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REGIONAL GEOGRAPHY
OF
ANGLO-AMERICA

PRENTICE-HALL GEOGRAPHY SERIES

Consulting Editor. Nels A. Bengtson

REGIONAL GEOGRAPHY OF ANGLO-AMERICA

by

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First Printing January, 1943
Second Printing October, 1945
Third Printing May, 1946
Fourth Printing . . . February, 1947
Fifth Printing . . . September, 1947
Sixth Printing. . . . July, 1948
Seventh Printing . . . January, 1949
Eighth Printing . . . October, 1949*
Ninth Printing . . . September, 1950

Preface

REGIONS are formed by man as he adjusts himself to his natural environment rather than by theoretical parallels and meridians or by "the vagaries of historical settlement and in the gerrymandering of the Congress." Close study reveals that Canada and the United States are not compact, single economic units. Each is a union consisting of numerous parts, each part having its own economy based upon a distinctive natural environment. Thus very few generalizations are applicable to the whole of the United States and Canada. So long as the various regions differ in climate and soil, water and minerals, fauna and flora, location and landscape character, just so long must man think and behave differently in dealing with such factors.¹

Geographic contiguity and similarity of economic problems have created a sense of interdependence between Canada and the United States. Moreover, American movies, radios, magazines, and mechanical devices, and the friendship resulting from movement back and forth, have created a strong community of interest between the two peoples. *

The reader will see how a people took possession of the land and how the land took possession of a people. He will become aware of the fact that the population is by no means evenly distributed through this living space, and that geographic factors are largely responsible for the uneven distribution.

The flowering of civilization in Anglo-America is partly a reflection of the degree to which man has levied tribute against the natural resources. From the Atlantic to the Pacific and from the Arctic to the Gulf, the white man has been a destroyer. The pioneers could not think about the distant future; but the day of the pioneer is over. Today no more virgin land, well located or potentially productive, stands ready for the plow. There are no new frontiers. *The future security of Anglo-Americans depends upon how well they use the land they already have.* It is for this

¹ George T. Renner and Mayme Renner, "Regionalism in American Life," *Teachers College Record*, Vol. 43, No. 5, February 1942.

reason that conservation of natural resources is discussed repeatedly throughout the book.

By December 7, 1941, Anglo-America had become engaged in a global war. Canada and the United States with their common past had been moving by "parallel roads toward similar goals." The geographic factor and the changing technology of naval and aerial warfare compelled a common war strategy. It became clear that mutual endeavor and good faith based on mutual understanding would augur for success in the struggle for enduring peace and prosperity.

This book is not a simple compendium of facts. Wherever possible, statistical facts are shown by maps, graphs, or photographs, for most of all human knowledge is gained through the eye, and the language of pictures and maps is universal.

The textual material has been used in the classroom several times by both authors. Frequently a significant question or comment by a keen student has been incorporated. Both authors have traveled widely over the continent and have carried on field investigations in many of the regions.

Agreement has been lacking among geographers on suitable names for the various regions of Anglo-America. Accordingly, a number of the leading geographers were consulted, and the titles used here are those suggested by the largest number of persons.

Acknowledgments

In writing this book, the authors have leaned heavily upon many geographers and colleagues in the closely related natural and social sciences. They have benefited also from the labors of numerous government employees who have collected statistical material, carried on surveys, and made maps. They have drawn especially upon articles in the professional geographical journals. Accordingly, the number to whom they are grateful is so large that only a general acknowledgment is possible. When quotations are used, the sources are cited in appropriate footnotes. The authors wish especially to express thanks to the men and women whose names have been listed, for convenience, in these five groups:

1. Those who helped in delineating and giving titles to the regions of Anglo-America:

John B. Appleton, Department of State, Washington, D. C.
C. E. Batschelet, Bureau of the Census, Washington, D. C.
Nels A. Bengtson, University of Nebraska.

The late Ralph H. Brown, University of Minnesota.
 William T. Chambers, Stephen F. Austin State Teachers College.
 Leonard Dykes, Department of State, Washington, D. C.
 W. Elmer Ekblaw, Clark University.
 Vernor C. Finch, University of Wisconsin.
 Richard Hartshorne, University of Wisconsin.
 J. W. Hoover, Northwestern State College, Natchitoches, La.
 The late Ellsworth Huntington, Yale University.
 Ben F. Lemert, Duke University.
 Harold Hull McCarty, University of Iowa.
 Raymond E. Murphy, Clark University.
 George T. Renner, Columbia University.
 J. Russell Smith, Columbia University (*emeritus*).
 Lewis F. Thomas, Washington University.
 Stephen S. Visser, Indiana University.
 J. Russell Whitaker, George Peabody College for Teachers.
 Derwent S. Whittlesey, Harvard University.
 Frank E. Williams, University of Pennsylvania (*emeritus*).
 Louis A. Wolfanger, Michigan State College.
 Clifford M. Zierer, University of California at Los Angeles.

2. Those who have given specific chapters a critical reading. They were consulted because they live within a given region or have made that region their special field of research and are, therefore, especially familiar with it. The authors wish to make clear, however, that these critics are not responsible for any mistakes in fact or philosophy.

John Q. Adams, War Department, Washington, D. C.
 O. E. Baker, University of Maryland.
 Robert E. Bates, Virginia Polytechnic Institute.
 S. Whittemore Boggs, Department of State, Washington, D. C.
 C. F. Brooks, Harvard University.
 The late Ralph H. Brown, University of Minnesota.
 William T. Chambers, Stephen F. Austin State Teachers College.
 George B. Cressey, Syracuse University.
 Sidney Ekblaw, University of Kansas City.
 W. Elmer Ekblaw, Clark University.
 W. H. Fairfield, Agricultural Experiment Station, Lethbridge, Alberta, Canada.
 Otis W. Freeman, Office of Education, Washington, D. C.
 John H. Garland, University of Illinois.
 Lynn Halverson, Northern State Teachers College, Marquette, Mich.
 Chauncy D. Harris, University of Chicago.

H. A. Hoffmeister, University of Colorado.
 J. W. Hoover, Northwestern State College, Natchitoches, La.
 Ben F. Lemert, Duke University.
 H. H. Martin, University of Washington.
 Peveril Meigs, Joint Intelligence Study Publishing Board, Wash-
 ington, D. C.
 Raymond E. Murphy, Clark University.
 Clarence Newman, Chesapeake and Ohio Railroad.
 D. F. Putnam, University of Toronto.
 George T. Renner, Columbia University.
 The late Albert Seeman, University of Washington.
 Earl B. Shaw, State Teachers College, Worcester, Mass.
 Julia Shipman, Mount Holyoke College.
 John Hall Stewart, Western Reserve University.
 Helen M. Strong, War Department, Washington, D. C.
 Lewis F. Thomas, Washington University.
 Rupert B. Vance, University of North Carolina.
 J. Russell Whitaker, George Peabody College for Teachers.
 Derwent S. Whittlesey, Harvard University.
 Clifford M. Zierer, University of California at Los Angeles.
 H. H. Zimmerly, Virginia Truck Experiment Station, Norfolk.

3. Those who have helped with the illustrations. Countless individuals, business firms, institutions, and branches of the several governments have cooperated generously. Obligation is acknowledged in credit lines accompanying the illustrations.

4. Those who helped in tracking down certain data and maps, and who assisted in proofreading, typing, and indexing.

Henry F. Donner, Western Reserve University.

John H. Garland, University of Illinois.

Meredith F. Burrill, Department of the Interior, Wash-
 ington, D. C.

5. S. Visher, Indiana University.

Esther Caldwell, Cleveland, Ohio.

Ruth E. Hays, Cleveland, Ohio.

Mary Sanford White.

Fannie Knight Foscue.

Especially the authors wish to thank Martha Irvine Anderson, who for years devoted much of her time to problems connected with this volume.

5. Nels A. Bengtson, consulting editor, Prentice-Hall, Inc., who read critically the entire manuscript and offered many constructive and helpful suggestions.

C. LANGDON WHITE
 EDWIN J. FOSCUE

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**REGIONAL GEOGRAPHY
OF
ANGLO-AMERICA**

CHAPTER I

The Physical Background of Anglo-America

THE CONTINENT of North America, especially that portion occupied by the United States, Canada, Alaska, and Greenland (frequently referred to as Anglo-America), has possibly the most strategic location of any land mass on the globe (Fig. 1)., 'Anglo-America lies entirely north of the Tropic of Cancer and largely south of the Arctic Circle, and thus is almost completely within the middle latitudes. The land mass also fronts on both the Atlantic and the Pacific Ocean and is thus in a favored position to play a dominant role in world trade. In addition, its great size causes it to have a wide variety of land forms, climatic types, vegetation associations, and soils. The marked diversity in the natural environment is clearly reflected in the economic use of the land by the

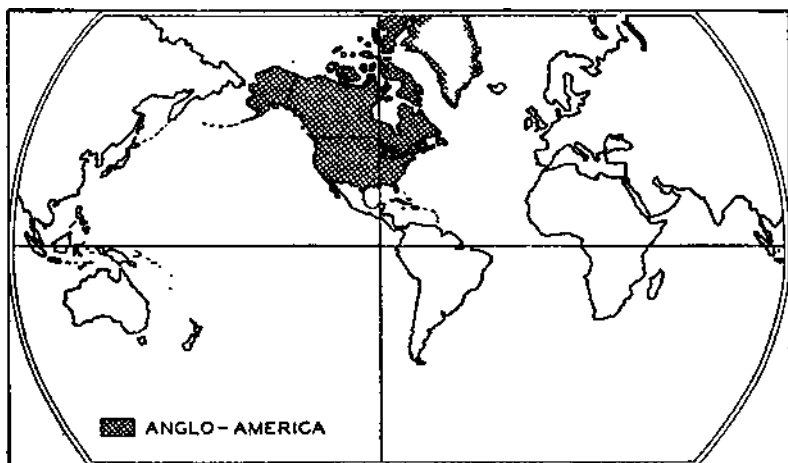


Fig. 1. The location of Anglo-America in relation to the rest of the world,

American Indians¹ in their stage of cultural development, and in the modern use of the same land by white men in building the great agricultural and industrial nations of the United States and Canada.

We shall first give a brief description of the physiography, climate, vegetation, and soils of the continent. Then will follow a brief narrative of the early responses to the natural environment by primitive man and the Amerind, and of how white men slowly took possession of the continent and spread completely across its area, ultimately to occupy and develop all lands that were capable of supporting a population.

Because of its structural axes, North America is wedge-shaped, with its widest part to the north. In the center of the continent between the Appalachian Mountains and the Rocky Mountains lies an extensive plain that is drained to the south by the Mississippi River and its tributaries, to the northeast by the St. Lawrence, and to the north by the several streams that flow into the Arctic Ocean, such as the Nelson and the Mackenzie. East of the Appalachians is a fairly extensive coastal plain that is crossed by many short but economically and historically important streams such as the Potomac, the James, and the Roanoke. A similar condition exists along the Gulf Coast both east and west of the Mississippi drainage. In the western part of the continent the several basins and ranges that constitute the Cordilleran Mountain System so completely dominate the area that there are no extensive plains and few major streams—in fact, a considerable part of this area has interior drainage. On the Pacific slope are several important coastal valleys that are drained by such streams as the Sacramento-San Joaquin, the Columbia, and the Fraser.

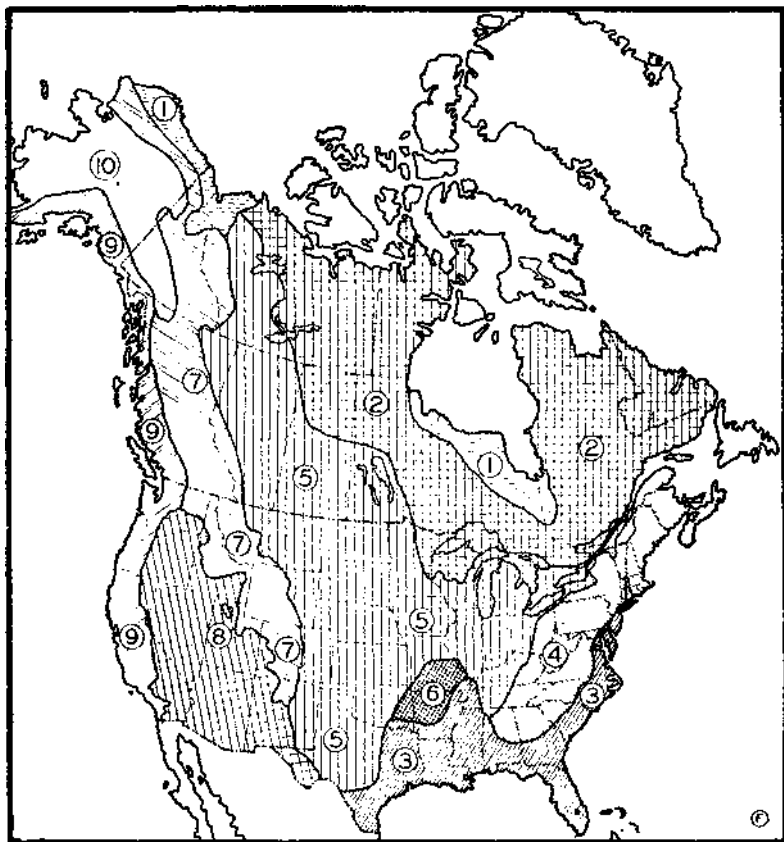
The Physiographic Regions

The North American continent contains a number of major physiographic regions (Fig. 2), most of which are found within the United States, although a few appear only in Canada. The map here presented is based primarily upon the classification of regions as worked out by N. M. Fenneman² for the United States portion and by W. N. Thayer³ for the Canadian portion. Wallace W.

¹ Hereafter we shall use the term *Amerind*, to designate the American **Indian**, a term that is winning recognition because of its meaning and conciseness.

- N. M. Fenneman, "Physiographic Divisions of the United States," *Annals of the Association of American Geographers*, December 1928, Vol. XVIII, No. 4, pp. 261—353.

³ W. N. Thayer, "The Northward Extension of the Physiographic Divisions of the United States," *Journal of Geology*, February-March 1918, Vol. XXVI, No. 2, pp. 161-185.



After Fenneman & Atwood.

Fig. 2. The physiographic regions of Anglo-America: (1) Arctic Slope, (2) Laurentian Plateau, (3) Atlantic and Gulf Coastal Plain, (4) Appalachian Region, (5) Interior Plain, (6) Interior Highlands, (7) Rocky Mountains, (8) Intermontane Province, (9) Pacific Coast Region, and (10) the Yukon Basin.

Atwood⁴ has published a map for the entire continent in his volume on *The Physiographic Provinces of North America*, to which the student is referred for more detail in regard to the descriptions of the several physiographic provinces.

Since subsequent chapters dealing with geographic regions each contain a brief description of the physical landscape, only a bare outline of the major provinces is given here.

⁴Wallace W. Atwood, *The Physiographic Provinces of North America*, Boston: Ginn & Co., 1940.

Along the north coast lies the region of the *Arctic Slope* which appears in two widely separated areas: northern Alaska and the southern shore of Hudson Bay. To the south of this region is the *Laurentian Plateau*, a denuded area of rolling landscape that dominates a major portion of Canada and extends into the United States in the northern Great Lakes area. Its soils have been largely stripped off by the continental glacier, leaving much of the area barren. .

The *Atlantic and Gulf Coastal Plain* has several subdivisions. The embayed section of the north Atlantic Coast has excellent harbors characteristic of a sunken shoreline. The Sea Island district of South Carolina and Georgia has emerged as indicated by the barrier beaches. The Florida Peninsula is an uplifted sea bottom. The east and west Gulf coast areas are separated by the Mississippi Embayment which has been filled by sediments from rivers. In the West Gulf Coast area the dip of the bedrock is to the southeast, while in the East Gulf Coast area it is to the south or southwest. On both sides the rocks dip toward the Mississippi Embayment, the cuestas facing inland with the long dip-slopes of the bedrock inclined seaward.

The *Appalachian Region* is subdivided into several areas. The Piedmont Plateau, which has the characteristics of a rolling plain, is underlain by old crystalline rock.) The Fall Line appears at the contact zone between the crystalline rocks and the soft, unconsolidated sediments of the Atlantic Coastal Plain. Streams crossing the Fall Line have developed small falls and rapids as a result of the difference in hardness of the bedrock on the two sides, the channels being more deeply incised in the softer strata of the Coastal Plain. (The break between the Piedmont and the Blue Ridge is abrupt but irregular, thus separating the two parts of old Appalachia. The Ridge and Valley country and the Appalachian Plateau to the west of the crystalline area are called the "Newer Appalachians" because the bedrock was formed in more recent geologic times than was that of the Piedmont or the Blue Ridge, The Ridge and Valley section is steeply folded, but the Plateau is characterized by gently flexed or horizontal strata.

The *Interior Plain* extends from the Appalachians to the Rocky Mountains and is one of the largest physiographic regions of the continent. It is level to rolling, increasing in height to the west, and it includes such outliers as the Black Hills of South Dakota and the Wichita Mountains of Oklahoma.

The *Interior Highlands* consist of the Ozarks on the north and the Ouachitas on the south, separated by the Arkansas River

Valley. The Ouachitas, rising boldly to a height of 3,000 feet, are folded mountains like those of the Ridge and Valley area. The Ozarks are comparable to the Appalachian Plateau, the Boston Mountains just north of the Arkansas Valley forming their highest remnant.

The *Rocky Mountains* consist of three divisions, the Southern, Middle, and Northern. The southern Rockies have been sculptured only in part by valley glaciers. In the northern Rockies, glaciers have been pronounced erosional agents in producing the details of the present topography. The Rocky Mountain System contains many intermontane basins.

The *Intermontane Province* is bounded on the east by the Rockies and on the west by the Cascade Mountains and the Sierra Nevada. It is in part an area of interior drainage containing several salt lake basins separated by isolated mountain ranges. To the north but still within the intermontane province lies the Columbia Plateau of Oregon and Washington. To the southeast lies the Colorado Plateau and the Arizona Highlands.

The eastern border of the *Pacific Coast Region* is flanked by the Cascade Mountains in Washington and Oregon and the Sierra Nevada in California. To the west lie the Coast Ranges and intervening valleys, the Valley of California, the Willamette Valley of Oregon, and the Puget Sound trough of Washington. Northward the interior valleys, having been submerged, become the Inside Passage of British Columbia and Alaska.

The appearance of the mountains and plateaus varies from place to place over the continent (Fig. 2). New England's irregular mountains are rounded, having been overridden by the continental ice sheet. The mountains of the Ridge and Valley area are characterized by linear ridges and valleys formed by stream erosion in areas of folded rocks. The northern part of the Appalachian Plateau has been so completely dissected by streams that it is a terrain of deep valleys and sharp intervening ridges; the southern part, with fewer streams, is still dominantly an upland with nearly flat-topped divides. The Interior Highlands resemble the Appalachians. The higher and more massive Rocky Mountains present a different appearance where valley glaciation has produced over-deepened valleys and majestically carved peaks—truly alpine scenery. In the East, heavy rains result in forest-covered mountains; in the West the rain is concentrated on favored slopes and the mountain summits rise above the timber line.

Plains also vary according to rainfall and vegetation responses. Much of the Coastal Plan is forested because of its heavy rainfall,

while the High Plains and the level lands of the Great Basin are semi-deserts and deserts.

Climate

The latitude of Anglo-America is an important factor in the seasonal distribution of pressure and winds. Since the whole area lies north of the Tropic of Cancer, it has no large tropical regions. Poleward, the continent extends beyond the Arctic Circle, but the major part lies between the Tropic of Cancer and the Arctic Circle.

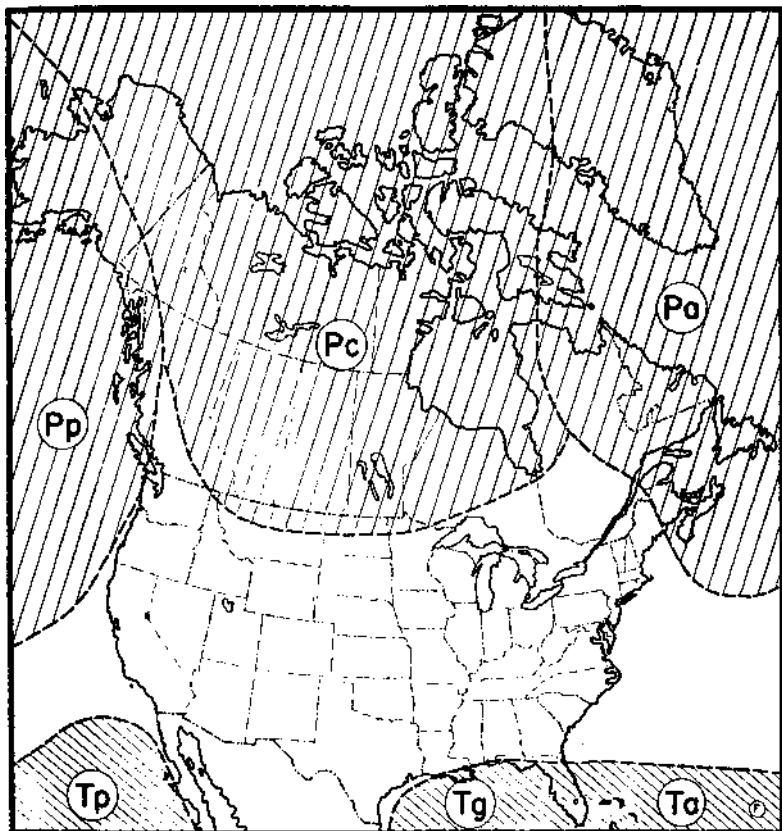
The major air masses ⁵

On the North American continent, as in all middle-latitude areas, intense interaction occurs between large air masses from tropical and from polar regions (Fig. 3). These air masses show contrasts not only in temperature but also in moisture content. They differ also from summer to winter in their influence upon the continent. The variation in moisture content is perhaps the most striking feature of the different masses; hence the character of the mass that dominates a specific region determines to some extent the amount of precipitation it receives.

The polar air masses are divided into 3 subtypes: Polar Pacific (Pp), Polar Continental or Polar Canadian (Pc), and Polar Atlantic (Pa). The Polar Pacific, originating in the Arctic region, crosses the warm waters of the North Pacific before reaching the western shores of North America. Thus it arrives at the coast as a relatively warm, moist, and (in winter) foggy air mass. Polar Continental air comes from the continuously cold Arctic Ocean and frozen tundra of northern Canada and reaches the central part of the continent without having been modified by any marine influence. Hence it is a cold, dry air mass of particular significance in winter. Polar Atlantic air exerts comparatively little influence upon the continent save along the northeastern coast. There it travels over a part of the cold North Atlantic before reaching the coast, and produces a cool, moist atmospheric condition.

The tropical air masses are also subdivided into Tropical Gulf (Tg) and Tropical Atlantic (Ta), usually considered together, and Tropical Pacific (Tp). In addition, a mass of tropical air remains **aloft over** most of southern United States during the year. This

⁶ For a more complete discussion of North American air masses, see Thomas A. Blair, *Weather Elements*, pp. 236-240, and also H. C. Willett, "Characteristic Properties of North American Air Masses," *Bulletin of the American Meteorological Society*, Vol. 17, No- 6-7, June-July 1936, pp. 55-84.



After Trewartha.

Fig. 3. Sources of the major air masses of North America: (Pp) Polar Pacific, (Pc) Polar Continental, or Polar Canadian, (Pa) Polar Atlantic, (Tp) Tropical Pacific, (Tg) Tropical Gulf, and (Ta) Tropical Atlantic. In addition (Ts), tropical superior air, frequently dominates the southern part of the United States. This mass is not shown on the map since it is usually aloft.

mass, known as Tropical Superior (Ts), sometimes reaches the land surface in southwestern United States. It is the warmest and driest of the masses, and is largely responsible for the hot dry weather the high plains experience in summer. All other tropical air masses are warm and moist, but the Tropical Gulf and Tropical Atlantic provide most of the warmth in winter and the moisture throughout the year for the Gulf Coast and the Mississippi Basin.⁶

⁶ Glenn T. Trewartha, *An Introduction to Weather and Climate*, pp. 162-168. New York: McGraw-Hill Book Co., 1937.

Climatic controls

From this brief analysis and a study of the air-mass map (Fig. 3), one sees that the weather at any given place is largely the result of the type of air mass that is dominant at the time. The major climatic controls, however, exert a modifying influence upon the dominant air masses. The seven climatic controls for North America are as follows:

1. *Latitude.* If there were no atmosphere, solar climate would exist on the earth, and position or latitude would be the only control. This was the Greek conception and their archaic idea still is preserved in some grade-school geographies through the use of such terms as "Torrid Zone," "Temperate Zone," and "Frigid Zone."

2. *Mountain barriers.* These are particularly important factors in the distribution of rainfall, as they cause heavy precipitation on windward slopes and little or no rainfall on leeward slopes.

3. *Water bodies.* Land heats and cools more rapidly than water. Accordingly, the oceans do not vary in temperature so much as do the lands. Large water bodies like the Gulf of Mexico and the Pacific Ocean exert an ameliorating influence on adjacent coasts. Even the Great Lakes affect an area 20 to more than 100 miles from the shore.

4. *Altitude.* Climate gets cooler and, within certain limits, moister with increased altitude. This is particularly noticeable in southwestern United States, where one can climb in a distance of a few miles from desert to timber line.

5. *Storms.* The constant shifting of the polar and tropical air masses over the continent (Fig. 3), produces an instability in the atmosphere usually referred to as *storms* or *cyclones*. These result from a meeting of warm, moist air from the tropics and cold, dry air from the Arctic. As the storms progress across the continent from west to east, warmth and moisture are brought into their southeastern sector, and cold dry air into their northwest sector. These storms produce the variable weather which characterizes lands dominated by the westerly winds.

6. *Ocean currents.* The West Coast receives some influence from the warm Japan Current. North of San Francisco the water is warm in relation to the land, particularly in winter. In southern California, except in winter, the same current appears cold in comparison with land temperatures. There is here, however, a considerable upwelling of cold water from great depths which reduces the ocean temperature along the coast from Oregon southward. A

strong current of water, the Gulf Stream, flows out from the Gulf of Mexico, which is always warm, and, with the Antilles Current north of the Bahamas continues as a warm current along the South Atlantic Coast as far as Cape Hatteras, from which it is deflected east-northeastward across the Atlantic Ocean. In the North Atlantic the cold Labrador Current follows the East Coast as far as the Grand Banks, then mixes with the warm waters of the Gulf Stream or the North Atlantic Drift.

7. *Prevailing winds.* From 30 to 60 degrees north latitude, the prevailing winds are the westerlies—on-shore along the Pacific Coast and off-shore along the Atlantic. If the shifting in the major air masses did not cause frequent changes in wind directions, the East Coast would be much less humid in spite of its proximity to the sea. San Francisco has a marine climate throughout the year because of the prevailing westerly winds, whereas New York experiences marine conditions only when the Polar Atlantic or Tropical Atlantic air masses dominate the coast. Were it not for the warm waters of the Gulf of Mexico and the moisture of the Tropical Gulf and Tropical Atlantic air masses, interior United States and Canada would be much drier.

The types of climates

There are almost as many classifications of climate as there are climatologists. While all classifications are fundamentally the same, minor variations and complex nomenclature may confuse the student. Unfortunately, no standard classification such as Fenneman's *Physiographic Regions* has been adopted. In this volume the comparatively simple but clear classification developed by White and Renner is used.⁷ The climatic regions map of Anglo-America (Fig. 4) is adapted from their map of world climates.

The Colorado Delta and the Imperial and Mojave valleys of southern California are the only areas in the United States having the *Arid Tropical Climate*. This climatic type is characterized by an exceedingly low rainfall and a growing season of almost 12 months. The fact that the Arid Tropical Climate has practically no winter season distinguishes it from the Arid Continental type which has a pronounced winter.

Along the Pacific Coast immediately north of this region lies an area of semi-desert *Mediterranean Subtropical Climate* with a winter rainfall maximum. The few rains of summer are convec-

⁷C. Langdon White, and George T. Renner, *Geography: An Introduction to Human Ecology*, pp. 31-32. New York: D. Appleton-Century Co., 1936.

tional showers. Frost may be expected each winter, with an occasional killing frost which plays havoc with the citrus orchards. The rainfall regime (winter rain and summer drought) is due essentially to cyclonic storms of winter.

The *Humid Subtropical Climate* produces a forest zone in southeastern United States from Georgia to East Texas. It is more continental than the subtropical climate of the West Coast. Along the seaboard the rainfall is rather evenly distributed throughout the year, with the maximum in summer when the heating of the land causes convectional showers. Much of the winter weather is influenced by strong, relatively dry winds from the interior. Only when winds blow from the Gulf is there any rain in the winter. Florida has a dry season in winter and a rainy season practically all summer. Miami, on the margin of the Monsoon Tropical Climate, gets most of its rain in the summer. The winters of this climatic region are more severe than on the West Coast because of the "northers" which blow out of the continental interior.

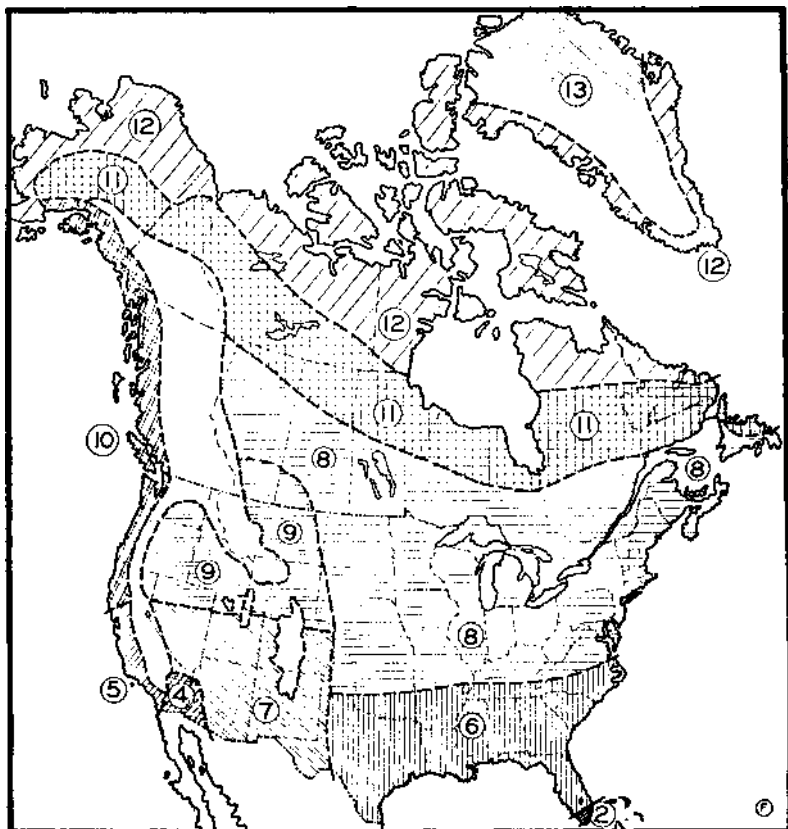
The *Dry Subtropical Climate* of the Southwest merges with the Humid Subtropical on the east and the Arid Tropical on the west. From east to west the vegetation changes from a chaparral region with tall grass and mesquite to semi-desert with creosote bush and cactus.

The *continental climates* to the north have a much greater range of temperature. The East Coast has hot summers and cold winters, with precipitation well distributed throughout the year. Snowfall is heavy in winter. The temperature extremes range from -20°F. to above 100°F. The more arid section is colder in winter and hotter in summer,

The *Temperate Marine Climate* of the Pacific Northwest is characterized by a small seasonal range of temperature. During the mild summers and mild winters, temperatures above 70°F. or below freezing are uncommon. Rainfall, fairly well distributed throughout the year, shows a strong winter maximum. Fogs are frequent. It is in this type of climate, considered by Ellsworth Huntington⁸ as the optimum for human activities, that the highest European civilization has developed.

The *Polar Continental Climate* is a transition between the Humid and Dry Continental types on the south and the Sub-polar on the north. Having the greatest temperature range of any climatic region in the world, its summers are warm and occasionally even hot, and its winters intensely cold.

⁸Ellsworth Huntington, *Civilization and Climate*, pp. 129-147. New Haven: Yale University Press, 1924.



After White & Renner.

Fig. 4. Climatic regions of Anglo-America: (2) Monsoon Tropical, (4) Arid Tropical, (5) Mediterranean Subtropical, (6) Humid Subtropical, (7) Dry Subtropical, (8) Humid Continental, (9) Dry Continental, (10) Temperate Marine, (11) Polar Continental, (12) Subpolar, and (13) Polar Ice Cap. Areas in white (unnumbered) indicate mountain regions to which a specific type of climate cannot be given. Climatic regions (1) and (3) do not occur within Anglo-America, and hence are not shown on this map.

The *Sub-polar Climate* lies north of the Polar Continental Climate. Its winters are long and cold and its summers short and cool. Temperatures of 90°F . are practically unknown.

The *Polar Ice Cap Climate* is a region of eternal winter with temperatures seldom above freezing. The interior of Greenland, and some mountain regions of Alaska, Canada, and the United States, are the only places in North America having this climatic type.

In addition to the climatic regions discussed above, certain high mountain types appear on the map (Fig. 4), particularly in the Rocky Mountains and the Sierra Nevada. Owing to the great differences in relief, each mountain side contains many climatic types; some have all types varying from Dry-Subtropical to Sub-polar.

Natural Vegetation

Anglo-America's natural vegetation is divided into three classes—forests, grasslands, and deserts.

Forests

The forests are grouped into six zones (Fig. 5): (1) the Great Northern, or *taiga*, (2) the northern hardwoods, (3) the southern hardwoods, (4) the southern pine, (5) the Rocky Mountain, and (6) the Pacific Coast.

The *taiga*, composed largely of coniferous trees growing under extremes of temperature in a region where the precipitation is largely in the form of snow, occurs in only two places: (1) on the North American continent—in Canada and northern United States—and (2) in Eurasia from Sweden to Kamchatka. On the southern margin of this forest, because of the longer growing season, large trees are found. They are dominantly conifers with wide annual rings, the result of rapid growth during the short but warm summer season. At the northern margin, the trees resemble those found at timber line on high mountains.

Three belts of forested land extend southward from the *taiga*. One prong follows the Appalachian Mountains and adjacent low* lands, another the Rocky Mountains,"and a third the Sierra Nevada. The easternmost (Appalachian) prong has three subdivisions: the northern hardwoods, the southern hardwoods, and the southern pine. Between these types no sharp lines can be drawn, since the characteristic species of trees in each mingle near the boundaries. The northern mixed forest of New England, New York, and Pennsylvania comprises a birch, beech, maple, hemlock association; it also includes other trees such as spruce and pine. The southern hardwood forest extends from Pennsylvania to northern Georgia and Alabama. Its northern part is dominated by oak, hickory, and maple while its southern part contains gum and cypress, mixed with conifers. In the southern pine forest, conifers **are found** on the upland and hardwoods in the bottomlands.\ There



After maps by the U. S. Dept. of Agriculture and the Canadian government.

Fig. 5. Vegetation regions of Anglo-America. Areas shown as northern hardwoods include several types of conifers.

are no pure stands of hardwoods.⁹ The nearly pure stands of pine formerly present in the southern forest have been destroyed, largely

⁹ The terms "hardwoods" and "softwoods" are the most generally accepted popular names for the two classes of trees, the *Angiosperms* and the *Gymnosperms*. Most *Angiosperms*, such as oak, hickory, sugar maple, and black locust, are notably hard woods, and many *Gymnosperms*, such as pines and spruces are rather soft woods. But there are a number of outstanding exceptions. Basswood, poplar, aspen, and cottonwood, all classified as hardwoods, are in reality among the softest of woods. Longleaf pine, on the other hand, is about as hard as the average hardwood, although

by lumbermen. On the southern tip of Florida is an area of mangrove swamp.

(The Rocky Mountain and Pacific Coast prongs are largely mountain forests. In the southern Rockies trees grow only in the uplands, but in the northern Rockies (Montana) some of the lowlands are forested. In the Rocky Mountain forest, Engelmann and blue spruce are common, with western yellow pine covering the lower slopes. Quaking aspen, the first tree to occupy an area after a fire, is one of the few deciduous trees. This forest has not been exploited to any extent by lumbermen because of the rugged terrain. Most of the stands are incorporated in national forests. The forest's worst enemy is fire, an especially serious danger after a period of drought. Open spaces—parks—have grass and are used for grazing. The Great Basin has no trees except pinon and juniper on the higher ridges.

The Pacific Coast forests are largely softwoods. In Washington and Oregon, the Douglas fir is dominant, growing 7 to 8 feet in diameter and 200 feet high. In northern California and in the Sierra Nevada the redwood and sequoia trees often attain a diameter of 15 feet and a height of 300 feet.

Grasslands

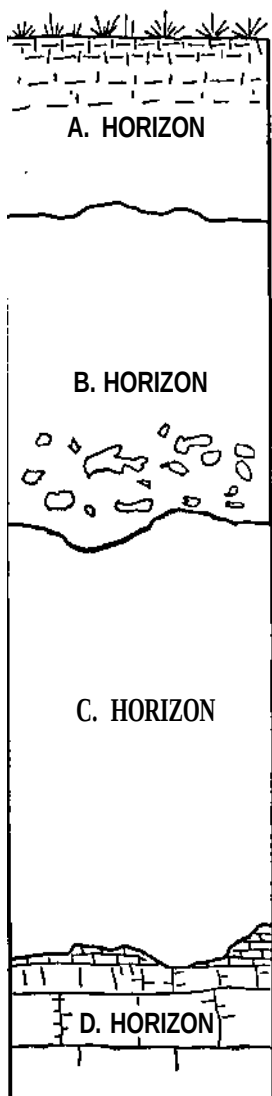
Grasslands are usually found in areas where the rainfall is insufficient for trees; most of them have never had any other type of vegetation. Sometimes grass is a climax vegetation but more often, as in southern Texas, it is replaced by a thornbush forest. Where grass is tall, it is called 'prairie'; where short, "steppe." Some characteristic species of the steppe are blue stem, buffalo, grama, and wire grasses. Toward the desert margin the short grass vegetation grades into bunch grass.

Deserts

The desert is too dry for much vegetation, but some of the characteristic plants are sage brush, mesquite, cactus, and creosote bush. The salt desert is nearly barren.

The tundra, a cold desert, is clothed with a spongy mass of mosses and lichens—a special pseudo-grassland.

it is classified as a softwood. The most accurate popular descriptions for the two groups are "trees with broad leaves" for the Angiosperms, and "trees with needles or scale-like leaves" for the Gymnosperms (from Technical Note No. 187, Forest Products Laboratory, Madison, Wisconsin).



ZONE OF ELUVIATION

Color varies with soil type
losing soluble constituents.
Contains most of the humus.

ZONE OF ILLUVIATION

Accumulating lime or iron-
alumina

SUBSOIL

Unaltered parent material

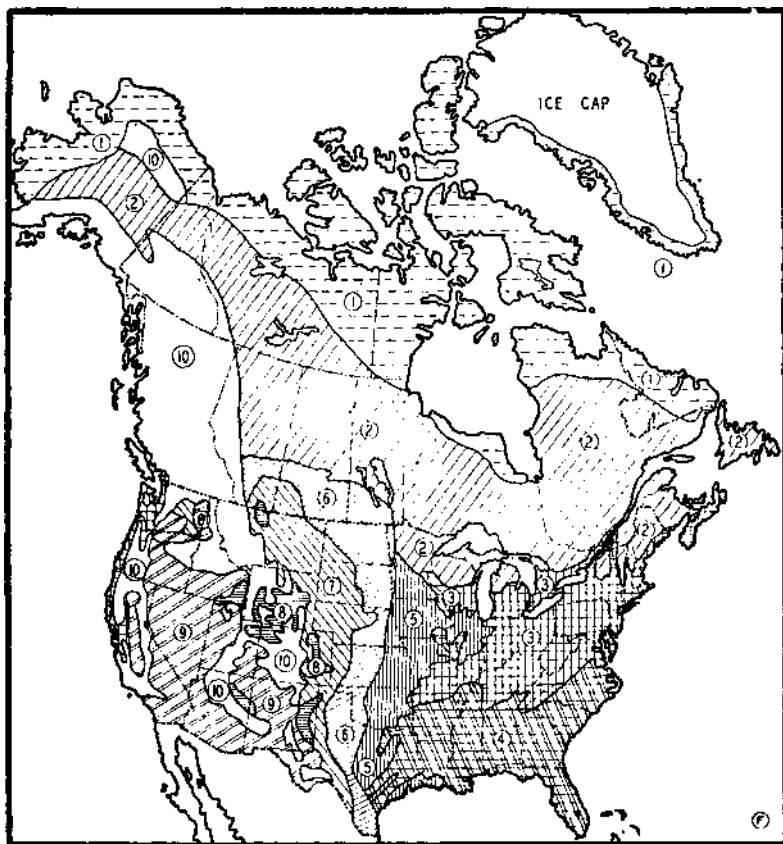
BEDROCK

Related to residual soils.
Unrelated to transported soils.

©

White & Rentier
(Courtesy of D. Appleton-Century Co.)

Fig. 6. Soil profile.



After Mai but and others.

Fig. 7. The soil regions of Anglo-America. The major soil types shown are: (1) tundra soils, (2) podzols, (3) gray-brown podzolic soils, (4) red-and-yellow soils, (5) prairie soils, (6) chernozems, (7) chestnut-brown soils, (8) dark-brown soils, (9) gray desert soils, and (10) soils of mountainous areas.

Soils¹⁰

Soil is more than merely the covering of the bedrock. A true soil must have remained in place long enough to develop a mature profile consisting of the A-, B-, and C-horizons (Fig. 6). The surface of the soil (A-horizon) is composed largely of organic material (humus) contributed by the native vegetation which gives it color;

¹⁰ For a more complete study of the soils of the United States, see *Soils and Men*, 1988 Yearbook of Agriculture, pp. 1019-1161.

the C-horizon or parent material is dependent largely upon the type of bedrock; but the B-horizon is the distinguishing factor. In humid areas leaching takes material from the B-horizon to the C-horizon. The division of soils into humid and arid groups is made on the basis of the minerals contained in the B-horizon. Characteristic minerals of the B-horizon are calcium carbonate and aluminum and iron salts; calcium carbonate is soluble, and aluminum and iron compounds insoluble. In humid soils lime has been leached out, the iron (ferric-oxide) producing a bright red color. In arid soils the calcium is present with the iron in the ferrous state. From the mineral composition of the B-horizon, arid soils were called *pedocah* and humid soils *pedalfers* (Fig. 7).

Somewhere near the line of 20 inches of rainfall, or the hundredth meridian, is a transition between the humid east and the arid west. In the humid east the main zonation of the pedalfers depends on the length of the growing season, since rainfall is sufficient for forests everywhere except along the western margin, where the prairie soils are found. From north to south lie the belts of podzols, gray-brown podzolic soils, and red-and-yellow soils. The degree of leaching is progressively greater from north to south because in the South, where the soil is not frozen in winter, leaching continues throughout the year. On the western margin of the pedalfers lie the prairie soils that form a transition between the pedalfers and the pedocals.

In the West, the soil belts run predominantly north and south, as they result from decreasing precipitation toward the west. The easternmost soil of the pedocal group is the black soil or *chernozem*. Next is the dark brown soil and finally the gray desert soil. In the Pacific Coast valleys, with their abundant rainfall, the soils are similar to those of the humid East. It is almost impossible to trace soil belts west of the Rockies. Large areas in the Rocky Mountains do not have true soils.

CHAPTER II

The Occupance and Land Utilization of Anglo-America

SINCE THE PHYSICAL environment of the continent has been sketched in the preceding chapter, let us now trace briefly the settlement and development of Anglo-America by man and see how in his various stages of culture he utilized the natural resources to develop our present civilization.

Much has been written about the antiquity of man in North America, but until recently little concrete evidence has been offered to support a view that man might have been present during the glacial period. Recent discoveries in the southwestern part of the United States suggest that man lived contemporaneously with such animals as the imperial elephant and the Pleistocene horse that became extinct in North America during the glacial period. Pre-historic man might have been represented by some of the early civilizations of the Southwest or possibly by the Mound Builders, although when and how the latter group reached the Ohio Valley is not clear. We know, however, that the natives found by the early explorers from Europe and erroneously called "Indians" had reached the eastern shore of the continent only a comparatively short time before they were discovered. In many cases they had not had time to make any permanent adaptation to their environment. It is usually assumed that the Amerinds came via the Bering Sea or the Aleutian Islands, and that the northeastern part of the continent was the last region reached by them. This may help to explain why the settlements in the Southwest or in Mexico and Central America were more advanced than those of the Northeast. Other factors, however, that retarded the development of the Amerinds were paucity of protected habitats (except in southwestern United States), lack of domesticated animals other than the dog, and unfamiliarity with metals other than gold, silver, and copper.

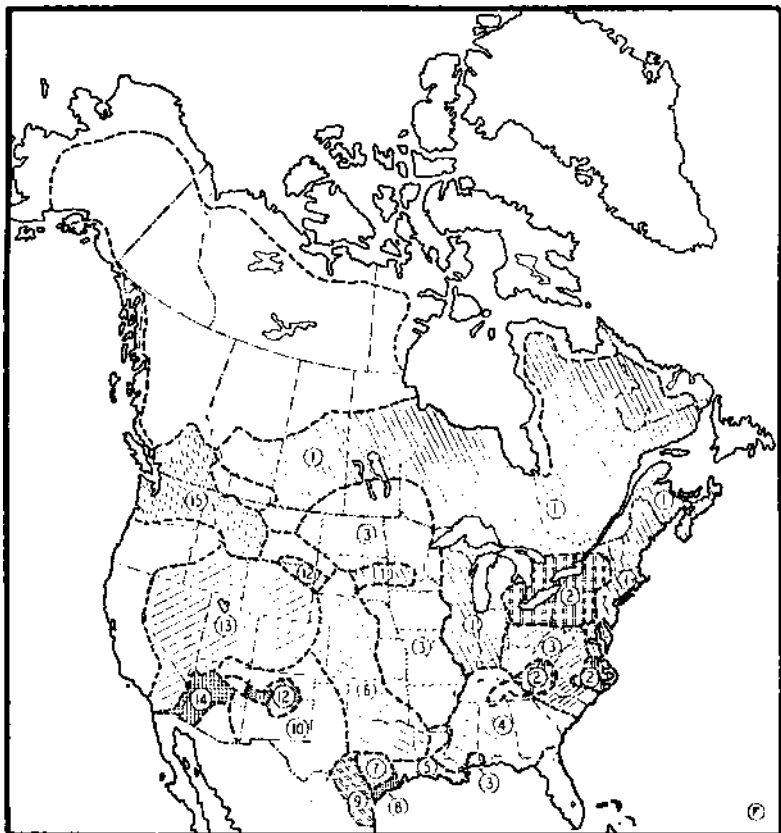
Though the Amerind adjusted himself well to nature, learning her secrets, he never increased his numbers greatly. When the whites arrived, the continent was comparatively empty. It is reliably estimated that New York City has today living within it more than six times as many people as did all of what is now Anglo-America when Columbus arrived (1,150,000). Of this number, 846,000 were within the limits of the present United States, 220,000 were in Canada, 72,000 in Alaska, and 10,000 in Greenland.¹

Why were there not more? Many scholars believe the small numbers to have been a result of the stage of culture (hunting and fishing), which allows only two to eight persons per square mile. Others believe incessant warfare, which was followed by unrest and famine, and ineffectual political organization, which prevented the emergence of a peaceful and stable state, to have been the cause. Still others make much of the conservative food habits whereby the Amerinds in their diet demanded a very high proportion of meat and fish. One authority thinks agriculture was of little importance in the East. On the other hand, there are those who believe that the majority of prehistoric aborigines, at least in that part of North America comprising the United States, were sedentary farmers and not roving hunters. They make much of the fact that the European has never grasped the idea that there is not a *typical* Amerind, that where the natural environment was favorable he accomplished much; where unfavorable, little. Had physical conditions been everywhere uniform, there would not have been distinctive cultures in different parts of the continent.

Because of the mobility of the several major Amerind tribes, their location at the end of the fifteenth century is not known, and it would be incorrect to show them as of that date in the territory where they were first contacted by the European. However, the map of linguistic or culture groups (Fig. 8) shows the approximate location of each at the time of its first contact with the white men. In the case of some of the more nomadic tribes of the high plains, it is difficult to assign them to any specific region. For instance, the Conianches (Uto-Aztecan) who were great bison hunters are shown as living in eastern Wyoming, yet in the early part of the nineteenth century they spent considerable time raiding settlements in Texas.

Several types of cultures were found within these different groups, and a brief description of the major activities of some of the tribes will show to what extent each had become adapted to the environment within which it was found by the European invader.

¹ Mathew W. Sterling, "America's First Settlers, the Indians," *National Geographic Magazine*, November 1937, Vol. L X X I I, No. X I, pp. 535-539.



After Hissler & Kroeber.

Fig. 8. Major Indian culture groups and tribes of Anglo-America: (1) Algonkin, (2) Iroquoian, (3) Siouan, (4) Muskogean, (5) Tunican, (6) Caddoan, (7) Tonkawan, (8) Karankawan, (9) Coahuiltecan, (10) Athapaskan, (11) Zuriian, (12) Kiowa-Tanoan, (13) Uto-Aztecan, (14) Yunnan, (15) Salishan.

The Algonkin occupied southern Canada and the Lakes Region (except for the section controlled by the Iroquois), and extended their control down the Atlantic Coast as far as Albemarle Sound. At best they comprised only a loose federation of tribes; certainly the Delawares in the southeast must have differed widely from the Blackfoot tribes of the Prairie Provinces of Canada. Those we know most about are the tribes living along the Atlantic Coast as far south as Albemarle Sound. At the time their domain was settled by the French and English, they were living largely by

hunting in a forested region. It is true they practiced some agriculture, but they made few permanent clearings of the forests. This possibly accounts for the fact that they were more friendly with the French trappers and voyageurs than with the agriculturally minded English. The clearing of the forest and resultant destruction of the wild game certainly failed to impress these hunting folk favorably. So long as the French maintained their supremacy in the St. Lawrence Lowland, the Algonkins withstood the advance of the Anglo-Saxon pioneers, but with the defeat of the French they were pushed westward and northward.

Extending along the Mohawk Valley and on both sides of Lakes Ontario and Erie was a strong democratic federation of tribes known as the Iroquois. They lived in permanent villages and practiced some agriculture, but lived mainly on products of the hunt. Because of their strategic central location in the Mohawk Valley, these tribes served to keep the French and English colonists apart, since neither group could achieve an effective alliance with them.

Russell Lord describes the contest between the English and French for the friendship of the Iroquois as follows:²

"Arc you ignorant," Duquesne demanded of the Iroquois, "of the difference between the King of England and the King of France? Sec the forts that our king has established. You can hunt under their very walls. . . . The English, on the contrary, are no sooner in possession of a place than the game is driven off. The forest falls before them as they advance and the soil is laid bare."

In the Southeast the Muskhogean, composed of such powerful tribes as the Creeks, Choctaws, and Chickasaws, successfully excluded white settlers from the major portion of the southern states between the inner Atlantic Coastal plain and the Mississippi River. They were a strong, obstinate forest folk who maintained a solid front against the southern Anglo-Saxon colonists. With the increasing demands for cotton lands after the beginning of the nineteenth century, however, these Amerinds were transferred beyond the Mississippi River to the Indian Territory—now Oklahoma.

Still another group of forest folk, the Caddoans, occupied the western extension of the southern forest in Louisiana, Arkansas, and east Texas. They were a friendly people who lived partly by hunting and partly by growing crops in the bottom lands. They built their houses of logs, chinked them with mud, and made a considerable amount of pottery. Although friendly to the whites,

² Russell Lord, *To Hold This Soil*, p. 15. Washington, I). C: Government Printing Office, 1938.

they were ultimately displaced and sent to Indian Territory. The northwestern extension of the Caddoans included several prominent prairie tribes like the Wichitas and Pawnees.

Along the Louisiana and Texas coast were several tribes, such as the Atakapas, the Tonkawans, and the Karankawans, which are difficult to classify in any cultural zone. The last-named tribe seems to have been composed of the renegade elements of several groups who lived along the coastal swamps and marshes, deriving most of their foodstuffs from the fish of the Gulf of Mexico. At times they even turned to cannibalism.

The Siouan cultural group consisted of two distinct types—an eastern and a western. The eastern occupied the middle Appalachian province extending from the Atlantic Coast in the Carolinas to the central part of the Ohio Valley. It included such tribes as the Santee, Cataba, and the detached Biloxi on the Gulf Coast. These were forest tribes living largely by agriculture, supplemented by hunting. Insofar as their adaptation to the natural environment was concerned, they differed little from the Algonkins to the north or the Muskogean to the south, although it is doubtful whether they were ever as strong as either of their neighbors. The western Sioux were akin in language and certain racial characteristics, but their habitat was the open prairie; hence their activities were similar to those of other grassland tribes.

The arid interior basin country was occupied by numerous Amerinds of the Uto-Aztecan group including the Pima, Hopi, Ute, Shoshone, and Comanche. They varied widely in their habits and economic activities—a consequence of contrasted habitats. The Comanches, one of the best-known tribes of this group, were buffalo hunters who migrated seasonally with the herds. They did not become particularly warlike until whitemen began to exterminate the buffalo and plow the land. Of the ensuing fights it has been said: "If the white man won, it was a great victory; if the Indian won, it was a massacre."

The Athapascans also comprised two distinct groups. The Navajos were a peaceful type of folk who, after the arrival of the Spaniards, became pastoralists and expert weavers in wool. In contrast the Apaches were a fierce, marauding, warlike mountain folk who preyed upon the Navajos and later upon the settlements of the white men. To most settlers the Apaches had no redeeming features.

In addition to these groups there were several numerically smaller tribes that had reached a high stage of culture in the Southwest.

Some of these were undoubtedly descendants of the old basket weavers that inhabited the area in pre-Columbian times.

Many small independent tribes inhabited the Pacific Coastal Region. Little is known about their culture or activities, although they doubtless fished the streams for salmon as do their descendants today.

The Haida and Tlinglit tribes of the Inside Passage of Alaska were skilled in the arts of fishing, navigation, and wood-working. The Eskimo, whose culture has been modified only slightly by white men, inhabited the Arctic fringe of the continent.

The Conflict Between the White Man and the Amerind

The white man subdued the Amerind in a comparatively short time. One factor in this struggle was the contrast in cultural development. The European was using iron and steel while even the most highly civilized natives were still in the Neolithic stage. The white man also had the horse and other domesticated animals while the native had only the dog. When he came to the New World he had to combat few new diseases;³ on the other hand, he introduced several. Measles and smallpox killed the natives in great numbers and accounted in large measure for the victory of the white man. It seems evident that most tribes had been in North America only a comparatively short time and had not completely adapted themselves to the new environment when the Europeans came. From every point of view the white man had the advantage.

The Amerind made many contributions to agriculture. In the New World the most valuable discoveries were not gold but new foods. Among the food plants domesticated and developed by them and given directly or indirectly to the white man, corn or maize stands first. In addition he contributed the white potato, tobacco, many kinds of beans, peanuts, pumpkins, squash, the sweet potato, tomatoes, and many other foods. According to H. J. Spinden of Peabody Museum, Harvard University,⁴ "four-sevenths of the total agricultural production of the United States, measured in farm value, consists of economic plants domesticated by the Indians. . . ." Everett E. Edwards, of the Bureau of Agricultural Economics, further states that the "white man has not reduced to

³ It has been rather generally recognized that syphilis and yellow fever are New World diseases that were unknown to Europeans prior to the discovery of America. H. J. Spinden, "Population of Ancient America," *Geographical Review*, October 1928, Vol. XVIII, No. IV, p. 644.

⁴ *Ibid.*, pp. 641-660.

cultivation a single important staple during the four hundred years that he has dominated the New World."⁵

Many of the crops introduced from Europe did well in North America. All cereals found favorable habitats. Only the Mediterranean grape, which was accustomed to dry summers, failed in the eastern part of the New World, because the heavy summer rains encouraged the growth of a fungus. A native grape, the Concord, however, was successful. In southern California the Spaniards had no difficulty in growing the Mediterranean grape because there it found a climate similar to that of its original habitat.

By fair means or foul, the white settlers killed off or pushed back the Amerinds. Today the remnants of most tribes in the United States live on reservations scattered throughout the West, and on a few reservations in the East.

A New Deal for the Amerind

After 150 years of handling Amerinds as wards of the government, our Indian Office has changed its policy of educating them away from their homes and traditions; instead of trying to "civilize" the Amerind, it now aims to produce a renaissance of their native culture. This means keeping them on the land.

In 1934 the former government policy came to an end by the passage of the Indian Reorganization Act. Its three major objectives may be thus summarized:

j 1. Land, the basis of all Amerind economy, will be restored to collective rather than individual use. The attempt to Americanize the Indians by making them individual property owners failed.

2. Tribal self-government is made optional.

3. Amerind folkways—culture, language, religion, arts, and crafts—are to be fully respected so far as is consistent with national trends.⁶

Exploration and Early Settlement

In ancient times European culture reached its highest development along the shores of the Mediterranean Sea. Later, barbarians destroyed this civilization. During the Middle Ages the main cultural centers moved into western Europe. However, several of the old Mediterranean cities, like Venice, Genoa, Florence, and

⁵ Everett E. Edwards, "American Indian Contribution to Civilization," *Minnesota History*, September 1934, Vol. XV, No. 3, pp. 255-272.

⁶ Harold Ward, "A New Deal for the American Indian," *Indians at Work*, September 1939, Vol. VII, No. I, pp. 26-27.

Constantinople (Istanbul), maintained their supremacy. Their importance resulted from trade with the Orient. In the fourteenth century Venice and Genoa became the main entrepot ports for Oriental goods. When Constantinople was captured by the Ottoman Turks in 1452, all trade routes to the East were closed. This ruined the trade of the Italian cities and caused them to decline commercially.

The Portuguese, under the patronage of Prince Henry the Navigator, had explored the west coast of Africa even before the fall of Constantinople, and had rediscovered certain Atlantic islands known to the ancient Phoenicians. Columbus, a native of Genoa, sailing in the interest of Spain, crossed the Atlantic in 1492 and landed in the West Indies. Depending on an ancient Ptolemaic map, he underestimated the distance from Europe to Asia and at first thought he had reached India. Probably he realized his mistake on one of his three subsequent voyages. Balboa crossed the Isthmus of Panama, saw the Pacific Ocean, and claimed all the lands on its borders for Spain—perhaps one of the most ambitious real estate claims in history. The quarrel between Portugal and Spain over their conflicting interests in the New World was settled by the Papal Line of Demarcation. Meanwhile England sent out the Cabots, who discovered Newfoundland and the Gulf of St. Lawrence and claimed that territory for England. Later Jacques Cartier, sailing under the flag of France, reached the Gaspé Peninsula. It was not until the close of the sixteenth and the beginning of the seventeenth century, however, that these two nations made any further attempts to acquire colonies in North America. The French then explored the main rivers including the St. Lawrence and the Mississippi, while the English confined themselves to settlements on the Atlantic Coast and in the West Indies.

In the sixteenth century Cortez, under the flag of Spain, conquered the Aztec Empire in Mexico, and secured large quantities of gold for himself and the homeland. Cabeza de Vaca, after being shipwrecked on the Texas coast, wandered across the Southwest as far as Arizona, then turned southward down the west coast of Mexico to the port of Culiacan, where an expedition under Coronado* was being outfitted to search for the Seven Cities of Cibola. Coronado traveled through Arizona and New Mexico, into Kansas, and then returned through the Southwest to Mexico. Having found no gold, he considered the expedition a failure.

At the same time that Coronado was exploring the Southwest, an expedition under DeSoto advanced northward from Florida, then turned westward and crossed the Mississippi somewhere south of

the present city of Memphis. DeSoto went as far west as the Ozarks, but upon returning from that area he died and was buried in the Mississippi. In spite of these extensive surveys of the South and Southwest, Spain made no definite claims to the area because her explorers found no gold. Thereafter, her interests were concentrated largely in Mexico and South America.

The French came to Canada, dominated the St. Lawrence Valley, then the Great Lakes area, and ultimately claimed all lands drained by the Mississippi River and its tributaries. The English, reaching North America later, settled only on the east coast. Each country ignored the claims of the others, all the grants to the English colonies reading "thence westward to the Pacific." The Finns and Swedes, who had settled in Delaware, were absorbed by the Dutch, who in turn were made a part of the English colony.

The Negro Slave

Not long after the first white settlers occupied the land of Tidewater Virginia there arose the problem of labor for clearing the forests, cultivating the soil, and harvesting the crops. Since land was free, no white man would consider working for another when he could have his own land, and the Amerind of the Atlantic Coast could not be enslaved as were the natives of the high plateaus of New Spain. At first this problem was met by a system of indentured servants—white men sent over from England who temporarily sold their services for the price of ship passage to the New World. These, however, did not prove satisfactory, because they were not numerous enough to supply the demand for labor, and because it was difficult to keep them as slaves once they reached the frontier.

Everett E. Edwards, of the Bureau of Agricultural Economics, in discussing African slaves and the labor problem, says: ^T

The first Negro slaves in the English Colonies were landed by a Dutch privateer at Jamestown in 1619. They were sold to the colonial government, which in turn sold them to planters along the James River. It was not until 1630 that a second cargo of Negroes was sold in the Virginia settlements. From 1635 on, a small number was imported nearly every year, partly from England and New Netherlands, but mostly from the West Indies. Despite the shortage of labor, Negroes were not popular at first, and even in 1690 there were only 5,000 in the tobacco colonies. However, at the end of the seventeenth century the English Government restricted kidnaping and attempted to check the sending of convicts to America. As a result direct slave trade with Guinea developed, and slaveholding

⁷ Everett E. Edwards, "American Agriculture—The First 300 Years," *Yearbook of Agriculture*, 1940, pp. 180-181.

began in earnest. It is estimated that there were 400,000 slaves in the Colonies in 1760 and that three-fourths of them, were in the southern Colonies. The slaves made up about two-fifths of the entire southern population. . . .

Later when cotton became the important crop of the Old South after the invention of the gin, Negro slave labor seemed essential for clearing new lands and for planting and picking the crop. Had it not been for this large supply of labor during the eighteenth and early nineteenth centuries, it is doubtful whether the Cotton Belt could have expanded so rapidly or whether the Old South could have attained its Ante-bellum cultural stage. By 1808, when further importation of African slaves was prohibited, nearly 20,000 were being brought into the United States each year. They were never successful as laborers in the northeastern industrial states, and even in the Middle Atlantic States of Maryland and Virginia they were of doubtful value. Only in hot humid areas of the deep South, where Europeans experienced difficulty in performing physical labor, could Negro slaves be employed profitably. Because slaves were unprofitable in the North, that section of the country demanded abolition, while the Cotton Belt states became more convinced than ever that slavery was essential. The result was armed conflict between the two factions, and the ultimate emancipation of the Negro. Since that time the Negro problem both in the South and in the North has been a subject of much study and discussion. It will be considered further in subsequent chapters.

Conflicts for Control of Anglo-America

By the early part of the seventeenth century, the English were entrenched from Nova Scotia almost to Florida. The French dominated the Great Lakes and the Mississippi Valley and the Spanish held Florida, New Mexico, and all lands westward to the Pacific.

The main base of Russian America was on Baranof Island at Sitka, Alaska. No one disputed the Russian possession of the region around the Aleutian Islands, but in southeastern Alaska there were conflicting claims. The Spanish had sent out an expedition from Mexico, and claimed the coast as far north as 62°N latitude. James Cook explored the Alaskan coast and claimed much of it for Great Britain. American clipper ships had traded up the West Coast, discovering the mouth of the Columbia River and the lands of the Northwest. Spain and Russia withdrew from the quarrel over the southern part of the area, leaving it to the United States and England. Spain relinquished her claims to the

United States in the Treaty of 1819,* when Florida was purchased. In the early part of the nineteenth century Russia ceased to make any further advances in the territory.

The Territorial Growth of the United States and the Westward Movement

In the space of fifty years, 1803-1853, the United States attained its present continental size, acquiring much of the territory by purchase (Fig. 9). Following the Revolutionary War and the

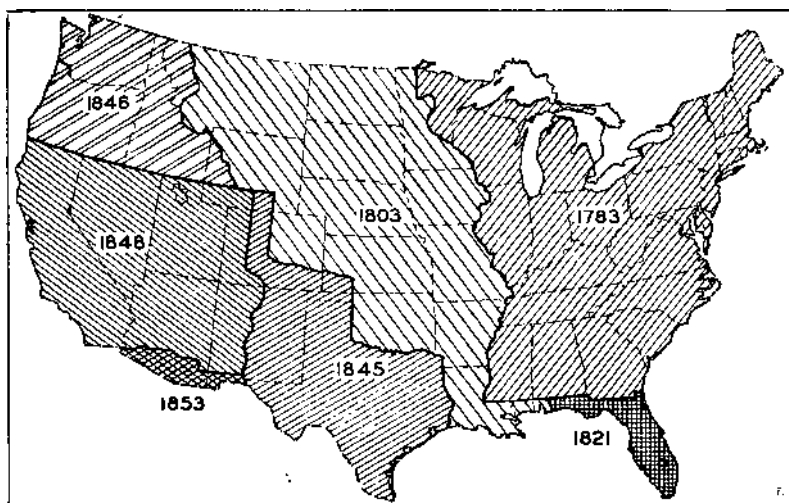


Fig. 9. Territorial growth of the United States.

creation of the United States as a new nation on the North American continent, the first land annexed was Louisiana in 1803. This territory had a complicated history. France had ceded Louisiana to Spain at the close of the French and Indian War to prevent it from falling into the hands of England. Spain, in accepting Louisiana, hoped to block the advance of the English colonists. She soon realized, however, that the advance of the new American republic could not be stopped, and hence decided to return Louisiana to France so that France could act as a barrier between the young United States and Spanish Texas.

Spain was dismayed when France immediately sold this territory to the neighbor she dreaded most. By 1800, American pioneers in

* Treaty finally ratified by Spain and the United States in 1821.

the Ohio Valley had begun to demand better treatment at New Orleans, their natural water outlet, and soon to insist upon the purchase of that port by the United States. The Trans-Allegheny people even threatened secession because their economic interests were more closely linked with the port at the mouth of the Mississippi River than with any of the American ports on the Atlantic Seaboard. President Jefferson, realizing the seriousness of the situation, opened negotiations with France for the purchase of New Orleans, and ultimately secured the whole of Louisiana for \$15,000,000. Although Congress had not authorized this purchase, Jefferson concluded the deal because he was far-sighted enough to recognize the importance of this tract of land to the growing United States. Immediately he sent out an expedition under Lewis and Clark to explore the new territory (Fig. 10). They ascended the Missouri River to its headwaters, crossed the Rocky Mountains, and descended the Columbia River to the Pacific Coast. Zebulon Pike explored the Southern Rockies, discovering the peak which bears his name. These organized expeditions were soon followed by trappers in the 1830's and 1840's. At this time the Great Plains were merely transit lands; no one was interested in occupying them or made any attempt to settle them.

Spain, having lost most of her colonial possessions in the New World, and realizing her inability to stop the territorial advance of the United States, sold Florida in 1821 to the new nation.

By 1820, settlers were moving westward rapidly. Meanwhile Mexico, having separated from Spain, controlled a broad area extending from Texas westward to the Pacific and as far north as the present northern boundary of California. Realizing that Texas should be occupied immediately, Mexico threw open the land to settlers, giving them several times as much land for homesteading as the United States later offered to its land-hungry population. Mexico soon realized her mistake in permitting Americans to homestead in Texas and tried to discourage further settlement by making it unpleasant for those already there, thus precipitating the Texas War for Independence. After operating as an independent republic for nearly a decade, Texas was subsequently annexed by the United States. In the Mexican War which followed, the United States was victorious. Mexico then ceded to the United States all territory in dispute, established the Rio Grande as the southern boundary of Texas, and sold her the southwestern territories including California. In 1853 the Gadsden Purchase was negotiated to extend the boundary of the United States south of the Gila River Valley.

In Oregon the claims of the United States and England conflicted.

The former demanded the territory as far north as the southern boundary of Alaska— $54^{\circ} 40'$ —on the basis of explorations by fur traders and by Lewis and Clark. England claimed the entire region because her trappers had descended the Fraser and Columbia rivers. The United States dispatched settlers over the Oregon Trail to clinch her claims, and this resulted in the slogan "Fifty-four forty or fight." England also joined the race. The two countries compromised, however, on the 49th parallel, which had already been agreed upon as the boundary from the Lake of the Woods to the Rocky Mountains. This boundary was projected across the mountains without regard to relief. The only exception in the use of that parallel is Vancouver Island in British Columbia.

The purchase of Alaska from Russia in 1867 completed the acquisition of territory by the United States in Anglo-America.

The Formation of the Dominion of Canada

At the close of the French and Indian War, Canada became a part of the British Empire. Unlike the English colonies to the south, Canada remained loyal to Britain. The War of 1812 was largely a

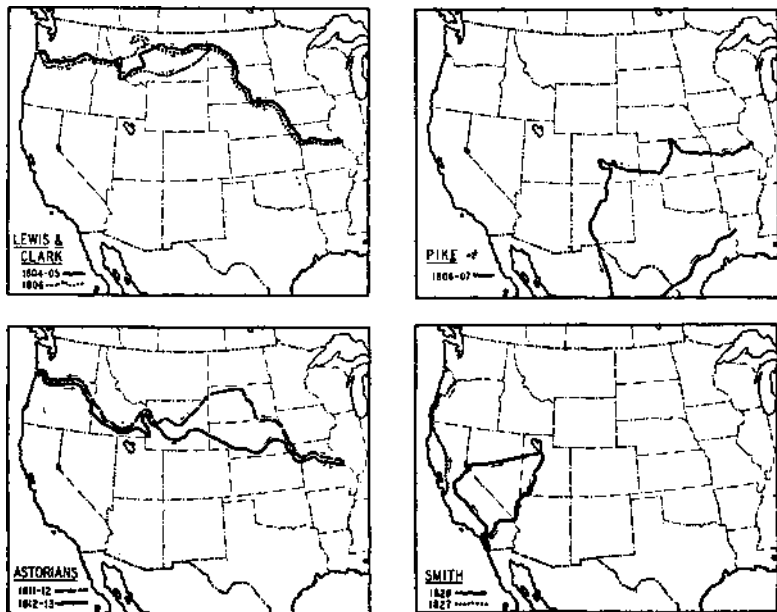


Fig. 10. Western exploration, 1800-1850.

war between the United States and British Canada. At its close, the two countries agreed to abolish all fortifications along their common border and to maintain no navies on the Great Lakes. Since then, only customs houses mark the boundary between these two great nations on the longest unguarded international boundary in the world (Fig. 11).

As England extended her domain in Canada to the Pacific Ocean, need was felt for some type of home government. In 1867 the Dominion of Canada was organized. This included all of British North America north of the United States except Newfoundland and its colony, Labrador. Since the settlement of the boundary dispute between Labrador and Quebec in favor of Newfoundland, there has been some discussion of a union between that colony and the Dominion.

In recent years Canada has attained virtual independence from the British Empire. It is practically an autonomous state—a rich and powerful unit in the British Commonwealth of Nations. With most of North America occupied and developed by two of the major English-speaking nations of the World, the United States of Amer-

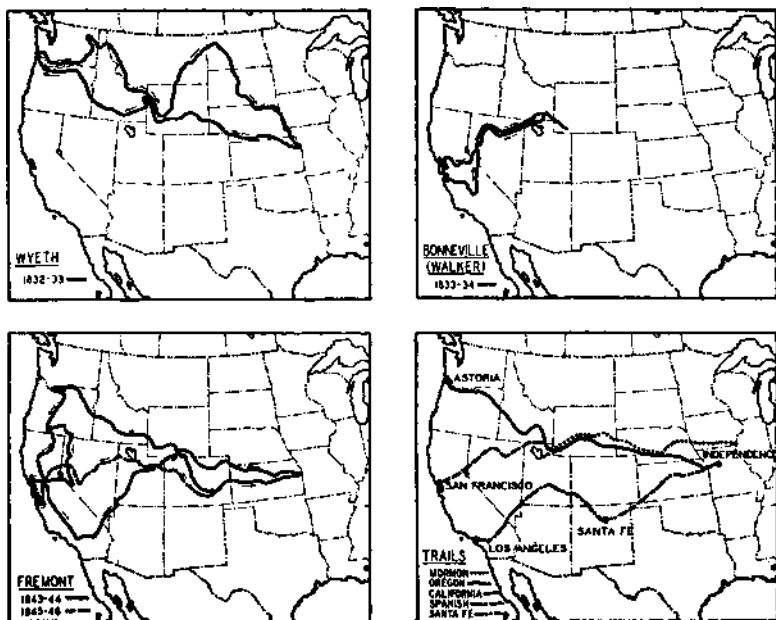
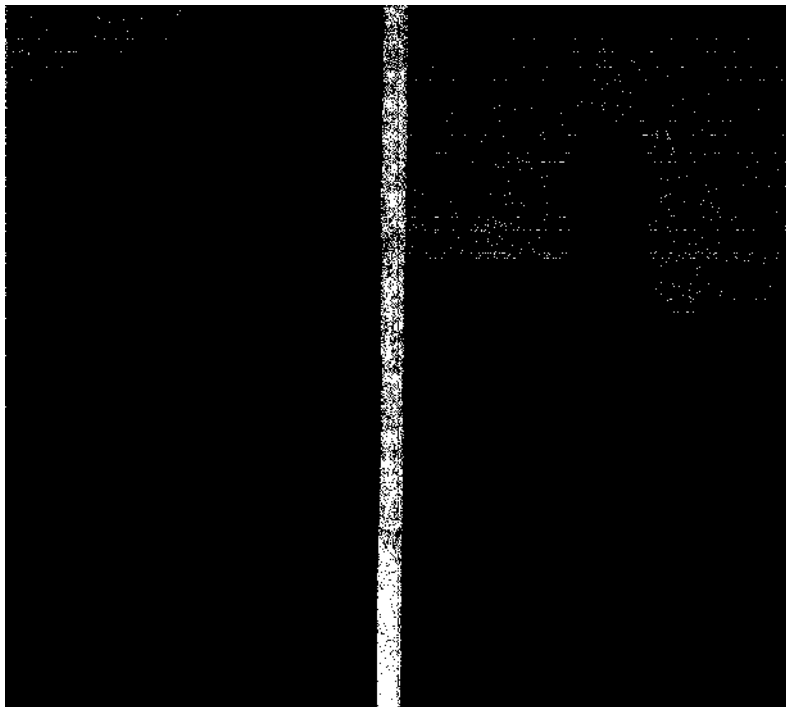


Fig.10 (Cont.)



