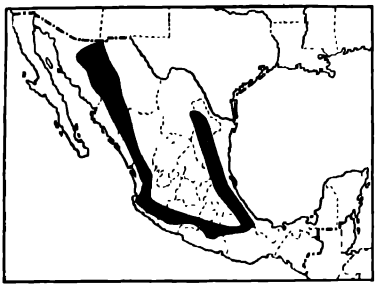
The future of this plateau region is primarily a political question. If stability can be maintained and if science and machinery could be applied to the agriculture as they are to the mining and manufacturing, this region might double its agricultural production. There is more water power in the mountains to run factories; the mines within this territory still have unworked ores, while the mineral resources of other parts of Mexico seem to be almost untouched. A peaceful and prosperous Mexico might easily see the population of the Central Plateau doubled, provided there is no great change in standards of living; another alternative would be a more expensive standard of living and a smaller increase of population. Whether it will be increase of numbers or increase of standards is an interesting question. The really heroic attempts of the Cárdenas administration toward education might shift the growth toward quality. When the mines (the money crop) are worked out . . . ?

It should not be forgotten that the people of Mexico are predominantly of Indian blood, that the great names are more Indian than European, and that these people once had a civilization that compared very favorably with that of many parts of Europe at the same time. The Mexican Indian is distinctly artistic, and very musical. His future is hard to predict; the Government is doing all in its power to give the Indian a chance.

In thinking of the Indian's future we should not forget the chilly plateau climate and the great achievements of his ancestors or predecessors (in that climate) in centuries and millenniums that are gone. The millenniums are gone, but the climate remains, and so does the Indian.

[13] This American artisan is not the farm laborer, not the share-cropper, not the unorganized Southern mill worker. He is the semimythological one we brag about ("American standard of living") — perhaps the member of a highly organized monopolistic union in the building or machine trades.

Chapter 48. THE MEXICAN CORDILLERA REGIONS



MOST of the level land of Mexico outside of Yucatán is in the Central and Northern plateaus. Aside from these level stretches, most of the country is mountainous, often very mountainous. For example, the plateaus are completely cut off from the Mexican shorelands by the eastern, western, and southern cordilleras. These mountains, which lie somewhat in the form of the letter U, usually rise 2000 or 3000 feet on the plateau side, with many peaks standing higher, and go down 8000 or 10,000 feet on the seaward side. The outer, or seaward, slopes of the Sierra give a fine example of the three zones so often mentioned by the Mexicans in describing their country: *tierra caliente* (hot land), elevations up to 3000 feet; *tierra templada* (temperate land), with its best development at 5000 feet; *tierra fría*, or cold zone, above 7000 feet. These zones, coming close to each other on the steep eastern slope, help to make this region a botanist's delight because of the great variety of plants to be seen growing close together. The seaward slope of the western Sierra runs out into the desert, but the seaward slope of the eastern Sierra runs down into a wide tropic plain where jungle covers much of the land. Above this coast jungle comes a wealth of orchids, and then of evergreen oaks, deciduous oaks, pine, spruce, and fir, which spreads out into fine forests between 9000 and 10,000 feet on the slopes of the volcanoes. The forest does not disappear until 13,000 feet, above which come the Alpine grasses and flowers, which are distributed throughout the world with strange uniformity in certain temperatures, whether they be at sea level in Alaska, at 10,000 feet in Colorado, at 14,000 feet in Mexico, or yet higher on the Andes.

The continuity of these mountain walls has done much to prohibit travel from the sea to the interior of Mexico, especially on the west, where there is no break, no railroad, no used trail even, between the United States boundary in latitude 33°, and the railroad that follows a gorge down to Mazatlán in latitude 23°.

The southern mountains are a string of high volcanoes, but they make less of a barrier than the eastern and western ranges. It was here that the first and for a long time the only railroad entered the plateau from a Mexican port — the line from Veracruz, a difficult and expensive piece of engineering, late in its inception and long in building.

The greater part of the Sierra region has few people. One section, however, is populous. That locality is the outer slopes of the Sierra at the southeastern tip of the plateau and especially the part near the giant cone of Orizaba, eternally snow-capped and 3½ miles high. The mountain slopes here are made of volcanic ash. The trade wind brings them more rain than comes to any other part of the Sierra. The melting snows of Orizaba furnish water that may be used for irrigation in a dozen valleys that gash its slope.

In thinking of this little Indian Eden we should not forget the beneficent volcano. It furnishes not only the irrigation water but also the volcanic ash — fertile new stuff lying under a climate that gives minimum leaching.

FROM VERACRUZ TO ORIZABA

The journey from Veracruz to Orizaba displays the life zones of this area. As one goes up the scene changes rapidly. The narrow plain behind Veracruz is grassland because of the long dry season. The cattle ranches show few signs of human activity. Immediately, as the road enters the mountain, signs of more continuous rain appear. The valley floor is silver-green with sugar cane or darker green with corn. Everywhere the mountainsides are dotted with the palm-thatched houses of the primitive agriculturalists, with their bananas, plantains, corn, and other vegetables immediately around the house. Steepness is no barrier. There seems to be a hut in every little pocket where one can be perched — where man can climb, he can use the machete, and the banana plant can stand. The land is populous, like the windward slopes of Puerto Rico. The porous soils of volcanic ash do not wash as much as other soils. I doubt if the world affords a steeper agriculture. After climbing a few hundred feet the railroad enters the coffee zone, with its three layers of vegetation — close to the ground the dark-green shrubbery of the coffee tree, and here and there among the coffee the more lofty banana plants, and standing above everything else thin-topped shade trees. Thatched houses are everywhere.

At 4000 feet in one of these valleys in the midst of fertility and climatic delight is the city of Orizaba. Neither mosquitoes nor malaria are found at this altitude, and Orizaba, built on the site of an ancient Aztec town, is a summer resort for Cubans and a winter resort for the people of the City of Mexico. The region is warm enough to grow sugar as well as corn, coffee, bananas, tobacco, and a great variety of produce, as well as many beautiful orchids and ferns. Not only is Orizaba a resort, it is also a manufacturing city, where there are thousands of cotton operatives. In this Manchester of Mexico the machinery is driven by engines burning Tampico oil and by electric energy from near-by water-power plants fed by the trade-wind rains and melting snows — melting on the flanks of the volcano Orizaba, the second highest mountain in North America.

A half-hour beyond Orizaba, the railroad passes 5000 feet elevation and enters another world. It leaves the tropics. The sugar cane, bananas, and coffee give way to corn and beans. The scattered thatched houses give way to villages with houses of thick adobe walls and walled gardens behind them.

POPULOUS, ISOLATED LITTLE VALLEYS

There are many small fertile valleys cutting back into the mountains on the edge of the plateau and opening out to receive the trade-wind rains. They are the most densely peopled part of Mexico. In some places the land is terraced, and the hoe agriculture resembles that of Japan in technique and in the density of population supported. These deep populous valleys, notched into the edge of the upland both on the east and on the west, are a striking feature of Mexican geography and Mexican life. Riding along on level land, you suddenly see over your mule's shoulder a ravine 3000 feet deep full of Indian villages and tropic produce. While you look at the landscape, a train of Indian men and women walk past guiding their donkeys loaded with bananas, yams, oranges, limes, and other warm-land produce that grows in their valley but will not grow in the plateau zone above them. They are carrying the produce of their warmer valleys to the city market of the next higher and therefore colder zone. Thus Guadalajara, Puebla, and other cities near the edge of the plateau have their markets enriched by the produce of two climates that are but a few miles apart.

Much of the southern Sierra is cut into a labyrinth of deep and isolated valleys with little level land in their bottoms and none on the mountains. Travel must be by long, steep, difficult mule trails. There is almost no trade. Large districts here have no white people at all, and the Indian lives very much as he always did save for the influence of some trade goods — cotton cloth, machete, and rifle. The mountains of this southern Sierra almost reach the sea. Manzanillo and Mazatlán have the only railroads that connect the plateau with the Pacific, and the traffic is not heavy.

THE EASTERN SIERRA

North of Veracruz the eastern Sierra is narrow; it receives less rain than farther south, and it has a scanty population.[1]

Near the center of this eastern slope is Ciudad Victoria, the capital of the state of Tamaulipas and a health resort for the people of the near-by lowland. In a gateway in the northern Sierra made by the Santa Catarina River is Monterrey, the Pittsburgh of Mexico. The coal field at Sabinas is not a good coal-field, but it is the only one in Mexico. More's the pity. The iron ores of Durango, aided by a high tariff, enable Monterrey to smelt some iron for use in the foundries and machine shops of the city, which has a popula-

[1] Mrs. Clare Sheridan, the sculptress, seeking a vacation in the northern part of the eastern Sierra, praises the beauty of the region. "We made camp in a glen, with mountains towering above and cascades and rapids near the tents . . . warm and sunny, full of flowers, butterflies and water falling, water rushing and water pools that trickle. I have loved spring days in England, with their mist of bluebells in the woods and brimstone butterflies, the color of primroses; but this seasonless country that has never known frost, this heaven of eternal sunshine and riot of beauty, is almost too wonderful to enjoy. It is as if one had picked all the best from every corner of the earth and put them here and made a composition picture. On one side of me were bamboo, palm trees and tall feathery reeds; and the moon caught the flat of the leaves and turned them to silver. I said good-by regretfully, lingeringly and tearfully, although I realized that if I lived in Mexico I would weary of the seasonal sameness."

tion of 133,000. The limitations of this "Pittsburgh" serve to emphasize the present and prospective poverty of Mexico as a manufacturing country. Sitting in a land of drought (22 inches of rain), the surroundings of Monterrey bear little resemblance to the tropical gardens of Orizaba.

THE WESTERN SIERRA

It is the western Sierra which has the smallest population of the Sierra and perhaps the greatest prospect of profitable employment of a mining population. In its present form the western cordillera is the work of volcanoes. An old mountain mass of quite unknown shape has been buried under many thousands of square miles of lava. This happened long ago, and since that ancient time the streams, cutting, cutting, cutting, at the eastern and western edges of the lava plateau, have notched valleys into all its edges and cut down into the old mountains beneath it, thus exposing to the prospector their mineral contents, which the volcanic period helped to develop. On the eastern side these valleys are little but canyons, often 1000 feet deep, with here and there a little patch of valley land at some bend in the stream. The stream itself is usually lost soon after it emerges into the dry interior (basins).

The western slope is a succession of sharp valleys cut back into the plateau, and sharp spurs of mountain reaching out into the plain, getting nearer and nearer the ocean the farther south they go.

The high plateau top is often fairly level, covered with forests of pine, oak, and cedar, standing over grassy, parklike floors much like the upland forests of Arizona and New Mexico, of which indeed they are almost a duplicate, almost a continuation except for a break near the Mexican boundary. In winter they are deep with snow.

The sharp canyons, branching out into labyrinthine valleys, isolating tracts of high mesa, provide localities that are most difficult of access. In these isolated places it is more than likely that there are Indians who have never in their lives seen a full-blooded white man and who are carrying on a primitive life, almost uninfluenced by the white man.

It is not hard to see why this is a land of no trade routes. On both edges of the mountains the journey takes the traveler up boulder-strewn canyons that a distant downpour of rain may turn into a flood, carrying the possibilities of death by drowning, or of hours or even days spent perched on some ledge with a roaring flood in front and an impassable cliff or gulch behind. When the top is reached, much of it is found to be rough lava, making bad going. A railroad across this mountain mass was projected, but the company failed. If one wishes to go by railroad from the coast of the Gulf of California to the Central Plateau, he must detour far to the south or far to the north. The northern detour will take him by way of Arizona, New Mexico, and the railroads of the Central Plateau, which reach out with several branches toward the western cordillera.

The good forests on the cool uplands are not likely to give Mexico an export of lumber, but along with the mountain streams they are a great god-

send and source of supply for men who will dig the metal out of these western mountains. This part of Mexico is thought to be very rich in metals, "the mineral storehouse of the world."

A MINERAL STOREHOUSE

The cracking and raising of the old mountain rocks by the lava that finally covered them is the very best process for the collection of ores, which have been exposed along both edges by the streams that have cut valleys through to the old rocks. The heavy production in past centuries under primitive conditions can be considered as a sample, pointing the way to great future production when the deposits are worked by modern methods. Thus the Rosario mines and the Guadaloupe de los Reyes mines in the western slope, several days on horseback from the coast, sent $175,000,000 worth of silver by mules down to the Pacific port of Sinaloa before the year 1900. These and many other mines have been worked by the wasteful and expensive methods that must be used where machinery cannot be had. Often these ores have been lifted out by windlasses or carried out in sacks. There can be no good smelter in such a place, so the ancient arrastra is the substitute. By this process mules pull a heavy stone roller over a stone floor and crush the ore. The richest pieces are then picked out by hand and hauled away on muleback to be finally smelted at Jersey City or in Wales. It is well known that most ore deposits have a small proportion of their metal in ores that are rich enough to stand the cost of such processes. There is usually a larger quantity of lower-grade ores that can stand the cost of a plant equipped for large-scale production, provided there is good transportation. To develop these ores may cost hundreds of thousands or even tens of millions of dollars for a single mine.

Large-scale enterprise with a huge capital investment calls for peace and order. The Government has provided security in recent years. It may also have to provide the capital, since mighty little foreign capital will be invested in Mexico as long as expropriation is the order of the day.[2]

When the trained geologist and the expert engineer have gleaned the last facts about the mineral wealth of these mountains, they will doubtless find generations of work for tens of thousands of men and scores of millions of capital. If new enterprises are built, the situation at the famous Cananea mines near the Arizona boundary will be repeated over and over again, for this situation is typical of Latin American mines. For years a small number of Americans, chiefly in positions of skill and superintendence, have managed more than ten times as many Mexicans, chiefly, of course, Indians and half-breeds, who did the rest of the work.

[2] On January 1, 1940, a new law went into effect under which the Mexican Government will publish a list of industrial enterprises whose prospects have been investigated and considered safe for investors. The Government will guarantee that anyone investing in these enterprises will receive the minimum annual interest and his money back whenever he wants it. The guarantee fund for this plan will be obtained from the proceeds of a tax on alcoholic beverages for the next five years. ("Mexico Will Guarantee New Capital and Interest," *New York Times*, Dec. 31, 1939)

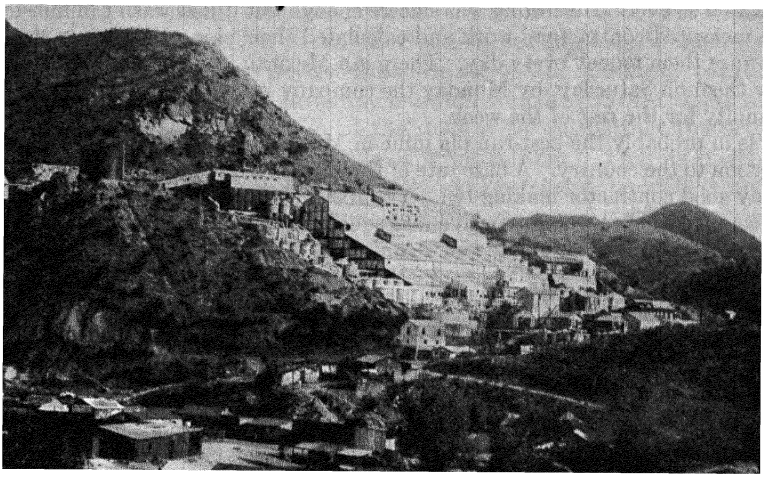


FIG. A. This huge pile beside a mine mouth in the Mexican mountains represents the large amount of foreign capital that was required to build it and equip it with elaborate and costly machinery to hoist ore, to sort it, crush it, and extract the metal. Some skilled men and much common labor are required to operate such a plant. Now that the Cárdenas policy of expropriation has made such further investments by foreigners unthinkable, the question arises as to the future for the next few years of Mexican mineral production. It might well be pointed out that the confiscatory phase of the Mexican Government will result in the conservation of metal, because it will probably lie and wait. (Courtesy G. F. Weeks, Mexican News Bureau, Washington, D.C.)

THE MEXICAN WORKMEN

The life and labor of these people is well told in the words of an American mining superintendent who had employed them. One day, while he was making an inspection, something went wrong and he started to fall to his death.

My helper, a Mexican boy of twenty-two or -three, watching above, had seen the break, thrown himself on the loose end to counter-balance my weight, and been hoisted up into the pulley. He had risked losing a hand and perhaps his life, but he had saved mine.

This chap was no model of virtue; he was an average Mexican. You had to figure on his being drunk at least one working day in the week. We were measuring contractors' work and you knew perfectly well that when you came to his brother-in-law's stope, if he had anything to do with it, there would be an overpayment of at least ten tons. . . .

There are fundamental points of variance. To begin with, the American is a worrier. The future is always bothering him; he has the success of any endeavor deeply at heart. It is physically impossible for a Mexican to worry. This same helper of mine had a small baby that died in one of the rare cold spells. He was rather moody the last two days and the morning the child died he did not work; but the next day he was back, quite cheerful. If some allusion to the affair came up he would burst into tears and be horribly depressed for an hour or more. But once it was out of his mind

he was perfectly normal again. And the Saturday afterwards he was at the dance, as intoxicated as ever. His feeling was sincere enough but it just wasn't in him to worry.

We measured contractors' work and calculated their pay once a week, but we had to advance them money every day. There is a Mexican law to that effect. If we were to pay them on Saturday, by Monday the company would have to support the entire community for the rest of the week. . . .

I was in probably the best-run big mine in Mexico. Our wages were high out of all proportion to the country. A base rate of three pesos a day (about a dollar and a half) and any good contractor making ten. Yet about 5000 Mexicans live in the little one-room company houses, about twelve feet square, a family to a house, sometimes two and three if things aren't going well. And there is no race suicide in this part of the world. Six, eight, ten people sleep in this one room, tight bolted up, with built-in windows. They eat heavy, greasy, highly seasoned native concoctions and drink spirits which make an American bootlegger a dispenser of soft drinks. The men worked underground all day, the temperature of the average working place being around eighty degrees, and came up on top and went home in the same clothes, to be changed only on Sundays to the brilliant striped shirts with which they imitate Northern culture. And yet foremen will go blind with rage at the Mexican "mucker" who will average only eight tons to the American's twelve!

The American foreman, however, is not usually as bitter as those who are in less direct contact with the men. . . .

The Mexicans are children. That is the idea that pops into your head the first time you have anything to do with them. It is a childish trait not to worry; it is childish to care little how one lives; it is childish to be cruel with one hand and kind with the other. And they are childish in their need of being understood thoroughly before anything can be done with them.

But they are children playing with real tools. There was, in that camp, an average of about a murder every ten days. I think in 90% of the cases both individuals were drunk. The company carried 1200 men on the payroll to insure a production from a thousand — one man in five off drunk or recovering every day. . . .

I hold no complete brief for the Mexican. I have worked with him enough and been too whole-heartedly angry with him for that. He is inclined to be lazy, without responsibility, thriftless and extremely dirty — though for this I blame no one but his employer. But I do hold that when treated justly he is very tractable; his very lack of worry makes him infinitely easier to handle than his American rival over the line. Like a child, he will repay trust with trust, understanding with understanding, and he is capable of great improvement.[3]

This quotation is not new, but unfortunately it has so much fundamental truth in it that we retain it in the new edition of this book. We leave it because it shows so much — first of all, the contrast between the capitalistic and the noncapitalistic mind, a contrast not limited to Mexico;[4] next, the necessity of outside capital; the opportunities for abuse and exploitation, also for collusion between the local government and the foreign manager and for friction between the foreign manager and the local government — if the latter happens to have a conscience. And finally, we get a glimpse of the possibilities that may follow the well-meaning attempts of President Cárdenas as he *gives* these people land and *lends* them money to develop it. We admire his intentions, but can only wonder and hope as to results.

[3] Ralph McAllister Ingersoll, "Mexicans on the Job," *Our World*, August, 1923.
[4] It has great resemblance to the Cotton Belt share-cropper system.