International Boundary Commission, Washington, D. C.

Fig. 11. The unguarded 49th parallel in the Rocky Mountains between Montana and Alberta, and one of the international monuments.

ica and the Dominion of Canada, it seems certain that they will be drawn more closely together in the future. Their problems are largely the same in time of peace as well as in time of war.

Land Occupance and Land Utilization

The course of empire moved beyond the Appalachians, crossed the Mississippi, rumbled over the plains, climbed over the Rockies, and finally came to the last frontier—the coast.⁸

The settlement and development of the West both in the United States and Canada resulted in the preemption of the best lands early in the twentieth century. Private ownership prevailed, and the frontier became a thing of the past. The details of the westward movement and of the settlement of the frontier will be con-

⁸ *Review of Reviews*, January 1935, p. 10.

sidered within the several regions involved, but the use and misuse of this new land should be mentioned here.

Several years ago O. E. Baker published an article, "Land Utilization in the United States: Geographical Aspects of the Problem."⁹ No clearer statement of the problems involved ever has been made. He describes first the settlement of the West and the passing frontier, with the best lands ultimately becoming privately owned. He then calls attention to the fact that cultivated land is increasing more slowly than population and suggests ways in which agricultural production can be increased—by irrigation, drainage, more intensive cultivation of some lands, use of improved pastures for crops, and changes in consumption of agricultural products. At that time (1923) Baker portrayed the trends in land utilization and emphasized the need for land classification surveys. Since that article appeared, the depression of the 1930's has produced many changes in the economic structure of the world. For a time the nation suffered from agricultural overproduction, with foreign markets almost disappearing. It seemed that there was no further need for increasing agricultural production when there was already an oversupply of farm products.

The urban-rural migrations that resulted from the closing of numerous industrial plants in the cities caused an overpopulation in many agricultural communities—some of which could not support additional people. Of those who returned to the farm, many were ill-fitted for farm work. Much of the land they occupied was "submarginal"; when "submarginal" people (those ill-suited for farm work) settled on submarginal land, the situation became exceedingly critical.

The federal government realized that the maladjustment of man to land was a problem of nation-wide scope, and that the people involved were financially unable to better their situation, even if they knew how to improve conditions. The dry years of the early 1930's brought the matter before the nation in the alarming destruction of lands through wind erosion in the "Dust Bowl" of the High Plains. Severe soil erosion was also noted throughout the Southeast, and it soon became apparent that the soil, and other resources, were being wasted largely through ignorance. This national emergency led to the establishment of several government bureaus like the Soil Conservation Service, the National Resources Board, and the Resettlement Administration. These agencies studied the problem of the land and its natural resources, and, in

⁹ *Geographical Review*, January 1923, Vol. XIII, No. 1, pp. 1-26.

many cases, made suggestions for the retirement of much land from cultivation. They also moved some families from the poorest lands to those of higher productivity, but not always successfully owing to a number of causes, many of which are sociologic in character. Farming people become rooted to the soil. They prefer to remain in their native habitat even under a low standard of living rather than move to a more productive area where they might improve their conditions. Of course if the habitat becomes untenable, such as sections of the "Dust Bowl," mass migration begins. Many "submarginal" people, like the "Okies," migrated to good agricultural lands in California and other western states, resulting in an overpopulation there. Since their numbers were large and not enough work was available, most of them had to go on relief. Eventually they became such a great financial responsibility that the people of California legislated against them. Efforts by the government to prevent the destruction of natural resources, which has characterized so much of the nation's past, must be continued for the danger will always be present.

CHAPTER MI

Regional Geography and the Geographic Regions of Anglo-America

PEOPLE live and work together as units of a geographical region far more than they do as citizens of a state. For some time historians have perceived a lack of uniformity in American life and attitudes. This dissimilarity in people and social conditions over the continent they have called *sectionalism*. Speaking of sectionalism in the United States, Frederick Jackson Turner, who made the outstanding contribution to American historiography, once said: "We are so large and diversified a nation that it is almost impossible to see the situation except through sectional spectacles. . . . We think sectionally and do not fully understand one another." ¹ Geographers, political scientists, economists, and sociologists also recognize the significance of regions and regionalism; but geographers, have been more exact than their fellow workers in these closely related fields and have achieved a definite regional viewpoint with which to examine American life. Probably the only thing on which *all geographers* see eye to eye is the fact that regional geography is the core of their subject. C. C. Colby, in his presidential address before the Association of American Geographers in 1935, after having stated several definitions of geography, said:

As these definitions are familiar ground to all of you, I shall be content with the assertion that, whatever their differences may be, they agree on one important issue, namely, the vital quality of the regional idea in the science.²

His opinion is shared by several other eminent geographers representing schools of geographical thought here and abroad:

¹ Frederick Jackson Turner, *The Significance of Sections in American History*, p 326. New York: Henry Holt & Co., 1932.

² C. C. Colby, "Changing Currents of Geographic Thought in America," *Annals of the Association of American Geographers*, March 1936, Vol. XXVI, No. I, pp. 28-29.

1. "Regional geography" is or should be the final goal of modern geography, its core and culmination." (R. E. Dickinson and O. J. R. Howarth.)

2. The one thing that is first, last and always geography and nothing else, is the study of areas in their compositeness or complexity, that is, *regional geography*. (N. M. Fenneman.)

3. Under this unitary view the final goal of all geography is regional geography. (Carl O. Sauer.)

4. We come now to regional geography, properly recognized as the culminating branch of the science because it involves facts and principles from all divisions and subdivisions of systematic geography. (H. H. Barrows.)

5. It is in the regional form that geography has finally attained consciousness of its object, its methods, its function—of itself. (George T. Renner.)

6. Almost every problem in human geography has a regional basis or lead* eventually to a regional conclusion or expression. (Isaiah Bowman.)

While disciples in both the social and the natural sciences wrestle with the various and sundry problems of regions, geographers logically have been the leaders in developing the major ideas about regions, *since their subject and no other makes the regional study of area or landscape its special field*. Moreover, regionalism lies exclusively neither in the social nor in the physical realm but grows out of man's adjustment to area. Accordingly, geography, which links the data of the social sciences with those of the natural sciences, is the logical discipline to specialize in the study of regions.

Geography—What Is It?

Geography is concerned with *nature* (physical and biological) only as it provides an *environment* for man, and it is concerned with *man* only in his *relationship* with nature. According to Carl Sauer, geography is the study of regions or areas. The authors agree, but would qualify the definition by stating that such study becomes meaningful only when it is directed into a search for the human ecology of such regions or areas. Regional geography tries to interpret and explain the numerous elements in the complex ecology of regions. Neither man nor place is considered a separate entity; they are considered together whenever the study is geographical.

Since the natural environmental complex varies from region to region and since human beings are in different stages of culture, the drama varies greatly from region to region. For example, what greater differences could be imagined than those found in Metropolitan New York, in the coastal region of northwest Greenland, and in central Amazonia? Here and there, however, even on different continents, where land forms, climate, natural vegetation, and soils are *roughly similar and where human beings are in the same*

stages of culture, the drama follows similar lines. Thus, in the tundras of both North America and Eurasia, man adjusts himself geographically in much the same manner; throughout the world's rainy tropics, too, the human ecology differs little, wherever the people are culturally at the same level.

What Is a Region?

There are many kinds of regions. What a region is considered to be depends entirely upon the training, interest, and purposes of the person who is studying it; a climatologist works with climatic regions; a geomorphologist deals with physiographic regions; a pedologist deals with soil regions, *ad infinitum*. *Not one of these regions, however, is, strictly speaking, geographical.* George T. Renner "hits the bull's-eye" in defining a geographic region when he says:

. . . the kernel characteristic of a region is that it is an area within which certain types of socio-economic adjustments to the [environment] have been made by man so generally as to constitute the real "regionally" of the area, and therefore to provide the reason for separating that area from adjacent areas which are characterized by different types of adjustments to the [environment].³

According to this point of view, the Agricultural Interior of the United States is a truly geographic region: throughout its extent is a similarity of natural environmental conditions and of human adjustments to them. To be sure, the system of farming varies here and there in accordance with such things as the size of the farm, natural vegetation, surface configuration, small differences in climate, type of people, and soil; nevertheless corn and hogs and corn and cattle put their stamp on most of the landscape from central Ohio to eastern Nebraska. Mining, manufacturing, and commerce are important. There are also many small industrial cities and several large ones. Nevertheless all are firmly rooted in the soil that gave them birth. Thus it is apparent that the Agricultural Interior is an area wherein a characteristic human adjustment to nature—farming—is being made, and that it is, therefore, a true geographic region.

Why Study Geography by Regions?

It has been pointed out that most continents, countries, or even states and provinces lack geographic unity. Each state or province

³ George T. Renner, "The Statistical Approach to Regions," *Annals of the Association of American Geographers*, September 1935, Vol. XXV, No. 111, p. 137

usually falls into two or more regional units—a situation obviously unsatisfactory. For government planning it means more difficult, less efficient, and costlier administration. From the standpoint of a teacher of geography, it is absurd to treat Minnesota, for example, as a geographical unit apart from its neighboring states. Actually it falls into three divisions, each of which is part of a larger region extending over adjoining states.

If today we could begin anew to subdivide North America into political states, the new boundaries certainly would not coincide with the present ones. In all probability, geographic regions characterized by uniformity of resource use would be employed, for "we live, produce, and trade regionally. To some extent we also think regionally."⁴ Such a division would be reflected in greater homogeneity in the economic and social life of the people. To think that such a subdivision will ever take place is but idle academic speculation, because state and provincial boundaries are no doubt permanently frozen both legally and psychologically. Actually, state boundaries are becoming more firmly entrenched.

Nevertheless, geography deals with areas, and different areas have distinctive individualities and personalities in both their natural and cultural landscapes. Regionalism is deep-seated in America and is ever apparent in the culture of its inhabitants. Therefore, geography can be treated most effectively on the basis of regions.

Plan of the Authors

In this book the continent is divided into geographic regions. The authors believe that the geographic region should represent a compromise between similarity of natural landscape, similarity of cultural landscape, and the functional integration of the two. It is hoped that each region is so treated that the serious student gets the "feel" of it—that he gets a picture of its life in relation to the natural setting. To facilitate this, carefully selected maps and photographs are generously used and should help the student to visualize the fact that regions differ one from another as distinctly as do human beings.

While an effort has been made to draw boundaries with all possible precision, the authors believe that it is not the boundaries

⁴ For types of regional thinking, see C. O. Paullin and John K. Wright, *Atlas of the Historical Geography of the United States*. Carnegie Institution, Publication No 401, Baltimore, 1932.

themselves but rather the qualities *within* their confines that give character to a given region.

More and more, geographers agree that regional boundaries are not lines but zones; probably not one person in a hundred would know definitely the moment he left one region and entered another. In short, *boundary lines are arbitrary*. It is desirable and necessary to draw them, however, provided the above point be constantly kept in mind.⁵

In this text, the use of the term *region* is restricted to large areas. The restriction is necessary because the majority of students studying the regional geography of Anglo-America have as background only a general course in the principles of geography. Any study of small sub-regions would confuse rather than clarify their thinking. The requirements of the intensive scholar in any field of learning differ from those of the teacher who organizes his material along simple, easily grasped lines for the purpose of instruction. Since this is a textbook, we must simplify and generalize in order to bring ideas and facts within easy grasp. Consequently, only the broadest regional lines have been drawn. The authors have, moreover, endeavored to relate each geographic region to its neighboring regions regardless of intranational and international political boundaries. By this method of working across political boundaries, the student should become aware not only of Anglo-America as a whole but also of its component geographic regions. Finally, he should be able not only to accumulate facts on a regional basis but also to use them in thinking interpretively and in arriving at sound regional understandings.

Distinction Between Regionalism and Sectionalism

The words "region" and "section" are used synonymously even by some professional social scientists who should know better. Among geographers, however, sectionalism is inseparably associated with politics and emotionalism, whereas regionalism is not. A re-

⁵ Said the late C. F. Marbut (America's foremost pedologist and chief of the United States Soil Survey), referring to a paper on regions delivered before a group of professional geographers: "... since I have been guilty of drawing many different kinds of boundaries, I probably have hardened my soul to the difficulties involved. I don't regard it as very important ... whether the boundary which I have placed on the nap of the United States between pedocals and pedalfers comes within fifty miles of the exact boundary. In fact I don't know whether there is an exact boundary or not." *Annals of the Association of American Geographers*, September 1935, Vol. XXV, No. 111, pp. 133-134.

gion provides a motif for economic planning; a section a "basis for political uproar."

What Does the Regionalist Mean by Anglo-America?

Until the nations comprising Anglo-America are brought into scientific focus, each appears to be a compact, single economic unit. According to Howard Odum and Harry Moore, however, the United States is not a single nation nor a confederation of states; it is rather a collection of regions, which differ markedly one from another, and whose relations give them some political but little geographical unity. (Odum and Moore refer only to the United States, but what they say applies equally well to all of Anglo-America.) Regional diversities are so real that they merit recognition. All regionalists, regardless of background, agree that the continent is not homogeneous and standardized. Anglo-America can be most intelligently utilized only when its problems are attacked regionally.

Difficulties Arising from Dividing Anglo-America Into Regions

To divide Anglo-America into regions acceptable to geographers and specialists in other fields is indeed a difficult task, for the word *region* evokes several divergent concepts. Probably people and areas will continue to be studied from different points of view. If one takes the regional maps of Anglo-America made by a physiographer, by a climatologist, by a plant ecologist, by a penologist, and by a few others, one will have before him a geographical jigsaw puzzle. Not one of the maps is in itself a geographical study. Each, however, is extremely valuable as a geographical tool. The geographer's task is to synthesize:

. . . like the builder of a house who takes brick, stone, sand, cement, nails, wire, lath, boards, shingles, and glass—the products of many industries—and builds them into a symmetrical structure which is not any one of the many things that have entered into it, but is instead a house for the occupancy of man.⁶

This does not mean that geography consists merely of recombined data of other fields; if such were the case, "it would be a card catalogue, not a science." It has been pointed out that the regional studies of geographers are entirely different from those of workers in borderline disciplines.

⁶ J. Russell Smith, *School Geography and the Regional Idea*, p. 2. Philadelphia: John C. Winston Co., 1934.

Geographers do something other than investigate in succession the geology, the botany, the zoology, the anthropology, the economics, the sociology, the political science, and the history of a region. Such a task, whatever its value might be, would call for mastery of too many disciplines. On the other hand, if geographers, recognizing their lack of fitness to make the series of geological, botanical, and other studies referred to, restricted their efforts to making syntheses for regions on which these other studies had already been made by workers in the several disciplines involved, geographical investigation of most regions would be postponed indefinitely.⁷

Because no single person can view and collect all the data which go into the making of a modern geographical study, the geographer must utilize the materials of others and draw them into an ordered and unified whole.

Another difficulty confronting the regional geographer is that regions overlap (Fig. 12). Yet there is overlapping in nature. As the late R. H. Whitbeck once pointed out, if man draws *definite boundaries* for nature, he does in most cases what nature did not do.⁸ Everyone who travels knows he cannot possibly tell precisely when he leaves the American Manufacturing Belt and enters the Agricultural Interior or when he leaves the Great Plains and enters the Agricultural Interior. *At some point, of course, the change is made, but the human eye is unable to perceive it at the moment of change.* The distinguishing features of one region grade or melt gradually into those of the neighboring region, except along the crest of a severing mountain range, along the shore of a large body of water, or at the border of a desert.

The core of the region is what counts; not its periphery. At the core is a well-developed self-conscious region with regional traditions in the minds of its inhabitants. Regionalism, then, is an attempt to express the meaning of environment through the lives of people who live in a region.

A third difficulty has to do with the criteria for regional differentiation. Probably the best solution here is to use no single basis for all regions, but instead those factors responsible for a given area's personality—those that brand their mark on it. In one area it may be surface features, in another climate, and in still others mineral resources, grazing, or recreation.

A fourth serious difficulty is the fact that nearly all government data are for statistical or administrative units—cities, townships,

⁷ Wellington D. Jones, "Procedures in Investigating Human Occupance of a Region," *Annals of the Association of American Geographers*, June 1934, Vol. XXIV, No. II, pp. 93-94.

⁸ R. H. Whitbeck, "Fact and Fiction in Geography by Natural Regions," *Journal of Geography*, March 1923, Vol. XXII, No. II, p. 91.

counties, and states. It is evident that in this respect the student of geographical regions works against greater obstacles than the student of statistical regions, which someone has cynically called "regions of convenience." The final results of the former, however, are more satisfactory.

Most geographers agree that the best bases upon which to group human beings are the predominant economic activities, for *economic interests are always regional*.

Determination of Areas of Homogeneity—Regions

The geographic region has already been defined, and while conditions within it are similar, *they are only broadly so*. Within every region is a certain amount of areal diversity. Dividing a continent into regions is a matter of "scientific generalizing" and is not, as someone once remarked, "merely a pedagogical device to facilitate the presentation of geographical material to classes of students," although it may admittedly serve this latter purpose.

The student beginning work in regional geography usually asks these three among other significant questions:

1. How does one go about studying regional geography in the field (that is, on the actual surface of the earth) ?
2. How does one recognize a region?
3. How can one tell where to draw regional boundaries in an effort to encompass homogeneous areas?

In answer to the first question, it can be said that the regionalist should study (a) the natural landscape—the surface features (both land and water), the climate, the soils, the natural vegetation (inseparably related to climate and soils); and (b) the cultural landscape—settlements, transportation routes (railroads, roads, canals), and land utilization. Next:

. . . these forms should be treated morphologically. They should be mapped as to their distribution, assembled as to their genetic connections, studied as to their origins and developments, and synthesized into the regional pattern. Beyond this irreducible minimum, the regionalist may then wander where he will. . . *

In answer to the second question, it may be pointed out that one recognizes a region by noting the intimate association existing between peoples of like interest and the area they occupy. Similarity of interests invariably indicates or points to similarity of

⁹ Robert B. Hall, "The Geographic Region: A Resume," *Annals of the Association of American Geographers*, September 1935, Vol. XXV, No. 111, p. 128.

natural environmental conditions. In the American Manufacturing Belt, especially the part west of the Appalachians, people think and talk in terms of iron and steel and the many products derived from them; in fact, iron and steel are called the "barometer of industry," because nearly all manufacturing enterprises depend upon them. East of the mountains, though steel still is important, manufacturing more nearly includes the whole gamut of fabricated products. In the Agricultural Interior to the west, however, the people are vitally interested in corn, oats, tobacco, fruit, hay, hogs, and beef and dairy cattle as the economic barometers of life. In either region, the natural environment is at the bottom of popular interests.

To answer satisfactorily the third question is a difficult task. As indicated earlier in this chapter, there are few places where sharp boundary lines exist in nature; boundaries are generally zones, within which regions melt gradually into their neighbors. If one who is studying an area in the field keeps going until he notes a change in the physical and cultural landscapes, he is probably safe in inferring that he has left one region and entered another.

The Cultural Landscape in Regional Analysis

Geographers deal with both natural and cultural landscapes. Everyone who has traveled, even if only slightly, has noted that the natural landscape changes from one part of the country to another. When two greatly unlike areas are neighbors, the student may separate them on his map by a line, thereby recognizing them as separate natural regions. Similarly, the student geographer may study the cultural or man-made landscape, and resolve it into separate cultural regions. Finally, he may try to integrate the two, and arrive at a set of truly geographic regions.

Whenever man comes into any area, he promptly modifies its natural landscape, "not in a haphazard way but according to the culture system which he brings with him. . . . Culture is the agent, the natural area is the medium, the cultural landscape the result."¹⁰ He cuts down the forest, plows under the native grass, rears domesticated animals, erects houses and buildings, builds fences, constructs roads, railroads, telephone and telegraph lines, digs canals, builds bridges, and tunnels under mountains. All this constitutes the *cultural landscape*.

¹⁰ Isaiah Bowman, *Geography in Relation to the Social Sciences*, pp. 149-150, New York: Charles Scribner's Sons, 1934.

While many kinds of specialists wrestle with the problem of landscapes, *only the geographer integrates the natural and cultural ones.*

Geography, however, consists of more than the mere distribution of men and things in the landscape. The distribution of races or climates or minerals by themselves is never geography. Rather it is ethnology, climatology, and geology, respectively. Such distributions become geographically significant only as they function in the mutual relationship of mankind to natural environment, as these relations are themselves *recorded in the landscape.*

Are Regions Fixed?

In many of the subjects or disciplines which are borderline to geography, the systems of regions that are studied are fixed by nature; climatic, pedologic, physiographic, and vegetative regions all are based on static or almost static natural boundaries. Geographic regions, however, are not fixed: instead of having hard-and-fast boundary lines, they have ever-changing ones. In regard to geographic regions, however, it may be remarked that, since Anglo-America is by no means mature economically, its regional boundaries are not fixed and hence no limits can be placed on their rate or their extent of movement. When man pushes wheat culture farther north in Canada or farther west in Kansas, or when he grows cotton farther north and west in Texas or Oklahoma, he is definitely responsible for changes in geographic regions, since boundary lines of such areas must then be redrawn.

Ecological Succession

Society appears to pass through a geographic cycle wherein more complex socio-economic forms replace the earlier simpler ones. Generally the most accessible and attractive resources are exploited first. Consequently, the sequence of occupancy in any region depends on the resource equipment as balanced against the cultural equipment of the population. Successive stages thus develop of necessity out of earlier ones. Derwent Whittlesey showed that New England, historically one of America's oldest sections, passed through (1) the pioneer period, (2) a period of maximum agricultural utilization, and finally (3) through a period of rural decline with depopulation and return of much land to forest and pasture. The knowledge of this kind of ecological succession is of value in providing a tool for use in regional planning, wherein efforts are

made to anticipate and provide for future changes in human economy.

Conclusion—The Goal of Geography

Regionalism is a fundamental fact in the geography of this vast heterogeneous continent. It has been shown that areas differ widely from one another in natural endowment and that each region tends to function as a mould into which the human element has been poured. The historian Frederick Jackson Turner expressed this thought in the following words:

It was evident at the outset of a study of the frontier movement that the American people were not passing into a monotonously uniform space. Rather, even in the colonial period, they were entering successive different geographic provinces; they were pouring their plastic pioneer life into geographic moulds. They would modify these moulds; . . . but even the task of dealing constructively with the different regions would work its effects upon their traits.

Not a uniform surface, but a kind of checkerboard of differing environments, lay before them in their settlement. There would be the interplay of the migrating stocks and the new geographic provinces. The outcome would be a combination of the two factors, land and people, the creation of differing societies in the different sections.¹¹

Each region offered to the on-coming wave of settlers a certain range of possibilities. The actual use made of these possibilities, however, depended to a very great extent upon the economic, social, and cultural heritage of the settlers. In other words, such additional factors as ideals, psychology, inherited intellectual habits—all of which are derived from the stock from which they came, function along with the natural environment. We must realize, of course, that only certain choices were open to the pioneer settler. Certainly commercial fishing could not be carried on in Wyoming; neither could petroleum be produced in New England nor wheat be grown successfully in Louisiana. The people were changed by their environment just as they altered the environment they entered. Thus New England in the Western Reserve of Ohio was not the New England from which the settlers came, nor was the central South the same as the Tidewater South. In every instance the newcomers modified but did not obliterate the natural landscape, just as their own cultural patterns were modified but not obliterated.

¹¹ Frederick Jackson Turner, *The Significance of Sections in American History*, pp. 38-39. New York: Henry Holt & Co., 1932.

As each chapter which follows is considered in its turn, the student will see that, contrary to what many people believe, the conditions of the natural environment are becoming more and more important in the lives of Anglo-Americans—culturally and psychologically as well as economically.

Strong sectional differences have emerged between the agricultural states of the South and the industrial states of the East. The cotton planters have wanted government intervention to make raw cotton cost more, while the textile manufacturers have demanded legislation to make fabricated cotton cost more. Accordingly the United States had a *farm bill* to boost the price of raw cotton and a *labor bill* to make manufactured cotton more expensive.

Regional Planning

In studying the geography of Anglo-America, one becomes aware of the "Roman holiday" the continent has been holding for 300 years. It was unique in its heritage of natural resources. For thousands of years time had stood still; the Amerinds, out of the very nature of their stage of culture, were perfect conservationists; they had not wasted the continent's wealth.

So far as the area now embraced in the United States and southern Canada was concerned, it had rich soil obtainable by nearly all those early settlers who wanted it. Its other resources were equally rich, abundant, and easy to obtain. The United States, however, has now cut three fourths of the virgin timber, killed three fourths of the game, mined more than one half of the copper and one third of the anthracite. For a long time it has been losing annually, through careless farming, three billion tons of topsoil. The people have looked upon these resources as limitless and inexhaustible; there was always more'Of everything farther west.

During the past decade, however, Anglo-Americans have become conservation-minded. They have seen that their economic system would have to be more closely attuned to nature, that they must avoid the mistakes of ignorance that characterized the past, that they must have enduring agriculture rather than soil-peeling, permanent forestry instead of timber-raping, and lasting human communities rather than squatter settlements. In other words, they must have regional planning, which, in its simplest terms, is a political direction based upon the social and natural resource structure rather than upon the outmoded statistical boundaries that were fixed to cope with the problems that were paramount when the United States and Canada were in their youth. Regional planning will result in greater national efficiency and harmony. Ac-

cordingly different branches of the two governments have been mapping the land—the soil, the relief, drainage, amount and distribution of rainfall, length of growing season, natural vegetation, subsoil minerals, soil erosion, hydro-electric resources, the people and their history. More and more this regional analysis becomes the first essential for public administration, and geography is playing and must continue to play an important role in all regional planning.

Regions of Anglo-America

On the basis of man's adjustment to the natural environment within specific areas, the continent may be divided into the following regions (Fig. 12):

- (1) The Drowned North Atlantic Coast.
A region of fisheries, forest products, commerce, and resorts.
- (2) Northeastern Uplands.
A region of forests, quarries, dairying, and resorts.
- (3) North Atlantic Coastal Plain.
A region of truck farming, fishing, and resorts.
- (4) The Piedmont.
A region of general farming, tobacco raising, and specialized manufacturing—cotton textiles, cigarettes, and furniture.
- (5) The Appalachian Uplands.
A region of mining, farming, resorts, and water-power.
- (6) Ozark-Ouachita Uplands.
A region of farming, mining, and resorts.
- (7) The Cotton Belt.
A region of cotton, corn, livestock, forest products, and minerals.
- (8) Subtropical Atlantic-Gulf Coast.
A region of rice, sugar cane, citrus fruits, early vegetables, fishing forest products, minerals, resorts, manufacturing, and commerce.
- (9) The Agricultural Interior.
A region of corn, small grains, tobacco, fruit, livestock, and dairying.
- (10) American Manufacturing Belt.
An urban region of diversified industries.
- (11) The Northern Continental Forest.
A region of logging, trapping, mining, and resorts.
- (12) Interior Grain Belts.
A region of winter wheat (*white*) and spring wheat (*shaded*), grain sorghums, and livestock.
- (13) Great Plains.
A region of grazing, irrigation agriculture, and minerals.
- (14) The Rocky Mountains.
A region of mining, grazing, farming, logging, and resorts.
- (15) Intermontane Basins and Plateaus.
A region of mining, grazing, farming, and resorts.
- (16) Subtropical Pacific Coast.
A region of citrus fruits, truck farming, ranching, fishing, petroleum, motion pictures, resorts, aircraft manufacturing, and commerce.

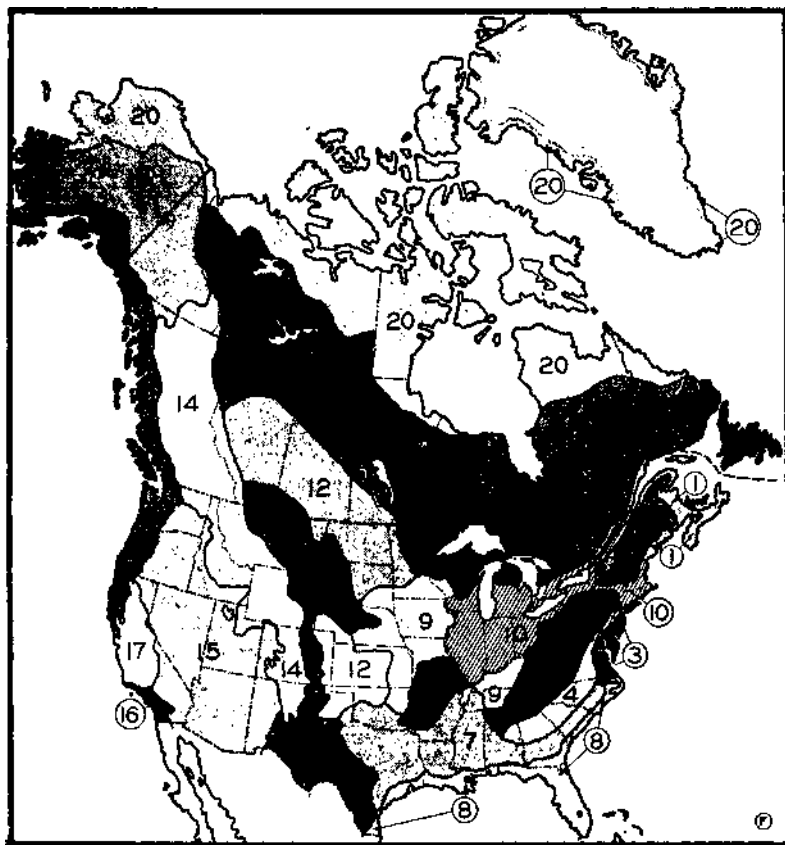


Fig. 12. Geographic Regions of Anglo-America.

(17) Central California.

A region of fruits and mixed farming, lumbering, mining, resorts, and commerce.

(18) North Pacific Coast.

A region of lumbering, fishing, farming, dairying, mining, manufacturing, resorts, and commerce.

(19) The Yukon-Kuskokwim Basins.

A region of mining, hunting, fishing, trapping, and subsistence farming.

(20) The Tundra.

A region of hunting, fishing, and mining.

CHAPTER IV

The Drowned North Atlantic Coast

A REGION OF FISHERIES, FOREST PRODUCTS, COMMERCE, AND RESORTS

HERE is a region that lies partly in Canada and partly in the United States. The Drowned North Atlantic Coast is definitely a *geographic region*; human adjustments to the natural environment differ markedly here from those in neighboring regions. *Here, in one way or another, the majority of the people are attached to the sea.* Whether they be engaged in fishing, lumbering, pulp and paper-making, shipping wheat, mining coal, growing apples, or rearing dairy cattle or foxes, their outlook is and must ever be seaward.

Should New England, the Canadian Maritime Provinces, and Quebec be Separate Regions?

Regionalists will not agree unanimously that all New England,, like all Gaul, should be divided into three parts. To many, the inhabitants of all six states are essentially New Englanders: "Americans of the older stocks think of the words 'New England' as connoting not only a region but a group of traditions, institutions, and ways of living and of thinking."¹ As a matter of fact, much work has been done of late that would justify New England being considered a region.^{2,3,4}

If, however, a geographical region is defined as an area whose

¹ American Geographical Society, *New England's Prospect: 1933*, p. 459. Special Publication No. 16. New York: American Geographical Society, 1933.

² *Ibid.*, p. 1.

³ National Resources Committee, *Regional Planning, Part III—New England*. Washington, D. C.: Government Printing Office, 1936.

⁴ N. E. Peterson, "American Industries by Geographical Sections." Boston: First National Bank, 1928.

socio-economic adjustments to the physical milieu are similar, then most emphatically New England is not one but rather parts of three regions. Southern and southeastern New England, for example, are more like the American Manufacturing Belt than like the Northeastern Highlands or the Drowned North Atlantic Coast.

It is more accurate to consider New England a *section* than a *region*, since a section is inseparably linked with politics; James Truslow Adams says, "As contrasted with the rest of America, even in colonial times, New England became a section clearly differentiated from the others socially, economically, and psychologically."⁵ Not long ago appeared a newspaper article—"Is There One New England or Many?"⁶ From this article it would appear that there is not just one.

As for the Canadian Maritime Provinces, which are geographically more a part of New England than of Canada, never have they been enthusiastic about the Confederation, holding it responsible for their failure to progress.⁷ Their plight has been due more to their isolation from the rest of Canada and to the closing of New England by the loss of reciprocity than to anything else. Certainly the future of these provinces is tied up with New England. A most helpful means of strengthening their fishing, coal, iron and steel, and lumber enterprises would be to make a trade agreement with the United States.

The Lower St. Lawrence Valley can logically be included in this region, for geographically it is set apart from its rugged and forested neighbors.⁸

Physiographically, the provinces of the United States extend into Canada, and one notes no marked differences in the way of life of the two peoples except in French Canada.. The population of Canada is confined largely to a narrow strip relatively close to the border (Fig. 13). The fact that each country, at the more important points of interchange, has resources which the other lacks has served to bring each country's railroads to important objectives beyond its border. It also helps to explain why Canada's

⁵American Geographical Society, *New England's Prospect: 1933*, Special Publication No. 16, p. 1. New York: American Geographical Society, 1933.

⁶*Boston Evening Transcript*, Jan. 26, 1931.

⁷The Dominion of Canada (a confederation) was created in 1867 from the four original provinces—Nova Scotia, New Brunswick, Quebec, and Ontario. The others came in later. Secession of the extremities was stayed only by the building of a transcontinental railroad.

⁸Mabel C. Stark and Derwent S. Whittlesey, *Major Geographic Regions of North America*, p. 11. Bloomington, 111.: McKnight & McKnight, 1923.



Courtesy of Fortune.

Fig. 13. Distribution of population in Canada. People have concentrated largely near the international border where the natural environment is most suitable for settlement. Elsewhere, because of cold, dearth of soil, infertile soil, poor drainage, semi-aridity, or rugged terrain—all adverse factors—the land is thinly settled.

railroads have been projected into the United States as a means of reaching strategic points—especially ports that are open to navigation during the winter.⁹

The Physical Setting

The natural setting of a region is as vital to an appreciation of its geography as is the setting for a movie.

The Drowned North Atlantic Coast (Fig. 14) occupies North America's indented coastal ribbon from Boston to and including the north bank of the St. Lawrence River. It comprises some of the littoral of Massachusetts, all the coast of New Hampshire, Maine, and New Brunswick, all of Nova Scotia, Prince Edward Island, and that part of Quebec on both sides of the river as far as the city of Quebec. It is by way of the natural outlet—the St. Lawrence—that interior Canada ships much of its products to the outside world.

⁹ William J. Wilgus, *The Railway Interrelations of the United States and Canada*, p. 26. Toronto: Ryerson Press, 1937.

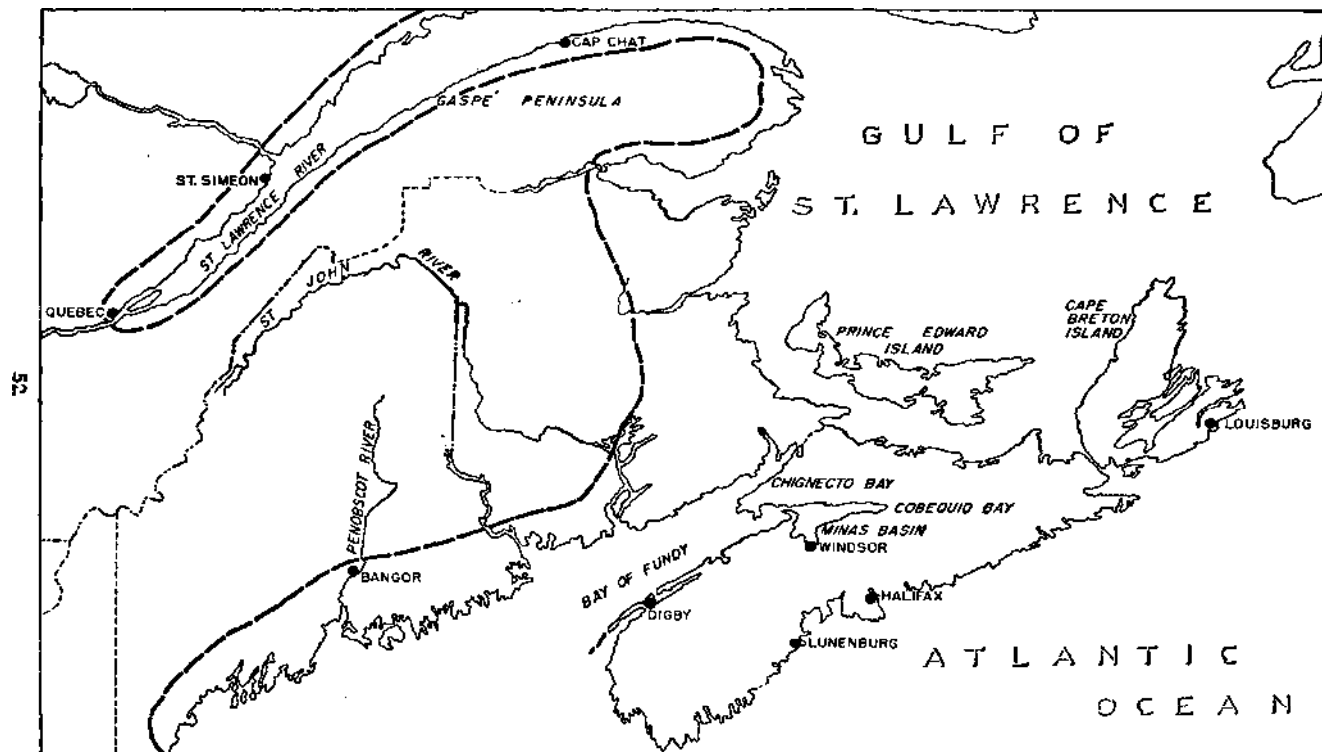


Fig. 14. The Drowned North Atlantic Coast: a region of fisheries, forest products, commerce, and resorts.

Climate

Climatically the region is *not* a unit. The littoral area (Massachusetts, New Hampshire, Maine, New Brunswick, Nova Scotia, and Prince Edward Island) differs from the Lower St. Lawrence Valley and also, to a small extent, from Maritime Quebec (Fig. 15).

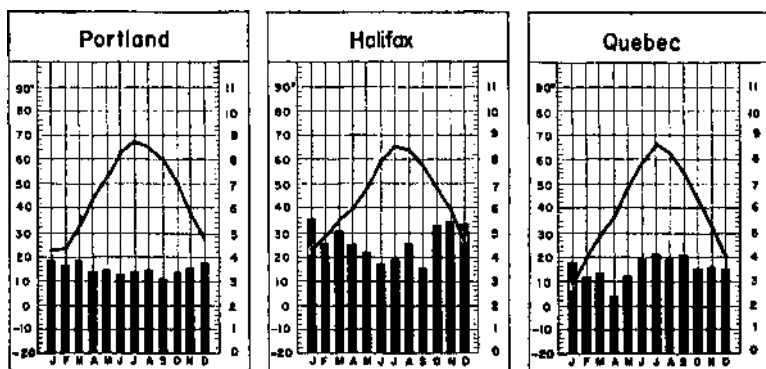


Fig. 15. Average monthly temperature and precipitation for Portland, Halifax, and Quebec.

The Littoral Area. Nearly every part of this area lies within 35 miles of the ocean and hence is greatly influenced by it. Nova Scotia's mean January temperature is about the same as that of central New York, despite its location two to five degrees of latitude farther north. Winters are long and cold though mild for the latitude, and temperatures fall below zero nearly every winter. Snow covers the ground throughout most of the winter. Spring surrenders reluctantly to summer because of the presence of ice in the Gulf of St. Lawrence and because of the Labrador Current. Summers are cool—temperatures of 90 degrees being extremely rare. The growing season varies from 100 to 160 days in Nova Scotia.

Except in northern New Brunswick, the precipitation of 40 to 55 inches is well distributed throughout the year¹⁰—a response to⁷ proximity to the sea (Fig. 15). Summer fogs characterize the Atlantic coasts of New Brunswick and Nova Scotia when southeast winds from the warm Gulf Stream blow across the cold waters between the Gulf of Maine and Newfoundland.

¹⁰ In northern New Brunswick, summer is rainier than winter.

Maritime Quebec. The area comprising the Gaspé Peninsula and Anticosti does not have a true maritime climate. Winters are very long (November through April) but not severe for the latitude. Summer, as a result of the sea, does not exist in the true sense, but this does not mean that the area is inhospitable.

The precipitation of about 30 inches is considerably less than in the Littoral Area; moreover, it varies from year to year. Though well distributed, the rainfall is greater in summer (Fig. 15). Fierce gales are common in winter, but not during the season of navigation.

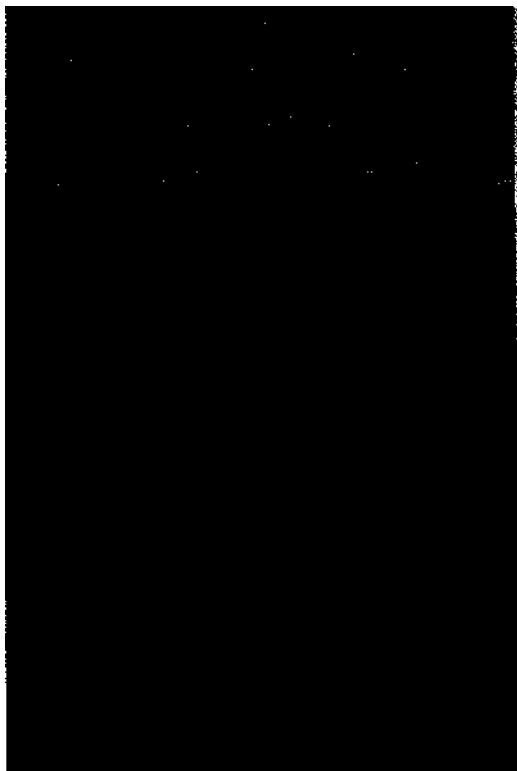
The Lower St. Lawrence Valley. This area has cold, long winters, though periods of mild weather are not uncommon. The mercury at Quebec has tumbled to 34 degrees below zero. The river is closed to navigation normally from December 16 to April 21. Summers are short and warm but the days are long. The growing season averages 135 days at Quebec.

The precipitation of 35 to 42 inches is not heavy but is evenly distributed throughout the year. As would be expected, the snowfall is heavy and increases downstream from about 70 to 150 inches. It remains on the ground all winter, for little thaws. Winter surrenders to spring, and summer to winter, with great rapidity.

Soils

The soils are extremely varied, partly because of differences in the parent rock and partly because of widespread glaciation. In the Maritime Provinces, there is a close correlation between the kind of soil and the underlying rock. The crystallines do not develop into deep fertile soils. Accordingly, most of the farm land is on the sedimentaries. All the muifure soils are pedalfers: gray-brown podzolic soils predominate in coastal New Hampshire and Maine, while podzols prevail in New Brunswick, Nova Scotia, and the Lower St. Lawrence Valley (Fig. 16). The gray-brown podzolic soils which develop under a forest cover (chiefly deciduous) are less leached and acidic than the podzols and are among the better pedalfers. They are low in lime and are in need of continuous fertilization.

The podzols, on the other hand, comprise the light gray soils characteristic of climates with cool, moist summers and cold, long winters. Here the natural vegetation is coniferous forest, huckleberry, and sweet fern—plants adapted to acid soils. Accordingly, this region has few outstanding agricultural areas.



D. F. Putnam.

Fig. 16. A podzol soil in Nova Scotia. The ashy A-horizon is locally known as "white sand." Such soil is well suited for apple trees.

Surface features

The Drowned North Atlantic Coast consists primarily of low hills and valleys, the hills invariably being rounded. Most of the region is traversed by fast-flowing streams and much is dotted with small lakes. The coastal area has been slightly submerged; accordingly, ocean waters have invaded the lower valleys, giving rise to bays or estuaries. Often branch bays extend up the side valleys.

The coast is characterized by innumerable superb harbors. Superficially, the coasts of Maine and Nova Scotia appear to be fjorded, but, according to Douglas Johnson, they are probably

drowned normal river valleys and have been but little modified by ice action.¹¹

The Lower St. Lawrence Valley, which extends from the Isle d'Orleans to the constriction in the river between Cap des Monts and Cap Chat, is bounded by sheer cliffs which, in places, rise abruptly from the river bank. The escarpment is 1,500 to 2,000 feet high on the north side and 1,000 feet on the south side opposite Quebec, and 3,000 feet as it nears the Gaspé Peninsula. Coastal terraces mantled with marine soils provide the more important sites for settlement. The Lower St. Lawrence is really an arm of the Atlantic, for the submergence of the region has enabled ocean waters to penetrate to within 80 miles of Montreal. Below the Isle d'Orleans the river expands into a broad stream 10 to 20 miles wide.

Natural vegetation

No other continent inherited such forest wealth as North America. While the rainy tropics have more species and the Russian realm more land in unbroken forest, neither compared with North America in combining vastness with large number of useful species.

It is extremely difficult to get an accurate word-picture of the forest in its primitive state. Probably nine tenths of the land included in this region was covered with forest. About the only treeless parts were the dunes, marshes, meadows, bogs, some mountain summits (if ice-scoured or exposed to wind), and Indian clearings. The last consisted of areas which were burned over by the fires of the Amerinds and were most numerous near the Atlantic Coast and the shores of lakes. Exactly how much land the aborigines had cleared will never be known. The total amount, however, could not have been great, for the population, which lived mostly by hunting and fishing and cultivated little land, is estimated to have been less than one per square mile.¹²

Composition of the forest

The composition of the forest was closely adjusted to land forms, soil, and climate. The Maritime Provinces of Canada and the eastern townships of Quebec, south of the St. Lawrence River, were covered by a mixed forest of hardwoods (beech, maple, and birch), and of conifers (spruce and fir). There was a great

¹¹ Douglas Johnson, *New England-Acadian Shoreline*, p. xii. New York: John Wiley & Sons, 1925.

¹² R. M. Harper, "Changes in the Forest Area in New England in Three Centuries," *Journal of Forestry*, April 1918, Vol. XVI, No. IV, p. 442.

variety of species and a great difference in the ages and sizes of the trees. Between the pine forest of the valleys and the spruce forest of the mountains was a belt of hardwoods—maple, yellow birch, and beech—with occasional sprinklings of pine, hemlock, spruce, ash, and paper birch.

Coastal New Hampshire and most of coastal Maine contained white pine, spruce, hemlock, red oak, and white ash. White pine was the outstanding tree. Attaining a height of 240 feet and a diameter of 5 feet at the butt, it dwarfed even the tall spruce. It was sometimes called the "masting pine" because the larger trees were marked with the Royal Arrow and reserved for masts for the, Royal Navy. Maine still is called the 'Tine Tree State."

Water-power Resources

The Drowned North Atlantic Coast, especially the Canadian segment, possesses considerable water-power—both potential and developed (Fig. 161). "This water-power is a godsend because of the lack of coal (except in Nova Scotia) and petroleum. The rocky north shore of the St. Lawrence below and including the lower Saguenay has great power possibilities, but, except for the St. Lawrence itself, the power sites are not in the lowland but on the border of the Shield. The south shore with numerous short streams having sharp descents also is favored. Nova Scotia and New Brunswick, because of their heavy precipitation, high altitude near the coast, and good storage facilities, have considerable power. The Mersey in Nova Scotia and the St. John in New Brunswick are power rivers of major proportions. The part of New England included in this region, while an enormous consumer of water-power, is not an outstanding producer. Most of New England's hydro-power is being generated in the upland of Maine, New Hampshire, and Vermont. Much of this power has been sent to industrial centers to the south in recent years.

International aspects

The Canadian part of the Drowned North Atlantic Coast could send much power by transmission line into industrial New England. But public sentiment in Canada feels that "if industries in a foreign country are built up with Canadian power, it will be impossible, without serious international complications, to withdraw that power when it is required in Canada."¹³

¹³ M. J. Pattern, "The Water-Power Resources of Canada/" *Economic Geography*, April 1926, Vol. II, No. II, p. 195.

Minerals

The Drowned North Atlantic Coast is not among the world's most favored in mineral resources; it does, however, possess valuable deposits of coal in Nova Scotia as well as some limestone, gypsum, and salt. Other than the small and unimportant deposits of anthracite in Rhode Island and some low-grade fuel in southeastern Brazil, Nova Scotia's coal measures are the only commercial ones along the Atlantic Seaboard in the entire Western Hemisphere. The New England segment is exceedingly poor in useful minerals, the only one being the limestone found on the coast of southern Maine.

Early Settlement

The Drowned North Atlantic Coast was not settled by immigrants from a single country: the earliest settlers in the Maritime Provinces and Quebec were French, while those in New England were English.

Maritime Canada

The first permanent settlement in North America, north of Florida was at Port Royal on the Bay of Fundy. Here the French found salt marshes which needed no clearing. This environment was attractive to men from the mouth of the Loire, whose forebears for generations had reclaimed and dyked somewhat similar land. These French called their new home Acadie (*Acadia*), and the Acadians converted the river marshes into productive farm land which characterized the cultivated area almost exclusively for a century.¹⁴

The French population grew rapidly after the Treaty of Utrecht in 1713. Louisbourg was fortified to guard the mouth of the St. Lawrence and the fishing fleet.

Except during very brief intervals, they received little continuous aid or protection from their mother country. They were truly a self-made people, and by the opening of the eighteenth century they were native to Acadie. They conquered it to provide themselves with sustenance. They were almost independent of the outside world. They knew little of and cared less for its problems and its politics. The only strong tie connecting them with Europe was their religion, kept alive and real by priests.¹⁵

¹⁴ J. B. Brebner, *New England's Outpost: Acadia Before the Conquest of Canada*.
p. 37. New York: Columbia University Press, 1927.

¹⁵ *Ibid.*, p. 38.

Acadia thus became a backwater off the main stream of American life.

The Acadians remained here until the outbreak of hostilities between the British and French preceding the Seven Years' War. Then more than 6,000 of them were rounded up and banished; they were scattered from Massachusetts to South Carolina. Some fled into the forests of what are now New Brunswick, Prince Edward Island, and Quebec; some made their way to Quebec City, the Ohio Valley, and even Louisiana;¹⁶ others joined the French in St. Pierre, Miquelon, and the West Indies. Many starved.¹⁷ The reason most commonly given for their expulsion was the fear on the part of England that so heavy a concentration of French in this part of the continent was a menace to English safety.¹⁸

This destruction and dispersal continued for eight years, ending in 1763. Then individuals and groups began to trickle back, and, though denied their old properties, they found abodes here and there in what are now called the "Maritime Provinces" (Digby to Inverness in Nova Scotia, the north shore of New Brunswick, and in Prince Edward Island).

The first appreciable number of British to settle in the Maritimes arrived in 1749 at the site now occupied by Halifax. Shortly afterwards 2,000 Germans founded Lunenburg. Highlanders, who were to make Nova Scotia a Scottish province, did not arrive until 1828; then they came by thousands. Although the largest group of British Loyalists arrived after the close of the Revolutionary War, considerable numbers came prior to 1776.

The Lower St. Lawrence Valley

The French colonized the Lower St. Lawrence Valley, occupying first the land along the river. As early as 1675 nearly all the ancestors of the present inhabitants had reached Canada. They practiced subsistence farming on terraces. Because of isolation, a civilization became established that was unique in its lack of progressiveness and less affected than any other group in North America by ideas and customs from the outside.

The New England Segment

The first important settlement in what is now New England took place at Plymouth in 1620. * All the early colonies, including those

¹⁶ See Henry W. Longfellow's *Evangeline*.

¹⁷ J. B. Brebner, *New England's Outpost: Acadia Before the Conquest of Canada* p. 224. New York: Columbia University Press, 1927.

¹⁸ Ruth A. Hudnut and H. Baker Crothers, "Acadian Transients in South Carolina/ *American Historical Review*, April 1938, Vol. XLIII, No. III, p. 500.

before and immediately after the landing of the Pilgrims, were, planted on the seaboard. The coast was, then, the first American frontier. Its settlements were bounded by untamed hills on the west and by the stormy Atlantic on the east. Its shore-dwelling pioneers, beckoned alike by the soil and the sea, obeyed both, and their adjustments to the two environments laid the foundations for the land life and sea life of the nation.

The Present Inhabitants

The international boundary between the Canadian and United States portions of the region does not mean what it would in Europe; for, socially, the English-speaking people are one. There is a great difference, however, between them and the French-Canadians.

The French-Canadians

The Lower St. Lawrence Valley and the Eastern Townships of Quebec are inhabited almost entirely by French-Canadians, who have one of the highest birth rates in North America. They have overpopulated their lands. Pressure of population has encouraged emigration to the United States and to the more western parts of Canada, as well as within French Canada itself. In order to stem the tide of migration and keep the people attached to the soil of the Province, the Roman Catholic Church and the Quebec Government are cooperating. They are creating a new Quebec in the Abitibi District in the western part of the Province (outside this region), where 70,000 farmers and miners have settled. The present generation is less conservative than most Americans picture it. Many of the young people especially are no longer attracted to the soil, feeling it will not provide them with an adequate livelihood.

The inhabitants of the Maritime Provinces

The Maritime Provinces are but sparsely settled and the number of cities is small. Most of the population is of British ancestry, though other nationalities are represented. About one fifth are descendants of the Acadians.¹⁹

This area has lost heavily through emigration to New England and to the Canadian Prairie Provinces. The rural population is less uniform than that of New England, because large blocks of immigrants settled together in groups. Thus most of northern

¹⁹ *Sixth Census of Canada, 1921*, Vol. I, Population, p. 354. Ottawa: 1924.

New Brunswick is French, south-central Nova Scotia is predominantly German, western Nova Scotia is English, eastern Nova Scotia and eastern New Brunswick are Scottish, and Prince Edward Island is very Scottish.

The New Englanders

The original white settlers, of English stock, remained dominant until about 1840. For two and one-half 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."²⁰ To them work was a virtue, idleness a sin.

The Yankees no longer dominate New England numerically, save in the rather isolated agricultural areas where there is a large proportion of old people. Yankee stock still contributes most of the bank directors, business executives, and college and university presidents—officials "not elected by popular vote." Less than 40 per cent of New England's population is today of Yankee stock.

Economic Activities

Early agriculture

Farming naturally was the first occupation of the colonists in the Maritime Provinces, the Lower St. Lawrence Valley, and New England. It was on a small scale and with few exceptions on infertile soils. Moreover, the cool, cloudy summers and the long, cold winters retarded the development of a thriving agriculture.

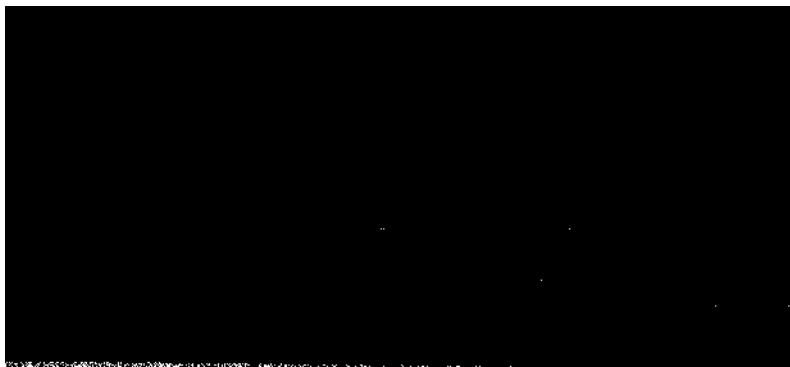
The Maritime Provinces. Agriculture began in the Maritimes in the seventeenth century when, by dyking, the Acadians reclaimed the tidal marshes along the Bay of Fundy. Before their expulsion in 1755, some 10,000 Acadians were supported comfortably in Nova Scotia. It is estimated that they had put 100,000 acres of land into pasture, orchard, and garden. They got as many as twenty bushels of wheat to the acre, made their orchards of apples, pears, plums, and cherries yield remarkably well, grew luxuriant small fruits, and pastured their cattle in natural meadows.

Because much of Nova Scotia and New Brunswick is characterized by low rounded mountain ranges, lakes, swamps, and forests, arable land always has been restricted. Approximately 90 per cent

²⁰ J. Russell Smith, and M. Ogden Phillips, *North America*, p. 113. New York: Harcourt, Brace & Co., 1940.

of New Brunswick still is in forest.²¹ Nova Scotia, though more favored, is not well endowed for agriculture; scarcely one third of its area is occupied as farm land. Its productive soils are confined primarily to the western coastal belt, the Atlantic Coast being an upland of crystalline rocks. The first successful farming colony was in the meadows around Port Royal—now Annapolis. Subsequent settlement was along the more extensive marshlands about Minas Basin, Cobequid Bay, and at the head of Chignecto Bay.

Quebec. The French-Canadians in this area began as farmers. Settlement was in the form of large estates (*seigneuries*); that of Beaupre, for instance, was 48 miles long and 18 miles deep—the long side paralleling the river. The land was rented by the *seigneur* to vassals. The peasant holdings were laid out along the river bank in long narrow strips 2,600 by 260 yards. Thus each holding had access to the river highway, which for a long time was the only thoroughfare, while the narrow width promoted continuous settlement (Fig. 17). The houses and outbuildings were placed close beside one another for miles and gave the impression of continuous vil-



Department of Lands and Forests of Quebec.

Fig. 17. The village of Petit Metis on the southern shore of the St. Lawrence, showing a typical French-Canadian settlement and particularly the alignment of the village along a road parallel to the river, with the holding strips running inland at right angles to the St. Lawrence.

²¹ D. F. Putnam, "Agricultural Development of New Brunswick," *Economic Geography*, October 1939, Vol. XV, No. IV, p. 413.

lages (Fig. 17). The same system was used with respect to roads, for it was easier to keep one road than several clear of winter snow. As time passed, holdings were subdivided. The long lots that extended back into the forest gave each family access to the river as well as property in each of the different zones—arable, grazing, and forest.²² The land devoted to pasturage increased with the clearing of the forest. The crops, with the exception of wheat, were mostly hardy ones, the same as those grown today. The agricultural technique was primitive; in the eighteenth century the two-field system was used, with alternation of wheat and fallow.

New England. Those who first settled New England arrived at the worst possible time for farming—the beginning of winter. At first they lived largely on corn and beans, which they obtained from the Indians. When they began their farming operations, they found that European cereals did not thrive. They accordingly grew more and more Indian corn, a pioneer crop with many advantages, including excellent keeping qualities and utility for food and feed. Not for some years were the Pilgrims successful in growing European cereals. Farming was very hard; it meant battling ceaselessly with the earth. A man had to spend a month removing stones from a single acre before he could plant his crops in it.

The rugged topography and the infertile soils necessitated small farms. It was impossible to accumulate capital in a small-farm economy—a circumstance that led New Englanders to turn to other occupations, especially fishing and trading.

Present-day agriculture

Today agriculture throughout the Drowned North Atlantic Coast continues on a small scale.

The Lower St. Lawrence Valley. Farming continues as the principal occupation of most of the French-Canadians in this area. On the north shore, the crops consist of hardy small grains, hay, vegetables, and tobacco for home consumption.²³ Except near Quebec, where milk, butter, and vegetables are produced for the urban market, cheese has long been the chief "money crop." The greater part of the cheese was exported. The trend today is toward the production of butter for consumption within Canada.²³

Farming practically terminates east of St. Simeon. On the south shore, where there is more lowland and the climate is somewhat

²² H. Harry Lewis, "Population of Quebec Province: Its Distribution and National Origins," *Economic Geography*, January 1940, Vol. XVI, No. I, p. 61.

²³ Canadian Pacific Railway, *Agricultural and Industrial Progress in Canada*, May 1937, Vol. XIX, No. 5, p. 73.

milder than on the opposite shore, potatoes constitute the chief crop. Dairying is important, too, for it enables the farmer to work in winter in a climate where he would otherwise be idle. Winter feeding and housing are costly, however.

The Maritime Provinces. In Nova Scotia the cultivated land, as a rule, lies in the northern lowland, settlement being discouraged by the granitic interior and the Atlantic Coast. Seventy-five per cent of the land is still in forest. The dyked lands of old Acadia, made famous by Longfellow in *Evangeline*, still are fertile, easily cultivated, and productive. Farm crops are primarily those able to mature in a short growing season—forage crops (hay and root). Potatoes, vegetables, and small fruits also are important. The commercial role of apples in the Annapolis-Cornwallis Valley is so great as to merit special treatment. Nevertheless, the sea has influenced Nova Scotia's economic life more than has the land.

While there is considerable fertile land in Nova Scotia on which general farming is practiced, the only area of outstanding commercial agriculture is the Annapolis-Cornwallis Valley, which produces about one half of the commercial apple crop of Canada. This fairly level valley, 100 miles long and 3 to 10 miles wide, is sheltered from northwest winds and fogs by North Mountain, which lies along the Bay of Fundy. Paralleling it is South Mountain. The valley trends in a general west-east direction from Digby to Windsor. Though apples are the main crop, hay and potatoes also are grown. About 30,000 acres are in orchards, and in normal years 70 per cent of the crop is exported to the United Kingdom. This area, first settled by French, is characterized by farms which are narrow strips of 20 to 120 acres having meadow and hay land in the bottom, orchard land midway, and pasture and woodland above.²⁴ By growing their trees on slopes the farmers benefit both from well-drained soils and from air drainage (Fig. 18). The latter especially is significant since there is danger to fruit trees from late spring frost.

, In New Brunswick the area in farms is about equal to that in Nova Scotia, but the area in field crops is nearly twice as great. That the Province is not outstanding agriculturally seems proved by the fact that forest still covers nine tenths of the land. Field crops are important in the central western and central eastern portions. Pasture is less important here than in Nova Scotia. Dairying is favored in southern New Brunswick by heavy summer precipitation and proximity to urban markets.

²⁴ H. S. Philpot, *The Province of Nova Scotia*, p. 86. Ottawa: Department of the Interior, 1930.

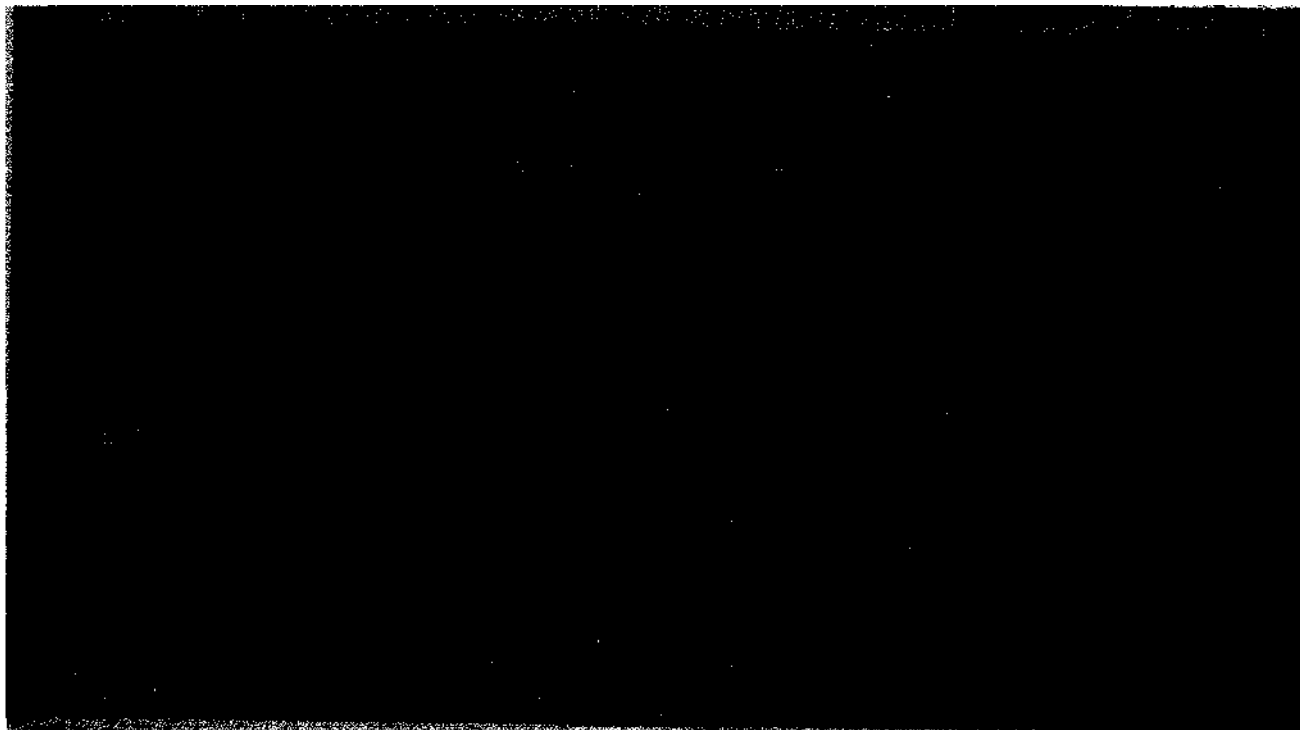


Fig. 18. Apple orchards in the famous Cornwallis Valley near Minas Basin. By occupying slopes, the trees benefit from **oirdrainage**. **Apple**, growing is the most highly specialized and the most prosperous type of farming in Nova Scotia.

Canadian Government Motion Picture Bureau,

Prince Edward Island, with about 80 per cent of its inhabitants engaged in farming, sustains a prosperous agriculture. The principal commercial crop is potatoes. The island enjoys an international reputation for certified seed potatoes. When the soil becomes exhausted, mussel mud, consisting of the decay of oyster, clam, and mussel shells, is dug up from the bays and river mouths (though not within 200 yards of live oyster beds) and is spread over the land.

New England. In coastal Maine and New Hampshire, Indian corn was the staple crop, and it continued to be so until large-scale agriculture was developed in the Middle West. Accordingly, the New England farmer, realizing that rough land surface discouraged extensive use of machinery in growing corn and wheat, turned to specialized crops—tree fruits, berries, vegetables, and dairy and poultry products.

Hay was and still is an important crop. It had great cash value when lumbering was at its height and large numbers of horses were used. But when pulp cutting replaced logging and lumbering, and machinery replaced horses, the market for hay was reduced. Hay continues to be important, however, because of dairying.

The crops of this area are now grown for consumption in near-by urban areas. The concentration of a large population in the near-by American Manufacturing Belt affords an important market for perishable foodstuffs. While dairying is important here, it is less so than in the Northeastern Highlands (see Chapter V). Unexcelled transport facilities permit enormous quantities of milk to be trucked daily into the cities.

In southern Maine, dairying has an adjunct, the important sweet-corn-canning industry. The business' of canning corn began here. The stalks and even the factory wastes—husks, shanks, silks, and cobs—are used for manure and silage.

Crop-specialty areas

Cape Cod and cranberries. Southeastern Massachusetts (Plymouth County) and Cape Cod lead the world in cranberry output, accounting for more than all the rest of the country combined. Cape Cod first grew cranberries in 1810 but did not get into commercial production until 40 years later.

This area, with hundreds of ponds, marshes, and swamps of glacial origin, grows its cranberries exclusively in bogs. These, averaging about an acre in size, have the necessary acid soils.

The growers clear the bogland and spread over it a layer of coarse



Fig. 19. Harvesting cranberries in a Cape Cod bog.

Christian Science Publishing Society.

sand about four inches thick, the purpose of which is to prevent the growth of weeds. Once the crop is planted, the growers watch the weather reports with great care. If frost is forecast, they flood the bogs as a means of protecting the crop.

During the first two years the berries are picked by hand. Thereafter a scoop is used (Fig. 19). Each acre yields on the average about fifty barrels of fruit.

Washington County and blueberries. Washington and Hancock counties in the northeastern corner of Maine are in an area of leached, acid podzolic soils called "blueberry barrens." These counties produce most of the nation's crop, and can about nine tenths of the total pack. When the tree cover is removed, low-growing blueberry bushes take possession of the ground. To keep down brush and tree growth, the land is fired every two or three years.

Forest industries

The Drowned North Atlantic Coast, America's pioneer logging region, possessed an almost incomparable forest of tall, straight conifers and valuable hardwoods. Perhaps nine tenths of the region was forest-covered. For 200 years or more after the landing of the Pilgrims in 1620, the settlers continued uninterruptedly the removal of trees. At first they had reverence for the forest, since it supplied their fuel, game, and the wood for their homes; but it also harbored their enemies—Indians and wild beasts. Moreover, their agriculture had to be of the self-sufficing type. To make room for their crops they had to clear away the trees. Hence, there grew up in their minds a hostility to the forest; they no longer considered its destruction reprehensible. R. M. Harper states that before the end of the seventeenth century a scarcity of timber was being felt in some of the colonies.²⁵

Before long, logging became an enterprise prosecuted for export as well as for the home market. The straightest and tallest trees were felled and river-driven downstream to shipbuilding plants. The coast of Maine was preeminent in this industry. Bangor, on Maine's Penobscot River, became the outstanding center specializing on the making and shipping of lumber. It had its own locally built fleet which carried lumber into far corners of the earth and brought back exotic products. Moreover, its loggers invented the snubber for handling sleds of logs on steep slopes, the log-branding

²⁵ R. M. Harper, "Changes in the Forest Area in New England in Three Centuries," *Journcti of Forestry*, April 1918, Vol. XVI, No. 4, p. 442.

ax, and the peavey, "the greatest lumber invention since the saw." North of Bangor were two and one-half million acres of incomparable virgin timber in a solid block owned by a single individual. So impressed was the young Thoreau when, in 1846, he saw this now historic lumber town, that he wrote:

There stands the City of Bangor like a star on the edge of night, still hewing at the forest of which it is built, already overflowing with the luxuries and refinements of Europe and sending its vessels to Spain, to England, and to the West Indies for its groceries—and yet only a few ax-men have gone up-river into the howling wilderness that feeds it.²⁶

Maine is no longer of outstanding importance in lumber production, though this is a state where everybody said the timber would last forever. Were it not for its other economic activities, Bangor today might be a decaying ghost town.

Logging was and still is a winter activity. Cutting began in autumn and usually terminated before January 1st. As soon as the snow became deep and the ground frozen, tens of thousands of logs were hauled over iced roads by sleigh to streams, which in late spring and summer carried the logs to sawmills. The end of each log was marked with the brand of its owner.

Logging and lumbering have been important also in the Lower St. Lawrence Valley and especially in New Brunswick, where all other economic activities have been secondary. Trading in lumber in the Maritimes began as early as 1650. Mariners returning to Europe took cargoes of masts, spars, and ship timbers.

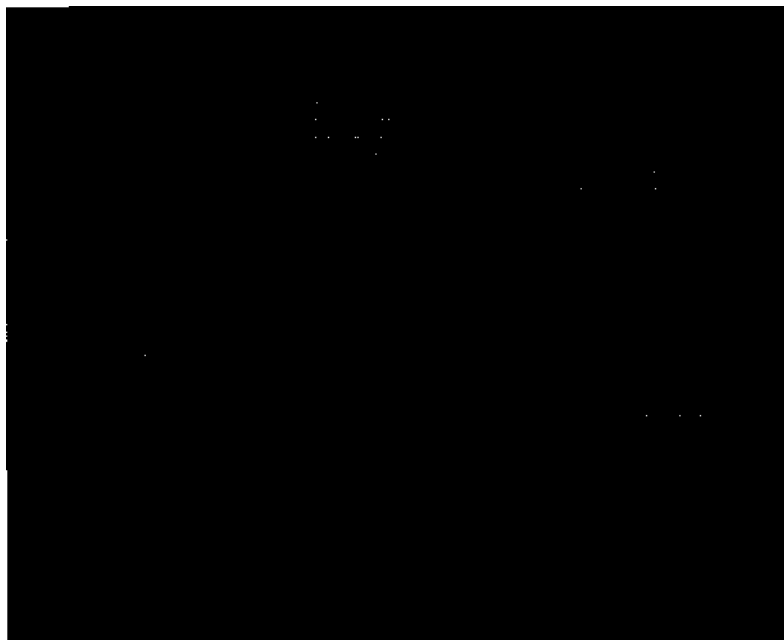
Fur-farming

The rearing of silver-black foxes began in 1894, when two farmers on Prince Edward Island noticed that those black fox peltries having silver-tipped tails and scattered silver hairs, which gave them a silver sheen, brought especially high prices on the London market. They, therefore, experimented secretly to "fix" this silver strain. They used wild foxes caught in their traps for breeding stock. The venture was highly successful. Single pelts of extraordinary quality brought as much as \$2,600. Ultimately, of course, neighbors learned of the secret and established additional fox farms. In 1912 live foxes for breeding sold for \$18,000 to \$35,000 a pair. As larger numbers of animals were reared and became available for sale, prices declined. By 1919 a pair was valued at about \$650.²⁷

²⁶S. H. Holbrook, "Historic Lumber Towns—No. I, Bangor, Maine," *American Forests*, February 1938, Vol. XLIV, No. II, p. 69.

²⁷Canadian Pacific Railway, "Fur Farming," *Agricultural and Industrial Progress in Canada*, October 1940, Vol. XXII, No. X, p. 155.

Foxes reach maturity in eight months and are very prolific. The increasing demand for furs along with reckless destruction of wild life at the hands of its greatest enemy—man—has restricted the regions where wild fur-bearing animals dwell. Close settlement and trapping cannot exist together. As the wilderness disappeared, so did the habitat of fur-bearing animals. Accordingly an increas-



Canadian National Railways.

Fig. 20. A silver-black fox, Prince Edward Island. The foxes' natural habitat is effectively reproduced with the aid of trees which are so placed as not to sacrifice too much sunlight. Of all Canadian fur-bearing wild animals, the fox is least disturbed by human beings and hence does well on fur farms.

ing proportion of the world supply of peltries is coming from fur farms (Fig. 20). These farms are important not only as a source of furs but as a stimulus to conservation, for without a vigorous, scientific conservation program, one of the oldest of the valuable resources of this continent might be completely wiped out.

Geographic conditions for the most successful fox ranching are (1) high humidity, (2) a sheltered area, (3) a woodland of birch, spruce, fir, and cedar, (4) a ground covering of heath and shrubs like the blueberry, (5) a climate cool in summer but cold enough in

winter to produce heavy fur and overhair, and (6) a soil with hardpan to prevent burrowing.²⁸ Good exposures on gentle south-facing slopes also are advantageous, for they receive a maximum amount of insolation, have excellent drainage, and are free from snow in the early spring when the pups emerge from the dens. Such conditions are common throughout most of this region.

Fox-farming has spread widely over Anglo-America, but Prince Edward Island, where it began, is the world's leader. It is an excellent adjunct to general farming because it (1) equalizes the seasonal distribution of labor by allowing winter work, (2) provides additional revenue, and (3) permits utilization of parts of the farm not suitable for the growing of crops.

Mining

Coal. While Nova Scotia has coal, the Dominion as a whole would benefit far more if these deposits were located in the more densely populated and industrialized parts of the provinces of Ontario and Quebec, where it is now cheaper to buy American than Canadian coal. Some Nova Scotian coal, however, is transported economically by water to the cities of Quebec and Montreal during the season of navigation. Nova Scotia contains only 1 per cent of the Dominion's coal deposits, but produces one half of that mined.

Nova Scotian coal has been mined for more than a century. There are four fields—two on Cape Breton Island and two on the mainland. All of the collieries are on or within a few miles of the ocean, and more than one half of the coal is actually mined beneath the Atlantic. The seams on Cape Breton Island vary from 3 to 9 feet. The thickest seams, however, are in Pictou County on the mainland, where the principal seam in the Allan Shaft is 45 feet thick. The coal is of good quality and can be coked.

Limestone. Limestone is quarried in Nova Scotia and at Rockland, Maine. Nova Scotian limestone is used for fluxing in open-hearth steel furnaces. The quarrying at Rockland constitutes the only mining activity of importance in maritime New England. Limestone was first burned for lime here in 1732. The deposits are small and parallel the shore for several miles inland.

Gypsum and salt. Gypsum, which is used in the manufacture of plaster and plasterboard and as a retarder in cement, has been mined in Nova Scotia since 1770, that province accounting for four fifths of Canada's production.

²⁸ H. S. Philpot, *The Province of Nova Scotia, Canada*, p. 94. Ottawa, Department of the Interior, 1930.

Some rock salt taken from the Malagash Peninsula in Nova Scotia is used in the canning and curing of fish. Production fluctuates with the fishing industry.

Fishing

The first shore-dwelling settlers obeyed both the call of the land and of the sea. But the hard land environment yielded little more than subsistence farming, whereas the sea was rich in fish. The fish caught here in colonial days paid for imports of sugar and molasses. Fish was the first export from the New World. From Newfoundland to Cape Cod lie the Grand Banks—one of the richest fishing areas in the world (Fig. 41). These banks were frequented by Scandinavian, Portuguese, Dutch, English, and French fishermen before the period of colonization in America. As early as 1504 Breton and Norman fishermen—men born to the sea—were catching cod in the western North Atlantic, and by 1577 France had 150 vessels, Spain 100, Portugal 50 and England 15 fishing for cod on the banks.²⁹

Fishing is further aided by the fact that the whole extent of coast is dotted with sheltered harbors, bays, and coves from which fishermen can operate with comparative ease and safety. The fisheries fall into two distinct divisions—(1) coastal or in-shore and (2) deep-sea—demersal (bottom) and pelagic (surface).

Coastal or in-shore fishing is done usually within five miles of shore in small, swift motor boats carrying two or three men. The catch is brought into port each day. The fish caught are primarily cod, haddock, mackerel, and herring. Pollock, cusk, hake, and flounder also are important. Part of these are *ground* fish (cod and haddock) and part *surface* fish (mackerel and herring). Herring are used for bait. The bulk of the catch, after gutting and washing, is dropped into ice-packed chambers. A good fisherman can clean 30 fish a minute.

For *banks or deep-sea fishing*, large vessels are used in the deeper waters over the 70,000 square miles of banks between Cape Cod and Newfoundland, where bottom fish such as cod, cusk, flounder, haddock, and halibut are sought. Both schooners and trawlers are used, the former still dominating in the Maritime Provinces. New England, on the other hand, has largely adopted the more efficient otter trawler.

The *schooner*, most efficient of all sailing craft, goes everywhere

²⁹ R. H. Fiedler, "Fisheries of North America," *Geographical Review*, April 1940, Vol. XXX, No. II, p. 201.

and sails in any kind of weather. It carries some fifteen or more dories (a type of rowboat), which are fitted one into another in nests. At sea, soundings are made until the lead shows the right kind of bottom. The dories, manned by two fishermen, are then launched and may go miles from the mother ship. In each dory is a tub containing a trawl line a mile or more in length. This is stretched about three feet above the ocean floor and set with 400 to 500 hooks, about six feet apart and baited with herring or clams. The dorymen then move back and forth along the trawl, removing cod and re-baiting the hooks.

Banks fishing is dangerous. The region is foggy 40 to 50 per cent of the time, and it lies in the path of trans-Atlantic liners, which occasionally run the schooners down. This is one of the stormiest parts of the Atlantic, and it abounds with icebergs in spring and summer. Despite the danger, the men of Gloucester, Boston, Lunenburg, and the host of other ports meet the sea on its own terms. Today many of the vessels are equipped with auxiliary engines to keep them moving when the wind fails.

Trawlers permit exploitation of distant fishing grounds, are quite safe and seaworthy in even the roughest weather, operate throughout the year, and are speedy in delivering their cargo. They tow along the bottom a huge bag-shaped net, called an otter trawl, which, as it is drawn forward over the ocean floor, envelops the fish. A trawler costs at least \$150,000, and averages 30 trips annually. Each trip lasts about twelve days—two and one-half going, seven on the banks, and two and one-half returning.

Part of the catch is dried, salted, and canned, but an increasing proportion is quick-frozen. Many vessels are equipped with complete refrigerating plants.

What are banks? Banks are shallows in the ocean at or near the outer margin of the continental shelf. Occasionally they reach the surface, though ordinarily they lie about 240 feet below it. The banks considered here are those that extend from Cape Cod to Newfoundland (Fig. 41). Their surfaces, with cuesta-like ridges, are hummocky. Several theories have been advanced to explain their origin. There seems to be little doubt regarding their relation to glaciation, since great quantities of gravel and boulders are found on them at considerable depths far from land. Moreover, fishing trawlers report bringing up boulders weighing as much as three tons.³⁰

³⁰ F. P. Shepard, J. M. Tiffethon, and G. V. Cohoe, "Origin of Georges Bank," *Bulletin of the Geological Society of America*, April 30, 1934, Vol. XLV, No. IV, p. 294.

Banks are invaluable for fishing because they are shallow. The sun's rays thus penetrate to an adequate depth for the growth of algae (plants), which are an abundant source of fish food. The banks thus serve as outstanding feeding grounds. The cold water favors the individual abundance of a small number of species, which aids in selling the catch to a single merchant.³¹ The banks also lie strategically with respect to the densely populated, highly industrialized seaboard of the United States—a great market for fish.

Cod, haddock, halibut, herring, and mackerel. *Cod*, the most important species, feeds on the bottoms and is usually caught with long trawls to which are fastened hundreds of short lines with baited hooks. During the past thirty years on the Grand Banks, an annual catch of more than 1,000,000,000 pounds has been made in this area, 12 per cent of which has been taken by the United States. *Haddock* for many years were considered valueless when caught on codfishermen's hooks and were thrown back into the sea. A desperate attempt to find a market for them resulted in the filet—free from bones and attractively packaged. This cheap fish appealed to the public's taste, and today haddock is popular. *Halibut*, caught in the same places as cod and usually by the same fishermen, is procured in a different manner. It usually inhabits deep submarine gullies near shore or between banks. The halibut, a fierce fighter, is caught from dories with hook and line. Once hooked, it is pulled up close to the dory, gaffed between the eyes, and lifted into the boat. To prevent the boat from capsizing when the big fish comes to, its tail is lashed. *Herring*, one of the most important fish, is cheap, appetizing, and nourishing. Moreover, the success of the great hook-and-line industry depends upon it for bait. In early spring herrings by the million swim close to the shore, where they are captured in fixed traps or in gill nets. *Mackerel*, an excellent food fish, schools in enormous numbers and eats at or near the surface.

Lobster-fishing. From Prince Edward Island to Massachusetts, some 30,000,000 lobsters are caught annually in the Maritime Provinces and 3,000,000 in Maine. Unfortunately, overfishing has badly reduced the catch; conservation for a long time was difficult because

³¹ Experiments carried on in 1923 by the Biological Board of Canada with the cooperation of the Newfoundland Government indicate that cod are particular about the temperature of the water—40 to 45 degrees Fahrenheit suiting them best. It has been suggested that, if codfishermen would study fluctuations in the temperature of the water along with the causes, they would get larger catches with less work. H. S. Philpot, *The Province of Nova Scotia, Canada*, p. 25. Ottawa: Department of the Interior, 1930.

the laws of Canada and of the United States were not uniform. In Maine, fishermen were required to throw back small lobsters, though few did so. Artificial propagation is receiving considerable attention at the present time and progress is being made. The eggs are artificially hatched, and the young lobsters are permitted to grow in ponds along the shore before being turned into the sea.

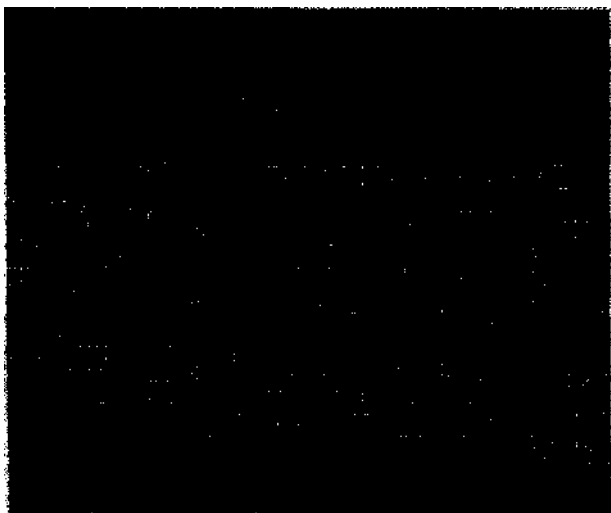


Fig. 21. Drying cod at Gloucester. This method of fish preservation is prosecuted most advantageously when an onshore wind is blowing and the temperature is about 67°F. When a hot sun is beating down, the racks must be covered with canvas.

Lobstering is hard, dangerous, and not very profitable work. Going out in all kinds of weather, working from sun-up to sun-down, the lobsterman visits the crates, removing his prizes and rebaiting with codheads and herrings.

Fishing ports. While almost every harbor where human beings live has its fishermen, there is only a limited number of outstanding fishing ports. The chief ones are Boston, Gloucester, Portland/Lunenburg, and Lockeport.

Boston, being a great commercial center with ready access to a populous hinterland, leads in the handling of fresh fish. *Gloucester*, with poor transportation facilities, has become a great fish-canning and drying center (Fig. 21). *Portland* is important because of its nearness to fishing grounds, but its remoteness from

large markets prevents it from rivaling Boston. *Lunenburg*, Nova Scotia's outstanding fishing port, provides the cities of Ontario and Quebec with a large part of their supplies.

The value of the fisheries. Despite continuous exploitation for more than four centuries, the western North Atlantic fisheries continue to provide a large and important supply of food—more than a billion pounds per annum.

Manufacturing

The Drowned North Atlantic Coast is not of outstanding manufacturing significance.⁸² It does, however, have several highly specialized industries.

Pulp and paper. In the production of pulp and paper, few areas in the world surpass the Drowned North Atlantic Coast (Fig. 22). Its distribution is largely a matter of geography: the pulp plants must be strategically situated with respect to the forest, cheap power, a dependable supply of soft, clean water, and good transportation facilities for the low-cost delivery of raw materials (sulphur, clay, soda). Fortunately, the Drowned North Atlantic Coast has large quantities of reasonably priced hydro-power close to great supplies of superior pulpwoods—spruce, hemlock, pine, poplar, and fir. One hundred tons of pulpwood yield less than 30 tons of pulp, but require the power equivalent of about 120 tons of coal. Consequently most pulp mills are located at convenient power sites close to the forest. Also, 100,000 gallons of water are utilized in the production of one ton of pulp. Paper mills, on the other hand, are located in centers of population where the bulk of the output is used. The Canadian part of the region contributes both pulp and paper, but the New England segment produces paper rather than pulp, except in Penobscot County, which ranks high in both.

When the United States tariff on newsprint was removed in 1911, much of the newsprint paper industry migrated from the United States to Canada, where the pulpwood could be made into pulp and paper at a saving of about 10 per cent.³³ Laws have been passed in Canada forbidding the export of raw pulpwood cut from Crown lands, though several provinces allow some to go under special permit. Most of the pulpwood exported is taken from privately owned lands.

³² The coastal cities of southeastern New England are not treated here but in Chapter XIII, *The American Manufacturing Belt*.

³³ A. G. Eldridge, "The Problem of Our Wood Pulp and Paper," *Journal of Geography*, September 1930, Vol. XXIX, No. VI, p. 253.

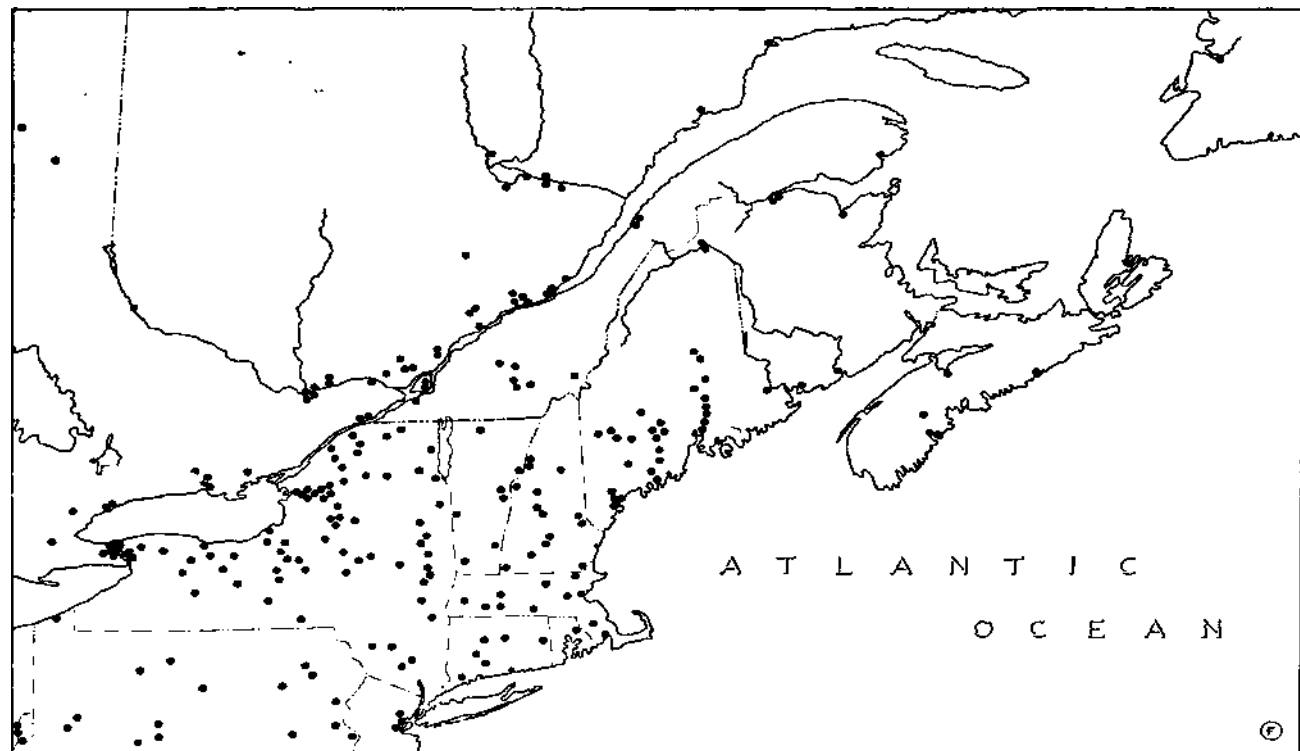


Fig. 22. Distribution of pulp and paper mills in northeastern United States and adjacent Canada.

Iron and steel. Though the Canadian metallurgical industry is small compared with that of the United States, it is "the basal stone in the economic structure of Canada's manufacturing activities." Iron-making in the Maritime Provinces began in 1872 but did not function along truly modern lines until 1900. Since 1918 the steel, coal, and related industries in the Maritimes have been administered by a single corporation.

Sydney, the center of the industry, is a strategic locale for iron and steel manufacturing:

1. It lies in the center of the coal area.
2. It had, when the industry began, an abundance of land near the waterfront well-suited to the manufacture of iron and steel.
3. It has a commodious and well-protected harbor.
4. It was already an important bunkering port.
5. It is the eastern terminus of the Canadian National Railways System.
6. It could get Wabana ore cheaply from Bell Island, Newfoundland.

To operate profitably, the iron and steel industry must be able to assemble iron ore, coking coal, and fluxing limestone economically. Few places are better located with respect to coal than Sydney, where the blast furnaces are within sight of the mine-mouths. Not only is the quantity of coal enormous but the quality is good. Limestone and iron ore suitable for blast-furnace use are obtained from Newfoundland. Despite the fact that the mines are 415 miles by steamer from Sydney, ore has been laid down for as little as 82 cents a ton.³⁴ While only of fairly good quality, Wabana ores mix readily with other ores, are easily and cheaply mined, and are strategically located for transport.

Markets are probably less advantageous than raw materials and labor. Canada is sparsely populated; its railroads are now built; its steel cannot invade the United States because of the protective tariff; and, despite an excellent location on the Great Circle Route to Europe, it cannot invade that market. The district is well located, however, for shipping steel by vessel to industrial Ontario and Quebec.

Textiles. North America's leading textile centers lie outside the Drowned North Atlantic Coast (Fig. 54). Nevertheless, attention

³⁴ W. H. Myer, "Iron and Steel Industry and Trade of Canada," United States Department of Commerce, *Trade Information Bulletin* No. 665, Washington, D. C., 1929, p. 7.

should be called to the importance of textiles in the Lower St. Lawrence Valley, where an abundance of cheap water-power and inexpensive labor offer genuine advantages.

Transportation

Rivers

In the Drowned Atlantic Coast only one river, the St. Lawrence, is outstanding. From the days of Cabot, Cartier, and Champlain, this river has offered unique opportunities for water transport. Much of the trade of Canada moves in and out over the St. Lawrence. The river also has had a centralizing influence. The French early dreamed of an empire of the St. Lawrence; actually, of course, the stream contributed mightily to the breaking-up of France's North American empire.

River transportation was of considerable importance in the early settlement of New Brunswick, when the St. John and its tributaries were widely used. Water transport was so easy as to discourage roadbuilding till after the War of 1812. It is unimportant now, however, since there are no streams that are navigable for any considerable distance. The Maritimes never benefited from St. Lawrence traffic.

Railroads

Maritime New England (except that part included in the American Manufacturing Belt), the Maritime Provinces, and the Lower St. Lawrence Valley have only limited rail facilities, owing to the type of economic activities followed, the rough terrain, and maritime location.

The New England railways are distinctive in that they serve directly only New England. More than in any other area in North America, tonnage consists of high-grade manufactures. Aside from forest and quarry products, the outbound movement of raw materials is almost negligible. Furthermore, food and industrial raw materials are carried eastbound into New England, but empty cars characterize much of the westbound traffic.

Prior to Confederation in 1867 which resulted in the construction of the first transcontinental railway, the Maritime Region had little railway mileage.' Nova Scotia, for example, had but 145 miles. New Brunswick was crossed from Saint John on the Bay of Fundy to Shediac on the Gulf. The Maritime Provinces were more interested in the Inter-colonial Railway than in the

Confederation. They felt that this railroad from the interior would greatly stimulate their ocean trade and their ports, especially in winter when the St. Lawrence could not be used. Prince Edward Island was the only part of the Maritimes to be indifferent, for it realized that such a route would not solve its local transportation problems. The extensions to the Maritimes are "weak thongs" in summer, but they become vital parts of the transcontinental systems in winter.

Railroads have been constructed for some distance on both sides of the St. Lawrence east of Quebec, but they are important only in winter.

Highways

The original settlements in Quebec were placed on the banks of rivers; those of the Maritimes and New England were along the coast. Everywhere they benefited from water transportation.

No roads were built in Acadia prior to the English conquest in 1713, and even by 1750 there were none fit for wheeled vehicles. In Canada, however, the French had built some. The earliest French adopted the methods of the Amerinds—using canoes and trails; in winter they used snowshoes, and sometimes frozen rivers instead of trails. The change came when the French introduced the wheeled vehicle, which demanded roads.

The building of roads in the Lower St. Lawrence Valley entailed many difficulties. Moreover, roads were discouraged to a certain extent by some of the chief occupations—fishing, logging, and trapping. Only farming was dependent upon them. The forest was almost continuous, so that cutting-and removing of stumps was necessary. The rivers required bridges. The severe climate induced deep frost which, in spring, raised humps and broke holes in surfaced roads and caused "the worst form of mud" on soft roads.

The two leading highways now run along the shore of the St. Lawrence—the chief focus of settlement.

In New England, as population increased and farms wore out, the need for new lands became imperative. The migration which followed utilized streams or Indian trails. These paths were first widened into pack trails and subsequently to wagon roads. Thus arose a system of trails radiating from the seacoast. Until well into the nineteenth century, well-built roads were practically unknown, even in rural New England. Only the ones between farm, church, meeting-house, and mill were maintained.

Roads for wheeled vehicles came into existence during the turn-

pike era, which began in 1795 and reached its climax between 1830 and 1850. Turnpikes declined with the advent of the railroad.

In recent years the Drowned North Atlantic Coast, which looks seaward, has not demanded and could not support a highway system comparable with that in the American Manufacturing Belt. The summer automobile tourist traffic, however, has greatly accelerated road building during the past several years.

Canals

The sea-level Cape Cod Canal, 17.4 miles long and 32 feet deep, was built to enable mariners to avoid the hazardous section south-east of Cape Cod and to shorten the distance between northern and southern New England (Fig. 23). It is now operated by the United States Government, toll-free, as a link in the intracoastal waterway from Maine to Florida. Adequate to accommodate all ships desirous of using it, the tonnage handled is increasing.

Another canal is St. Peter's on Cape Breton Island between Bras d'Or Lakes and the Atlantic. It is only a half-mile long and 18 feet deep.

Commerce

Civilization is clustered around the shores of the oceans and seas and along the banks and shores of rivers and lakes. Denizens of great maritime regions see "the world as a vast living waterway broken by obstacles—the land." There is wisdom in this view. The sea is a great highway for trade. Over it ships ride rapidly, easily, cheaply. People who go to sea live in a different world from that of their land-plodding countrymen. Their native land serves only as a resting place between voyages. Thus seafaring New Englanders were so bitterly opposed to the War of 1812 as to consider secession from the Union in 1814. They could not comprehend the point of view of the "Jeffersonian landlubbers."

So attractive were trade and shipping that, during colonial and Revolutionary times, maritime commerce became a leading activity. American and Nova Scotian captains and sailors were recognized as among the ablest and most fearless to be found on the oceans. They sailed everywhere.

Then came wars, followed by privateering and piracy. No longer did people believe in the slogan "Live and let live"; it was everybody for himself. Hence speed in ships was imperative. Accordingly, the schooner became a clipper ship, and with it New England and Maritime Canada experienced the golden age of their salt-water



Corps of Engineers, U. S. Army,

Fig. 23. The Cape Cod Canal. This man-made waterway connecting Massachusetts Bay and Buzzards Bay saves 70 miles on the trip from Boston to New York and enables vessels to avoid storms and the treacherous shoals of Nantucket. Owned by the United States Government, it forms a link in the Intracoastal Waterway.

activity. During this era—the first half of the nineteenth century—clipper ships dominated the seven seas, carrying the name of New England and of Nova Scotia to almost every port in the world. In general Nova Scotia's trade resembled that of New England, fish being exchanged for rum, sugar, and molasses. This continued until the advent of the iron ship. In 1860 United States vessels carried about two thirds of the country's foreign trade; by 1890 the amount had fallen to one tenth. Americans all but abandoned the sea—a situation attributable to (1) steamships made of iron, which displaced wooden sailing vessels, (2) national legislation whereby protection to American shipping was removed, (3) the War Between the States, and (4) the development of the natural resources in trans-Appalachia.

It might seem that the Maritimes should *throb* with trade, yet such is not the case. The late R. H. Whitbeck significantly said:

I have encountered no instance of a region [Nova Scotia] seemingly so favorably situated for ocean commerce and which has proved up to the present to be so unfavorably placed.

Nova Scotia, the outpost of Canada on the Atlantic, the colony which was thought to have the best commercial situation in the American world, illustrates, when taken in connection with the St. Lawrence, the fact that it is not usually the point where the land juts farthest into the sea, but the point where the sea pierces farthest into the land, that offers the most advantageous place for the meeting of land and water routes.³⁵

To a very real extent the Maritimes, commercially considered, are a land "that has been passed by."

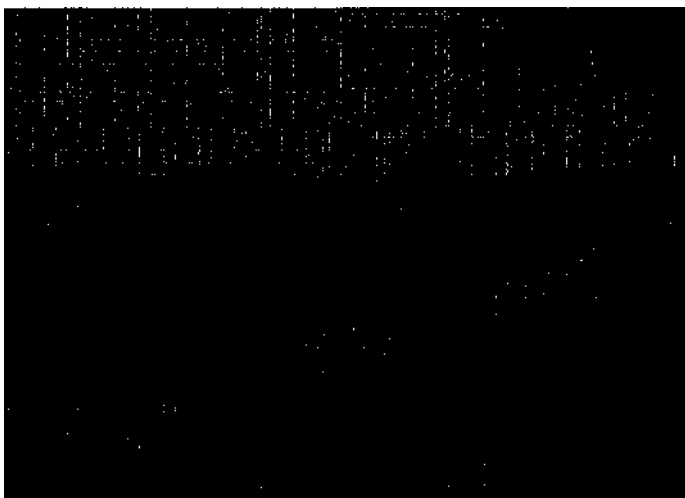
But even New England, which whitened the seven seas with her ships, is commercially at ebb-tide.

Recreation

Recreation as a business started here in the middle of the nineteenth century, but it was completely revolutionized later by the automobile. Large numbers of tourists began to invade the New England segment, many going to private homes. Catering to tourists has proved to be a salvation to large numbers of people, both in rural areas and in small cities and villages. The Drowned North Atlantic Coast is highly attractive to tourists, for it has: (1) fine scenery of mountains, bold cliffs, varied coastline, glacial lakes, and fast-running streams; (2) cool, bracing summers and cold, snowy winters; (3) excellent fishing in both inland waters and

³⁵ R. H. Whitbeck, "A Geographical Study of Nova Scotia," *Bulletin of the American Geographical Society*, June 1914, Vol. L, No. VI, pp. 413-419.

the ocean; (4) yachting and boating with continuous shelter; (5) skiing and tobogganing; (6) famous historic shrines; (7) architectural gems; (8) striking villages with their characteristic commons; (9) quaint people (the French-Canadians of the Lower St. Lawrence); (10) distinctive groups of farmhouses; and (11) stone-walled fields (Fig. 24),



Edwin J. Foscue.

Fig. 24. A picturesque New England stone wall. The stones were picked up from the glacial drift by farmers as they cleared their land for crops and pasture.

In New England most farmers who live near the coast, produce special crops for tourists. Many are not farmers in the same sense that they would be if they lived in the Dakotas or Iowa, since agriculture constitutes only a secondary element of income. The Drowned North Atlantic Coast is said to attract about 10 per cent of the tourist trade of both the United States and Canada. New England alone in 1935 attracted 3 million visitors, who spent 400 million dollars. About \$30,000,000 were spent in the Canadian segment.

Acadia National Park

The federal government has established on the coast of Maine, in what was once French territory, Acadia National Park. With its high rocky cliffs, forested slopes, and beating surf, it offers out-

standing scenic attractions. It is now available to the public for educational and recreational use.

Cities *

In a maritime region, cities develop where land and water routes converge.

Quebec (200,814), lying mostly on the north slope of the hill and the plain of the St. Charles River, was originally founded because of its high military value; the "Heights of Quebec" provided an ideal site for guarding the St. Lawrence highway. The river is constricted here more than at any place farther downstream, and hence is the last bridgehead on the lower river. Economically, Quebec, merely at the threshold of the St. Lawrence Lowlands, is less advantageously located than Montreal, which is in the midst of them. It is really a capital city, *civil* and *religious*, with a manufacturing side-line—boots, shoes, leather, tobacco, and printing.

Portland (106,566), Maine's largest city, though possessing nearly all the qualifications of a great harbor, is not an outstanding commercial port because artificial factors have neutralized natural advantages. It ships some Canadian grain in winter but is engaged mostly in receiving coal, petroleum, and forest products.

Bangor (29,822), located on the west bank of the Penobscot River 60 miles from the Atlantic at the head of navigation, is the natural transportation outlet for the St. John and Aroostook river valleys. It was the first of the classic lumber centers and possibly the greatest of them all,³⁶ but the town's statue (The Last Drive) is the only reminder today that Bangor once led the world in lumbering. It is the center of a large area which contributes wood pulp, paper, sardines, canned blueberries, cheese, textiles, and canoes. The city is served by the Maine Central and the Bangor & Aroostook railways.

* The general plan for the metropolitan districts that have been set up for use in the 1940 Census is to include in the district, in addition to the central city or cities, all adjacent and contiguous minor civil divisions having a population of 150 or more per square mile. The metropolitan district is thus not a political unit but rather an area including all the thickly settled territory in and around a city or group of cities. It tends to be a more or less integrated area with common economic, social, and, often, administrative interests. Population data for Canadian metropolitan districts from the *Eighth Census of Canada, 1941*.

For all urban centers of less than 50,000 the population of the political city is given.

³⁶ The other preeminent ones are Saginaw and Muskegon, Michigan, and Grays Harbor, Washington. Fascinating articles dealing with these colorful towns appeared in *American Forests*, Vol. 44, 1938, the first on Bangor in February 1938, p. 69.

/ *Sydney* (28,305), in northern Cape Breton Island, lies in the center of the island's mining and industrial area. The harbor is deep, free from fog, and 800 miles nearer Liverpool than is New York City. Despite these advantages, however, it is not a truly great port, since it lacks a populous and productive hinterland. Moreover, it is troubled for about two months each year by drift ice.

Halifax (91,829), founded in 1749, almost on the Great Circle Route between northeastern United States and northwestern Europe, has a magnificent harbor—"a masterpiece of nature." It is built on a tongue of land between the northwest arm and the harbor proper and is well sheltered from Atlantic storms. The harbor is commodious and always free from ice, silt, and troublesome currents. The tidal rise is only 4 to 6 feet. Halifax was formerly an outstanding port, but following Confederation it was eclipsed as a business center by Montreal and Toronto.

Halifax is an important naval base and commands the North Atlantic Trade Route. It has the only quay in Canada capable of berthing the largest ocean liners. Its grain-handling facilities enable several ships to load simultaneously, but the decline in foreign trade in wheat, along with competition from the port of Vancouver, has affected it adversely. Halifax is the eastern terminus of the Canadian National Railway's transcontinental lines and of Trans-Canada Airways.

Saint John (65,784), on the northern shore of the Bay of Fundy, has a fine, deep harbor. It is the winter port of New Brunswick and is, next to Montreal and Vancouver, the Dominion's most important exporter of wheat. It is ice-free because the tides of the Bay of Fundy (the highest in the world) prevent the formation of ice. During the season of navigation on the St. Lawrence, Saint John's grain-handling facilities are idle.

Moncton (22,763), in central eastern New Brunswick, is the most important railway and distribution center in the Maritime Provinces as well as a growing manufacturing city.

The Outlook

Agriculture in the Drowned North Atlantic Coast should not change greatly; its fishing may decline but certainly will not disappear; its pulp and paper industry should persist; its mining may increase; its shipping should hold its own. Recreation may ultimately become the most important single activity.

Economically, the Maritime Provinces will suffer as a consequence of (1) isolation from the real center of Canadian activity

and (2) political separation from their neighbor New England. Agriculture cannot be greatly expanded because of the dearth of arable land, and mining, manufacturing and commerce all are definitely restricted in their possibilities for expansion.

The New England section has been condemned repeatedly to economic readjustments. Though forced to shift constantly to different types of economic enterprise, it has always done so successfully and promises to continue to do so.

As for the Lower St. Lawrence, agriculture will dominate, but will be mostly a self-sufficing patch type. Man must battle with nature to wrest even a bare living from the infertile soils. This part of the region will continue to be the land of the French-Canadian.

CHAPTER V

The Northeastern Uplands

A REGION OF FORESTS, QUARRIES, DAIRYING, AND RESORTS

THE NORTHEASTERN UPLANDS include (1) the Adirondack Mountains, (2) the Green Mountains, (3) the Berkshire Hills and Taconic Mountains, (4) the White Mountains, and (5) the Notre Dame and Shickshock Mountains. Within the upland masses are several low-

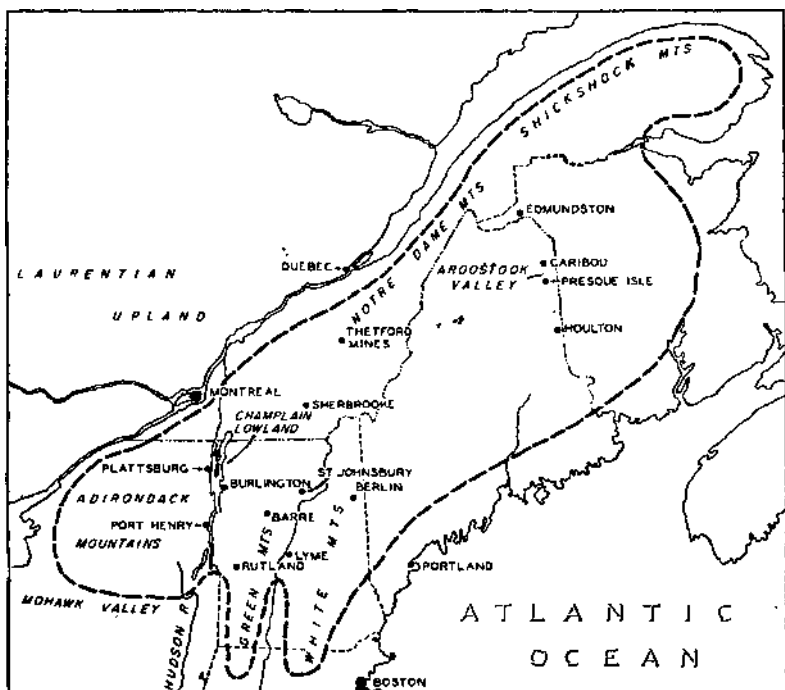


Fig. 25. The Northeastern Uplands: a region of forests, quarries, dairying, and resorts.

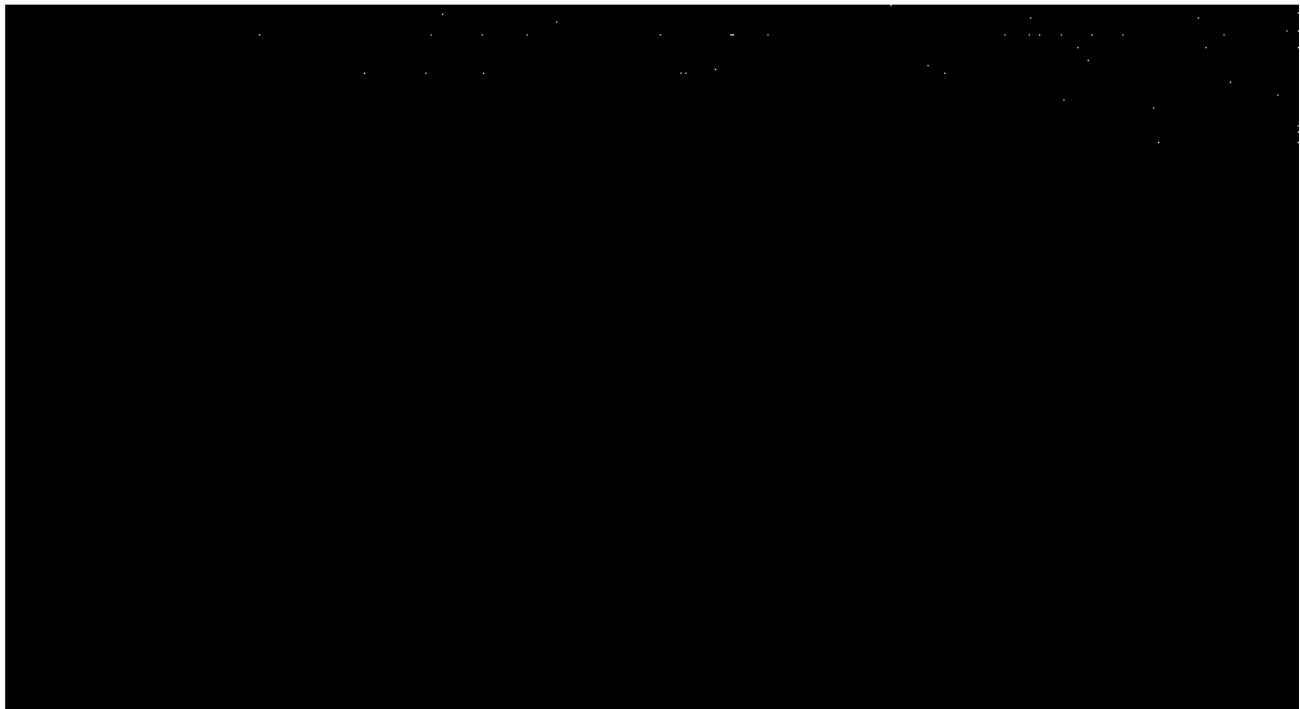


Photo by Chandler.

Fig. 26. The Green Mountains,

land areas: the Aroostook Valley of northeastern Maine, the Lake Champlain Lowland in northern Vermont and New York, the northern Connecticut Valley, and many smaller valleys. This region is both physiographic and geographic, and its borders almost everywhere are marked by pronounced physical features (Fig. 25).

Physiography

All of the mountains are geologically old and have been worn down by erosional agents for a long time. The Taconic Mountains, which border the western side of the Berkshires, are among the oldest on the North American continent. The Green Mountains of Vermont have rounded summits (Fig. 26)—the result of the great ice sheet which over-rode ridges and valleys alike. The highest summits are less than 4,500 feet above sea level. The White Mountains are higher and bolder, particularly in the Presidential Range of central New Hampshire, where Mount Washington rises to an elevation of 6,293 feet. Northeastward the mountains become more rounded and less conspicuous, although their summits remain at an elevation of nearly 5,000 feet.

The mountains of eastern Canada are lower and more rounded, having been subdued through long periods of erosion. Their general elevation is slightly more than 2,000 feet above sea level. On the west the Adirondacks, geologically an extension of the Laurentian Uplands, are considered a part of this region because of identical human activities. Although an older upland mass, the Adirondacks underwent changes at the time of the Appalachian mountain-building movement, which caused a doming of the upper surface. They also were eroded profoundly during glacial times. While not so high as the White Mountains, the Adirondacks cover more area and are a greater barrier.

The entire Upland is composed of crystalline and metamorphic rocks—granites, schists, gneisses, marbles, and slates—so valuable that this has become the leading building-stone region of the continent.

The stream courses of the Upland were altered by glaciation. Many water bodies like Lake Placid, Lake Winnepesaukee, and Moosehead Lake characterize the region. They have been of inestimable value in the development of the tourist industry.

The Aroostook Valley, occupying the upper part of the St. John River drainage, is the result of stream erosion in softer rocks.¹ The

¹ N. M. Fenneman, *Physiography of Eastern United States*, p. 367. New York: McGraw-Hill Book Co., 1938.

Lake Champlain Lowland, also of softer material, was eroded severely by a lobe or tongue of ice that moved southward from the St. Lawrence Valley between the Green Mountains and the Adirondacks.²

Climate, Vegetation, and Soils

The Northeastern Uplands lie within the humid continental climatic region, with the Atlantic Ocean exerting little influence. The growing season is short, averaging less than 120 days. Summers are cool, and winters extremely cold—temperatures dropping at times to -30°F . The abundant precipitation is evenly distributed throughout the year (Fig. 27), but in winter most of it falls as snow.³ Snow has been of great importance in the recently developed winter sports.

All of the region, except the highest mountains, was originally clothed in a dense forest. The higher slopes had the typical fir, hemlock, and spruce of the northern forest; the lower ones had white pine and mixed hardwoods. As man cut the more accessible timber for lumber and firewood and later cleared much of the land for farms, the primeval forests began to disappear. Rapid cut-

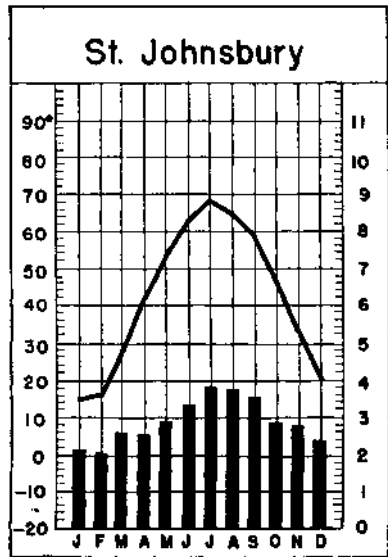


Fig. 27. Average monthly temperature and precipitation for St. Johnsbury, Ver-

ting, followed by forest fires, ruined much of the natural beauty of the Upland, accelerated stream run-off, and caused floods and soil erosion. In recent years state and federal agencies have attempted to reclaim abandoned farmlands by reforestation. Forest reclamation has led to the establishment of several state forest preserves as well as the Green Mountain and the White Mountain national forests.

² Wallace W. Atwood, *The Physiographic Provinces of North America*, pp. 220-221. Boston: Ginn & Co., 1940.

³Derwent S. Whittlesey, in *New England's Prospects: 1933*, p. 450. New York: American Geographical Society, Special Publication No. 16, 1933.

The Northeastern Uplands have thin soils which belong largely, if not exclusively, to the podzol group. The forests (largely coniferous) and the heavy year-round precipitation have together produced leached, acid soils of low productivity.

Settlement and Early Development

As population became denser in maritime New England and Canada, the more venturesome settlers seeking new lands trekked farther into the wilderness. As long as the French controlled the St. Lawrence Lowlands, the Amerinds of the Upland remained entrenched in this so-called "neutral ground," thus restricting white settlements to the seaboard. In the Adirondacks hostile Iroquois kept the whites confined to the Hudson and Mohawk valleys until the close of the Revolutionary War. After the expulsion of the French from Canada, pioneers from the older parts of New England penetrated the Upland feeling that at last the power of the Amerind had been broken. By the 1760's most of the lower valleys in New Hampshire and Vermont were occupied. Only forested slopes were therefore available to "newcomers"—slopes that never should have been cleared.

Agriculture was of the subsistence type.

In New England . . . the colonial pattern of agriculture continued dominant until the second decade of the nineteenth century. Cultivation was extensive and exploitative, tools clumsy, systematic crop rotation and fertilizers generally absent, livestock neglected, and orchards and woodlands badly managed. . . . For the most part tools and clothing were made in the farm home.⁴

The clearing of the forest for farms, led to an early development of the lumber business, which could be carried on in winter when farm work was not available. The logs, dragged on the snow to frozen streams, were floated to mills in the spring when the ice melted, thus providing a supplemental source of income for the pioneers, which continued to be important until the latter part of the nineteenth century.

Between 1800 and 1810 Merino sheep, imported from Spain, greatly improved the domestic flocks and gave a new industry to the upland farmer. Rearing wool sheep became a leading activity for the next 3 decades, and was especially profitable during the

⁴ Everett E. Edwards, "American Agriculture—The First 300 Years," *1940 Yearbook of Agriculture*, v. 205. Washington, D. C: Government Printing Office, 1940.

1830's. By 1840, Eastern wool growers owned 60 per cent of the country's sheep. The New England industry was confined almost exclusively to Vermont and the hills of western Massachusetts and Connecticut.

Because of remoteness and a more severe winter climate, the Canadian section of the Northeastern Uplands has remained largely a wilderness with little agricultural development.

The Decline of Agriculture

In the early part of the nineteenth century, the level, more fertile, and more accessible lands of the upper Mississippi and Ohio river valleys began to compete seriously with the stony hillside farms of the Upland. The Erie Canal, opened in 1825, brought a steadily increasing quantity of foodstuffs and wool to Eastern markets. The building of railroads west of the Appalachians opened up still larger farm areas in the Middle West. Meanwhile, because of its inability to meet this competition, the sheep industry declined. Besides, high wages in the mills of southern New England or the possibility of greater profits on new lands in the West attracted the more energetic farmers of the Upland, resulting in a widespread exodus of young people. Only the more conservative preferred to remain on the hillside farms.

As long as they were able to supplement their income by working in the woods in winter, they could stay on; but when the forest was cleared, the farmers too had to go, because their small farms were definitely submarginal.

In describing the deserted town of Lyme, New Hampshire, James W. Goldthwait says:

... for almost a century deserted farms in New Hampshire have been growing up to blueberry pasture, woodland, and forest. The sturdy population that was once evenly distributed over thousands of square miles of the stony upland has slowly and steadily moved down from the hilltops, emigrating to distant places, or lingering yet awhile in the valleys. Large tracts of land have been abandoned or have become the summer homes and playgrounds of well-to-do vacation seekers from the cities. . . . The eastern half of this [Lyme] township is deserted country, with scarcely an occupied house and very few traveled roads. . . .⁶

Between 1920 and 1930, two thirds of Vermont's and half of New Hampshire's townships lost population.

³ James W. Goldthwait, "A Town That Has Gone Downhill," *Geographical Review*, October 1927, Vol. XVII, No. 4, p. 527.

Agricultural Specialization

Aroostook County, Maine

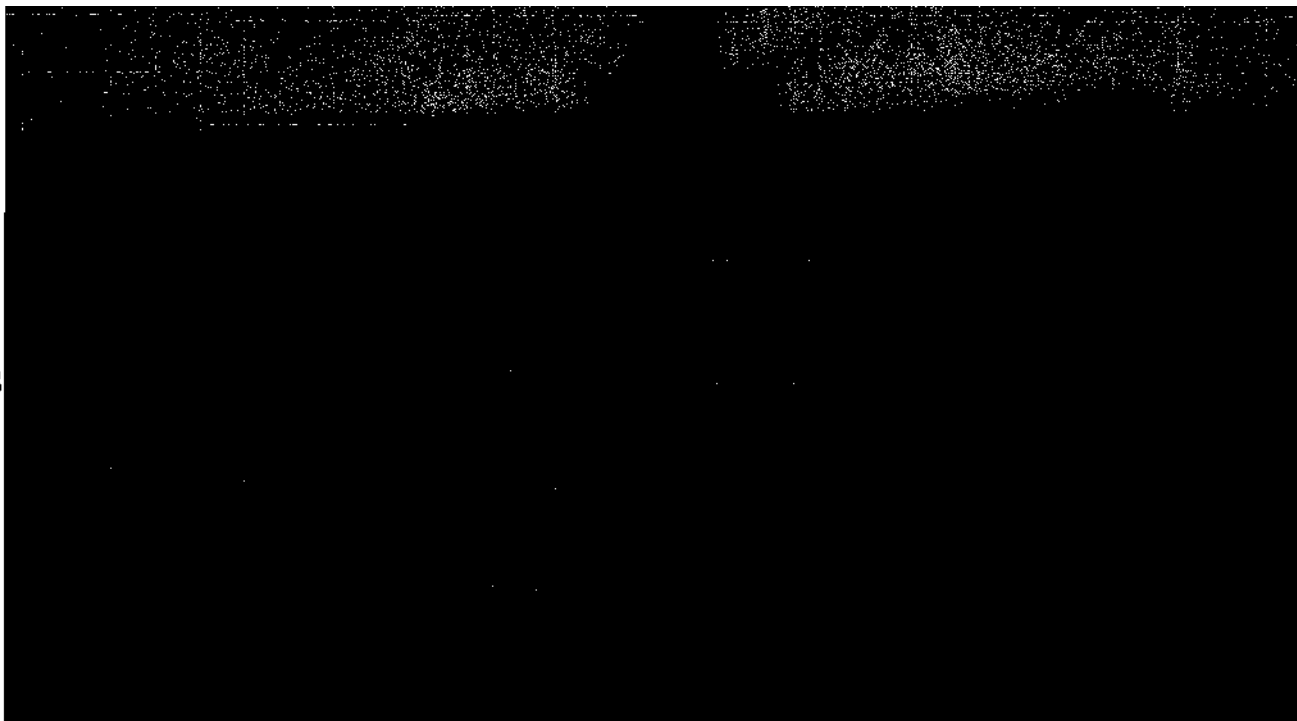
Aroostook County in northeastern Maine produces about one eighth of the total potato crop of the United States. The area has a short growing season and an easily cultivated silty loam glacial soil. Large-scale enterprises and highly mechanized production methods (Fig. 28) have built up a sizable industry in this remote corner of the United States.

The crop is grown both for seed potatoes and for food. Seed potatoes are especially in demand by the truck-farming areas of the Atlantic Seaboard and the Southern states, while for food purposes Aroostook potatoes supply the markets of almost all states east of the Mississippi River. Although commercial production in this area began in the 1870's, it did not become important until after the completion of the first railroad in 1895. Because of the short growing season, large shipments are confined almost completely to the months from May to August when great quantities of early white potatoes are sent to the New England markets. Unfortunately, Aroostook County has followed an unscientific rotation of crops—*potatoes*, *potatoes*, and more *potatoes*.⁶

The Lake Champlain Lowland

Throughout its early agricultural development, the Lake Champlain Lowland and tributary valley areas produced wheat, oats, and other small grains. But Western competition forced much of the area to abandon the growing of cereals. The mild, moist summers, however, were highly conducive to the growing of forage crops. This Lowland, then, was an ideal environment for the dairy cow. With the coming of railroads, and later good motor highways, the area became connected with the large urban markets of New York and Boston, and developed into one of the major dairy regions of the country (Fig. 29). While it had to compete with dairy regions to the west, near-by markets for fluid milk (which is 85 per cent water and hence is expensive to transport) gave it a decided advantage. The Champlain Lowland occupies the center of the great overlapping milksheds (areas from which cities draw their fluid

⁶ Russell Lord, *To Hold This Soil*, Department of Agriculture Miscellaneous Publication No. 321, p. 38. Washington, D. C.: Government Printing Office, 1938.



Maine Development Commission.

Fig. 28. Harvesting potatoes in Aroostook County, Maine.

milk) of New York and Boston. Vermont, dominating the major part of the Lake Champlain Lowland, ranks first among the states in per capita production of milk.

The agriculture and agricultural practices of the pioneer have vanished, except in the most remote localities. In the valleys and on the lower slopes of hillsides, the dairy cow is supreme. Fields of oats and hay occupy the fertile bottom lands, while apple orchards cover many hillsides. The newer and more scientifically located orchards occupy northward-facing slopes.

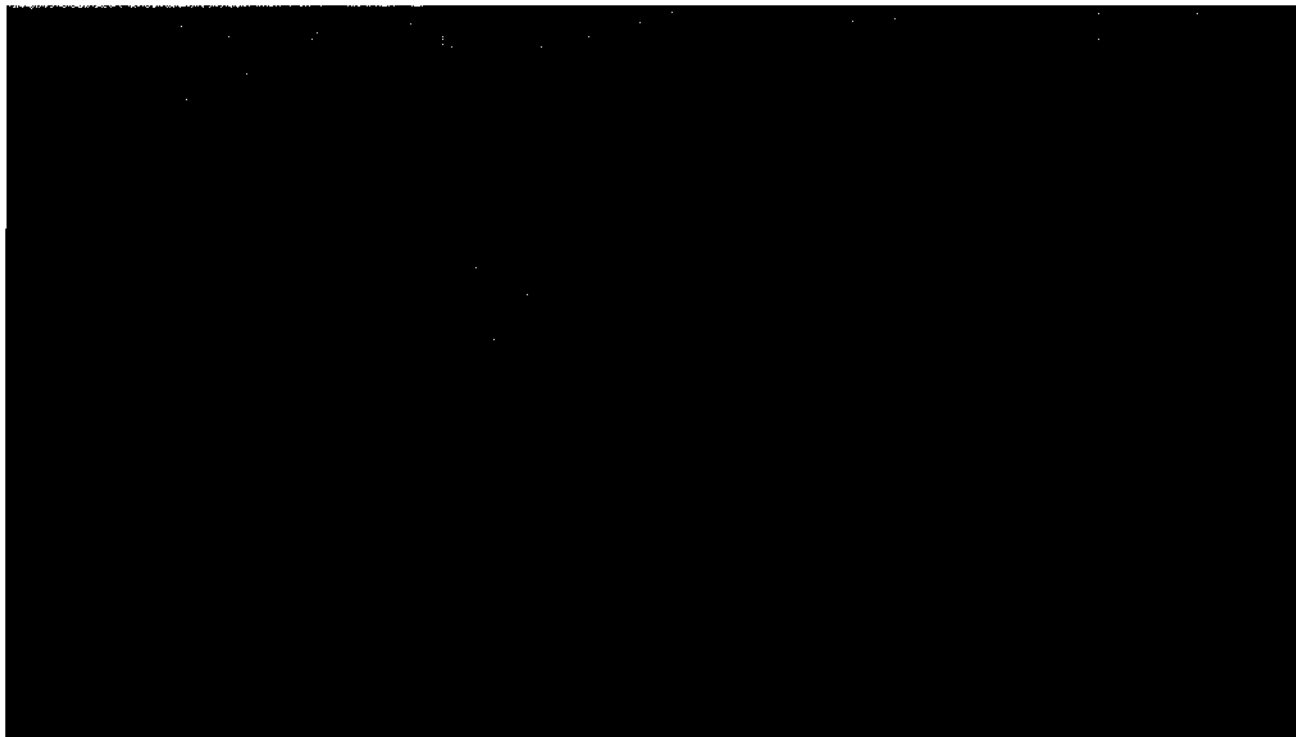
Forest-products Industries

The pioneers found the entire Northeastern Uplands, with the exception of the highest peaks, covered with a dense forest. At first the land-hungry settlers considered the forest an enemy in the same sense that they did the Amerind. Later, because of the ever increasing demand for timber on the Atlantic Seaboard, for structural purposes and for shipbuilding, these same farmers found it profitable to cut logs in winter when they could not farm, and float them down the streams to tidewater mills. In some places in the region this supplemental source of income surpassed that from farming.

When iron and steel ships replaced those made of wood, New England's shipbuilding industry declined. Until the opening of the forests in the Upper Lakes states in the latter part of the nineteenth century, the Upland continued to provide the major part of the lumber for the United States. In a brief period of a little more than two hundred years, most of this great forest was destroyed. Lumbering today is relatively unimportant, though the cutting of pulpwood for paper is a major enterprise. Proximity to the great printing centers in New York and southern New England, together with water-power and an abundance of small timber suited to pulpwood, make this one of the greatest paper-manufacturing regions of the continent. The huge pulp and paper industry located along the St. Lawrence River in Ontario and Quebec was described in Chapter IV.

The maple sugar industry

The highlands of Vermont and New York produce nearly two thirds of the maple sugar and syrup of the United States, and those of eastern Quebec account for most of the Canadian supply. The



Vermont Department of Agriculture.

Fig. 29. A Vermont dairy herd.

sugar maple, the chief tree from which the sap is extracted, has a very long life. It is rarely suitable for tapping (Fig. 30) until 40 years old, and it is usually twice that age when it reaches the height of production.

The process of making maple syrup and maple sugar is briefly described in an article "Agricultural Vermont":

The tapping of the sap provides invigorating out-of-door work. About four feet from the ground a small hole is bored in the tree; if the tree is large and vigorous, two or more holes are sometimes bored. The hole is an inch and a half or two inches deep and slanting in such a way that the sap can take a downward course as it oozes from the cut tissue of the tree. A spout with a hook is driven into the hole and on the hook a bucket is hung. In order to prevent rain water from becoming mixed with the sap, a cover is often placed over the bucket. When it is time for the gathering, a team is hitched to the gathering sled on which is placed a large tub. The team is driven through the orchard and the sap in the buckets is gathered and poured into the tub on the sled. Thereupon the sap is brought to the sugar-house, emptied into the sap container, and then boiled in order to eliminate the water through evaporation. The product thus obtained is maple syrup which through further boiling may be reduced to sugar. Since the sap contains 94 or 95 per cent water, the boiling is a very tedious task. On the average the production per tree amounts to ten gallons of sap, yielding when boiled down about one fourth of a gallon of syrup or two pounds of sugar.⁷

Saxiculture

Quarrying

The rocks that compose the Northeastern Uplands are dominantly crystalline or metamorphic, consisting largely of granite, marble, slate, and others universally used as building stones. High-quality stone and nearness to large urban centers have made the region a leading producer in the building-stone industry. Although the Canadian part of the region is underlain with the same rock, its building-stone industry has not developed to any extent, no doubt the result of remoteness from markets.

Granite. Granite, the hardest, most massive, and most durable stone is quarried extensively in central Vermont. The major producing area is in the vicinity of Barre, where the nationally famous "Rock of Ages" quarry is located. Because of its hardness and massiveness, granite is difficult to quarry. Drill holes are placed close together along a line in the bedrock, and into them wedges are driven. When the pressure from the wedges becomes

⁷ S. Axel Anderson and Florence Woodward, "Agricultural Vermont," *Economic Geography*, January 1932, Vol. VIII, No. 1, p. 37.

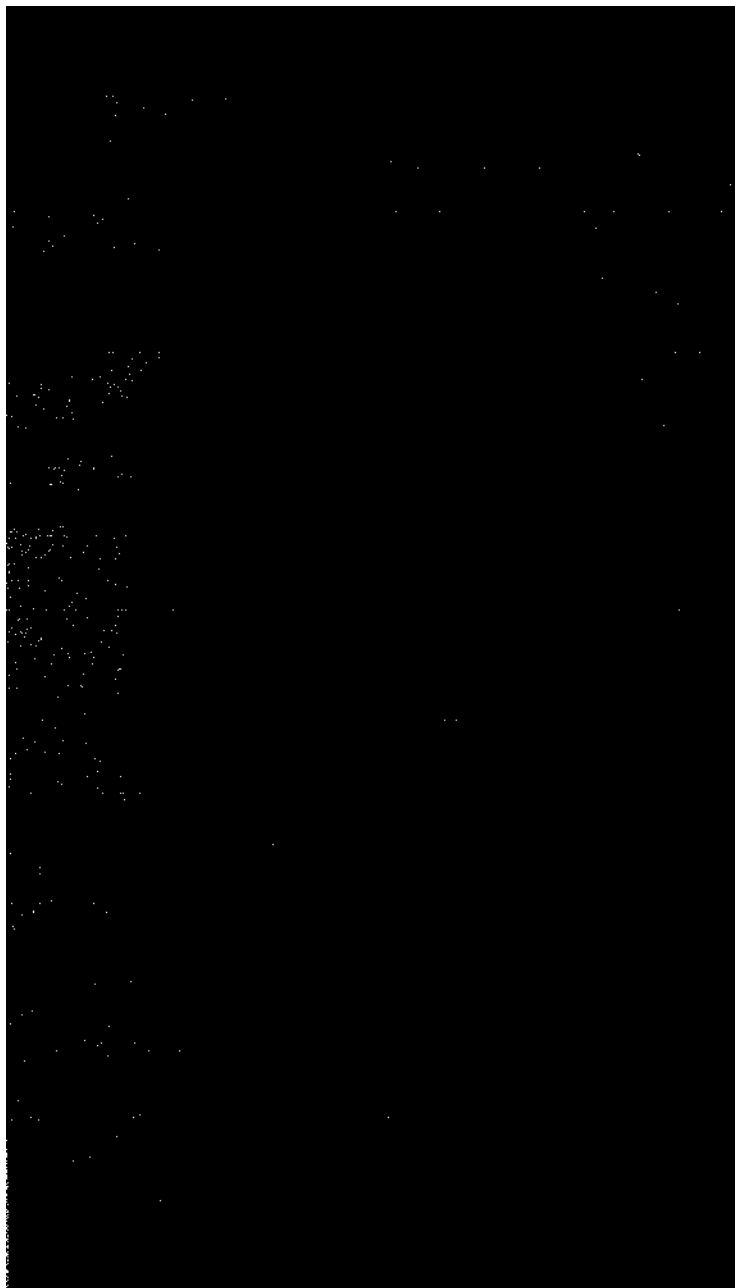


Photo by Chandler.

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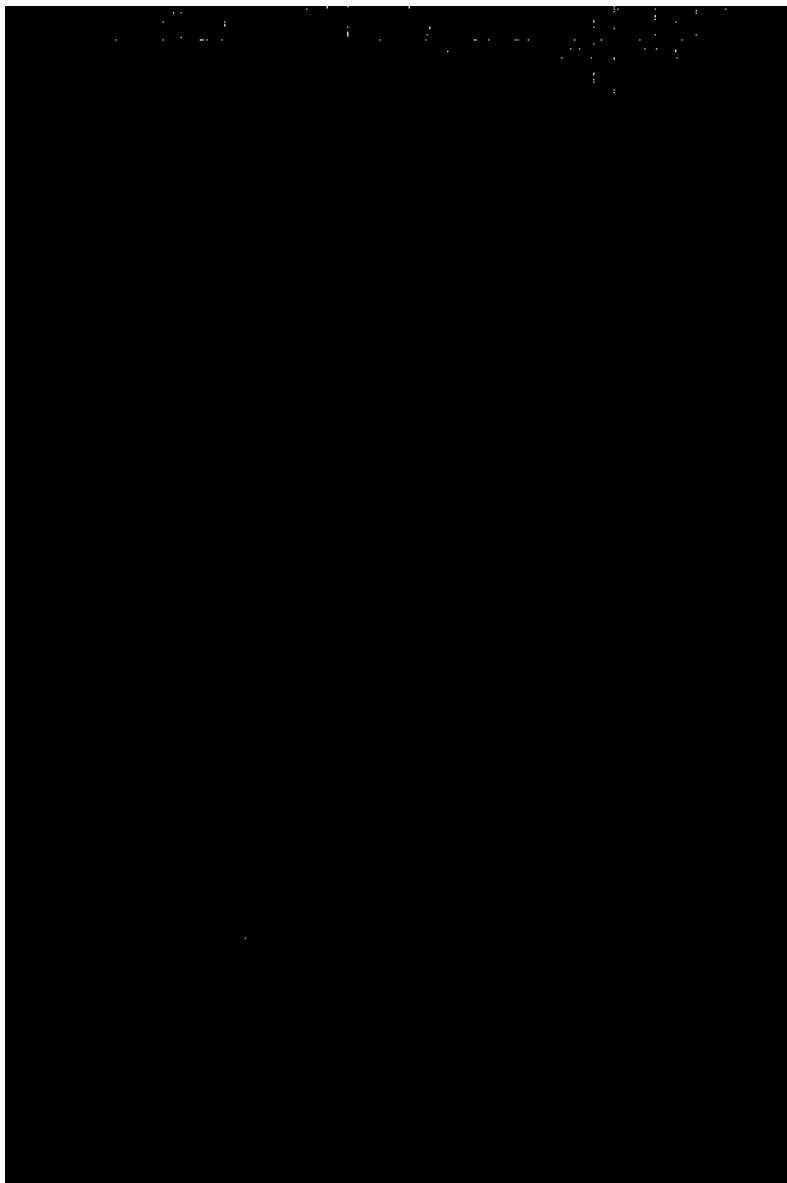
sufficiently great, the granite block begins to crack along the line, and the stone is extracted in large blocks that are ideal for monumental and construction work. One block, extracted from a quarry at Barre, had the dimensions of 60 feet by 7 feet by 6 feet.⁸ Small stones are used for paving or are crushed for road-building material. More than 100 plants for the manufacture of granite products are located in Barre, Montpelier, and adjacent Vermont towns. Numerous granite quarries have been opened in Maine, but their output is used chiefly for structural purposes. Since most of these quarries are located at or near tidewater, the stone can be shipped to Boston and New York at a low cost.

Although Canada possesses one of the largest supplies of granitic rock in the world, only an infinitesimal part is used there, commercial development being confined to areas near centers of population.

Marble. Vermont ranks high in the production of marble, although in recent years it has been surpassed by Tennessee and Georgia. Nevertheless in 1939 it produced nearly 17 per cent of the total for the United States. Marble is a metamorphosed or altered limestone rock that has been hardened by heat and pressure. Although classed as a hard stone, it is much softer than granite, and hence can be quarried by sawing the bedrock into blocks with either gang-saws or diamond-tooth saws (Fig. 31). The relative softness of marble makes it easy to work, but also keeps it from being a good building stone, particularly for exteriors. Nevertheless, it is quarried extensively, the chief producing centers being Rutland and Proctor. Vermont marble has the advantage of a wide variety of colors—pure white, red, gray, and green.

Slate. Slate, also a metamorphosed stone, is unique in that it splits into thin sheets. Hence it is highly prized as roofing material, for electric panels, and for flagstones. The 2 most important slate-producing areas of the continent are in Maine, near the town of Monson, and on each side of the Vermont-New York boundary. The slate from Monson is a black variety of high quality, used primarily in the manufacture of electrical panel boards and blackboards. The Vermont-New York product, occurring in several attractive colors, is used primarily for roofing. Vermont produces approximately 33 per cent of the total for the United States, New York 8 per cent, and Maine nearly 6 per cent. Some slate is quarried commercially in Richmond County in eastern Quebec, but the industry there has declined in importance in recent years.

⁸ H. Ries, *Economic Geology*, p. 112. New York: John Wiley & Sons, 1937.



Vermont Marble Company,

Fig. 31. Marble quarry near Proctor, Vermont.

Mining

In addition to building stones, the Northeastern Uplands contain deposits of 2 valuable minerals—asbestos and magnetic iron ore.

Asbestos. Asbestos was discovered in Quebec in 1877, and mining began a year later. The deposits are of great extent, outcropping in a 70-mile strip in the eastern townships; the center is at Thetford, just north of the Vermont border. Asbestos is a non-metallic mineral resembling stone, is green or yellowish-green in color, fibrous, soapy to the touch, tasteless, and odorless.

Practically all asbestos mining is of the open-pit type. Asbestos is found in serpentine rock which is overlaid with a covering of soil. In the mining process, holes are drilled into the rock, loaded with explosives, and detonated. The ore is then sorted, loaded into cars by big power shovels, and delivered to crushing mills. The largest mine, Jeffrey's Pit, works day and night, summer and winter.⁹ The recovery of the fiber in the milling process amounts to about 9 per cent. An output of 4,900 tons during a recent year meant the milling of 6 million tons of rock.

Asbestos is used primarily in the manufacture of automobile brake linings, building materials, and heat insulators. Its chief properties are flexibility, incombustibility, and slow conduction of heat. Since the United States leads the world in the manufacture of automobiles and in building, it consumes most of the world's asbestos.

Iron ore. Metalliferous deposits are widely scattered throughout the Northeastern Upland, but usually they are of small commercial value. Most important are the magnetic iron, deposits found on the east and west sides of the Adirondacks. The richest ore, averaging 60 to 70 per cent metallic iron, comes from the Mineville district on the eastern flank of the Adirondacks a few miles inland from Port Henry, New York. These ore bodies, the largest and most productive in New York State, are insignificant when compared with those of the Mesabi Range of Minnesota. Mineville is of greater historic than current importance, being one of the oldest iron-ore producers on the continent. Records show that its mines were opened about 1785.¹⁰

Other metallic minerals. The Green and the White mountains have little metallic wealth, but farther to the northeast in the

⁹ T. R. Elliott, "Fibres of Gold," *Canadian Geographical Journal*, March 1938, Vol. XVI, No. 111, pp. 109-125.

¹⁰ James F. Kemp, "Mineville-Port Henry Mine Group," *New York State Museum Bulletin* 119, p. 58. Albany: University of the State of New York, 1908.

Shickshock Mountains of Quebec and New Brunswick, workable quantities of lead and zinc are found.

Water-power

Water-power has been an important factor in the early development of the Upland. The numerous small rapids and falls which characterize almost every stream were utilized by the early pioneers for power. As has been shown, cheap hydro-power was the basis for the paper and pulp industry, which is concentrated along the north flank of the region, particularly in the Adirondacks. The destruction of the forest cover over much of the Upland reduced the water-power possibilities considerably. There is a great need for a systematic survey and control of the power resources of the entire region, so that they may be utilized to their greatest capacity. As yet water-power in the Canadian section in eastern Quebec and New Brunswick has received little attention.

Manufacturing

In spite of the many saw mills, pulp and paper mills, and small industrial plants, the Northeastern Upland is not an important manufacturing region. It is interesting to note, however, that the Fairbanks Scales Factory, one of the largest and best-known in the United States, is located at St. Johnsbury, Vermont. This industry and others of a similar type represent in many cases the ingenuity of the people who started them, though frequently they are poorly located for modern business. The investments at the original sites, coupled with a supply of highly trained workers, makes a move to a more scientific location undesirable.

Transportation

As the pioneers pushed farther into the upland wilderness, they naturally used the Amerindian trails, which for the most part followed the streams. When wheeled vehicles (ox carts) came into use, trails were widened where possible. Although the streams pointed the way through the forest, they seldom provided means of transportation. The same rapids and falls that aided the development of power hindered navigation. In the 1840's railroads penetrated the Upland and caused some of the wagon roads to fall into disuse.

Railroads

The Northeastern Uplands are so located as to profit from railroad development outside the region. The first railways were built from the Atlantic ports of Boston, New York, and Portland to tap the resources of the Upland. The Champlain Lowland, however, which had always been a highway for traffic between New York and Montreal, soon secured through lines. Later Canadian railroads, seeking ice-free ports on the Atlantic, built several main lines across the Upland. A current map of the region shows a loose network of lines. The Adirondacks, northeastern Maine, and the Canadian section are largely avoided. Accordingly, many localities still are remote.

Highways

Although many of the old turnpikes fell into disuse after the coming of railroads, they possibly survived better in the Northeastern Uplands than elsewhere. With the advent of the automobile, many old roads were improved and new ones constructed. The ever-increasing automobile traffic through the Uplands has created a demand for good roads. But major trunk highways comparable with those in southern New England do not as yet exist. Except in the most remote places the region is well served by modern highways. The automobile highway has penetrated the mountain fastness to a greater extent than has the railroad.

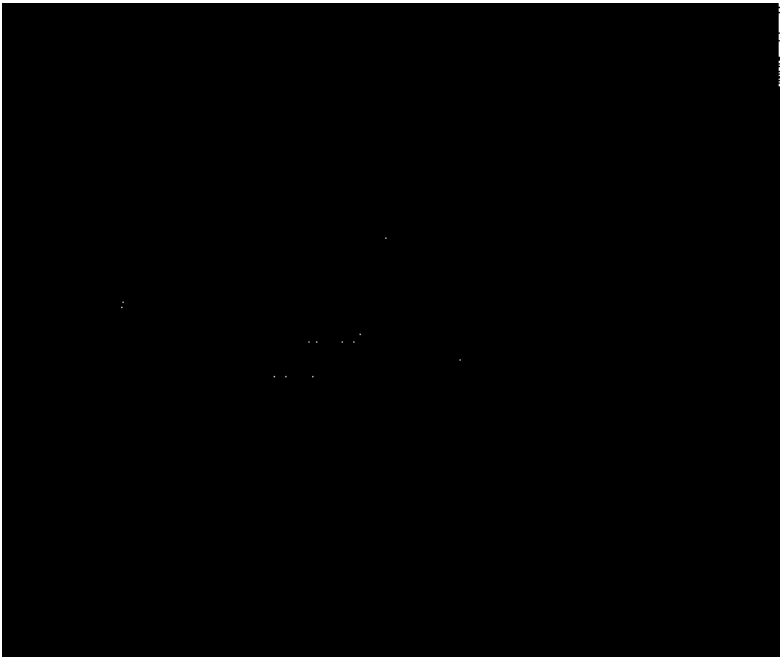
The Resort Industry

The Northeastern Uplands are endowed with practically all of the natural factors necessary for the development of a large resort industry. On the physical side are mountains, hills, lakes, streams, forests, and wildernesses that harbor native wild animals. The cool, moist summers are ideal for summer vacationists, and the snowy winters are popular with winter-sports enthusiasts. In addition, the region profits from proximity to centers of dense population. "One fourth of the people of the United States and Canada live within a day's drive . . . and over half of the largest cities of the two countries lie within 900 miles of Mt. Washington."¹¹ The ease of access by people living in the crowded urban centers of the Northeast makes the Northeastern Upland one of the most popular recreational lands of the continent.

¹¹ National Resources Committee, *Regional Planning, Part III—New England* p. 37. Washington, D. C.: Government Printing Office, 1936.

Summer resorts

The Adirondacks and the Green and White mountains began to attract summer tourists by the middle of the nineteenth century. As railroads were projected farther into the mountain fastness, more and more summer visitors came. Owing to the inconvenience of



Courtesy of Saranac Inn.

Fig. 32. A large resort hotel in the Adirondack Mountains.

reaching the resort areas by train in those days, most tourists spent the entire summer there, and there was a demand for large resort hotels. These were built usually of the abundant timber from the near-by area. As the trade grew, many such summer hotels were built and equipped to provide every need of the visitor—swimming, boating, hiking, horseback riding, tennis, and golf (Fig. 32). They were run on the American plan. Such hotels are expensive and appeal only to a wealthy clientele. Few facilities were provided for the low-income group because, before the days

of the automobile, not many of that group reached the more remote places.

Until recently, the Upland had confined the tourist business to the summer months, closing its hotels during winter. In many instances the manager of a large hotel in the White Mountains or in the Adirondacks operates a resort hotel in Florida during the winter, moving seasonally from one to another with all of his domestic help, barbers, and bootblacks.

The automobile altered the summer resort industry considerably. According to Derwent Whittlesey:

All-summer or month-long stays by a select few at a favorite hotel have tended to give place to short stops by nearly everybody in many hotels. Farmers and townsfolk who used to take in boarders now offer overnight accommodations to fleeting auto nomads. Villages still purvey groceries and meats, but they have added to the list ice cream and soda, gasoline and oil, and luncheon and tea.¹²

With the development of the automobile and good highways, the Upland finds itself at the crossroads between southern New England, French Canada, the Thousand Islands District, and the Maritimes.

State and national planning boards, park and forestry services have done much in recent years to develop the resort industry in this region. Several national forests have been established to preserve and restore the woods as well as to encourage summer resorts. Some of the recreational services now provided by the national forests for tourists include: (1) foot trails (more than 1,000 miles in the White Mountain National Forest alone), (2) youth hostels, (3) bridle trails, (4) canoe routes, (5) hunting and fishing facilities, (6) golf courses, (7) camps, and (8) winter sports. Today the Northeastern Upland is a playground for all classes of people—those who spend their summers at large resort hotels as well as those who can stop only for the week-end, traveling by automobile and spending each night at a tourist home or cabin. The latter type of traveler has made it possible for many of the all-but-abandoned farms to revive. The old farm houses and the covered bridges add materially to the natural beauty of the region and attract large numbers of tourists. The Canadian section, wilder and hence largely unknown, is gradually becoming a resort center, particularly toward the outer end of the Gaspé Peninsula, where the mountains approach the sea and French fishing villages add charm to the landscape.