Anyone who reads this should remember that the writer quoted above was speaking of day laborers, and that there is a class of educated, cultured, traveled Mexicans, representatives of Spanish, or mixed Spanish, stock. Their manners are usually better than those of the hustling capitalistic Yankee, and their instinct for property is much weaker. Grant opportunity, and it is only a matter of time until the ones with an instinct for property will have almost all of it — witness poor Puerto Rico. That is one of the real bases of what might, without much exaggeration, be called an irrepressible cultural conflict between English-speaking America and Latin America. The English-speaking Americans have, and will continue to have, the capital. The Latin Americans need it, and will continue to need it.

Chapter 49. THE TRADE AND THE FUTURE OF NORTH AMERICA

WHAT of the future of this continent during the next half-century? During this period most of the younger readers of this book will be dwelling in North America making their living from its resources and participating in its affairs. What will these fifty years bring to them? What is to be the future of North America? Certainly it will be a period of change. There is every promise of technological change — more of it than in any like period of the past. And technological change brings social change.

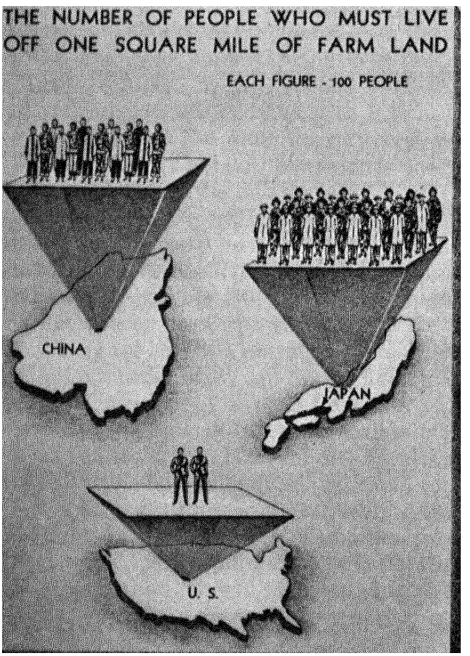


FIG. A. This figure shows how rich the American people are in that most vital of all resources — land. Soil must provide our food of the future. We need to learn how to conserve it and how to use it. Then there can be jobs and abundance for all. (Courtesy Foreign Policy Ass'n)

The continent starts this new half-century magnificently equipped by nature and by man to be the home of scores of millions of men — many more than it now has. If these millions of men, women, and children are not comfortable, it will not be the fault of the continent. Compare it with Europe, with South America, with Africa, with Australia. North America has everything that each of these continents has. No other continent has anything approaching the equivalent of our Corn Belt, our Cotton Belt, our coal supply. And as for oil, only South America can rival North America, and what is oil in the continent to the south? Scarcely a fuel; chiefly an export which it partially imports again. Something that makes the money roll in — merely a temporary cause for jubilation for Venezuela and Colombia, and something for Bolivia and Paraguay to fight about. Compared with other continents, North America may be called boundlessly rich in both quantity and variety of resources.

In order to appreciate the variety of resources, one should review the regions of this continent and observe the surplus commodities that arise

naturally from the resources of each. The regions and their leading *surplus* commodities are as follows:

The Coasts of Newfoundland and Labrador — paper and pulp, fish, sealskins, iron ore

The St. Lawrence Valley — lumber, wood pulp, dairy produce, asbestos, manufactures

The New England Canadian-Maritime Region — textiles, shoes, miscellaneous fine machinery, hardware, jewelry, fish, apples, granite, vacations

The Erie Canal Belt — clothing, heavy machinery, gloves, cameras, many small manufactures, alumina

The Northeastern Highlands — wood and maple sugar, milk, granite, marble, vacations

The North Atlantic Coastal Plain — truck, oysters, fish, ships, vacations

The Northern Piedmont — milk, apples, meat animals, tobacco, peanuts

The Appalachian Ridge and Valley Region — anthracite coal, silk goods, peaches and apples, lumber, rayon

The Allegheny Plateau and the Upper Ohio Valley — soft coal, iron, steel in many forms, machinery, glass, petroleum, wood, milk, wool, buckwheat

The Blue Ridge and the Great Smoky Mountains — wood, fruit, vacations

The Cotton Belt — raw cotton, cotton cloth, lumber, naval stores, iron, petroleum, furniture, tobacco, bauxite

Subtropic Coasts and the Florida Peninsula — rice, cane sugar, citrus fruits, winter vegetables, tung oil, phosphate rock, sulphur, vacations

The Corn Belt — corn, oats, wheat, beef, pork, dairy products, fat lamb, horses, hay, some machinery

The Lower Ohio Valley — tobacco, iron and steel manufactures, livestock, phosphate, hardwood

The North Central Dairy Region — milk, cream, butter, cheese, pork, zinc

The Winter Wheat Belt — wheat, beef

The Spring Wheat Region — wheat, oats, rye, butter, beef

The Upper Lake Region — iron ore, copper, lumber

The Lower Lake Region — agricultural machinery, many iron and steel manufactures, automobiles, packing-house products, apples, grapes

The Great Northern Forest — pulpwood, lumber, fur, nickel, silver, and other metals

The Great Plains Ranch Region — stock cattle, stock sheep, wool, beet sugar, wheat

The Lower Rio Grande Valley — citrus fruits and winter vegetables, cotton, wool, stock cattle

The Rocky Mountains — gold, copper, silver, coal, phosphate rock, wood, wool, apples, peaches, vacations, water

The Semiarid Southwestern Intermountain Plateaus — wool, mohair, stock cattle, stock sheep, gold, silver, copper, potash, water power, health resorts, water

The Great American Desert — Egyptian cotton, cantaloupes, early vegetables, citrus fruits, dates, alfalfa hay, butter, winter vacations

The Great Basin and the Upper Snake Valley — wheat, beet sugar, potatoes, wool, cattle, sheep, gold, copper

The Columbia-Fraser Basins — apples, wheat, wool, meat, water power

The Los Angeles Basin and the Coast of Southern California — moving-picture films, petroleum, citrus fruits, winter vegetables, miscellaneous manufactures, vacations, airplanes

The Sierra Nevada — lumber, water, water power, gold, vacations

Central California — prunes, peaches, raisins, plums, oranges, lemons, early vegetables, canned fruit and canned vegetables, ships

The Puget Sound-Williamette Valley — sawed lumber, wood pulp, prunes, cherries, vegetables, small fruits, ships

The North Pacific Coast and Mountains — wood, salmon, halibut, sealskins, gold

The Grasslands of Southwestern Alaska and Iceland — fish, sheep, wool, sheepskins, tallow, horses

The Yukon Valley — The American Finland? — gold, some reindeer products

The Arctic Pastures — reindeer meat, reindeer skins

The Arctic Sea and the Greenland Icecap — whale products and sealskins

The West Indies — Trade-Wind Islands — sugar, molasses, tobacco, winter vegetables, coconuts, bananas, tourist cruises

Yucatán and the Bahamas — sisal, sponges, winter vacations

The Uplands of Central America and of Southern Mexico — coffee, hides

Moist Eastern Lowlands of Central America and Mexico — bananas, mahogany, chicle, petroleum, vanilla

The Pacific Coast of Central America and Southern Mexico — bananas, hides

The Central Plateau of Mexico — silver, gold, lead, zinc, copper, manufactures

The Mexican Cordillera Regions — gold, silver, lead, iron and steel

The same racial stocks settled in Europe and in North America, but the development of industries in the two continents proceeded along different lines. All Europe was settled in the *oxcart* era centuries ago, when each community had to develop a high degree of local self-sufficiency or go without many things. In this period of self-sufficiency, settlement in North America advanced little beyond the fringes of the continent. As long as the European settlers had to make or do without, they and their descendants lingered near the sea. When the Machine Age burst upon them with its railroads, they rushed through the continent as the roots of a plant rush through soft soil. These settlements could export a product or two, and buy everything. Therefore most American regions were *settled in the commercial era*, and began life on the heavy-export-import basis. Therefore they began with regional specialization, and have kept on with large trade to a degree not often found in Europe today. This difference in the development of the regions of the two continents may be called an accident of history — a difference due to the differing technology available at different times.

Superior resources are not the only advantage that North Americans have had over Europeans in the great task of making civilization. They have had a great advantage in their isolation, which provides a natural defense. Europeans are now (1940) destroying each other with war as they have been doing at frequent intervals for the last thousand years and more. When not actually at war, the European nations have only too often been getting ready for war. From this curse the United States and Canada have had more than a century of relative immunity, thanks in large part to the favors of geographical location.

Unfortunately Central America and Mexico have not shared this advantage of peace. They have had isolation, but that was no protection from civil war. They have probably suffered more, far more, from wars in the last hundred years than Europe has.

North America has had another advantage. Most of the continent has not been separated into a multitude of little tariff units, each inflicting high

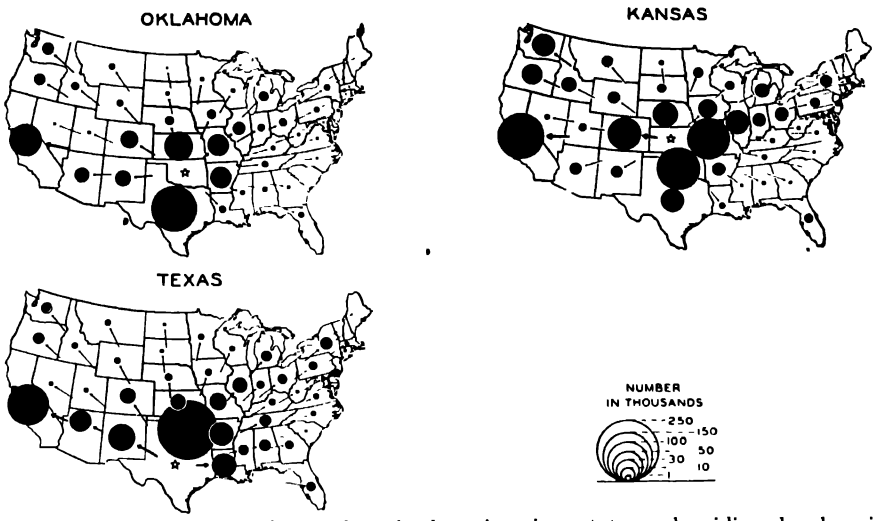


FIG. A. Native white migrants born in three American states and residing elsewhere in 1930. Perhaps we are not in the habit of thinking of Kansas as an old state and a center of migration, but here are the facts. Note that this does not include the drought refugees of the 1930's. Remember the newness of Oklahoma — only forty years old in 1930.

The large number that have gone to California, whence they can go no farther, graphically illustrates the ending of an epoch, and shows that we need a new psychology to fit the facts. (Courtesy Nat'l Resources Board)

costs upon itself and bedeviling its neighbors who would like to trade with it. It is of course impossible to say what might have been if something long ago had been different, but certainly it has been a great advantage in the development of resources for the United States to have 3,000,000 square miles in one tariff unit and for Canada to have 3,000,000 more in another tariff unit. It would have been better, of course, if the two countries could have had a free-trade arrangement.

With regard to its future, let us consider North America in four areas — (1) Mexico, (2) Central America and the West Indies, (3) Canada, and (4) The United States.

MEXICO

The Mexican coat of arms shows a cactus. On the cactus is perched an eagle holding a snake in its beak. The coat of arms is symbolic of the thorny situation in which that collection of diverse peoples, mostly Indian or mixed, finds itself.

Mexico emerged from the complete self-sufficiency of the nontrading primeval society by exporting minerals, and it still depends upon them.[1] As

[1] Although it is true that Mexico exports irreplaceable minerals in order to be able to import certain goods not produced locally, something like 90% of the population is not affected by this fact to any important degree, because they consume imported goods in insignificant quantities. Examination of the Commercial Attaché's reports on different trade areas in Mexico in almost every instance shows that the market for imported goods is limited to a small upper crust, a privileged Europeanized group, in most cases less than 5% of the population.

with England, the import trade of Mexico is chiefly paid for by the export of limited and irreplaceable resources. In England the basis of trade is coal and the manufactures that coal makes possible. In Mexico it is the direct export of minerals. Without doubt Mexico is rich in minerals, but every mineral is an irreplaceable resource, and the supply of most of the minerals that enter into international trade is definitely limited.

Now that Mexico has adopted the policy of expropriating foreign-owned property within its borders, the problem of getting sufficient capital to develop its mineral resources and other resources will be difficult. Therefore the question of when Mexico will reach its peak of mineral export is problematical, but perhaps the peak will be reached during your fifty years. After minerals, what can Mexico export? The lamentable shortage of coal and the probable exhaustion of oil offer small probability of any important export of manufactures.

If an effective solar engine should turn deserts into power houses, Mexico would still have its political, racial, and cultural limitations. Every other desert might be a competing industrial region, which would tend to limit Mexico's efforts to the home market.

Mexico is an exquisitely beautiful and interesting country, but as to resources other than metal and oil, one must emphasize its poverty, not its riches. Its great wide northwest is nearly all semiarid or desert. In the southeast are the dry limestone (karst) plains of Yucatán. Between these two unfortunate extremes are unwholesome tropic lowlands and scores of thousands of square miles of rugged mountains, rugged beyond belief, so rugged that large populations of Mexicans have never seen a wheeled vehicle. For wheels there is no track here—only the path for the foot of man or pack animal.

On the southern end of the Mexican plateau there is some good land, very good land, but in relation to the whole country there is precious little of it, and it is full of people.

The population of Mexico is large in comparison to the nonmetallic resources. The people are poor. It is quite natural that it should be so. For most, the standard of living is low. The population is increasing rapidly, with almost no corresponding increase of resources available for their support. Perhaps the people are in the position of those of Barbados, with just enough science to reduce infantile death rate from disease but not enough to check the birth rate. Hence malnutrition advances.

Furthermore, the Mexican population is extremely diverse, with many tribes of Indians and dozens of languages. Under the Presidency of the Tarascan Indian Cárdenas, there are very substantial signs of Indian dominance, with the suggestion that the white man may be pushed into economic, social, and political oblivion. Even if this should happen, it does not necessarily bode ill for Mexico's ultimate future. It is in the list of possibilities that the Indian may make the best civilization on the continent, but he will have a tough job to do it in Mexico, for Mexico is beset with problems. In the next fifty years Mexico may make great cultural advances within itself, but its cultural contribution to other countries in this period will probably be meager.

CENTRAL AMERICA AND THE WEST INDIES

What can we expect from Central America, with its coffee uplands, its banana lowlands, its revolutions, its corporations and (their?) dictators? [2] And what from the West Indies, the trade-wind isles, all ruled from without except Hispaniola and Cuba, where, thanks to the Good Neighbor policy begun by Franklin D. Roosevelt, three so-called republics are once more independent.

As in the past, we may expect the future of this region to supply sugar, bananas, coffee, a little cacao, and a few minor tropical products. But hold! Perhaps the West Indies may be the scene of a new type of tropic revolution — industrial, not political. The large corporation, which has run so many political revolutions in this area, may perhaps take a hand at running the climate, and make over some parts of the land. This area of small land units and many isles and shores may in your fifty years be discovered by corporations blessed with constructive imagination as well as capital and business ability.

SCIENCE AND CONSTRUCTIVE IMAGINATION

Science and invention have given man the powers of classic gods. Powers now within human reach give us almost unbelievable possibilities for the material basis of a civilization, perhaps even in the tropics. To name a few of the opportunities that now seem to be within reach: We can irrigate our dry lands, drain our swamps, almost drive out malaria, reduce preventable disease to a low figure for all except those of low intelligence and weak will power. We can probably get sources of almost unlimited mechanical power. We can probably open parts of the tropics to the white race, and the West Indies offer unusually good opportunities for these new adventures by those who use science.

Two of these possibilities, power from tropic sea water and the control of tropic climate by air-conditioning, merit discussion.

POWER — PERPETUAL AND UNLIMITED

Unlimited mechanical power seems to be within the reach of man in the West Indies and perhaps elsewhere in low latitudes. First, it is a well-known fact that ether is turned from a liquid to a gas at a temperature of less than 80° F., and that this gas, like steam and other gases, will run an engine. Second, the warm surface waters of the South Atlantic, the Caribbean, and the Gulf of Mexico have the necessary 80° to boil ether. At a depth of 2500 feet these same seas have a temperature of 40°. Engineers have pointed

[2] In 1939 someone made a generalization as follows: "South of the United States there is one country, Costa Rica, which is a democracy. All the others are dictatorships, and all the dictatorships are dictatorships of the right save Mexico, which is a dictatorship of the left."

This statement is slightly figurative, but it is so much more accurate than many official pronouncements that it should be examined with some care.

out that all that is needed for developing power is to supply an ether engine with both kinds of water. Warm water vaporizes the ether, which then runs the engine. The ether gas is then condensed by the cold water. This now liquid ether is then ready to be heated and vaporized again by the warm water — and so on and on. This process is identical with that by which a condensing marine engine takes a limited amount of boiler water at New York and repeatedly boils it with fire and condenses it with sea water and thus makes the journey across the ocean. The entire West Indies is swept by the trade wind at a temperature year in and year out warm enough to run ether engines. At places on the Virgin Islands of the United States, on some Cuban shores, on the Bahamas, and probably elsewhere, cold water for condensation can be had a half-mile from shore at a depth of 2500 feet. These islands might become power plants of an almost unlimited extent, with perpetual supply of the "makings" as long as the sun holds out, the trade winds blow, and the cold water keeps replenishing itself from the abundant supplies at the poles. This opens a wide vista to speculation and invention. Many hydrocarbons have low boiling-points. One boils at 26° F.

Perhaps some person who is inclined to look down and not up will call attention to the fact that M. Georges Claude of France, the inventor of the neon light and the foremost experimenter with the sea as a source of power, did not make a success of his attempt off the coast of Cuba. That is true. It is also true that he has made power by this method experimentally. It is also true that Hero's steam engine whizzed experimentally nearly eighteen hundred years before James Watt put it to work, and that it was another hundred before Hero's principle of the hissing jet had become the turbine engine. But in this age technological advance is more rapid if financially supported. Application of these principles might mean a quick shift of electrical smelting and other industries requiring great amounts of power.

There is no physical reason why such plants and their attendant towns might not grow up on West Indian isles as quickly, for example, as the largest oil-refineries in the world have already grown up on the isles of Curaçao and Aruba, Dutch possessions just off the potentially troubled coasts of Venezuela.

This electric development may be greatly aided by another great invention.

THE ESCAPE FROM TROPIC CLIMATE

Science is now ready to do the second half of a job of which the first half was done ages ago. The innovator who first heated his shelter with fire doubtless created a great hubbub among the cave dwellers. Heating the dwelling no doubt opened some lands of frost to man. It is probable that before man had heat in his domicile, he had been an inhabitant of the tropics. This revolutionary invention of fire greatly changed the history of man. If we make a house with a tropical or near-tropical temperature and so can live in cold lands, why should we not make a house with a cool temperature and dry air and be able to live in it in tropic lands? We have worked out to perfection the temperature and humidity conditions necessary for the pres-

ervation of dead pigs and then practiced the science as a fine art in cold-storage plants. This was done decades before we had done anything to find out what conditions of temperature and moisture in a building were best for the living human animal.

Ellsworth Huntington, in his book *Civilization and Climate*, has advanced the claim that man's mind functions best when the outdoor temperature is about 40° F., and his body does best when the outdoor temperature is from 60° to 70°. , The same author has since followed his conclusions with other studies,[3] all of which tend to show the great improvement of health and vigor that come to human beings who live under certain conditions of temperatures and humidities.[4] Great is the resistance of the human mind to new ideas, but a decade or so after Huntington's book appeared, commercial interests moved air-conditioning from the cold-storage plant (city storage and house refrigerator) to the cigarette factory and the stock exchange, and in the decade of the 1930's there was much investigation, much advance in knowledge, and there were thousands of installations. Indeed the curve of the business of the air-conditioners has gone steadily up through the years of the depression since 1929. The book *Living with the Weather* by Dr. Clarence A. Mills states the conclusion that a tropic denizen can work out of doors and maintain health and vigor if he can get a full night's rest under proper conditions of temperature and humidity.[5] A colony of petroleum technicians now resides in air-conditioned houses on the hellish Bohrein Islands in the Persian Gulf.

It seems to be perfectly clear, as a theoretical proposition, that we can build on a tropical shore a large residential structure in which conditions for health and vigor will be almost as good as those prevailing in northwestern Europe or any other place that we deem ideal. There is no technical obstacle to enclosing a whole town under one roof, including playgrounds, stores, and places of public assemblage. Here women and children might spend from twenty to twenty-four hours a day. Here men would spend the hours of sleep, of eating, of loafing. Workers could enter the factory without going out of doors and could thus spend worktime, sleep time, and eating-time in ideal and controlled climate.

As for agricultural workers, they might after breakfast travel by motorbus a few miles out to the plantations, where eight or ten hours a day in the tropical air might do them no more injury than results from eight or ten hours a day in freezing or zero weather in Minnesota. I have seen in Spain agricultural villages with from 3000 to 5000 people, 4 or 5 miles apart, without a dwelling between. The land between the villages is cultivated by the villagers, who go forth to their distant fields — without the aid of motorbusses. They live in the villages because man is a social animal. The tropical town

[3] See *Modern Hospital*, January, 1920.

[4] Mr. Huntington may not be wholly right in his figures, but theoretically he is right in his main point — that there must be some degrees of temperature and humidity that give more human effectiveness than others, and if he, the pioneer in this idea, has not found the exact degrees, it should not be long before others do find them by experimentation.

[5] See "Living Problems in Subtropical, Tropical and Oriental Regions with Prolonged Periods of Moist Heat," Chap. XIV in this book (University of Cincinnati, 1934).

under one roof, with an ideal climate mechanically made, would have the advantage of social opportunity, good conditions for health, and greatly multiplied energy.

Three things need to be considered together: unlimited power from ocean water, air-conditioned dwellings, and the almost equally new science of preventive medicine. Bring these three assets together, and the past of the tropical sections of North America and the West Indies need not be taken too seriously as barred from future economic development, perhaps even social development. Ocean heat may furnish power for industry and power for conditioning the air in the dwelling. There might quickly follow a shift of electric smelting, air-nitrate plants, and other heavy power-using industries that could quickly make a considerable number of sizable West Indian cities.

Suggestive of what may be done in tropical agriculture is the striking reduction in malaria and some other diseases that has been effected by the United Fruit Company on its banana plantations. With our newly developing technique of soil conservation and the development of crops that grow upon trees, there seems to be the possibility that even tropical lowlands might become as habitable in the future as our Cotton Belt has been in the past, perhaps more so.

The successful development of Central American communities depending upon tropical agriculture and maintaining good health and permanency is a far more difficult matter than to evolve a wholesome industrial city on a West Indian island.

An enemy of the elimination of disease, especially tropical disease, is modern swift transportation. It is said that the British rulers of India live in constant terror lest a couple of mosquitoes arrive some day by airplane and kill 100,000,000 people by introducing yellow fever. The population of the forested Congo area of Africa is actually declining because of the spread of disease, largely by white men's agencies.

CANADA

Canada is larger than the United States, but most of Canada is a sea of mountain, forest, and waste. In this sea are four islands of good land. These four islands are the settled lands of the Maritime provinces, the basin of the St. Lawrence and the Great Lakes, the prairies west of Winnipeg, and the Pacific Coast of British Columbia.[6] Nearly all Canadians live in these four soil islands. It is unfortunate that the inhabited parts are so completely separated, but it is fortunate that no enemy can sail his ships on the forests and wastes that separate these islands. This factor may have helped the Canadians, despite their separations, to merit the title of a nation and to become reasonably well united. On the other hand, the physical separation of these four blocks of human beings, each with its rather distinctly different economic interests, offers an opportunity for injury of one or two by the others by way of tariffs, with resultant hard feelings if the injured are in-

[6] The Pacific Coast area of good land is very much smaller than the other three, but its climate and the power resources are excellent.

telligent enough to know it. Large groups in the United States lack that intelligence.

The fact that so many of the people of Quebec are French (see Chapter 3 of this book) has at times seemed to be an element of disunion. Indeed in 1939, upon the outbreak of the European war, the feeling of disunion went so far that the then dominant politician of French-speaking Quebec began to talk of secession. The politician had been elected by a tremendous majority, but after he began to talk of secession another election was held, and his majority seceded from him so fast that Canada stepped forward to the support of Great Britain with an unexpected solidarity.

Racially Canada is fortunate. It has hundreds of thousands of square miles of Indian country, but very few Indians. This statement is not meant to intimate that the Indian is in any way bad, but the attempt to mix peoples of vastly different cultural heritages and life objectives is apt to produce unfortunate results. In all of the four populous Canadian areas the people are of almost pure Caucasian stock. While the French Canadian refusal to enter the melting-pot has caused a racial problem, it is not characterized by a barrier like the dark skin which marks a man's ancestry no matter where his talents may fit him to go, and no matter what cultural changes his mind and spirit may undergo. Indeed, difference in pigmentation of the human epidermis is geography's most cruel gift to man — if it really is a result of geographical environment. Any generation may lay off or take on a culture, but not a complexion.

THE GOOD VARIETY OF CANADA'S RESOURCES

In variety of resources Canada is great, but it is substantially restricted by latitude. Its resources are those of the North. It has great possibilities for the production of wheat, oats, barley, rye, clovers, and potatoes — oh, so many potatoes if desired! — also apples and berries, and vegetables without end; but there is no subtropical cotton, no cane or citrus fruits, and not much corn.

There is wood on hundreds of thousands of square miles, and water power by millions of horse power. There is coal, mostly lignite, by billions of tons, and much iron ore if we include Newfoundland — and we should because of its location. In the rough North are the world's greatest nickel deposits, and almost certainly vast reserves of other metals of which new discoveries are being made steadily.

It is unfortunate that the St. Lawrence drainage areas of Canada are devoid of coal. That lack ties (or cements) the industries of this part of Canada to the coal mines of Appalachia.

With a bracing, wholesome, invigorating climate, good European stock of men and animals, good resources for agriculture, lumber, mining, manufacturing, and fishing, it is difficult to imagine that Canada's future will not be good. It will be the fault of man, not of the geographical setting, if Canada fails to have a satisfactory future development. Compare Canada's riches with the meager resources of most of western Europe!

CANADA AND THE UNITED STATES STAND OR FALL TOGETHER

It is also difficult to see how Canada's future can be considered as separate from that of the United States, or Canada as having a fate very different from that of the United States. The two countries are too nearly the parts of one economic and cultural whole. This is strikingly symbolized by 3000 miles of undefended boundary between the two countries. Except for the French of Quebec, the Canadians have the same language as the Americans. They all use the dollar. Business flows back and forth across the imaginary boundary with great ease and frequency. Trains run across the boundary between the two countries almost as easily as between the different provinces of Canada or states of the United States. To see how much the two countries are parts of a whole, look at the pocket map of North America in this book and observe that every natural region of Canada that touches the American boundary extends into the United States. It is difficult to conceive of Michigan and Ohio as being prosperous (or the reverse) without Ontario's sharing that same prosperity (or its reverse). The same applies to the prairie lands of Canada and adjacent American states. In these two Canadian regions are the homes of the great bulk of that Northern nation's people.

THE UNITED STATES

The United States, in the lucky middle latitudes, has the lion's share of the good things of the continent, and therefore from the United States the greatest achievement should be expected.

Each region described in this book has a surplus of one or more commercial commodities that could not possibly be consumed within the region by its present population. Also every region has many, many commercial deficits. Therefore it is scarcely an exaggeration to say that each region is dependent to some extent upon almost every other region (Fig. 958 A), and is greatly dependent upon many.

THE BASIS FOR MATERIAL ABUNDANCE

This mutual interdependence gives rise to an enormous trade. Steam transportation permits an inland region with *one salable product* to enter the full commercial life of the Western world. This one fact has caused vast frontiers to be settled in a few decades, and has given us an orgy of trade. As is often the case with new enterprises and human affairs in general, the pendulum has swung too far. In agriculture, at least, we are swinging away a little from that degree of complete commercial interdependence. In nearly all sections of the country the agencies promoting agriculture are trying to persuade the individual farmer, as well as localities, to grow a greater variety of crops, and so become a little less dependent upon the production and the price of an export or two. We have found this in the Cotton Belt, the tobacco sections of Virginia, the wheat belts of the United States and Canada,

and elsewhere. The efforts of the Tennessee Valley Authority to promote manufacturing in that area are an attempt to disperse manufacturing, but manufacturing shuns the great open spaces.

The economic life of the United States, as of the rest of the world, shows a distinct separation of the land into manufacturing areas and areas that produce raw materials. The centralization of manufacturing is in large part the result of the advantage that comes with nearness to routes that have water transportation. It pays for a factory to be near the sea or other water route. The potent advantages of the water route as compared with the rail route are shown by the fact that many products bound from Milwaukee to the Pacific Coast are sent by rail to Eastern ports, chiefly New York. The products are then transferred to boats and proceed through the Panama Canal to the Pacific Coast. This circuit is cheaper than the direct rail route from Milwaukee to the Pacific Coast.

Despite this transport advantage, it does upon the face of it look as though we should, in time, be able to work out a somewhat uniform dispersal of some manufacturing industries throughout the good farming areas. Thus far, however, we have not made much progress in this rational direction.

The northeastern part of the United States and adjacent Canada is the focus toward which the producers of raw materials direct the vehicles loaded with their produce. From Florida and the South the coasting steamers, steaming endlessly, and the freight trains, rumbling endlessly, toil northward to city markets with their burdens of cotton, lumber, rosin and turpentine, rice, oranges, grapefruit, and vegetables. From the center of the continent there roll without ceasing the monthly thousands of carloads of wheat, flour, oats, corn, and wool, and the other thousands of ill-smelling cars of grunting, bawling, squealing animals to be sweetened, stilled, and chilled at packing-plants before proceeding elsewhere in more close-packed refrigerator cars, cans, or barrels. Through the Great Lakes the stately procession of steamers carries the annual summer rush of crude raw material with its terrible weights. Rushing over the high Rockies and the wide plains come the aristocrats of long-distance freight traffic, the thousands of cars of California fruits and vegetables and of lumber from Washington, Oregon, and British Columbia.

From the factory areas there goes out in return an almost equal value of manufactured goods: shoes, automobiles, clothing, phonographs, skates, rifles, bicycles, printing presses, pins — the list is longer than the Sears Roebuck catalogue. Most of the consumption goods go in carload lots to Spokane, Atlanta, Denver, Dallas, Des Moines, Baltimore, Indianapolis, Los Angeles, and other jobbing centers, where wholesale merchants pass them on in small lots to the retail stores in hundreds of tributary small towns and villages. What a wonderful world of material things is this — if one has the power to buy. The number and variety of things would have been unbelievable not long ago. But it is also a world of standardization and increasing monotony, as is shown by national magazines and their advertisements, rural delivery of mail, the mail-order catalogue, the phonograph and the radio, the clothing styles that reach the remotest hamlet almost instantly. Exit local color!

A PLACE FOR THE HUMAN SPIRIT?

What of its future? At the end of our fifty-year period will this country be a better place for material support of man and for the human spirit than it is now? At the age of ten the senior author was sure of the grand and glorious future of his country in every respect. He sat in the back of the one room in the little red schoolhouse on the hill and heard his elders in the seventh and eighth grades, up near the teacher's desk, recite the glories of the American Revolution. He gloated over the death of every Englishman and German slaughtered there, seethed with virtuous and contemptuous indignation over the wickedness of Hessians. He borrowed the book and read of the American victories of the War of 1812.

Years later he learned that that war was a series of American defeats, but for some strange reason his history book did not give his boy mind any inkling of that. In 1923 or 1924 a veteran of the first World War, Private Pete, in lecturing against war said that he had examined the history texts of thirty-six countries, and they all agreed in three things: 1. All our wars have been just. 2. All our armies have been victorious. 3. We can lick any country in the world in six weeks.

At the age of ten he was convinced that the people of other countries were inferior to Americans; that there never had been anything like us upon the face of the earth; that the golden age would be the time when other people became like Americans.[7] He also believed that the United States was the most powerful nation on earth and that the nation and its culture would stand forever and forever, that the earthly millennium was starting here in this the best of all possible worlds. He believes now that he was at that age the typical American youth exhibiting a characteristic of which his people had no monopoly.

Since that youthful day of shining imagination undimmed by doubt, he has seen ruined Roman cities on the plains of North Africa with fourth-century Christian churches where not a single human being was in sight. He has seen the grass growing in the marble steps of the Temple of Heaven at Peiping. He has seen the plain of ruined palaces near Delhi, the pile of earth that was Babylon, another that was Ur of the Chaldees, the tumbled walls of Persepolis, the Mosque of St. Sofia. And now, alas! he is not quite so sure as he was at the age of ten. Is not this psychological nationalism a part of the same stuff that the Nazis use when telling themselves about the great inherent superiority of the German race? This inability or unwillingness to see ourselves correctly is a danger to which all humans are exposed.

We have a problem cycle somewhat as follows: First, a scientific discovery, then a mechanical invention, after which the invention revolutionizes an industry, making new wealth and new poverty. Advancing technology promises to bring these problems with increasing speed to all machine-using

[7] The junior author missed the great experience of the little red schoolhouse on the hill, but at the age of ten he had the same reactions regarding American history and all things American, which we believe were typical of American youths of decades that are past. What about the present?

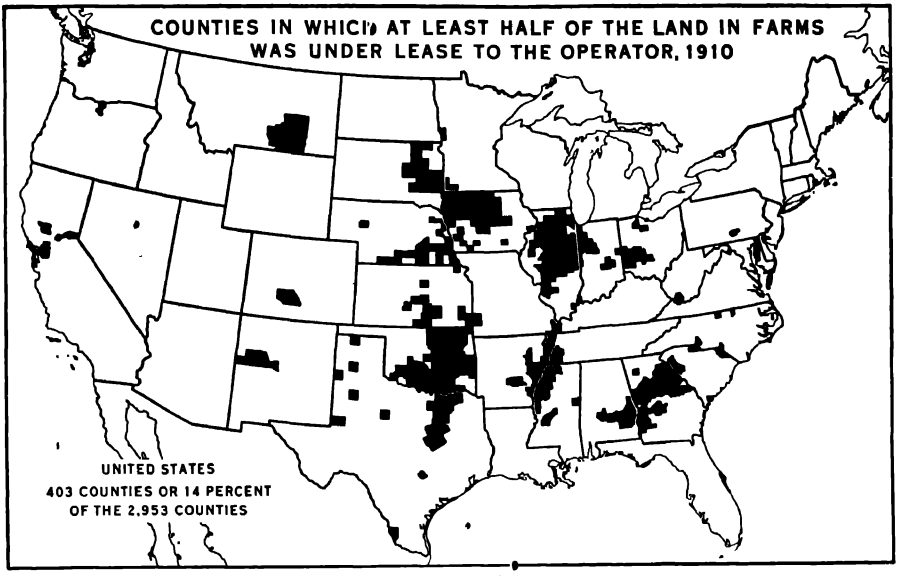


FIG. 947 A

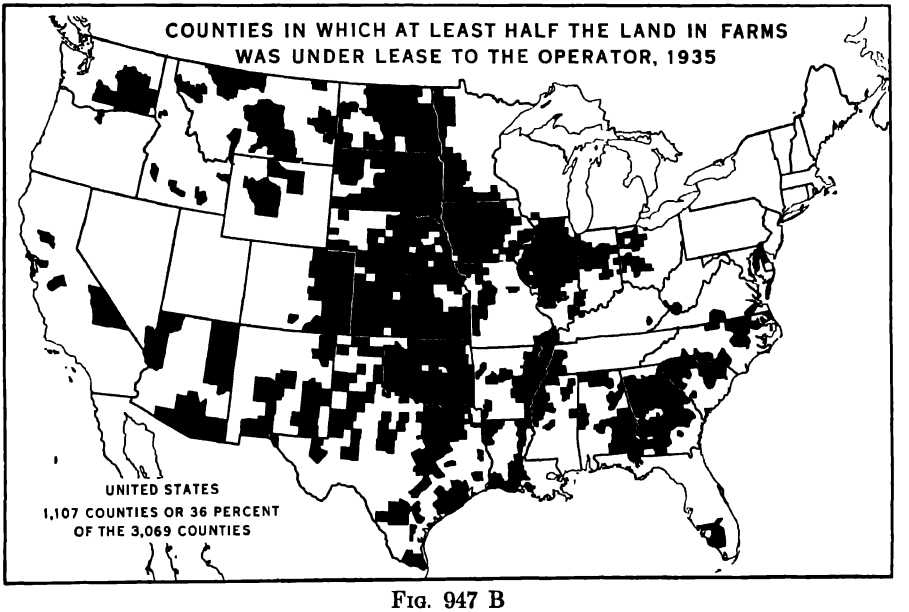


FIG. 947 B

The soil-erosion map (Fig. 35 A) shows how dreadfully we have failed in America with the problem of conserving our basal resource, soil. This pair of maps shows an equally tragic failure in another of the essentials of national welfare. They also help to explain in part the soil-erosion map. Perhaps a nation can remain in a healthful condition on the basis of tenantry, but we have made no start in developing a good tenant in the United States. (Courtesy U.S. Dept Agr.)

countries. We present here a few of these problems with which the readers of this book must deal — or be the worse for not doing it.

A LAND POLICY

In this book are three maps that should make any patriot pause, and perhaps shudder if he considers future generations. The maps are Fig. 35 A and Figs. 947 A, 947 B. First look at Oklahoma on the map of soil erosion. Oklahoma is the newest state agriculturally. It is less than fifty years since Uncle Sam handed much of it out to "every one of us." The erosion map shows how we have destroyed it in that short fifty years.

Then look at Oklahoma on the tenancy maps. See how the land is passing from the hands into which the Government gave it, passing from owners to tenants. Every student of society agrees that a tenant population is undesirable. Our farm-owners are becoming tenants at an alarming rate. Furthermore, we are the worst landlords in the world. In England and some other European countries leasing is an art that encourages the tenant to make improvements, because the improvements are his, in part at least. But in this country the regulations that govern renting are such that the tenant is usually tempted to skin the farm, let it erode, and then move on to another farm.

If our people, our culture, our country, are to be great in the future, we must get and act upon an idea that is unfamiliar to many Americans. This idea is *permanency*. If we glance back at the long record of the race and then take a similar look into the future, we realize that American civilization seems never to have thought of permanence. Like children and birds, we are living in the day only. This people needs to take hold of itself and realize that it *is* a people, and that it must look out for its future.

In the United States one of our first necessities is to work out and apply a land policy — ownership, tenancy, conservation, taxation. Mr. Lincoln's policy did not do what he expected (other than help elect him).

BEDEVILED BY PLENTY AND STARVING IN THE MIDST OF IT

Within the boundaries of the United States are unrivaled riches of natural resources, of raw materials, of industrial equipment. In 1940 we are using enough of these things to keep ourselves going after a fashion, and at the same time we keep millions of would-be workers standing unhappily on the sidelines. They wish to work, but we do not give them work. There seems little reason to doubt that full employment in the United States, coupled with reasonably equitable distribution of the product, would give every family that had one willing adult worker a sanitary house with a bathroom, hot and cold water, at least three rooms heated, enough clothing to keep the family warm and respectable, wholesome food, high-school education that prepared youth for jobs and citizenship, good reading matter, some flowers and pets, the service of dentist, physician, and hospitalization, some money for church, club, and community participation, a radio, an automobile for

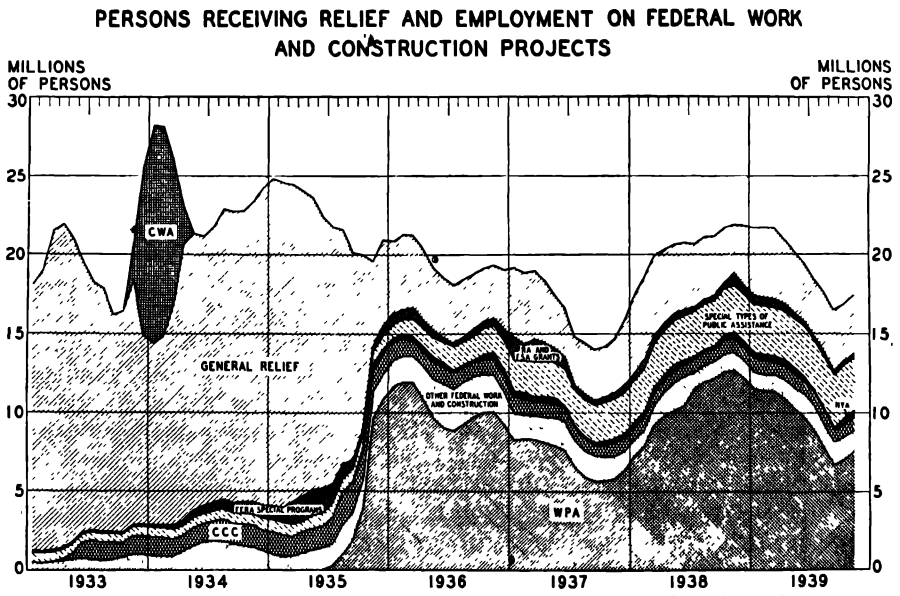


FIG. A. This covers the unduplicated number of persons, including dependents, in the continental United States. Persons receiving aid under two programs are included in the program occupying the lower position in the chart.