¹²Derwent S. Whittlesey, in *New England's Prospects: 1933*, p. 455. New York: American Geographical Society, Special Publication No. 16. 1933.

Winter sports

Within the past few years, winter sports have developed rapidly, owing to (1) improved methods of clearing highways, (2) local promotion of winter sports, and (3) "snow trains" and "snow busses." The Northeastern Upland is particularly favored for all types of winter sports.

In 1938 people spent \$3,000,000 for skis, \$6,000,000 for ski clothes, and \$15,000,000 for transportation to and lodging at winter playgrounds. Probably no other form of outdoor recreation offers a wider range of appeal. The small boy with his home-made sled or barrelstave skis has as much fun as the expert with his carefully chosen equipment.¹³

Winter sports, then, attract rich and poor alike. People living in cities are learning that the sun does shine in winter in the great outdoor recreational areas, and are going to them by the thousands. The snow-bound residents of the Upland now keep open roads that were never before plowed in winter, and the residents can go into villages whenever they please. Also, the owners and operators of some resort hotels can stay open in winter and thereby increase their earnings.

Cities and Villages

The sparse population and the lack of concentration of people at focal points for manufacturing or trade precludes the development of large urban centers. The largest city has less than 40,000 inhabitants, and most of the places called "cities" are of only moderate size (Fig. 25).

Sherbrooke (35,651),¹⁴ a short distance north of the international boundary, is the largest city. It is the chief agricultural and manufacturing center of southern Quebec.

Burlington (27,686), on the eastern shore of Lake Champlain, is the center of the major agricultural section of the Upland. It also is a popular resort, particularly in winter when the lake provides ice-boating.

Berlin (19,084), the chief city of northern New Hampshire, with good water-power and an abundance of timber, is one of the leading pulp and paper-milling centers of the region.

Among the smaller places are: *Thetford Mines* (12,788),¹⁵ with

¹³ Russell Lord, *Forest Outings*, p. 118. Washington, D. C.: Government Printing Office, 1940.

¹⁴ *Eighth Census of Canada, 1941* (preliminary figures).

" *Ibid.*

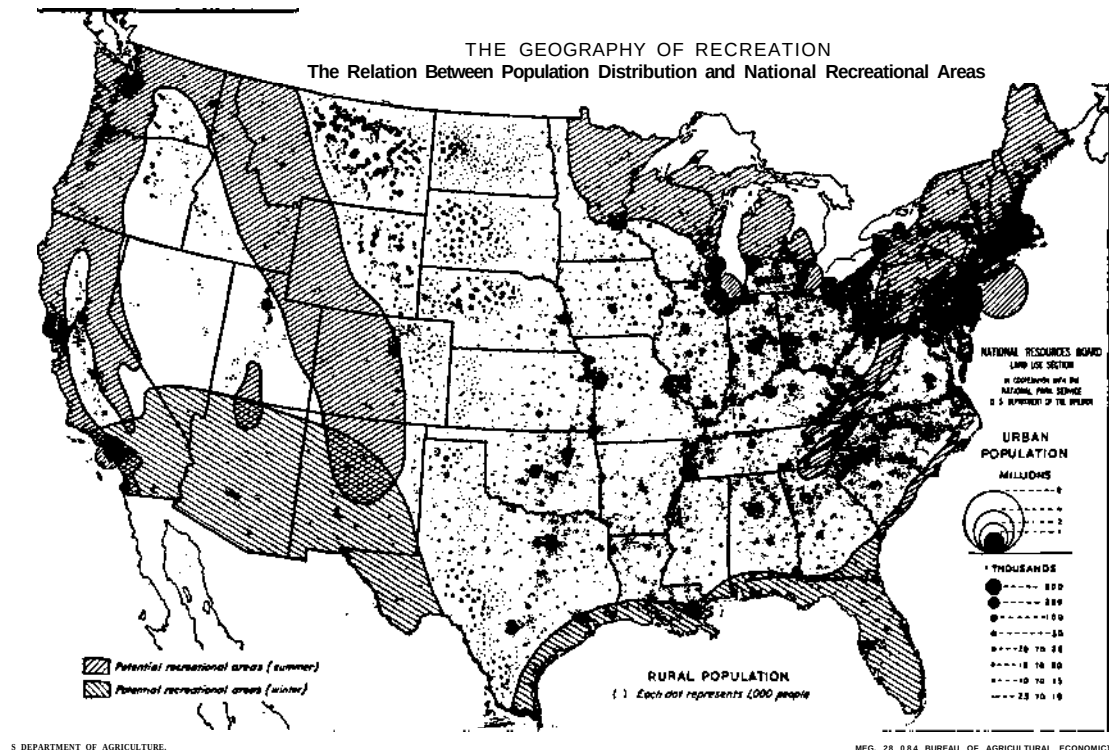


Fig. 33. Major resort areas of the United States.

its large asbestos pits; *Barre* (10,909), the center of the granite industry; *Rutland* (17,082), with large marble quarries; *St. Johnsbury* (7,437), home of the Fairbanks Scales Company; *Montpelier* (8,006), the capital of Vermont, *Plattsburg* (16,351), the headquarters for the Citizens Military Training Camps; *Presque Isle* (7,939) and *Houlton* (7,771), the chief agricultural centers of Aroostook Valley; and *Edmundston* (7,028),¹⁵ a major pulp and paper manufacturing town and the one important trading center of northern New Brunswick.

The Outlook

For the most part the Northeastern Upland has been either (1) exploited and largely abandoned or (2) left as an unexplored wilderness. The steeper lands that were exploited by the farmer, the sheepman, and the lumberman never should have been cleared of their virgin forests, and accordingly are now being returned in many cases to national or state forests and wild-life preserves. The more inaccessible forest areas that, because of remoteness, have been spared destruction will probably remain in permanent possession of the general public.

Many of the villages and cities have established themselves on a firm footing, and, though not expected to grow in population because of limited industrial possibilities, they should not decline.

Water-power might be further developed, and pulp and paper manufacturing should continue to be important. The building-stone industry, though not likely to expand, should hold its own.

The activity with the brightest prospect is tourism. With an ever-increasing number of tourists visiting the region in summer and winter, and with the rapid increase in the number of summer camps for boys and girls, the Upland will continue as one of the major playgrounds of North America (Fig. 33).

CHAPTER VI

The North Atlantic Coastal Plain

A REGION OF TRUCK FARMING, FISHING, AND RESORTS

THE North Atlantic Coastal Plain has been called a geographic back-water cramped between ocean and Piedmont, out of reach of the swirling activity of the American Manufacturing Belt on the one hand and the slow but powerful economic current of the Cotton Belt on the other. *Probably no other region in North America is so lacking in personality or individuality.* While possessing diverse environmental conditions, none is so overwhelming as to give distinct character to the whole area. This is a region because, throughout its extent, the type of farming is essentially the same. Within it, however, are localities whose types of farming differ distinctly from those of the broad general region.

The region, occupying a belt 50 to 100 miles wide along the Atlantic Seaboard from northern North Carolina to northern New Jersey and Long Island (Fig. 34), owes its economic life to the huge market for fruits and vegetables created by the dense population between Norfolk and Boston.

The Physical Setting

Climate

The mild, semi-marine climate is the region's most important environmental factor. Its warm spring makes the early maturing of vegetables and small fruits possible.

The Gulf Stream, which moves northward along the coast, ameliorates the range of temperature. The insular or marine climate is due partly to the numerous bays which seam the land.

Average annual precipitation varies from 40 inches in the north to 55 in the south, with the maximum in late summer and the minimum in autumn (Fig. 35).

The long growing season, a result of proximity to the ocean,

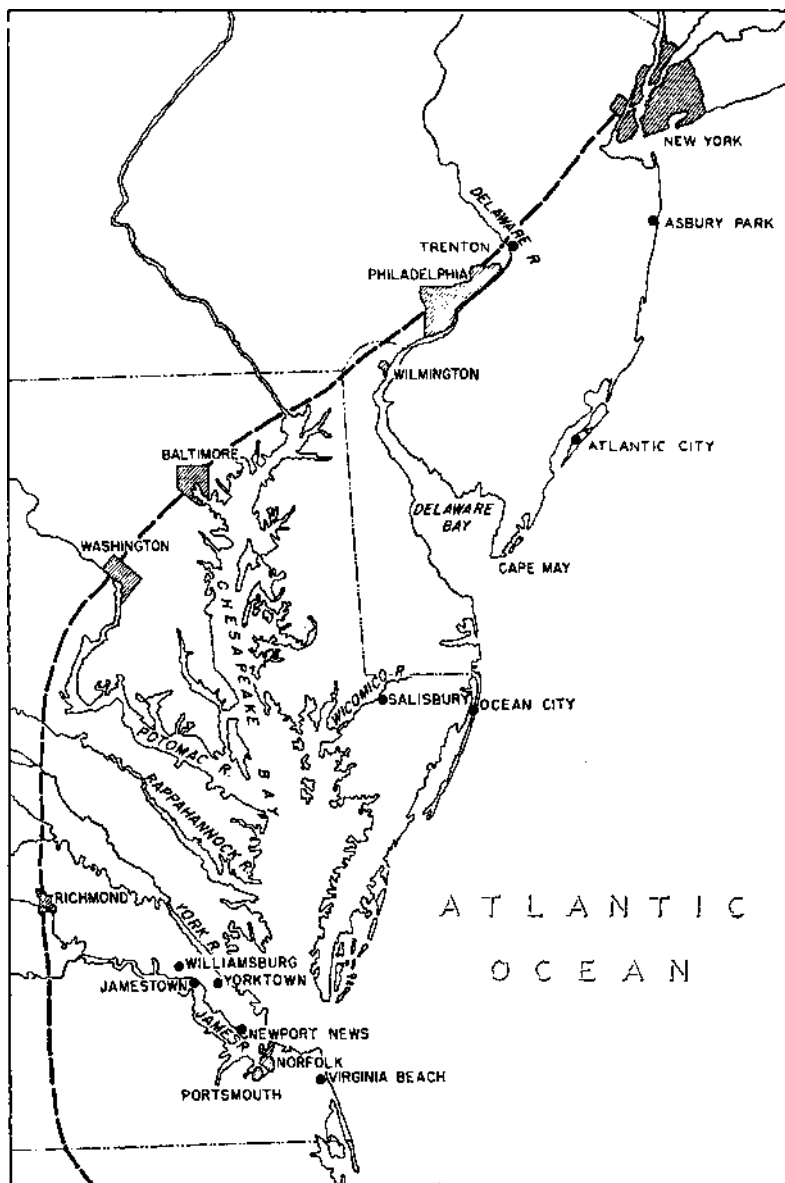


Fig. 34. The North Atlantic Coastal Plain: a region of truck farming, fishing, and resorts.

ranges from 190 days in the north to 240 in the south. Thus 2, 3, or even 4 truck crops can be grown regularly on the same piece of land within a year.

Surface features

This region, a part of the Atlantic Coastal Plain, was formerly a portion of the continental shelf that was raised above the sea without essential deformation. It is level to gently rolling. In

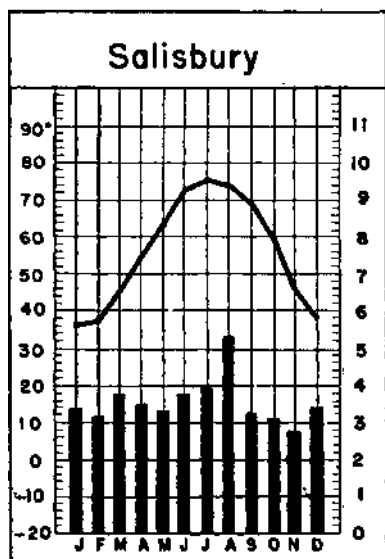


Fig. 35. Average monthly temperature and precipitation for Salisbury, Maryland.

relatively few places does the land rise more than 100 feet above sea level, though some of the long interstream areas rise to nearly 400 feet. Most of the cultural features, including roads and residences, are on these higher lands.

Poor drainage is the principal surface condition limiting the use of land, especially along the marshy coast of Virginia and North Carolina. The land is so level that drainage is exceedingly sluggish. This marsh and swampland is a breeding place for myriads of pestiferous mosquitoes whose presence definitely discourages settlement.

The coast is broken by numerous peninsulas which are generally "splintered into smaller tongues." The lands of Tide-

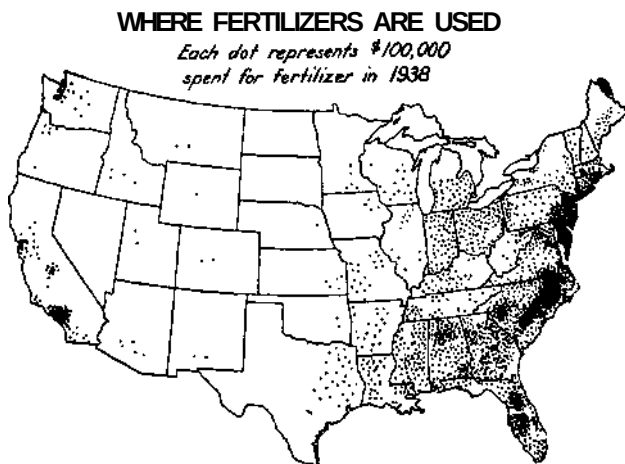
water Virginia lie along 4 major rivers—the York, the James, the Rappahannock, and the Potomac. The head of tidewater on the last three lies at the Fall Line. The coastline is one of submergence, so that stream valleys are drowned and form broad tidal estuaries.

The seaward margin is fringed with an almost continuous succession of beaches and bars—the work of wave action. Incoming waves do not reach the shore, but break some distance out to form sand bars known as barrier beaches. Lagoons, varying in width from one half to as many as 8 miles, lie between these bars and the mainland. Most lagoons have been filled or are being filled

by streams from the mainland or by sand blown from the beaches. Eventually the barrier beaches become so large as to prevent even the highest waves from washing over them. They are separated one from another by narrow inlets through which the tide enters.

Soils

Despite the agricultural importance of the North Atlantic Coastal Plain, *its soils generally are not fertile.* This condition is not alto-



PREPARED BY THE NATIONAL FERTILIZER ASSN.

Fig. 36. The greatest expenditure for commercial fertilizer in Anglo-America is in the Atlantic and Gulf Coastal Plains and in the Piedmont—areas which grow intensively cultivated crops—vegetables, fruits, cotton and tobacco. This part of the continent receives heavy rainfall and its soils are badly leached.

gether the result of man's failure to rotate crops, fertilize the soil, and employ a scientific system of farming. L. A. Wolfanger says that "Nature herself had 'robbed' the soils long before the first colonist set foot upon the continent."¹

Though all the soils are pedalfers, they are not all alike. Gray-brown podzolic soils cover the greater part of the region. Podzols and those so poorly drained as to have no profile characterize the sandy section of southeastern New Jersey. Red and yellow soils

¹ L. A. Wolfanger, "Abandoned Land in a Region of Land Abandonment," *Economic Geography*, April 1931, Vol. VII, No. II, p. 168.

predominate in the extreme southern part of Virginia and adjacent North Carolina. While podzols are usually associated with heavy rainfall and low temperatures, they are present here by reason of the sandy soils, which leach readily. All require manure or commercial fertilizer to produce cash crops. Of all the regions in Anglo-America, only the Cotton Belt and the Piedmont expend as much for commercial fertilizer (Fig. 36).

In the North Atlantic Coastal Plain, soil is considered "primarily a medium through which to feed the crops."

Natural vegetation

Originally, except for the coastal marshes and sand dunes, virgin forest of conifers (pitch pine, shortleaf pine, and white cedar), or of deciduous species (black oak, chestnut, maple, hickory, beech, ash, and elm), or a mixture of the two, characterized this region.

Conifers dominated the podzols and the red and yellow soils (the problem area), but deciduous trees with practically no conifers prevailed over the gray-brown podzolic areas—the better soils.

More than one half of the region is still in forest and brush (not virgin), despite its settlement by white men and its nearness to the great cities of New York, Philadelphia, Baltimore, Washington, and Norfolk. Some 1,200 square miles in southeastern and south-central New Jersey have almost no farm settlements. In these "pine barrens" dwell the "pineys," who have attracted much attention from sociologists, historians, and others. On hidden trails and beside dismal swamps live many illiterate people, despite the fact that they are within easy walking distance of modern communities and within 2 hours by train from Philadelphia and New York. At the outset the people who occupied the pine barrens were the same stock as those who settled on what later proved to be the better lands. The more energetic and able emigrated, however, resulting in a depreciation of the stock that remained. Their backwardness proves that nature as well as nurture plays heavily in human affairs.

Settlement

This region, especially Tidewater Virginia, was a cradle of Anglo-America. Colonial life centered in the plantation, rather than in the town, as in New England. The local isolation and economic self-sufficiency of the plantation were antagonistic to the development of towns (Fig. 37). Prior to 1700, Jamestown was the only settlement in this region that really could be called a *town*, and it was actually nothing more than a village.

Nearly all settlements were located on navigable streams, and

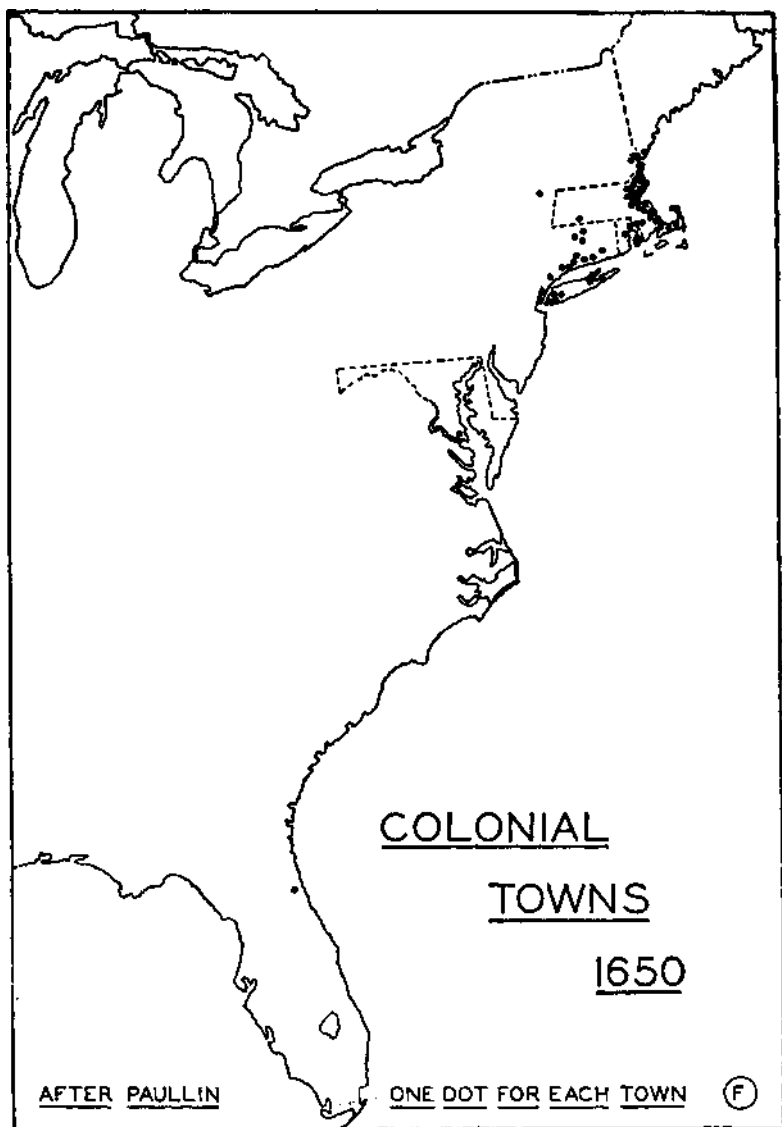
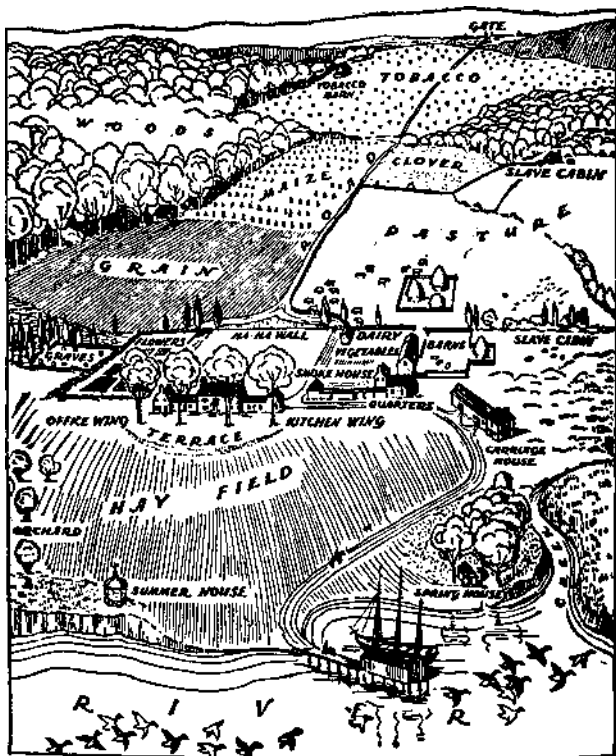


Fig. 37. Colonial towns. Since each plantation in Maryland and Virginia was a community within itself and since ships from England came direct to the wharves of many plantations, important collecting and distributing centers (towns) did not grow up. Note the difference in the number of towns between Maryland and Virginia and in New England. (Adapted from map (Plate 61) in "Atlas of Historical Geography of the United States.")

every planter owned a wharf which could be reached by the small ships of that day (Fig. 38); in fact, one of the strongest reasons for which the planter selected his land was that it fronted on a water highway.



Courtesy Ginn & Co. and Maryland State Planning Commission.

Fig. 38. A typical eighteenth century waterfront plantation. With hundreds of miles of shoreline available on 3 sides but with trackless forests inland, settlers naturally located their plantations on the waterfront, relying almost wholly upon water transportation.

Plantations were governed geographically by the streams; counties were governed by the plantations; men thought in terms of plantations. . . . The growth of towns and cities was simply not a part of the scheme of society. When late in that first century men bethought themselves of the need of towns, it was too late. "The rural system was so well established that it was impossible to overcome its influence."²

² A. B. Hulbert, *Soil: Its Influence on the History of the United States*, pp. 111-112. New Haven: Yale University Press, 1930.

Within 12 years after the founding of Jamestown, plantations had spread 70 miles upstream, extending inland for several miles from either bank. Nowhere was there between rivers a land-reach greater than 20 miles, and frequently it was 5 miles or less. It would be wrong, however, to believe that colonial Tidewater Virginia and Maryland were entirely lands of plantations, slaves, and beautiful mansions.

There were several strata of society, but only the great land-owners and the yeomen will be considered here. The wealthier and more intelligent planters occupied the more productive lands. Yeomen, for the most part poor, operated the medium-size farms in the less productive areas. They found it both difficult and irritating to compete with Negro slaves. So powerful had the large plantation owners become that the yeomen experienced great difficulty in obtaining even small holdings. Hence the ablest migrated westward.

The introduction of slavery

Slaves were first introduced because the tobacco-growers of Tidewater Virginia and Maryland demanded them. Slaves could be used only where the work was set in simple and continuous tasks, where the winters were mild so that they could work out of doors 12 months in the year, and where the cost of living was low. In fields growing tobacco and corn, slaves working in gangs could be supervised easily. Women and children also worked. Slavery never really prospered in this region, however, as it did in the cotton and sugar areas to the south. It is thus apparent that the distribution of slavery throughout the United States was based on geographical conditions and not on sentiment. By 1840 it was declining in both Maryland and Virginia.

Economic Activities

Early agriculture

From earliest settlement, farming has been the predominant occupation. In colonial days it was assumed to be the necessary employment of all, and nearly everyone considered the ownership of tillable land the acme of "human earthly desire." Even those who were classed as merchants, fishermen, and manufacturers were really part-time farmers.

The colonies composing the North Atlantic Coastal Plain were not entirely self-sustaining; they had to produce something for exchange. They planted the European grape, but it failed; they

introduced the mulberry and the silk worm, but unsuccessfully; they tried to rely on furs, but the supply was neither permanent nor plentiful. Something must be found that was in demand and had high value per unit of weight or bulk. *Tobacco proved to be that product.*

Tobacco. The commercial production of tobacco began in 1612, and within a few years it was the leading crop. In fact, it was grown almost to the exclusion of foodstuffs. When Captain John Smith was questioned by a Royal Commission to explain why Virginia did not grow wheat instead of tobacco, he replied that a man's labor in tobacco cultivation was worth six times what it was in growing wheat.

The continuous growing of a single crop on a given area, however, is soil robbery, and the history of early agriculture here is the history of land conquest. Tobacco had not long been cultivated before planters found it necessary to acquire additional land. As soon as the soil showed signs of exhaustion, it was allowed to grow up in grasses and trees, and a new field was cleared. For this reason the large plantations came into being. The tobacco planter had to have enormous acreage on which he could grow his crop, since it was necessary to reclaim new land from the forest as the soil lost its fertility. It was soon found that the soils were becoming depleted at so rapid a rate that few fields could produce more than 3 consecutive crops. To make matters worse, the neglect of the old fields encouraged washing and gulying. Thus tidewater counties were suffering from soil depletion as early as the First Census—that of 1790. About that time some planters began to move onto the Piedmont. Though there was an agricultural revival during the 1850's when farm journals and soil chemists pointed out the value of commercial fertilizer,³ deep plowing, and improved seed, tidewater Virginia and Maryland were losing their Southern characteristics. The plantation was giving way to the small diversified farm, in which slavery had a steadily declining part. The truck farms were in sharp contrast to the large old-fashioned plantations from which they were carved.

³ The use of chemical plant food in the United States probably dates from 1830, when the first Chilean nitrate was imported. Production of mixed fertilizers was started in Baltimore in 1850, and the establishment of other factories along the Atlantic Seaboard followed. It is estimated that production in 1856 was about 20,000 tons and in 1868, 50,000 tons. (H. Willett, "Fertilizer Consumption in the United States," *The National Fertilizer Association*, Washington, D. C., August 1937, p. 3.)

Present-day agriculture

Since the earliest settlement, a selective process has been going on in this region—the best lands continuing productive, the bad ones reverting to wilderness. Tobacco no longer is important except in southern Maryland west of Chesapeake Bay, where it is a major cash crop. Wheat, corn, and hay occupy a considerable part of the land under cultivation, the gray-brown podzolic soils being well adapted to them, especially in Maryland, Delaware, and the Northern Neck of Virginia. If proper rotations are maintained and moderate amounts of commercial fertilizer used, the yields are satisfactory. Thus Virginia's highest per-acre yield of corn is procured from its Eastern Shore. In Maryland, Delaware, and the Northern Neck of Virginia, the average wheat yields compare favorably with the average for the United States.

The growing of vegetables, however, is profitable in many parts of the region. Vegetable consumption in North America has increased greatly since 1920, largely as a result of (1) dietary research—especially as regards the value of vitamins—and (2) the development of refrigeration, which permits perishable products to move great distances in season.

Every urban dweller, exiled from the soil, consumes 175 pounds of fresh vegetables each year, or a half-pound each day. While this may seem like a sizable amount for a single individual to consume in a year, 2 months' cultivation of a field 45 feet square can meet this requirement. Thus only a fraction of the land available for truck crops is actually utilized in the North Atlantic Coastal Plain. This region is the world's foremost producer of commercial vegetables. Moreover, truck farming is so intensive that it is not profitable, ordinarily, to work a large farm. On identical acreage, vegetables require 5 to 20 times as much labor as wheat. Ordinarily, as fast as one vegetable is harvested, the field is plowed, fertilized, and planted to another (Fig. 39).

Vegetable production nearly always is ahead of consumption. In 1938 the largest canned-food and frozen-food surplus in America's history—22,000,000 cases of canned goods and 51,300,000 pounds of frozen vegetables—was carried over into the 1939 season. It is for this reason that only a small part of the region is under cultivation. O. E. Baker says: "It appears certain that most of the land in this area will remain in forest or brush for many years to come—probably permanently."⁴

⁴ O. E. Baker, "Agricultural Regions of North America: Part VII, The Middle Atlantic Trucking Region," *Economic Orography*, January 1929, Vol. V., No. I, p. 46.

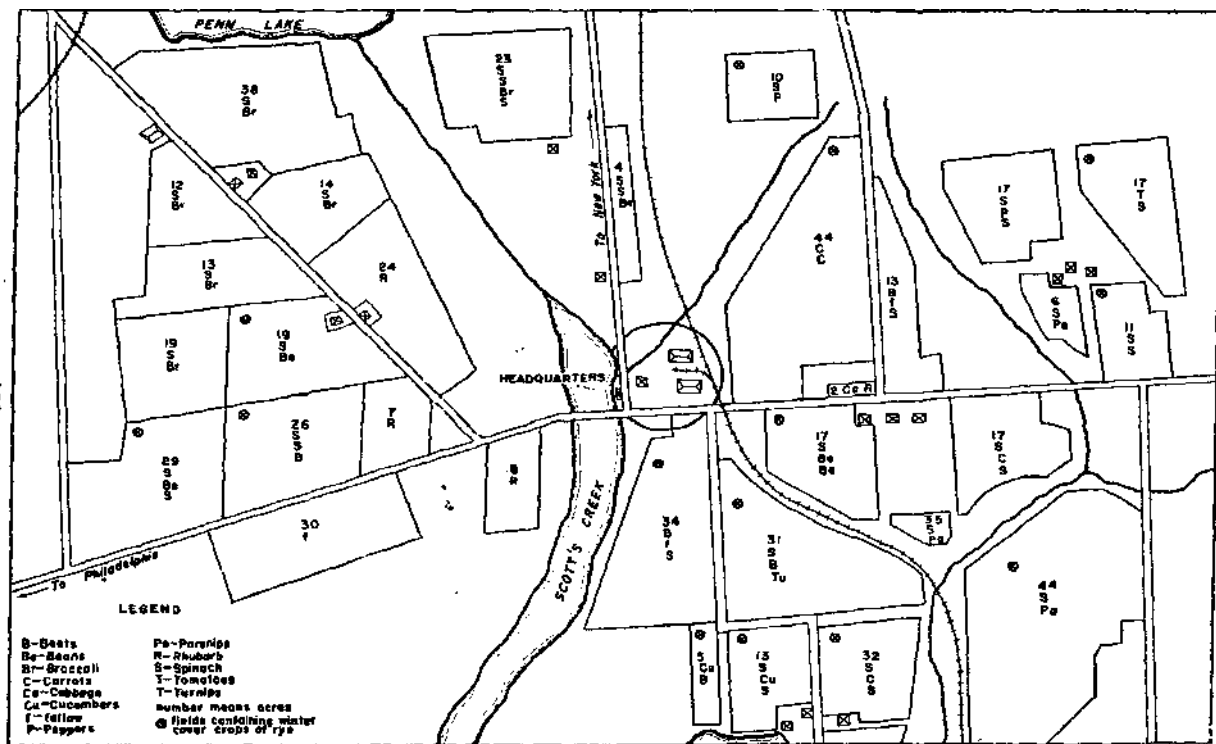


Fig. 39. A section of the King Farms, Morrisville, Pennsylvania. (Adapted from a chart in "Fortune.")

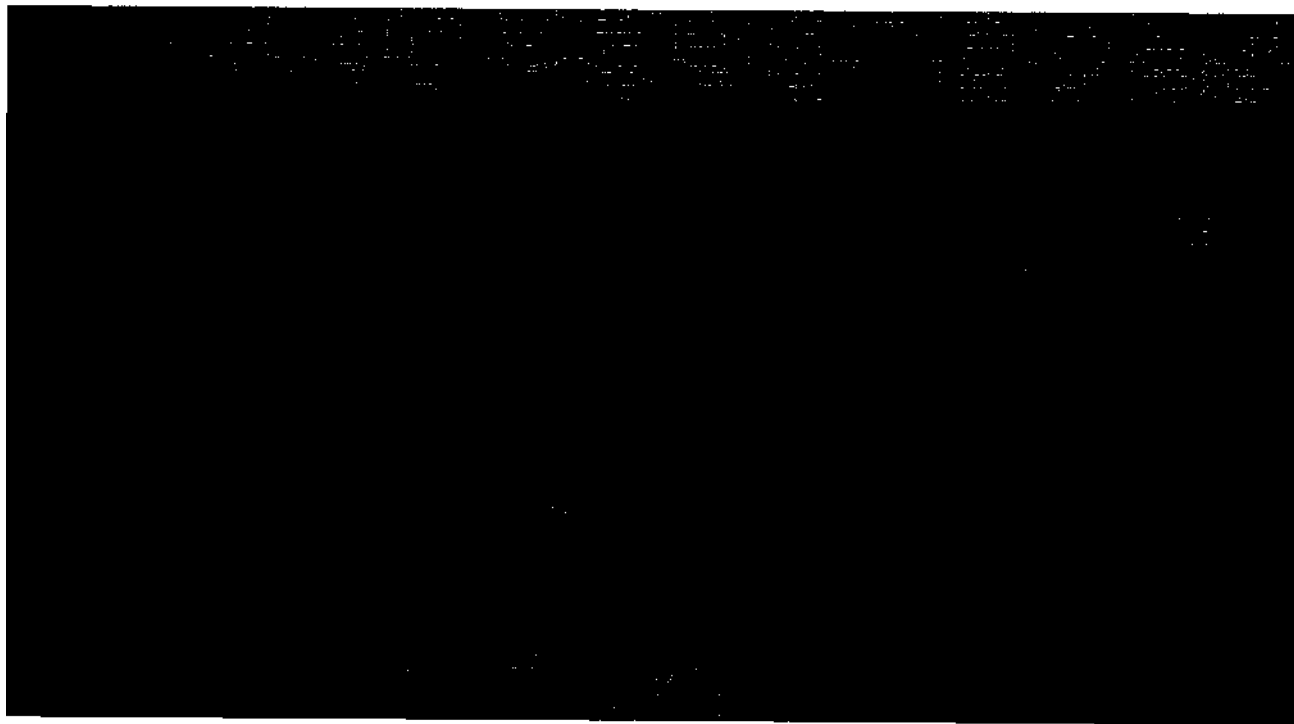
The region is favored geographically for vegetable production by its long growing season, its level terrain, and its light, easily tilled soils that warm rapidly in the spring. A superb location with respect to the nation's outstanding markets for truck crops, along with almost unexcelled transportation facilities—rail, boat, and truck—add to this region's advantages.

The crops. Potatoes and sweet potatoes are among the outstanding crops. Though potatoes reach their optimum in areas having cooler summers, they were first grown here for the fancy prices that usually go with an early crop. Since fancy prices have been lacking for more than a decade, acreage has greatly decreased (about 45 per cent in eastern Virginia). Some growers continue to produce potatoes on the better soils where they can get the highest yields, but most of them are raising truck crops, especially tomatoes, instead. This region's potatoes appear on the northern market from late June to early August—after the peak of the season in the Carolinas but before the arrival of the Long Island crop. For the most part, potatoes are grown close to large population centers; in fact, maps of population and potatoes usually coincide remarkably well. A notable exception is the southern part of the Eastern Shore, where the industry is important because of especially favorable physical conditions for the crop.

Sweet potatoes, tropical or subtropical in origin, have been grown here since 1650 and perhaps since 1610. Favorable conditions are the sandy loam soils, long growing season, warm nights, and relatively high temperatures. Possibly more important than the physical conditions is the fact that a product so perishable and low in price must be grown near markets. Commercial production since 1909 has been concentrating in New Jersey, the Eastern Shore of Maryland and Virginia, and northeastern North Carolina.

Other commercial crops include sweet corn, cucumbers, cabbage, peas, peppers, onions, greenbeans, lettuce, celery, asparagus, tomatoes, and spinach. Some of these are sold as they ripen, while others are grown for canneries. When truck farmers grow fresh vegetables for sale, they make the most money by getting their crops to market early; hence they try to settle in the warmest part of the area.

In summarizing, it may be noted that (1) potatoes are exceptionally important in central New Jersey, the southern part of the Eastern Shore of Virginia, and northeastern North Carolina; (2) sweet potatoes are found in northeastern North Carolina, on the Eastern Shore of Virginia, and in Maryland, Delaware, and New



Campbell Soup Co.

Fig. 40. Harvesting tomatoes for a canning factory. The North Atlantic Coastal Plain is by far the greatest tomato-producing area in Anglo-America and probably in the world.

Jersey; (3) tomatoes are dominant in southern New Jersey, Delaware, eastern Maryland (Fig. 40), and Virginia.

Peanuts are important, especially in southeastern Virginia and adjacent North Carolina, which grow the large-podded variety for human consumption. This crop requires a long summer and a light-textured soil.

Although a legume, peanuts do not add nitrogen to the soil if the nuts are harvested. Hay from the peanut plant is fully as valuable as alfalfa and clover. The peanut has helped to terminate the one-crop system of farming so long prevalent here.

Small fruits such as watermelons, cantaloupes, strawberries, blackberries, and raspberries are grown here and there. Delaware, Maryland, and Virginia are notable for strawberries and southern New Jersey for cranberries. After Georgia, New Jersey is the next greatest peach-producing area near the Atlantic Seaboard.

Dairying. The North Atlantic Coastal Plain generally is of minor importance in dairying, despite large near-by markets for fluid milk. Pasture comprises less than 5 per cent of the farmland. In no other region in the entire continent is pasturage so unimportant. Where vegetables really thrive one rarely sees a dairy farm.

A notable exception, however, is to be found on the Eastern Shore of Maryland where, because of insect pests and diseases, the fruit industry failed. Proximity to large cities and improved transport facilities enabled it to market fluid milk, much of which is sold by cooperative organizations. A city ordinance in Baltimore requires that milk come from a distance not to exceed 50 miles.

The transportation and marketing of vegetables

Large-scale commercial production of truck crops became possible only in proportion to the availability of rapid and efficient transportation. A region with an ideal combination of natural environmental conditions but lacking rapid transportation facilities could have no truck-farming industry of importance. Prior to the advent of the railroad, refrigeration, and other facilities for handling fresh vegetables to distant points, commercial production was restricted to the outskirts of large cities. But, if transportation helped the region market its products, it also required the grower to increase acreages of some crops, decrease others, and eliminate ^Atill others. The region everywhere is well served by rail, water, or highway. Moreover, within or adjacent to it is a long line of cities reaching from Boston to Norfolk whose total population comprises an amazingly large part of Anglo-America's

total (Fig. 131). Probably no other region on earth possesses such an enormous and immediate city market for its products. The great resorts are an additional market; tourists in New Jersey alone number millions annually. The Hampton Roads district is more important than its population figure indicates, because of its military posts and naval bases, and because many commercial vessels replenish their supplies there. The importance of proximity cannot be overestimated—75 per cent of the vegetables sold in New York City come *in season* from farms within 100 miles.

Transportation by water. For generations water was the only form of transportation in most of this region. Boats carried vegetables from Norfolk to Philadelphia, New York, and Boston but such shipments are no longer important.

Transportation by rail. The railroads, because of their speed, supplanted boats, and for many years carried almost unbelievable quantities of vegetables and fruits to the large Atlantic Seaboard cities. Railroads continued to dominate until the advent of improved highways and motor trucks. Now some of the railways that were built to handle truck crops are in a rather sorry plight.

Transportation by truck. The speed and directness of the motor truck have enabled it to displace almost completely the boat and to compete seriously with the train as a carrier of truck crops. Trucks are used especially when the distance does not exceed 150 miles. New York City, which formerly received only 5 per cent of its vegetables by motor truck, now gets 35 per cent by truck. These vehicles can be loaded quicker and they go three times as fast as boats. With good roads, farmers can now serve more markets and compete more successfully with distant producing areas. Nearly every truck-farm is within driving distance of several large cities between Boston and Norfolk.

West Shore transportation. Strangers frequently are amazed to learn that whole counties in the North Atlantic Coastal Plain have not a single mile of railroad; this is true of 10 of Virginia's tide-water counties.

Because of the excellence of water transportation and the difficulty and cost of north-south railroad construction in an area deeply cut by large rivers and estuaries, waterways provided the only means of transport for more than 150 years. Hence most north-south railroads and highways are on the Piedmont west of the Fall Line. Also, in Tidewater Virginia, the dominant population living on large estates did not wish its culture disturbed by an influx of outsiders attracted solely by economic motives. These people were by no means certain that the railroads would be finan-

cially successful, and, since they possessed the bulk of Virginia's wealth, they did not wish to finance a *sour* improvement.⁵ They were fairly well provided with transportation, considering that each plantation was largely self-sustaining so far as the necessities of life were concerned and that English merchantmen brought other items to their very wharves (Fig. 38). Much later, railroads were discouraged because of the fear of competition from the hinterland.

Rural Depopulation

Despite the importance of truck-farming, fewer people are engaged in agriculture today than a century ago. In fact, the more southerly part of the region passed the climax of its prosperity on the eve of the War for Independence.⁶ It suffered still more in the War of 1812. From 1820 to 1840 there was a heavy exodus. "Ask those who have gone, or are going west, why they have left, or intend to leave their native hills," declared the editor of the *Farmer and Gardener*, "and they will tell you the soil is worn out." While this was an important reason, the principal cause of emigration was the opening of the cheap land and extremely fertile soils of the Middle West, with which Tidewater Virginia and Maryland could not compete. An additional factor was that the plantation system was so lacking in democracy that the family of small means could make little headway socially or economically, and the New West loomed as a beacon of hope. According to the late A. E. Parkins, "There was naturally little in common between the wealthy, better educated, more intelligent larger slave-holding planters on the more fertile tracts and the poor, unschooled small farmer who performed most of [his own] farm tasks."⁷

In Virginia, for example, outside of the major cities, 20 of the 28 tidewater counties lost heavily in population in the decade 1920-1930. Moreover, this is the only part of the state where depopulation is occurring and the loss is not absorbed by cities. The population in Tidewater Virginia and Maryland is only about half of what it was in 1810. The same is true in New Jersey which has 400,000 acres of deserted farms; here, however, the urban pull is strong and suburbs occupy much former farm land.

⁵C. C. Wright, *The Development of Railroad Transportation in Virginia*, p. 4. Charlottesville: University of Virginia, 1930.

⁶Wilson Gee and J. J. Corson, "Rural Depopulation in Certain Tidewater and Piedmont Areas of Virginia," *University of Virginia Institute Monograph No. III*, 1929, p. 14.

⁷A. E. Parkins, "The Antebellum South," *Annals of the Association of American Geographers*, March 1931, Vol. XX I, No. I, p. 7.

Present Inhabitants

South of Delaware Bay the farmers are old American stock and 35 per cent are colored. North of Delaware Bay, especially in New Jersey, the farmers are largely of foreign origin: German, Irish, English, and Italian. European immigrants have long shunned the lands south of the Mason-Dixon Line because their higher standard of living would prevent them from competing with the Negro and because the social status of agricultural labor is unattractive.

The difference in population north and south of Delaware Bay affects the tempo of life. To the north the manner of living is typically Northern, to the south typically Southern. In the latter area farming is not so scientific, and the standard of living is low. The Negro prefers the spasmodic labor of truck farming to the rigid requirements of dairying.

In Maryland and Virginia Negroes generally occupy better lands than white farmers, for they work parts of former plantations which had to be sufficiently productive to support both the landlord and his slaves.⁸ A large part of the white farmers attempt to farm sandy soils that never were much good.

Canning

The North Atlantic Coastal Plain is the greatest vegetable-canning area in the world, and Baltimore is the only large American city ranking high in that industry. No doubt a major cause has been the ease with which steamboats gather vegetables from the widely scattered areas interlaced by tidal estuaries.

Canning does not depend solely on the surplus produce of the area—that which would otherwise spoil because of glutted markets. It is unwise to let the surplus reach the cities, since an increase of only 5 per cent depresses the price 25 per cent. In Maryland 90 per cent of the tomatoes, sweet corn, and peas are sold to some 400 canneries. At least 90 per cent of the requirements of the canneries is grown and sold on a contract basis. In spring a contract is made whereby the farmer agrees to grow a certain number of acres of crops for a definite price. He guarantees that he will deliver only his own produce and that this will be all he raises except for his own consumption. The best canneries watch their farmers closely,

⁸ O. E. Baker, "The Agricultural Regions of North America: Part VII, The Middle Atlantic Trucking Region," *Economic Geography*, January 1929, Vol. V, No. 1, p. 66.

keeping inspectors constantly on the job, estimating yields, and advising on scientific production. The farmer normally contracts with a cannery located near-by, to simplify the problem of transportation. Good farmers who contract for 15 or 16 acres in tomatoes may get as much as \$2,500 for them.

Growers who produce without a contract must sell wherever and for whatever price they can get.

The tendency in the past was toward regional specialization in the growing of crops for canning. Only the market gardens, which lie close to great cities, grew a large variety of vegetables. Recently, however, the trend in truck farming has been toward greater variety.

From the growers' standpoint, the canning industry is a form of insurance- In years of glutted markets, they are saved by the canneries. It is significant that canning communities are invariably prosperous.⁹

Fisheries

The region leads all others in North America not only in commercial truck farming but also in the production of shellfish. About five sixths of the world's oysters are removed from the coastal waters between Cape Cod and Cape Hatteras, the outstanding areas being in Chesapeake and Delaware bays, Long Island Sound, and Maurice River Cove (Fig. 41). Until 1924 the annual oyster catch was the nation's most valuable seafood, but the salmon now leads. Nevertheless about a third of the total value of American fisheries is from oysters.

The favorable geographic conditions of the region are its many bays, estuaries, coves, and tidal flats, and its relatively warm and shallow water. Chesapeake Bay is the choice fishing ground: its waters have the ideal salinity, its tides are weak, it is relatively free from mud and shifting sands, and it lacks such pests as screw-borers, black-drums, and starfish. It also is close to the great markets of the industrial East.

The Amerinds taught the white man to catch oysters with a forked stick. This method was too slow for the white man, however, and he soon used a boat and a pair of tongs (Fig. 42A). Later came the dredge for scooping along the bottom (Fig. 42B). The oyster industry boomed from 1870 to 1890, when between 800 and 900 dredges sailed the Chesapeake region, scooping up oysters from

⁹ L. C. Corbett and others, "Fruit and Vegetable Production," *1925 Yearbook of Agriculture*, p. 430. Washington, D. C: Government Printing Office, 1925.

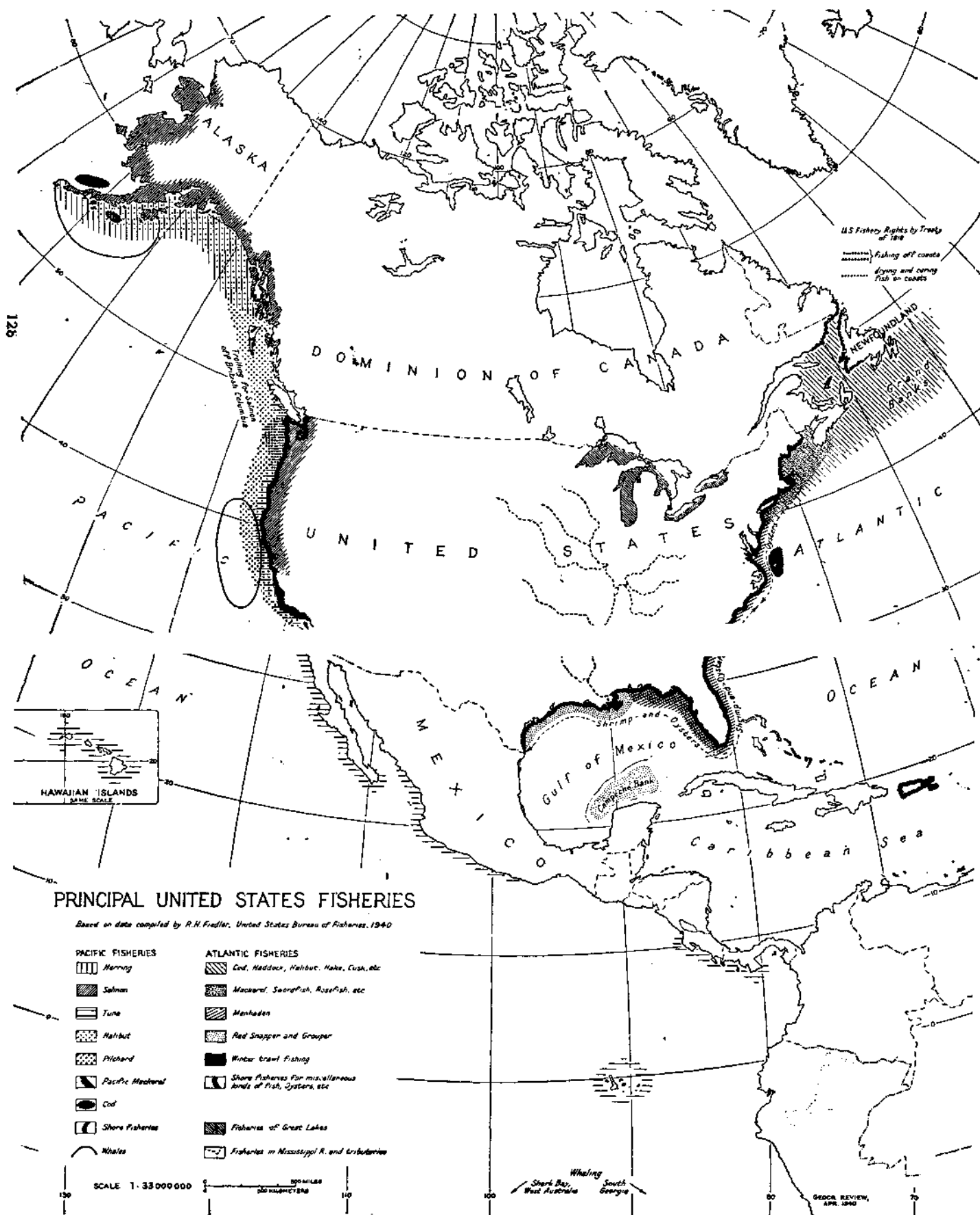
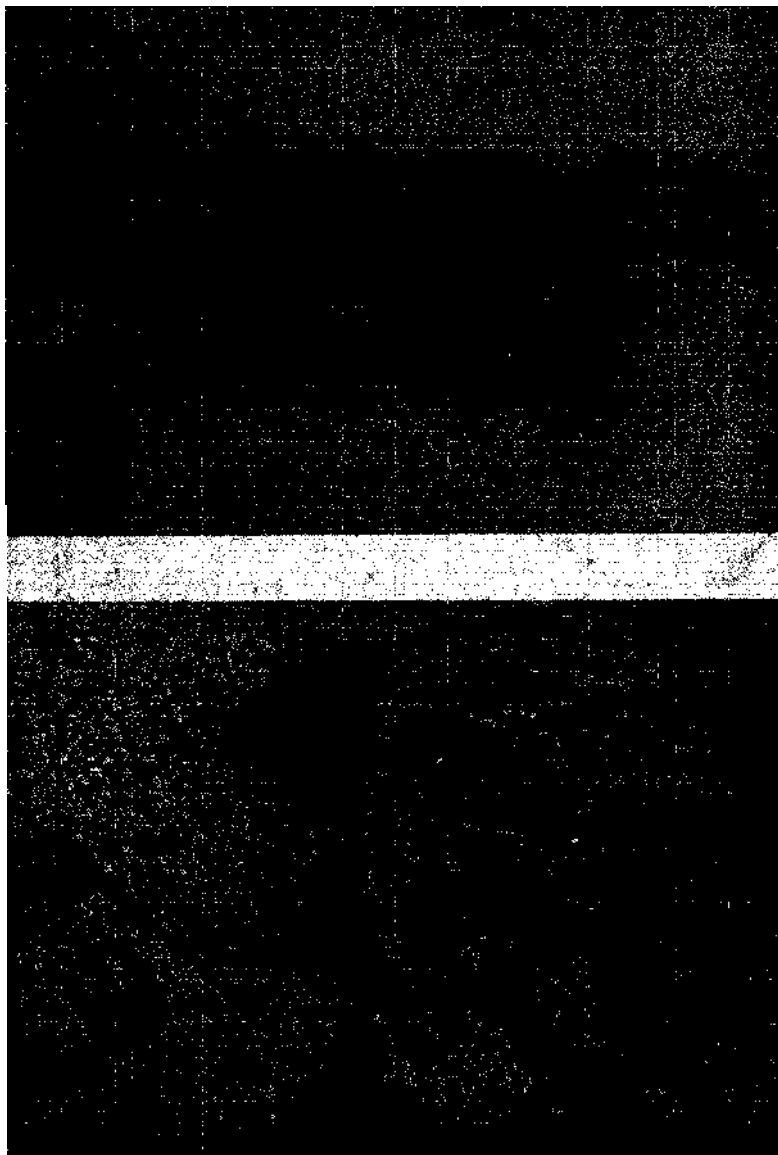


Fig. 41. Principal United States fisheries.



Virginia State Chamber of Commerce,

Fig. 42. Harvesting oysters in Virginia waters with tongs (top) and dredge (bottom).

the bottom of the bay and stripping the beds. In 1880 the catch in Maryland alone exceeded that of all the rest of the world. As a result of overfishing and pollution, the rich Chesapeake beds were nearly destroyed in two decades. Thereupon oyster farming was begun, and it is hoped that this will insure a continuous supply. The industry's future depends on "whether oystermen can change their viewpoint from that of hunters to that of farmers."¹⁰ Thousands of acres of useless bottom have been transformed into valuable food-producing areas, Virginia alone having 60,000 acres operated by lessees. The oyster is readily cultivated. Living in shells, it cannot move after once cementing itself to some clean, hard, submerged object—an old tin can, bottle, auto tire, tree, loose rock, or oyster shell. It takes most readily to an abandoned oyster shell.

Under favorable conditions the shell remains ajar. Water passes through the gills, bringing oxygen and food. It is said that an oyster pumps more than 15 gallons of water through its gills daily.¹¹ A single female in one season may lay as many as 500 million eggs. The development of the oyster from the egg to the setting stage requires 13 to 16 days. The eggs, after being laid, float through the water and hatch in the drifting current. The ideal temperature for spawning and propagation is 68°F. or above. For a short time the young oyster is a free swimmer. During autumn and winter it hibernates. Some states, for example New York, do not permit oysters to be sold from April through August. Oysters are not palatable in summer, for they are either full of spawn (whence their flat taste) or they have just spawned (hence their thinness and stringiness).¹²

Shad, sea trout, flounder, butterfish, alewives (river herring), and menhaden all are important commercially in the region. In spring millions of these fishes ascend the streams to spawn. Menhaden are inedible but supply a valuable oil and play an important role in the commercial fertilizer industry. Menhaden travel in enormous schools and are detected by airplanes which inform the fishing boats of their whereabouts. Trawl fishing and pound fishing both are important locally along the coast. In pound fishing, huge nets are attached to piles, which rise through seven fathoms (42 feet) of water and project above high tide for 10 feet.

¹⁰ "The Oyster," *Fortune*, December 1930, Vol. 11, No. 12, p. 72.

¹¹ H. F. Prytherch, "Scientific Methods of Oyster Farming," *Scientific Monthly*, February 1934, Vol. 38, No. 2, p. 127.

¹² "The Oyster," *Fortune*, December 1930, Vol. 11, No. 12, p. 71.

Recreation

The coast, one of the leading summer playgrounds for the great industrial East, is dotted with scores of resorts including, among the better-known, Asbury Park, Atlantic City, Cape May, Lewes, Ocean City, Rehoboth Beach, and Virginia Beach. The warm water and white sand make bathing far more pleasant here than in New England.

Atlantic City is the most famous. Its site was formerly low-lying, sandy, mosquito-ridden, and uninhabited. With a population of 100,096, it receives annually about 16,250,000 visitors. With more than 1,200 hotels, many of which are elegant, it can accommodate in excess of 500,000 overnight guests. It is reached by magnificent motor roads and fast railways.

This coast eventually may become almost solidly lined with cities and cottages as workers in manufacturing plants put in shorter hours and have more leisure.

What Atlantic City is to the northern part of the region, Virginia Beach is to the southern. In addition to the incomparable bathing characterizing the entire coast, Virginia Beach is near many of the nation's top-ranking tourist attractions—colonial Williamsburg, Jamestown, and Yorktown, as well as Langley Field and Fortress Monroe.

Manufacturing

Away from the Fall Line Belt, the coastal plain has had merely "crossroads," "stores," and "courthouses." Even today a county seat may consist of little more than a* courthouse. The coast has few harbors capable of accommodating large ships and hence has not developed an industrial and commercial population.

The large manufacturing cities of northern New Jersey, along with Baltimore, Philadelphia, and Wilmington, belong not here but in the American Manufacturing Belt.

The canning industry has given rise to many subsidiary enterprises—the making of crates, baskets, and boxes. The only other industries are fertilizer-making, shipbuilding, vegetable-oil processing, and cleaning and roasting peanuts.

Manufacture of fertilizer. The North Atlantic Coastal Plain, strategically located with respect to large local markets for fertilizer and ports that import fertilizer ingredients, ranks high in this branch of the chemical industry. In fact this region has been important in the manufacture of commercial fertilizer since the

middle of the nineteenth century. Fertilizer materials take first rank into the import trade of several cities, such as Norfolk.

Shipbuilding

Newport News has one of the largest and best-equipped ship-building plants in the world. It has constructed many of the nation's most powerful and formidable battleships as well as an imposing list of merchant vessels. The city's advantages for this industry are (1) a wide channel, (2) deep water, (3) a climate permitting out-of-door work throughout the year, and (4) plenty of room for piers and dry docks.

Cities and Towns

So overwhelmingly agricultural is the region that it has few cities. It relies on the production of truck crops for the American Manufacturing Belt to the north and northwest, which is unable to provision itself, and for the Cotton Belt to the south, which specializes in an inedible product. In colonial days there was no need for towns except as seats of government. The people had to live and hence they turned to the soil.

The region then was "at heart townless." In Maryland were many large manors—one of them containing 32,000 acres. Grouped around the manor house were quarters for the servants and workshops for blacksmiths, weavers, shoemakers, and others (Fig. 38). Few towns grew up during colonial times because each plantation was practically a community in itself. In 1683 Maryland decided that it must have more towns and ordered that in five years 62 should be built on navigable water; most of them never got beyond the paper stage.¹³

Norfolk (323,326)¹⁴ is the one large city that belongs entirely to this region. It owes its population to its position on the great harbor of Hampton Roads, formed by the union of the James, Nansemond, and Elizabeth rivers, and to its relation to a natural route to the Atlantic Seaboard from the rich coal country of the Appalachians.

Norfolk as a city is not old. Though it was a town in 1705, its rise had to await the railway. The great ocean vessels could not go to the falls at Richmond so conveniently and economically as railways could bring coal from the hinterland to the ocean docks.

¹³ Maryland State Planning Commission, *Regional Planning: Part IV, Baltimore Washington-Annapolis Area*, p. 6, Baltimore, 1937.

¹⁴ This figure is for the Norfolk-Portsmouth-Newport News metropolitan district.



Thus the railroads became "the arteries that pumped life-blood to and from the hinterland." Accordingly, Norfolk is the world's leading coal-handling port (Fig. 43).

Norfolk is on a truly great harbor—that of Hampton Roads—which it shares with Newport News, Portsmouth, and Hampton. It has a water frontage of 50 miles, and more than 20 miles have been developed. It has easy access to the west by eight trunk-line railroads; it is close to the Atlantic; it is free from ice, has no dangerous currents, has only a low tidal range, and few fogs and storms. It is primarily an exporting port, and in this respect is the exact opposite of Boston.

Norfolk is not only important commercially; it is also an important manufacturing center. It is a strategic location for industries that utilize raw materials from overseas or depend upon foreign markets or American seaboard cities. The chief industries are those engaged in making commercial fertilizer (enormous quantities of inedible fish, largely menhaden, from local fisheries are used), refining cotton-seed oil, roasting coffee, processing cork, fabricating forest products, assembling automobiles, and making cotton and silk textiles.

Newport News, like Norfolk, is located on Hampton Roads and is the terminus of the Chesapeake & Ohio—one of the country's leading coal-carrying railways—which follows the James River through the Appalachian barrier to tidewater. While an important port in foreign and coastwise trade, it is surpassed by Norfolk. One of North America's largest shipbuilding industries and repair plants is located at Newport News.

Atlantic City (100,096), on an island of New Jersey's south shore, is a pleasure resort. The summer population (300,000) is several times as great as its winter population. Atlantic City cares for about 16,250,000 visitors a year. Its boardwalk, 60 feet wide and 7 miles long, is world-famous.

Salisbury (13,313) occupies an excellent harbor at the head of navigation on the Wicomico River and ranks next to Baltimore in importance among Maryland's ports. It is the trading center of the Eastern Shore as well as much of the Del-Mar-Va Peninsula. Its industries are engaged in canning and manufacturing clay products, fertilizers, and clothing. With marshlands abounding in wild fowl and with fresh and salt waters rich in fish, Salisbury is a mecca for sportsmen

The Outlook

Possibly no other region in Anglo-America has an outlook so difficult to forecast as that of the North Atlantic Coastal Plain. That part of the region being farmed will continue, perhaps for a century or more, to specialize in the commercial production of vegetables and fruits for the large urban markets near by. Most of the region, however, will probably remain in forest, with the area under cultivation actually declining, because sandy soils are not well suited to most staple crops and pasturage and because truck crops demand but small acreage.

If the mosquito problem could be solved, the tourist business would greatly increase. Part of the region, especially the New Jersey portion, might become more highly industrialized. The North Atlantic Coastal Plain might be suitable for the type of community being strongly recommended by some regional planners—one combining farm work with factory work.

CHAPTER VII

The Piedmont

A REGION OF GENERAL FARMING, TOBACCO GROWING, AND SPECIALIZED MANUFACTURING—COTTON TEXTILES, CIGARETTES, AND FURNITURE

INLAND from the North Atlantic Coastal Plain (Chapter VI), between the Blue Ridge and the Fall Line Belt, lies the Piedmont—a long belt of foothills averaging about 100 miles in width (Fig. 44). Extending from southeastern New York to Alabama, it reaches its greatest width in southern Virginia and North Carolina. It differs from its neighbors to the east and west. It is not homogeneous throughout, but it definitely is a region. The region may be divided into:

1. The Northern Piedmont (from southeastern New York across Maryland to north-central Virginia)—an area of general farming and dairying.
2. The Central Piedmont (central and south-central Virginia and north-central North Carolina)—especially noted for the production of tobacco and apples.
3. The Southern Piedmont (south-central North Carolina, western South Carolina, northern Georgia, and eastern Alabama). Regionally this segment may be included also in the Cotton Belt, since the growing of cotton is the leading enterprise. To the authors, however, it seems to be so definitely a part of the Piedmont that it is discussed in this chapter.

The White Man Arrives

When white men began to settle the Piedmont some two centuries ago, they found a beautiful, forested region. The forest growth was so dense there was no apparent erosion of soil. Except during rains, the streams were clear and sparkling.

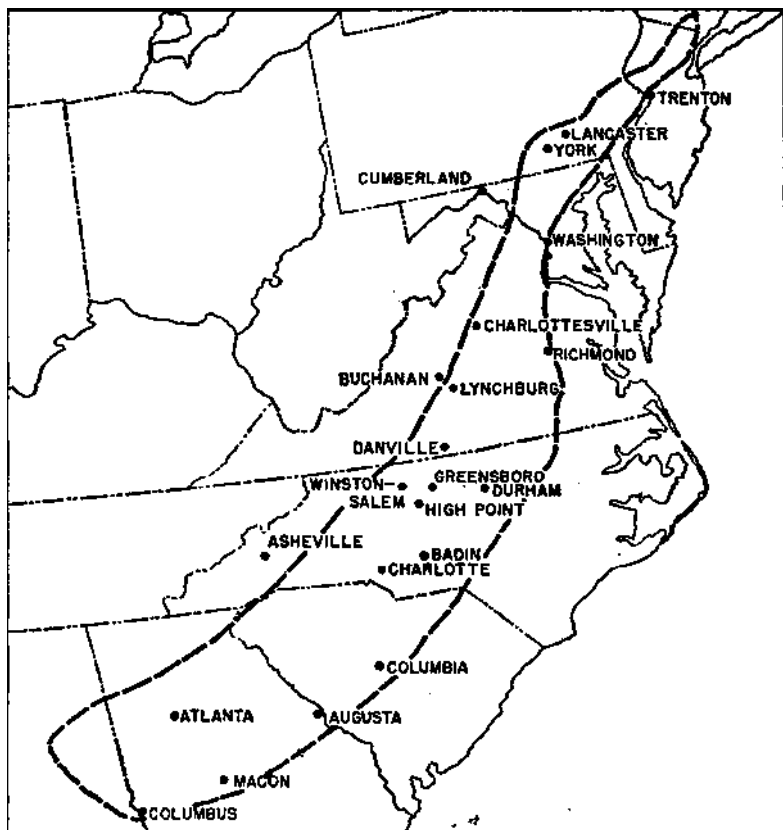
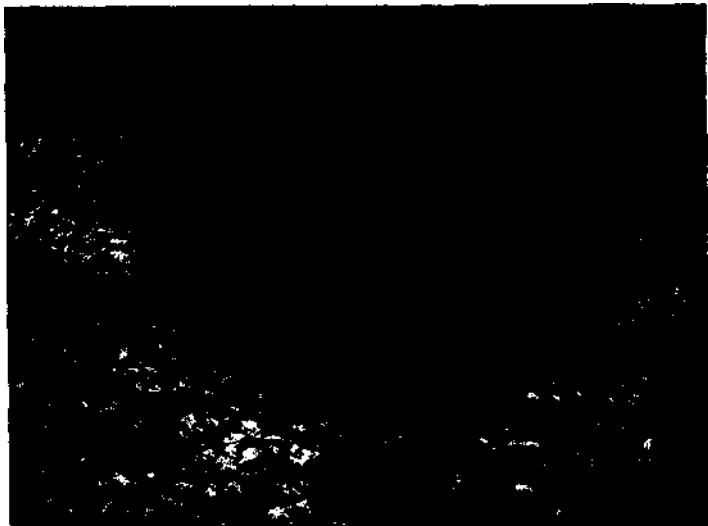


Fig. 44. The Piedmont: a region of general farming, tobacco growing, and specialized manufacturing—cotton textiles, cigarettes, and furniture.

A squirrel might have leaped from bough to bough for a distance of a thousand miles and have seen scarcely a flicker of sunshine on the ground, so contiguous were the tree crowns and dense the foliage.¹

The soils, whose life cycle had not been interrupted, were covered with forest litter. They absorbed water easily and filtered it slowly to the streams (Fig. 45). Game was abundant—wild turkey, deer, and partridge.

¹ W. C. Lowderrailk, *Soil Erosion and Its Control in the United States*, p. 2. Washington, D. C: Government Printing Office, 1935.



Soil Conservation Service.

Fig. 45. Leaf litter and humus in a Virginia Piedmont hardwood forest. Forest litter, forming a thick covering over the ground, affords excellent protection to topsoil when torrential rains threaten to move it. The force of the fall is broken and much of the water is absorbed. During a normal rain there would be little or no surface run-off from this forest. Even during a downpour water could move but slowly over the surface.

Into this pristine wilderness pushed the white man with ax and fire, plow and seed. Soon—*unbelievably* soon—the original forest disappeared. It was removed at a rate never before equalled in world history. Unfortunately, most of it went up in smoke, since only a small part could be used for fuel, fences, palisades, and dwellings. The forest seemed inexhaustible. Furthermore, it was a barrier in the way of agricultural progress.

Before the coming of the white man, the region had long been settled by American Indians, who, being primarily hunters, had not changed the primeval character of the landscape. They had divided the hunting grounds into family-size portions and never trespassed unless forced to do so. Each family killed only the game it actually consumed. This system of occupancy put no scars of exploitation on the land.

The Piedmont was settled from the older sections to the east—from the Chesapeake Bay and Albemarle Sound country and from Charleston, South Carolina—by people one, two, or three generations removed from the earliest settlers. It also received large numbers of Germans and Scotch-Irish who had followed the Great

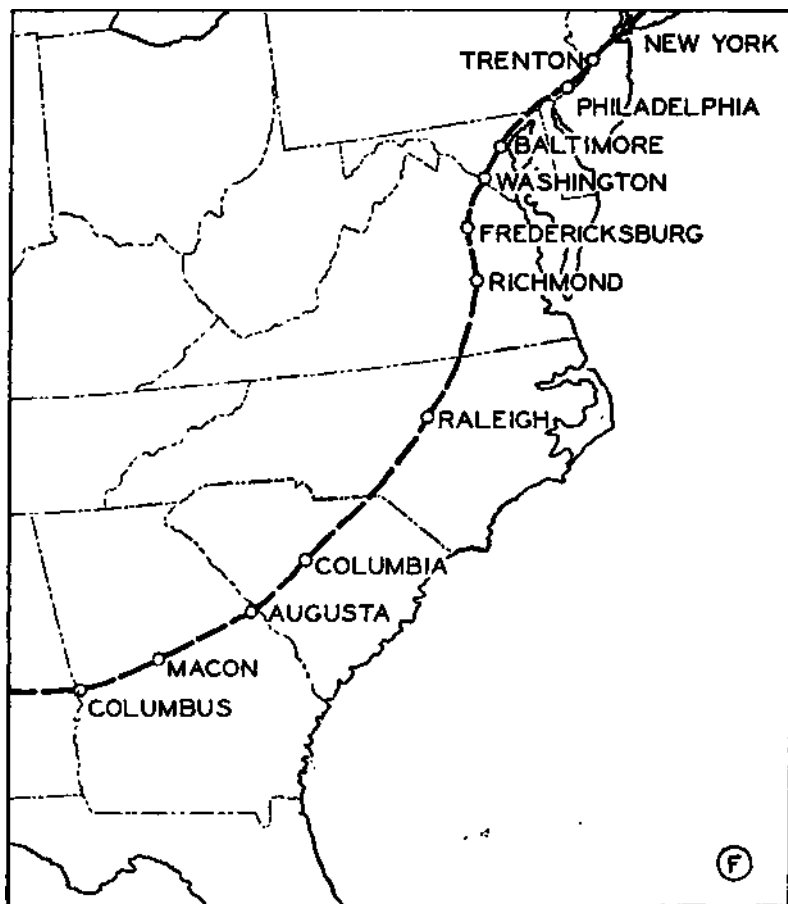


Fig. 46. Leading Fall Line cities. New York, Trenton, Philadelphia, Baltimore, Washington, and Richmond are Fall Line cities and ports, owing to the submergence of the coastal plain. In the Carolinas and Georgia, however, Fall Line cities are inland centers inasmuch as submergence was less extensive and the coastal plain is broader.

Valley southward and entered the Piedmont from the west. By 1750 most of the Piedmont had been occupied by white people.

The Physical Setting

Surface features

The Piedmont, a rolling, hilly area at an elevation of 100 to 1,500 feet, differs considerably from the lower level-to-undulating lands

of the Coastal Plain. While the Piedmont is called an upland, it really is a plain of denudation with a few hills (monad-nocks) rising above its otherwise gently rolling surface. The divides, with few exceptions, rise to an even skyline. It is smoothest along the interior border close to the Blue Ridge, where the full erosive power of the streams has not been felt. All the rivers are muddy and they fluctuate considerably in volume.

Most of the arable land is now restricted to the uplands, that in the bottoms having been ruined by recurrent floods. Accordingly many farms located on the bottom lands have been abandoned.

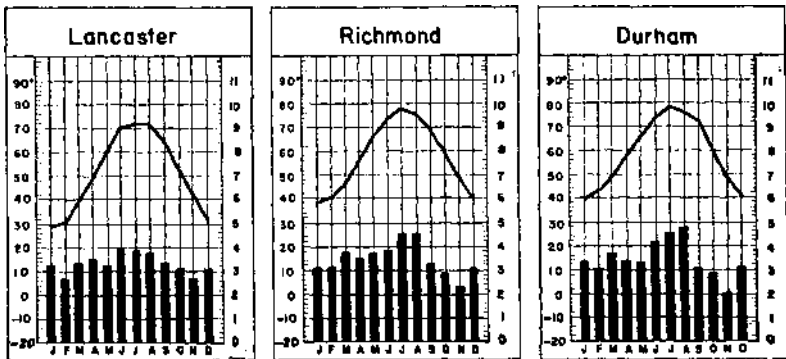


Fig. 47. Average monthly temperature and precipitation for Lancaster, Richmond, and Durham.

Most of the cultural features—dwellings, highways and railroads—are on the uplands. A notable exception is the railroad that follows the valley of the James because of the easy grade.

The Fall Line Belt. Numerous rivers flow from the Blue Ridge to the Atlantic. Where they pass from the older and harder rocks of the Piedmont onto the younger unconsolidated sediments of the Coastal Plain, there is a stretch of rapids—the Fall Line Belt. This Fall Line Zone has played a significant role in American history, since it determined the sites of a string of important cities from New York to Columbus, Georgia (Fig. 46). Frequently rapids marked the head of navigation for sea-going craft; here bulk had to be broken. Moreover, water-power was available for manufacturing.

Climate

Climatically the Piedmont is a sort of transitional area between the North with its long, cold, snowy winters and the South with

its short, mild ones. Obviously an area extending over so much latitude could not have an identical climate throughout. It is mostly on the basis of climate that the Piedmont is divided into subregions. The growing season varies from an average of 160 days in the north to more than 230 in the south. The Southern Piedmont in winter averages 15°F. warmer than the Northern Piedmont.

Few agricultural areas in the United States receive so much annual precipitation; relatively few stations get less than 40 inches and some receive as many as 50 (Fig. 47). Maximum rainfall, in the form of thundershowers, comes in summer when crops need it most. These heavy downpours cause much soil erosion in a region where clean-tilled crops prevail. Hardly a week passes without a good rain, though this region, like most others, does have its occasional dry spells.

Soils

Viewed regionally, the soils of the Piedmont vary in quality from good to bad. Soil is, nevertheless, the most potent single natural environmental factor distinguishing the region. Lancaster County, Pennsylvania, is a notable exception, its fertile limestone soils being world-famous. All Piedmont soils are *pedalfers*—gray-brown podzolic soils or red and yellow soils. From north to south they vary in texture from light to heavy. They are *residual*, that is, they are derived from the long disintegration in place of granites, gneisses, and schists—which underlie most of the region. Pedologists estimate that nature requires nearly 1,000 years to build one inch of topsoil. The only transported soils are confined to the valleys and are immature, having no relation to the underlying bedrock.

In colonial days, sandy loams 7 to 15 inches deep predominated, but these are now mostly gone, having been eroded from exposed slopes. Piedmont soils never were high in humus because they were forest soils; as a matter of fact only the top layer contains much organic matter and available plant food. Piedmont soils have been depleted both by erosion and by leaching.² Leaching, especially in the Southern Piedmont, occurs throughout the year; in the Northern Piedmont, however, the ground is frozen during much of the winter and hence does not suffer.