Before 1930 public relief was almost unknown in the United States, and then it descended upon us like an avalanche. This whole graph may be called a record of the failure of our industrial system. (Courtesy U.S. Dept Agr.)

part of the time at least. These things might be called the minimum physical basis for the good life.

Compare the United States with, say, Switzerland, Denmark, or Sweden in two respects. First, in economic resources per capita; second, in the life the people have been able to achieve from these opportunities. If this could be fairly done, I suspect that America would come out second-best as a utilizer of resources. (See Gove Hambidge's statement in this chapter to the effect that "only about 10 per cent [of us in the United States] have really good diets.")

Perhaps you have been sufficiently wicked or sufficiently interested in science to poke a stick into an anthill, turn the community upside down, and watch the frightened little creatures run wildly in all directions seeking places of safety in which they might deposit their helpless young. The bewilderment of the anthill reminds me of the bewilderment of the Western world in general and of the United States in particular. As the prying stick throws the anthill into turmoil, so the age of science and machinery has thrown us into turmoil and bewilderment. Here is the cycle. Someone makes a scientific discovery, for instance, the alternating current in electricity. Next a mechanical invention, the motor. Next come many industrial changes through the use of the new machine, new wealth for the owners of the machine, displacement of workers by the industrial changes.

There is an "almost terrifying exodus" of tenants, share-croppers and small farmers who are being squeezed out by machinery.

Machines of all sorts — tractors, combines, corn pickers, cotton pickers, cane harvesters — are invading every section of the country, lowering the cost of production and destroying the demand for millions of hours of man labor.[8]

Dr. Alexander estimated that nearly 2,000,000 displaced farm people were on the march, following the crops from one section of the country to another. This is an *example* of a fundamental problem. A book might be filled with similar examples.

It is difficult for us human beings to make important changes suddenly, and this Machine Age has fallen upon us almost as suddenly as a prying stick upsets an anthill. For some five thousand years before the invention of the steam engine there had been very little industrial change in the more advanced economies. George Washington and Nebuchadnezzar belonged in the same epoch economically. Their clothing was hand-spun, hand-woven, their few tools were hand-wrought. They depended upon the muscle of a beast to plow their fields, to cart their stuff, to carry their persons when they were in a hurry, and to bear a speedy message. Continental interiors were so difficult to reach by these slow, inefficient means that the more distant ones were almost or quite unknown. On the sea man traveled with the aid of oars or the wind.

A change came suddenly. New mechanical inventions came piling upon us one after the other, by a process which, instead of being finished, seems to be now going on faster than ever. This change is going on faster in the United States than in any other country. This fact gives support to the statement of a European named Jacques, who said he didn't know whether this civilization was going to perdition or paradise. After two years' sojourn in the United States he still didn't know, but he was sure that wherever it was going, America would get there first.

MACHINES AND REGIONAL SPECIALIZATION

The first forty years after 1776 were a period when the American economy was much closer to that of Nebuchadnezzar than to the one we have today. It was a period when most of our people still lived on farms, when many American farm homes, perhaps most of them, still had the spinning wheel and the hand loom, and the farm and its neighborhood had the very high degree of self-sufficiency mentioned on pages 78 and 221. Then the Machine Age arrived, and specialization developed. Today Dakota and Kansas give us wheat; Iowa gives us meat; Wisconsin gives us butter; Connecticut gives us hardware; Michigan gives us automobiles; Florida and California give us fresh and dried fruit; and so on.

In the age of rural self-sufficiency a good harvest meant satisfaction and abundance. Barns and granaries were full; cellar, pantry, meat house, and attic were full; and Thanksgiving Day rang true. In the present age of

[8] Dr. W. W. Alexander, head of the Farm Security Administration, quoted in the *New York Sun*, Apr. 13, 1939.

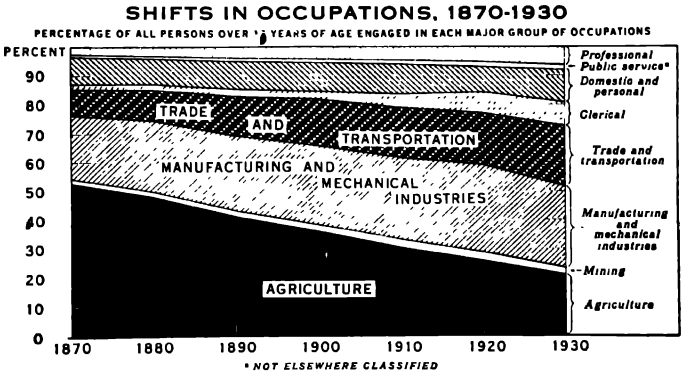


FIG. A. Here is one graphic way of showing what machinery, commercial fertilizer, and scientific agriculture have done to the farmers' numbers. (Courtesy U.S. Dept Agr.)

specialization a good harvest means alarm, the fear of the glut, the low price, loss, foreclosure of farm mortgages. That is a real revolution.

Suddenly abundance has become the terror of the age. Scarcity, not abundance, is the industrial objective. Regional specialization has been checked by the glutted market.

In Canada (1922), 120 miles east of Calgary, I rode along irrigation ditches stretching through the fertile plains. Water was in the ditches and had been there for a year or two, but not a farm was in sight and settlers were not coming. There was no profit in raising wheat, the great money crop of the center of the continent, and good Canada grainlands could be bought that year and the next year and the next for a fraction of the assessed valuation. In 1924, the Dominion Government closed the land offices it had maintained in Omaha and many other American cities for twenty-five years in its process of giving quarter-sections of land to young American farmers who went to Canada. The Government still had some land, but the young Americans were not going to Canada. They were going to towns. The price of manufactures still remained high.

For the first time in a century the frontier had ceased to show the signs of abundant resources; namely, an effective invitation to come and settle. There followed a quick reversal of a century-long ratio of wages. In January, 1923, when the average of farm wages was 30 per cent above the 1913 level, it was only 15 per cent above it in the West North-Central states (Wheat Belt), whereas it was 56 per cent above it in the North Atlantic states (where factory prosperity still continued).

In January, 1924, the president of the Wheat Council was quoting a letter from President Coolidge expressing approval of the attempt to curtail wheat production:

> The effort in an organized and systematic way to establish such a measure of control over the wheat acreage as will measureably insure against over-production is altogether to be commended. Almost every important business except agriculture

has trade organizations and associations through which it is possible to deal with such vitally important matters. Quite obviously the business of agricultural production would benefit by the same methodical approach to the underlying problem which it must always confront.[9]

In the spring of 1924, the National Producers' Alliance was signing up farmers by the thousands in Nebraska and elsewhere in this effort to limit production.

The "control-production" idea in farming is rampant in Nebraska this spring. Half a dozen or so separate organizations are busy among farmers in Nebraska combining them into societies having for their object restriction and curtailment of production of wheat, corn and other farm products. Each of these organizations reports farmers are anxious to join.[10]

Of course the farmers of Nebraska failed in their attempt to limit production. If Nebraska hadn't raised a bushel of wheat or corn, there would have been enough independent spirits (the labor unions would call them scabs) in other states to increase *their* acreage with an eye to getting the resultant higher price. But note the significance of one sentence in Coolidge's letter above quoted. "*Almost every important business except agriculture has trade organizations and associations through which it is possible to deal with such vitally important matters*" — that is, restrict production, maintain a relative scarcity, get a price that will pay back the cost and more.

Coolidge's mild encouragement of the farmers may have had some vote-getting influence, but it probably made no net reduction of acreage. That awaited the arrival of President Franklin D. Roosevelt. In the panic year of 1933 surpluses produced by the boom equipment of the "golden twenties" had become a problem indeed. The National Industrial Recovery Act (NRA), with its codes for manufacturers which aimed to make prosperity for all, bristled with restrictions to make relative scarcity in the product of each particular group of producers. The *restrictions* worked fairly well, prices rose quickly, but wages did not rise correspondingly; purchasing power therefore declined, and the law failed economically before it failed legally — by decision of the United States Supreme Court.

On the farms the gluts of wheat and cotton and corn and meat animals were so severe that corn was burned in schoolhouses for fuel. Prices were below costs. Deficits were everywhere, and the agricultural scarcity that Coolidge encouraged was created by law under the agricultural restrictions of Franklin D. Roosevelt's administration.[11] Since abundance bedeviled us, we set out to get rid of the abundance. In 1940 the scarcity objective is still widespread, rampant, and too often triumphant.[12]

[9] *Philadelphia Public Ledger*, Dec. 31, 1923.

[10] Special to the *Philadelphia Public Ledger* from Omaha, Apr. 17, 1924.

[11] Even before 1927 there had been hundreds of such laws enacted in this and other countries. (See U.S. Dept of Agr., Bureau of Agricultural Economics, *Agricultural Economics Bibliography* 23, *Control of Productions by Governments, a Selected Bibliography*, December, 1927.) And note that this was before the United States had begun to get under way at all with the postpanic (of 1929) restrictions, which really began in 1933.

[12] The *New York Times*, Dec. 29, 1939, with a two-column front-page special article, gave us a perfect, alarming, and one might say pathetic, or perhaps tragic, illustration of the terror of the American people at the idea of abundance. The Bata shoe-manufacturing

We did not limit ourselves to making scarcity within our own boundaries. American representatives have attended conference after conference in the attempt to persuade our three great wheat-exporting rivals, Argentina, Australia, and Canada, to produce less. This is but one of a number of international attempts to restrict production and trade and thereby hold up price and profits.

We are still *making improvements in machinery to produce* factory goods, farm crops, minerals, lumber, and fish. This increase of output per worker combined with *restricted production* can have but one result, namely, fewer persons employed. The unemployment of 1930–40 is a logical, even a mathematical, result of these conditions. In this age of science and its offspring technology, we can produce almost up to the dreams of fairy tales. But we have not yet learned how to distribute the product. Unfortunately this trouble is not restricted to the United States. It plagues the entire machine-using world, but we, having the most and the best machinery, have the most urgent problem on our hands. Therefore the greatest economic need of the United States at this moment is a better system for distribution of the things that we can make. If we could distribute our product so that a willing worker could have a bathroom, three bedrooms, a dentist, etc. (see page 948), we would start the greatest industrial boom in history. Relief would go on vacation, and charity would almost follow it. All classes would share the boom.

Gove Hambidge, editor of the 1939 *Yearbook* of the United States Department of Agriculture, says:

> Because of his acquaintance with livestock, the farmer should be the first to realize the importance of nutrition with human beings. Any livestock man knows that it costs more to feed an animal well than to let it starve along. A great many people in the United States are starving along. Half of them, according to recent surveys, do not have even fair diets, and only about 10 per cent have really good diets. The farmers stand to gain if poor diets are corrected. The immense surplus of many farm products would be wiped out if enough people could be well nourished. In fact, farmers would have to produce larger quantities of some of the very products that are now in surplus.

THE NEW SECTIONALISM

In the little countries like Switzerland, Denmark, or the Netherlands there is narrow variety of resources and narrow variety of economic activity. Within such a country about the only important economic difference is the one between the rural area and the urban area, and the short distances of the small areas tend to reduce this difference. In these countries the simplicity of economic life has forced legislators to keep tariffs at a low figure.

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organization, with main offices in Zlin, Czechoslovakia, has branches in many countries (said to be 25) and is starting one at Belcamp, Maryland, not far from Baltimore. This company, whose factories far exceed in size and output anything in the United States, has devised efficiency methods which have caused it to be called "the Ford of the shoe industry." For months the company had been trying to get approval for the admission of 72 skilled Czechs to teach hundreds of Americans. This was opposed by shoe workers' unions, both A.F. of L., and C.I.O., by American manufacturers, by members of Congress.

In the United States diversity of regions and products is so great that there is a perennial temptation for logrolling groups to take legislative advantage of the people as a whole. In the past our laws have given special privileges to manufacturers by way of patents and tariffs. A few agricultural specialists, such as woolgrowers and citrus-fruit growers, have had their tariffs, but the majority of farmers, producers of cotton, of meat, of grain, have sold in the open world market with no special privilege or equivalent until the administration of Franklin D. Roosevelt. His administration tried to give the farmers a share by paying them hundreds of millions of dollars *not* to produce. This was an attempt to give special privilege to all, which of course is an impossibility. It may possibly be true that the many regions of this country and the great variety of resources serve as a curse when it comes to legislative influence — as evidenced by this attempt to give special privileges to all.[13]

Not only are we harassed by regional blocs in legislation, but we also have the class groups, such as organized labor and organized finance, concerning which Professor Walter P. Webb points out an astonishing imperialism in the following quotations:

"The process began with the passage, in 1862, of the Homestead Act, which the South had opposed, and the construction of the Union Pacific Railroad on a route that made the West tributary to the North. It continued with protective tariffs which favored Northern industries, with Civil War pensions nearly 90 per cent of whose payments have gone to the North, with the flow of pension money into developing manufactures, and with multiplying patents of which 90 per cent or more of those that produce money are owned in the North.

"Most important of all, however, has been the influence of corporations. . . ."

The specifications, as he elaborates them, make an impressive showing. Of the 200 corporations dealt with in the well-known study of Berle and Means, 180 are "chartered, operated and have their home offices in the North." Between 90 and 95 per cent of the national magazine advertising is furnished by that section. Of 4,664 firms making or selling druggists' supplies, 3,948 are in the North. The "American religion" of life insurance, with 105 billion dollars of insurance for American citizens on its books, shows 95 per cent of the total in the hands of Northern companies, and the real property of the South and West is "rapidly passing," through mortgage loans at high interest rates, into their hands. In 1933 nearly 80 per cent of demand deposits and more than 82 per cent of time deposits were in Northern hands.[14]

Southern spokesmen have complained bitterly for many years about tariffs, railway freight rates, and other discriminations against their part of the country. This gives us occasion to ponder sadly on Harold Laski's definition of government — "a function of the group that can exert the most pressure."

Now that the frontier is gone, this problem seems to become more acute.

[13] The following Associated Press dispatch from Buffalo, Feb. 21, 1940, gives an admirable example of local interest hurting the larger interest. "The Buffalo City Council reappropriated $10,000 today toward a campaign against the proposed St. Lawrence Seaway, overriding a veto of Mayor Thomas L. Holling, with only one dissenting vote."

[14] From the *New York Times* Book Review Section, Jan. 9, 1938, review of Webb's book *Divided We Stand*, Farrar and Rinehart, 1937.

AMERICA MUST CHOOSE

Not long ago a young man, city-born, who had graduated from college shortly before 1929, remarked, "When I was in school and college I never had any idea that I could not always get a job somewhere, and a reasonably good one too." The young man still has a job, but in seven years he has had no advances. He has had salary cuts instead, and he is an able man.

That statement and that situation symbolize the end of an epoch, the end of the frontiers, the end of being able to run away from unpleasant situations (see Chapter 1). Until 1921, the year of the agricultural collapse, we in the United States were the greatest collection of runners-away that the world has ever seen. We were runners-away because running was easy. We did not have to take a stand and there succeed or fail. We could try here, and if unsuccessful or dissatisfied, we could go West or go to towns. When the Plymouth Colony began to get a bit crowded, the young men overflowed into the Connecticut Valley. It was a dramatic trek through the forest, the start of a process that lasted for three centuries. From the Connecticut Valley the New Englanders went to western Connecticut, eastern New York, western New York, Ohio, Indiana, Illinois, Michigan, Iowa, Oregon, western Canada, California.

Being able to run away from tough situations has made us the spoiled children of creation. This does not imply that the frontiersman was a softie. The statement is that he was *rich*, rich in opportunity. *He had alternative opportunity.* He could choose between paying high prices in cash in the old community and working and building a home on the frontier. If his fancy was to rove, the continent had unoccupied land that made roving easy.

It has been so easy to move to another situation that our people have not developed the habit of facing really unwelcome facts. This was perfectly illustrated by the national policy of drift and shift, borrow and wait for Santa Claus, which characterized the mind of both politicians and businessmen in the United States in the period 1930–40. "When will this depression end?" they asked one another. "When will we get back to the good old 'principles' that made the country great?" — that is, run back to the past. They could not run away to the frontier, so they would run away to the past to avoid facing the present. And so they sat and complained when *work* was needed.

Henry A. Wallace, Secretary of Agriculture under Franklin D. Roosevelt, tried to make us face some facts in a little book *America Must Choose*, of which the essence is this: The United States has three possible policies with regard to foreign trade, and we must choose one of them.

First, we may choose the policy of much trade, which means low tariffs, a boom of imports, and a boom of exports to pay for the imports. The question here is, What industries shall we elect to be killed? Since we have had a national tariff built upon the theory that the nation could produce almost everything, a policy of much trade would require that we import some things that we are now making at much greater cost than we can buy them for

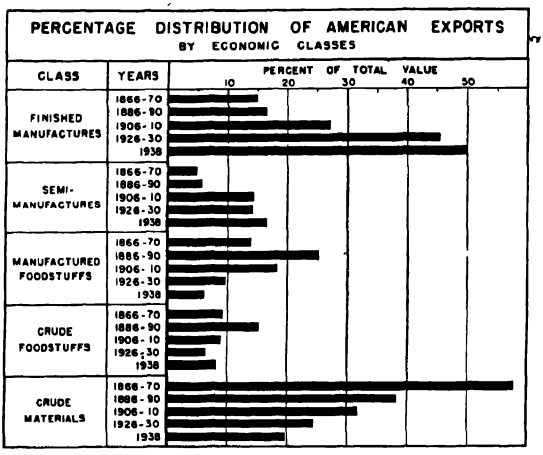

FIG. A. Here is industrial history at a glance. It might be called "The United States Grows up Industrially." Notice especially the changed proportions between the first and last periods. (Data from U.S. *Statistical Abstract*)

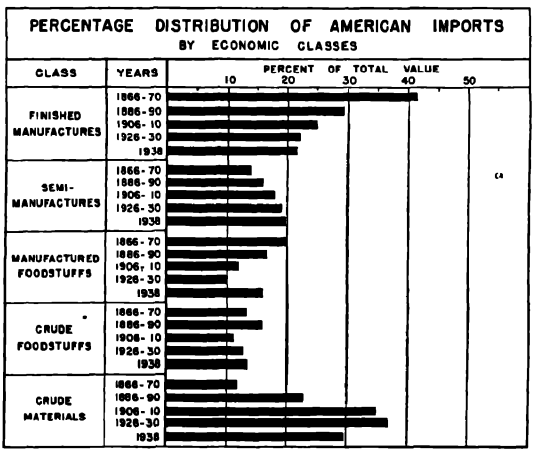

FIG. B. In this chart the important thing is the changed position of finished manufactures and of crude materials. (Data from U.S. *Statistical Abstract*)

abroad. Therefore if we adopt policy Number One, we must resolutely drown kittens.

Policy Number Two, the opposite of Number One, is: Have as little trade as possible, produce almost everything for which there is any half-reasonable possibility — approach the condition of autarchy, or complete economic independence. This policy means kill imports. It also means kill exports, because *exports must be paid for by imports.* Therefore abolishing the import trade abolishes also the export trade. Industries must therefore be killed. Which shall be killed? Again, kittens must be drowned, really good kittens, too.

The third policy is intermediate between the two, or to be more exact, will probably vacillate from a mild stage of one to a mild stage of the other. That is to say, we may choose to wobble. The party situation is that one Congress may, by means of legislative favor, give a boom to one industry or section; after another election a new line-up may reverse this favor in behalf of some other industry or section — still drowning kittens, but doing it spasmodically, irresolutely, in a vacillating way.

Come what will, the facts that Mr. Wallace presents to us cannot be dodged. We may hide our eyes, but the facts will be there, and they will hit us. Vacillation will not help. We of the United States need to use more intelligence and more nerve.[15] In the future, intelligence and social control

[15] The people of the United States talk to one another loudly about their rugged individualism. But are we so individualistic? Much evidence might be advanced to show that since the days when Uncle Sam had a farm to give to every one of us we have become more and more dependent upon him in ways that are surprising if we but look at them objectively.

must replace free land as the national safety valve. The Frenchman De Tocqueville is said to have remarked to an American a hundred years ago, "When your land is all settled and you have many large cities — then will come the real testing of your democracy."

Does the housekeeper discover some bedbugs? She sends to Washington for U.S. Dept of Agr. *Leaflet* 146, *Bedbugs*. Do mice trouble your apple trees? Then the Predator-Rodent Fund of the U.S. Biological Survey has mouse poison for you at a very reasonable price. Are the bobcats and coyotes stealing your chickens and carrying off your pigs and lambs? Call for the U.S. Game Exterminators. There are 500 of them constantly roaming over 13 Western states.

Do moth and rust attack your apples? There is awaiting you a veritable volley of bulletins from Washington and from many of the state experiment stations. And further, there are staffs of agricultural extension experts-on-wheels who will rush to your place to tell you which bug or rust it is, what spray will kill, where to buy it, how to mix it, when to put it on.

Are you going to have a baby? There are excellent bulletins in Washington to prepare you for this very vital event, and others to tell you how to feed the baby. Also you may learn about feeding the pig, the lamb, and the colt, and how to can food, and how to do many, many other useful things.

Did the moths eat your fur coat? Then you failed to get and apply the bulletin on protection from moths. Is the grocer's meat derived from healthy animals? Look for the mark of the Federal inspector. Do you want to build a house? The United States Department of Agriculture has excellent plans ready.

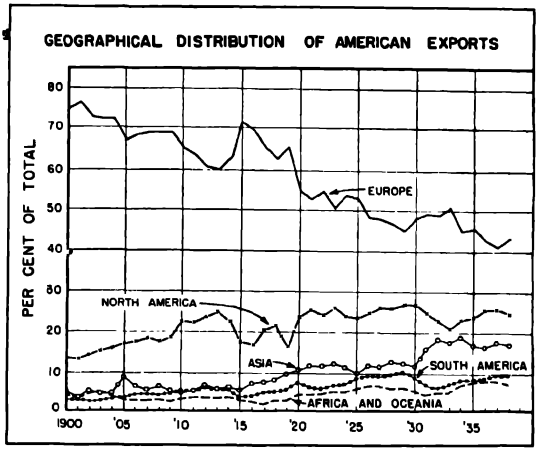

FIG. A. The startling change in Europe's place is due partly to the industrial growing-up of the United States, partly to the World War changes in Europe, partly to Europe's postwar tariff epidemic, but despite these declines Europe is still our great market. The proportional changes in the trade with Asia and South America have been equally startling. (Facts from U.S. *Statistical Abstract*)

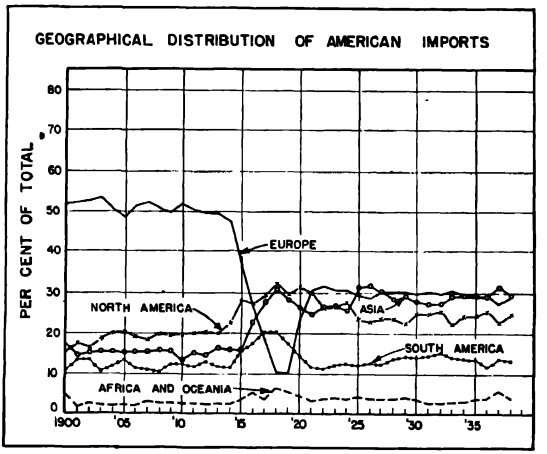

FIG. B. Perhaps one way to describe the effect of the World War (1914–18) on European trade with the United States would be to say that Europe committed suicide. The changes that the war forced upon us for a short time became permanent changes. (Data from U.S. *Statistical Abstract*)

All this and much more was being increasingly done by our Government for the people before we went on relief and before the arrival of that flood of new government aids that bear the name of the New Deal. Are we of the United States the rugged individualists, or is it the Danes, the Swedes, the Swiss, the Finns (1939), who are or were doing by private co-operative enterprises many of the things which we have the Government do for us? It is just possible that American rugged individualism, so-called, is a bit of Machine Age mythology.

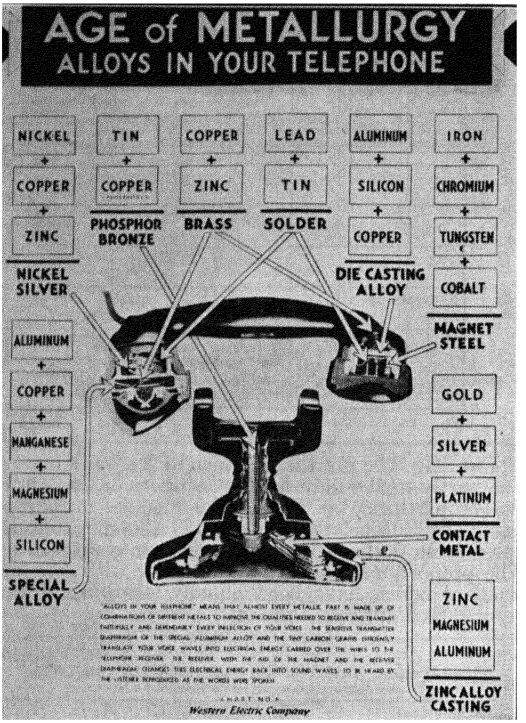

FIG. A. Specialization is continental as well as regional. Climate imposes painful restrictions on the country that would try to live without commerce, but the distribution of minerals places ironclad restrictions. (Courtesy Western Electric Co.)

REGIONAL SPECIALIZATION AND THE CITY

In 1870, 54 per cent of United States workers were engaged in agriculture. In 1931 machinery had become so effective that only 21 per cent were in agriculture. This is but the continuation of a process that has advanced steadily throughout the era of machinery.

In 1787, the year in which the Constitution was framed, the surplus food produced by 19 farmers fed one city person. In recent years 19 farm people have produced enough food for 56 non-farm people in the United States plus 10 living in foreign countries. One hundred and fifty years ago American agriculture was but little advanced over that of the ancient Egyptians. Today it is a highly specialized, commercialized industry.[16]

This increased efficiency in agriculture has made possible the growth of cities. Between 1910 and 1920 the United States gained in population 14.9 per cent, but more than 1000 counties lost in total population, and many more lost in rural population. In this one decade the urban population of the United States increased from 45.8 per cent to 51.4 per cent of the total, while rural population declined from 54.2 per cent to 48.6 per cent of the total. In the next decade, 1920–30, our urban population increased from 51.4 to 56.2 per cent, and rural population declined from 48.6 to 43.8 per cent. Reducing them to percentages *of the groups*, in the decade 1910–20 the urban population increased 25.7 per cent and the rural increased only 5.4 per cent. In the next decade the urban population increased 26.98 per cent and the rural increased 4.7 per cent.[17] Urban concentration is not

[16] *Extension Division News*, Virginia Polytechnic Institute, August, 1937.

[17] Before 1930, urban population, according to the U.S. Census, comprised people living in incorporated places of 2500 inhabitants or more. The 1930 census extended the definition to political subdivisions not incorporated that had a total population of 10,000 or more and a population density of 1000 or more per square mile. Therefore the figures of the census are not exactly comparable as to amount of urban population before 1930; but the later definition is a better definition of urban population.

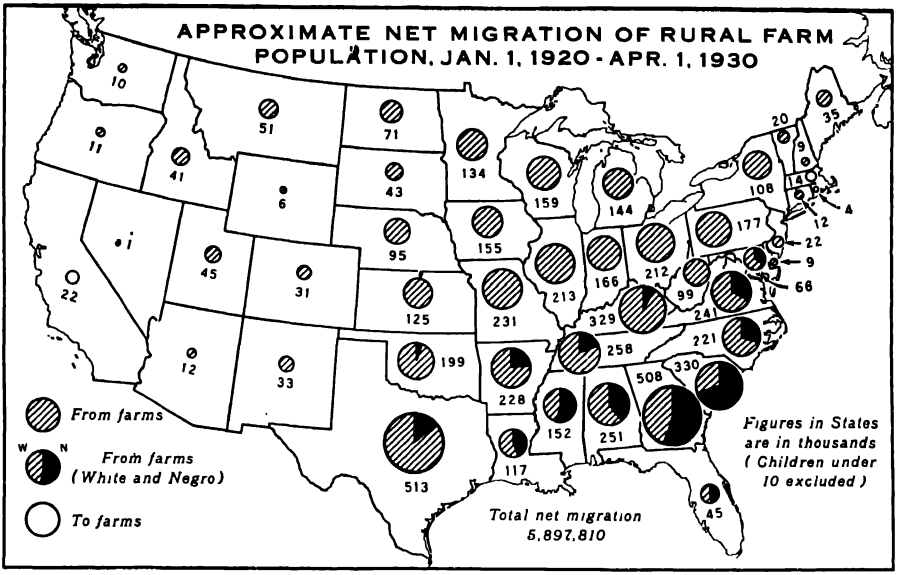

FIG. 959 A. This map shows that young people have been one of the chief crops that passed from farm to town in the United States. It also explains the very great increase of Negro population in some Northern cities during this decade. (Courtesy U.S. Dept Agr.)

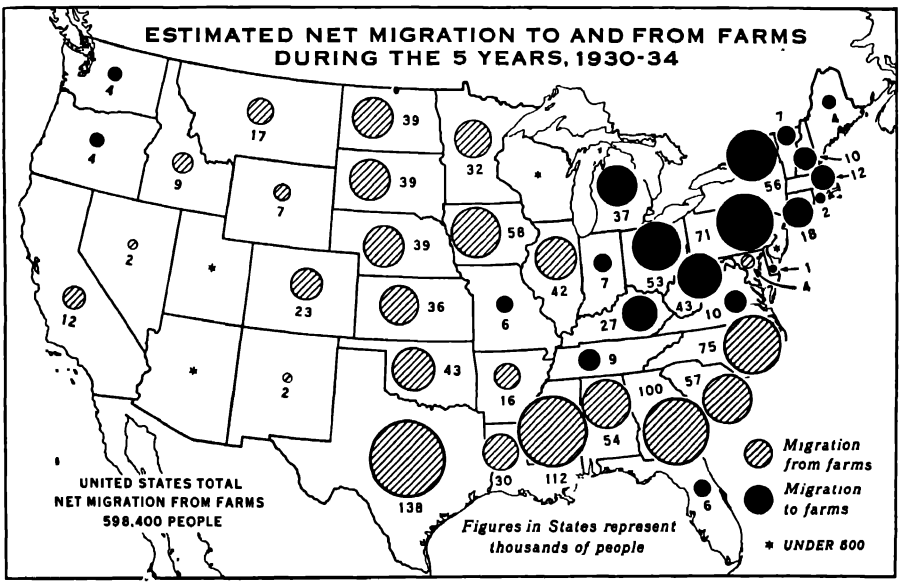

FIG. 959 B. During the depression people were driven from the cities by unemployment and sought refuge on the farms. Many of these were part-time farms. They also went back to their old mountain homes in Appalachia. Meanwhile there was a surprising continuance of migration from farm to town in the South and the West, where commercial agriculture prevailed. (Courtesy U.S. Dept Agr.)

limited to the manufacturing East. The relatively young Pacific Coast states almost rival New England in urban population, having 67.5 per cent in their cities, 32.5 per cent in rural areas. Massachusetts, Rhode Island, and Connecticut had 80.1 in urban areas in 1930.

This concentration in the city must be approaching its peak, for there are now many forces permitting decentralization of manufacturing, at least from the city into rural counties in the manufacturing regions. Strange to say, our great cities are menaced by decay through migration from their centers while the city itself still grows. Swift and frequent train service brings the well-paid office worker from the suburbs or the country to the downtown business sections, and so all our large cities have had an enormous migration from the older parts of the city. This takes away to the suburbs (usually other cities) persons of ability, of wealth, of leisure. Thus the older city loses too many of those with the capacity to lead and to create good government.

This migration of men has been accompanied also by a migration of industry from the older congested sections of the cities. Walk through the older downtown sections of San Francisco, St. Louis, Cleveland, Philadelphia, Manhattan. The dilapidated structures, the empty buildings, the unprosperous-looking neighborhoods, will shock you.

This migration of industry takes place for four main reasons: (1) the disadvantage of congested location; (2) high wages, due in part to high cost of living and in part to stronger labor organizations; (3) high taxes; (4) graft and racketeering.

The graft and racketeering may be illegal or in the forms of law. Anyone who tries to do business on Manhattan Island, for example, will find to his chagrin that there is a building code, and building inspectors. If he wishes to build, enlarge, or alter a business building he will find that in many cases the building code prescribes that such and such building functions must be performed by *specific brands* of material. Trace it out and you will find that these are manufactured by some politician who is getting a huge profit because you *must use his material or not build at all.* Walter B. Pitkin claims that this combination of graft and racketeering becomes greater as the old city, sucked dry by the suburbs, begins to decline.

In the winter of 1939–40 the *New York Times* published many articles, some of them front-page and two columns wide, telling about the migration of scores and hundreds of industries from New York City to Connecticut and New Jersey. Thus they escaped New York City disadvantages and kept most of the advantages of the port.

Removal of both people and industry from the old city leaves an undiminished burden of debt resulting from past waste, extravagance, graft, and expectation of that endlessly expanding future which we have capitalized for generations. Hence the menace of still higher taxes or big-city bankruptcy, which in some cities has passed the point of menace. This plight of the big cities may be claimed, in part, as one more phenomenon made more acute by the ending of free land, which promises to dash the idea of endless city growth.

IDLE MEN OR IDLE MACHINES?

Dr. O. E. Baker's dot map (Fig. 134 A) of new farms since 1930 shows a substantial increase in the number of farms. If anyone thinks this is a sound movement back to the land, the point should be emphasized that it is *back to poor land.* As Carter Goodrich so clearly points out, it is really a distress signal.[18] People who had gone to town were thrown out of work; they went back to the country and took what they could get, which was the poorest. This is a perfect illustration of the axiom of agricultural economics that the efficient man gets the good land and the less efficient man gets the poor land.

The new farmers of the depression era since 1929 are, for the most part, subsistence farmers on small units of rough land or poor land that is not fit for modern machinery even if the people could buy or borrow the machines. Meanwhile the good new machines are improving every year and are still replacing men and putting them off the good land. At the same time the normal movement of young people from the country to the town is checked — temporarily, they hope — pending the opening up of town jobs.

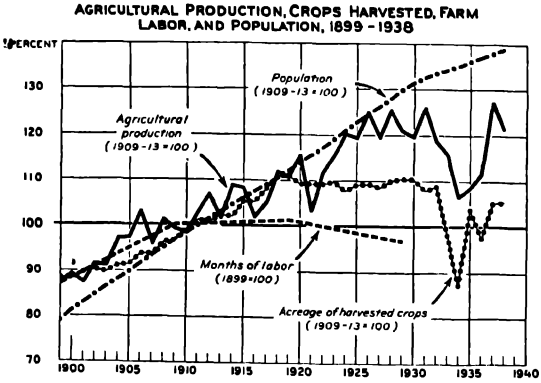

FIG. A. By comparing agricultural production with months of labor we get a measure of the use of agricultural machinery and a partial explanation of the removal of people from country to town. By comparing agricultural production with population we get a measure of the poverty that unemployment has been forcing upon us. (Courtesy U.S. Dept Agr.)

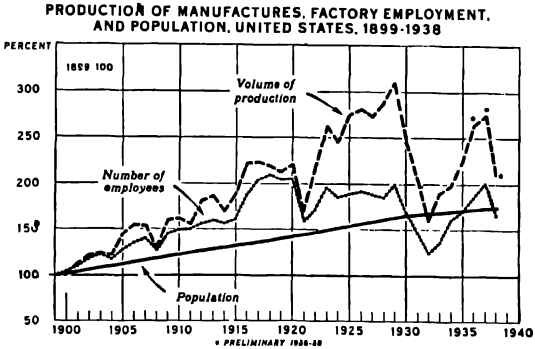

FIG. B. Comparing number of employees with volume of production gives an indication of the increasing efficiency of machinery. Comparing production with population enables us to see what possibilities we have for a rising standard of living if we can keep the machinery running. (Courtesy U.S. Dept Agr.)

A county in the Wheat Belt of Kansas illustrates this process. In the last thirty years the county has lost half its population, but it has kept right on producing wheat. A Kansas State Agricultural College bulletin of 1931 explains the reason for the exodus. A study of farms producing 600 acres or more of wheat per farm showed that the preharvest cost of producing an

[18] Carter Goodrich and others, *Migration and Economic Opportunity*, University of Pennsylvania Press, 1936, p. 510.

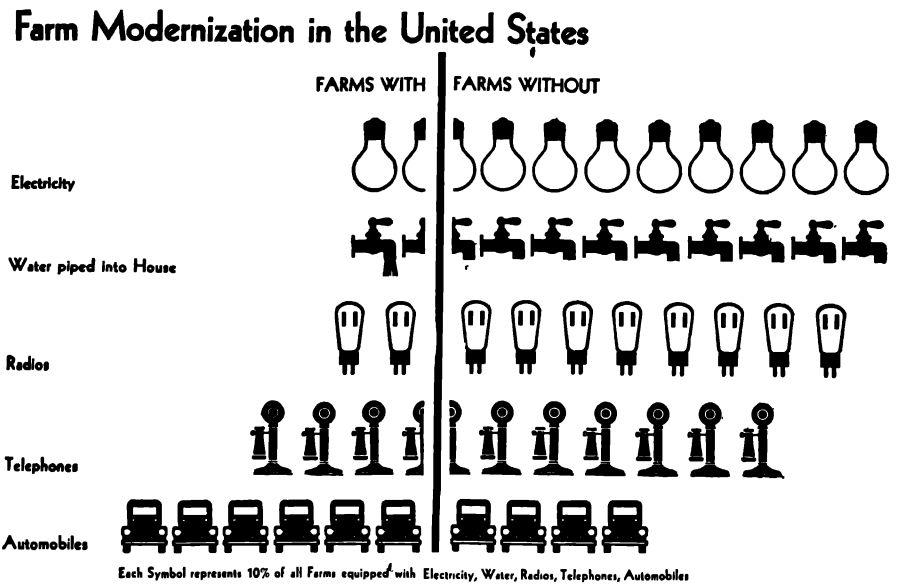

FIG. A. This graph shows some of the many things that we might do in this country if we could keep the people employed. The unorganized farmer and the unorganized farm worker might be called the butt of American economic life. Compare our percentage of farms having electricity with the 85% that are so equipped in Denmark. (Courtesy Nat'l Resources Board)

acre by mass-production machinery was $4.61, the harvesting cost $1.21, total $5.82, of which $3.06 was fixed overhead, chiefly interest, with some taxes and miscellaneous expenses. It is a perfectly plain case of the machine replacing the man.

Denmark has faced the situation by concluding that high mechanical efficiency is not so important for the national welfare as a healthy family on the farm, and so Denmark has passed laws prohibiting the consolidation of farms. This is deliberate legislation for productive inefficiency, and at the same time with the objective of social welfare. This legislation should be compared with the American alternative — idleness and relief. There is much to be said for this Danish policy. From the standpoint of the nation, what is the use of having machines produce efficiently while the men stand and rot? It is true that nothing deteriorates a man so fast as enforced idleness. Slavery can't touch it as a destroyer of character, health, and personality.

We now have, over large areas of the United States, tens of thousands of agricultural machines that work a few days or a few weeks of each year; the machine then loafs the rest of the year. The same regions have tens of thousands of people who loaf a considerable part of the year because there is nothing for them to do when seasonal farm work is finished. If we knew how to distribute the products of industry, these rural populations might have two sets of machinery — one on farm, and one in factory. One

would stand idle while the other worked, but the people would work eleven months or more in the year. As it is now, we let the men stand idle. It would be better to have an extra set of machinery stand idle instead of men.