² Land that is cultivated loses fertility through the draining away of those mineral elements which dissolve in water. Some leaching is inevitable, but it is increased by practices which leave the land bare throughout much of the year. It can be retarded by growing grass and cover crops.

Generous applications of commercial fertilizer must be used in this region to make the soil productive. The Southern Piedmont is said to be the most heavily fertilized part of the United States.

Mineral resources

The Piedmont ranks poorly in minerals, though it does have several building stones of economic value. The first coal to be mined in the United States was dug near Richmond, Virginia, and, until the Gold Rush to California in 1849, Georgia was the country's leading source of gold. But no part of the Piedmont is important today for metallic minerals.

Most of the rocks are crystalline and are among the oldest in the world—granites, gneisses, schists, marbles, and slates. Granites of high quality are quarried widely throughout the region and are used in a number of Eastern cities as building and monumental stones, curbing and paving blocks. Broken-up granite is used as an ingredient of concrete, as railroad ballast, and as artificial sand. In the hilly Piedmont of northern Georgia is a narrow belt some 60 miles long and a few miles wide, where one of North America's more important marble-working areas is to be found. Pure-white and pink marbles of high quality are quarried. Asbestos, chromite, copper, corundum, feldspar, gold, mica, serpentine, and talc are also produced.

Limestone, quarried in Lancaster County, Pennsylvania, is used for cement, burnt lime, and building stones, and dolomite serves as a flux in the iron industry.

Water-power

Water-power is one of the leading resources of the Piedmont. The natural factors responsible for it are:

1. A heavy rainfall well distributed throughout the year.
2. Land mostly in slope, which hastens run-off.
3. Forested watersheds.
4. Room for dam sites and storage reservoirs.

The Piedmont possesses more than 20 per cent of the developed hydro-electric power of the country, though it has within its boundaries only 7.6 per cent of the potential supply.

The principal part of the Piedmont's water-power development includes the Catawba-Wateree, the Yadkin-Pedee, the Broad, the Saluda, and the Tallulah-Tugaloos rivers. This area, 170 miles long

and 100 miles wide, is the major power section of the South.⁸ The Catawba, a remarkable stream, drops 1,058 feet in a distance of only 300 miles. One of the most interesting features of the hydro development in this stream is the use of dams and pools. So well planned is it that at many places the tailrace of one pond flows into the head of the next. In 1911 the Catawba experienced a drought so serious as to close 152 mills and throw out of employment 70,000 workers. This situation probably never will recur, since storage reservoirs have been built. Unfortunately, careless farming methods have resulted in silting up many of the reservoirs, thereby reducing the amount of water-power available. Nothing could better indicate the far-reaching effects of erosion.

Economic Activities

Agriculture

Agriculture employs more people than any other industry on the Piedmont, though from Lynchburg to Atlanta, manufacturing made great strides after 1930.

As already noted, the Piedmont was settled by farmers from the tidewater region and the Great Valley. Upon clearing the forest, many of them planted tobacco, a row crop, successively for 3, 4, or even 5 years. When tobacco was no longer profitable, they grew corn until it would not pay for the labor expended. Then they abandoned the fields, cleared new land, and repeated the process. It is now realized that man must establish a healthy relationship with the land; he must not farm badly eroded terrain.

The central and southern parts of the Piedmont are essentially areas of small farms. Many so-called "problemi farms" have an average of only 18 acres in harvested Crops and a real estate value of about \$500.⁴ Much of the land is marginal and submarginal. Production is directed largely toward such cash crops as cotton and tobacco, whose prices fluctuate widely and occasionally bring misfortune to the farmers. Nowhere else in Anglo-America is tenancy increasing more rapidly; in fact, 68 per cent of the farms in the Southern Piedmont are operated by tenants.⁵ Here is to be found the most abject rural poverty in the United States. Nowhere else

³ A. E. Parkins, *The South*, p. 348. New York: John Wiley & Sons, 1938.

⁴ National -Resources Board, *Maladjustments in land Use in the. United States*, Part VI, p. 23. Washington, D. C: Government Printing Office, 1935.

⁵ Rupert Vance, *Human Geography of the South*, p. 33. Chapel Hill: University of North Carolina Press, 1935.

do livestock, milk, and home-grown vegetables play so small a part in the farming enterprise. There are, however, local exceptions, especially around cities and towns, due to manufacturing and commerce.

The *Northern Piedmont*, lying north of the James River in the states of Pennsylvania, Maryland, and Virginia is the dairy section. The farms, averaging 50 to 100 acres, are usually smaller than those in any other geographic region of their respective states. Dairying is so organized as to supply fluid milk to near-by cities; some goes as far as New York City. A secondary factor is that the soils are not sufficiently fertile nor the topography sufficiently flat for most successful general farming practices. Proximity to great markets has enabled the farmers to rise above the minor deficiencies of soil and topography. Probably nowhere in America is there an area better suited to dairying. Nearly all crops are grown with reference to it. Much wheat is grown, not for its cash value, but for the protection it offers against excessive soil erosion and leaching and for the straw it supplies for bedding dairy cattle. Barley is planted as a winter cover crop for the same reasons. Corn, grown for grain and silage, also is a major crop. The land, after it is laid by, is planted to winter wheat or barley. The hay crop is invariably a legume, either alfalfa or red clover.

Nearly all the farmers are white, because the plantation system never was important in Pennsylvania and did not extend beyond the Coastal Plain even in Maryland. Farmers of German descent, who follow scientific practices, are numerically important, especially in Pennsylvania, and the high standard of the dairy industry is in no small measure attributable to them.

Lancaster County, Pennsylvania, the most scientifically farmed county in the United States, merits separate treatment. It has been said that the people rather than the land is the reason why Lancaster County has few rivals. On this point the authors cannot concur; agricultural prosperity could not have been attained, regardless of the caliber of the people, had not the natural environment been highly favorable. In short, it is man *plus* nature that made Lancaster County what it is.

For the most part this area is a broad undulating plain lying southeast of all the mountain ridges of Pennsylvania. The climate is highly favorable for farming. The growing season of 160 to 175 days is adequate for most middle-latitude crops. Winters are mild and summers hot. Precipitation averages about 40 inches, nearly two thirds of which falls from April to September, inclusive, when

the crops need it most. The fertile limestone soils—those that have developed from a residue resulting from the decay of limestone—are, undoubtedly, the best in the state.

Lancaster County has one of the most advantageous locations in the entire country with respect to large consuming markets, being near Philadelphia, Baltimore, and Pittsburgh, and having excellent transportation facilities, both railway and highway.

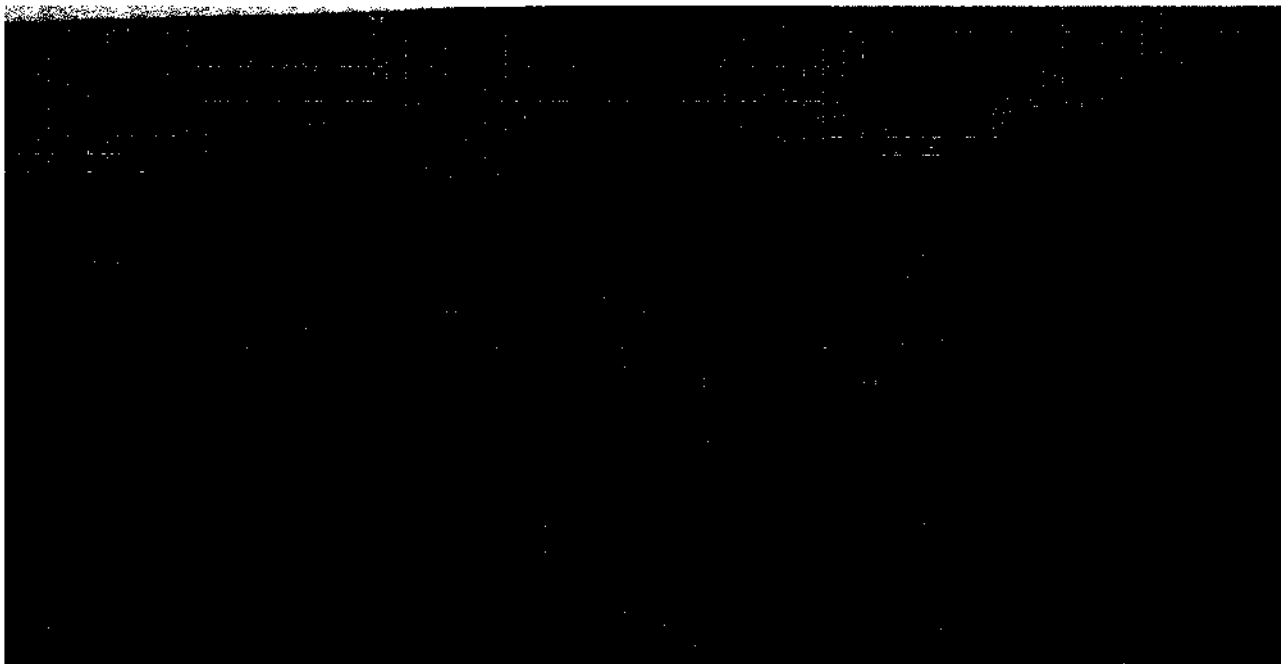
Swiss Mennonites, followed later by Germans, were the original settlers. Today Lancaster County and Pennsylvania-Dutch (German) are synonymous; three quarters of the people in the county are of German ancestry. It is indeed significant that this area was settled by immigrants from the Palatinate on the Rhine between Bavaria and Alsace, whose ancestors for many centuries had cultivated one of the richest wheat-growing regions of Europe. They were used to soils with a high lime content, and Lancaster County appealed to them. The Scotch-Irish, on the other hand, having learned from experience in their homeland that limestone soils are dry and given to heaving, selected the hills to the southwest or pushed into York County.⁶ Since settlement, these thrifty and diligent Pennsylvania-Dutch have transformed the region into a highly fruitful one (Fig. 48). They are exceedingly cooperative, as indicated by their formation of "spray rings" where 10 to 15 potato-growers join forces to buy spraying machines and sometimes spray. Unlike farmers in other regions, generations pass through the same homesteads, sons following their fathers on the same soil.

Several years ago Lancaster County farmers began worrying about the future. With land valued as high as \$500 an acre, large families experienced difficulty in "landing" sons. Recently some families moved 130 miles away to St. Mary's County, Maryland, an area that had been badly farmed but could be restored and made productive. Three families sold their 188 acres in Lancaster for \$44,000 and purchased 1,135 acres in St. Mary's for \$25,000.⁷

Lancaster County is above all an agricultural land. More than 90 per cent of it is in farms, and in some townships more than 80 per cent is in crops. There is little waste land. Farms are relatively small—averaging only 53.3 acres—and are well cared for. Houses are well built but not ostentatious; barns are large and in excellent condition; all outbuildings and fences are painted. Roads everywhere are good and railroads numerous. The whole cultural landscape reflects prosperity.

⁶ A. B. Hulbert, *Soil: Its Influence on American History*, pp. 135, 142-144. New Haven: Yale University Press, 1930.

⁷ "High Land Prices Start Amish on an Exodus to Maryland," *News Week*, December 11, 1939, Vol. XIV, No. XXIV, p. 40.



Lancaster Chamber of Commerce.

lands to a high degree of fruitfulness.

Corn, winter wheat, hay, and tobacco are the major crops. Tobacco, which fits into the system of diversified farming of Lancaster County, is the money crop. Nevertheless, the smallest acreage is given to it because (1) it is a "robber" crop, draining fertility from the land, and (2) it requires an abundance of labor from planting through harvesting and marketing.

A 3-, 4-, or 5-year rotation is scrupulously followed. The 4-year is the most common: (1) tobacco, (2) wheat, (3) clover or alfalfa, and (4) corn. Lancaster County tobacco, mild in aroma and flavor, is used primarily for cigar fillers, of which it contributes about two thirds of the nation's supply.⁸

Lancaster County produces about 90 per cent of Pennsylvania's tobacco. Its per acre yield is high, varying from 1,200 to 2,500 pounds. In order to procure this high yield, the crop is grown only on the better soils—especially the silt and clay loams—and these are generously fertilized. Few areas have solved their fertilizer problem so well. This is done with the manure of steers and dairy cattle. Dairying is not so important as one might expect, as its labor requirements are heavy and would compete with tobacco for the farmer's time. It is for this reason that the county has gone in for fattening steers. Stockers, purchased in Lancaster, come mostly from western Virginia, an area growing insufficient corn to fatten them. During part of the autumn, Lancaster receives from 100 to 400 carloads of lean steers per week and has become the largest cattle market east of Chicago.⁹

Hay, corn, and straw are fed to the steers and concentrates are purchased in addition. Not more than 10 per cent of the land is in pasture.

Wheat shares with tobacco the distinction of being the principal cash crop, being widely distributed and grown on all soils. At least half is used within the county for livestock and human consumption. Corn, like wheat, is widely distributed. Lancaster County gets more bushels of corn per acre than any other in the United States.¹⁰ Since corn cannot stand shipment because of its low value, most of it is fed to steers and poultry. Potatoes, low in value and perishable, are grown by nearly every farmer. The excellent location of this area with respect to large consuming centers

⁸ The *filler* is the interior of a cigar. It is composed of loose leaves and cuttings and is held together by the *binder*, a single leaf, which is entirely covered by the *wrapper*, another single leaf.

⁹ Garet Garrett, "Farming with Security and Independence," *Saturday Evening Post*, October 13, 1928, Vol. 201, No. 15, p. 7.

¹⁰ *Ibid.*

favors commercial production of potatoes. Probably no other area in this country gets larger per acre yields—about 600 bushels. Hay is an important rotation crop. Timothy, alfalfa, and especially clover all are grown. Legumes yield well everywhere. Nearly all the hay is fed on the farms where it is grown.

The apple area of the Virginia Piedmont. Bordering the Blue Ridge from the James to the Rappahannock is one of the leading apple districts in the eastern United States. The belt, with Charlottesville as the center, is approximately 45 miles wide and extends in a northeast-southwest direction. The industry began some 65 years ago when farmers planted apple orchards in the small, moist, fertile valleys (*coves*) at the foot of the mountain ridges. Location on slopes enabled them to benefit from air drainage. Many of them are on rough land and are called "mountain orchards."

In the Piedmont the Winesap makes up two thirds of the entire planting. The Albemarle Pippin (Yellow Newtown) is most widely cultivated in Albemarle County, to whose granitic soils, rich in feldspar, it is especially adapted.¹¹ It is an export apple largely because of its good keeping qualities. The exports have long gone primarily to England.

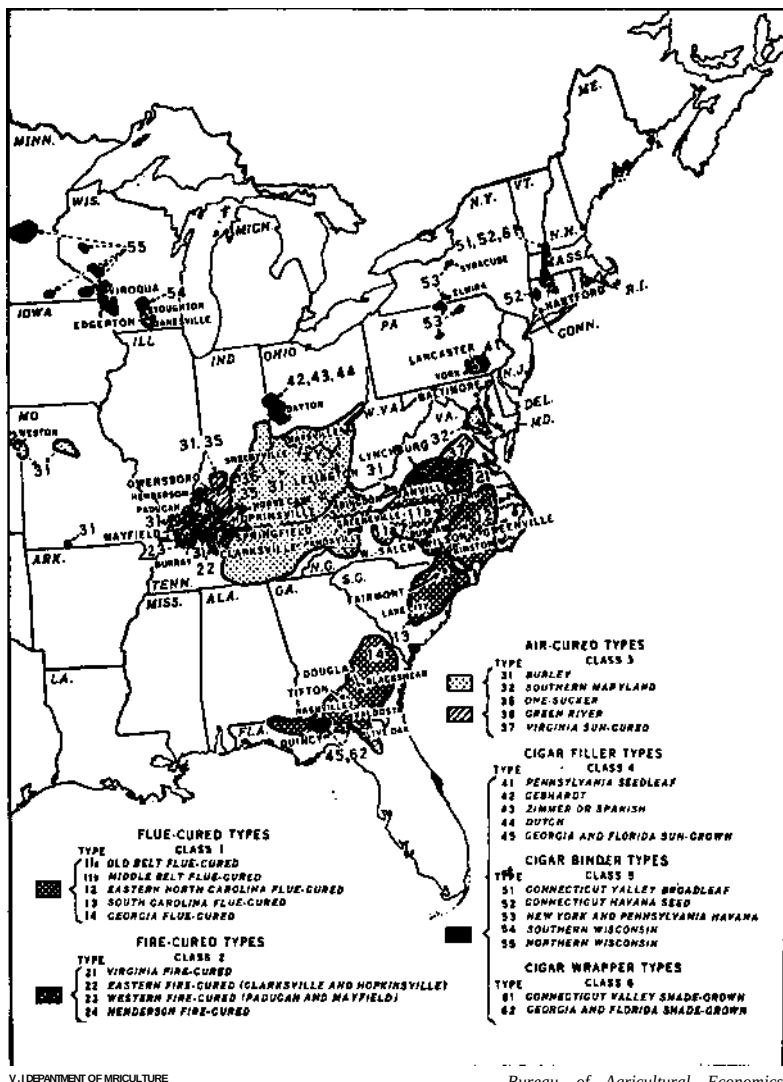
The Central Piedmont—Land of tobacco. The Central Piedmont, one of the continent's two major tobacco-growing areas (Fig. 49), grows dark fire and air-cured leaf in Virginia and bright flue-cured in Virginia and the states south of it.

It was pointed out earlier that Virginia's tidewater was mostly occupied by the beginning of the eighteenth century. As early as the Revolution, tobacco had nearly exhausted that area's "second bottoms" and was moving up the valleys of the Virginia and North Carolina Piedmont. Tobacco was the staple and every attempt to produce other export crops such as silk, grapes, flax, hemp, and cotton failed.¹² But not everyone on the Piedmont grew tobacco. Those who came from the Great Valley were opposed to slavery and hence did not grow tobacco, and the poor whites who migrated from the Coastal Plain were non-slaveholding.

Dark fire-cured and air-cured tobaccos. These types are grown on the heavier soils of the Virginia Piedmont—the former in the central part, the latter in the north-central portion. The fire-cured type is identical with that grown in early days of Jamestown, and the method of treatment is fundamentally the same as that employed by the Amerinds. The cured leaf of these types is dark in

¹¹ According to W. B. Alwood, apple grower, Greenwood, Virginia.

¹² L. C. Gray, "Market Surplus Problems of Colonial Tobacco," *Agricultural History*, January 1928, Vol. II, No. I, p. 21.



U. S. DEPARTMENT OF AGRICULTURE

Bureau of Agricultural Economics.

Fig. 49. United States tobacco-growing districts. The production of the various types is the result of a long process of evolution and specialization in response to soil and climate. Each type has a different use. Flue-cured, by far the world's most important type in point of quality, today constitutes about one half of the total tobacco production of the United States. It is grown on light and relatively infertile soils. In Caswell County, North Carolina, original home of this type, out of a population of 20,000, at least 19,600 people derive the major part of their income from tobacco.

color, thick, tough, oily, and high in nicotine. Dark tobaccos are used for pipe-smoking mixtures, snuff, and chewing. The fire-cured types have been grown primarily for export and the air-cured types for domestic manufacture. The demand both in foreign and domestic markets is downward.

Bright flue-cured tobacco. In 1852, near Durham, North Carolina, two farmers broke away from tradition and set their plants in light, sandy, siliceous, infertile soil. They heated some of the yield over hot flues and got a clear, rich gold leaf that was mild and sweet to smoke. Thus was revived the social economy of the worn-out soil, and lands that had been abandoned jumped in value many-fold. Flue-cured tobacco now is the most important cigarette variety in the world and has a money value nearly 6 times that of dark tobacco. Today most of the crop of North Carolina, Virginia, South Carolina, Georgia, and a few counties in Alabama and Florida is flue-cured.

Land used for tobacco is carefully selected, since soil is the dominant environmental factor contributing to aroma, flavor, and thinness of leaf. On any given farm, only a small acreage is planted in tobacco and but a fraction of this grows the highest quality. Light-colored and light-textured soils, with little clay and organic material in the subsoil, are best for cigarette and pipe tobacco. Most farmers devote from two to ten acres of highly prized land for tobacco and use it year in and year out. This type of farming has so ruined the land that virgin soils are now at a premium. Legumes dare not be used to build up the soils, and manures must be used sparingly. The grower prefers to put his crop on almost sterile soil, to which he then may add plant foods in the right amount. It is little wonder then that this area is one of the largest consumers of commercial fertilizer.

Only a small acreage per farm is in tobacco because it is a back-breaking, highly technical crop to grow. It requires so much labor that little time is left for other crops. There is the seed bed, the preparation, the fields, transplanting, cultivating, topping (to prevent the growth of seeds), worming, suckering, spraying, harvesting, curing, stripping, and marketing.¹³ Tobacco is a crop that wears out men as well as the land.

Tobacco is now grown largely by tenants, white and black, many of whom are very poor. The monetary returns do not by any means compensate them for their time and hard work. Since

¹³ Rupert Vance, *Human Geography of the South*, p. 209. Chapel Hill: University of North Carolina Press, 1935.

tobacco-growing is not profitable to most of the growers, many people wonder why Piedmont farmers continue to produce it generation after generation. The reason is that they have been reared in a tobacco atmosphere and through experience have learned the intricacies of its cultivation. Moreover, they know nothing of any other system of farming and hence are reluctant to change.

Tobacco is hard on the soil because its root system tends to suck rather than to grasp and hold the soil. Moreover, it is a clean-tilled crop that induces erosion. The rows are kept scrupulously free of weeds during the growing season. There is no scientific rotation; if any exists at all, it consists of corn, tobacco, and corn. Finally, open winters and torrential summer rains on steeply sloping fields mean only one thing—soil loss.

Tobacco in the Central Piedmont is meeting some competition, especially from dairy and poultry rearing, because of almost constant overproduction and consequent poor prices.

Corn is the outstanding crop in acreage and almost every farmer grows it. It yields best in river and creek bottoms but is grown also on steep hillsides. Like tobacco, it is a row crop that facilitates soil erosion. It is made into corn meal for human use and is used as feed for livestock.

The Southern Piedmont—Land of Cotton and Corn

From central North Carolina to Alabama, cotton replaces tobacco as the principal cash crop. This area lying south of the July isotherm of 78°F. has a growing season of 200 days or more. Its soils are heavier than those in the tobacco area to the north. Cotton, outstanding since 1820, was an excellent pioneer crop in the pre-railroad era because high value enabled it to stand transport charges. It could also employ Negro slaves.

The Southern Piedmont is one of the oldest cotton-growing areas in the United States but is no longer one of the best. It is finding it increasingly difficult to compete with the less humid cotton districts in Texas and Oklahoma.

The Piedmont, unable to grow long-staple cotton, produces the short-staple variety and hence is competing with such countries as China, India, and Brazil, which have much cheaper labor.

The natural environment in the Southern Piedmont is satisfactory for growing cotton. Rainfall is light in spring and early summer when cotton requires little moisture and great heat, and low in autumn when precipitation would discolor the lint in the opening bolls and retard picking.

Cotton has been hard on the land. Tens of thousands of ruined acres have returned to forest.

... an experienced traveler can guess the number of years that have elapsed since cotton last was grown by estimating the age of the pine trees with which nature in many places reclaims cottonfields.¹⁴

Corn, a subsistence and not a cash crop like cotton, is grown for farmers and mules. Like cotton, however, corn is a clean-tilled crop facilitating sheet and gully erosion and hindering systematic rotations. It also draws heavily on the life-giving soil nutrients. Many farmers over-crop with corn against their better judgment because low labor-income and tenant status offer no alternative. Corn and cotton have made much of the Southern Piedmont a problem area—a large portion of which should not be farmed at all.

Lespedeza, a deep-rooted perennial, is revolutionizing agricultural practices in the Southern Piedmont. It affords an excellent protective cover, makes the soil more absorbent, is a popular forage and, when plowed under, increases the yields of subsequent crops.

Soil Erosion

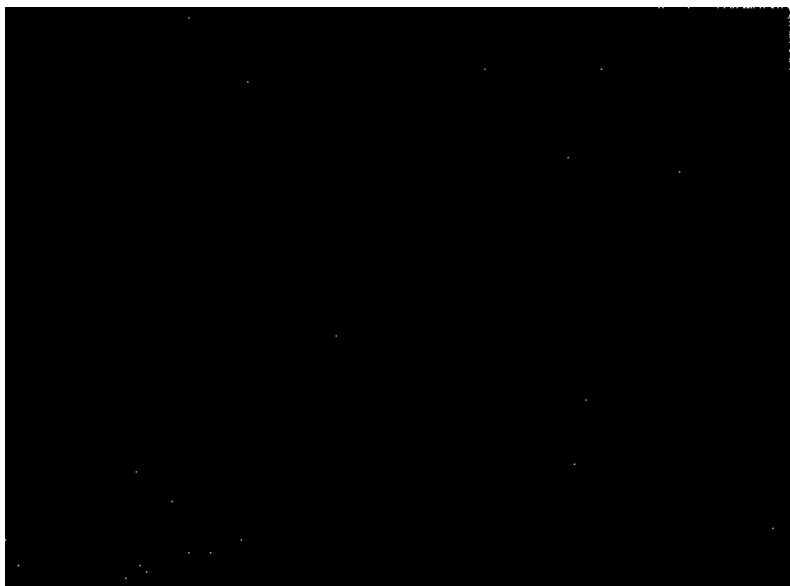
Few areas have been so manhandled (Fig. 50) as the Piedmont. Soil erosion occurs on practically every acre of slope land, and the prevailing system of farming has not encouraged soil conservation. Hence nearly one third of the Southern Piedmont has lost 75 per cent or more of its topsoil. Over large areas crops are being grown on subsoil. Considerable land has been abandoned because it is submarginal—cannot produce crops at a profit. From 1920 to 1930, 50,000 farms, because of advanced erosion, were retired from cultivation in Georgia and the Carolinas.

There were no gullies here prior to the coming of the white man, but as early as the Revolution erosion was making serious inroads into the agriculture of Virginia.¹⁵

Over much of the Piedmont the topsoil was 6 to 7 inches deep—the accumulation of thousands of years. But because of indifferent farming, much of it was destroyed in 20 years.

¹⁴ E. M. Rowalt, *Soil Defense in the South*, Farmers Bulletin No. 1509, p. 3. Washington, D. C: Government Printing Office, 1938.

¹⁵ "The James River was not always tawny-maned. Early settlers refer to it as a very clear and beautiful stream. The muddiness came when men began to plow the red hills on the watershed of the Rivanna. Deforestation, which involves a quick run-off of rainfall, also contributed to give the river water its now familiar color. Before the coming of the white man, the watershed of the Rivanna was not plowed at all by the Indians, and practically no timber had been cut." *The Daily Advance*, Lynchburg, Virginia, May 23, 1929.



Farm Security Administration and Consumers' Guide,

Fig. 50. Soil erosion in Caswell County. This county was probably the richest in North Carolina prior to the Civil War; today it is one of the poorest. Sharecropping during the almost 80 years since Appomattox has left a terrible scar on the land. When topsoil is carried away, gullies tear through to the subsoil.

The washing away of soil is the great problem of the Piedmont (Fig. 50). Thousands of farmers operating on slopes now stripped of topsoil cannot make a satisfactory living. Their families are "ill-fed, ill-clad, and ill-housed."

Conservation

A national objective is to pass on to future generations a soil as nearly unimpaired as possible. The Soil Conservation Service is attempting to improve both the Piedmont and its people: little can be accomplished without considering both. Some of the conservation practices being employed on the Piedmont are:

1. *Contour farming.* The farmer plows around the hill rather than up and down the slope. Each small ridge and furrow helps to hold back rain water.

2. *Strip cropping.* Strips of close-growing crops alternating with rows of clean-tilled crops are grown on the contour. The strips of close-growing crops filter out the soil particles from the silt-laden

water moving downhill. The water is obstructed, its velocity is checked, and the load is dropped. The water then has more time to soak into the ground and prevents washing.

3. *Terracing.* Terraces act as impediments to the flow of water, thereby reducing its erosive power. They let surplus water run from the field in an orderly manner.

4. *Lespedeza.* Lespedeza is grown on hillsides, gully slopes, and road cuts, to reduce run-off and resist erosion. On an experimental plot this crop lost only about one ton of soil per acre as against 28 for bare plots, 18 for cotton, and 7 for corn.¹⁶

Topsoil contains the bulk of the life-giving humus and nitrogen. Since subsoil is only one fourth to one half as productive as topsoil, the need for conservation is obvious.

Tenancy

The Piedmont has been presented as a capital example of man's misuse of the land. Throughout the United States there is unmistakable correlation between tenancy and erosion.

Tenancy, and all that makes for tenancy,¹⁷ is at the root not only of the agricultural but of the conservation problem.

Tenancy had its inception after the Civil War. Planters with land and experience lacked funds for paying wages to their former slaves, and hundreds of thousands of newly freed Negroes were poor but knew the routine of caring for cotton under rigid direction. The tenant system brought these two interdependent groups together. The former slaves were given a share of the crop (usually half) for their part of the labor. At first only Negroes were croppers, but now whites and blacks almost balance. White croppers dwell mostly in the Southern Piedmont and are cotton growers. Some also occupy the tobacco lands of the Central Piedmont. Nearly all emanate from the adjacent mountain areas or from patches of poor land which were scattered between plantations before the Civil War. Such people work hard, are poor, and invariably have large families.

In normal times, farmers make just enough to keep out of debt and start the year with a clean slate. But if, as is usually the case, times are subnormal, they must mortgage the crop. After 2 or 3

¹⁶Dr. Ben Lemert of Duke University says regarding these four points: "All of these will be slow in giving results without animal manure, which I consider to be the secret of handling this soil." (Personal communication.)

¹⁷H. S. Person, *Little Waters: Their Use and Relations to the Land*, p. 36. Washington, D. C: Government Printing Office, 1936.

such experiences, if they own the land, they become tenants. During the 1920's thousands of Negroes left these blighted areas and migrated to the great industrial centers of the North. White tenants then moved in to take their places.

Most croppers are little more than *peons*. Many are poorly nourished and have hookworm, malaria, or pellagra. Their dwellings, of 2 or 3 rooms, are poorly constructed, weather-beaten and unsightly. In spite of the presence of the anopheline mosquito, doors and windows are rarely screened.¹⁸ Pellagra flourishes, because the tenant farmers grow no green vegetables and keep no milk cows or stock for supplying lean meat. Few tenants remain on the same piece of land for more than a year or two; in fact, one out of every 3 moves each year. Under such a system there is little incentive to conserve the land, which each year becomes more depleted and eroded. Moreover, the average tenant family cultivates only 18 acres, 99 per cent of which is in cash crops—those that exhaust soil. What this area needs more than anything else is to reform its agriculture—to break away from the one-crop system and attempt to feed itself, so far as meat, bread, fruits, vegetables, and dairy products are concerned.

Landlords must make more sacrifices and be content to receive less profit. They must plow back more of the profit into the soil. They must do more work themselves. They must make the tenant feel they are doing things for his welfare as well as for theirs. They must give him a piece of pasture, a corn field, a plot for vegetables, several cows, pigs, and some chickens. Then they must give him time to take care of them. They must see that he builds up the soil especially with manure and proper crop rotations. With close supervision, minus greed, some authorities believe tenancy would be successful.

Piedmont Manufacturing

Until the early 1800's, manufacturing on the Piedmont was important only in Fall Line cities. Of these Richmond alone was important, Philadelphia, Trenton, Wilmington, and Baltimore all being included in the American Manufacturing Belt. The Fall Line cities benefited from advantageous location at the head of river navigation and from water-power. Immigration and industry were not attracted by the Piedmont in the early decades of the

¹⁸ University of North Carolina Extension Bulletin, *Country Life in North Carolina*, Vol. IX, No. V, pp. 40-41. Chapel Hill: University of North Carolina Press, 1929.

nineteenth century at the time the northeastern United States was booming industrially. At heart the Piedmont was agrarian: a "poverty to the point of wretchedness in the cabins of the hillbillies and sharecroppers is preferable to the poverty [a southerner] sees or imagines in the industrial slums of the North."¹⁹ The Piedmont had few incentives for manufacturing. In the 1880's Richmond added, to its iron works, cotton and flour mills, factories making boots and shoes, fertilizer, and tobacco products.

Since then the manufacture of tobacco, cotton, furniture, paper, and chemicals has increased, replacing agriculture to a considerable extent.

Cotton manufacturing

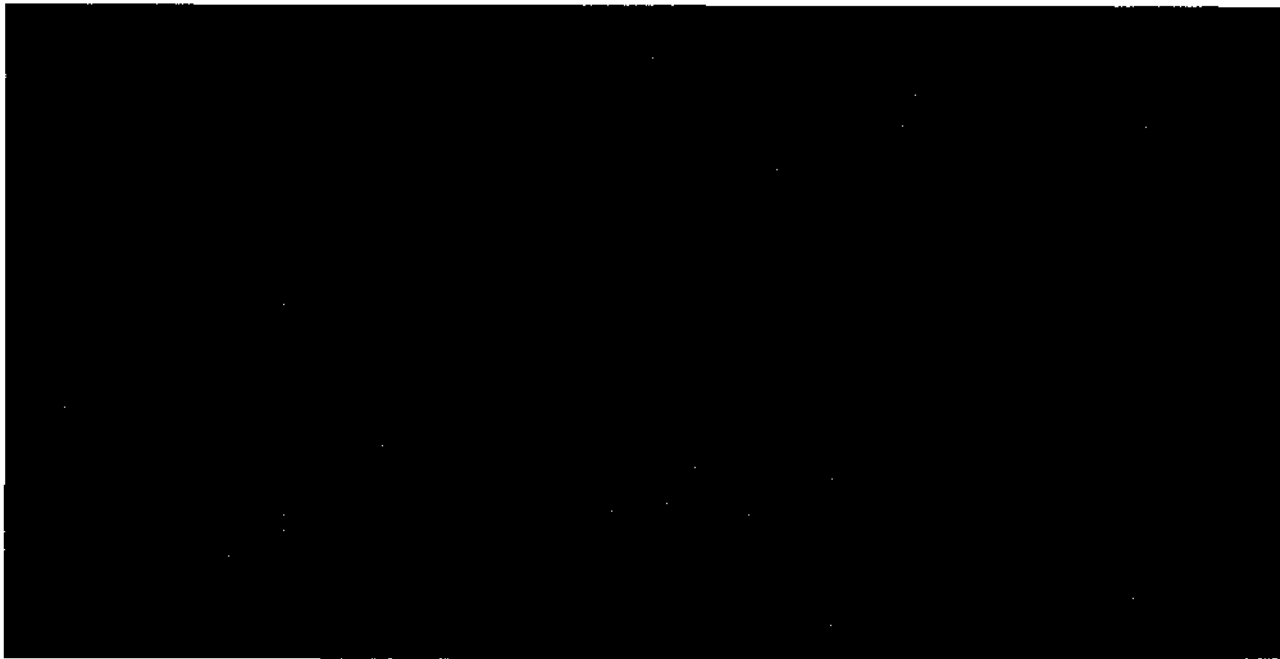
The South has become the center of the nation's cotton textile industry and the Piedmont is the heart of it. It does not rival New England in the quality of its goods, but it does produce good grades of coarse and medium textiles which constitute four fifths of the national total. The principal advantages of the South over the North have been the price differential and the longer working hours of labor. The price differential, however, is fast disappearing and the differential of working hours (of the individual worker) already has disappeared.

Piedmont mill workers are mountain whites and former croppers. Most of the mills occupy villages on the outskirts of towns, many lying only a short distance from the fields. Labor unions made little progress with these workers before the New Deal. In the next nine years unionization progressed considerably, wages were raised, and hours shortened.

The labor supply is abundant, and it can subsist at less expense than that employed in Northern mills. The textile worker often rents his home for \$1.00 per room per month, including light and water. He usually has a garden which supplements his income from the mill. Thus, though he receives smaller wages than the New Englander, his dollars go further.

Nearness to raw cotton is not the chief location factor. For many years cotton production has been falling on the Piedmont. Mostly the short-staple variety is grown. Seven out of every ten bales manufactured in North Carolina are brought in from other states, mostly west of the Mississippi. Thus Piedmont manufac-

¹⁹ Garet Garrett, "The Problem South," *Saturday Evening Post*, October 8, 1938, Vol. 211, No. 15, p. 90.



Courtesy of Frank Pierson, Durham Chamber of Commerce, and O'Brien Lemen.

Flo. 5, . A cotton mill near Durham, with port of its mill village, covers hundreds of acres. At the left is the Southern Railway. This mill
fire protection.

turers, getting their raw cotton from the same sources as the New England mills, have but a slight advantage if the product moves all the way by rail.

As regards power, the Piedmont is as favored as New England. Moreover, its power is considerably lower in cost. Mills are free to locate anywhere as the result of the transmission of electrical energy.

Atmospheric conditions of the Piedmont originally were less favorable than those of New England, but the use of the artificial humidifier and temperature regulator in factories has changed this.

The Piedmont is not hampered by tradition or obsolescent power establishments, and its mills are located strategically (Fig. 51). Most of them are close to the main line of the Southern Railroad, which has direct outlets to the North, the South, and the Middle West. The Piedmont differs from New England in that its mills are *scattered* and not *concentrated*. The *position* factor is of slight importance in the Southern Piedmont, one choice being about as good as another. It is the *site* factors that count, and they will play an increasingly important role in the choice of industrial locations in the future.

Tobacco manufacturing

Tobacco manufacturing is the most notable manufacturing enterprise entirely created and owned in the South. It is rooted geographically in propinquity to raw material—bright tobacco (Fig. 49). Manufacturing on a large scale began in the period 1890-1900. North Carolina and Virginia together account for 84 per cent of the 170 billion cigarettes produced each year, and pay enormous taxes to the Collector of Internal Revenue. The entire industry, confined to the Piedmont between Richmond and Winston-Salem, includes also Durham, Reidsville, and Petersburg.

The Central Piedmont is the logical place for cigarette making, since, for the past 70 years, thousands of men have studied and solved the intricate problems connected with the production of bright leaf tobacco. There is little likelihood of any drastic relocation of this industry.

A unique feature of the cigarette industry is the great spread between the cost of raw material and the price of the finished product. Even then, the industry pays attractive wages. The answer, of course, is large-scale production by machinery. This industry is practically immune to depression.

The factories invariably occupy the hearts of their cities, since



Courtesy of Liggett & Myers.

Fig. 52. Chesterfield factory at Durham. The plant consists of a group of large four-story buildings, each occupying about the space of a city block. All of the buildings are air-conditioned and are well lighted. Tobacco manufacturing requires plenty of light

they were there first (Fig. 52).²⁰ The highly mechanized processes require little labor. Both white and colored workers are employed (cotton mills employ only whites). In tobacco towns, therefore, a large proportion of the population is colored.

Furniture industry

The furniture industry of the Piedmont began about 1888 with the "Industrial Revolution of the South." The first center was at High Point, North Carolina, a city that today means as much to the South as does Grand Rapids to the North. The furniture area lies in the Central Piedmont. The two leading centers in Virginia are Martinsville and Bassett. While all kinds are made, the region specializes in bedroom and dining-room furniture. The region's principal advantages are:

1. Reasonably priced, abundant, reliable, and willing male labor.
2. An abundance of hardwood timber and proximity to softwoods of the Coastal Plain.
3. Cheap power—hydro and coal.
4. Good transportation facilities.

Originally the industry supplied only the Southern market, but since 1921 it has invaded the North. At first only cheap furniture was made, but now some of the factories make products of a very high quality. To take advantage of the largest stratum of the market, however, most factories turn out medium-grade furniture.

The leading companies own and operate their own forests, practicing efficient reforestation and replanting as they cut. They engage in every phase from logging to shipping the finished product.

Pulp and paper industry

The manufacture of pulp and paper has grown rapidly in recent years. The South, of which the Piedmont is an important part, gives promise of becoming a great future source of pulp and paper.²¹

Rayon industry

The South is the center of the rayon industry—Virginia alone accounting for about one third of the total production. Some of the plants are located on the Piedmont, which shares the follow-

²⁰ S. T. Emory, *Bright Tobacco in the Agriculture, Industry and Foreign Trade of North Carolina*, p. 120. University of Chicago Press, 1939.

²¹ For a fuller account of this industry, see pp. 264r-267.

ing advantages with the Appalachian Uplands of the South: (1) a copious supply of soft water (150 billion gallons are used in the South's rayon industry each year), (2) access to an ample supply of reasonably priced white labor capable of being quickly trained, (3) nearness to markets, (4) ready access to an abundant supply of raw material—cotton linters and wood pulp, (5) plenty of level land, (6) riverside locations for the disposal of waste, and (7) efficient transport facilities and favorable freight rates.

Most of the factories are located in agricultural areas rather than in or near large cities where they would have to compete for labor.

Knit-goods and clothing industry

The knit-goods industry, chiefly full-fashioned hosiery, has become very important in the Piedmont of North Carolina. In High Point, for example, the value of hosiery produced is greater than that of furniture.

Factories making women's cotton dresses, men's dress and work shirts, overalls, and novelties of cotton cloth dot the landscape of the Piedmont of North Carolina and western Georgia.

Other industries

At Badin, North Carolina, on the Yadkin River, is an electro-metallurgical plant for reducing alumina, a pure powdery compound of aluminum and oxygen, to metallic aluminum. The plant in 1937 made 19 per cent of the new aluminum of the United States. It is advantageously situated with respect to low-cost hydro-power and markets.

Fertilizer, another important chemical industry, is much concentrated on the Southern Piedmont because of nearness to both raw materials and markets.

Transportation

Compared with the Coastal Plain, the Piedmont in colonial days was retarded economically and socially because its rivers were not navigable. It did not come into its own until the advent of railroads, canals, and hard-surface roads.

Railroads

The railroad broke down the barriers of distance and isolation in the Piedmont. Railroads were built here (1) to supplement canal and river transportation, (2) to haul agricultural products from the

Piedmont to the Northeast in exchange for manufactured goods, (3) to deliver agricultural products to the Middle West in exchange for grain and manufactured goods, (4) to transport coal to near-by ports, and (5) to furnish cheap commercial fertilizer to the farmers.

All of the east-west railroads are located on interstream divides, except the Chesapeake & Ohio, which follows the James and thus has the advantage of easier grades and the disadvantage of less speed and greater distance. From north to south the leading east-west railroads are the Pennsylvania, the Philadelphia & Reading, the Baltimore & Ohio, the Chesapeake & Ohio, the Norfolk & Western, and the Virginian. The last three have their termini at Hampton Roads, the others at Philadelphia and Baltimore. There is no east-west trunk railroad in North Carolina, although the Southern operates trains across the Appalachians via Asheville and the French Broad Valley to Knoxville and beyond. The Clinchfield & Ohio also cuts through the Appalachians in western North Carolina.

The important north-south railroads are the Atlantic Coastline, the Seaboard Airline, and the Southern—the last serving nearly every community of importance.

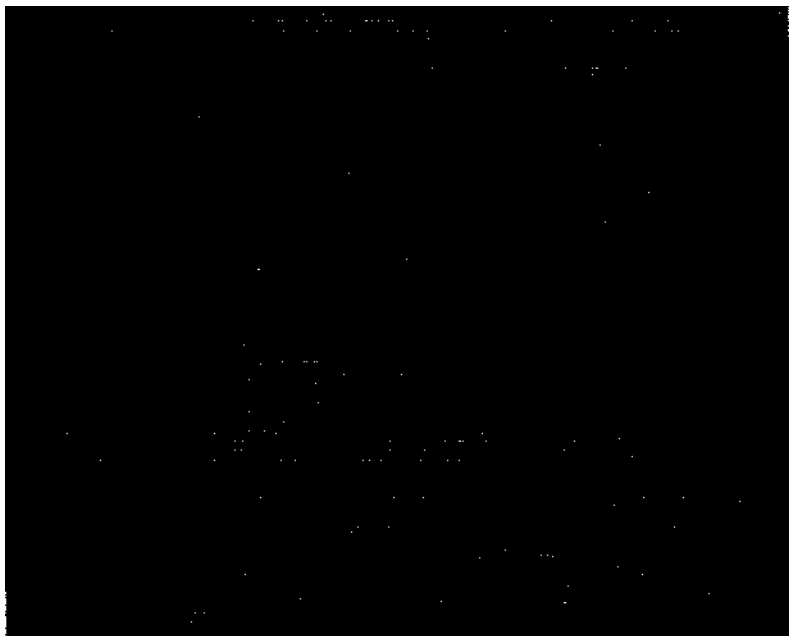
Canals

Until the 1880's there was considerable traffic on the canals of the Piedmont. The West was being opened up and prosperity beckoned to those able to tap its resources. New York led the way in 1825 with the Erie Canal; Pennsylvania, Maryland, and Virginia answered the challenge, but theirs was a poor reply.

The *Pennsylvania Canal*, opened in 1834, was built to stem some of New York's Erie Canal trade. The route consisted of a railway from Philadelphia to Columbia, a canal from there to Hollidaysburg, another railway over the abrupt rise of the Allegheny Front to Johnstown, and a canal from there to Pittsburgh. At Hollidaysburg the canal boats were mounted on wheels and hoisted over the Allegheny Front (Fig. 53) on an inclined portage railway using horses for power on the level stretches and stationary engines on the inclines. Though its rates were lower than those of the turn-pikes, the Pennsylvania was no match for the Erie Canal.

The *Chesapeake & Ohio Canal*, started in 1828—3 years after the completion of the Erie Canal—was completed in 1850. It was 186 miles long and connected Washington (Georgetown) with Cumberland, Maryland. Though started before the Baltimore & Ohio Railroad, it did not reach Cumberland until 1850—8 years

after the railroad, which it fought all the way. Its cost is estimated at 15 million dollars. The canal boats, pulled by mules, carried coal as well as freight and passengers. For decades this canal was an important link between the Ohio Valley and the Atlantic Sea-



Ginn & Co.

Fig. 53. **The Pennsylvania Canal**—Pennsylvania's answer to New York's Erie Canal, but a poor reply. The purpose of this canal was to give Philadelphia a commercial route to and from the new West, via the Ohio and Mississippi rivers. Thus in the 1840's one could start from Philadelphia, change from railroad to canal packet at Columbia on the Susquehanna, be pulled by mules along the canal to Hollidaysburg, transfer there to the Portage Railroad for the abrupt rise over the Allegheny Front, change back to packet boat at Johnstown and arrive in Pittsburgh five days after starting. The canal boats were drawn across the mountains on wheeled trucks by means of **stationary engines and cables**.

board. It had locks, aqueducts, tunnels, and dams on the Potomac River.

The *James River Canal*, the first in the United States, was fostered by George Washington. It extended west from Richmond in the Fall Line Belt to Lynchburg, the route being along the course

of the James River. This part was completed in 1840 with 47 locks and a total lift of 555 feet. It was further extended to Buchanan in 1851, making a total distance of 175 miles. So insuperable, however, was the mountain barrier that the canal never got beyond this point. It cost more than 10 million dollars but never carried so much traffic as the more northerly canals. Nevertheless, it developed its tributary area and was invaluable to Richmond and the Confederate Armies during the War Between the States. It had one advantage over other canals; it did not have to suspend operations in winter. It was abandoned after a damaging flood in 1877.

Turnpikes and roads

During the French and Indian War, local stretches of road were built to facilitate military movements. By 1758 there was a continuous road connecting Philadelphia with Pittsburgh. Land transportation was expensive; whereas it cost \$10.00 to send a ton of goods from London to Philadelphia, it cost \$125.00 to send the same consignment on to Pittsburgh. The turnpike, a privately financed toll-road, was introduced to remedy this situation.

Until about 1925 there were, except in the Northern Piedmont, very few good roads. Piedmont highways once were the subject of stage jests. Today all is changed. Isolation and inaccessability, with their attendant provincialism, have been broken down by the highway. State-consciousness was but a dream until the era of good roads. Fortunately, the whole Piedmont from north to south has an abundance of road-building material.

Cities

The Piedmont is not anywhere a land of great cities, since, except for Atlanta, no site, unless it be on a major stream at the Fall Line, has an outstanding locational advantage.²² Except for Lancaster, Washington, Richmond, Charlotte, Winston-Salem, and Atlanta, no single city (metropolitan district) has more than 100,000 inhabitants.

Washington, D. C. (907,816), at the head of navigation on the Potomac, occupies some 70 square miles of hill, valley, and plain. No other city in the United States was so carefully planned. Said Major Pierre C. L'Enfant in 1791 when he was laying out the city:

No nation ever before had the opportunity of deliberately deciding upon the spot where their capital city should be fixed. . . . It will be obvious that the

²² Atlanta (442,924), the one exception, is a Piedmont city that differs from all the others in not having the Appalachian barrier behind it.

plan should be drawn on such a scale as to leave room for that aggrandizement and embellishment which the increase of wealth of the nation will permit it to pursue to any period, however remote.²³

Anyone looking down on Washington today will understand precisely what L'Enfant meant. He adapted the natural landscape to the elements of his plan, providing for the needs of recreation and of learning. Every part has organic relations with every other part. The system of boulevards and parks is admirable. Nowhere else in the world is there such an aggregation of beautiful buildings—marble, limestone, and sandstone.

Washington is dedicated entirely to government. There is practically nothing in the way of commerce or industry. "Every second person is a government worker or his dependent." In all probability, however, when George Washington chose the site, he was influenced by:

. . . the expectation that the new city just below the falls of the Potomac would in no long time rival Philadelphia, New York, and Baltimore as a center of industry and would become the continental mart for ocean-borne commerce—would be, in short, the metropolis of the Western World.²⁴

But, because of the railroad, the Potomac River never became the great highway to the Ohio country as Washington forecast. As the federal government played an increasingly prominent role in the affairs of the nation, the city grew notably; when the government came there in 1800, it had 123 clerks; in 1941 the total number of government employees was 180,000. The Census asserts that Washington is the fastest-growing large city in the country.²⁵

Richmond (245,674), a Fall Line city, is strategically located because here the north-south railroads*triat have been following the coast are forced inland by the broad James River estuary. The important Chesapeake & Ohio—an east-west railroad—also passes through Richmond en route from the coal fields of the Appalachians to Hampton Roads. Richmond is possibly the South's oldest important manufacturing center and still is one of the leaders, based on the value of its products. Average-size ocean-going vessels dock at its wharves.

Because of its age and its strategic location with respect to the

²³ Paul Fredericksen, "The New Washington," *The New York Times Magazine*, July 28, 1940, p. 6.

²⁴ Edward Channing, *The History of the United States*, Vol. IV, 1905-1917, p. 105. New York: Macmillan.

²⁵ "Congestion in Washington: By-Product of Defense," *United States News*, April 25, 1941, Vol. IX, No. 17, p. 16.

tobacco areas of the Piedmont, Richmond has long been a leading market and manufacturing center for tobacco products. Cigarette-making is the most important industry, though paper, rayon, cellophane, locomotives, and flavoring extracts all are important.

Atlanta (422,294) is the only large city strictly of the Piedmont. Located near the southern end of the Appalachian Mountains, it is the greatest rail center in the South, primarily because of its strategic geographical location. Upon Atlanta, therefore, converge the routes from the Northeast and Northwest which chose to go around rather than across the mountain wedge.

Unlike many Southern cities, Atlanta has a bracing climate, because it is more than 1,000 feet above sea level and near to both the Gulf of Mexico and the Atlantic Ocean. Though considered essentially a commercial city, it nevertheless has important manufactories. Being near both water-power and coal, and close to clays of great variety and high quality, Atlanta manufactures much brick and tile. Though not a primary iron and steel center, it is an important secondary one. Other manufactures include textiles, cotton-oil products, chemicals, paper, fertilizer, and furniture.

As cities go, Atlanta is young. As late as 1850 it was not sufficiently large to be included in the United States Census.

Lancaster (132,027) occupies a flat site in the fruitful valley of the same name. It benefits from excellent transportation facilities; the main line of the Pennsylvania Railroad serves it, and so does the Lincoln Highway. Additional hard-surface roads radiate from it in all directions.

Lancaster is an old city. Many of its houses consist of continuous blocks built flush with the sidewalk and all under a single roof. There are few foreign born in its population.

As an agricultural center, it has stockyards reputed to be the most important east of Chicago; as an industrial center, it manufactures linoleum, cigars, silk, rayon, and watches.

York (92,627), lying in the level-floored York Valley, follows the trend of the lowland. Like Lancaster, it has important industries but emphasizes capital goods to a greater extent—refrigerator equipment, ice machines, safes and vaults, tire chains, and textiles.

Lynchburg (44,541), located on the James River near the foot of the Blue Ridge, has for many years been an important transportation center. Because of gaps through the Appalachians, east-west and north-south railroads and highways cross here. It also benefited from water transportation during the era of the James River Canal. **It lies in the center of the dark tobacco area of Virginia.**

Lynchburg has a number of important industries, including the largest shoe-manufacturing enterprise in the South. Lynchburg also manufactures pig iron, cigarette-making machinery, textiles, and knit goods.

Danville (32,749), on the bank of the Dan River in the tobacco growing area, is one of Virginia's leading tobacco markets and its major cotton textile center.

Winston-Salem (109,833), like Durham, grew around the cigarette factories and is today the world's leading manufacturer of tobacco products. It is the outstanding industrial city of the entire South viewed from the value of its products, making two thirds of the nation's cigarettes. It also ranks high in the manufacture of woolen goods, hosiery, and underwear.

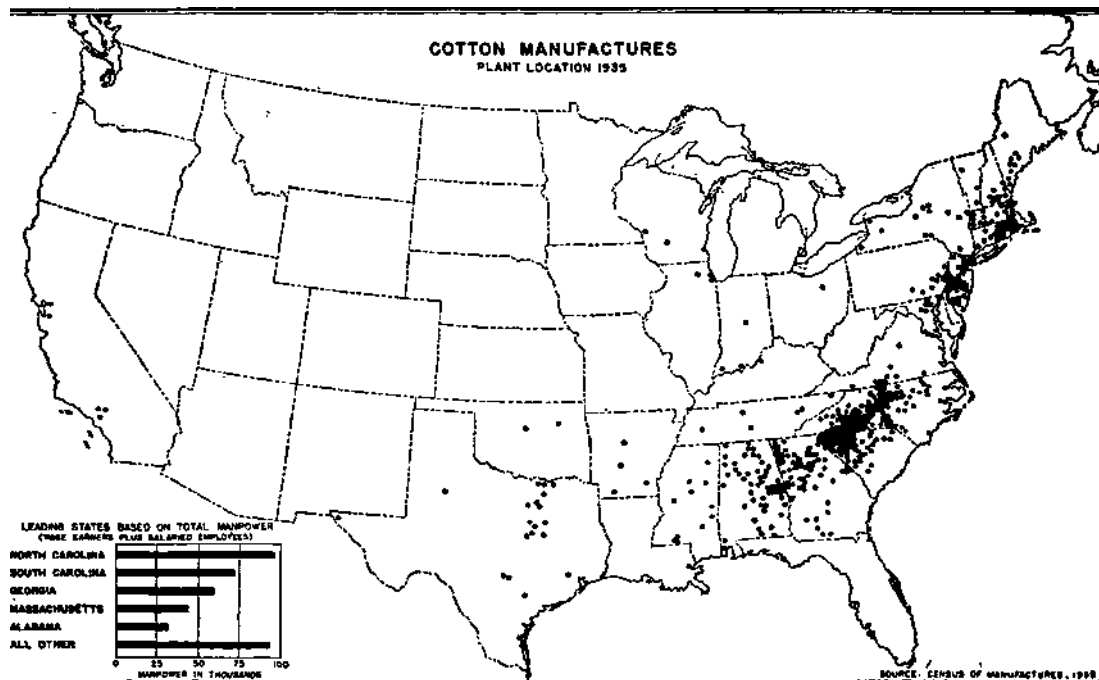
Greensboro (73,055), midway between Winston-Salem and Durham, has large cotton and silk hosiery mills and important cigar factories (fifty million cigars annually). It occupies a cross-roads location where the main north-south lines of the Southern Railroad meet east-west lines. It is also a distributing center of some importance, being well served by hard-surface roads over which trucks carry merchandise to surrounding towns and villages.

Durham (69,683), in the heart of the tobacco country, is one of North America's leading cigarette-manufacturing centers. It grew up around the tobacco factory. In addition it produces smoking tobacco, cotton textiles, silk hosiery, tobacco-packing machinery, and bricks. A city of this type rarely grows very large, since the processes involved in making cigarettes are highly mechanized and their labor requirements are limited.

High Point (38,495), near the hardwood forests of the Piedmont and Blue Ridge, is the furniture-manufacturing center of the South. Its first factory was established in 1888. It also has a cotton-textile and a silk-hosiery industry.

Macon (74,830), *Augusta* (87,809), *Columbus* (92,478), and *Columbia* (89,555) lie on the outer edge of the Piedmont on the Fall Line. All are surrounded by empty areas because of topography—the rough surface being less suited to attracting and supporting a large population than the more level Coastal Plain to the south and the Piedmont to the north. All four cities are important textile centers and contribute to make the Southern Piedmont the leading textile area of the South (Fig. 54).

Charlotte (112,986), North Carolina's largest city and chief distributing center, is situated close to the South Carolina border. Lying in one of the more fertile and productive parts of the entire Piedmont, Charlotte was an outstanding agricultural center until



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Fig. 54. Distribution of cotton textile mills in the United States. Comparison with Fig. 82 shows that only a scattering of cotton textile mills is to be found in the cotton-growing areas. The locational pattern of cotton manufacturing is that of a "relatively foot-loose industry bound neither to resources nor to consumers nor yet lying directly along the line of flow from one to the other"

slavery was abolished. It is today a leading textile center. On all but its southeastern edge, the city is surrounded by mill villages with their thin, long rows of square uniform four-room houses. Charlotte's mills lie close to the Catawba River, whose abundant power has played a vital part in the growth of cotton manufacturing throughout this entire area.

The Outlook

The Piedmont as a region will continue to be important agriculturally. The growing of tobacco and certainly of cotton will decline, whereas dairying and its supporting crops should increase. Farming will necessarily become more scientific and intensive. Soil erosion should be reduced, as too many farms have been melting away. Man has been practicing level-land farming on rapidly eroding hills. For centuries he has been growing gully-stimulating crops—corn-tobacco-cotton. Slope lands plus summer torrential rains, plus clean-tilled crops constitute an ideal triad for erosion. Moreover, land destruction is worse in the Southern Piedmont since turf does not thrive in hot humid areas. In the future, man must cultivate intensively only the level to gently rolling areas, terrace and strip-crop the more sloping fields, and place the remainder in pasture and trees. He must and doubtless will have an animal industry that will supply his family with milk and butter and his acres with manure.

Much of the Piedmont, however, is rapidly developing into a major manufacturing region. Especially is this true of that portion between Lynchburg and Atlanta, where factories literally dot the landscape (Fig. 54). In fact there are some areas—the Hickory, Greensboro-High Point, Charlotte-Gastonia, Shelby, and many others—where mills seem to run along for 20 miles at a stretch. In this subregion there seems to be a close balance between manufacturing and agriculture.

The future of the cotton textile industry of the Piedmont seems assured, though as the wage differential between Northern and Southern mills is narrowed, as a result of new federal laws and the growth of unionism in the South, the Piedmont's chief location factor—the price differential in labor—may no longer be important.

Although cigarette manufacturing may not expand, it should not relocate. The furniture industry will become more important now that the forests are being conserved. Forestry systems are evolving whose purpose is (1) to effect proper cutting and (2) to treat trees as a crop. Manufacturing is becoming more varied, as numerous

small plants making a large variety of products locate in the region.

Since few parts of the country have so many attractive small towns where labor, power, and efficient transportation are satisfactory, numerous new industries will be attracted. The Piedmont is an up-and-coming region.

CHAPTER VIII

The Appalachian Uplands

A REGION OF MINING, FARMING, RESORTS, AND WATER-POWER

THE APPALACHIAN UPLANDS are an elongated highland mass dissected by narrow and broad valleys. They consist of (1) the massive irregular mountains of the Blue Ridge on the east, (2) the series of linear valleys and ridges in the center, and (3) the dissected plateaus of the west (Fig. 55).

This is one of the most highly diversified regions in Anglo-America—topographically, climatically, pedologically, and economically. Nevertheless, a thread of internal unity holds the several parts together, making them one major geographical region. One feature characterizes the whole—an elevation higher than the lands which surround it. The most densely settled areas, those with more than 100 persons to the square mile, are the valleys, while the sparsely settled areas, those with ten inhabitants per square mile, are those of broken relief. The opportunities available to the inhabitants are closely associated with the distribution and utilization of natural resources. Considerable discrimination is shown in the selection of places for settlement, especially regarding the suitability of the land for crops. Since most of the population consists of farmers and miners, the inhabitants of the Appalachian Uplands are everywhere conscious of their dependence upon nature.

J. The Blue Ridge

This subregion consists largely of crystalline rocks of igneous and metamorphic origin—granites, gneisses, schists, diorites, and slates. Extending from Pennsylvania to Georgia, the Blue Ridge exceeds all other mountains in the East in altitude: north of Roanoke it consists of a narrow ridge cut by numerous gaps; south of Roanoke it spreads out to form a tangled mass of mountains and valleys, in

North Carolina more than 100 miles wide. The mountains are steep, rocky, and forest-covered. The highest peak in eastern United States is Mount Mitchell in North Carolina (6,684 feet.)

Some of the gaps through the Blue Ridge enable railroads to

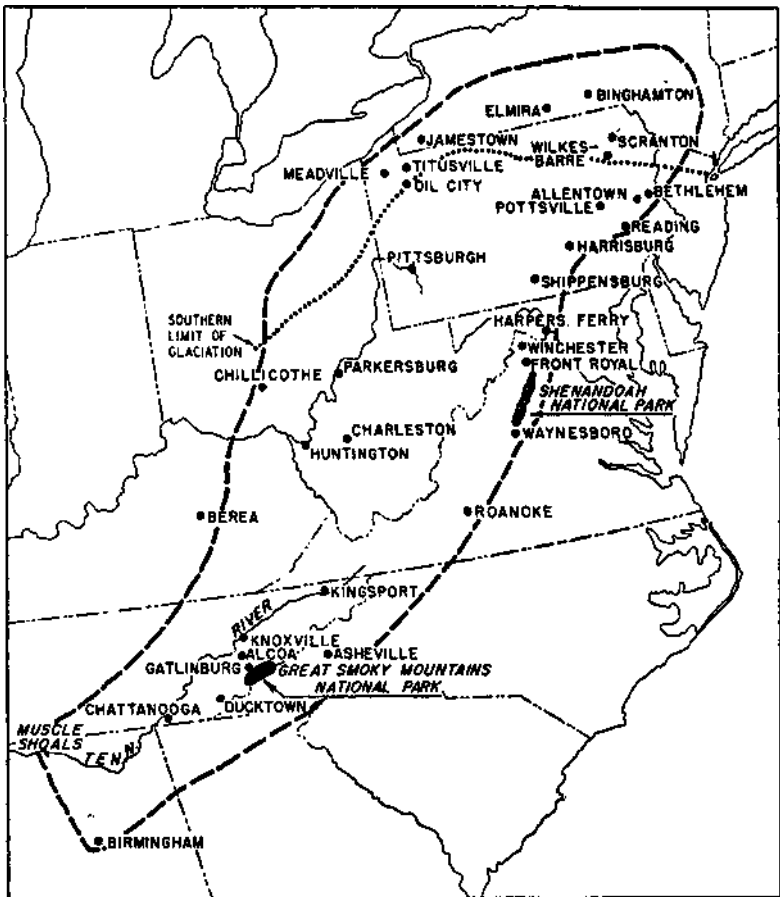


Fig. 55. The Appalachian Uplands: a region of mining, farming, resorts, and water-power.

penetrate the barrier; outstanding is that at Harper's Ferry, through which the Baltimore & Ohio passes.

No other part of the United States, except a portion of the Pacific Coast, receives so much precipitation. Because of heavy rainfall, [the Blue Ridge was clothed with magnificent forests, the original

covering being hardwood, especially oak, chestnut, and hickory. In luxuriance possibly only one other forest in the world surpassed it, the *selva* of the Rainy Tropics. The greater part of the original forest was logged years ago, much of it being converted into charcoal for iron furnaces in the nineteenth century. Much of the area has been cut repeatedly and, what is worse, a great deal has been badly burned. Only the isolated areas are being exploited at present.

Economic activities

Agriculture. While agriculture is the most important economic activity in the Blue Ridge, (the area does not favor commercial farming.) Much of the land, both in the north and south, is rugged and stony and should be forever the stronghold of the forest. 'It is, therefore, an area of self-sufficing farms:

Houses are built by farmer-carpenters; stores are run by farmer-merchants; church choirs are composed of farmer-singers; the sick are nursed by farmer-neighbors, who often voluntarily cultivate the household crops during the neighbor's illness.¹

In the southern Blue Ridge, small patches of arable land called locally "coves and hollows" are given over to growing corn, apples, and sorgo (sweet sorghum for syrup). The coves vary in size from those able to support only a single family to those capable of sustaining 40 to 50 families. Commercial apple orchards were started in this area near Afton, Virginia, as early as 1890. Most of the orchards of Virginia, Maryland, and Pennsylvania are confined to the gravelly loams on either side of the Blue Ridge, primarily to guard the trees against spring frosts—the slopes assuring good air and water drainage. Access to both the Great Valley and the Piedmont enables the crop to be delivered without difficulty. In the more isolated sections, large quantities are converted into apple-jack. Corn, the leading crop, is grown by agile farmers on amazingly steep slopes or in the narrow valley bottoms. Though grown mainly for subsistence, when made into whiskey, the corn becomes a cash "crop." The value of corn in proportion to its bulk is so low that the mountain farmers cannot economically deliver it to market, but by converting it into whiskey, only one thirtieth as bulky, they can sell it to bootleggers for about 90 cents a gallon.

¹ M. Taylor Matthews, *Experience—Worlds of Mountain People*, p. 13. New York: Columbia University, Teachers College, 1937.

Moonshining, "the hidden industry of the hills," has been important in this region since colonial times. Federal agents spot stills by flying over the mountains in winter when the woods are leafless. Considerable land is in pasture on which cattle and sheep are reared.

Most of the people who live in the Blue Ridge are of old colonial stock. Their ancestors were crowded out of the tidewater by slave labor and plantation management. The pressure of population in the southern "Carolina Mountains" is so great that every arable spot is now preempted, and in many areas the once productive soil has become depleted by overcropping or hopelessly ruined by sheet erosion and gullyng. Much of that being cultivated should be in forest. Some of the fields are on such steeply sloping ground that bedrock is exposed within 3 or 4 years.

For the most part the people are among the poorest in the United States. Their houses are crude, bathrooms are practically absent, and, in most instances, water is carried from near-by springs. The standard of living is low and inbreeding common. Yet there is something to be said in favor of their way of life.

They do not make elaborate preparations to enjoy life but begin at once, and if their scheme of things is simple, it is no less satisfying. A mountain man will hardly slave through a sunny spring day when he longs to enjoy the weather in order that he may take a vacation in the same sunshine somewhere else later on. His affairs are not so pressing. As soon as he thinks of it, he will probably pick up a chair, tilt it back against the sunny side of the house, tip his hat down over his eyes, and start in on the business of enjoying the day.²

Since the small mountain farms of the Blue Ridge cannot be subdivided indefinitely, children from the large families find it necessary to migrate to the lowlands. Sometimes the entire family moves onto the Piedmont to work in textile mills. Lemert quotes a South Carolina mill owner as follows:

Many of our people came from the mountains. They came down to the mills, and for six months or a year were terribly dissatisfied and finally resigned and went home. Back there, they never saw anyone, their kids could not go to school, had no one to play with and their wives had no one to talk to. The men folks had had the novel experience of hearing coins jingle in their own pockets and it's hard to find even enough to eat back in those mountains. Almost without exception they write back, "For God's sake send us money to come back to the mill village." The one trip back weans them away from the mountains and brings them into the mill life for good.³

² Muriel Earley Sheppard, *Cabins in the Laurel*, pp. 157-158. Chapel Hill: University of North Carolina Press, 1935.

³ Ben F. Lemert, *The Cotton Textile Industry of the Southern Appalachian Piedmont*, p. 48. Chapel Hill: University of North Carolina Press, 1933.

Manufacturing. Manufacturing, as compared with that in the neighboring Southern Piedmont, is unimportant. Some textile mills and furniture factories are situated in those localities where timber, labor, power (hydro, coal, wood), and transportation are available.. Copper smelting is carried on at Ducktown, Tennessee, whose tributary area is one of the most noted examples of unrestricted erosion in the entire Appalachian Upland Region. Copper smelting is one of the few industries based upon Blue Ridge mining. Asheville is the manufacturing capital of the Blue Ridge. ~~

The tourist trade. From north to south the Blue Ridge is becoming a resort region. Resorts and summer homes are springing up in Pennsylvania's Blue Ridge, which is relatively near Philadelphia, Baltimore, and Washington.

In the South the national parks attract large numbers of tourists. Shenandoah National Park, Virginia, offers beautifully timbered slopes and valleys, and attracts about a million visitors each year—leading all other national parks in attendance. The picturesque Skyline Drive is a paved highway extending 67 miles along the crest of the Blue Ridge between Front Royal and Waynesboro. Later on it connects with the Blue Ridge Parkway. The Great Smoky Mountains National Park possesses beautiful lofty mountains clothed with dense forests of spruce and fir in the north and hardwoods in the south. The southern segment of the Appalachian Trail, which extends from Maine to Georgia, follows the crest of the Blue Ridge. One of the country's leading regional planners, Benton MacKaye, who conceived the Appalachian Trail, has called it "the backbone of a primeval environment, a sort of retreat or refuge from a civilization which was becoming too mechanized."⁴

Asheville (76,324), located in the Blue Ridge, is unique in being both a tourist and health resort and an industrial center. Its elevation of 2,216 feet has enabled Asheville to become a mecca for health seekers who want to escape the muggy summers of the Coastal Plain and the Piedmont. The city has ready access to some of the most beautiful scenery in eastern United States. It lies close to national forests and the Great Smoky Mountains National Park.

While Asheville is connected in the minds of most people with health and tourism, it also sustains important industries—especially those concerned with textiles, forest products, foodstuffs, and minerals—especially mica. It is the economic center for eighteen mountain counties in the western half of North Carolina.

⁴ Harlean James, *Romance of the National Parks*, p. 209. New York: The Macmillan Co., 1939.

The Great Appalachian Valley

The Great Valley, a nature-chiseled groove that trends north-east-southwest from the Hudson Valley of New York to central Alabama (Fig. 55), is one of the world's longest mountain valleys. Actually it is not a valley in the ordinary sense of the word but a topographic lowland. It came into existence because the underlying limestones and shales were easily eroded. One can go from end to end without ever crossing a mountain ridge. In no sense a rugged area, it is broad and relatively flat-bottomed, though not in the same way as is the plain of the Mississippi. The divides between its several streams are decidedly rolling.

The Great Valley has numerous segments. Near the Delaware, it is called the Lehigh Valley; north of the Susquehanna, the Lebanon Valley; south of the Susquehanna, the Cumberland Valley; in northern Virginia, the Shenandoah; in Virginia as a whole, the Valley of Virginia; and in Tennessee, the Valley of East Tennessee.

It has long been the great north-south highway in the Appalachian barrier as well as one of the most productive agricultural areas in the East. For the most part it has never been of outstanding industrial importance, though several of its cities, particularly in Pennsylvania and Tennessee, have important manufacturing establishments. Furthermore, it has no imposing array of great cities.

The physical setting

The eastern and western confines of the Great Valley are definite: the knobby wooded crest of the Blue Ridge towers above the valley floor on the east; the wild, rugged, though less imposing Appalachian ridges bound it on the west.

Except in Pennsylvania, the Valley is not uniformly wide. Thus in Maryland it is about 20 miles wide; in northern Virginia, 6 to 10, in western Virginia, 20; and in East Tennessee, where it is broadest, 55.

Gray-brown podzolic soils prevail over all but the southern part where red and yellow soils rule. Valley soils range in color from light gray to grayish brown and from yellow to reddish brown and even dark red. In texture they vary from loams to clay loams. The most productive are the transported soils of the larger flood plains; next best are those derived from limestone, then slate, and finally shale. Having developed largely under a forest cover, they

contain little humus and are acid in reaction. Some leaching has occurred.

Climatically this area gets less rainfall than other parts of the Appalachians—about 40 inches. This difference is due to the sheltering effect of the Blue Ridge on the one side and the Allegheny-Cumberland Escarpment on the other. The seasonal distribution is quite even, though autumn is somewhat drier than spring; about half the precipitation falls during the growing season.

The frostless period is about 2 weeks longer and the average summer temperature 2 degrees Fahrenheit higher than on the adjacent ridges to the east and west. The length of the frostless season increases from north to south.

The native vegetation of this subregion consisted primarily of oak and hickory in the valley lands with sycamore, elm, and willow near the streams. There were also areas of grassland in the broader river valleys—the result of annual burning by the Amerinds. The greater part of this magnificent forest has been destroyed. Some was used for farm buildings, rail fences, charcoal for iron furnaces, and some for domestic fuel; some was burned by bark peelers to reduce the fire hazard to their bark piles; much, however, was piled into huge log heaps and burned, or girdled, or permitted to rot on the stump.

Settlement

The Great Valley was settled largely by English, Scotch-Irish, and Germans. Because of their craving for independence, the Scotch-Irish especially made admirable frontiersmen. The Germans chose the rich limestone soils, the Scotch-Irish the slaty hills.⁵ Hostile to the Virginian and North* Carolinian way of life, the Germans and Scotch-Irish made the Valley one of relatively small holdings, diversified farming, and free labor. Slavery never was so important here as in the areas to the east.

Economic activities

Mining and industries based on mining. The output of mines and quarries is important, though less so than that of farms. Widespread limestone deposits have encouraged industrial development, especially the manufacture of cement. Time was when the Lehigh Valley of Pennsylvania produced the bulk of the nation's cement. Its advantages were then and are now:

⁵ A. B. Hulbert, *Soil: Its Influence on the History of the United States*, pp. 143-144. New Haven: Yale University Press, 1930.

1. Highly strategic location with respect to great cities.
2. Large resources of high-grade cement rock.
3. Early start and wide reputation.

In 1910 the Lehigh Valley produced more than 70 per cent of the total output of the United States, but by 1935 this had been reduced to 20 per cent. The cement industry is now decentralized, since the market is nationwide and the product of low value and great weight. Freight rates accordingly set a definite limit on the distance a given area can serve; freight is said to add one third to the cost of cement for every 100 miles it is shipped.