EDUCATION AND THE CITY — HOW LONG CAN WE SURVIVE THEM?

We are faced by even greater problems. For the maintenance of the complex civilization on this continent, the apparent degeneration of human stock is even more immediately menacing than the waste of resources. Medical science, sanitation, and surgery have done little to improve human vigor, and have done much to reduce it. The laws of heredity, well worked out and practiced by man with regard to his plants and animals, show very clearly that the way to improve stock is to improve parents — take advantage of heredity. Thus far, medical science seems to have been chiefly occupied with saving human weaklings who have propagated their kind. Civilization has made the world safe for weaklings, and continues to produce them.

Civilization has also "made the world safe for stupidity." [19] An interesting and not too encouraging comment on intelligence is seen by implication if we examine the fate of the able and the dull among us. Every recent study of the American birth rate points to the disappearance of the human stock in almost every group that is in leadership in our society. In contrast to this we have developed institutional systems for the care and preservation and attempted improvement of the feeble in both mind and body. The wayward and weak of mind have special homes for refuge. Hospitals assist them in giving birth. Skilled physicians care for the slow-witted progeny. Nurses wait upon them. In special schools devoted childless teachers strive to inject ideas where ideas will not go. Then we, who breed pigs and pups with great care, release the moron and the near-moron to increase his kind, and we give him aid therein.

If one of us is born brilliant, we usually put him into an elaborate educational chain gang where he is in lockstep with mediocrity. The Man from the Moon might well conclude that we thought our civilization depended on the weak and the dull. It is peculiarly ironical that while we breed our animals up, we appear to be breeding ourselves down. While all this is going on, every thoughtful person can see that this civilization of interdependence, in combination with the recent enormous increase in scientific knowledge and the complexity of life, is putting greater stress upon personal and social character and demanding a higher grade of intellectual ability, social vision, honor, and constructive imagination. This situation seems to place great value upon the work of those reformers who are striving for the day when we shall have only planned parenthood. The continuance of this civilization and its improvement through the utilization of the almost unbelievable powers now at hand is first of all a problem in eugenics. We need men and women big enough to use the new powers. It has been said of man in New York (it may be taken as a type of Western civilization):

[19] See A. E. Wiggam, *The New Decalogue of Science*, Bobbs-Merrill Company, 1923.

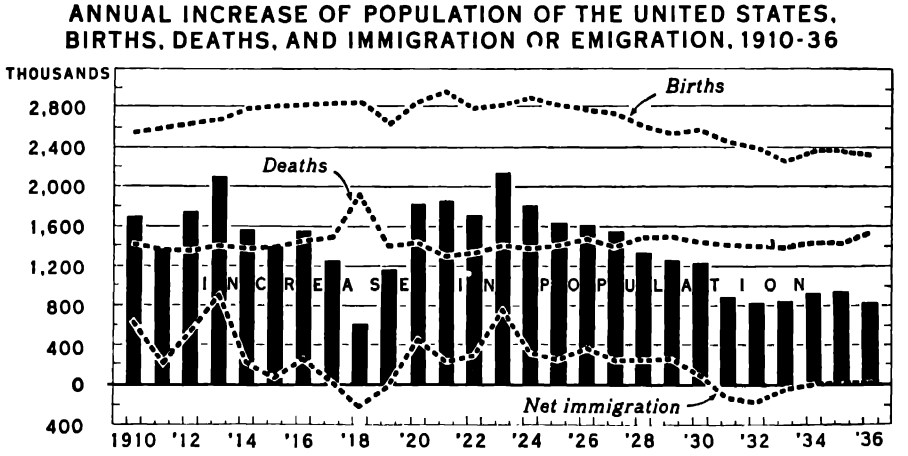

FIG. 964 A. This graph shows startling changes in a quarter of a century of development in the growth of the American population. For more than a century nearly all our operations have been based upon a rocketlike ascent of the population curve. Now it flattens out. The increase of 1936, 800,000, is only half what it was a decade before. Dr. O. E. Baker states that the birth rate has declined 10% in less than a decade (U.S. Dept Agr., *Miscellaneous Publication* 265). (Courtesy U.S. Dept Agr.)

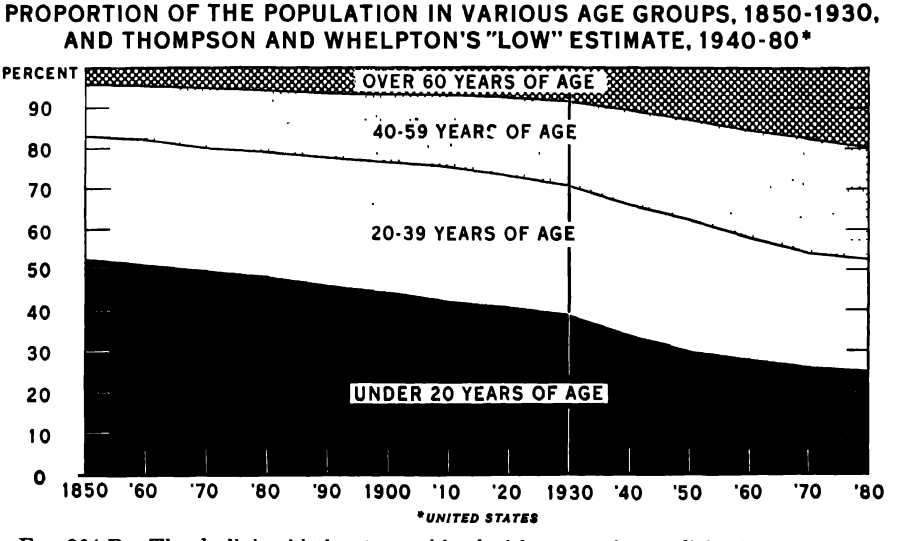

FIG. 964 B. The declining birth rate combined with preventive medicine is making great changes in our age groups. Perhaps we shall soon begin to convert abandoned schoolhouses into homes for the aged. (Courtesy U.S. Dept Agr.)

His mastery, however, depends upon the preservation of his energy, vigilance, industry, inventiveness, honesty and other high traits of character. Our constantly growing dependence upon nature makes it more necessary than ever before that science should play its part in preserving those traits which alone can render man permanently victorious over his geographical environment. . . .

Today we are at last coming to a realization that only by weeding out the weak-bodied, weak-willed parts of the community through some form of eugenic selection, and by seeing that people are adjusted to their physical environment, can we provide proper human material for the great tasks of civilization. We can scarcely avoid the conclusion that the building up of character is as much the work of the scientist as of the preacher, teacher or philanthropist.[20]

Recent vital statistics show that the birth rate of the millions who live in our large cities is too low to maintain their numbers (Fig. 966 A). Similar studies of the birth rate among college alumni show that they too are not maintaining their numbers.

It would appear from the standpoint of families and human strains that there are two diseases loose among us — diseases that kill and decimate human stocks, indeed, more than decimate. One is urbanism and the other is higher education. How long can we survive them? [21] Apparently as long as some other groups in other places continue to have children enough and children good enough to send to town to replace those who go to town and disappear.[22] At the present time this group is in the country, made up chiefly of farm laborers. It is their children, apparently, who are destined to inherit the American earth if our present group birth rates continue. How fares it with this ancestry of the future? Lowry Nelson, professor of sociology at the University of Minnesota, described him thus in a paper read before a conference on rural welfare at Lexington, Kentucky, in the autumn of 1939:

1. The two or three million American laborers working for wages on farms constitute the least privileged group in the rural population. Their wages are the lowest, housing the poorest, with social and economic hazards and handicaps greater than for any other major group.

[20] Ellsworth Huntington, "The Water Barriers of New York City," *Geographical Review*, September, 1916.

[21] There is some reason to believe that Europe exceeds America in having families of ability, wealth, and power that feel a sense of family pride and social responsibility which causes them to maintain themselves and carry on generation after generation. Indeed an American newspaper of wide circulation recently made a special-feature article of the fact that the third generation of a certain family of multimillionaires were really decent moral fellows and willing to try to do something worth while.

[22] This process of sending the boy crop and the girl crop to town is a heavy financial drain on the rural areas.

"The 1930 census reported a net loss to Virginia through out-of-state migration of a little over one-half million people. If $500 is allowed as the cost of rearing and educating each individual, a very conservative estimate, Virginia has contributed around 250 million dollars to other states through migration. Such a drain has been going on for generations.

"The movement of around 100,000 rural folk to Virginia cities in the 1920–30 decade has transferred many million dollars of rural wealth to the State's cities. This large loss of wealth from rural districts helps account for the relative poverty of such areas and has a bearing on marginality aside from the loss of good blood." — Report No. 7 on Marginal Population, Virginia State Planning Board, 1939.

That is not the whole story. My summer neighbor, a farmer, has a son who stays on the farm and three daughters who have married and gone to town. When his estate is settled, three-fourths of it will go to town.

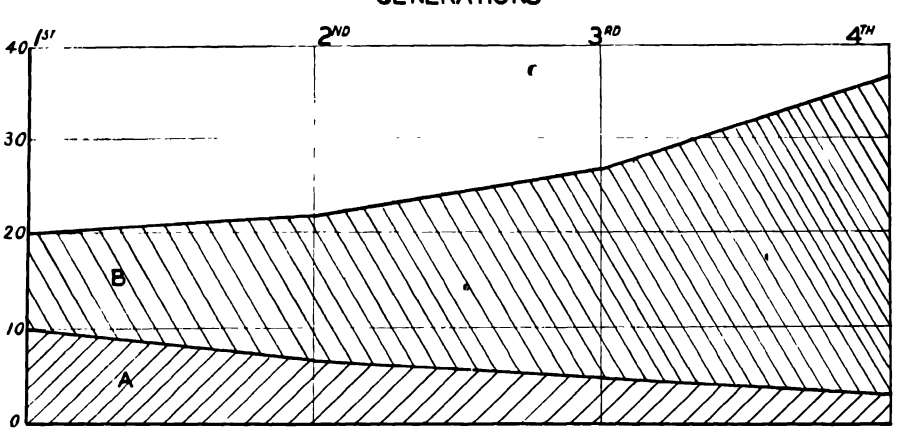

FIG. 966 A. **A**, the offspring of 10 adults in the large cities of the United States if present birth rates continue. **B**, the same for 10 adults in the poorer farming regions of the United States. The effects of such changes are a matter upon which there can be much speculation, but effects there certainly will be. (From O. E. Baker, U.S. Dept Agr., *Miscellaneous Publication* 266, p. 69)



FIG. 966 B. A group of students at the college door. This doorway is the entrance to what? According to the present record, to personal distinction for some, and to the extinction of the group (see the figure just above it). The United States record for men's and women's colleges alike is that every 100 who pass out from these doors will have less than 100 children. Their offspring are in numbers like, or less than, those of Group **A** in the preceding figure. The question is, how long can our civilization stand it? Certainly no nation can survive on any high level of economic life or culture if the education of a group starts its numbers into a continuous and progressive decline. Did the founders of colleges mean to wipe out American civilization? We need a new concept — two of them, indeed. We own land in trust for the future. Also a sound body and a sound mind are a public trust to be passed on like the land. Irresponsible individualism menaces America in many ways.

2. They are conspicuously exempted from social legislation designed to protect wage workers in industry.

3. Despite their considerable numbers, they constitute an unorganized heterogeneous mass of human beings.

4. Their numbers are doubtless increasing through recruitments from higher tenure groups, while their fertility exceeds that of any other tenure class.

5. They are victims of unusual progress in mechanization and rationalization of the agricultural industry.

These statements which I think are commonly made by observers may sound a bit strong when put in this categorical manner, but one cannot read the literature and come through with very many favorable observations on the status of their group.

To say that one group of people in a community, especially one economic group, promises to be great-grandparents of better or worse great-grandchildren than does another group is a bit perilous, but if the study of genetics shows us anything, it is that the way to change a strain of animals or plants is to pick out of each generation a certain type and breed from them, or conversely, to pick out of each generation a certain type and discard them. Thus have we changed the qualities of domestic animals and plants. Of course we cannot do this quite so concretely with human beings, but the advocates of planned parenthood in the United States are out to get the same results by their two recommendations: 1. Disseminate knowledge, so that the only children will be the wanted children. This is expected to stop much of the large birth rate. 2. Persuade persons of education and important position to have three or more children per family, so that the numbers of this strain will increase. If this can be brought to pass, city families will not die out as they are doing at present.

This process of migration to the city is new to the Western world. What will be its future effect on the quality of American population if it is not checked? A Virginia study gives a rather disquieting answer:

A study over a number of generations of the rate of increase of family strains of predominantly marginal standards as compared to strains of predominantly high standards indicates that the former multiply more than double as fast. For instance, an exhaustive check of the descendants of George Washington's grandfather, made by the Washington Bi-Centennial Commission, revealed only 890 persons, both male and female lines considered, of whom only 170 lived in Virginia. Only 26 of these were named Washington. In contrast one of the predominantly marginal family strains studied, whose ancestors were contemporaries of the early Washingtons, now has around 2800 descendants in Virginia, descendants of male lines only considered. A check of 367 completed families of this and several other similar strains showed 7.3 live children per family and 1.3 dead. Other marginal and higher standard strains show similar trends.

Vertical Social Mobility. The disproportionate increase of the marginal group would not be a matter of such great social import if a fair percentage of the offspring advance from generation to generation. Such data as was obtained on this point indicates that a relatively small percentage of a given generation make a marked rise and that this movement is partly off-set by sub-strains of once higher standard families dropping in the scale.[23]

[23] Mimeographed Report No. 7 from the Virginia Polytechnic Institute, Blacksburg, Virginia, March, 1939, prepared for consideration of the Marginal Population Committee of the Virginia State Planning Board, pp. 2–3.

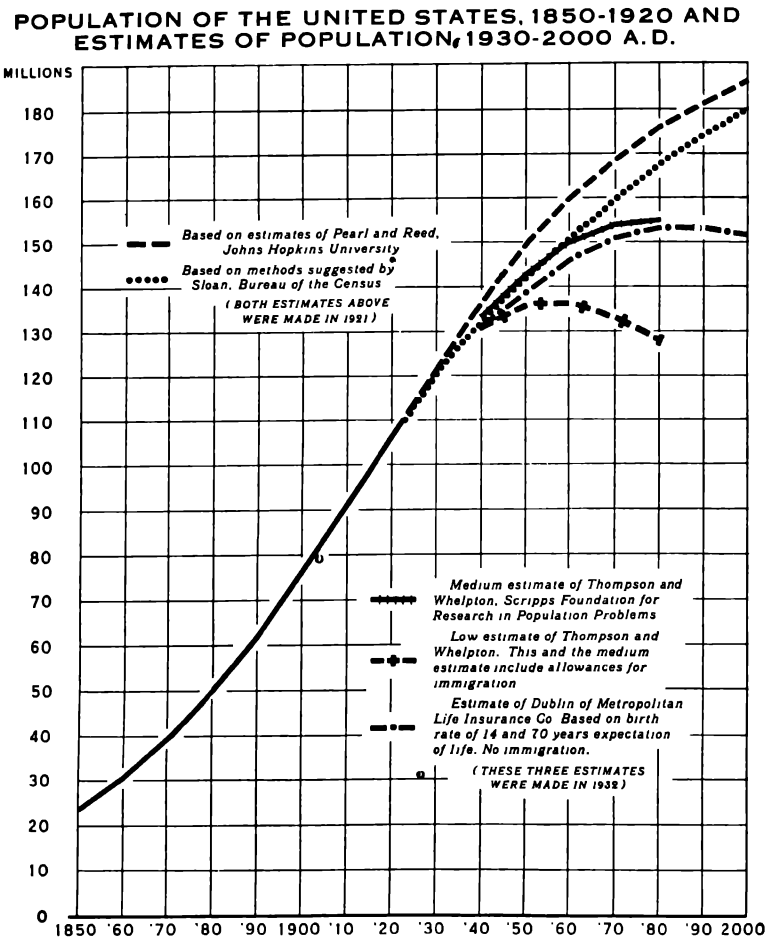

FIG. A. The rocket. For a century our population went up like a rocket. Industry, schoolhouses, and debt followed suit. Everything was based on a future that would pay for present expansion, and then ——. It will be interesting to compare these estimates with the U.S. Census of 1940. (Courtesy U.S. Dept Agr.)

IN CONCLUSION

First Imperative. We need in this rich continent of North America to conserve our material resources so that there may be homes for men. If there is no place for man, he cannot exist.

Second Imperative. The overtowering need of man today is for a slight increase in each generation of the average of hereditary intelligence and self-control. If this can be built up a little as generations go by, we can perhaps put civilization on a permanent and improving basis. If intelligence declines, another era of primitive agriculture and natural selection may await us, or we may be pushed aside by a people that keeps its intelligence.

Third Imperative. A system that will enable us to distribute the goods that we can produce is indispensable. It is probable that much of our low birth rate in the dominant groups is due to the terrible uncertainty and unemployment resulting from a faulty system of distribution. The future of American civilization may depend upon the prompt achievement of an economic system that can employ the population and give us social security.

Our present vision cannot picture the beautiful civilization that awaits us if we can maintain peace and keep up the intelligence, kindliness, and constructive imagination of our people. Everything else is in our hands. Only a few of these things can be attained until we get more people of a new type, the type *not* described by the Frenchman who said, "I don't believe your average American businessman is interested in anything but business." The man who amasses wealth has been our national hero too long — the man who wants to buy more land to raise more corn to raise more pigs to buy more land to raise more corn and so on. Science has produced wealth. Its next task is social righteousness and social reconstruction, for which North America offers splendid material resources.

These next fifty years, years of swift social change, will be an interesting time in which to be alive.

Appendix A

Geographers, as well as the general public, do indulge in a varying amount of inaccuracy and a surprising amount of imaginary processes in using the words "average rainfall," "average temperature."

This habit comes quite naturally, because it is so easy to talk about averages despite the fact that, as geographic phenomena, they are rare. Plants and animals do not live under conditions of *average* rainfall or *average* temperature. They live in the conditions of the moment. The so-called averages are really averages of *figures* of rainfall. The real question is: How do actual conditions differ from the average?

For those who wish to examine this matter a little we append herewith the rainfall records of a number of typical stations in the United States by months for a decade — a rather bad decade it was. (T in the tables means trace too small to measure. Rainfall measurements are in inches and temperatures in degrees Fahrenheit.)

PRECIPITATION DATA, 1929–1938, FOR SELECTED STATIONS

Year	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Total*
						SACRAMENTO, CALIF.							
1929	0.88	1.44	0.78	0.44	0.04	1.02	T	0	0	0.15	0	4.06	*8.81*
1930	3.65	1.62	2.86	0.94	0.34	T	0	T	0.29	0.47	1.11	0.56	*11.84*
1931	2.50	1.35	1.14	0.05	0.67	0.29	T	T	T	0.18	1.30	6.84	*14.32*
1932	1.09	1.76	0.34	0.76	0.30	T	T	0	0	0	0.36	2.11	*6.72*
1933	2.85	0.95	1.44	0.03	0.30	0.08	T	0	0.03	0.66	0	5.74	*12.08*
1934	1.33	2.97	0.13	0.16	0.26	0.30	0	T	0.01	0.45	2.61	2.50	*10.72*
1935	4.81	1.97	2.93	5.81	0.01	0	T	T	T	1.22	0.77	2.18	*19.70*
1936	3.80	8.59	1.33	1.69	0.68	0.27	T	0	T	0.35	0.03	2.62	*19.36*
1937	2.92	6.18	6.37	1.10	0.01	0.18	T	0	0	0.87	2.69	4.06	*24.38*
1938	3.50	8.24	3.92	1.51	0.04	T	T	0	0.30	1.29	0.88	0.71	*20.39*
						SALT LAKE CITY, UTAH							
1929	1.53	1.34	1.96	3.97	0.18	0.70	0.40	0.41	2.45	0.98	0.12	0.43	*14.47*
1930	1.38	2.15	0.74	1.48	1.52	0.32	0.84	1.87	2.40	1.42	1.07	0.54	*15.73*
1931	0.72	0.61	1.14	1.84	0.58	0.33	0.61	1.07	0.56	0.57	1.95	1.42	*11.40*
1932	1.27	0.99	1.51	2.04	0.78	1.41	0.52	2.70	T	1.06	0.79	1.81	*14.88*
1933	2.07	0.99	1.44	1.28	3.25	T	0.18	0.20	0.34	0.66	0.19	0.51	*11.11*
1934	1.47	2.24	0.96	0.46	0.01	0.82	0.68	1.01	0.40	1.48	2.89	1.87	*14.29*
1935	0.30	0.72	1.35	2.89	3.68	0.13	0.01	0.88	0.53	0.26	1.33	0.88	*12.96*
1936	2.54	3.69	1.29	0.89	0.34	1.20	1.70	0.93	0.14	1.76	1.10	2.17	*17.75*
1937	2.04	1.50	1.25	1.15	1.17	0.26	1.23	0.51	0.68	2.63	0.80	1.32	*14.54*
1938	0.60	1.15	4.11	1.78	2.09	0.53	0.29	0.48	0.09	1.61	2.05	1.63	*16.41*

PRECIPITATION DATA, 1929–1938, FOR SELECTED STATIONS

Year	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Total*
						SCOTTSBLUFF, NEB.							
1929	0.18	0.51	1.70	3.12	1.20	2.60	1.79	0.77	3.25	1.63	0.92	T	*17.67*
1930	0.67	0.22	0.22	1.73	4.04	1.28	0.47	3.95	1.81	1.89	0.81	0.17	*17.26*
1931	0.03	0.50	0.89	1.34	1.51	0.72	0.11	0.36	1.24	1.38	0.51	0.88	*9.47*
1932	0.11	0.76	1.24	3.23	2.27	1.88	1.84	1.32	0.44	0.89	0.23	0.30	*14.51*
1933	T	0.04	1.22	3.69	3.91	0.32	0.89	2.84	0.88	T	0.16	0.69	*14.64*
1934	0.22	0.81	0.48	0.90	0.89	4.25	0.47	1.22	1.26	T	0.33	0.29	*11.12*
1935	0.17	0.32	1.48	4.15	7.52	2.26	1.34	0.30	0.94	0.04	0.22	0.15	*18.89*
1936	0.30	0.53	1.03	2.19	2.39	2.35	0.53	1.12	0.27	0.57	0.86	0.98	*13.12*
1937	0.52	0.15	0.70	0.87	2.22	2.07	0.48	1.21	1.59	1.10	0.73	0.44	*12.08*
1938	0.24	0.25	1.15	2.67	3.92	3.51	2.54	0.69	3.17	0.27	0.94	0.17	*19.52*
						DES MOINES, IOWA							
1929	2.70	2.06	1.11	4.38	2.18	2.42	3.72	2.82	4.67	2.74	1.87	0.34	*31.01*
1930	1.41	0.50	1.12	2.35	3.36	3.69	0.56	1.00	1.53	2.64	1.05	0.36	*19.57*
1931	0.57	0.09	1.52	1.55	2.68	6.14	3.60	3.66	4.44	3.54	7.10	3.72	*38.61*
1932	1.83	0.92	1.19	1.00	2.68	3.40	2.76	8.40	2.11	1.19	2.22	1.60	*29.30*
1933	1.06	0.16	2.19	0.93	2.65	0.23	4.06	1.85	2.40	3.15	0.22	0.77	*19.67*
1934	1.22	0.72	1.00	0.98	1.06	3.18	2.52	1.39	6.20	1.67	4.08	0.30	*24.32*
1935	1.57	1.32	1.10	0.74	7.18	7.75	3.06	1.85	5.99	3.11	2.68	0.80	*37.15*
1936	1.86	0.95	1.57	1.33	1.45	3.81	0.41	2.53	8.50	0.93	0.76	1.54	*25.64*
1937	1.85	0.80	1.99	3.29	7.13	3.95	0.58	2.72	1.41	1.38	0.65	0.68	*26.43*
1938	0.83	0.46	2.24	4.21	5.21	2.33	2.49	3.08	2.55	1.33	2.14	0.74	*27.61*
						ALBANY, N.Y.							
1929	2.21	3.68	3.10	6.31	2.34	2.65	0.63	1.02	3.45	2.32	1.82	2.16	*31.69*
1930	1.77	1.04	2.76	1.53	3.02	3.21	4.33	2.20	1.96	1.13	1.90	0.69	*25.54*
1931	2.26	2.07	1.48	2.31	5.92	4.00	5.76	2.34	1.91	1.37	1.18	2.62	*33.22*
1932	2.83	1.80	2.73	2.05	1.69	2.24	4.66	3.30	1.73	4.79	5.41	1.01	*34.24*
1933	1.49	2.52	4.02	3.92	2.41	2.21	1.83	5.95	6.28	3.14	1.02	3.39	*38.18*
1934	2.36	2.68	3.13	2.82	2.56	5.75	2.98	2.76	5.82	1.43	2.26	1.93	*36.48*
1935	4.10	2.26	1.60	2.48	2.35	5.20	4.96	1.47	2.90	1.42	4.15	0.85	*33.74*
1936	4.59	1.92	5.39	3.12	4.20	1.86	1.94	6.54	1.34	3.99	2.16	2.90	*39.95*
1937	2.61	2.08	2.40	1.89	4.13	5.31	4.35	4.16	5.08	2.61	1.83	2.05	*38.50*
1938	3.49	1.60	1.63	2.59	3.42	3.52	5.11	3.18	8.76	1.18	2.36	3.33	*40.17*
						PORTLAND, ORE.							
1929	3.50	0.97	2.90	4.06	1.14	2.19	0.02	0.23	0.31	1.33	0.67	8.79	*26.11*
1930	3.43	5.03	2.21	2.72	3.08	0.69	T	0.06	1.79	2.15	2.84	3.16	*27.16*
1931	4.30	2.40	8.12	2.40	1.09	3.13	T	0.04	2.10	4.32	6.38	8.40	*42.68*
1932	5.63	2.58	6.08	3.57	1.50	0.07	0.48	0.45	0.11	3.76	7.88	7.87	*39.98*
1933	7.94	4.26	5.10	0.95	3.59	2.60	T	0.86	2.97	4.59	2.54	17.45	*52.85*
1934	6.02	1.40	5.18	2.46	1.60	0.96	0.11	0.33	1.32	5.30	10.47	10.83	*45.98*
1935	3.45	3.17	5.28	2.48	0.61	0.50	0.28	0.20	0.86	3.20	3.27	5.89	*29.19*
1936	8.55	4.73	3.10	0.80	3.72	2.43	0.40	0.07	1.41	0.44	0.36	8.28	*34.29*
1937	6.02	6.34	2.81	6.22	1.06	3.88	0.20	1.41	2.06	2.91	10.08	13.86	*56.85*
1938	5.06	7.83	6.42	2.02	0.65	0.45	0.25	0.35	1.38	2.87	4.83	4.16	*36.27*

PRECIPITATION DATA, 1929–1938, FOR SELECTED STATIONS

Year	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Total*
						PENDLETON, ORE.							
1929	2.39	0.38	0.62	0.26	0.76	1.33	0	0.09	0.18	0.53	0.12	2.98	*9.64*
1930	1.96	1.49	0.85	0.52	1.55	0.49	T	0.27	0.60	1.42	0.75	0.61	*10.51*
1931	1.03	0.78	2.39	0.97	0.11	2.10	0	0	0.36	1.06	2.21	1.83	*12.84*
1932	0.50	0.94	2.78	0.87	0.83	0.05	0.18	0.07	0.01	0.87	2.30	0.50	*9.90*
1933	0.84	1.55	1.33	1.04	1.20	0.98	0.05	0.35	1.02	1.19	1.05	2.33	*12.93*
1934	1.24	0.63	1.02	0.51	0.23	1.55	0.11	0.14	0.12	1.20	1.90	1.37	*10.02*
1935	0.90	0.92	0.62	1.93	0.25	0.57	0.05	0.17	0.26	1.03	0.35	1.36	*8.41*
1936	2.46	2.13	0.26	0.58	0.42	1.78	0.06	0.01	0.98	0.05	0.05	0 88	*9.66*
1937	1.61	0.92	1.46	2.39	0.32	2.41	0.02	0.12	0.03	0.72	1.85	1.82	*16.37*
1938	1.03	1.38	1.02	1.46	0.52	1.05	0.02	0.04	0.26	1.41	1.00	0.94	*10.13*
						LEWISTOWN, MONT.							
1929	1.14	1.22	1.76	0.61	3.28	3.92	1.00	0.54	1.91	1.73	1.42	2.22	*20.75*
1930	0.78	0.17	0.81	0.40	0.79	0.88	2.87	1.33	1.85	2.26	0.53	0.71	*13.38*
1931	0.24	0.15	0.58	1.04	1.99	2.04	1.00	1.94	2.14	0.10	0.70	0.45	*12.37*
1932	0.80	0.44	2.82	1.57	2.82	5.64	1.36	1.90	1.23	2.24	0.86	1.08	*22.76*
1933	0.62	0.82	0.28	2.34	3.63	1.59	0.21	3.17	0.70	0.73	0.70	1.20	*15.99*
1934	0.67	0.82	1.42	0.40	1.54	3.42	2.20	0.21	1.66	0.31	0.13	1.38	*14.09*
1935	0.38	0.02	1.83	1.09	2.69	1.90	1.58	0.23	0.33	1.38	0.97	0.29	*12.69*
1936	0.69	1.44	0.98	1.54	2.28	1.10	0.98	1.55	0.52	0.62	0.62	0.72	*13.04*
1937	0.81	1.16	0.53	0.56	0.43	3.48	1.77	0.53	1.88	1.05	0.67	1.71	*14.58*
1938	0.83	0.10	1.87	0.56	2.60	5.67	2.88	0.89	0.20	2.71	0.73	0.71	*19.75*
						BISMARCK, N.D.							
1929	0.69	0.32	1.61	1.87	2.37	1.09	1.06	0.75	1.69	1.82	0.25	0.81	*14.33*
1930	0.23	1.36	T	1.37	2.19	2.19	1.90	1.71	2.70	1.94	0.98	0.19	*16.76*
1931	0.05	0.74	1.26	0.42	1.94	1.66	3.39	1.58	2.81	1.19	0.25	0.53	*15.82*
1932	0.35	0.20	0.73	2.08	3.78	2.57	1.38	0.61	0.33	2.05	0.16	0.17	*14.41*
1933	0.83	0.22	0.68	0.73	2.38	1.95	1.61	0.48	0.37	0.44	0.74	0.43	*10.68*
1934	0.08	0.03	0.62	0.32	0.09	3.39	0.98	0.50	0.54	0.86	0.20	0.13	*7.74*
1935	0.04	0.29	0.99	3.03	2.25	2.82	5.46	1.14	0.38	T	0.82	0.71	*17.93*
1936	0.36	0.59	0.88	0.37	0.12	0.47	0.10	0.62	1.66	0.14	0.45	0.21	*5.97*
1937	0.70	0.39	0.58	1.43	1.52	6.09	2.17	1.12	1.19	0.49	0.41	0.51	*16.60*
1938	0.40	0.76	0.58	0.54	2.45	3.17	2.36	0.84	1.11	0.24	0.81	0.16	*13.42*
						MINNEAPOLIS, MINN.							
1929	1.60	1.05	1.31	1.62	1.91	4.21	3.33	2.15	3.57	2.17	0.36	0.36	*23.64*
1930	0.95	2.66	0.48	0.62	3.38	6.68	0.92	0.72	4.14	1.14	2.41	0.06	*24.16*
1931	0.13	0.70	1.49	1.20	1.35	4.78	1.12	2.97	2.42	1.87	3.29	0.71	*22.03*
1932	1.70	0.74	1.42	2.15	2.05	1.56	4.36	3.87	0.85	0.89	2.28	1.52	*23.39*
1933	0.89	0.77	2.15	1.43	7.87	1.31	2.16	1.09	3.44	1.26	0.57	0.71	*23.65*
1934	0.68	0.17	0.68	1.57	0.21	2.30	1.40	1.61	4.86	5.64	2.38	1.23	*22.73*
1935	1.44	0.21	1.63	2.32	3.81	4.82	2.59	3.02	1.98	3.95	0.69	1.04	*27.50*
1936	0.77	1.55	2.66	1.48	2.25	2.29	0.11	3.48	0.78	0.66	0.66	1.78	*18.47*
1937	1.24	0.48	1.07	2.62	5.42	3.11	0.48	4.10	1.67	1.36	0.51	0.53	*22.59*
1938	0.87	0.62	2.11	3.27	6.97	2.96	3.36	3.45	3.24	0.84	1.29	0.77	*29.75*

PRECIPITATION DATA, ,1929–1938, FOR SELECTED STATIONS

Year	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Total*
						AMARILLO, TEX.							
1929	0.16	0.34	1.84	T	3.19	0.77	1.76	4.54	1.97	3.28	0.91	0.11	*18.87*
1930	0.57	0	1.27	2.19	1.49	4.47	2.42	1.61	0.20	2.57	0.33	0.46	*17.58*
1931	0.3[illegible]	1.83	1.69	1.57	3.11	0.69	1.40	2.19	0.51	0.92	2.89	1.24	*18.35*
1932	1.60	0.41	0.42	2.21	1.02	9.24	1.22	0.70	2.79	0.64	0.02	0.87	*21.14*
1933	0.02	0.29	0.56	0.64	2.01	0.05	0.66	6.02	0.88	0.49	0.58	0.02	*12.22*
1934	0.09	0.09	2.83	0.77	3.21	1.94	0.19	1.51	0.96	0.21	1.13	0.40	*13.33*
1935	0.75	0.22	1.14	0.05	2.57	0.28	0.81	5.32	2.03	0.87	1.27	0.18	*15.49*
1936	1.02	0.25	T	0.25	9.02	0.84	0.51	1.39	4.74	0.82	T	0.88	*19.72*
1937	0.29	0.18	1.10	0.39	6.83	2.83	1.49	0.64	2.61	0.31	0.14	0.29	*17.10*
1938	0.18	2.87	1.24	1.07	4.03	2.49	1.88	0.15	1.62	3.06	0.43	0.08	*19.10*
						MONTGOMERY, ALA.							
1929	4.30	10.34	15.38	7.56	7.27	4.68	3.94	0.82	5.42	3.21	12.01	3.32	*78.25*
1930	4.92	2.69	4.93	2.26	2.10	1.98	2.67	3.96	6.78	2.08	4.91	2.48	*41.76*
1931	2.48	3.35	2.88	3.68	2.55	1.61	3.18	4.07	0.63	0.88	1.89	7.24	*34.44*
1932	5.86	5.17	4.17	2.86	3.16	7.62	3.49	5.26	2.97	4.67	1.77	7.76	*54.76*
1933	3.23	5.65	10.65	5.72	1.76	4.07	3.86	3.02	5.91	3.47	0.36	3.03	*50.73*
1934	1.86	3.55	5.09	3.40	4.50	3.33	4.10	4.19	1.32	7.95	2.25	2.83	*44.37*
1935	1.67	5.62	5.97	3.85	2.89	1.66	5.63	4.83	1.91	0.65	1.44	4.87	*40.99*
1936	12.14	7.29	2.08	6.16	2.22	4.14	9.16	3.43	1.86	2.45	2.10	6.63	*59.66*
1937	4.66	5.51	5.59	6.62	2.87	2.53	2.17	5.67	7.20	4.81	3.24	2.29	*53.16*
1938	2.39	1.32	5.97	9.60	1.41	4.31	8.84	3.08	0.18	0.15	2.28	2.48	*42.01*
						WASHINGTON, D.C.							
1929	2.16	3.19	2.64	6.10	2.29	7.41	1.29	1.30	4.32	4.82	1.70	2.20	*39.42*
1930	2.85	1.64	2.26	3.12	1.81	3.19	2.30	0.62	0.76	0.28	0.79	2.04	*21.66*
1931	1.56	1.36	3.50	2.87	4.84	2.12	4.23	5.92	2.79	1.28	1.01	2.03	*33.51*
1932	4.82	2.46	6.45	2.12	5.07	2.84	2.43	1.36	4.24	7.40	6.43	3.93	*49.55*
1933	3.25	2.63	3.24	4.67	6.26	3.88	6.71	9.91	2.62	2.56	0.95	2.43	*49.11*
1934	1.97	3.22	4.18	2.27	3.85	2.87	2.88	5.21	17.45	0.75	3.58	2.91	*51.14*
1935	5.27	2.37	3.39	3.95	3.54	3.43	2.25	2.40	8.08	2.76	4.03	2.06	*43.53*
1936	5.87	3.83	4.47	1.98	5.32	2.29	4.07	3.61	1.98	1.70	0.76	5.23	*41.11*
1937	7.83	3.33	1.50	6.85	4.02	5.23	3.67	6.70	1.76	8.81	3.88	0.71	*54.29*
1938	2.64	2.37	2.23	1.67	3.51	2.26	5.06	4.64	4.27	1.15	2.60	2.69	*35.09*

Source. — U.S. Dept Agr., Weather Bureau, *Climatological Data for the United States by Sections*, Vols. 16–25, No. 13, years 1929–1938, printed at the several section centers, assembled and bound at the Washington office for service use and exchange

SELECTED CLIMATIC DATA FOR SELECTED STATIONS

(From establishment of stations to 1930)

STATIONS	Month	TEMPERATURE IN DEGREES: *Lowest temperature during month*	*Average of coldest month*	*Average of month*	*Average of warmest month*	*Highest temperature during month*	*Average precipitation in inches*
BOSTON, MASS.	J.	− 13	20	28	39	70	3.5
	F.	− 11	21	28	38	68	3.3
	M.	− 8	26	36	46	83	3.7
	A.	11	39	46	52	89	3.5
	M.	31	51	57	64	97	3.2
	J.	42	60	66	71	100	3.1
	J.	46	68	72	77	104	3.5
	A.	47	65	70	74	98	3.7
	S.	34	59	64	68	102	3.0
	O.	25	48	54	60	90	3.4
	N.	− 2	33	42	50	77	3.7
	D.	− 14	22	32	40	69	3.4
SEATTLE, WASH.	J.	3	31	40	44	63	4.8
	F.	4	35	42	47	67	3.8
	M.	20	40	45	50	81	3.1
	A.	30	46	50	56	85	2.4
	M.	36	51	55	58	92	1.8
	J.	40	57	60	63	98	1.3
	J.	46	61	64	68	95	.6
	A.	46	60	64	68	92	.7
	S.	36	56	59	62	87	1.7
	O.	29	48	52	57	81	2.8
	N.	15	38	46	52	68	4.8
	D.	12	36	42	46	62	5 5
CHARLESTON, S.C.	J.	10	33	50	62	80	3.0
	F.	7	40	52	65	82	3.1
	M.	24	49	58	69	94	3.2
	A.	32	58	65	72	93	2.4
	M.	45	66	73	78	98	3.3
	J.	49	75	79	86	101	5.1
	J.	63	75	82	86	104	6.2
	A.	62	71	81	86	102	6.5
	S.	49	70	77	82	100	5.2
	O.	37	58	68	77	95	3.7
	N.	23	50	58	69	83	2.5
	D.	12	42	51	62	79	3.2
MIAMI, FLA.	J.	29	63	68	73	85	2.8
	F.	27	63	68	73	88	2.1
	M.	34	63	71	75	92	2.5
	A.	45	70	74	79	93	3.2
	M.	50	74	78	81	94	6.8
	J.	61	79	80	82	94	7.0
	J.	66	80	82	83	96	6.1
	A.	60	80	82	84	96	6.3
	S.	62	79	81	83	95	8.9
	O.	52	74	78	81	93	9.2
	N.	36	67	73	77	88	2.8
	D.	32	63	68	73	91	2.0

SELECTED CLIMATIC DATA FOR SELECTED STATIONS

(From establishment of stations to 1930)