The Lehigh Valley, with some 25 plants, still ranks first in this industry. Since cement-making requires much fuel, the Valley's location close to coal is advantageous. Cement-making is not confined to the Lehigh Valley; it characterizes numerous towns and cities throughout the entire extent of the Valley. In Pennsylvania the industry has attracted the parasitic textile mills and textile-products mills which came to reap the benefits of cheap female labor.

Additional stone-working enterprises include the quarrying of slate in the Lehigh Valley, which produces almost one half of the total of the United States, based on value; marble in the Knoxville District of East Tennessee; and clays for brick and tile throughout the entire Valley.

Agriculture. Most of the Great Valley is in crops or pasture, and the majority of the people make their living from agriculture. General farming predominates, though dairying is important near cities and towns.

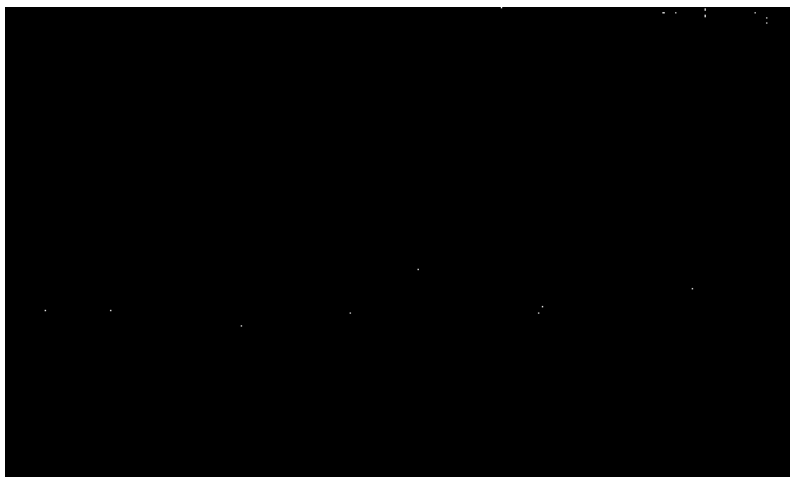
The Valley is Virginia's leading agricultural section and vies with Pennsylvania's Lancaster County in importance. In the Shenandoah Valley, one of the best general farming areas in the entire Appalachian Upland Region, the population averages only 40 persons to the square mile—considerably lower than in the less fertile and more rugged neighboring subregions. This mirrors no relative paucity of possibilities for agriculture, because soil, terrain and climate all are favorable; it means rather that general farming requires more capital and smaller units of labor than subsistence farming.

Northern crops such as wheat, corn, hay, and apples predominate from Pennsylvania to Alabama. For a century after the Valley was occupied it was a leading wheat-growing section. Wheat is well-suited to the fertile limestone soils, and most farmers made it their chief crop. But, as the frontier followed the setting sun, areas of cheap fertile flat land were put under the plow in the Middle

West, forcing the Valley farmers out of competition. Nevertheless, winter wheat still is a major crop.

Corn fits into every rotation system. Though grown on both level and rolling terrain, it is more concentrated on alluvial bottom lands where the highest yields are procured.

Hay plays a dominant role in every rotation. It provides feed for livestock, supplies fertility by adding humus and nitrogen to



Bureau of Agricultural Economics.

Fig. 56. A dairy scene typical of much of Virginia's famed Shenandoah Valley. The cattle, pure-bred Holsteins, are on permanent pasture.

the soil, needs little labor as compared with apples and other clean-tilled crops, and provides excellent fall pasturage.

The Valley is one of the country's outstanding apple-growing sections. In the Shenandoah Valley people think and talk in terms of apples just as do those in Iowa of corn and hogs. Though apples have long been grown, commercial orcharding has been important only during the past 4 or 5 decades. While some failures have occurred where air drainage was poor or where soil was not suitable, the soil, climate, topography and access to market make the Valley well-suited to this crop.

j Orchards are found along mountain slopes and foothills and on level and rolling land. The most famous area is "Apple Pie Ridge" which extends through Frederick County, Virginia, to Berkeley

County, West Virginia. Here for a distance of 25 miles is an almost unbroken series of apple orchards.

The bulk of the crop is grown for the European market. New York City rather than Hampton Roads is the exporting port because of faster rail service.

Livestock. With splendid pastures during six to eight months of the year and with large urban centers not far away, the rearing of dairy cattle obviously is important (Fig. 56).

J Beef cattle are reared in large numbers in the Virginia-Tennessee portion—on those lands too steep for crops. Formerly large numbers of beef cattle were exported alive to Europe; now, however, they are shipped either to Lancaster County, Pennsylvania, for winter fattening, or to Jersey City or New York City for the Kosher trade.⁶

A great highway

Pioneers westward-bound had to find a way across, through, or around the Appalachian Uplands. The most famous early route was via the Great Valley. The bison, Indian, explorer, pioneer, soldier, engineer, scientist, trader, and tourist all have appreciated it. The fact that it was much more level than the Piedmont and had crushed stone for road-making encouraged its wide use.

Prior to the Revolutionary War it was used by the English Quakers and German colonists from eastern Pennsylvania in their migrations southward. Some pioneers left the Great Valley near Shippensburg, Pennsylvania, and went over the mountains to Pittsburgh. Most of those from Maryland, Virginia, and North Carolina, en route to the Blue Grass Region of Kentucky, followed the Great Valley to the headwaters of the Tennessee to a notch in the Cumberland Mountains—Cumberland Gap. From here on was the famous Wilderness Road.

During the Civil War the Valley was the roadway by which the Southern army moved north and the Northern army marched south. The Confederate army reached its most northerly point in the Great Valley at Carlisle, a few miles south of Harrisburg. It was following the line of least topographic resistance. The Valley's strategic location with reference to objective points of both armies is well known: Richmond, capital of the Confederacy, was the goal of the Army of the Potomac, while Washington was the goal of the Army of Virginia.

⁶ Food sanctioned by Jewish law as ritually clean.

Few areas saw so much fighting or devastation as the Shenandoah Valley. Winchester was taken and retaken 72 times during the conflict. Here General Phil Sheridan made his famous ride. Here too General Stonewall Jackson made history with his "foot cavalry." So productive was the Valley that it was called the "granary of the Confederacy," until Sheridan left it "so desolate that a crow flying over it would have to carry a knapsack."

Interesting indeed is the fact that the present "Valley Pike" (the old Indian Road) was the first macadamized highway in Virginia, having been built between 1830 and 1840. For decades it was the main line of travel for farmers of this and adjacent areas.

Recreation and travel

The Valley is a great highway connecting the North and the South. It is rich in limestone wonders such as Natural Bridge and numerous famous caverns, is one of the country's most historic areas, and is productive agriculturally. Possibly nowhere else in North America are historical episodes presented so clearly and accurately to the traveler. From one end of the Valley to the other are substantial farmhouses carrying signs "Tourists Welcome."

Valley cities

Towns grow up at places that have such advantages of location as fertile soils for agriculture, energetic and healthful climate, deposits of minerals, good water supply—all combined with good transport facilities. Every part of the Valley enjoys these advantages, but no one place has any locative superiority. The Great Valley, therefore, has no New York, Boston, or Chicago; it does have numerous small cities and scores of towns. Most of the cities are found where gaps through the mountains enable east-west railroads to get through and where these cross north-south lines.

Allentown-Bethlehem-Easton (325,142) constitute a metropolitan district, there being no real break between them. *Allentown* is the chief trading center of the Lehigh Valley segment of the Great Valley as well as an outstanding manufacturing city. It is strategically located with respect to markets. Allentown is primarily a textile center with metal industries ranking second. Outstanding among its manufacturing enterprises is the International Motor Company, maker of trucks. *Bethlehem* lies on both sides of the Lehigh Valley and abuts against the Reading Prong in the south. Its pattern, like Allentown's, conforms to the trend of the Great Valley—the long streets follow roughly the trend of the valley

floor. Bethlehem, a great iron and steel center, is the original home of the Bethlehem Steel Company, which began operations during the Civil War, using anthracite as fuel. The plants lining the river bank are impressive. *Boston*, third Lehigh Valley city, lies at the confluence of the Lehigh and Delaware rivers. It is a textile (silk and rayon) manufacturing city and, unlike Allen town, has no important metal manufactories. It is also an important trading center for the surrounding country.

Chattanooga (193,215), gate city to the Valley of East Tennessee, is on the Tennessee River. It has important industries—cement, brick and tile, textiles, woodworking, iron, and knit goods. It also is a great transportation center, both rail and river.

Reading (175,355), accessible to Philadelphia and to the anthracite area, lies at the intersection of the Schuylkill and Great valleys. It is highly industrialized. Manufacturing is favored by (1) strategic location, (2) early start, and (3) high-class skilled labor, mostly of German origin. Textile and textile products lead, especially hosiery, followed by metals. The city is the center of the Reading railroad system; it is also served by the Pennsylvania Railroad.

Harrisburg (173,367) is located where the Susquehanna crosses the Great Valley. It lies on a flat terrace at a point where canals, railroads, and modern highways all focus upon it. Harrisburg is important both industrially and politically, having a primary and a secondary iron and steel industry as well as textile mills—the latter partly parasitic. It is also the capital of Pennsylvania, the second most populous state in the Union.

Knoxville (151,829), is located in the Upper Tennessee Valley. It has an advantage unique among this group of urban centers—it benefits from water transportation and cheap hydro-electric power and from the Tennessee Valley Project. It is also the trade center of an extensive area consisting of both valley and hill country. Surrounded by mines, quarries, and timber, Knoxville manufactures furniture and quarries large quantities of marble. It also makes knit goods.

Roanoke (110,593), the most important city in the Valley of Virginia, is located where gaps permit the great coal-carrying Norfolk & Western and the Virginian railways to follow a relatively easy route through the mountains from the coal fields to Hampton Roads. It has large railroad shops, one of the largest rayon mills in the world, and factories making chemicals, furniture, and miscellaneous goods. Its tributary agricultural area is one of the richest in Virginia.

Kingsport (14,404)/ in Tennessee, a planned manufacturing town less than 50 years old, was located where formerly were only bare hills and poor hillsmen. The area was retarded so long because it lacked railway transport and the mountain barrier kept coal from reaching it. The chief mills make rayon, cellulose acetate for camera films, and cement. The Kingsport Press, probably the largest in the world, manufactures books for publishers in New York, Boston, Chicago, and elsewhere. One of the world's largest and finest chemical plants is located in Kingsport. The factories procured almost half of their workers from farms, and maintain high standards for them. The city is relatively free from poverty.

Alcoa (5,131) ⁷ is on the east side of the Valley near the foothills of the Great Smoky Mountains. It is an aluminum-manufacturing town that was built up from the ground in 1914 (Fig. 168) because of the availability of practically limitless amounts of hydro-electric power. So important is the power factor that it minimized such others as proximity to raw materials and to markets, which usually dictate industrial location. The power, derived from a system of three reservoirs on the Little Tennessee and its tributary, the Cheoah, is sent to the plants over transmission lines. The demand for aluminum for war resulted in tremendous expansion of the industry in the early 1940's.

The Tennessee Valley Authority ⁸

The TVA is the greatest experiment in socio-economic planning and development thus far carried out by the federal government. It was created to aid in controlling, conserving, and utilizing the water resources of the area. It deals with such diverse problems as flood control, power development and distribution, navigation, fertilizer manufacturing, agriculture, afforestation, soil erosion, land planning, housing, and manufacturing.

The TVA, a kidney-shaped area about as large as England (Fig. 57), consists of the watershed of the Tennessee River and its tributaries and embraces an area of some 40,600 square miles. It lies in seven states and contains 2,000,000 people in its watershed and an additional 4,000,000 on adjoining territory.

This area was selected because of its relation to navigation, flood control, and power production. Except that it is a drainage basin, the TVA is not a unified region because land utilization, agriculture,

⁷ Population of the city, not the metropolitan district.

⁸ The TVA is not confined to the Great Valley, but since the most important part lies within it, this seems the most logical place to discuss the project.

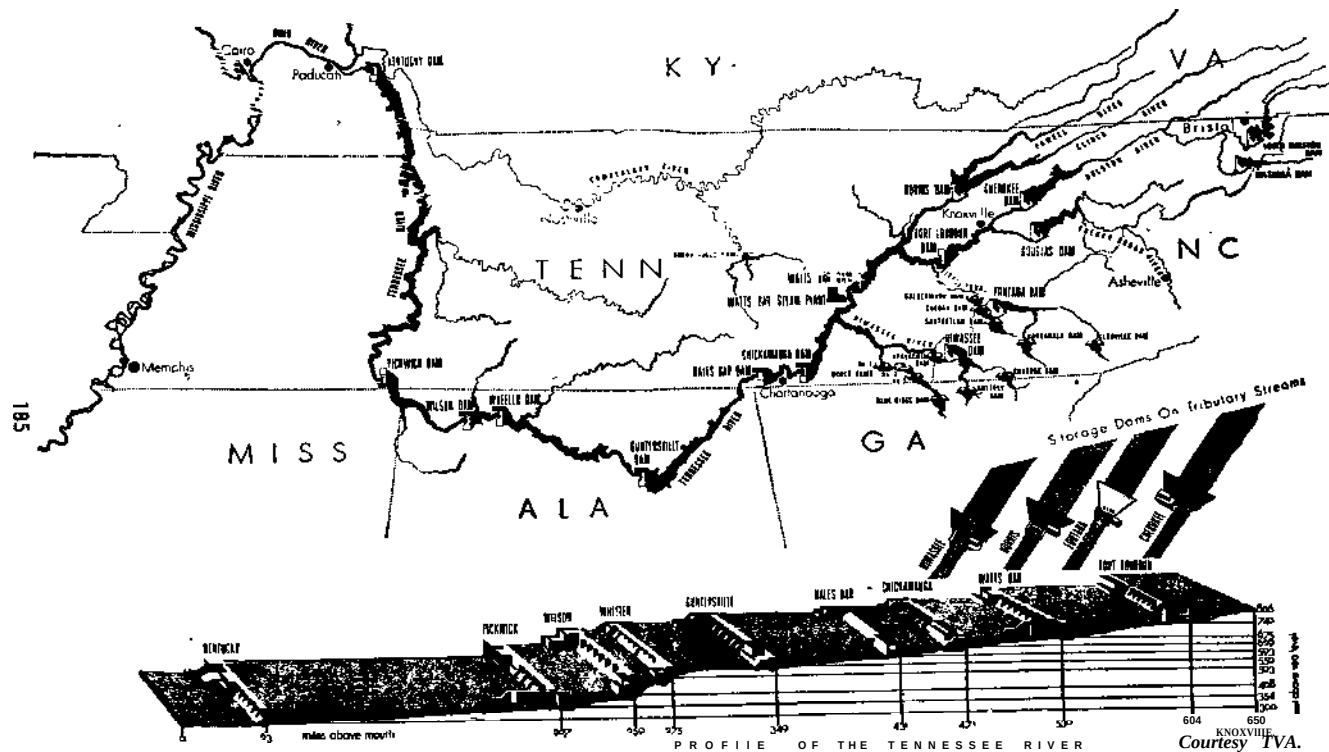


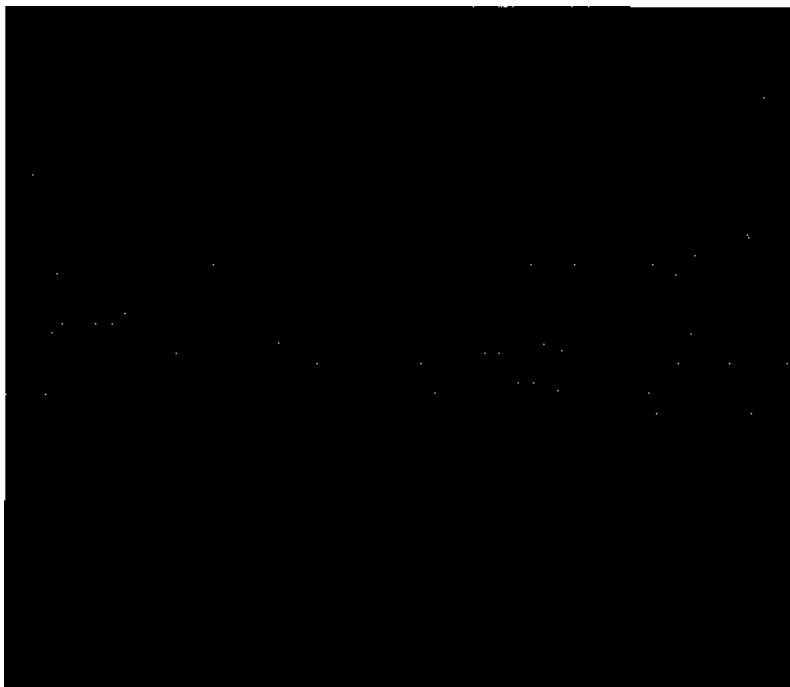
Fig. 57. The Tennessee Valley Authority—America's first real attempt at social planning.

manufacturing, transportation, and the economical distribution of hydro-power all cut across the drainage boundary.

Nevertheless the TVA has many of the things necessary for a well-developed economy: hydro-power, coal, petroleum, metals, chemicals, pigments, abrasives, ceramic materials, fertilizer ingredients, lumber, and farm lands.⁸

Power

In potential water-power the TVA is one of the richest areas in eastern United States. For example, in the vicinity of Muscle Shoals, prior to the building of Wilson Dam, the river dropped 134 feet in 37 miles. Generating plants are now located at the foot of each of its dams (Fig. 58). The water flows through raceways



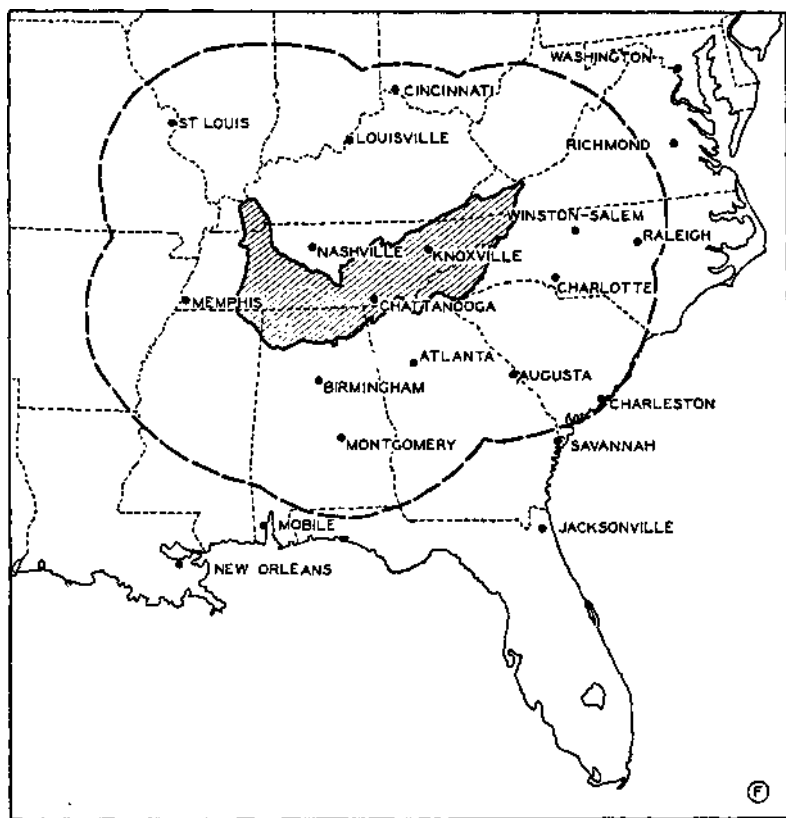
Tennessee Valley Authority.

Fig. 58. Wilson Dam at Muscle Shoals, TVA, aids navigation by eliminating 15½ miles of shoals and converts the power of falling water into electricity. Though the dam was started during the first World War, it was not completed until 1925. This impressive dam is 137 feet high and 4,860 feet long with a reservoir of 16,100 acres.

⁸ National Resources Committee, *Regional Factors in National Planning*, p. 88. Washington. D. C: Government Printing Office, 1935.

against the blades of giant turbines, which generate electricity for the transmission lines. Behind the dams are artificial lakes, some more than 70 miles long, for storing water.

So large is the area, so sparse the population, and so unimportant the manufacturing, except in the Knoxville and Chattanooga areas, that a major economic problem faced by the government is the lack of major local markets for power. The great power market—that consuming two thirds of the nation's supply—lies east of the Mississippi River and north of the Ohio. A considerable part of TVA electricity must be marketed, therefore, outside the delimited area. This energy can be transmitted economically a distance of some 250 miles (Fig. 59). In the early 1940's a tremendous step-up of power



Tennessee Valley Authority.

Fig. 59. Approximate area over which TVA electricity may be transmitted economically.

was required by the war industries—aluminum, munitions, chemicals, and others.

The TVA markets power by underselling private corporations, yet it is claimed by some who are disinterested that the government does not know the *exact cost* of this power, since part of the expense is charged to flood control and navigation.

Navigation

The Tennessee River connects southeastern United States with the Mississippi Valley. Its channel is to have a minimum year-round depth of 9 feet from the mouth at Paducah to Knoxville. Proponents believe that cheap water transportation will stimulate the out-movement of many low-grade raw materials and the in-movement of certain commodities such as gasoline, coal, pig iron, and wheat. Opponents assert that river transportation based on heavy expenditures of public moneys for improvements is out-moded and that the deepening of the Tennessee involves economic waste.

The history of inland waterways in the United States indicates that, aside from the Great Lakes and the Ohio River and a few short routes where natural conditions and industrial development are especially favorable, costly improvements are economically unjustified.

Soil erosion and conservation

More than one half of the two million people in the TVA live on farms. Man has cut down the forest and farmed steep slopes as though they were flat land. Hill-country agriculture is very bad. It is not uncommon to see hill farmers hauling loads on little sleds. In many sections the farmers are working steep and eroded acreages and becoming poorer each year. There has been too much dependence upon the one-crop system; diversification is necessary. Another major aim of the TVA is to conserve soil, first as a means of giving the farmers a higher standard of living, second as a means of retarding the filling-in of reservoirs behind dams.

Flood control

A major purpose of the TVA is to control floods that formerly destroyed millions of dollars of property, took many lives, and left desolation and poverty in their wake. It is alleviating flood damage not only in the Tennessee Valley but in the Mississippi Valley

as well. When all the dams are completed, the reservoirs will provide approximately 10 million acre-feet of controlled storage.

Manufacturing

The TVA has the following resources for industrial development:

1. Fuel—coal, lignite, petroleum, natural gas.
2. Light metals—bauxite and magnesium.
3. Heavy metals—iron ore, chromium, and manganese.
4. Raw materials for making cement, ceramics, chemicals, and fertilizer.
5. Low-cost hydro-electric power.
6. Improved transportation—water, rail, and highway.

As a result of careful planning, industrial progress is being made. The TVA has a Division of Land Planning and Housing (for making an inventory of the natural resources) and a Division of Social and Economic Studies. These learn what new industries would be best adapted to the area and precisely where they would be most scientifically located. They can and do give advice. Those in charge believe that the TVA will be a better place for human beings if industry is decentralized—if factories are scattered among the small rural communities. Plants, small in size, would employ members of farm families, who would live on their farms. These families would at least have food and shelter if the shops were forced to close down during a depression.

Among the more important industries already established are those making cheap fertilizer, which is badly needed to restore the worn-out soils. Scientists in TVA laboratories have contributed a new product, 'metaphosphate, the most highly concentrated phosphate compound. Synthetic nitrogen compounds also are being made. Textile mills are springing up where power, labor, and transportation are favorable.

Since the idea of national planning is new in the United States and there is nothing to compare the TVA with, geographic appraisal is extremely difficult. The bulk of the literature is highly colored for or against the project. But the region was *going* downhill rapidly; its resources had been largely wasted, unused, or exploited. Such depletion often results in new social theories. What the outcome will be only time will tell.

V- The Appalachian Ridges and Valleys

Many geomorphologists and geographers consider the Appalachian Ridges and Valleys and the Great Valley as one. The

authors believe, however, that there is sufficient difference in the topography and soils and in the human adjustments to them to justify separation. The Ridge and Valley area has a more restrictive environment than the Great Valley; over a large part of it ridges are more prominent topographic features than valleys. Moreover, agriculture is far less important, the land less prosperous, and the people more provincial and less well educated than in the Great Valley.

The Ridge and Valley subregion consists of a belt of land between the Great Valley on the east and the Appalachian Plateaus on the west. It is characterized by a series of roughly parallel ridges and valleys, variable in width and in number of component ridges. From an airplane the forested ridges show up as dark parallel bands and the cleared valleys as light ones.

Beyond that is a little narrow valley, then another ridge, and another and another and another, until finally, after thirty or forty miles of narrow ridges and the valleys between them, you come to a ridge that has but one side. Reaching its top you do not see another valley but instead the level land of the Appalachian Plateau stretching away towards the West.¹⁰

The ridges are not everywhere the same: here they are low and narrow, there high and fairly broad. For the most part the valleys

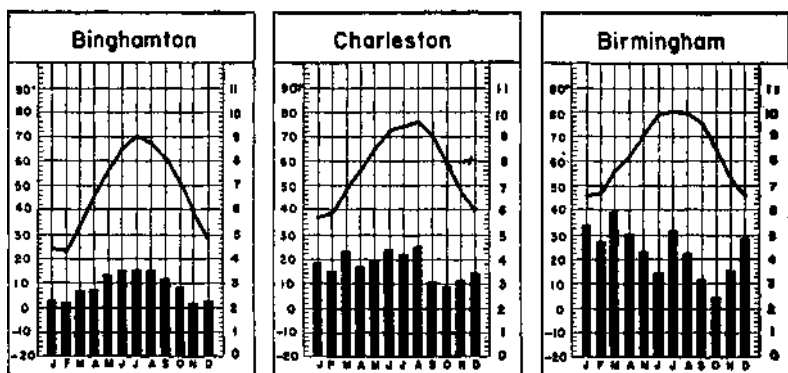


Fig. 60. Average monthly temperature and precipitation for Binghamton, Charleston, and Birmingham.

are narrow, flat to undulating, and cleared. Everywhere the ridges are supplied with gaps. South of Knoxville the Appalachian

¹⁰ J. Russell Smith, "The Great Valley—A Function of Limestone," *Journal of Geography*, September 1921, Vol. XX, No. VI, p. 234.

Ridges and Valleys merge with the Great Valley to form one sub-region.

Since more land is in sandstone, shale, and conglomerate ridges than in limestone and shale valleys, most of the soils are infertile.

The climate here resembles that elsewhere in the major region, except that in the Tennessee Valley the precipitation is heavier. The seasonal distribution is fairly even, though autumn is somewhat drier than spring. At night valleys have lower temperatures than might be expected, since cold, dense air from higher elevations flows into them. The average length of the growing season varies from 176 days in the north (Williamsport, Pennsylvania) to 200 days and longer in the south in the valleys of Alabama (Fig. 60).

Transportation

Rugged land presents many obstacles to transportation in the Ridge and Valley area. The numerous high ridges hamper ingress and egress. In the pioneer period travel was by horse and wagon and followed the valleys. The chief barriers to transportation were not broken down until the advent of railroads which came to exploit the coal, iron ore, and lumber. Main lines invariably follow the transverse stream valleys—the Juniata, Susquehanna, Schuylkill, Lehigh, Potomac, and others.

Roads, which were the first improved means of transportation, were scarcely better than trails hewn from the forests. Most famous of the early ones was the Wilderness Road¹¹ blazed by Daniel Boone in 1775. This road led from the Valley and Ridge province through the Cumberland Mountains to the Cumberland Plateau. For about 30 years it served as the main link connecting the new settlements in Kentucky with the Atlantic Seaboard. The rise of the Wilderness Road was attributable to the fact that the easiest and best route, the Mohawk Valley, was blocked by the powerful and hostile Iroquois. That through Pennsylvania to the Ohio led to a stream that was uncharted and hence dangerous. The country south of the Appalachian barrier was controlled by the warlike Cherokees. Because Kentucky was a neutral ground, the first important settlements west of the mountains took place there, and the Wilderness Road, the only feasible route to the west, was followed. From 1775 to 1800, 300,000 people went through Cumberland Gap and over the Wilderness Road through the long miles of mountainous desolation. The Road de-

¹¹ William Allen Pusey, *The Wilderness Road to Kentucky*. New York: Doubleday, Doran, 1921.

clined when the power of the Indians was broken and better routes could be utilized.

Today there exists a comprehensive network of all-weather roads. Those in Pennsylvania and Virginia are especially good. Many of



Pennsylvania Turnpike Commission,

Fig. 61. Pennsylvania Turnpike. During the entire history of human travel across the Appalachian barrier, from pre-white days to the present, easy routes have been favored. Between Harrisburg and Pittsburgh lies an imposing array of linear ridges that form barricades to east-west movement. But modern engineering has enabled the State of Pennsylvania to surmount these barriers with a superhighway—the only low-grade route through the Appalachians. Additional advantages are the absence of sharp turns, four twelve-foot lanes with the separation of those eastbound and westbound, and reduced distance—the shortest between points in the West and Metropolitan New York. There are seven tunnels—the typical approach to one being shown here with the portal building which houses the giant fans for supplying fresh air to the tunnel.

the highways follow the prevailing northeast-southwest trend. The most notable highway in all North America in 1942—the Pennsylvania Turnpike (Fig. 61)—traverses the Ridge and Valley country enroute from Harrisburg to Pittsburgh. It has two wide lanes in each direction separated by a central plot of grass. It has not a single traffic light or cross-road and in normal times has no speed limit. It follows a route laid out for a railroad in 1881, at a time when a great battle was being fought between the New York Central and the Pennsylvania railroads.

Agriculture

About one half of the land is in farms, but of this only a small part is actually under the plow. In Grainger County, Tennessee, for example, the farms average only 64 acres with 38 acres cultivable. The broken surface insures wooded slopes and abundant pasture land; hence the rearing of livestock is important. Settlements are scattered along the valleys and lower slopes. The ridge farms, as well as those in many extremely isolated canoe-shaped valleys, are definitely submarginal and should be replaced by forest.

Often the valleys are so narrow that farmers find it difficult to make room for even a small field. Where limestone valleys occur they are wider and more fertile, a few of many examples being Burkes Garden in Virginia, Greenbrier Valley in West Virginia, and the Central Limestone Valley in Pennsylvania. In Pennsylvania the large, fertile Nittany and Kishacoquillas valleys, floored with limestone, reach in places as high a degree of productivity as Lancaster County. Some of these valleys are miniatures of the Great Valley.

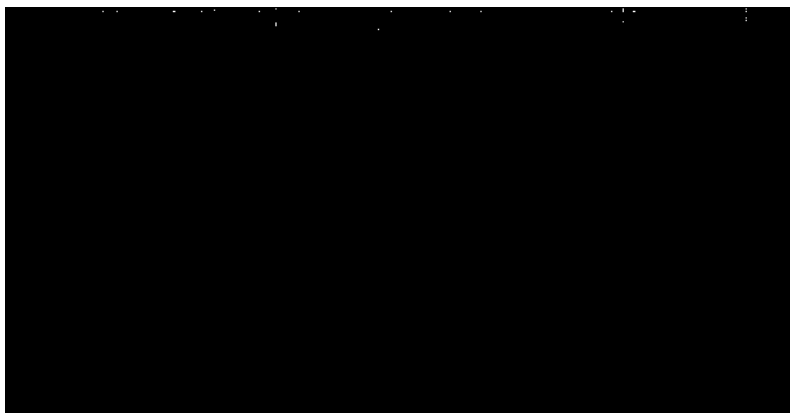
By and large, however, the Ridges and Valleys do not constitute an area of big barns and well-kept homes such as characterize the Great Valley, but rather one of small farms and poor homes and barns. Erosion has been robbing the farmers of their richest topsoil, and scarred fields characterize most holdings. In Grainger County, Tennessee, nearly 70 per cent of the land units are undergoing abnormal soil loss. Numerous corn fields are to be found on slopes in excess of a 40 per cent grade; moreover, many farmers run their rows up and down the slopes, thus making erosion more rapid than necessary. Parts of this area rival parts of New England in farm abandonment. So much land has been ruined that almost whole townships are for sale at what at first seem ridiculously low prices.

Farmers are frequently urged to take up dairying. The dearth

of cities and the limited transportation, however, mean a small market for fresh milk. Initial steps are being taken in the processing of milk, especially for cheese and canned milk. General farming, therefore, is the rule, the chief crops being wheat and corn.

Livestock

In an area with rugged topography, with soils of only fair fertility, with cool, moist conditions favoring luxuriant grass, and



Bureau of Agricultural Economics,

Fig. 62. Cattle grazing in southwest Virginia. If these slopes were used for crops, the soil would rapidly wash away. Hence they are pastured. The steepest slopes—those along the mountain ridge in the background—are kept in forest.

with limited transportation, the rearing of livestock is an outstanding economic activity. Where the land is not too steep for pasture and yet too rugged for growing crops, beef cattle are reared (Fig. 62). Over much of this area, natural blue grass clothes the slopes as soon as the timber is removed.

On slopes too steep for cultivation and the grazing of heavy cattle, sheep are being reared in increasing numbers. Sheep are effective destroyers of weed seeds and demand little labor.

Anthracite

In the extreme northern end of the Ridge and Valley country in northeastern Pennsylvania lies the great anthracite coal field of the United States. It is unique in being engaged almost exclusively in mining; it is not a farming area merely interrupted by sporadic evidences of mining. The anthracite region, characterized by narrow valleys, is clogged by large mine buildings, enormous piles of waste, and many railroads. Though only 480 square miles in extent, this area produces almost 100 per cent of the nation's anthracite. The Northern Field, one of three, is the most important, contributing more than half the tonnage and employing more than half the labor in the entire industry. The mines and mining towns are located in the valleys and are huddled so close together that the whole seems to be a single urban center.

How formed. Anthracite is metamorphosed bituminous coal—soft coal that, as a result of geological changes, has lost most of its volatile material. As the earth's crust in eastern Pennsylvania folded, the horizontal coal beds were elevated, distorted, compressed, and fractured to such an extent that the volatile materials were squeezed out.

Mining. As a result of folding and faulting as well as of the presence of much earthy material, anthracite is neither so easily nor so cheaply mined as the bituminous coal of western Pennsylvania. Accordingly, more labor is required in mining and separating it from slate. Both strip and underground mining are carried on, but the latter is more important.

Rise and decline of anthracite mining. The first record of the practical utilization of anthracite was for blacksmithing in 1768. Until the discovery of Connellsville coal and the establishment of Pittsburgh as the center of iron-making, the American metallurgical industry was concentrated in the anthracite region. The area lost this, its chief market, after 1875. Anthracite, because it is smokeless, is in great demand for domestic heating. It is suffering from intense competition, however, with natural gas, petroleum, and coke.

The anthracite industry has passed its peak and is definitely declining, but not because of exhaustion of deposits. The reasons are (1) the development of substitute fuels, (2) partial loss of the Canadian market, (3) increased efficiency in heating equipment, resulting in lower fuel requirements, and (4) mismanagement and strikes.

Despite Pennsylvania's monopoly of this valuable resource, the anthracite district is not prosperous; in fact it is poor and the future is far from bright. The principal reason is unemployment. Whereas 158,000 miners were employed in the decade 1920-1930, only about 100,000 were employed in the decade 1930-1940. With thousands unemployed, anthracite bootlegging has become important. Many crude shafts and miniature mines dot the hillsides of much of the area.

Manufacturing

At certain strategically located points in this subregion, manufacturing is important. In the anthracite area, the Wyoming Valley, every town of more than 5,000 inhabitants has some manufacturing. Scranton is the dominant center. Everywhere the textile industry, especially silk-threading and weaving, is important. Textile mills employ the wives and daughters of miners. Important too is the manufacturing of machinery for mines and textile mills.

In the extreme south, at Birmingham, Alabama, is an important iron and steel industry. This is the only district in the United States that lies astride all three raw materials for iron-making: on the east is red hematite ore; on the west, good coking coal; in the valley bottom, dolomite and limestone. About one fourth of the mined ore is self-fluxing—carrying 38 per cent iron oxide and 20 per cent lime. This district has the lowest assembly costs in the country, though it uses larger quantities of both iron ore and coal than other districts. Gaps through the ridges give ready access to and from the rest of the country. Though Birmingham is not actually on navigable water, to all intents and purposes it is, since it lies only 18 miles from Birmingham on the Black Warrior River, over whose waters the Federal Barge Line operates. The two are connected by a short railroad, owned by the federal government, which functions (so far as freight rates are concerned) as though the channel of the Black Warrior extended to the Birmingham mills. Despite these many advantages, Birmingham has not rivaled Pittsburgh, Chicago-Gary, or even Youngstown (in 1935 it had only 6 per cent of the nation's blast furnaces and 3 per cent of its steel-making capacity) because it is far removed from the major markets for iron and steel. Hence its advantage in assembly cost is partially offset by the expense of marketing when it sells pig iron and steel north of the Ohio River. Birmingham is strategically located, however, for supplying structural steel and oil-field equipment to the rapidly growing industrial South, for shipping to

the Pacific Coast, and for engaging in the export business. Moreover, its largest mills are owned by the United States Steel Corporation, which gives it many market advantages.

Cities

Scranton-Wilkes-Barre (629,581), comprise a metropolitan district. *Scranton* in the Wyoming Valley, is strategically located with respect to railroad outlets and is the largest city in the Ridge and Valley area. It is so completely dominated by anthracite that its pulse "throbs and ebbs with the status of coal mining." Here the basin is larger and the seams of recoverable coal are thickest and closest to the surface. Gaps afford practicable routes for the east-west railroads to cross the valley. Aside from being a great mining and transportation center, Scranton is also important industrially. The textile industry—especially the manufacture of silk and rayon—constitutes the most important part of Scranton's industrial life. This is a perfect example of a parasitic industry, as four fifths of the work in these textile mills is done by women and girls. The work is simple, wages are low, and labor is plentiful. No other enterprise is of outstanding importance, though metal-fabricating industries have developed for making machinery, railroad equipment, mine pumps, and so on.

Scranton's future is uncertain. The recoverable anthracite will probably *be* gone in 25 to 50 years. *Wilkes-Barre*, about 16 miles southwest of Scranton, is located similarly on floodplains and adjacent low ridges. While gaps enable railroads to go through the mountain barrier, they are not so good as those at Scranton.

Other cities whose sole existence is based on anthracite and which are of considerable importance are Plymouth, Pittston, Pottsville, Shamokin, Hazelton, Mahanoy City, Carbondale, and Nanticoke.

Birmingham (407,851), located in Alabama at the dividing line between the Southern Cumberland Plateau and the Southern Appalachian Valleys, is the youngest great city in the subregion. In 1870 its site was in corn and cotton fields; between 1900 and 1910 it became one of the fastest growing cities of the United States in its class. Birmingham owes its growth and industrial development to the near-by coal, iron ore, and dolomite.

Altoona (114,094) is one of the few metropolitan districts in Pennsylvania's Ridge and Valley area. It is located at the base of the Allegheny Front a few miles from the celebrated Horseshoe Curve, where the Pennsylvania Railroad climbs up onto the Allegheny Plateau. The city owes its existence to the Pennsylvania Railroad and is primarily a railroad center, though it does have sev-

eral silk and rayon mills. Branch lines focus upon the main line of the Pennsylvania here enroute to Pittsburgh.

The Appalachian Plateaus

The western division of the Appalachian Uplands is a broad belt of land known as the Appalachian Plateaus. It has a bold, high escarpment along its eastern edge—the Allegheny Front, which is so steep that roads and railroads ascend it with extreme difficulty. The layers of rocks comprising the plateaus lie flat one upon the other. This subregion extends from the Catskill Mountains to north-central Alabama, and from the Allegheny Front to the Interior Lowland (Fig. 55). The plateau is everywhere dissected, but not identically throughout. "About the only true statement that can be made of all is that they are plateaus in process of dissection or degradation."¹² Geographically this area is divided into three parts: (1) the Northern Glaciated Allegheny Plateau, (2) the Central Unglaciated Allegheny Plateau, and (3) the Cumberland Plateau.

The Glaciated Allegheny Plateau

This part and the unglaciated section are separated by the southern limit of the Wisconsin ice sheet (Fig. 55).

The physical setting

Rugged topography put its stamp on most of this area which on the north is bounded by the Mohawk Valley and Ontario Plain. The nearly flat-lying sandstones and shales are much dissected by streams that have cut down and back into the plateau. There is hardly a square mile into which at least one stream has not worked its way. In the northern part—the Finger Lakes country—six slender north-south trending lakes occupy the valleys of preglacial streams that were modified by ice erosion and blocked by ice deposition. Here is an area of rolling terrain. In northeastern Ohio and adjacent northwestern Pennsylvania, the plateau was modified by the ice, and the topography is gentle with broad divides. Northeastern Pennsylvania consists of a hilly upland with numerous streams, lakes, and swamps.

Gray-brown podzolic soils characterize the entire area. These are mostly derived from sandstone and shale, are acid in reaction,

¹² Nevin Fenneman, *Physiography of Eastern United States*, p. 283. New York: McGraw-Hill Book Co., 1938.

and are not outstanding in fertility. Locally, limestones and calcareous shales occur and their soils are more fertile.

The climate is Humid Continental and is characterized by long, cold winters and rather cool, short summers. There is ample precipitation for staple crops—35 to 40 inches. In places frost may occur ten months of the year.

Agriculture

The farming is varied; general farming prevails over much of the area but fruit, truck, dairy, livestock, part-time, and self-sufficing farming also are common.

The *Finger Lakes District* is nationally famous for its fruits, vegetables, and dairy products. A large grape industry is supported here, especially on the slopes of Lake Keuka (5,000 acres of vineyards border this one lake). The care of the vines is a year-round job, for there are about 650 individual vines on a single acre. One half of the crop consists of the Concord variety. Along the shores of the lakes are also fine orchards of apples, peaches, pears, and plums.

In the northern part of the Finger Lakes district is one of the few truck-farming areas in the East comparable with that of the North Atlantic Coastal Plain (Chapter VI). It produces two fifths of the cabbage and a large part of the beets, beans, peas, asparagus, and sweet corn of New York State. Many of these are grown for canning factories. At Phelps (north of Geneva) is the center of the nation's sauerkraut industry. A single factory converts 30,000 tons of cabbage into 30 million cans each year—one third of the total American pack.

In *southern New York and adjacent northwestern and northeastern Pennsylvania, as well as in northeastern Ohio*, is an outstanding dairy section. Much hay (timothy and clover), oats, winter wheat, corn, and potatoes are grown. Potatoes and fresh milk are in demand in Cleveland, Buffalo, Rochester, Syracuse, and Pittsburgh. They even move to New York City and Philadelphia. This area also is the country's leading buckwheat producer. The crop does well here because it is quick-growing and hence can do well even with a short frostless season. It matures if sown as late as July.

Manufacturing and cities

The Glaciated Allegheny Plateau, except that portion in northeastern **Ohio** and adjacent northwestern Pennsylvania, does **not**

rank sufficiently high in industry to be considered as one of the principal subregions in the American Manufacturing Belt (Fig. 127). Nevertheless, it does have several small cities which, because of excellent transportation facilities and low living costs, have attracted industry. These cities have not become large, because their hilly tributary areas are not sufficiently productive. *Binghamton* (145,156), situated in the narrow valley of the Upper Susquehanna and very close to the Pennsylvania state line, is a shoe-manufacturing center. Here is located one of the largest shoe factories and tanneries in the world. The success of this enterprise is due more to business genius than to any locational advantage. Binghamton also makes cameras and many kinds of metal products. It is an important transportation and distributing center, since its valley comprises part of the second most important east-west route across New York State, a route utilized by the main line of the Erie Railroad. *Elmira* (45,106), lying at the confluence of Newtown Creek and the Chemung River, is one of the leading cities in this area. Near the coal fields of Pennsylvania and the great primary iron and steel centers of both Pennsylvania and New York, Elmira manufactures tools, machinery, office equipment, fire-fighting apparatus, and castings. It also contributes upholstery, silk, and wood products. With four railroads, it enjoys superior transportation facilities.

At *Athens* and *Sayre*, the Lehigh Valley Railroad maintains shops. Silk and metal products are made here. *Corning* (16,212) is world-famous for its fine-quality glass, an industry encouraged and sustained by the city's strategic location with respect to natural gas and glass sand. *Olean* (21,506) in the oil-producing area, is important as a source of equipment for this industry as well as for its railroad shops. *Hornell* (15,649) is a railroad center and a manufacturer of silk. *Jamestown* (42,638), a division point on the Erie Railroad and one of the nation's leading manufacturers of office furniture, is also the center of the Lake Chautauqua resort area. *Meadville* (18,919), in northwestern Pennsylvania, has large railroad shops.

In the Ohio portion of the Glaciated Plateau, most of the important industries are related to the manufacture of iron and steel and of clay products. This area and its cities are treated in Chapter XIII, "The American Manufacturing Belt."

Several small cities outside the "American Ruhr" should be mentioned, however. *Mansfield* (37,154), in a rich agricultural area, is an important manufacturer of electrical equipment, brass, stoves, and rubber. *Newark* (31,487), at the confluence of the North and

South Forks of the Licking River, is a leading glass center, with cheap natural gas. It also makes rubber tires and refines oil. *Lancaster* (21,940), in the Hocking Valley, benefits from location in a rich and productive agricultural area. Among its early settlers were large numbers of Germans from Lancaster in Pennsylvania. With natural gas, it early attracted the glass industry. *Chillicothe* (20,129), first capital of Ohio, is located in the rich Scioto River Valley. It has many small factories.

Scattered over the entire Glaciated Plateau are cheese factories, milk-products plants, and creameries.

The Central Unglaciated Plateau

Topographically this plateau is like its glaciated neighbor to the north, except that it is more rugged. *Most of this area might properly be regarded as hill country*, for the plateau has been maturely dissected. In the Kanawha Valley, the streams are from 1,000 to 1,500 feet below the plateau surface. Some of the valleys are so narrow and canyon-like (for example, the Clarion River southeast of Oil City, Pennsylvania) as to be uninhabited; some have inadequate room even for a railroad or highway.

Gray-brown podzolic soils prevail here, but in the eastern portion, near the Allegheny Mountains, the soils are infertile and stony. All have developed from sandstone and shale, are light in color, are classed as sandy and silt loams, and are deficient in lime and humus. Along the larger streams are patches of sandy alluvium.

Economic activities

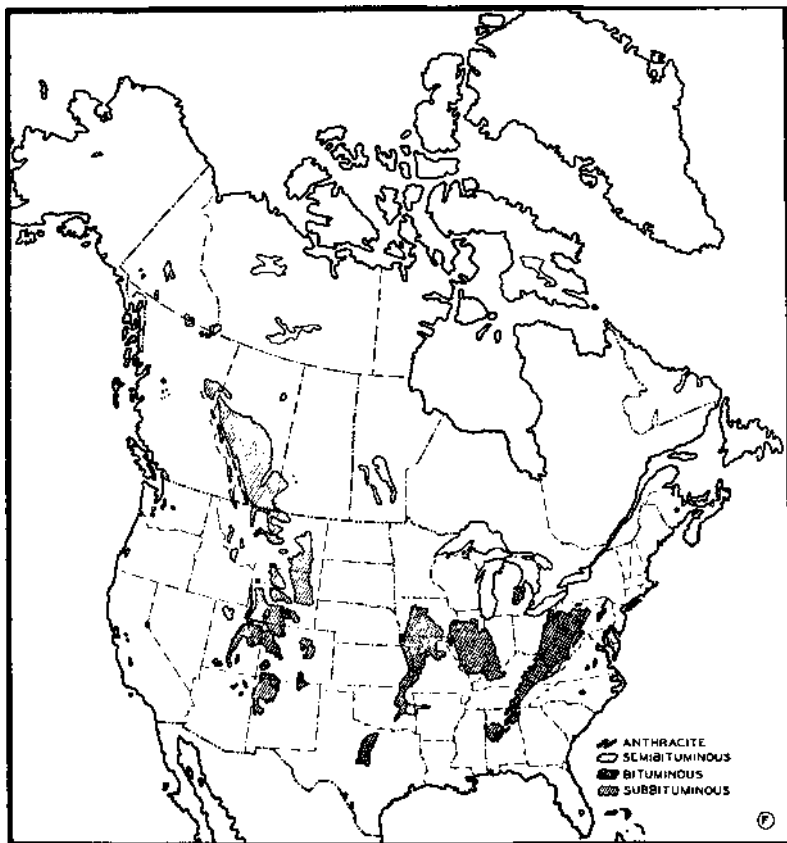
Coal mining. Most of the Appalachian Coal Field, greatest in the world, lies in the dissected Allegheny Plateau (Fig. 63). Nearly the entire area is underlain by bituminous coal, which is interbedded with layers of sedimentary rocks. The seams vary in thickness from a few inches to more than 10 feet. The bulk of the mining is carried on in beds 4 feet thick or more.

When the plateau was being formed, there was so little deformation of the strata that neither the coal beds nor the rock between them were disturbed (Fig. 64). Over much of the area, streams in cutting toward base level have exposed the seams on the sides of the valleys (Fig. 65), making possible the low-cost drift type of mining, where the miners tunnel into the out-crop at the side of a hill.

As one travels over the area, he is not always aware of the im-

portance of coal-mining, since scores of mines are tucked away in the hills and are thus invisible from the main highways.

The coal for the most part is of high quality. The Pittsburgh bed in western Pennsylvania, eastern Ohio, and West Virginia is the world's largest deposit of high-volatile gas and coking coal. So excellent was much of this fuel that it set the standard for coke-making. The bulk of the high-quality coking coal of the continent is here, as well as most of the so-called "smokeless coals." (For



U. S. Geological Survey.

Fig. 63. Major coal fields of the United States and Canada, distinguished on the basis of types of fuel. Note particularly that (1) large areas of coal lands are present in the United States in or near all parts except the Pacific Coast and (2) Canada's resources are restricted to the western Prairie Provinces and the Maritime Provinces—far from the great centers of population and industrial concentration.

coke-making, see Chapter XIII, "The American Manufacturing Belt.")

Seventy-five per cent of the mining is done by machinery. As the coal is cut, it is placed in cars, which are brought to tipples at

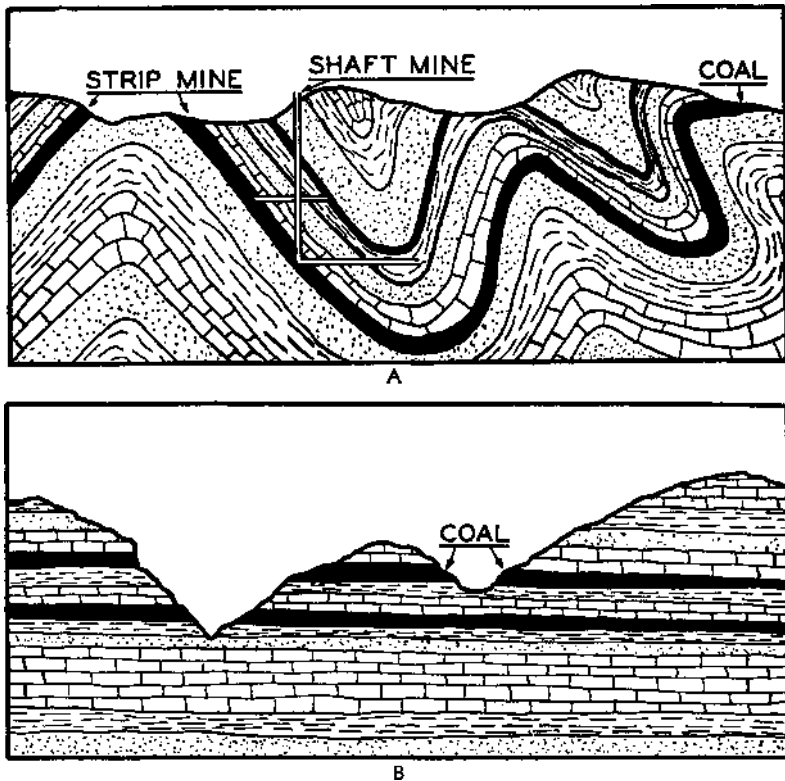


Fig. 64. Cross-section of anthracite and bituminous coal beds. (A) The highly-folded coal beds of the Pennsylvania Anthracite District. Underground mining here is both difficult and costly. (B) The nearly horizontal coal beds of the dissected unglaciated Allegheny Plateau. Note how much more easily and cheaply coal can be handled here than in (A).

the mine mouths (Fig. 65). Here it is sized and dumped into railway cars or river barges (Fig. 141). When the distance to market is not great, trucks may be used. At present an increasing amount of coal is being taken from strip mines, where the daily output per miner is nearly 4 times that in underground workings. Stripping, however, makes the country a sort of "no man's land"—unfit for farming or anything else.



Norfolk & Western Railway.

Fig. 65. Loaded coal cars awaiting shipment from a Norfolk & Western Railway tippie. The struggle for existence forces coal-mining companies to focus their operations on the beds most amenable to exploitation. The favorite method of underground mining is to tunnel into the side of a hill at the outcrop of the coal, following the contour of the seam as the work goes forward. Thus the coal is easily reached and cheaply transported. Railroad tracks are laid along the valley floors to serve the mines. At the mouth of each drift is a tippie—the mine's "nerve center"—where coal from underground is screened into various sizes and dropped into waiting freight cars.

The unglaciated plateau is the source of most of America's coal. Pennsylvania and West Virginia alone contribute about one half of the total bituminous coal output. The reasons are the large reserves, ease of mining, and high quality, as well as the area's proximity to the American Manufacturing Belt and efficient transport facilities.

This area has about one third of the available bituminous coal of the United States, which in 1936 was placed at 1,407,808,291,000

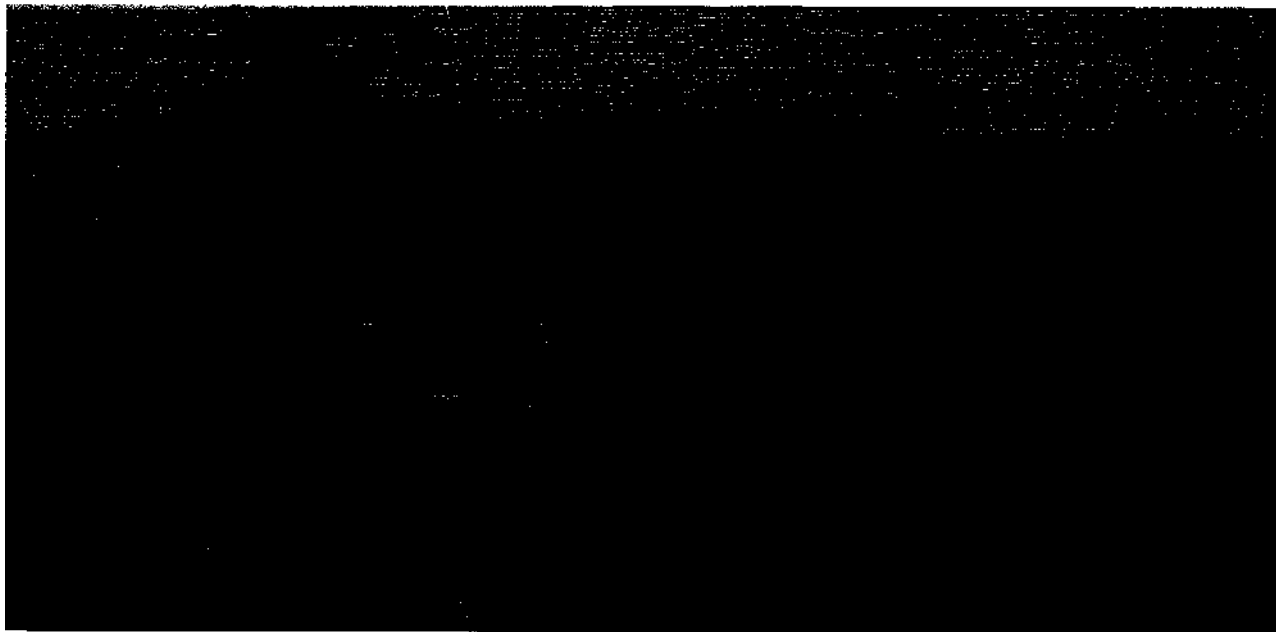


Fig. 66. Sheep with spring lambs grazing an Ohio hillside. Much of the land in this subregion is too rough for successful tillage and must, therefore, be kept in pasture. Sheep graze such slopes to advantage, feeding avidly upon the weeds and grasses. These animals require comparatively little crop land but large areas of pasture. This particular photograph was taken a short distance northwest of the boundary between the unglaciated and the glaciated Allegheny Plateau—in the latter.

tons.¹³ Hence mining should persist as a dominant activity for centuries.

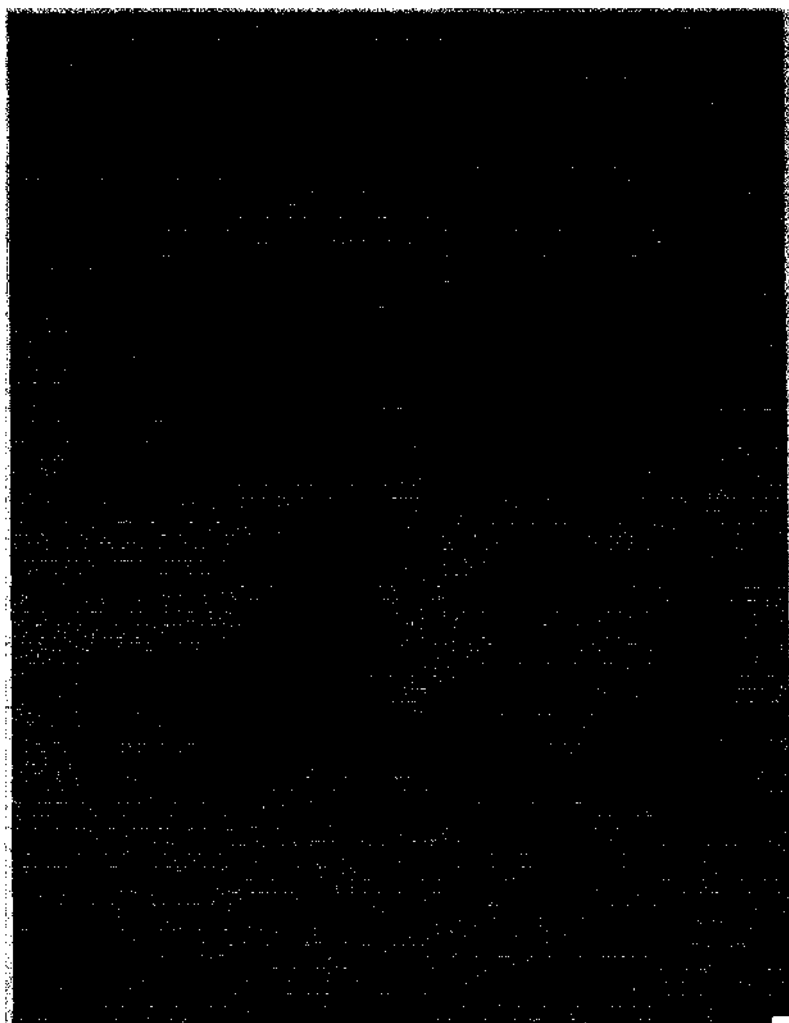
Petroleum has long been important in Pennsylvania and Ohio; in fact the first oil well sunk—the Drake Well—was put down near Titusville in northwestern Pennsylvania in 1859, and that state led all others in the production of crude oil until 1895. Before the Drake Well, petroleum, which had been called "Seneca Oil," was gathered from the surface of springs with blankets. Following the completion of the first well, land values soared; land formerly valued at \$5 an acre became worth \$50,000 or more. Pennsylvania reached its peak about 1891 when it produced 31,424,000 barrels of petroleum. Though still productive, the area is outstanding more for high-quality lubricants than for the quantity of production. Oil should be produced here for another 50 or 75 years. The area is unique in its vast number of wells—the Pennsylvania portion alone having 80,000 in 1934, half again as many as Oklahoma.

Livestock. Sheep have their greatest and almost their last stronghold in the East in western Pennsylvania, southeastern Ohio, and northern West Virginia, mostly in the unglaciated parts (Fig. 66). Rough topography and soils derived largely from sandstone and shale discourage agriculture. Thus the eastern boundary of the Corn Belt halts abruptly upon reaching the Allegheny Plateau. Sheep thrive better on steep slopes than do cattle. Moreover, the climate favors the rearing of sheep; winters are relatively mild and only a small amount of feed is necessary. Labor requirements are not great, a significant factor where agriculture does not thrive and cannot hold or attract many people. Most of the sheep are of the dual-purpose type, suitable either for meat or wool, depending upon the market price.

Agriculture. The farmland is much like that in the glaciated Area to the north except that it is more rugged and the soils are less fertile. More than one half of the land is in forest, about one fifth is in pasture, and only one fifth is in crops—considerably less than in the glaciated area to the north. Almost one half of the land is too hilly or too infertile for growing crops. General farming prevails—the chief crops being winter wheat, corn, oats, and hay (Fig. 67). Much land is impoverished by long cultivation, the owners failing to realize that inch by inch the topsoil was slipping away.

Throughout much of the unglaciated subregion, farm buildings

¹³ National Resources Committee, *Energy Resources and National Policy*, p. 285. Washington, D. C.: Government Printing Office, 1939.



F. E. Charles and Sod Conservation Service.

Fig. 67. Strip cropping and rotation in Ohio's unglaciated Allegheny Plateau. This is a well-planned farm: woods are fenced out and separated from pasture; steep land is retired to permanent meadow; soil-depleting crops are planted in strips and follow the contour; sandwiched in between the soil-depleting crops are soil-building and soil-conserving crops. The strips, rotated from year to year, provide a "double-barreled weapon against erosion," because the hay and wheat check any erosion that gets started in the corn. Strip cropping reduced soil losses from about 100 tons per acre in 1936, when the program was just getting started/ to about 4 tons in 1938.

are falling into disrepair and taxes are becoming delinquent. In Vinton County, one of the poorest in Ohio, more than half the funds expended for public services are provided by the state. Everywhere the public relief load is heavy.¹⁴

Cities

In the valleys of the Allegheny, Mahoning, Monongahela, and Ohio rivers is a "world apart from the rest of the Plateau—a world of smoke, of giant manufacturing plants, of busy railroads, of barges loaded with coal, and of dense urban development."¹⁵ These cities are included in the Cleveland-Pittsburgh District of the American Manufacturing Belt. Elsewhere over the Unglaciaded Plateau there is not a single great city; in fact there are few cities at all. Those which are present are mainly concerned with coal.

Charleston (136,332), West Virginia, on the navigable Kanawha River, a tributary of the Ohio, is the outstanding commercial and industrial center of the Unglaciaded Allegheny Plateau. It is well located with respect to high-grade deposits of coal and to natural gas. Considerable coal is shipped down the river from the mines near by. Charleston also is served by the important coal-carrying Chesapeake & Ohio Railroad as well as by the Baltimore & Ohio and the New York Central. The fuels have brought many furnace-type industries to the city. Charleston ranks high in the manufacture of chemicals, machinery, and glass. The United States government has plants here for making armor plate, projectiles, and gun-forgings.

Huntington-Ashland (170,979), form a metropolitan district. Huntington, near the point where Ohio, Kentucky, and West Virginia meet, is one of the more important cities of the Unglaciaded Allegheny Plateau. It was founded in 1871 as the western terminus of the Chesapeake & Ohio Railroad. It is also served by the Baltimore & Ohio. With a rich coal-producing hinterland, Huntington has important manufacturing enterprises. *Ashland*, outstanding city in eastern Kentucky, stretches along the Ohio River for about 7 miles. The river bank here is unusually high, and along it are strung iron and steel plants, coke ovens, packing houses, and brickyards. Ashland ranks as one of the older Ohio River iron-making centers, its first furnace having been set up in 1826, when

¹⁴ National Resources Board, *Maladjustments in Land Use in the United States*, p. 23. Washington, D. C: Government Printing Office, 1935.

¹⁵ Raymond E. Murphy and Marion Murphy, *Pennsylvania—A Regional Geography*, p. 477 Harrisbure: Pennsylvania Book Service, 1937.

coal was brought to it over the waters of the Big Sandy. Today the American Rolling Mill Company, with 3 to 4 miles of riverfront property, operates an important plant and benefits from water shipments on the rejuvenated Ohio, which today carries far more freight than in the heyday of the old river boats.

Parkersburg (30,103), located at the junction of the Ohio and Little Kanawha, 150 miles from Pittsburgh and 200 from Cincinnati, is an important river town. Its proximity to large coal deposits, natural gas in abundance, clays, forests, and iron and steel districts, has stimulated manufacturing. Its more important products are rayon, electric insulators, oil and gas derricks and tanks, shovels, floor tile, Vitrolite, office furniture, and oil- and gas-drilling tools. It is served by the Baltimore & Ohio Railroad and the Ohio River—a year-round navigable stream.

The Cumberland Plateau

Possibly no other area in Anglo-America shows better the relation between man and a restrictive environment than the Cumberland Plateau. Certainly no other presents a more interesting social and geographic picture: here dwells some of the best racial stock in the United States (much of it pre-Revolutionary) and at the same time the largest number of illiterate and poverty-stricken people in the nation. What they are, no doubt, is more a matter of natural environment than of anything else. Yet economic and social factors complicate the reciprocal relationship between population density and the degree of surface roughness or soil fertility. Historical background also has played a prominent role in the density of population. The hillsmen, the theme of many a romantic tale from the Revolution to the present, have lived in a world of their own.

The Cumberland Plateau is mostly rugged hill country, being so maturely dissected that practically none of its former plateau characteristics remain. It is reached only with great difficulty—from the east by relatively few gaps through the steep Cumberland Front, and from the west by tortuous and labyrinthine valleys from the Blue Grass Region and the Nashville Basin. No sharp boundary separates it from the Allegheny Plateau to the north. In fact, the boundary is arbitrary. Thus the Cumberland Plateau is regarded here as beginning in southern Kentucky (the upper reaches of the Kentucky River) and extending to the Gulf Coastal Plain.¹⁶

¹⁶Nevin M. Fenneman, *Physiography of Eastern United States*, p. 284. New York: McGraw-Hill Book Co., 1938.

It includes parts of southeastern Kentucky, eastern Tennessee, and northern Alabama.

Topography

The Northeastern Cumberland Plateau is less dissected than the Unglaciaded Allegheny Plateau to the north. Streams have etched it into an elaborately branching system of narrow, steep-sided valleys separated by narrow, winding ridges. There is a dearth of level upland, especially in the northern part, and not a great deal of level lowland except narrow strips along the streams.

The Northwestern Cumberland Plateau, a belt 40 miles wide and 300 miles long, extending from Kentucky to Alabama, is in sharp contrast to the maturely dissected Northeastern Cumberland Plateau. This area, a true tableland, is undulating to rolling, and is crossed and cut into by V-shaped valleys.

The Southern Cumberland Plateau, lying entirely in Alabama, is rolling to hilly, with here and there roughly dissected parts. Its physiographic character is like that of the Northwestern Cumberland Plateau except that the bluffs are lower and hence less effective barriers.¹⁷

Isolation

The Cumberland Plateau has been isolated partly because of the topography and partly through the influence of topography upon the transportation pattern.¹⁸ Most of the main railroad lines avoid it by going north and south of the Appalachian barrier.

The people

After the Revolution and even to a certain extent before, the frontier was moving westward. Some of the pioneers migrated by way of gaps through the Appalachians. Large numbers continued on their way, but many dropped like seeds into the pockets (coves) in the Appalachians. Eli Whitney's cotton gin also played an important part by increasing the size of Southern plantations and pushing the small farmers into the poorer lands of the Coastal Plain and Piedmont, and even forcing some of them into the hill coun-

¹⁷ Francis J. Marschner, "Rural Population Density in the Southern Appalachians," *Department of Agriculture Miscellaneous Publication No. 867*, 1940, p. 11.

¹⁸ National Resources Board, *Maladjustments in Land Use in the United States*, p. 21. Washington, D. C.: Government Printing Office, 1935.

try.¹⁹ About three fourths of the population is rural and mostly dependent on agriculture, mining, and logging.²⁰

The poverty is more dire than that in the slums of our great cities. The people remain mostly because of their traditional preference for the hills. Rightly or wrongly, many people prefer to continue to live their lives in their own way.

The first settlers occupied the valleys, where they built cabins and tilled crops. Isolation forced upon them a subsistence type of agriculture. They combined farming with stock rearing and with hunting and fishing. As their numbers increased they found it necessary to work back into the hills. Their forests are now largely gone, most of the game has been destroyed, and the topsoil has been swept from the steep cultivated slopes by torrential rains. As a result, poverty has settled down upon the people, hope has departed, and they have been cast into a mold of helpless inactivity. They see no way whereby they can, through their own efforts, shake off the forces that have rendered them helpless. The only possibility for improvement lies in government aid through geographic planning.

The hill folk are not inferior. They are of Anglo-Saxon and Celtic stock and as intelligent and resourceful as the people elsewhere on the continent, but nature denied them nearly all means of making a livelihood except by farming. Roland M. Harper states well the reason for the primitive condition of the Southern Appalachian mountaineer:

The ancestors of the mountaineers in most cases settled there a century or more ago, when standards of living were low nearly everywhere, and their descendants have not progressed much, on account of the difficulties of communication with the rest of the world. . . .²¹

High birth rate and density of population. In this study of Anglo-America, a high birth rate is uncommon among whites, except among the French-Canadians in Quebec (p. 60), the Mormons in Utah (p. 665), and the highlanders in the Southern Appalachians. All three of these areas of high birth rate are more or less isolated, and ideas from the outside world penetrate slowly. Early marriages and large families persist in the Cumberland

¹⁹ Lois McDonald, "Mountaineers in Mill Villages," *Mountain Life and Work*, January 1929, Vol. IV, No. III, pp. 3-7.

²⁰ Francis J. Marschner, "Rural Population Density in the Southern Appalachians," *Department of Agriculture Miscellaneous Publication No. 867*, 1940, p. 2.

²¹ Roland M. Harper, "To What Extent Does Topography Control Civilization?" *Journal of Geography*, September 1923, Vol. XXII, No. VI, p. 235.

Plateau; a household of 10 to 15 is not uncommon.²² Many of these poverty-stricken areas support a denser population than the most productive parts of the Corn Belt. Neither the old nor the young find opportunity or incentive to leave. Considering the type of region, this is one of the most densely populated areas in North America. Many valleys in this area, devoted almost entirely to farming, contain more than 200 persons to the square mile. Frequently such valleys are hemmed in by slopes having no resident population whatsoever. The distribution of population is influenced not only by physiography and soils but also by the exploitation of coal and timber, by the transportation situation, and by the holding of large tracts of arable land not used for farming. On the other hand, cultural factors are so potent as to complicate any simple relationship that might exist between population distribution and density and the degree of surface roughness or the fertility of the soil. The principal problems grow out of an excess of population in relation to economic opportunity. The women here show the highest fertility in the United States. If no emigration should take place, this population would double itself in one generation; and, in Knott, Breathitt, and other counties in southeastern Kentucky, the population would increase 2½ times in 30 years.²³ Population pressure here is a grim reality.

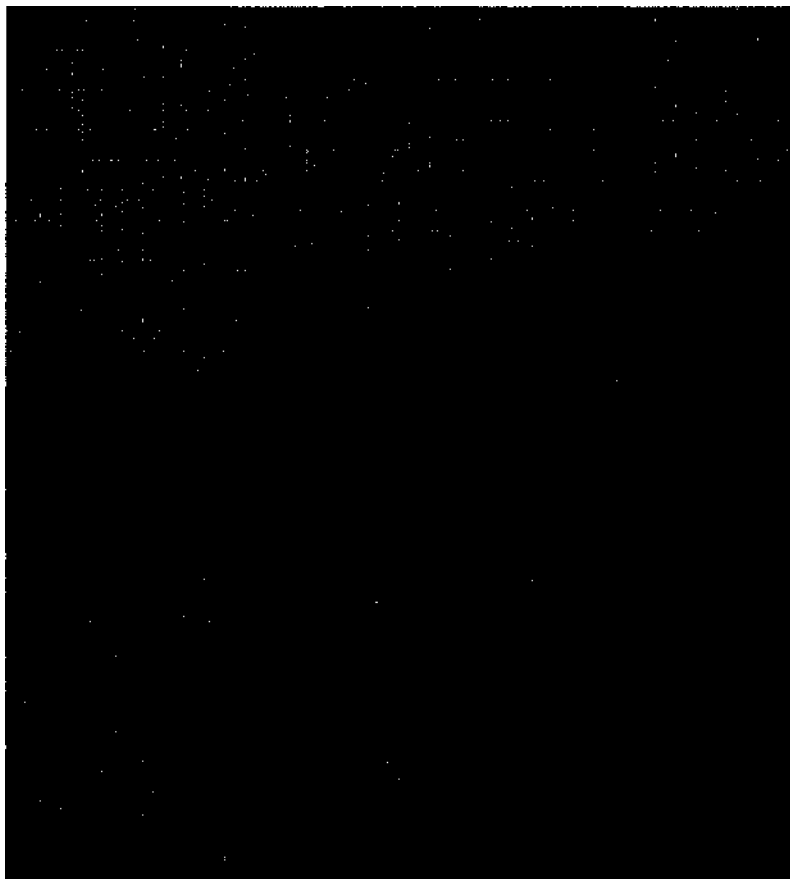
Living conditions. Most of the farm homes are unlivable according to present standards, and many are in a pitiable state of disrepair. Most of them are small, one-storied log cabins or simple board shacks of one or two rooms (Fig. 68). Seldom is one painted. The chimney is made of rough stones and mortar. The walls are commonly papered with newspapers, the windows are unscreened, and heat is derived from an open fireplace. The roofs often leak, the furniture is home-made, sanitary arrangements are crude or lacking altogether, and springs and wells are unprotected from contamination. In 1930 the average value of 228 such houses in Knott County, Kentucky, was \$340.²⁴ Some of the houses had a value as low as \$20.

Health. So poor is the soil that the men and women who work it are literally worn out, and the plight of the children is wretched and pathetic. Pellagra, a deficiency disease common in areas where

²² Paul F. Crossey, Sociologist, Wheaton College, Massachusetts. Personal communication, December 8, 1940.

²³ National Resources Committee, *The Problems of a Changing Population*, pp. 122-123. Washington, D. C.: Government Printing Office, 1938.

²⁴ National Resources Board, *Maladjustments in Land Use in the United States*, p. 22. Washington, D. C.: Government Printing Office, 1935.