STATIONS	Month	TEMPERATURE IN DEGREES					Average precipitation in inches
		Lowest temperature during month	Average of coldest month	Average of month	Average of warmest month	Highest temperature during month	
LOS ANGELES, CALIF.	J.	28	49	55	61	90	3.1
	F.	28	51	56	63	92	3.0
	M.	31	52	58	63	99	2.8
	A.	36	56	60	64	100	1.0
	M.	40	59	62	66	103	1.4
	J.	46	63	66	71	105	.1
	J.	49	65	70	74	109	0
	A.	49	68	71	76	106	0
	S.	44	65	70	74	108	.2
	O.	40	60	65	71	102	.6
	N.	34	56	62	67	96	1.2
	D.	30	53	57	64	89	2.6
WASHINGTON, D.C.	J	− 14	24	34	44	76	3.3
	F.	− 15	26	35	43	84	3.1
	M.	4	34	43	56	93	3.7
	A.	15	48	54	59	95	3.3
	M.	33	59	64	70	97	3.5
	J.	43	66	72	78	102	4.1
	J.	52	72	77	81	106	4.5
	A.	49	70	75	80	106	4.2
	S.	36	62	68	77	104	3.4
	O.	26	51	57	63	93	2.9
	N.	11	40	46	51	83	2.5
	D.	− 13	26	36	46	74	3.1
OMAHA, NEB.	J.	− 32	8	22	35	67	.7
	F.	− 26	14	26	41	78	.9
	M.	− 8	27	38	54	91	1.3
	A.	6	43	52	60	94	2.7
	M.	25	54	62	70	99	3.7
	J.	42	66	72	79	105	4.6
	J.	50	71	77	85	109	4.0
	A.	44	68	75	82	111	3.4
	S.	30	60	66	75	102	3.3
	O.	8	43	54	62	92	2.3
	N.	− 14	28	39	47	80	1.2
	D.	− 20	16	27	39	71	.9
BISMARCK, N.D.	J.	− 45	− 9	8	24	60	.4
	F.	− 43	− 4	10	28	64	.4
	M.	− 36	8	24	43	81	.9
	A.	− 3	34	42	52	90	1.5
	M.	13	45	54	61	97	2.3
	J.	31	58	64	71	107	3.4
	J.	32	63	70	76	108	2.2
	A.	32	64	67	73	105	1.8
	S.	10	53	58	67	102	1.2
	O.	− 10	34	45	53	91	.9
	N.	− 28	7	28	40	73	.6
	D.	− 42	− 2	15	29	64	.6

SELECTED CLIMATIC DATA FOR SELECTED STATIONS

(From establishment of stations to 1930)

STATIONS	Month	TEMPERATURE IN DEGREES					Average precipitation in inches
		Lowest temperature during month	Average of coldest month	Average of month	Average of warmest month	Highest temperature during month	
DENVER, COLO.	J.	− 29	17	30	38	76	.4
	F.	− 22	18	33	42	77	.5
	M.	− 11	26	39	50	82	1.0
	A.	4	39	47	56	86	2.0
	M.	19	49	56	62	92	2.3
	J.	32	61	66	72	99	1.4
	J.	42	67	72	77	102	1.7
	A.	40	66	71	75	105	1.5
	S.	21	55	62	66	97	1.0
	O.	− 2	43	51	56	90	1.0
	N.	− 18	22	40	46	79	.6
	D.	− 25	21	32	40	74	.7
LAKE PLACID, N.Y.	J.	− 37	3	14	21	54	3.4
	F.	− 36	3	15	27	65	2.8
	M.	− 23	15	25	35	75	3.6
	A.	− 10	29	37	46	80	3.0
	M.	17	43	49	55	88	3.0
	J.	24	52	58	65	90	3.6
	J.	30	58	63	71	96	4.0
	A.	29	51	61	65	91	3.3
	S.	18	49	54	59	92	3.1
	O.	5	38	44	50	84	3.0
	N.	− 9	24	31	40	69	3.0
	D.	− 39	6	19	30	58	2.8
NEW ORLEANS, LA.	J.	15	46	55	65	82	4.6
	F.	7	45	57	66	83	4.2
	M.	30	55	63	71	90	4.7
	A.	38	65	69	74	90	4.8
	M.	52	72	75	79	96	4.5
	J.	58	77	81	85	102	5.5
	J.	66	79	82	85	102	6.6
	A.	63	79	82	86	100	5.8
	S.	54	76	80	83	99	4.8
	O.	40	66	71	80	94	3.5
	N.	29	56	62	67	89	3.8
	D.	19	48	56	64	83	4.6
RENO, NEV.	J.	− 19	9	32	50	67	1.5
	F.	− 12	10	36	61	76	1.1
	M.	− 3	21	41	62	79	.8
	A.	14	24	48	74	88	.5
	M.	16	33	54	79	98	.5
	J.	28	41	62	88	100	.3
	J.	35	48	70	92	104	.2
	A.	35	47	69	91	102	.2
	S.	24	40	60	83	96	.2
	O.	16	30	51	74	87	.3
	N.	5	23	42	60	80	.6
	D.	− 7	16	33	55	69	.9

Appendix B

This table of city populations at three census periods demonstrates how the cities are faring. It shows clearly the boom of Detroit through automobiles and of Los Angeles through residence. An oil boom shows itself in Oklahoma City and Tulsa, Oklahoma, and in Houston and Port Arthur, Texas. Washington, D.C., booms with bureaucracy.

Lawrence and New Bedford, Massachusetts, and Butte, Montana, decline. Kansas City and many inland towns are nearly static: nothing new has turned up.

In judging metropolitan cities like Boston, Philadelphia, and St. Louis it should be remembered that the central city areas are losing population to the suburbs.

This table almost merits reading by students as a final review — to see if you know where the city is, what it is and why it stands or shrinks or swells.

Place	*Population*		
	1920	1930	1940
Akron, Ohio	208,435	255,040	244,791
Albany, N.Y.	113,344	127,412	130,577
Albuquerque, N. Mex.	15,157	26,570	35,449
Amarillo, Texas	15,494	43,132	51,686
Amsterdam, N.Y.	33,524	34,817	33,329
Anaconda, Mont.	11,668	12,494	11,004
Ashland, Wis.	11,334	10,622	11,101
Atlanta, Ga.	200,616	270,366	302,288
Atlantic City, N.J.	50,707	66,198	64,094
Auburn, N.Y.	36,192	36,652	35,753
Aurora, Ill.	36,397	46,589	47,170
Baltimore, Md.	733,826	804,874	859,100
Bayonne, N.J.	76,754	88,979	79,198
Beacon, N.Y.	10,996	11,933	12,572
Bellingham, Wash.	25,585	30,823	29,314
Bethlehem, Pa.	50,358	57,892	58,490
Billings, Mont.	15,100	16,380	23,261
Binghamton, N.Y.	66,800	76,662	78,309
Bloomfield, N.J.	22,019	38,077	41,623
Boston, Mass.	748,060	781,188	770,816
Bremerton, Wash.	8,918	10,170	15,134
Brookline, Mass.	37,748	47,490	49,786
Brooklyn, N.Y.	2,018,356	2,560,401	2,698,285
Brownsville, Texas	11,791	22,021	22,083
Buffalo, N.Y.	506,775	573,076	575,901
Butte, Mont.	41,611	39,532	37,081
Cambridge, Mass.	109,694	113,643	110,879
Camden, N.J.	116,309	118,700	117,536
Catskill, N.Y.	4,728	5,082	5,429

Place	Population		
	1920	1930	1940
Charleston, W. Va.	39,608	60,408	67,914
Charleston, S.C.	67,957	62,265	71,275
Charlotte, N.C.	46,338	82,675	100,899
Chattanooga, Tenn.	57,895	119,798	128,163
Chester, Pa.	58,030	59,164	59,285
Cheyenne, Wyo.	13,829	17,361	22,474
Chicago, Ill.	2,701,705	3,376,438	3,396,808
Cincinnati, Ohio	401,247	451,160	455,610
Cleveland, Ohio	796,841	900,429	878,336
Clifton, N.J.	26,470	46,875	48,827
Colorado Springs, Colo.	30,105	33,237	36,789
Dallas, Texas	158,976	260,475	294,734
Danville, Va.	21,539	22,247	32,749
Denver, Colo.	256,491	287,861	322,412
Des Moines, Iowa	126,468	142,559	159,819
Detroit, Mich.	993,678	1,568,662	1,623,452
Dobbs Ferry, N.Y.	4,401	5,741	5,883
Dubuque, Iowa	39,141	41,679	43,892
Duluth, Minn.	98,917	101,463	101,065
Durham, N.C.	21,719	52,037	60,195
East Orange, N.J.	50,710	68,020	68,945
East Rochester, N.Y.	3,901	6,627	6,691
East St. Louis, Ill.	66,767	74,347	75,609
Eau Claire, Wis.	20,906	26,287	30,745
Elgin, Ill.	27,454	35,929	38,333
Elizabeth, N.J.	95,783	114,589	109,912
Elmira, N.Y.	45,393	47,397	45,106
El Paso, Texas	77,560	102,421	96,810
Endicott, N.Y.	9,500	16,231	17,702
Erie, Pa.	93,372	115,967	116,955
Evansville, Ind.	85,264	102,249	97,062
Everett, Mass.	40,120	48,424	46,784
Everett, Wash.	27,644	30,567	30,224
Fall River, Mass.	120,485	115,274	115,428
Fargo, N. Dak.	21,961	28,619	32,580
Flint, Mich.	91,599	156,492	151,543
Fond du Lac, Wis.	23,427	26,449	27,209
Fort Worth, Texas	106,482	163,447	177,662
Fulton, N.Y.	13,043	12,462	13,362
Galveston, Texas	44,255	52,938	60,862
Geneva, N.Y.	14,648	16,053	15,555
Gloversville, N.Y.	22,075	23,099	23,329
Grand Forks, N. Dak.	14,010	17,112	20,228
Great Falls, Mont.	24,121	28,822	29,828
Greeley, Colo.	10,958	12,203	15,995
Greensboro, N.C.	19,861	53,569	59,319

Place	Population		
	1920	1930	1940
Hagerstown, Md.	28,064	30,861	32,491
Hamtramck, Mich.	48,615	56,268	49,839
Harrisburg, Pa.	75,917	80,339	83,893
Hastings-on-Hudson, N.Y.	5,526	7,097	7,057
Haverhill, Mass.	53,884	48,710	46,752
Helena, Mont.	12,037	11,803	15,056
Herkimer, N.Y.	10,453	10,446	9,617
Highland Park, Mich.	46,499	52,959	50,810
High Point, N.C.	14,302	36,745	38,495
Hoboken, N.J.	68,166	59,261	50,115
Holyoke, Mass.	60,203	56,537	53,750
Houston, Texas	138,276	292,352	384,514
Hudson, N.Y.	11,745	12,337	11,517
Ilion, N.Y.	10,169	9,890	8,927
Indianapolis, Ind.	314,194	364,161	386,972
Ironton, Ohio	14,007	16,621	15,851
Irvington, N.J.	25,480	56,733	55,328
Ithaca, N.Y.	17,004	20,708	19,730
Jacksonville, Fla.	91,558	129,549	173,065
Jersey City, N.J.	298,103	316,715	301,173
Johnson City, N.Y.	8,587	13,567	18,039
Johnstown, N.Y.	10,908	10,801	10,666
Johnstown, Pa.	67,327	66,993	66,668
Joplin, Mo.	29,902	33,454	37,144
Kansas City, Kan.	101,177	121,857	121,458
Kansas City, Mo.	324,410	399,746	399,178
Kearny, N.J.	26,724	40,716	39,467
Kenmore, N.Y.	3,160	16,482	18,612
Key West, Fla.	18,749	12,831	12,927
Kingston, N.Y.	26,688	28,088	28,589
La Crosse, Wis.	30,421	39,614	42,707
Lackawanna, N.Y.	17,918	23,948	24,058
Lancaster, Pa.	53,150	59,949	61,345
Lansing, Mich.	57,327	78,397	78,753
Las Vegas, N. Mex.	4,304	4,719	5,941
Lawrence, Mass.	94,270	85,068	84,323
Lexington, Ky.	41,534	45,736	49,304
Little Falls, N.Y.	13,029	11,105	10,163
Little Rock, Ark.	65,142	81,679	88,039
Lockport, N.Y.	21,308	23,160	24,379
Logan, Utah	9,439	9,979	11,868
Los Angeles, Cal.	576,673	1,238,048	1,504,277
Louisville, Ky.	234,891	307,745	319,077
Lowell, Mass.	112,759	100,234	101,389
Lynchburg, Va.	30,070	40,661	44,541
Madison, Wis.	38,378	57,899	67,447

Place	Population		
	1920	1930	1940
Marquette, Mich.	12,718	14,789	15,928
Martinsburg, W. Va.	12,515	14,857	15,063
Medina, N.Y.	6,011	6,071	5,871
Memphis, Tenn.	162,351	253,143	292,942
Milwaukee, Wis.	457,147	578,249	587,472
Minneapolis, Minn.	380,582	464,356	492,370
Mobile, Ala.	60,777	68,202	78,720
Montgomery, Ala.	43,464	66,079	78,084
Nashville, Tenn.	118,342	153,866	167,402
Newark, N.J.	414,524	442,337	429,760
New Bedford, Mass.	121,217	112,597	110,341
New Brunswick, N.J.	32,779	34,555	33,180
Newburgh, N.Y.	30,366	31,275	31,883
New Orleans, La.	387,219	458,762	494,537
Newport News, Va.	35,596	34,417	37,067
Newton, Mass.	46,054	65,276	69,873
New York, N.Y.	5,620,048	6,930,446	7,454,995
Niagara Falls, N.Y.	50,760	75,460	78,029
Norfolk, Va.	115,777	129,710	144,332
North Bergen, N.J.	23,344	40,714	39,714
North Tonawanda, N.Y.	15,482	19,019	20,254
Nyack, N.Y.	4,444	5,392	5,206
Ogden, Utah	32,804	40,272	43,688
Oklahoma City, Okla.	91,295	185,389	204,424
Oneida, N.Y.	10,541	10,558	10,291
Omaha, Neb.	191,601	214,006	223,844
Orange, N.J.	33,268	35,399	35,717
Oshkosh, Wis.	33,162	40,108	39,089
Ossining, N.Y.	10,739	15,241	15,996
Oswego, N.Y.	23,626	22,652	22,062
Paterson, N.J.	135,875	138,513	139,656
Peekskill, N.Y.	15,868	17,125	17,311
Perth Amboy, N.J.	41,707	43,516	41,242
Philadelphia, Pa.	1,823,779	1,950,961	1,931,334
Phoenix, Arizona	29,053	48,118	65,414
Pittsburgh, Pa.	588,343	669,817	671,659
Pontiac, Mich.	34,273	64,928	66,626
Port Arthur, Texas	22,251	50,902	46,140
Portland, Oregon	258,288	301,815	305,394
Portsmouth, Va.	54,387	45,704	50,745
Portsmouth, Ohio	33,011	42,560	40,466
Poughkeepsie, N.Y.	35,000	40,288	40,478
Provo, Utah	10,303	14,766	18,071
Pueblo, Colo.	43,050	50,096	52,132
Reno, Nevada	12,016	18,529	21,317
Rensselaer, N.Y.	10,823	11,223	10,768

Place	Population		
	1920	1930	1940
Richmond, Va.	171,667	182,929	193,042
Roanoke, Va.	50,842	69,206	69,287
Rochester, N.Y.	295,750	328,132	324,975
Rome, N.Y.	26,341	32,338	34,214
Salt Lake City, Utah	118,110	140,267	149,934
San Angelo, Texas	10,050	25,308	25,802
San Antonio, Texas	161,379	231,542	253,854
San Francisco, Cal.	506,676	634,394	634,536
Santa Fe, N. Mex.	7,236	11,176	20,325
Sault Ste. Marie, Mich.	12,096	13,755	15,847
Savannah, Ga.	83,252	85,024	95,996
Schenectady, N.Y.	88,723	95,692	87,549
Scotia, N.Y.	4,358	7,437	7,960
Seattle, Wash.	315,312	365,583	368,302
Seneca Falls, N.Y.	6,389	6,443	6,452
Sioux Falls, S. Dak.	25,202	33,362	40,832
Solvay, N.Y.	7,352	7,986	8,201
South Bend, Ind.	70,983	104,193	101,268
Spokane, Wash.	104,437	115,514	122,001
Springfield, Mo.	39,631	57,527	61,238
Staunton, Va.	10,623	11,990	13,337
St. Louis, Mo.	772,897	821,960	816,048
St. Paul, Minn.	234,698	271,606	287,736
Superior, Wis.	39,671	36,113	35,136
Syracuse, N.Y.	171,717	209,326	205,967
Tampa, Fla.	51,608	101,161	108,391
Tacoma, Wash.	96,965	106,817	109,408
Tarrytown, N.Y.	5,807	6,841	6,874
Tonawanda, N.Y.	10,068	12,681	13,008
Trenton, N.J.	119,289	123,356	124,697
Trinidad, Colo.	10,906	11,732	13,223
Troy, N.Y.	72,013	72,763	70,304
Tulsa, Okla.	72,075	141,258	142,157
Union City, N.J.		58,659	56,173
Utica, N.Y.	94,156	101,740	100,518
Waco, Texas	38,500	52,848	55,982
Washington, D.C.	437,571	486,869	663,091
Watervliet, N.Y.	16,073	16,083	16,114
Wheeling, W. Va.	56,208	61,659	61,099
Wichita, Kan.	72,217	111,110	114,966
Wilmington, Del.	110,168	106,597	112,504
Winona, Minn.	19,143	20,850	22,490
Winston-Salem, N.C.	48,395	75,274	79,815
Yonkers, N.Y.	100,176	134,646	142,598
York, Pa.	47,512	55,254	56,712

CANADA

Province	*Land Area* (sq. miles)	*Population* (1931)
Prince Edward Island	2,184	88,038
Nova Scotia	20,743	512,846
New Brunswick	27,473	408,219
Quebec	523,534	2,874,255
Ontario	363,282	3,431,683
Manitoba	219,723	700,139
British Columbia	359,279	694,263
Alberta	248,800	731,605
Saskatchewan	237,975	921,785
Yukon	205,346	4,230
North-West Territories	1,258,217	9,723
Totals	3,466,556	10,376,786

CENTRAL AMERICAN REPUBLICS

Country	*Area* (sq. miles)	*Population*
Costa Rica	23,000 (estimate)	639,197 (1940 estimate)
Guatemala	45,452	3,284,269 (1940 census)
Honduras	44,275 (approximate)	1,105,504 (1940 census)
Nicaragua	60,000 (estimate)	1,172,324 (1938 estimate)
Panama	32,380	467,459 [1] (1930 census)
Salvador	13,176	1,744,535 (1940 estimate)

[1] Excluding Canal Zone.

CUBA

Province	*Area* (sq. miles)	*Population* (1938)
Havana	3,170	1,045,677
Pinar del Rio	5,206	364,338
Matanzas	3,256	364,128
Santa Clara	8,257	871,418
Camagüey	10,064	439,397
Oriente	14,211	1,142,629
Totals	44,164	4,227,587

MEXICO

State or Territory	*Area* (sq. mi.)	*Population* (1930 census)
Aguascalientes	2,499	132,900
Baja California, N. Terr.	27,653	48,327
Baja California, S. Terr.	27,976	47,089
Campeche	19,670	84,630
Chiapas	28,729	529,983
Chihuahua	94,822	491,792
Coahuila	58,062	436,425
Colima	2,009	61,923
Distrito Federal (Mexico City)	573	1,229,576
Durango	42,272	404,364
Guanajuato	11,804	987,801
Guerrero	24,885	641,690
Hidalgo	8,057	677,772
Jalisco	31,149	1,255,346
México	8,267	990,112
Michoacán	23,200	1,048,381
Morelos	1,916	132,068
Nayarít	10,444	167,724
Nuevo León	25,134	417,491
Oaxaca	36,371	1,084,549
Puebla	13,124	1,150,425
Querétaro	4,432	234,058
Quintana Roo (Terr.)	19,438	10,620
San Luis Potosí	24,415	579,831
Sinaloa	22,580	395,618
Sonora	70,477	316,271
Tabasco	9,782	224,023
Tamaulipas	30,731	344,039
Tlaxcala	1,555	205,458
Veracruz	27,736	1,377,293
Yucatán	23,926	386,096
Zacatecas	28,122	459,047
Federal Islands	2,114	
Totals	763,944	16,552,722

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