*Tennessee Valley Authority**

Fig. 68. A run-down hill-country farm, wasted by the ravages of erosion. On these acres, farmers can hardly make a living, often cannot pay taxes to support schools and other public services. Whole communities in the hill-country are being pauperized.

the people do not get enough meat, milk, eggs, fresh fruits, and vegetables, is common. Only the undernourished and the hungry contract it. The prevailing diet of cornbread, molasses, and "sow belly," supplemented in summer with vegetables, is deficient in phosphorus, calcium, iron, proteins, and vitamins. Educating the people to produce green vegetables has brought about much improvement, and pellagra is diminishing. Other common diseases are typhoid, dysentery, tuberculosis, and hookworm. There are

few doctors. In 1930 the Northwest Cumberland Plateau, whose population is widely scattered, had only 3 physicians per 5,000 inhabitants.²⁵

Patients needing medical care and hospital treatment are sometimes carried on men's shoulders for many miles over rough hill trails. The general level of physical efficiency is low, the death rate is high, and old age comes early to most men and women.²⁶



F. E. Charles and Soil Conservation Service.

Fig. 69. Suicidal agriculture in the hills of Tennessee. Slopes as steep as these should not be cultivated but should be kept in forest or permanent pasture. With practically no level land, however, the hillsmen do the best they can in farming steep slopes in their effort to make a living. In this region 8 bushels of wheat and 10 bushels of corn to the acre are considered "a right good crop."

Agriculture

In the *Northeastern Cumberland Plateau* fanning is the predominant occupation. In spite of the fact that nearly all the arable land is in use, it is incapable of supporting the large population. Much of the area is submarginal—sterile and very steep. Level land is lacking except along the larger stream courses. Fields, accord-

²⁵ "Economic and Social Problems and Conditions of the Southern Appalachians," *Department of Agriculture, Miscellaneous Publication No. 205*, p. 158. Washington, D. C.: Government Printing Office, 1935.

²⁶ National Resources Board, *Maladjustments in Land Use in the United States*, p. 22. Washington, D. C.: Government Printing Office, 1935.

ingly, extend around the steep hillsides. A cornfield on a 55 per cent slope is not unusual (Fig. 69). Most of the hillsides are too steep for wheeled implements, and home-made sleds must be used. After several years of this type of farming, the land is eroded beyond repair and must be abandoned. Yet many a barren field continues to be doggedly tilled as the only means of family subsistence. Abandoned fields which have grown up in brush and bramble occasionally are reclaimed several years later. Agriculture is of the subsistence type—inaccessibility to market debarring many farmers from growing staples. The family cash income often totals less than \$300, and 50 cents is considered a good daily wage. Many a family must and does get through an entire year with less than \$100 in cash.

Poor land is farmed because it is cheap land, and this is the only kind poor people can acquire. Fertile land is so expensive as to be beyond their reach.

In southeastern Kentucky the average hill farm has about 10 acres in crops, three quarters of which is in corn, yielding about 20 bushels to the acre. The yield is about 40 bushels in Iowa and eastern Nebraska where the average area in crops per farm is 100 to 150 acres, one half of which is in corn. Yet southeastern Kentucky has about twice as many farming people per square mile as Iowa, the nation's leading agricultural state, where most of the land is level to gently rolling and where more than 80 per cent of the land is in crops. Furthermore, these farms are producing 100 per cent more children than are needed to maintain their present population.²⁷

The Northwestern Cumberland Plateau. In the Northwestern Cumberland Plateau, where the surface is not deeply dissected by rivers and creeks, farming encounters few physical obstacles. Though machinery may be used, the area is poorly developed agriculturally and only about one fourth is in farms. This situation is hard to explain. Some attribute it to shallow, rocky soils, but *isolation appears to be the dominant factor*. Roads, now penetrating the highland, eventually will make it more accessible. At present, however, this subregion persists as one of the outstanding examples of nonconformity between population density and surface configuration.²⁸

²⁷ O. E. Baker, "Food and Folks from the Hinterland," *Survey Graphic*, October 1, 1932, Vol. LXVIII, No. 13, p. 452.

²⁸ Francis J. Marschner, "Rural Population Density in the Southern Appalachians," *Department of Agriculture Miscellaneous Publication No. 367*, pp. 10-11. Washington, D. C.: Government Printing Office, 1940.

The Southern Cumberland Plateau. In the Southern Cumberland Plateau, where the terrain is similar to that in the northwestern segment (though a notable difference exists in their elevation), agriculture is more advanced. Warmer weather permits the growing of cotton. Since cotton farms are small, owing to the restricted acreage of cultivated land, the population is dense. The tablelands, despite their less fertile soils, are better for cotton than are the valleys, whose heavier soils warm up slowly in the spring and are more difficult to handle. Hence the population is denser—an inversion of the more orthodox densely populated valleys and empty uplands.

Language and music

Until about 50 years ago the Southern Appalachian highlanders in hundreds of isolated communities had a vocabulary that was colloquial and provincial. It had remained so for 150 years. In some of the more isolated and inaccessible coves, this situation still holds. With improved rural education, the youth of the region are giving up their lingual Scottish and English heritage and are using the speech of the lowlanders.

Ballads centuries old have been handed down from generation to generation. Cecil Gray, an English folk-music authority, while carrying on research in Harlan County, Kentucky, found the children doing the old English folk-dance "running-set" in a way closer to the time of Queen Elizabeth than he had found anywhere in England. Nowhere in Europe could more primitive music be found. The music critic of the *Cleveland Plain Dealer*, after a trip into the Cumberland Plateau, wrote:

What impressed me most about this singing was its sadness, its deep, sweet melancholy and remoteness, as if produced in a trance and coming to us from some far off mysterious past, hidden deep in racial instinct. It was impersonal, entirely without artifice, and not a little troubling by its complete passiveness and serenity.

There is much more to be said about it than can be included here. What I want particularly to call attention to, however, is that music such as this supplies something that so-called cultivated music does not often give us.²⁹

The culture of which these songs are the product is dying out and soon will be a thing of the past.

Changes through improved transportation

For generations the Southern Appalachians were a sort of landlocked island isolated from the rest of the country. For the most

²⁹ Herbert Elwell, *Cleveland Plain Dealer*, April 30, 1939.

part the rivers were too swift to be used for transportation, and the rugged terrain caused railroads and highways to avoid it. Even today most of the railways are branch lines built solely to exploit the coal and timber resources. Until lately, highways were dirt roads and some mere trails hewn from the forest. More recently the federal government and the several states have built highways in an effort to break down isolation and make this unique region available to people throughout the nation. Many counties are just now acquiring their first gravel roads, and some localities still cannot be reached except by horseback and "jolt-wagon."

In Kentucky, with probably the most "back-woodsy" areas in the plateau, are many counties where pioneer culture and primitive living persist. The most striking changes came to the area when WPA money was used for building "farm to market" roads.

With improved highways, better agricultural methods are being introduced by farm agents. Home demonstrations in canning, sewing, and household management, along with "4H" Clubs, are bringing better living conditions. The handicrafts of the hills are now being sold in Asheville, Gatlinburg, Berea, and Spruce Pine, as well as in many large stores in the metropolitan centers of the North. Improved roads are leading to the consolidation of schools. Mail-order catalogues (the "wish-books") are making the people, especially the women, fashion-conscious.

The invasion of the highway has brought these people into contact with "civilization" which in some respects is having unfortunate results. Drunkenness, for example, is more widespread than it ever was in the past, and the introduction of "blood (venereal) diseases," of which previously most highlanders knew not even the names, have spread.⁸⁰ How widespread they are is not known because some counties lack health departments.

What should be done for the more rugged and isolated parts of the Appalachian Upland Region?

This region has seen better days. Farming over much of it is inimical to public welfare. Much of the land is submarginal and should be returned to forest. The federal government, through several of its agencies, is endeavoring to divert large acreages from their present uneconomic use to those for which they seem best adapted. Any plan dealing with the land must, however, take cognizance of the occupants, about half of whom are on relief.

⁸⁰ Anne W. Armstrong, "The Southern Mountaineers," *Yale Review*, Spring Number, 1935, Vol. XXIV, No. 3, pp. 539-554.

The Outlook for the Appalachian Uplands

With the exception of the Great Valley and the Glaciated Allegheny Plateau, which have satisfactory environmental conditions for farming or for certain types of manufacturing and whose future promises to be a continuation of the present, the rest of the Uplands is largely a problem region. As thousands of acres were destroyed by soil erosion, much of the land became submarginal and the standard of living of the inhabitants fell. The majority of these people have never known prosperity in any form.

So far as the mineral resources are concerned—coal, petroleum, and natural gas—they are largely drawn into the American Manufacturing Belt. While they do enrich outsiders, they have done little to ameliorate the living conditions of the hillsmen. Eventually most of the coal-mining towns will become "ghost towns," since they have nothing to sustain them once the coal is gone. Exhaustion locally is already resulting in abandoned communities hopelessly stranded. Conditions are bad, however, even when the mines are operating. Despite enormous reserves, the coal is disappearing at a rapid rate. In Allegheny County, Pennsylvania, three fourths as much coal has been mined or lost as remains, and the rest will be more difficult and expensive to mine, as is invariably the case when reserves reach a mature stage of utilization. The life expectancy of mines in this area is relatively brief—24 years in Ohio, 29 in Pennsylvania, 42 in West Virginia, and 43 in Kentucky. The peak of production in both petroleum and natural gas has long since been passed.

Lumbering too as prosecuted in this region has been short-lived. In Cross Fork, Pennsylvania (in the strongly dissected plateau), for example, when logging operations began, only 5 or 6 families lived there. With completion of the saw-mill, it drew to it a population of 2,000. So long as the lumber supply lasted, Cross Fork prospered. But in 1909 the mill shut down, and today the population is 60 persons. It is significant that the forest is once again occupying thousands of acres of land wrested from it during the past 150 years.

While the struggles of the people in the Blue Ridge, the Unglaciated Allegheny Plateau, and the Cumberland Plateau have made a brave human story, it is a story that violated all the rules of careful stewardship of land. For the most part the outlook is dark. The region is now definitely overpopulated. According to Francis J. Marschner, the youth here face three alternatives: (1) they can clear more land on the mountain sides, (2) increase the surplus of

unskilled labor, or (3) move on to settle as tenants on other poor land. Unfortunately, each of these involves continued maladjustment in land use. It would seem that migration to better farmlands and to industrial centers in other parts of the country might have been mentioned. Yet between 1930 and 1935 the movement was in the opposite direction.⁸¹ The problems facing these people today are beyond their individual wills or efforts and call for careful regional planning. To improve their lot, whether they be miners or farmers, is a big task, and the solution is not easy. This problem is not one to be solved in the next few centuries but one to be handled now, because the saturation point (keeping in mind decent living standards) has already been reached over a wide front. The one outstanding example of geographic and social planning is the TVA, where the federal government has undertaken a comprehensive development of the entire watershed of the Tennessee River. As stated heretofore, it is not yet possible to forecast with assurance the result of this experiment, but it is an attempt to keep a region viable and may ultimately serve as the model for the whole nation.

³¹ National Resources Committee, *The Problems of a Changing Population*, p. 108. Washington, D. C: Government Printing Office, 1938.

CHAPTER IX

The Ozark-Ouachita Uplands

A REGION OF FARMING, MINING, AND RESORTS

LYING IN the south-central part of the great Interior Plain of the United States is the Ozark-Ouachita Upland area of more than 50,000 square miles. This region is completely surrounded by lowland plains. Its somewhat higher elevation, greater relief, poorer soils, and forest vegetation give it an economy and culture quite in contrast with those of the contiguous plains. Thus, although the boundaries are physiographic, the Upland is in every sense a human-use region.

Physical Appearance ¹

The Ozark-Ouachita Upland (Fig. 70) is composed of two major divisions and their subdivisions. The Ozark section, by far the larger part, consists mainly of plateaus, including the Salem and Springfield plateaus, along with two hilly areas, the St. Francois Mountains in Missouri and the Boston Mountains in Arkansas. The hilly areas rise considerably above the general level of the plateaus and appear as low mountains. The Boston Mountains marking the southern border of the Ozark Province drop off abruptly into the Arkansas River Valley. The general structure of the Ozark Upland is that of a low dome.

The Ouachita Mountain area is subdivided into (1) the Arkansas River Valley, a broad synclinorium corresponding in structure with the Ridge and Valley section of the Appalachians, and (2) the Ouachita Mountains, a lens-shaped, compressed, and faulted anticlinorium. The broad trough of the Arkansas Valley provides an easy means of transit through the Upland between the Boston Mountains on the north and the Ouachita Mountains to the south (Fig. 70) and is well suited to agriculture. The Ouachita Mountains reach their highest elevation—about 2,800 feet above sea level, near the Arkansas-Oklahoma border.

¹ The physical description of the Ozark-Ouachita Upland is based largely on Nevin M. Fenneman, *Physiography of Eastern United States*, pp. 631-689. New York: McGraw-Hill Book Co., 1938.

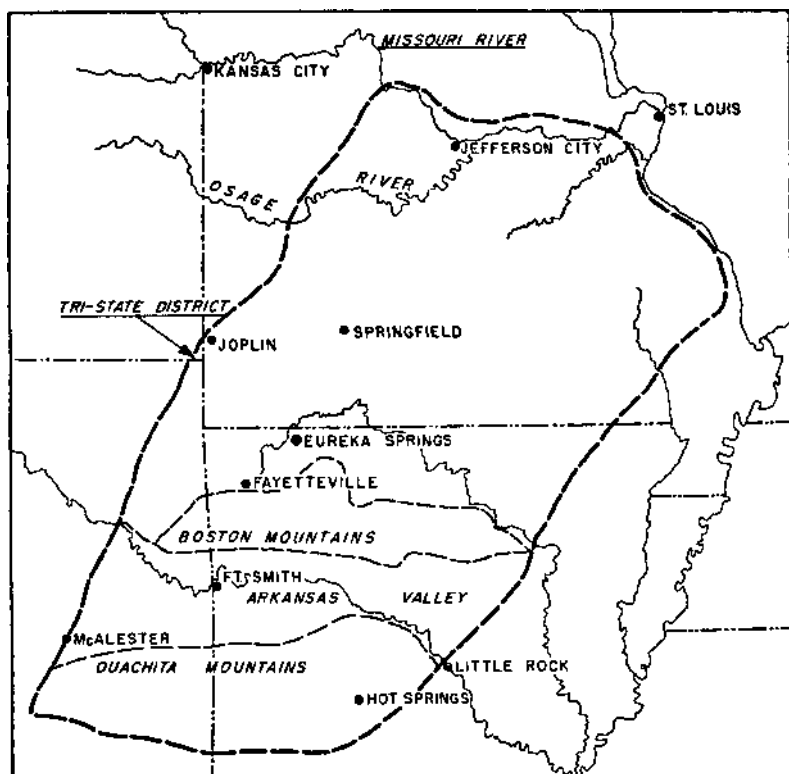


Fig. 70. The Ozark-Ouachita Uplands: a region of farming, mining, and resorts.

A Frontier Region ²

The earliest white settlements in the Ozarks were those of the French along the northeastern border in Missouri. They were only feeble attempts and were based on the minerals—lead and salt. Since silver, the one metal they wanted, was lacking, the French did not explore systematically or try to develop the region. The first recorded land grant was made in 1723. The French, who never penetrated far into the Upland, were reduced to a minority by English-speaking colonists toward the close of the eighteenth century. The new settlers were encouraged by the Spanish government to locate in Upper Louisiana. After the purchase of this

² Historical data taken from Carl O. Saner, *The Geography of the Ozark Highlands of Missouri*, pp. 73-137. University of Chicago Press, 1920.

territory by the United States in 1803, settlement proceeded rapidly.

The Upland was occupied before settlements were made in the lowland prairies to the northwest, west, and southwest. The area immediately to the west was set aside by the United States government between 1820 and 1837 as the Indian Territory, and was not opened to white settlement for many years. The Kansas-Nebraska prairies to the northwest and the Texas prairies to the southwest,

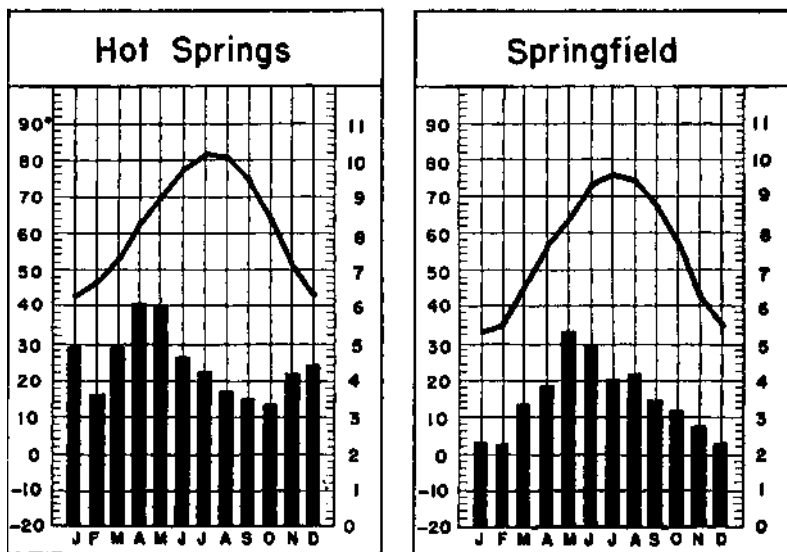
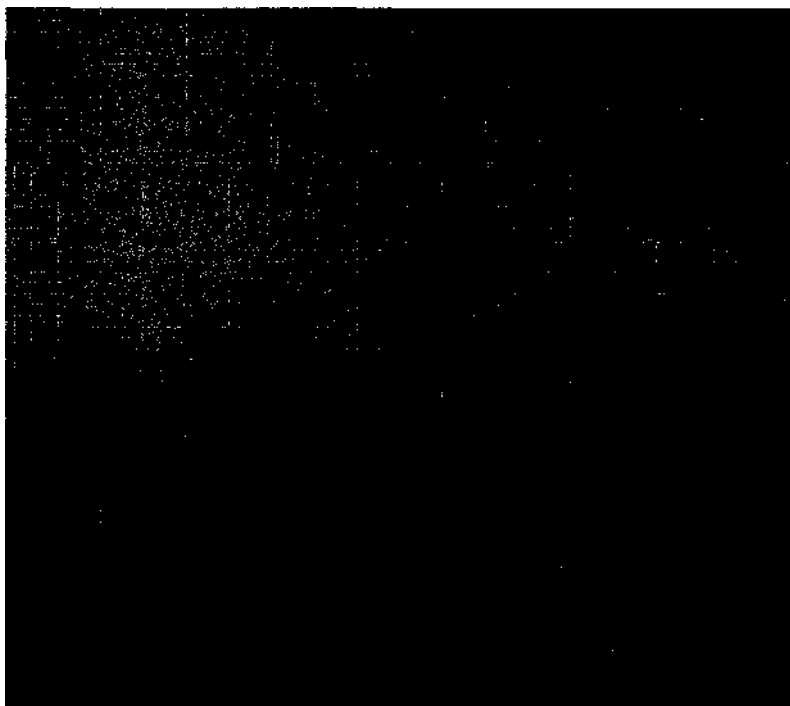


Fig. 71. Average monthly temperature and precipitation for Hot Springs and Springfield.

however, could have been occupied by these pioneers had they wished to settle there. Several factors attracted them to the Upland: (1) the climate was more humid and the winters less severe (Fig. 71) than on the adjacent plains; (2) the plateau was timbered, thus providing the pioneer with wood for construction and fuel; (3) the soils were believed to be more fertile; (4) hillside springs were abundant and supplied good potable water; (5) wild game was plentiful; and (6) Indians were less numerous here than on the plains. After the first settlements in the Missouri, Mississippi, and Arkansas river valleys, succeeding pioneers entered the rougher and more remote sections of the Upland and remained there. The hilly forested habitat that provided so amply for the needs of the

pioneers later retarded their development by isolating them from the progress of the prairies.

Hunting is no longer dominant. Subsistence farming and the rearing of livestock, particularly sheep and low-grade cattle, are the main occupations in the more rugged areas, supplemented by



Fowler photograph,

Fig. 72. Cabin in the "back country." There are many like this scattered throughout the Ozark-Ouachita Region.

certain household industries such as weaving, basketry, pottery, and furniture-making. Before the middle 1920's when the Missouri and Arkansas state highway systems were constructed, the mountaineer of the Ozarks was truly a backwoodsman living out of touch with the world. Even today his life is simple and his wants few. His farm consists of a few acres of bottomland in which he grows corn and other food crops, and timbered hillsides which furnish pasturage for sheep and hogs. His house, usually in the valley

bottom but occasionally on the ridge, is a one- or two-room cabin made of roughly hewn logs or roughly sawed boards (Fig. 72), and so is his barn, if he has one.

Soon after the American pioneers entered the Upland, other settlers came from Germany. They occupied the northeastern borders of the Upland, particularly in the Missouri section; later they moved down into the valleys and into the cities. These Germans developed a better type of agriculture, partly because of their inherent skills and partly because of the fertility of the valleys in which they settled. Agriculture in these border sections has kept pace with the modern development on the prairies beyond the Upland. The farmsteads of the Springfield plain resemble those of the Kansas prairie or the Missouri River lowlands.³ Though the two areas—the isolated hilly Upland and the low, rolling border areas—have very different cultures, there is, nevertheless, enough homogeneity to set the area off as a definite region.

The Breakdown of Isolation

While parts of the Upland continue to present a picture of remoteness, isolation is gradually being broken down. Soon after the middle of the nineteenth century railroads, built primarily to tap important lead mines or to connect St. Louis with the rapidly growing prairie lands to the west and southwest, began to penetrate the region. The mining roads were usually short and did not reach far into the hills. The through railroads were built either around the east side, like the St. Louis, Iron Mountain & Southern (Missouri Pacific System) and the St. Louis Southwestern (Southern Pacific System), or were built around the west side, like the Missouri Pacific, the Missouri, Kansas & Texas, and the Kansas City Southern. Only one railroad penetrated the interior of the Upland. The Atlantic & Pacific (later a part of the Frisco System) built its line from St. Louis to Springfield, later extending it into Oklahoma. It also built a line southward through the heart of the Arkansas Ozarks from Springfield to Fort Smith, and another from Springfield southeastward to Memphis. Fig. 73-A shows that for the most part the railroads avoided the Ozark-Ouachita Upland. The Rock Island, building westward from Memphis, used the Arkansas Valley between the Ouachita and Boston mountains.

Highway development in the Ozarks was belated. Many of the mountain farmsteads were accessible only by trails that could not

³ For a good study in contrasted types of farmsteads, the reader is referred to Margaret Riggs, "Valley Contrasts in the Missouri Ozarks Region/" *Journal of Geography*, December 1936, Vol. XXXV, No. IX, pp. 351-359.

accommodate wheeled vehicles. The advent of the automobile and the building of motor highways with state and federal aid have greatly reduced the isolation of many areas. Fig. 73-B shows several national highways crossing the Upland. Most of these are all-weather roads, many being hard-surfaced. Highways have penetrated areas never reached by rail. Secondary roads have been extended into the even more remote areas and, with the

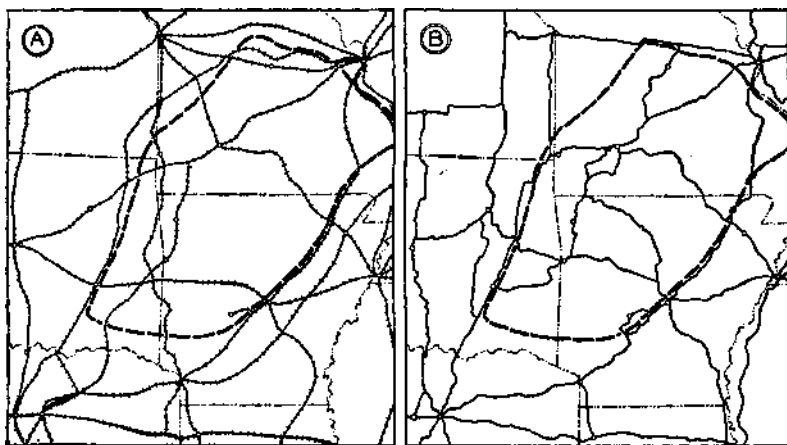


Fig. 73. (A) Railroad lines of the Ozark-Ouachita Region. Most of the major railroads tend to go around the upland area rather than cross it. (B) Highways of the Ozark-Ouachita Region. The highways tend to serve the region more completely than the railroads, penetrating interior areas not reached by rail.

development of Rural Free Delivery, have made every settlement accessible to the outside world.

A most important factor in the breakdown of isolation was the first World War. The selective draft and the appeal for volunteers brought many of the Upland ridge dwellers from the hills to join the army. The high wages during the War also brought many from their mountain fastnesses into contact with the outside world. After the War, those who returned brought back new ideas. The depression following 1929 had the opposite effect, for many who went to the cities lost their jobs and returned to the Upland.⁴ With

⁴ The returning "native sons" were accompanied by large numbers of urban unemployed who were "took in," or who attempted to make a living on the cheap cut-over land which was available on almost any ridge. Most of these refugees have since moved out, but many of the returned "native sons" have adjusted themselves and have settled down in the hills. (Personal communication from Professor John Q. Adams. University of Missouri.)

the development of various relief agencies under the "New Deal," a large part of the plateau population went on relief. Many people wonder if the mountaineer ever will want to work for a living so long as the government will feed him. The Resettlement Administration attempted to move some families from their "scratch" farms to the fertile river bottomlands in southeastern Arkansas. Such a move seems to have had doubtful value, however, since the bottom areas were already densely settled by Negro tenant farmers who

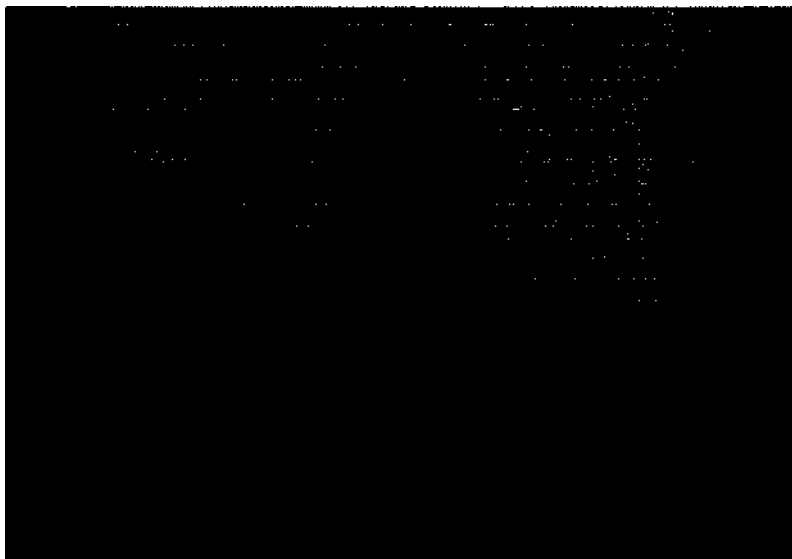


Photo by John O. Adams

Fig. 74. Woodcraft, chiefly basket work, for sale at roadside store on U. S. Highway 66 in the Devil's Elbow Country south of Arlington, Missouri.

were barely making a living. The mountaineer was no doubt better off in his hills. Competition with Negro tenant farmers, even on the rich alluvial lands of the Mississippi Valley, cannot improve his living conditions, for, although the Ozark mountaineer is poor, he is proud and independent. The idea of working for a share of a crop on land belonging to another has no appeal to him. The large farms of the Mississippi bottoms are not his country. Resettlement and the redistribution of the hill folk may be necessary in time, especially among the younger people, but the ridge folk should be left on their upland farms even though they seem to be near starvation at all times. Since much of the land still is in timber, soil erosion has been less serious than in the Southern

Appalachians. The pioneer Anglo-Saxon who came into this Upland a century ago succeeded in establishing a home and making a living, and his descendents, too, will no doubt work out their destiny in this environment they understand and love.

As in the Southern Cumberland Plateau, modern highways and the automobile are influencing the lives of the people more than any other thing; they not only bring in outsiders, especially to the resort areas, but also make it possible for the mountaineer to get into the village or town with comparatively little effort. Some of the products of home industry, particularly pottery and baskets, find their way with ease to crossroad stores or resorts on through highways, whence they are carried to cities of the near-by plains or sold to tourists (Fig. 74).

Agriculture

The agriculture of this region consists of two distinct types: (1) subsistence farming as practiced by the mountaineers on the upland ridges or in the narrow valley bottoms, and (2) modern commercial farming in the Arkansas Valley and the Springfield Plateau. In the latter peripheral areas, crops are grown for outside markets and sold for cash. Most farms are prosperous and resemble farmsteads in better localities elsewhere. The same contrasts exist here as between those of the Blue Ridge and the Great Galley in the Appalachian Region.

Because of climatic conditions and nearness to the great cotton-producing lowlands of southeastern Arkansas, the Arkansas Valley can be considered an extension of the Cotton Belt. Although there is some diversity, cotton in normal times constitutes the chief cash crop. Good transportation by railroad and highway facilitates marketing this crop at Little Rock and other Cotton Belt cities lying along the eastern border of the region. (See the next chapter—"The Cotton Belt.")

The fruit farming of the Springfield Upland

North of the Boston Mountains the open land resembles the rolling terrain of the Virginia Piedmont more than the hilly areas of the Ozarks. This Springfield Upland or Southwestern Ozark Plateau has developed into an important fruit-producing region, the leading crops being grapes, apples, strawberries, and tomatoes.

In recent years the rolling hill country of northwestern Arkansas and southwestern Missouri has become the fifth ranking grape region of the continent. Production for years was confined to fresh

grapes for the city markets in the surrounding territory. During Prohibition, some of the surplus crop was profitably converted into grape wine. With the repeal of the Volstead Act, this area could make grape wine legally and, though it hoped to build up an outstanding wine industry, competition with more favored areas—western New York and California—has made this impossible. Nevertheless, there are many small wineries in this part of the region.

This section of the Ozarks is one of the few places in the South able to grow a good table apple. Like the grape industry, however, apple production suffers from a lack of large near-by markets.

Strawberries also are important. It is estimated that one seventh of the nation's crop comes from here. Recently strawberries have returned a yearly cash income of more than \$600,000 to the highland growers. Sections of southwestern Missouri specialize in shipping early high-quality strawberries to the large northeastern markets.

Recently the canning of tomatoes has become important in northwestern Arkansas and adjacent counties of Missouri.

The Animal Industries

The Ozark-Ouachita Upland has long produced wild game and semi-wild hogs (razorbacks), but until recently few domestic animals were reared for the outside market. In some sections sheep have been reared largely for wool to be sold in urban markets. More recently cattle and poultry have been introduced. Cattle fed on native grasses are snipped as stockers and feeders into the Kansas City area of the Corn Belt, where they are fattened before being slaughtered. Those fattened on corn from the better farms in the valleys go directly to packing plants in Kansas City, East St. Louis, or Chicago. Poultry and dairy cows have taken the place of sheep and cattle in some of the more favored districts and, for the region as a whole, rank next to meat animals as a source of farm income. In areas near St. Louis and Springfield, however, dairying has become a major enterprise. Great expansion in the animal industries is not likely to occur in the near future because of lack of capital.

Lumbering

Lumbering never has been important commercially except in a few restricted areas because of the difficult terrain over which logs have to be transported (Fig. 75) and because of the region's near-

Hess to the important lumber-producing Cotton Belt. Cutting, however, has taken place over most of the forests, the timber being used for railway ties, firewood, and barrel staves. Much of the area still is in forests—mostly second growth. The chief lumber mills are located in the small valleys of the Ouachita Mountains, up which logging roads have been built to secure hardwood trees for flooring mills and furniture factories.



U. S. Forest Service.

Fig. 75. Hauling logs out of the Ozark National Forest by use of large eight-wheeled wagons and a double team of mules. Compare this method with logging operations in Washington as shown in Figure 263.

A considerable part of the timbered lands, having been secured by the federal government, are now included in two large national forests: the Ouachita (1,473,487 acres) and the Ozark (803,765 acres). The former is only slightly developed.

Mineral Industries

For an upland area, the Ozark-Ouachita region is poor in minerals. The northeastern section, one of the oldest mining areas of the United States, however, is a major producer of lead. It was worked by the French in the early eighteenth century. In the northwestern plateau lies the famous Tri-State (Missouri-Kansas-Oklahoma) Zinc and Lead District, one of the major zinc producers of the country. Aside from these two metals, however, there are

few valuable minerals. In the western part of the Ouachita Mountains are some small deposits of anthracite coal that were worked profitably in the past. Some coal is still mined near McAlester, Oklahoma. The great production of petroleum and natural gas in the region surrounding the Upland leaves little demand for coal as a fuel. In the southeastern part of the Ouachitas, near Hot Springs, is a small but unique whetstone industry that quarries Arkansas novaculite. Since it must compete with artificial abrasives, this enterprise has declined in importance.

The lead district of Southeastern Missouri

This district was discovered by French explorers in the early part of the eighteenth century. Except for spasmodic interruption during the early years, production has been continuous since 1725. Today it is the largest single lead-mining area in the world. Prior to 1869, nearly all the lead was obtained from shallow workings in solution pits and caves, but with the perfection of the diamond drill, ore was procured from greater depths. Since then the output has increased greatly.

The low metallic content of the ore necessitates large-scale operations. When conditions are normal, approximately 25,000 tons of ore are handled each day. In recent years the mines have been consolidated, two companies now producing the entire output. Practically all ore is concentrated at the mine-mouth before being shipped to the lead refineries.⁵

At St. Joe, about 60 miles'south of St. Louis, is located the major lead-producing mine of the United States, and the third-largest in the world. It is surpassed only by the great Sullivan Mine in British Columbia and by mines at Broken Hill, Australia. Practically all workings of this mine are deep under ground; only the few buildings around the mine shaft and the large piles of ore waste (tailings) give any indication of the magnitude of the subterranean activities. Below ground no mine props are used and no timber is visible; the roofs of the vast chambers, ranging up to 200 feet in height, are supported by huge limestone columns.⁶

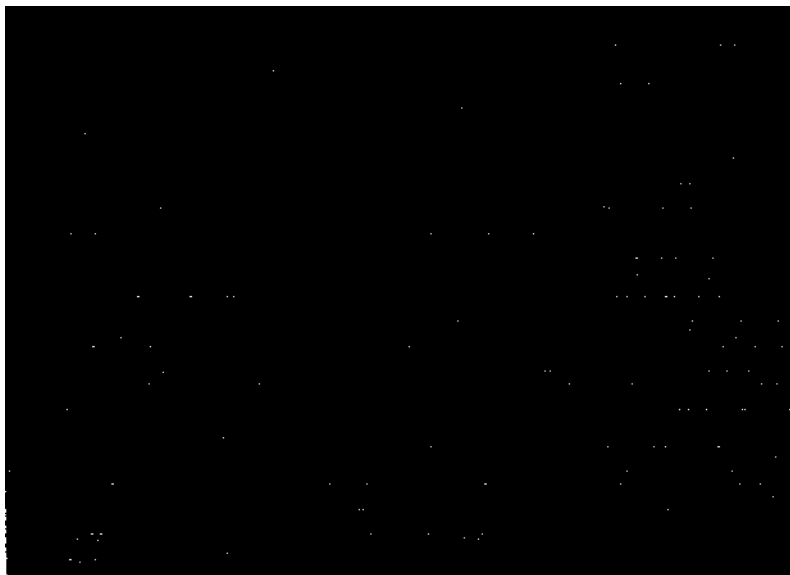
The Tri-State Zinc-Lead District

The Tri-State Zinc-Lead District, lying along the northwestern edge of the Ozark Plateau, is located in southwestern Missouri, southeastern Kansas, and northeastern Oklahoma. Although its

⁵ H. A. Buehler, "The Disseminated-Lead District of Southeastern Missouri," *XVI International Geological Congress, Guidebook II*, pp. 45-55. Washington, D. C.: Government Printing Office, 1932.

⁶ *Fortune*, June 1937, Vol. XV. No. VI, pp. 93-96.

presence has been known for a long time, large-scale production has been carried on only during the past half century. The district, mainly a producer of zinc, has yielded from 50 to 80 per cent of the total for the United States and nearly 30 per cent of that for the world. Although covering an area 37 miles long and 27 miles wide, production is confined to small units of varying size, separated from



American Zinc Institute

Fig. 76, Aerial view of the Richer Field in the Tri-State Zinc District. Note the numerous mine dumps indicating the many small shafts and the great amount of waste material. The Tri-State area is one of the continent's most important zinc-producing districts.

each other by relatively barren ground. Hence the entire district is pitted with mine shafts (Fig. 76) and presents an unusually barren appearance. While zinc is the chief metal mined, lead, which was worked first, is also produced in sizable quantities. Nearly all the zinc and lead ores are shipped to Joplin for further processing and refining. Ores from the Oklahoma-Kansas portion of the district average 5.5 per cent zinc and 1 per cent lead. Recently the old tailings from the mines have been reworked and a considerable amount of each metal has been recovered.⁷

⁷ Samuel Weidman, "The Tri-State Zinc-Lead Region," *XVI International Geological Congress, Guidebook II*, pp. 74-91. Washington, D. C.: Government Printing Office, 1932.

Iron ore deposits of Pilot Knob and Iron Mountain, Missouri

The iron-mining district in southeastern Missouri, where production began in 1845, is of only minor importance today. It was to tap this resource that the first railroad into the Upland was built.⁸

Other minerals

In southeastern Missouri is also located one of the nation's chief producing areas for barium sulphate (barite), locally called "tiff." This white, inert mineral is taken from the subsoil where it has remained unweathered. It is used in sludge for oil wells and replaces white lead in paints.

Near the town of Herman, in the east-central Missouri Ozarks, is a major producing area for diaspore aluminum, which is used in the manufacture of the high-grade refractory clay products of the St. Louis industrial area.

Resorts

Although the resort possibilities of the Ozark-Ouachita Upland were recognized by Congress as early as 1832, the resort industry as it exists today is a recent development. In addition to Hot Springs, other centers became important locally in the 1890's. The present development, however, had to wait until (1) better railroads and highways, particularly the latter, were built into the region and (2) the urban centers in surrounding regions attained sufficient size to support a large near-by resort industry. Both of these goals have now been achieved, and the Ozark-Ouachita Upland today occupies the unique position of being the only hilly or mountainous area within a day's drive of populous urban centers such as Kansas City, St. Louis, Memphis, Little Rock, Monroe, Shreveport, Dallas, Fort Worth, Oklahoma City, and Tulsa. The most remote of these places lies less than 300 miles from the center of the region. The highway map (Fig. 73-B) shows the easy accessibility of the region from the places mentioned above. So far as location is concerned, the Ozark-Ouachita Region reaps the same advantage as the North-eastern Uplands.

The climate is only reasonably favored for resorts, and it does tend to offset, to some extent, the advantages of location and

⁸ M. C. Lake, "The Iron Ore Deposits of Iron Mountain, Missouri," *XVI International Geological Congress, Guidebook II*, pp. 56-67. Washington, D. C: Government Printing Office, 1932.

mountain scenery. Winter temperatures are cold and there is considerable snow on the higher slopes, but not enough for winter sports. Summers experience spells of hot, humid weather that are far from desirable in a resort region. Occasionally protracted droughts occur and the foliage of the forest, which usually is green, becomes brown and unattractive. Autumn is usually the best time



U. S. Dept. of the Interior.

Fig. 77. The business section of Hot Springs, Arkansas, showing the numerous hotels of the area located in a heavily timbered mountainous country. The Hot Springs area was set aside by the federal government as a reservation many years, before the establishment of the National Park Service, but was not created into a park until 1921,

to visit the Upland, because at that season the days are clear and cool, the nights frosty, and the foliage is highly colored.

The establishment of the Ouachita and Ozark National Forests has greatly improved conditions for the resort industry, because the Forest Service has not only opened up much inaccessible territory through the construction of good secondary roads but has also built recreational facilities in various scenic parts.

Resort centers are scattered throughout the region. The better known are: (1) Lake of the Ozarks, a large mountain lake in a scenic setting, formed by damming the Osage River, (2) Eureka Springs, one of the older resort centers of the Ozarks, known for its medicinal waters, (3) the Boston Mountains, the highest, most rugged, and most scenic portion of the entire region, and (4) Hot

Springs, with its nationally famous hot springs and beautiful Lake Hamilton. Hot Springs is the only national park in the region and the oldest government reservation ultimately to become a national park (Fig. 77).

Cities

The Ozark-Ouachita Region contains no large cities, although several large ones lie in contiguous regions near its margin. Of the smaller cities lying within the region, only five will be mentioned.

Springfield (70,514), near the center of the well-developed Springfield Upland, is the largest city of the region. Deriving most of its business from the agriculture of its tributary area, it is the commercial center of southwestern Missouri.

Joplin (37,144), in the northwest part of the region, is the chief industrial and smelting center for the lead and zinc ores of the Tri-State District. Although an agricultural center of some importance, its chief interest is in minerals.

Fayetteville (8,212), the commercial and agricultural center of northwestern Arkansas, is also the home of the University of Arkansas. The city is a resort center of considerable importance.

Fort Smith (36,584), in the Arkansas Valley and almost on the Arkansas-Oklahoma line, was a trading post on the eastern border of the former Indian Territory. Serving as a local agricultural center, it also manufactures products such as staves, barrels, furniture and glass bottles.

Hot Springs (21,370), a resort town, lies in the eastern Ouachitas adjacent to the Hot Springs National Park. It is one of the largest strictly resort centers in the country.

The Outlook

The Ozark-Ouachita Upland is largely a frontier region. In spite of modern commercial and industrial developments in scattered spaces, it will likely remain in a somewhat backward and wild state. Much of its forests are now in national reservations and more will be in the future.

The mineral industries of southeast Missouri and the Tri-State District will continue to produce for some years, since the reserve of lead and zinc ores appears large. There is little likelihood, however, of this industry increasing markedly in importance.

Commercial agriculture offers little opportunity for further development. Most of the area is not suited to it, and, save for the small "scratch" farms on the ridges, only the most favorable locali-

ties in, the larger valleys will be utilized for cash crops. The growing of fruits and berries should be increased year by year as better marketing facilities are perfected, but the region has no particular advantages to make it an outstanding national producer. The demand for beef cattle and dairy products in near-by cities should increase these enterprises to some extent, but it is doubtful that they will become large.

The one industry whose future seems brightest is tourism. This area has natural scenic beauty and is easily accessible to a number of large urban centers. Only in a few places are hotel and recreational facilities up to the standards of other resort regions. However, improvement is being made in this respect, and the Ozark-Ouachita Upland will grow in importance as a resort center.

CHAPTER X

The Cotton Belt

A REGION OF COTTON, CORN, LIVESTOCK, FOREST PRODUCTS, AND MINERALS

THE COTTON BELT includes all parts of southeastern United States where cotton is the dominant crop, except for the Southern Piedmont cotton-growing district (Fig. 78), which has been included in the Piedmont Region (Chapter VII).

The regional boundaries of commercial cotton production are largely climatic, though areas of intensive production lying within these boundaries are primarily a response to favorable soil. The northern limit coincides roughly with the line of a 200-day growing season—the time between the last killing frost in spring and the first killing frost in autumn. Cotton grown north of this line is speculative. The western boundary is approximately the line of 25 inches of rainfall; it extends to the 20-inch isohyet in the Red Prairies of Oklahoma and the Texas Panhandle.. Cotton grown in areas with less than 20 inches of precipitation is speculative. The western boundary is a transitional zone between the cotton area and the range area. As more drought-resisting varieties are developed, cotton may be grown farther west if there is a demand for it.

The southern boundary is drawn approximately on the 10-inch autumn rainfall line. Where more than this amount falls, the cotton may be beaten down and discolored, and picking seriously hindered. This rainfall boundary, paralleling the coast 75 to 100 miles inland, separates the Cotton Belt from the Subtropical Gulf Coast.

The eastern boundary is indefinite. The boll weevil rendered much of the Carolina-Georgia coast unproductive to cotton; nevertheless, cotton appears to be as important as any other crop. Much of this land has reverted to wilderness.

Terrain

The Cotton Belt lies almost wholly within the physiographic province known as the Atlantic-Gulf Coastal Plain (Fig. 2). Minor exceptions are the Red Prairies of Texas and Oklahoma,

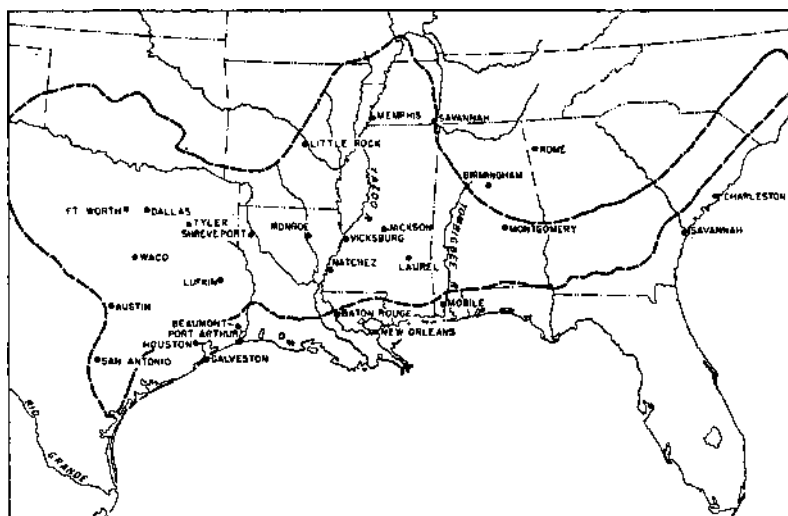


Fig. 78. The Cotton Belt: a region of cotton, corn, livestock, forest products, and minerals.

and the Arkansas Valley and its tributaries in the Ouachita-Ozark province. Most of the Cotton Belt is a broad plain composed largely of sedimentary materials brought down by streams from the Appalachian Mountains on the east and the Ozark-Ouachita Highlands on the west. The rivers cross through low-lying swampy areas, particularly in the southern section. Flowing southward and dividing the region almost equally is the Mississippi River.

Climate

The rainfall of the Cotton Belt varies from 20 inches on the west to more than 60 on the east but averages between 30 and 50 inches (Fig. 79). The growing season ranges from 200 to 260 days. For cotton production:

. . . the best weather conditions . . . are found where a mild spring with light frequent showers merges into a moderately moist summer, warm both day and night, followed by a dry, cool, and prolonged autumn.¹

The convectional thunder-shower type of rainfall, if not too violent, with intervening days of warm bright weather, is ideal in late spring and early summer, but is undesirable during the cotton-picking season, when clear weather is needed.

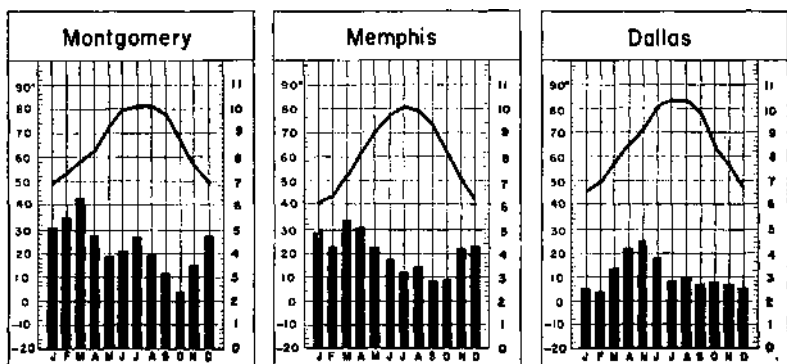


Fig. 79. Average monthly temperature and precipitation for Montgomery, Memphis, and Dallas.

Soil²

Except in northwest Texas and southwest Oklahoma, Cotton Belt soils are pedalfer. By far the largest part of the region is covered by red and yellow soils (Fig. 7). Red soils occupy areas of good drainage where the water table lies many feet below the surface, whereas yellow soils lie in flat areas where ground water comes near the surface. These are all forest soils.

The soils of the Black Belt of Alabama-Mississippi and of the Black Prairie of Texas are also pedalfer, but derived largely from marl or limestone. Natural vegetation here accumulated considerable organic matter, which gave the soil its dark color. In the Black Belt of Alabama, however, one of the more common prairie soils is rarely black, having lost its dark color through excessive sheet erosion.

The dominant soils along the Mississippi and its tributaries are

¹⁰ E. Baker, "Agricultural Regions of North America, Part II, The South," *Economic Geography*, January 1927, Vol. III, No. I, p. 68.

² C. F. Marbut, "Soils of the United States," *Atlas of American Agriculture, Part III*, pp. 40-45. Washington, D. C.: Government Printing Office, 1935.

of alluvial origin. Those of the Mississippi, rich in organic materials, are dark in color, having been transported in part from the northern prairies or the Great Plains, while those of the Arkansas and Red rivers are reddish in color, having been eroded from the Red Prairies of western Oklahoma and Texas. Cotton is grown on almost every type of Cotton Belt soil but its yields are greatest on the better soil types.

Natural Vegetation

The Cotton Belt was originally a timbered region (Fig. 5) characterized by southern pines (longleaf, loblolly, slash) and southern hardwoods (gum, oak, cypress); exceptions were the prairies of Alabama and Texas, which later became two of the most productive cotton districts of the South.

Historical Geography of Cotton Production

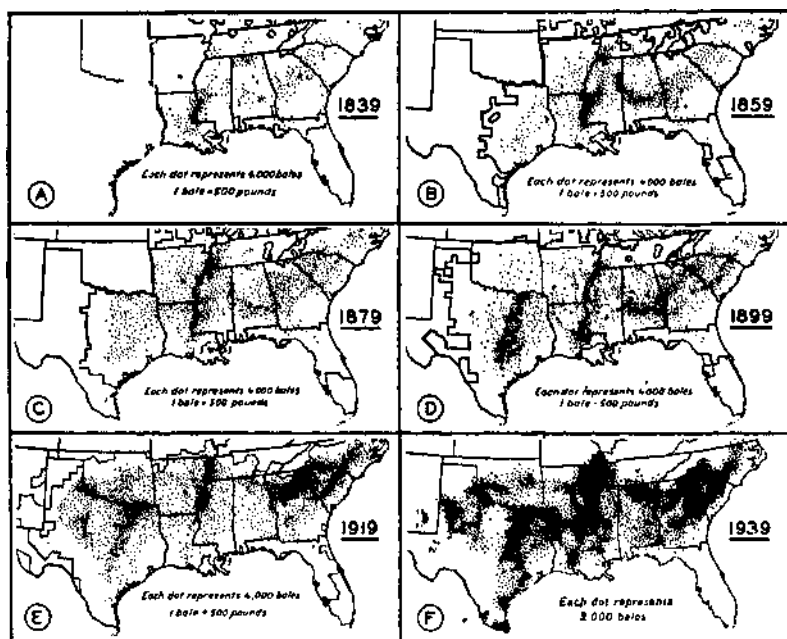
When this region was first settled, the colonists thought they were in a tropical country, where it was assumed that white men could do no physical labor. Accordingly, Charleston and Savannah became great slave-importing cities. The first crops raised with the help of slave labor were rice, indigo, sugar cane, and some cotton. In 1786, long-fibered Sea Island cotton was introduced and was successfully grown along the coastal lowlands.

In 1793, Eli Whitney invented the cotton gin, which soon revolutionized cotton growing. Until then cotton had been one of the more expensive vegetable fibers because its separation from the seed was so difficult a task that large scale production was impossible. The textile industry in northwest Europe began to demand increasing quantities of cotton, and the southern planters (of the Carolinas and Georgia), having had little success with crops previously grown, saw new opportunities in cotton. More acreage and more slaves were needed, and the plantation then became a major system of farm economy.

Westward movement of cotton

Westward expansion of cotton growing was blocked temporarily by Amerinds in western Georgia, Alabama, and eastern Mississippi. At the beginning of the nineteenth century the white settlements that composed the cotton South were confined to a relatively narrow strip along the Atlantic Coast and on the southern Piedmont. Acquisition of Louisiana and the opening of the bottom lands along the Mississippi and its tributaries created large areas for the estab-

lishment of the plantation system. The intervening areas were also thrown open to settlement. It was at this time that the Black Belt of Alabama became the heart of the Old South. With the separation of Texas from Mexico, the establishment of the Republic and its annexation to the United States in 1845, cotton migration continued westward (Fig. 80) until it reached the treeless prairies of central Texas, where it halted, owing to (1) the pioneer's distrust of



Courtesy of Bureau of Agricultural Economics.

Fig. 80. Cotton production for the past century. Map F is on a different scale from the other five. Note the westward migration of areas of intensive production from 1839 to 1939.

grasslands, (2) the heavy soil that was difficult to till, and (3) the lack of protection from nomadic, warlike Amerinds. Thus during the first half of the nineteenth century cotton became King in the area between the Atlantic Ocean and the Texas prairies.

The Civil War and its effects

By the time of the Civil War many southern planters realized that slavery was doomed, that it was no longer economical. Had some practical method been suggested at that time for compensat-

ing them in part for their heavy investments in slaves, secession might have been averted. However, the strong agitation of the radical abolitionists of the North caused these planters to resolve to hold their slaves, even at a loss. (At that time most plantations were caring for many more laborers than were necessary in the fields or as domestic servants.) Another cause of the Civil War was the growing protective tariff that increased the cost of all manufactured goods the southern planter had to purchase while it did not favor his agricultural product—cotton.

In 1860 the United States shipped more than 4 million bales of cotton to Europe as against 779,000 for the rest of the world. By 1864, federal blockade of all Southern ports and decreased production due to the war reduced exports to 241,000 bales (most of these smuggled out), while foreign regions supplied 2,300,000.⁸ Thus began foreign competition in the production of cotton. It did not become serious, however, for nearly fifty years, and immediately upon the resumption of normal trade after the Civil War, the South again became the greatest cotton-producing area of the World.

Two other factors must be considered as consequences of the War: (1) the freeing of slaves; and (2) the abandonment of many plantations in the southeast and a second westward movement. As soon as the southern planter became reconciled to the fact that his slaves no longer belonged to him, he set about rebuilding his farm economy. If his land had not become worn out by continuous cotton cultivation, he subdivided the old plantation into small plots for former slaves who refused to leave even though free. So began the share-cropping system that has received such wide publicity. It was a natural outgrowth of the former plantation-slavery system. Throughout much of the Old South it was the only solution. The Negro farmer had no experience in planning for himself, nor did he have land and the financial backing necessary for independent farming.

In many cases, however, the old plantation was so completely ruined and the planter's family so broken up that he could only move westward to make a new start. Some planters settled in unoccupied lands of east Texas, some moved to the Black Prairies and with the help of ex-slaves again planted cotton, while still others went farther west where they engaged in the cattle business on the High Plains. This migration took place before 1879 and it largely brought about the increase in cotton acreage in Texas (Fig. 80-C).

³ E. J. Kyle, "Cotton Farmers at the Crossroads," *Cotton Trade Journal, International Edition*, 1938, p. 158.

The boll weevil and its effects

Another westward shift in cotton production took place in the early twentieth century with the invasion of the boll weevil (Fig. 81). Since the weevil thrives under the more humid conditions of the eastern Cotton Belt, those areas were abandoned in favor of the dry lands to the west and northwest. The shift from South Carolina and central Georgia to the Red Prairie of Oklahoma and



U. S. Department of Agriculture and Victor H. Schoffelmayer.

Fig. 81. Boll weevil on cotton boll, greatly enlarged.

Texas between 1899 and 1919 is shown on maps D and E of Fig. 80.

The boll weevil, a native of the plateau of Mexico and Central America, first appeared in the United States in 1892 near Brownsville, Texas. By 1894 it had spread through southern Texas. By extending its range annually from 40 to 160 miles, it had reached every part of the Cotton Belt by 1921.

When the boll weevil first appeared, it damaged as much as 50 per cent of the crop, creating panic among cotton planters. Later, they reduced considerably this loss by using calcium arsenate and by burning or plowing under, in autumn, cotton stalks which otherwise would be used by the weevils as hibernation places. To destroy the greatest numbers of weevils, the plowing-under should be done before the first killing frost.

The boll weevil has also been responsible for the use of earlier-maturing cotton. Many of these varieties are higher yielding, have longer and finer staples, and are more resistant to weevils.

Decline in South's supremacy in cotton production⁴

When Southern farmers first began growing cotton more than 100 years ago, they had the best natural environmental conditions for the crop and hence became the world's most important producers. Nature favored a prosperous agriculture, but economic factors such as exorbitant interest rates, high ginning costs, and high transportation and marketing costs took a heavy toll.

During the Civil War, Southern cotton growers were cut off from foreign markets, a situation that greatly stimulated foreign production. At the close of the first World War, as prices of farm products collapsed, cotton farmers, hoping to offset low prices, increased their plantings. But the financial positions of the United States and Europe were reversed, and Europe, as the debtor, experienced difficulty in purchasing cotton.

Cotton farmers are today in a desperate situation because (1) the monopoly they once had is gone—destroyed largely by their own government through high tariff walls, (2) soil erosion has reduced the productivity of their land, and (3) insect pests and diseases have taken a heavy toll.

If the farmers of the North, West, and South could get together, they might be able to bring about lower tariffs on manufactured goods, so that all agricultural products, including cotton, could again establish their foreign markets.

Areas of Intensive Cotton Production

Cotton is grown on practically all the better-drained lands of the Cotton Belt, but certain areas of greater cotton density due to better soils stand out (Fig. 82).

The *Sea Island District* of Georgia, South Carolina, and northern Florida was the first important cotton-growing area in the United States. Both the coastal islands and the mainland grew the long staple "fancy Sea Island" variety which commanded a high price because of its superior quality. Because of the boll weevil, very little cotton is grown in the South Atlantic coastal area today; in fact little of anything is grown there.—It is a desolate country and except for a few coastal cities is practically depopulated.

⁴ E. J. Kyle, "Cotton Farmers Rt the Crossroads/' *The Cotton Trade Journal*, Tenth International Edition, Vol. XVIII. 1938, pp. 158, 192.

The *Southern Piedmont* was once important in cotton production but soil erosion and boll weevil infestations have restricted the acreage. Where the boll weevil did its second greatest damage, a famous peach-growing area was developed. The Southern Piedmont, because of its importance in textile manufacturing, is here considered outside the Cotton Belt, even though it still produces considerable cotton.

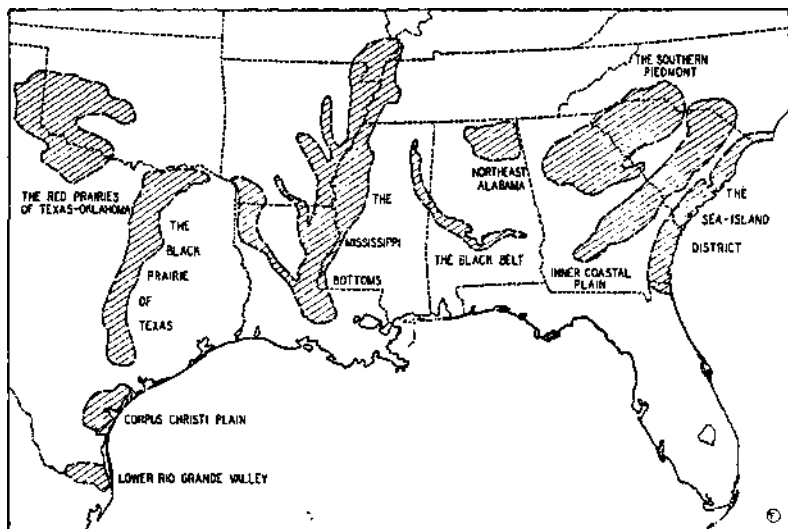


Fig. 82. Areas of intensive cotton production (present and historic).

The *Black Belt* is no longer one of the South's important cotton districts, although cotton still leads other crops in acreage and importance. The dark calcareous soils formerly produced heavy yields, but as a result of soil destruction (erosion and depletion), boll weevil ravages, unstable markets, and an exodus of Negro laborers, acreage dropped 50 to 60 per cent between 1910 and 1935.⁵

With the decline of cotton, the mainspring of Black Belt agriculture, the area suffered a severe blow. By tradition and habit its farmers are cotton growers. However, cattle raising has become an important activity, having been stimulated by the losses suffered in the decline of cotton prices following the World War.

⁵ J. Sullivan Gibson, "The Alabama Black Belt: Its Geographic Status," *Economic Geography*, January 1941, Vol. XVII, pp. 20-21.

The *Inner Coastal Plain of the Carolinas and Georgia*, an old cotton-producing area, has suffered greatly from soil erosion and the ravages of the boll weevil. Nevertheless, it is still an important producer of cotton, principally because nearness to the textile mills of the Southern Piedmont gives it an advantage in the marketing of the crop. The use of much fertilizer on the old depleted soils has enabled the area to rank high in per-acre yield.

Northeastern Alabama. The rich alluvial lands of the Tennessee Valley and the adjacent rolling areas of northeastern Alabama, comprise another important cotton-producing district. Proximity to the textile mills of southern Tennessee have stimulated a recent expansion of the crop. The area, however, as here considered, lies outside the Cotton Belt and in the southern Appalachian Upland, despite its heavy cotton acreage.

The *Mississippi Bottoms*, which include the floodplains of the master stream and its tributaries, form a belt of alluvium in Arkansas, Mississippi, and Louisiana. The better-drained soils, rich in lime and organic matter, are devoted to cotton, the highest yields being obtained in the Yazoo. Flat bottom lands, fertile soils, and heavy rainfall permit this area to lead in the production of upland long staple.

The *Black Prairie of Texas*, an area of heavy cotton production, is about 300 miles in length from north to south, and from 40 to 70 from east to west. It is nearly twice as large as the State of Maryland and throughout is composed of black calcareous soil, well-suited to cotton production. Practically the whole area is arable, and the heavy black soils are the most fertile of the entire trans-Mississippi region. The climate favors cotton production because of (1) rainfall which varies from 30 to 40 inches, (2) a growing season ranging from 230 days in the north to 260 in the south, and (3) long, hot summers. Cotton still is the dominant crop in the Black Prairie though its low price is stimulating greater diversification. The cotton grown in this area is a good medium staple ranging in length from $\frac{7}{8}$ to $1\frac{3}{32}$ inches.

The *Red Prairies of Texas-Oklahoma*, newest of the important cotton-producing districts, owes its importance largely to the ravages of the boll weevil in the more humid sections of the South. Its semi-aridity makes it an unfavorable habitat for this pest. It is the one major cotton producer that is not bothered by the boll weevil.

In the western part are some rough, badly-eroded areas, locally known as "breaks," which are unsuited to cultivation. The brown and red soils are of fair fertility. The annual rainfall of 23 to 30

inches is offset by high summer temperatures, high wind velocities, and low humidity. Production is limited by frequent summer droughts. The cotton plant can stand drought better than many crops because it stops growing during dry periods, resuming growth and putting out new bolls only after a good rain.

The *Corpus Christi Plain*, a low, flat, poorly drained area, lies a few miles back from the salt-water lagoons of the Gulf Coast in southwest Texas. Formerly devoted to cattle, it is now a major cotton-producing district. Cotton is grown on large farms that have been carved out of the old ranches. Lying farthest south of the major districts (Fig. 82), the Corpus Christi Plain picks and markets its crop several weeks before its competitors.

The *Lower Rio Grande Valley of Texas* is also an important cotton producer, but because the major emphasis in that area is placed on subtropical fruits and vegetables, it is considered here as a part of the Subtropical Atlantic-Gulf Coast Region. As the southernmost cotton-producing area in the United States, the valley area usually markets the first cotton bale of the new crop each year.

Other minor producing areas. In addition to the ten areas of intensive cotton production (present and historic) shown on the map (Fig. 82), two other areas should be mentioned. These are (1) the loess bluffs of Mississippi and Tennessee, and (2) the high plains of northwestern Texas and eastern New Mexico. The latter area lies outside the boundaries of the Cotton Belt as considered in this text and falls within the Great Plains Region (Chapter XVI).

The Production of Cotton from Seed to Bale

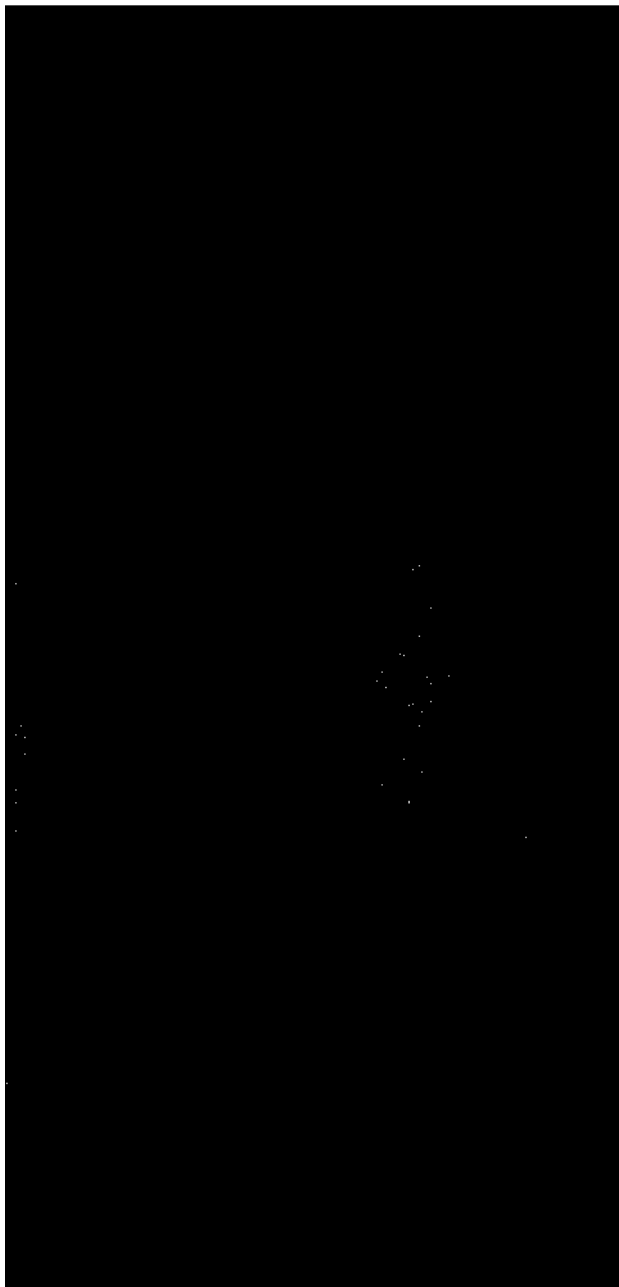
The entire process of cotton production is so well described by Victor Schoffelmayer in his book, *White Gold*, that it is here quoted in detail.⁶

All over the Cotton Belt, in late winter, farmers are busy raking up the stalks of the previous crop, sometimes with the aid of mechanical stalk-cutters. The stalks may be piled in long rows and burned. This practice, however, is not good for the soil. It destroys precious organic matter which the earth needs, although it may kill a few over-wintering insects.

The one-horse cotton farmer is limited to plowing less than an acre a day, but on the large level cotton farms of the Southwestern Plains, one man and a powerful tractor may turn 50 acres in the same time.

Plowing is followed by bedding of the land into ridges usually three or four

⁶ Victor Schoffelmayer, *White Gold*, pp. 28-47. Evanston: Row, Peterson & Co., 1941.



Waco Chamber of Commerce,

Fig. 83. Cotton pickers in a field near Waco, Texas,

feet apart. After this seedbed has settled for several days the cottonseed is dropped into the newly opened furrows by a mechanical planter. In the backwoods areas, however, some farmers still use home-made planters which are carried up and down the rows and operated by hand. . . .

Usually cotton seeds begin to come up in from four to eight days, depending upon both warmth and moisture of the soil. The young plant at first is so weak that it requires the combined strength of several tiny stalks in any one place to break through the top crust that might have formed on certain types of clay soil after long rains. That is why farmers plant more cotton than will be allowed to stand. . . .

Cotton-chopping time is the season's earliest opportunity for a general, social, friendly contact between old and young. During the period of two weeks, tens of thousands of farm families of the South work together in the fields to reduce the number of cotton plants in every row to what is called a "stand." . . .

The cotton plant . . . [at] from four to six weeks old, [is] about six inches tall. . . . Cotton chopping takes so much time that practically all the men, women and half-grown children must help.

On a little farm the family may be able to do this work, whereas on a plantation a small army of men, women and children will make a holiday of the task as they sweep across the broad acres.

Happy-go-lucky Negroes of all ages, up long before sunrise, swarm into the cotton fields. Chopping has become almost a ritual. Even the width of the hoes used by the workers is considered important by a first-class cotton chopper. The expert swing of the long-handled tool, so that neither too much nor too little cotton is hoed out of the row at each stroke, must be quickly learned. On the plantations the practice is to let two or three plants stand about twelve to sixteen inches apart, in rows three feet wide. . . .

Cotton-chopping time is followed by nearly two months of weekly cultivation, usually by the familiar mule and Negro and a shallow plow called a "sweep." There may be a hoeing or two of the crop if the weeds and grass become troublesome. By the time six or seven cultivations have been completed the plant has grown so rank that further tillage would injure the crop.

About the end of June or early July, in most of the South, the cotton plant begins to bloom. In a few days the fields are white with blossoms which resemble creamy-white morning glories. The flowers" open early each morning, turn pink by noon, red or purplish the second day, and fall off on the third. A pea-sized boll is left, which will develop in the next forty to fifty days into the valued cotton lint and seed.

The cotton boll at first resembles a small green walnut. As it ripens it becomes speckled with brown or reddish dots. Its walls harden and finally split where its chambers, called "locks," join each other, and the ripe, snow-white cotton fleece hangs out. A heavily fniited, open cotton field is one of the most beautiful sights in the world. It gladdens the heart of the farmer and his family, who have worked so hard and long through the hot summer days to safeguard the crop against possible loss. . . .

About the middle of July the cotton crop of Dixie is "laid by." All work in the fields suddenly stops. The sun is near zenith; the days and nights are uncomfortably hot and often highly humid. The cotton plant is "setting" fruit rapidly, and cotton picking is a whole month away.

Negroes and whites have reached the time of the crop season which they consider their own. The Negroes are of a highly religious nature, which finds expression in the picturesque "camp-meetin's" that fill the night air of Dixie with the

chanting and mass singing of the well-known spirituals. Itinerant preachers weave their spell over the excited congregations and bring transgressors to the mourners' bench. . . .

Under the spell of cotton's gradual opening the South throws off its mid-summer lethargy and in one great mass effort devotes itself to getting cotton out of the field and into the channels of trade.

There is no time to lose, for every Southerner knows that even one rain may injure the quality of the delicate cotton fibers and lower the market value. Any day, at this time of year, a hurricane may suddenly sneak up into the Cotton Belt from the Gulf of Mexico and ruin thousands of landlords and tenants alike.

It is only four months since the little cotton plant had such trouble breaking through the hard-crust soil, but now it has become an imposing bush, flaunting its dazzling white banners to the wind across 1,600 miles of hills and valleys.

Four million workers, in fields, gins, compresses, warehouses, or engaged in transportation and shipping, each year band themselves into a vast army to pick, process, and move into the channels of trade a crop of anywhere from 10 million to 18 million bales. Cotton-picking time is one continuous payday for aill of Dixie.

While on the whole the cotton-picking season is a time of great excitement and merriment among the Negroes, a sort of annual homecoming and a time of renewing friendships, it is also a time of much backbreaking labor. There is a sudden halt to the camp meetin's and revivals, and a settling down by everyone to the serious business of converting into actual money a crop which has been nearly five months in the making [Fig. 83].

The cotton plant is very sensitive to sudden weather changes. Though tall, it may be poorly fruited, requiring much stooping and hunting of the open bolls hidden in the dense foliage. Pickers welcome a mild frost, which shrivels the leaves of the plant but does no injury to the fiber.

In a well-fruited cotton field a strong, active man may average 150 to 200 pounds of seed cotton in a ten-hour day of picking. The average for the Cotton Belt is nearer 125 pounds. Exceptional pickers have set records of 400 to 600 pounds in a day. Women usually pick about 100 pounds, and children 50.

At one end of the cotton field stands a big wagon. It has very high sideboards, because it must hold about three times as much seed cotton as a standard bale of 500 pounds weight. Each picker dumps his sack into the wagon after the weigher has hung the sack on the scales and made an entry in his record book [Fig. 84]. The scales are typical of the Cotton Belt—a long steel bar with a sliding weight at one end and a hook at the other. . . .

Pickers' wages may vary from 50 cents per 100 pounds of seed cotton to \$1 or \$2, depending upon whether cotton is bringing a higher-than-average price. In recent years it has brought growers 8 to 11 cents a pound. After the World War the price for a time rose to 40 cents and left in its wake a false prosperity which soon vanished. In those days a fast picker was paid \$4 to \$6 a day, but the money was usually spent recklessly, and at season's end there was little or nothing left. . . .

Usually farmers haul their cotton to the gin as soon as it is gathered. Every type of vehicle is pressed into service, from the mule-drawn wagon with improvised sideboards to the converted flivver truck, or the trailer pulled by an ancient "jalopy."

One of the picturesque sights of the American Cotton Belt is a long line of these cotton wagons and trucks, sometimes a hundred or more, waiting turn at the gin. Farmers in rough clothing, sometimes accompanied by several boys,

come prepared to sleep on their cotton loads or in nearby wagon yards, so as not to lose their place in line. It is every man for himself. . . .

As the waiting wagons finally move up in the line the farmer drives his vehicle onto a weighing platform where a record is made of the cotton's weight. That may vary from 1,300 to 2,000 pounds, depending upon whether the cotton is hand-picked or "pulled" and "sledded," methods which have been developed in the Southwestern cotton areas. From the scales the farmer drives under a shed along-side the gin, where a suction tube draws the cotton out of the wagon bed into the gin house.

It is fed through complicated machinery to the whirling saws. The fibers, called lint, drop onto a roll from which they travel slowly into a box the size of



U. S. Dept. of Agriculture.

Fig. 84. Weighing seed cotton and loading a wagon train at Wilson, Arkansas.

the final bale. Here a powerful plunger and plate press the lint into a dense mass, which when it emerges will be covered with a strip of burlap and held together with six thin iron bands about an inch wide. The finished bale is automatically dumped to the platform and is ready to begin its travels.

Selling the cotton. As soon as the farmer gets his ginned bale on his wagon, he usually drives into a near-by town and offers it for sale to cotton buyers who hold forth on the courthouse square or in the streets. The buyer climbs upon the hub of the wagon and with a long sharp knife cuts a hole in the bale and pulls out a sample, which he draws through his fingers and carefully examines. The grower usually looks on in blank silence, for he is generally ignorant of this phase of the cotton business. Finally the buyer

tells the farmer that the cotton is "barely middlin' seven eighths" or something similar, and offers a price per pound, based on the day's quotation. The farmer may sell or he may wait for a better offer, which he may or may not get. If no sale is made he hauls the bale back to his farm, dumping it in his front yard where, being exposed to the weather, it deteriorates. Some farmers store their cotton in a warehouse and pay storage until such a time as they can sell. However, storage costs reduce profits. In most cases, the individual farmer, being in debt to the local bank or general store, is forced to sell at the current price. He then visits the bank or the creditor merchant, pays his debts, gets new provisions for the family, and finds himself with little cash left. He knows, however, that his credit has been re-established and that he can arrange to be "carried" when his cash is gone.

Of course, this picture does not apply to the large cotton farmer or plantation owner, who markets his crop in a scientific manner. Since most of the southern cotton crop is produced by small tenant farmers or share-croppers, however, the above scene is typical of Cotton Belt buying and selling operations.

Compressing. Plants for compressing bales, known as "compresses," are usually located at interior markets or railroad concentration points. So bulky is the standard 500-pound square bale (density 12 to 15 pounds per cubic foot) as it comes from the gin that only 30 to 35 of them can be loaded in a box car. Hence, in order to be shipped, they are compressed to a density of 22 to 24 pounds per cubic foot which enables 65 to 75 bales to be loaded into a box car. Some exporting ports such as Houston, Galveston, New Orleans, or Mobile have "high density" compresses that give the bale a density of 35 pounds or more per cubic foot.

The Future of Cotton

Soil erosion and depletion

With the growing of intertilled crops such as cotton and corn year after year on at least three fourths of their crop land, soils have deteriorated more rapidly than in any other part of the nation. The natural factors of rolling lands, open winters, and heavy rainfall are conducive to soil erosion; but if fewer intertilled crops were planted, erosion could be reduced.

According to S. S. Visser,⁷ on the average, the South has more

⁷ S. S. Visser, Personal communication. See also his article "Torrential Rains as a Serious Handicap in the South," *Geographical Review*, Vol. 31, No. 4 (October 1941), pp. 644-652.

than twice as many thunderstorms as the North. Moreover, in the North, nearly all thunderstorms occur in late spring and summer, while in the South they occur throughout the year. Most Southern stations have received at some time or other more than 8 inches of rain in 24 hours; twenty-nine more than 15 inches; and seven more than 20 inches in 24 hours.

These intense rains cause serious damage to the soil. Upon even slightly sloping land, they run off in torrents that carry away much soil. Already much sloping land that was once farmed has been abandoned or rendered infertile by soil loss. Level land, too, is injured by excessive rainfall, which leaches out the mineral plant food in sandy areas. Thus the South uses more fertilizer than the North. River bottoms are flooded and covered with mud or other sediment. It has been assumed generally that such land is made more fertile, but as a rule the reverse is true because runoff often carries not only fertile topsoil but also infertile subsoil and even sand and gravel.

The Cotton Belt has become accustomed to the gully and has accepted it as the symbol of erosion, but the process that precedes gullying—sheet erosion—has gone unnoticed in most places. At a Soil Conservation Station in east Texas, it was found during a four-year period of experimentation that a farm planted continuously in cotton lost 105 times more soil than one planted in grass and 237 times more than one planted in trees.

Thus it may be seen that the torrential rainfall and the traditional system of farm economy, with two dominant row crops occupying most of the cultivated land, conspire to accelerate soil erosion and soil depletion in the Cotton Belt. This tends to explain the trail of discarded farm lands that stretches completely across the region from east to west. Millions of acres in the Cotton Belt are no longer fit for cultivation and should be retired to pasture and forest as soon as possible.

Thanks to the Soil Conservation Service and to the observations of the more intelligent farmers of the region, the Cotton Belt is now trying to remedy the situation. All types of measures are being used: (1) terracing, which is not so successful because the heavy rainfall sometimes breaks the upper terrace thereby flooding the entire field, (2) contour plowing, which is more valuable, especially when practiced with terracing, (3) strip cropping, particularly valuable in checking sheet wash on the Black Prairie of Texas, and (4) the planting of cover crops to be plowed under as green-manure. With the active work now being done by the federal government,

and state and private interests, soil erosion in the future should be reduced greatly.

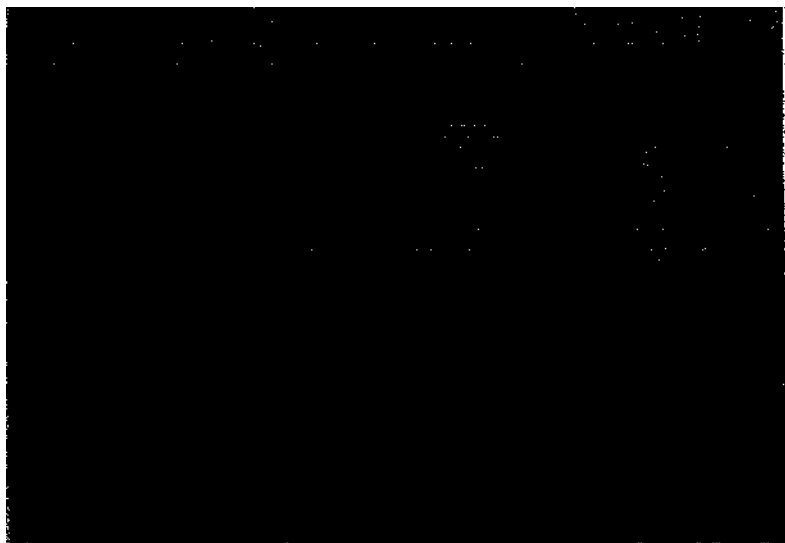
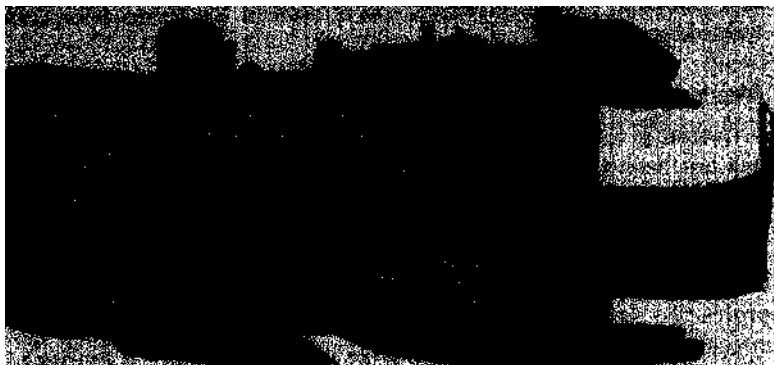
Mechanization of cotton picking

Cotton is the only one of our major agricultural industries that has not been largely mechanized. Most planting is now done by some type of machinery, and chopping, still a hand process, could be mechanized with little difficulty. Picking, however, offers several drawbacks to mechanical processes, mainly because cotton, unlike the grains where extensive fields all ripen at one time, has a protracted season during which both green bolls and ripe bolls appear on the same stalk. Any large piece of machinery similar to a harvester would destroy a sizeable part of the crop unless, as some inventors have implied, it was a type of mechanical robot with brains and eyes that could select the mature and leave the immature cotton.

The mechanical picker. Many types of mechanical pickers have been used with varying degrees of success. One involves a series of mechanical fingers or whirling nozzles attached to a suction tube, which must be applied to the individual cotton bolls. Another sucks off the open fiber in the manner of a huge vacuum cleaner. These pneumatic pickers, however, have failed because of the great amount of power required to operate them, and because of the leaves, trash, and dirt sucked in by the vacuum. Furthermore, since they must be applied directly to the individual cotton boll by hand, they are about as slow as hand picking.⁸

A large agricultural-implement house has recently developed a spindle type of picker that consists of two vertically parallel revolving cylinders, between which the cotton plant must pass as the machine moves through the field (Fig. 85). Each cylinder has 154 spindles containing small barbs to catch the fiber. As these rotating spindles touch the open bolls, the barbs catch and extract the cotton, and dump it by means of a belt conveyer into a receptacle. This machine, which has been operating experimentally for some time in the Mississippi Bottoms, can harvest 1,500 pounds of lint cotton in approximately one hour and twenty minutes, the work of 75 hand pickers. However, the initial cost of the machine along with that of operating it makes its use on all but the largest farms a matter of speculative value.

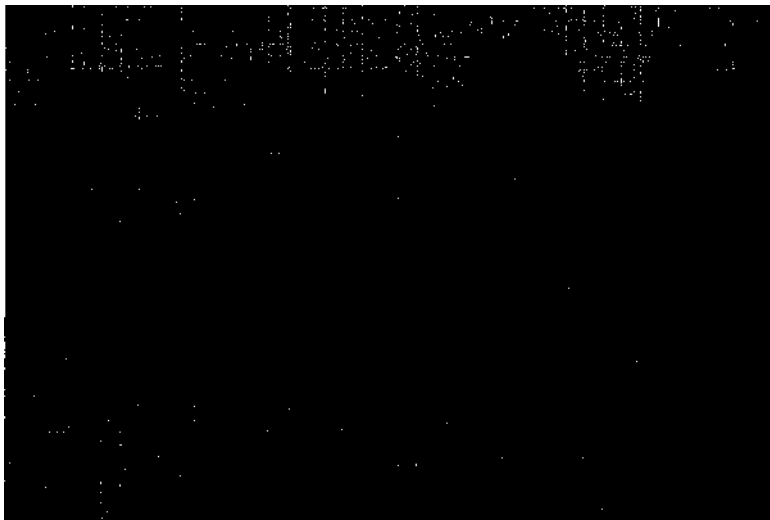
⁸ E. A. Johnston, "The Evolution of the Mechanical Cotton Picker," mimeographed release by the International Harvester Company, Chicago.



International Harvester Co.

Fig. 85. Mechanical cotton picker. The latest type cotton harvester is provided with two vertical and parallel revolving cylinders between which the cotton plants pass as the machine moves forward along the rows. Each cylinder contains 154 spindles equipped with numerous tiny needles or barbs which catch the lint. The top photograph shows the mechanical picker mounted on a "farmall" tractor, while the bottom photograph shows it being operated in a cotton field.

The cotton sled. Some years ago the High Plains of northwest Texas had a large crop of cotton going to waste because pickers could not be secured. Late in the season a farmer experimented with a piece of picket fence which he dragged through his field to snap off the bolls. While his experiment was extremely crude and he got a mass of cotton burrs, green bolls, stalks, and dirt along with the cotton, it was the forerunner of the cotton sled that has been



Texas Agricultural Experiment Station,

Fig. 86. Cotton harvester mounted on side of a tractor. Harvested cotton is shown in the trailer.

used extensively on the High Plains. Many improvements have been made, and some implement manufacturing companies have developed types called "Cotton Harvesters" that are quite successful (Fig. 86). Because cotton in this region tends to ripen simultaneously and since it is grown extensively, hand picking had taken the form of snapping the entire boll rather than picking the fiber from the boll. A man could snap 400 to 450 pounds in a day but with a sled he could get 1,500 to 2,000 pounds. Sledding, however, collects considerable trash, which must be separated from the fiber before going to the gin. Many farmers in this region have installed their own cleaning machines and can thus take reasonably clean lint to the gins. The ratio of cotton as a result of the different picking methods is as follows:

1,400 pounds of picked seed cotton make one 500-pound bale.

2,100 pounds of snapped cotton make one 500-pound bale.

2,900 pounds of sledded cotton make one 500-pound bale.

Mechanical pickers may someday become as efficient as grain combines, since both farm machinery manufacturers and farmers are working on the problem. When complete mechanization does come it will cause widespread unemployment among thousands of Negro tenant farmers and pickers, whose services will no longer be needed in the Cotton Belt. This, however, appears relatively remote.

Negro Migrations to the North and to Southern Cities

During and following the first World War, immigrants from Europe came to the United States in ever decreasing numbers, and with the accelerated demand for factory and domestic help at high wages in all cities large numbers of Negroes migrated northward from the Old South. The Southwest relied primarily upon Mexican labor and hence did not feel the migration so much as the Southeast, which experienced a critical labor shortage. J. S. Gibson describes this migration from the Black Belt of Alabama as follows:⁹

... the industrial development particularly in Birmingham and to a less degree in the North and Middle West provided thousands of jobs for unskilled workmen, and many of the more industrious and ambitious negroes left the Black Belt and other parts of the South' in response to this newly-opened opportunity for employment. The coming of the boll weevil about the close of the second decade brought untold trouble to the cotton farmer. The new pest took one crop after another, leaving stranded the negro farfn'er who knew no other type of farming than cotton growing. Many left the farm discouraged, and turned northward to join countless others who preceded them to factory jobs and high wages in Birmingham, Chicago, Detroit and other industrial cities.

The depression of the 1930's caused many Negroes to return to the plantations, and left stranded in northern cities many others. However, if cotton ceases to become the dominant crop or if the industry should become completely mechanized, there will be another migration from the Cotton Belt Region because of unemployment. This could be more serious than the migrations of the "Okies" and the "Arkies" to California during the past decade.

⁹ J. Sullivan Gibson, "The Alabama Black Belt: Its Geographic Status," *Economy Geography*, January 1941, Vol. XVII, No. I, p. 17.

The Need for Diversification of Crops

Throughout much of the region cotton has been the only crop that offered the farmer a cash income and the only one that could be used for collateral in advance of planting. Crop rotation and diversification have been unsuccessfully preached throughout the South for years, because no means could be found of financing the farmers except by their growing cotton. Prior to the development of recent government agencies, particularly the AAA, a survey revealed the following startling facts about southern farms:

600,000 had no home gardens

600,000 had no milk cows

800,000 had no hogs

300,000 had no chickens.

All of these deficiencies occur in a region that is one of the best naturally endowed for agriculture on the continent.

Foreign markets for cotton have been curtailed so seriously by the second World War that foreign buyers (chiefly England) take only a fraction of their former purchases. In 1941 the United States Government had on hand in cotton warehouses a surplus of 10,500,000 bales. It might seem that the Cotton Belt should quit growing cotton for a few years to allow the market to absorb the surplus. This, however, is impossible since it would eliminate the major income of some 2½ million farm families who depend upon cotton for their support.

The United States Department of Agriculture, through the AAA, has recently presented a "Cotton Stamp Plan" that may solve the problem. Under this plan farmers are

. . . encouraged to shift some of their acres from cotton growing, which wears out the soil, to the raising of other farm products which build up the soil. Fanners are encouraged, too, to live at home, to plant kitchen gardens, to raise the fresh fruits and vegetables they need in a good healthful diet, to get themselves a family cow so they can have the milk and the butter their families need, to raise chickens and pigs so their families can have meat, no matter which way the cotton market goes.¹⁰

The new plan pays farmers in cotton stamps at the rate of ten cents for each 200 pounds they forego producing, with \$25 as the maximum any one family can earn in a season. These stamps can be

¹⁰ "Stamp Planning a New Way," *Consumers' Guide*, January 15, 1941, Vol. VII, No. 8, pp. 6-7.

used at the neighborhood store or at certified mail-order houses for the purchase of cotton clothing or cotton goods. If the plan works it not only will reduce the cotton acreage so that the surplus can be disposed of, but will also increase the domestic demand for more cotton clothing. Though the plan may appear fantastic, the present seriousness of the problem demands its being given a chance.

Other crops in the cotton belt

Corn. Corn occupies almost as much acreage as cotton but the crop is fed to livestock and draft animals or is consumed by the farmers as "hoecake and hominy" and hence is not important commercially. The principal system of farming, therefore, is based on these two crops—cotton and corn—practically every farmer growing both. Some other crops are grown when labor requirements do not conflict. Since it costs more to grow corn here than in the Corn Belt, only that which is needed locally can be grown economically. As a supplemental crop corn is possibly the best that can be grown, but there seems little likelihood that its acreage will increase. Should the cotton farm become completely mechanized, corn production would certainly lose its importance.

Wheat. In the western part of the Cotton Belt wheat tends to replace corn as the second crop. In Oklahoma and the northern part of the Black Prairie of Texas wheat occupies almost as much land as cotton (Figs. 80-F and 182). In terms of the major crop, much of this border area might be considered as a part of the Interior Grain Belts growing cotton, rather than as a part of the Cotton Belt growing winter wheat. The grain elevator shares with the cotton gin the cultural landscape of many Oklahoma and north Texas towns.

Grain sorghums. In the drier sections of Oklahoma and the Texas Panhandle the grain sorghums—kaffir corn, milo maize, feterita, and hegari also share acreage with cotton. These drought-resisting crops serve as stock feed in an area that is too dry for corn.

Legumes. Several important legumes grown throughout the Cotton Belt are used for green manure, stock feed, and even food for human consumption. *Peanuts* (groundnuts), a legume that is frequently classed as a nut because of its flavor, are grown widely, the most important areas of production being southern Georgia and Alabama and central Texas. The small "Spanish Peanut," the dominant variety, long used for stock feed, is now also being used in candies and in peanut butter. *Cow peas* are grown largely for

stock feed. The areas of major production lie in the inner coastal plain of South Carolina and Georgia, and in Arkansas and Louisiana. *Velvet beans* grown for green fertilizers and stock feed, are produced largely in southern Georgia and Alabama.

Sweet potatoes and yams. Although these are grown principally in the South, they extend as far north as Iowa and New Jersey. They are grown in the South chiefly as a food, but recent experiments in dehydration have proved that they can be turned into valuable stock feed. The dried vines have about as much feeding value as alfalfa. Recently a sweet potato starch factory was established at Laurel, Mississippi, to provide sizing for textiles and adhesive for stamps. Other uses doubtless will be found for this interesting root crop that grows so prolifically in the Cotton Belt.

Truck crops. Although the Subtropical Gulf Coast is the major truck-producing region of the South, a wide variety of truck crops is grown in the Cotton Belt. The most important are *tomatoes*, *onions*, and *watermelons*. The two areas of greatest tomato production are southwestern Mississippi and northeastern Texas. Onions are grown widely for local use, but in the northern part of the Black Prairie of Texas a large commercial industry has developed. Watermelons are grown for local consumption throughout the South. Georgia is the chief producer, but Alabama and central Texas also rank high. Parker County, in the west cross-timber belt of central Texas, is famous throughout the Southwest for the quality of its watermelons. At the height of the season, farm wagons loaded with melons dominate the courthouse square in Weatherford, the county seat, as much as do cotton wagons at the close of the picking season in most small agricultural towns of the Cotton Belt.

Tree crops. Peaches lead all other fruits in importance. Georgia—"The Peach State"—is the chief producer, and with California accounts for nearly one third of the country's total. A secondary center was northeast Texas, but recent freezes have so seriously discouraged growers that they have abandoned orchards. Another tree crop typically southern is the pecan. Although native pecans are grown throughout the Cotton Belt, large commercial orchards are restricted to east Texas, Louisiana, and Georgia. While these two tree crops have brought a large revenue to many growers, the total amount of land planted to each is limited by market demand.

Rice was the leading crop of this region during colonial times. Today most of the nation's rice is grown outside the Cotton Belt in

the Subtropical Gulf Coast in western Louisiana and southeast Texas. A small area in the Cotton Belt lying between the Arkansas and Mississippi rivers, in southeastern Arkansas, is also important. The land here is low and flat, with consequent poor drainage. The annual average rainfall of more than 50 inches is ideal for rice culture. Although ranking far below Louisiana and Texas, this small section of Arkansas with its 171,000 acres produced 8,700,000 bushels in 1939.¹¹

Livestock. Although all cotton farms maintain a small supply of work animals (frequently only one mule) and occasionally a dairy cow and a few chickens, the rearing of livestock is relatively new. The Black Belt of Alabama, having been forced to abandon much of its cotton land because of soil erosion, has led the way, but other sections may soon follow, if the industry shows any sign of being profitable.

In the Black Prairie of Texas, also, many acres of former cotton land have been returned to pasture and are carrying large herds of beef cattle and sheep. While this shift from row crops to pasture should reduce soil erosion in some of the areas more seriously affected, care must be exercised so that the pastures are not overgrazed.

Dairying is a new but growing industry in the Cotton Belt. Small dairies have for years supplied the needs of southern cities, and many of these became large plants as their urban markets grew. Recently, however, some of the large northern dairy-products companies attracted by the rapidly growing urban markets, have established large dairy farms and milk-products factories in the region. The chief advantage of the South is that the mild, open winters make possible the pasturing of dairy cows throughout the year. However, the South is handicapped by a smaller urban population and dairying will possibly never become as important as in Wisconsin or Vermont.

Chemurgy

Chemurgy, a word coined in the early 1930's by William J. Hale, research chemist of Midland, Michigan, refers to the application of chemistry and related sciences to farm-production problems by finding outlets in industry for the crop surpluses. Only the name is new, for products such as celluloid, rayon, plastics, vegetable oils, and many others developed by the industrial chemist have been used

¹¹ *Agricultural Statistics*, 1940, p. 96. Washington, D. C.: Government Printing Office, 1940.

for years. Only recently, however, has the nation become aware of the great wastes in agricultural production, and their value for industrial products.

A recent survey reveals that 133 different raw materials now used by industry come from some 86 agricultural commodities. These raw materials are converted into 240 manufactured products which in turn have more than 400 uses.

In 1938 the United States Congress authorized the establishment of a large research laboratory in each of the 4 major agricultural sections of the nation. The Southern Research Laboratory, located in New Orleans, is at present confining its studies largely to cotton, sweet potatoes, and peanuts, but will ultimately include all southern crops.

Cotton lint (fiber) contains one of the purest forms of cellulose, but the stalks and hulls also contain large amounts. Cellulose, when partly refined, is used in the manufacture of paper, building and insulating board, and absorbents. When freed of impurities and converted into cellulose compounds, it is used in the making of rayon, lacquers, plastics, cellophane, explosives, and many other products.

Though the *sweet potato starch* industry is small, nevertheless the new plant at Laurel, Mississippi, produced more than 2½ million pounds in 1940. Farmers around Laurel are now making more money growing sweet potatoes for starch than they ever made from cotton.

Forests and Forest-products Industries

The Cotton Belt lies largely in the southern part of what was once the greatest unbroken stretch of timber in the world—the eastern forest. With the exception of the prairie areas, every part of the Cotton Belt was originally forested (Fig. 5). Demand for cotton land, coupled with reckless burning, reduced the standing timber long before lumbering began. Logging and lumbering operations were so widely and actively prosecuted that today only about half the former timbered area may be classed as forest. Even this classification is not definite, since an acre of forest land may be covered by an excellent stand of saw timber, or by small scattered trees that are not restocking themselves. The hardwood forests, particularly in the bottom lands of Arkansas, Louisiana, and Mississippi, have been more completely destroyed than the softwoods, and since they grow more slowly they cannot restock themselves so rapidly.

Fifty-four per cent of the commercial forest of the Cotton Belt

is owned by private corporations, 39 per cent is in farm wood-lots, and the remaining 7 per cent is under public ownership. Only 1 per cent is included in the 19 national forests of the region. Southern national forests are increasing in number but inasmuch as nearly all timbered land was formerly under private ownership, these reservations can be established only through purchase by the federal government or through gifts.

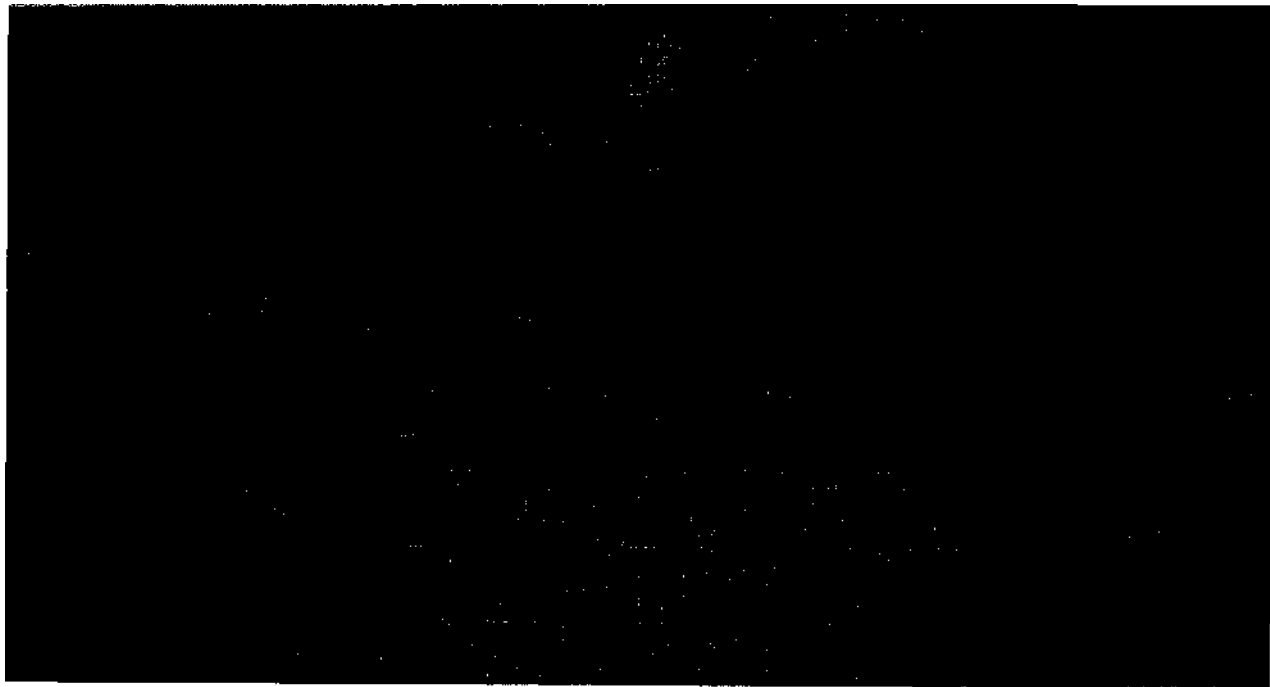
Lumbering

The lumber industry removed the better timber first in the Upper Lakes District and then in the South. Its traditional policy has been to cut the best timber as fast as possible and then move to a new location. This policy was followed throughout most of the Cotton Belt, which today is scarred as a result of destructive lumbering. The system of taxation based on standing timber was in part to blame, since it encouraged cutting the timber as soon as possible and moving from the land.

The South is favored, however, over other lumber-producing sections of the country in that its rate of tree growth is more rapid. New growth, from voluntary seedlings and reforestation, has maintained a large lumber industry despite the fact that many companies moved to the Pacific Northwest after the best of the virgin timber had been cut. Today about 37 per cent of the board lumber produced in the United States comes from the South—mostly from the Cotton Belt. The large mills (Fig. 87), which constitute only 2 per cent of the total, account for about half of the total production. The average cut of these mills is about 40,000 feet a day. Some of these larger mills also produce woodpulp and plastics.

The hardwood industries

A considerable part of the southern forest consists of hardwoods such as oak, hickory, cypress, and gum. These hardwoods have been in great demand for furniture, veneers and shingles. Since the best stands were in the Mississippi bottoms, Memphis, the largest near-by city, became the leading hardwood center in the nation. At first the industry cut only choice large trees that were suited for furniture. . The railroad cross-tie industry has used many smaller and less desirable hardwood trees, but as a result of creosoting, pine cross ties now can compete. Although most southern pulp mills use pine, some pulp is being made from hardwoods; no doubt the pulp industry will provide an increased outlet for this type of timber,



Crossett Lumber Co.

Fig. 87. A large lumber mill and woodworking plant in Arkansas. Note the sawmill in the foreground, chemical plant to the left of the smokestack, and paper mill in the background.

Naval stores

Before the advent of iron and steel ships, when wooden vessels carried the commerce of the high seas, tar and pitch from the south Atlantic coastal states were used to calk seams and preserve rigging. Tar and pitch products therefore became known as "naval stores." Later, when it was discovered that turpentine and resin could be distilled from the gum of longleaf and slash pine, many new uses were found for these products in the manufacture of paints, soaps, shoe dressing, and medicines. Though the South produced about 80 per cent of the world's naval stores up to 1900, it now contributes only about half the total. Petroleum by-products are competing seriously with pine turpentine in many of the trades.

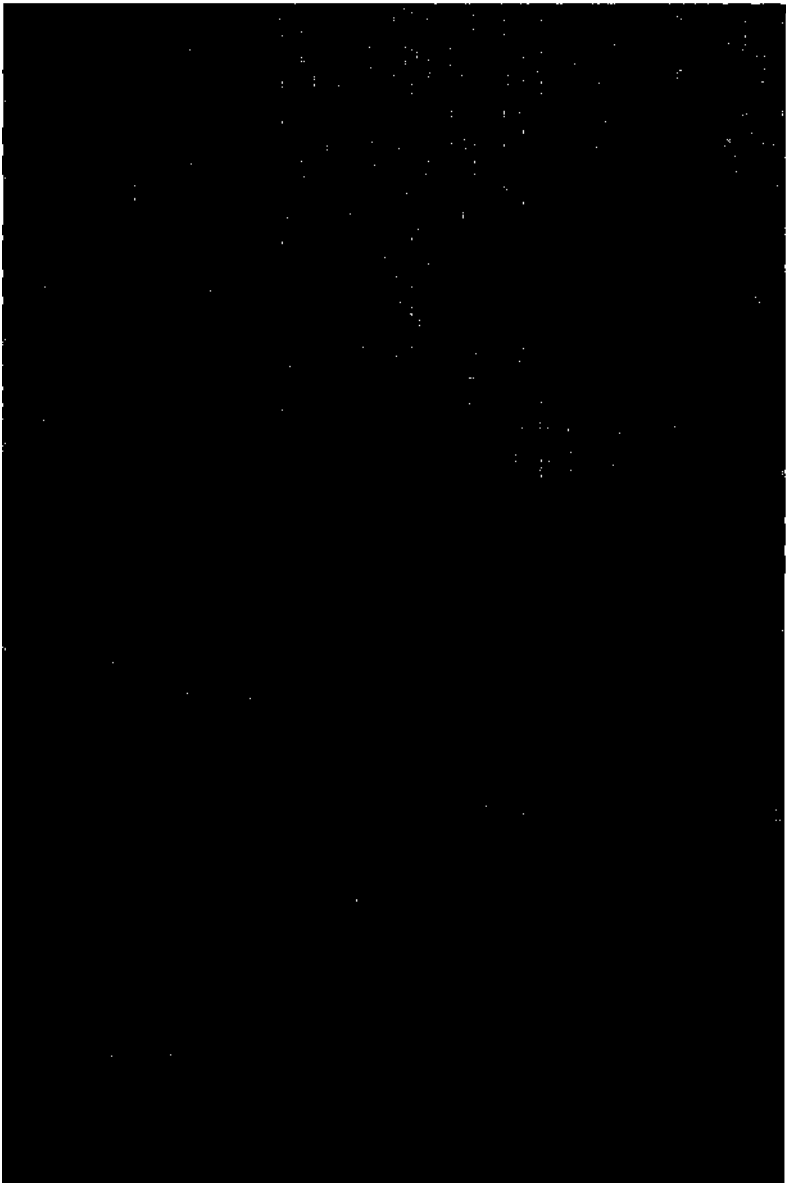
The naval-stores industry, however, still is of major importance in the South, its annual volume of business being nearly 45 million dollars, and its labor requirement nearly 45,000 men. Turpentin-ing is carried on in a backward manner by Negro labor (Fig. 88). After the gum is collected it is carried to small stills in the forest where it is refined.

The major naval-stores area today is in southern Georgia and northern Florida partly in the Subtropical Gulf Coast, but a secondary center of some importance lies in Louisiana and eastern Texas. Trees are usually turpented for some years and are then cut for pine lumber. Savannah and Jacksonville are the chief export ports, for naval stores but much moves to interior markets by rail.

The pulp and paper industry

The manufacture of pulp and paper has grown with amazing rapidity in recent years. The South, particularly the Cotton Belt, gives promise of becoming the nation's great future source of pulp and paper. With its copious rainfall and abundant sunshine, conifers grow four or five times as fast as does the spruce of New England, the Lake States, or Quebec. At ten years of age a slash pine may have a trunk large enough for pulpwood. In 1911 a small mill was established at Orange, Texas, to produce sulphate pulp for wrapping paper. Today there are 31 kraft paper and pulp mills operating in the deep South (Fig. 89), representing an investment of nearly 200 million dollars. These mills produce 2½ million tons of paper a year and employ about 30,000 people—about half of them working in the forest.

Today most kraft paper made in the United States comes from southern pines and southern mills. Existing mills, now making.

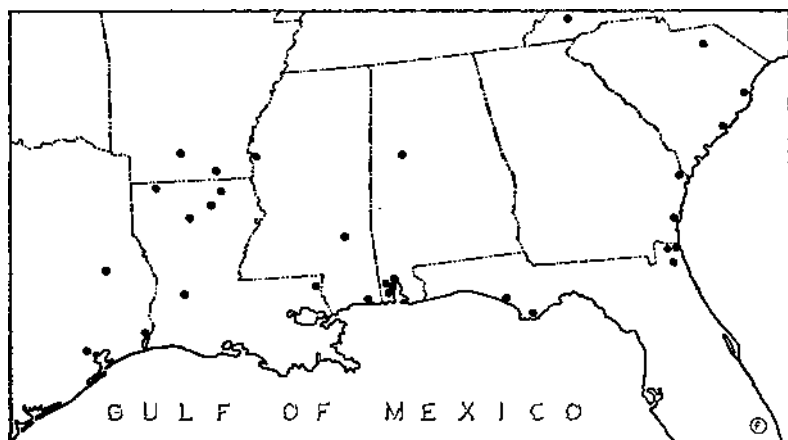


V. S. Forest Service,

Fig. 88. Turpentine slash pine in Georgia by means of the cup system.

wrapping paper or corrugated board, with a few mechanical changes might be able to produce newsprint and white paper if these should be needed. Techniques of paper making have been so highly developed that this step could be attained quickly.

For a long time it was thought that newsprint could not be made from southern pines, because of the resin problem, but ultimately it was discovered that resin occurs only in the older trees—those more than 25 years old. Resin is a pathological substance produced



After map by U. S. Forest Service.

Fig. 89. Pulp mills in the South. ⁹⁶Each dot represents the location of a single mill.

by nature to heal a cut or wound in a tree. It is significant that most trees in this region are less than 25 years of age, the older ones having been removed by the lumber industry some years ago. This means that the best supply of trees for pulp in the whole nation is to be found in the South.

Bleached pulp has recently become an important southern product. In 1940 the South's first newsprint mill was opened at Lufkin, Texas. During its first year of operation this plant manufactured, sold, and shipped more than 31 million tons of newsprint valued at about \$1,600,000. Recently it shipped to China 250 tons of sheet paper.¹² Plans for the construction of a 6-million-dollar newsprint mill at Savannah, Tennessee, have been completed, and a similar mill is planned for Rome, Georgia. The mill at Lufkin will soon

¹² Victor H. Schoffelmayer, Talk before the Southwestern Social Science Association, Dallas, Texas, April 11, 1941.

be enlarged. Huge United States investments of nearly 600 millions dollars in Canadian pulp mills and the dearth of capital in the South have retarded the southern industry, but paper consumption is increasing rapidly. With all of its natural advantages for production, the South seems destined to dominate the paper and pulp industry in the future.

Other Manufacturing Industries of the Cotton Belt

Textiles and rayon

Cotton textiles are manufactured throughout the South and many large mills lie within the bounds of the Cotton Belt. The same holds true for the rayon industry although as yet most of the mills are in the Piedmont and Appalachian regions. Since these industries have been discussed, no further consideration of them is given here.

Cottonseed products

Before the Civil War period cottonseed was considered a waste product and those not needed for planting the next season's crop were destroyed. During the Reconstruction Period large quantities of seed were used in the Deep South for fertilizer.

Although the extraction of oil from cottonseed began before the Civil War, the industry did not become important until 1879 when it was learned that oil could be made edible by a new purifying process using fuller's earth. As cottonseeds deteriorate rapidly in storage, the industry of necessity is highly seasonal, coinciding with that of ginning. Oil mills operate as near to capacity as possible so as to offset the large overhead cost of the mill, which remains idle for a greater part of the year. With the expanding use of cottonseed oil as food, and with the increase in the number of mills, intense competition for seed has developed. Manufacturers and refiners, to protect themselves on the supply, price, and quality, bought out and combined many of the crushing plants, and also acquired control of many gins in an effort to assure themselves sufficient seed. Soon the industry became concentrated in the hands of several large companies that operated chains of mills throughout the entire Cotton Belt. During the first World War there was a great inflation in cottonseed prices (\$65.59 per ton in 1919) and an overexpansion of the industry. The deflation that followed ruined many oil plants and caused a complete reorganization of the industry. A second price collapse came in the depres-

sion years of the early 1930's when cottonseed reached an all-time low of \$8.97 per ton.¹⁸

Cottonseed yields 4 primary products—oil, linters, hulls, and cake or meal. Oil, the most valuable, is a base for vegetable shortening, salad oil, sardine packing, and soap. Linters, the residual fibers left on the seed after ginning, are used for absorbent cotton, felt, writing paper, explosives, photographic films, and rayon. The hulls and other solid material left after oil extraction are pressed into a cake, ground into meal, and sold as stock feed and fertilizer. With further development of chemurgy, additional uses will doubtless be found for cottonseed products.

Plastics¹⁴

Within recent years the manufacture of plastics, one of the fastest-growing industries of the United States, has become important in the South. It utilizes a great number of waste products from both farm and forest.

The plastics industry is probably the best example of man's ability to improve on nature. Many of these products leave the mould finished, not requiring further treatment such as varnishing or painting. The bulk of organic plastics can be made from forest and farm products. The recently developed sweet potato starch plant now uses the starch as a basis for transparent glass-like plastics.

As yet this industry in the South is small, but expansion seems assured because of the great variety of raw materials available.

Minerals of the Cotton Belt

Geographic regional boundaries which seldom are determined by mineral distribution, frequently cut across mineralized areas. Thus many minerals of the South such as iron ore, phosphate, sulphur, salt, and coal lie largely, if not entirely outside the boundary of the Cotton Belt (Fig. 78) and hence are not considered in this chapter. In fact the only ones of major importance in this region are those hydrocarbons, petroleum, and natural gas, that are found largely in the trans-Mississippi portion. In addition some lignite, bauxite, and salt are mined. Formerly large bodies of low grade iron ore

¹³ *Agricultural Statistics, 1940*, p. 134. Washington, D. C: Government Printing Office, 1940, and letter (February 2, 1942) from Joseph A. Becker, principal agricultural statistician, U. S. Department of Agriculture.

¹⁴ A mixture of organic substances which, under combined heat and pressure, becomes fluid enough to permit moulding into any desired shape.

were worked in east Texas. The Birmingham iron ore deposits have been described in Chapter VIII. Phosphate, salt, and sulphur mining are discussed in Chapter XI. Accordingly only bauxite, other than oil and gas will be considered here.

Bauxite

Although more than half the bauxite ores used in the United States still are imported, largely from Surinam and British Guiana, domestic production, as a result of the aircraft industry, has increased markedly in recent years. All domestic supplies now being worked lie within the boundaries of the Cotton Belt Region. Saline and Pulaski counties in central Arkansas, near the boundary of the Ozark-Ouachita Region, account for 96 per cent of the nation's production; 3 counties in Alabama and Georgia supply the remainder. Forty-five per cent of the bauxite consumed in the United States in 1939, came from domestic sources.¹⁵

In the Arkansas district, more than half the production comes from underground mines and about 40 per cent from open-pits. Most of the ore is dried and processed in plants within the mining area, but some still is shipped to East St. Louis.

Most bauxite is consumed in the aluminum industry, although an increasing amount is being used for abrasives, chemicals, and oil refining. In the latter use it is beginning to replace fuller's earth in decolorizing lubricating oils.

None of the nation's electrolytic aluminum reduction works lies within the Cotton Belt; they are located at Alcoa, Tennessee, Massena and Niagara Falls, New York, and Badin, North Carolina. Alcoa contributed 41 per cent of the nation's output in 1939.

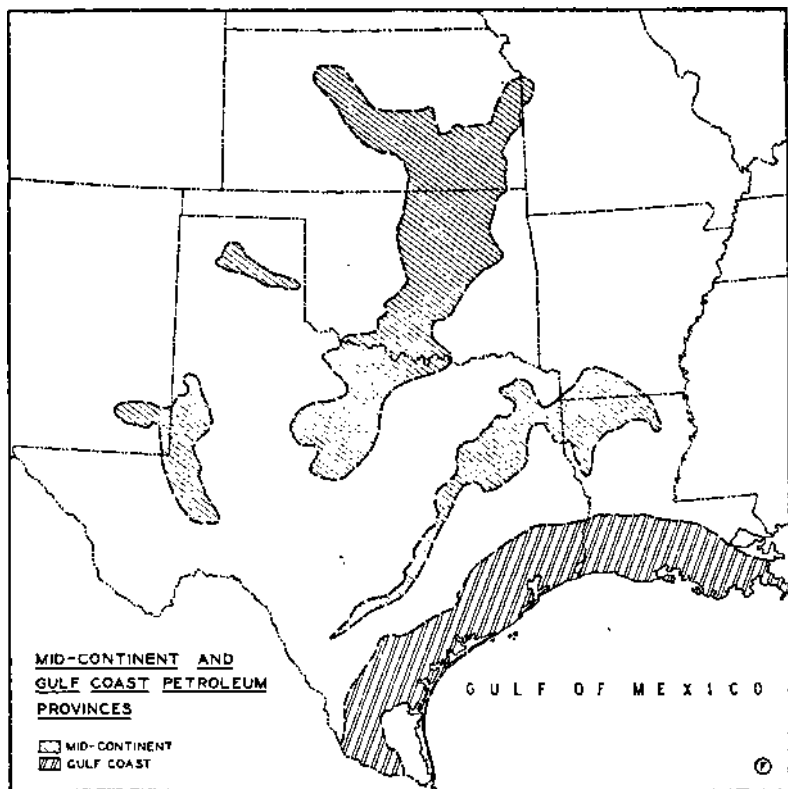
Petroleum and natural gas

Commercial petroleum production began with the discovery of the Drake Well in northwestern Pennsylvania in 1859. It spread westward into Ohio and Indiana, and later into most parts of the United States and even many foreign countries. Oil from numerous seeps was used locally throughout the country. One such locality, Nacogdoches County, in the southwestern part of the Cotton Belt, procured oil from an open pit as early as 1867. It was used on harness leather. The development of the large Mid-Continent Oil Province, which lies partly in the western Cotton Belt and partly within the Interior Grain Belts, began in Kansas,

¹⁵ Herbert A. Franke and M. E. Thought, "Bauxite and Aluminum," *Minerals Yearbook*, 1940, pp. 637-638. Washington, D. C: Government Printing Office, 1940.

later spreading to Oklahoma, Texas, Arkansas, and Louisiana (Fig. 90).

The first commercial production in the Southwest began in the 1890's with the discovery of oil in a well being drilled for water near Corsicana, Texas. Within a short time Texas production had



Adapted from Oil and Gas Journal.

Fig. 90. The Mid-Continent and Gulf Coast Petroleum Provinces.

climbed from 50 barrels in 1895 to nearly 66,000 in 1897. In the following year it had reached 546,000 barrels and the great oil industry of the Southwest was under way. Although numerous small fields were brought in during the next decade, no important development took place within the Cotton Belt until 1911, when the Electra Field, near Wichita Falls, Texas, was discovered. Many

large fields were then discovered in rapid succession, including such famous producers as Ranger, Burkburnett (the field that caused the Red River Boundary controversy with Oklahoma), Mexia, and Powell in Texas; numerous fields in southern Oklahoma; Smackover and El Dorado in Arkansas; and many important ones in Louisiana. Although each presented new problems of overproduction the industry in the Southwest and the nation as a whole continued to postpone the "evil-day" when oil wells should have to be prorated and production limited. Such conditions might have continued had not the East Texas Field, the largest in the world, been developed in the early 1930's. Its enormous potential production threatened to wreck the entire petroleum industry. The size and importance of this field warrants a more detailed description.

The East Texas Oil Field. Some time before the discovery well was brought in, geologists had condemned the area as an oil producer because it did not show any of the common structures present in other developed fields. Accordingly no major companies had leased large tracts of land, and the whole area was in the hands of small land owners. A veteran "wildcatter," C. M. (Dad) Joiner, brought in the discovery well (3,592 feet deep) in the southern part of the field in Rusk County on September 8, 1930. It was the third well he had drilled, the other two having been dry holes. Since it produced only about 300 barrels per day, it all but discouraged further drilling in that section. On December 28, 1930, the second well was brought in yielding between 10,000 and 15,000 barrels a day (Fig. 91). This started the boom in the East Texas Field. Table I indicates the

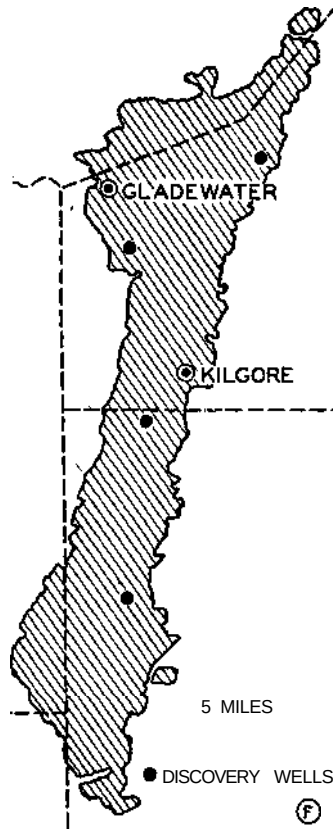


Fig. 91. East Texas Oil Field showing discovery wells. Adapted from map in "The Oil Weekly," October 7, 1940.

rapid rate of well drilling in the next decade.¹⁶ Since most of the land in east Texas was privately owned, almost everyone having

TABLE I

WELLS DRILLED BY YEARS IN EAST TEXAS FIELD

<i>Year</i>	<i>Oil Wells Completed</i>	<i>Gas Wells Completed</i>	<i>Dry Holes</i>
1930.....	5	0	0
1931.....	3,299	0	41
1932.....	5,723	6	64
1933.....	2,424	6	27
1934.....	3,696	6	60
1935.....	3,999	4	121
1936.....	2,509	1	117
1937.....	2,380	2	84
1938.....	1,765	0	41
1939.....	417	0	8
Total.....	26,217	25	563

land within the field drilled a well if he could secure financial backing. Ultimately the boundaries of the field were determined by the marginal dry holes. At its maximum extension, the field proved to be about 42 miles long and nearly 9 miles wide. Within an area of about 300 square miles, more than 26,000 producing

TABLE II

PRODUCTION OF AMERICA'S FIVE LEADING OIL FIELDS¹⁷

<i>Field</i>	<i>State</i>	<i>Production Since Discovery (bbls.)</i>
East Texas	Texas	1,431,000,000
Midway-Sunsot	California	877,000,000
Seminole	Oklahoma	820,000,000
Long Beach	California	638,000,000
Oklahoma City	Oklahoma	488,000,000

wells were drilled. Small cities, like Gladewater or Kilgore, had more than 300 within their boundaries. Although production has been curtailed almost from the beginning, this field easily leads the nation.

So great was the production from these many wells in the East

¹⁶ *Kilgore Oil Carnival*, Kilgore, Texas, October 1940.

¹⁷ A. G. White and others, "Crude Petroleum and Petroleum Products," *Minerals Yearbook*, 1940, p. 955. Washington, D. C: Government Printing Office, 1940.

Texas Field that soon the market was flooded with oil and prices declined. Oil that brought \$1.10 a barrel when the discovery well came in dropped to ten cents by the following spring. The Texas Railroad Commission (the controlling agency) provided a total allowable of 70,000 barrels a day for April, 1931, but by the time the order became effective, the field was producing 140,000 barrels per day. On April 9th, it increased the daily allowable to 90,000 barrels, but the field was then producing 195,000 barrels daily. On May 7 the allowable was placed at 160,000 barrels daily, but a week before the field was producing 340,000 barrels daily.¹⁸ The average price of oil by that time was between ten and fifteen cents per barrel. The entire American petroleum industry faced ruin. Finally on August 17, 1931, the Governor of Texas called out the State National Guard and completely closed the field until September 5th. During that period the Railroad Commission conducted hearings to determine the best method of proration, it having been definitely proven necessary for the future welfare of the industry. These first proration orders considered among other things the proper spacing of wells and the limitations of production per well. Unfortunately, through the ignorance of some and the greed of others, this attempt at control was unsuccessful. Too many people were determined to get their oil to the refineries at all costs and thus began a new development—"hot-oil running."

Influence of oil on the cultural landscape. Clifford M. Zierer has described oil field development in California as an "Ephemeral Type of Industrial Land Occupance."¹⁹ Certainly this description applies to east Texas. The sandy lands of east Texas that previously had little value suddenly became almost priceless. The new industry was purely extractive and had no interest in community betterment. Its workers came with a single motive—to exploit the oil resources. These newcomers completely changed the agricultural community:

Big-shot oil men with shiny cars swarmed into East Texas. Lazy hamlets turned like magic into bustling towns. Great swarms of unemployed working men, harried from job to job by the great depression, descended upon the new boom towns searching for work. Powerful trucks, loaded high with pipe and drilling equipment, dared the slick roads and tricky swamps. Huge, brown, heavy men with square jaws and leather boots cursed and shouted. Tank build-

¹⁸ Frederic H. Lahee, "The East Texas Oil Field," *American Institute of Mining and Metallurgical Engineers*, Petroleum Division, (1932), p. 283.

¹⁹ Clifford M. Zierer, "An Ephemeral Type of Industrial Land Occupance," *Annals of the Association of American Geographers*, September 1936, Vol. XXVI, No. 111, pp. 126-157

ers beat out a steady rhythm with riveters upon steel tanks. East Texas came alive.²⁰

Kilgore, in the heart of the field, illustrates the remarkable development of an oil-boom town. Before oil was discovered, it was a small rural business center in a cotton-farming district of low productivity. It was unincorporated and hence was not listed in the 1930 census; estimates placed its total population at a few hundred.²¹ The community had been hard hit by the depression and its economic outlook was far from bright. By the close of 1930, however, when the East Texas Field was definitely established, the quiet conservative spirit of Kilgore had disappeared almost overnight, and in its place had grown an ugly, dirty oil camp, overrun by a multitude of strangers and ill-equipped to serve them. Since the town was on productive property, oil wells were drilled on almost every lot. As the boom subsided and the oil-workers moved on to other parts of the field, Kilgore began to spend its newly acquired wealth on new buildings, street paving, and city beautification. Though Kilgore today is a modern city, it still retains the forest of steel derricks that represents its lifeblood. Nowhere else, save in a town dependent upon minerals can one find a single industry dominating the life of such a large proportion of the population.

Natural gas. Although most oil wells contain gas, its presence after lifting the oil to the surface has, until recently, been a liability.

In most old fields, large gas flares told the story of man's waste of this valuable natural resource. As a result of recent legislation, oil operators must send it to market by pipelines, utilize it in drip gasoline plants or put it back into the ground. Many long gas pipelines from southwestern fields serve communities at a great distance, but much gas still remains below ground. In the Rodessa gas field of northwest Louisiana, wells operated only one day a month produce all gas needed in the area, the rest remaining in storage underground for future use. A gas field may ultimately have the value of an oil field, but at present such is not the case because of the enormous supply and the limited market.

Transportation

Rivers and canals

Navigation on the Mississippi probably dates from prehistoric times, but real trade developed after 1811, when the first steamboat

²⁰ *Kilgore Oil Carnival*, Kilgore, Texas, October 1940.

²¹ William T. Chambers, "Kilgore, Texas: An Oil Boom Town," *Economic Geography*, January 1933, Vol. IX, No. 1, pp. 72-85.

appeared. Prior to that date there was considerable downstream flat-boat and raft traffic. The use of steam made possible the upstream journey, ushering in a period of steamboat traffic that reached its zenith in the 1840's. As railroads began to offer serious competition in the 1850's, river traffic started to decline.²² From the close of the Civil War to the beginning of the twentieth century, traffic almost vanished.

The creation of the Inland Waterways Commission in 1907 marked the beginning of a new era in river transportation. Yet even with the improvements that have been made on the Mississippi and its tributaries (including TVA work on the Tennessee) little traffic moves by water as compared with that by rail or motor truck. Shipments by water benefit from rates much cheaper than those by rail or truck, but they are also much slower. No other water transportation of significance is found today in the Cotton Belt except on the Tombigbee and Black Warrior rivers of Alabama.

Flood problems. For many years the whole plan for preventing floods in the lowlands (many of these are below the level of the river) was the building of levees along the banks of the stream. For most high water stages, these winding levees served well but an unusually heavy flood occasionally broke the levee at some weak point, usually on the outside of a bend, and flooded extensive bottom lands. Since floods of dangerous proportions came only at intervals of 5 or more years, insufficient thought was given to the problem. The banks of the river lay in six states—Missouri, Arkansas, Louisiana, Kentucky, Tennessee, and Mississippi—and with no unified Federal action, these states could not and did not agree on a plan. It took the severe flood of 1927 to prove that Federal aid was needed. Soon after that disastrous experience, plans were made to treat the flood problems of the lower Mississippi as a unit.

Many factors were involved in this new plan, but probably the most significant was the establishment of major emergency floodways that would carry rapidly the excess floodwaters so as to reduce the level of the main stream. Although these floodways have not been completed, the great flood of the Ohio River in 1937 demonstrated their feasibility. The New Madrid Floodway, below the point where the Ohio empties into the Mississippi, carried off the Ohio waters rapidly and greatly reduced the crest of the flood on the lower Mississippi.

²² W. H. Haas, "The Mississippi Problem," *Annals of the Association of American Geographers*, March 1929, Vol. XIX, No. 11, p. 2.

Another method of protection against this menace is the straightening of the river by cut-offs. Below Cairo, the river has a meandering course—a characteristic of streams with low gradients. The air distance from Cairo to the Gulf is less than half the river distance. Not only did this crooked channel slow down the movement of water traffic, but it increased the flood hazard by checking the movement of flood waters en route to the Gulf. In that section



Army Air Corps.

Fig. 92. Air view of the Ashbrook, Tarpley, and Leland cut-offs, and the Greenville dyke on the Mississippi River. (Published by authority of the Mississippi River Commission, Vicksburg.)

of the Mississippi between the mouths of the Arkansas and Red rivers (a distance of nearly 350 miles), 13 cut-offs have been dug across the larger meanders, reducing the distance by 115.8 miles.²³ These cut-offs, navigable at all times, also increase the velocity of the stream and therefore reduce flood hazards. One of the crookedest parts of the entire river, lying opposite Greenville, Mississippi, required three cut-offs (Fig. 92),

²³ Data supplied by the Mississippi River Commission, Vicksburg, Mississippi.

Railroads

Southern railroads (The Cotton Belt and the Subtropical Gulf Coast) have developed rapidly within the last fifty years. With the decline of river traffic (largely produced by railroad competition) southern industries demanded better rail transportation. Today the Cotton Belt is well served by railways (Fig. 93-A), and no part of the area lies far from the steel rail.

Highways

Many old stage roads existed in the South before the coming of the railroad, but few were more than trails. The most famous road of that period was the Natchez Trace, which ran from Natchez to Nashville. Railroads supplanted highways so completely that until quite recently the South had few modern highways. Within the last two decades, however, huge sums have been spent on highway development. Figure 93-B shows the major Federal roads of the Cotton Belt and the Subtropical Gulf Coast regions.

Airways

Commercial aviation became well established in the South in the 1920's and expanded rapidly in the last decade. Several airlines now operate regular services between major southern cities (Fig. 93-C) and provide excellent connections with the industrial cities of the North, as well as with Latin America. The Cotton Belt has thus been reduced in size by the airplane. Dallas is today only 4½ hours from Atlanta.

Pipelines

When the oil industry was first developed in the Southwest, most petroleum was shipped in tank cars. Considerable oil still moves by rail, and a large part of the refined gasoline is transported by motor truck; however, the bulk of the crude petroleum, natural gas, and gasoline today flows to refineries and markets by pipelines (Fig. 93-D).

Cities of the Cotton Belt

So long as the Cotton Belt was essentially an agricultural region, the southern plantation served as the economic unit, and no reason existed for city development save at a few seaports (Charleston or Savannah), or at a river port (Memphis). The South was a land of

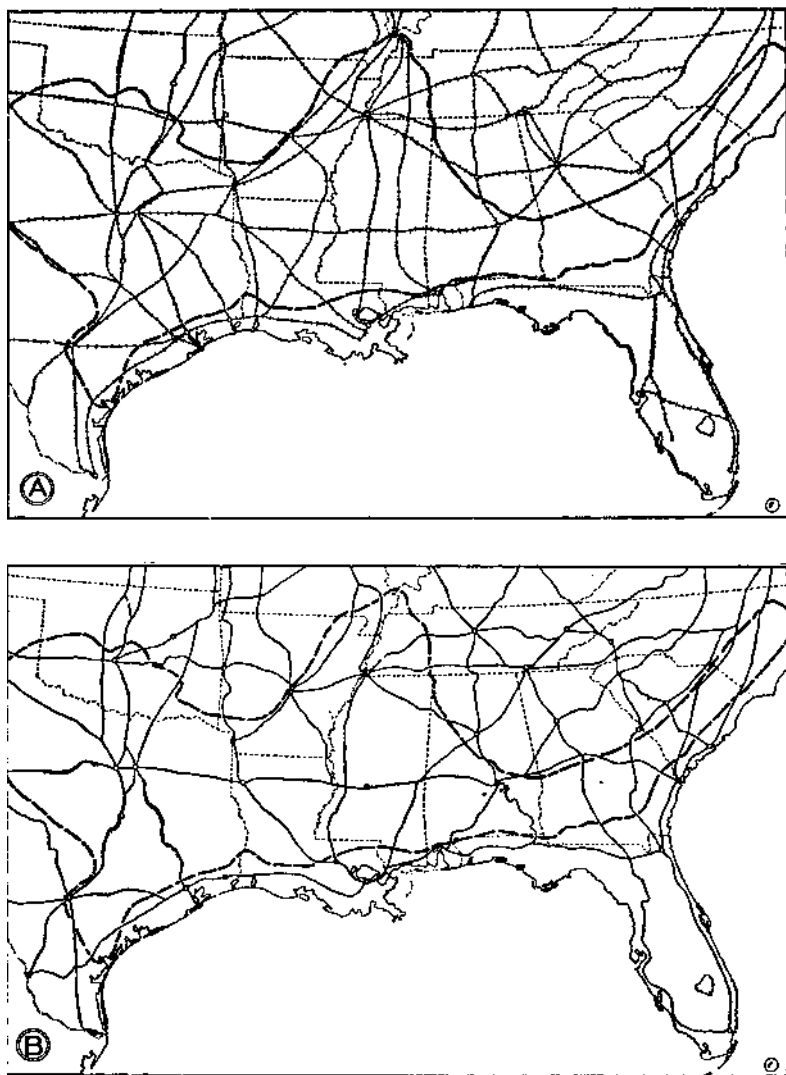
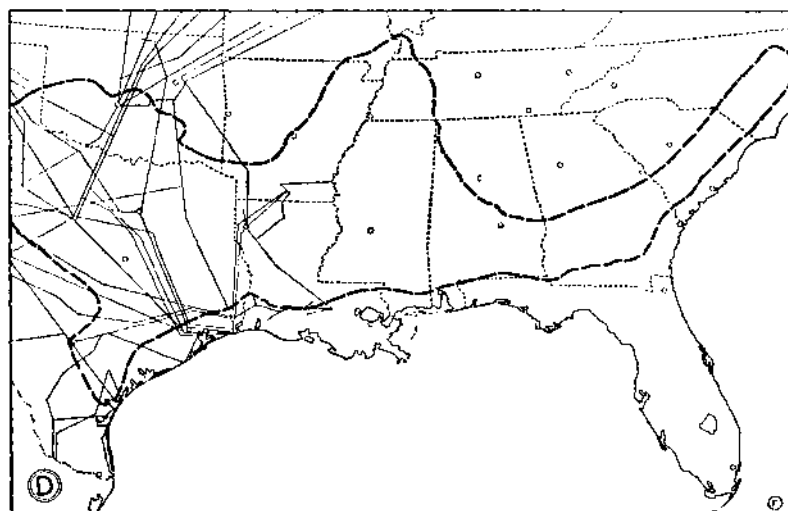
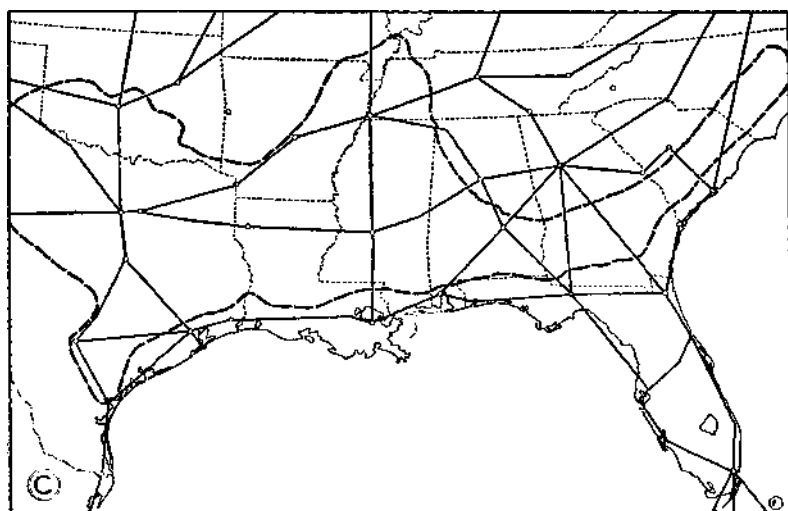


Fig. 93. The Cotton Belt and

(A) Major railroads. (B) Principal highways.



Subtropical Gulf Coast regions.

(C) Airways. (D) Chief pipelines.

farms, not industries, and hence no urban concentrations developed. As late as 1870, there were no cities in the Cotton Belt with a population of more than 100,000. Urban growth is a product of the new industrial and commercial development of the twentieth century. In 1940 there were seven cities of over 100,000 population, and numerous smaller ones ranging between 25,000 and 100,000. In the group of urban centers briefly described below, all cities of over 100,000 population and a few under that figure are considered if they serve an important district or trade territory. The specific location of these places is shown in Figure 78.

Montgomery (93,697) is located on a high bluff overlooking the Alabama River—the site of a former Indian village. It is the capital of Alabama and, for a time during the Civil War, was the capital of the Confederacy. Lying adjacent to the richest cotton area of the ante-bellum South (the Black Belt), the city has been an important agricultural center for more than a century. Although even today it holds to many ante-bellum traditions, the city is a modern agricultural center, well served by numerous railroads and highways. Cheap electric power from the Alabama Power Company (TVA), and nearness to the coal fields of the Birmingham district, make Montgomery a favorable locality for new industries, which consist mainly of those making lumber, textiles, and cotton-oil products. Packing plants, dairies, syrup, and pickle factories also are important.

Jackson (88,003), lying almost in the center of the State of Mississippi, has been an important focal point for railroads since the 1850's. Despite the fact that it had become the state capital in 1821, the city had only a little more than 3,000 people at the outbreak of the Civil War. During the war years, the town was burned three times, the last time (July 16, 1863) so completely that for some years thereafter it was called "Chimneyville." The city recovered slowly but by 1900 had less than 8,000 inhabitants. Rapid growth has come within the last 20 years, the city having trebled its population in that time. This is partly due to the South's recent agricultural and industrial growth and partly to the discovery of natural gas and oil. It is now a city of diversified industry, but one that still retains its ante-bellum charm.

Memphis (332,477), on a high bluff overlooking the Mississippi River, is strategically located as a river port. It dominates the fertile Yazoo Valley of Mississippi and southern Tennessee, and the important bottom lands of eastern Arkansas and southeast Missouri. Memphis has grown rapidly in recent years and is becoming one of the South's leading industrial and commercial cities,

With hardwood lumbering centered in the Mississippi Bottoms, the city soon became the nation's leading hardwood center. It also ranks high in the production of cottonseed products. Memphis is a major cotton market and the most important river port between St. Louis and New Orleans. It is also a focal point for railroads and highways, because for many years it possessed the last and southernmost bridge across the Mississippi. In recent years bridges have been completed at Greenville, Vicksburg, Natchez, Baton Rouge, and New Orleans, but none of these is likely to divert trade from the large Memphis market. Memphis is more important than Little Rock for the major agricultural area of Arkansas.

Little Rock (126,724), on the Arkansas River near the eastern edge of the Ozark-Ouachita Region, serves as a major trade center for that region as well as for the cotton and rice lands of eastern Arkansas. Here railroads extending westward from Memphis crossed those being constructed around the east side of the Ozarks, making Little Rock an important railroad center (Fig. 73-A). Little Rock has cottonseed-oil mills and woodworking plants. It is also the capital of Arkansas.

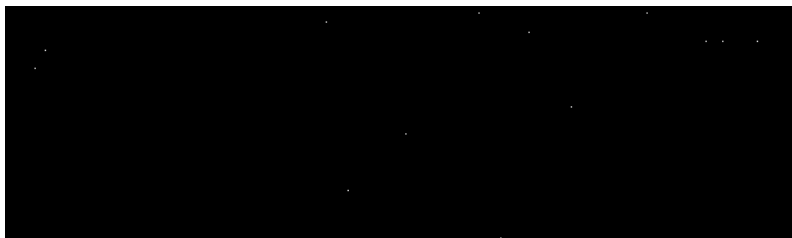
Monroe (28,309), an important cotton-shipping port on the Ouachita River during steamboat days, again became a center of some significance when the hardwood lumber industry developed in the Mississippi Bottoms. The discovery in 1916 of the world's largest natural gas field near by provided the city with a superabundance of fuel which could be sent by pipeline to distant cities. This supply of cheap fuel has attracted numerous heavy industries with large fuel requirements. Monroe manufactures large quantities of kraft paper and carbon black, the latter being made from natural gas. It promises to become one of the South's leading industrial centers.

Shreveport (112,225), the second largest city in Louisiana and the oil capital of the northwestern part of the state, developed during steamboat days as a port on the Red River. Later it became important for lumber, and more recently for petroleum. The numerous north Louisiana oil and gas fields including Rodessa, which lies in three states, are tributary to the city. In fact one field lies within its corporate limits. Shreveport manufactures oil-well machinery, glass and lumber products, and serves as a chief market center for a large agricultural area in northwest Louisiana and east Texas. Barksdale Field, one of the nation's largest army air fields, is located on the level Red River bottom lands near the city.

Dallas (376,548), the largest city in the Cotton Belt, dominates the northern part of the Black Prairie of Texas. Its early growth

came after that fertile agricultural area was developed, and for a long time its chief function was that of an important inland cotton market. As the first railway cross-road in north Texas, it soon surpassed rival towns. Early industries, however, were confined to the processing of agricultural products. By the close of the century Dallas was the center of the chief agricultural area of the State as well as of its most populous section.

Its leading activity today is that of a distributing center, most nationally advertised products having their state or southwestern



Dallas Chamber of Commerce.

Fig. 94. The skyline at Dallas, Texas. Note the whiteness of buildings resulting from the use of natural gas instead of soft coal as a fuel.

headquarters in that city. Its financial leadership was strengthened materially when it was selected as one of the 12 centers in the United States for a Federal Reserve Bank. Highways followed railroads, making Dallas a focal point of transportation routes, increasing its trade territory and contributing to its dominance as the wholesale and retail center of the State. It also became one of the style centers of the nation² The city's growth was stimulated again by the oil industry, many companies establishing headquarters there. Industrially, Dallas produces large quantities of farm implements, cotton-ginning machinery, and oil-field equipment. It has cottonseed-oil, textile, and flour mills as well as oil refineries and cement plants. Recently a large airplane factory began operations on the western edge of the city. Dallas, along

²⁴ *Fortune*, November 1937, Vol. 16, No. 5, p. 113.

with other southwestern cities, burns gas as a fuel and hence is one of the cleanest cities of the nation (Fig. 94).

Fort Worth (207,677), located just 32 miles west of Dallas on the Grand Prairie, has apparently all the advantages of location enjoyed by Dallas, and yet it is considerably smaller. Although it lies in the Cotton Belt, Fort Worth's chief interests have been and still are in the range country to the west. Large stockyards and packing plants were established after railroads connected Fort Worth with ranching areas to the west and northwest, and it then became the packing center of the Southwest. With the discovery of oil in central west Texas, Fort Worth became an important refining center. Other industries include cottonseed-oil mills, flour mills, and cement plants. A large airplane-manufacturing company has located in Fort Worth.

Students of economic geography frequently wonder why two large cities whose centers are only 32 miles apart have grown up on the Texas prairie. Their functions are quite different, Dallas, a distributing center, reflects the industry and business of the North and East, while Fort Worth, a market center, reveals its contact with western ranching. Each therefore should continue to profit from the growth of the Southwest.

Waco (71,114) lies approximately in the center of the Black Prairie of Texas. As an inland cotton market it has been of major importance in serving a fertile farming section including the Brazos River bottoms and the central part of the Black Prairie. Its industries, such as cottonseed-oil mills, gins, and compresses, cotton-textile mills, and milk-products factories, reflect the agricultural importance of its trade territory.

Austin (106,193), near the southwestern border of the Cotton Belt Region does some business in marketing and processing agricultural products. Its chief importance, however, lies in the fact that it is the capital of Texas and the home of the state university, which has an enrollment of more than 10,000 students. Both Waco and Austin suffer from a location between Dallas and Fort Worth on the north, and San Antonio and Houston on the south.

San Antonio (319,010), the oldest city in Texas, was an important Spanish frontier settlement in the early part of the eighteenth century when all the Southwest was a part of Spain. The historical background and high percentage of Mexican population tend to give it the Latin American culture and charm to be found in few cities north of the Rio Grande. This together with the Alamo, historic missions, and mild winter climate make San Antonio a popular resort. Although located within the boundary of the

Cotton Belt, it reflects largely the activities of the range country of southwest Texas, being one of the major wool and cattle centers. Because of nearness to the international border, the United States Army maintains a large military post at Fort Sam Houston in the city. Randolph Field, the "West Point of the Air," is also located in San Antonio, this field training a major part of the Army's cadet flyers.

The Outlook

Although the Cotton Belt continues to be primarily agricultural, manufacturing is becoming increasingly important. In the southwestern part the oil and gas industry has flourished for the four decades of the twentieth century and brought great wealth, much of which has been reinvested locally. The Cotton Belt has become the nation's chief oil producer.

While the Civil War had hurt cotton production, and the invasion of the boll weevil had done untold damage, foreign competition and the decline of foreign markets presented the South with its most serious problem—one it has not yet solved. Diversification of agriculture is increasing but it is questionable whether these new crops can replace cotton in Southern farm economy. However, mineral resources, cheap fuel, and an increase in manufacturing give this region, particularly the Southwest, a bright industrial future.

CHAPTER XI

The Subtropical Atlantic-Gulf Coast

A REGION OF RICE, SUGAR CANE, CITRUS FRUITS,
EARLY VEGETABLES, FISHING, FOREST PRODUCTS,
MINERALS, RESORTS, MANUFACTURING, AND
COMMERCE

THIS REGION, which is characterized by the production of early vegetables and by citrus fruits and other subtropical crops, extends from the Atlantic Coast of the Carolinas, Georgia, and Florida to the Mexican border in the Lower Rio Grande Valley (Fig. 95). Although it includes the southern part of the Atlantic Coast, it is largely dominated by the Gulf of Mexico. Most of the region is bounded on the north by the Cotton Belt (Chapter X). Some cotton is grown in this region, but it is not a major crop. On the southwest the region borders the southern Great Plains, the boundary being drawn where ranching dominates. The Atlantic and the Gulf of Mexico determine the eastern and southern boundaries. The region may be subdivided into (1) The Florida Peninsula and

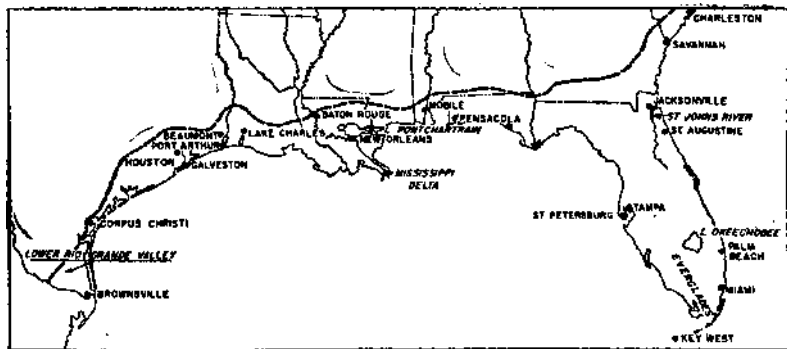


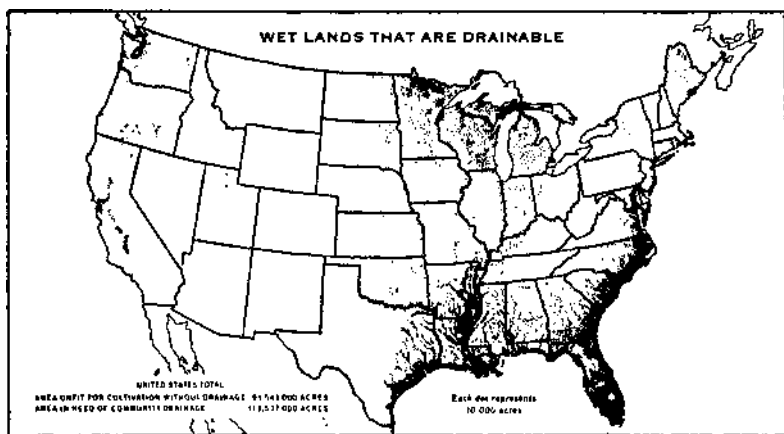
Fig. 95. Subtropical Atlantic-Gulf Coast: a region of rice, sugar cane, citrus fruits, early vegetables, fishing, forest products, minerals, resorts, manufacturing, and commerce.

the South Atlantic Coast, (2) the East Gulf Coast, (3) the Mississippi Delta, (4) the West Gulf Coast, and (5) the Lower Rio Grande Valley. The last is included because it produces early vegetables and subtropical fruits, even though they are grown under irrigation.

The Physical Setting

Relief of the land

Since this region represents the outer portion of the South Atlantic and Gulf Coastal Plains, its physiography is similar to that of the Cotton Belt, except that its terrain is definitely flatter. No part



U. S. Dept. of Agriculture.

Fig. 96. Wet lands in need of drainage. Note the preponderance of wet lands in the South.¹⁴⁴

of the region lies more than 500 feet above sea level; some large areas are only a few feet above the ocean. Interior swamps or coastal marshes and lagoons occupy a considerable part of the region, giving it the largest percentage of land needing drainage within the United States (Fig. 96). The entire coast line, except for the Mississippi Delta, is bordered by barrier beaches. North-central Florida, a gently rolling area with underground drainage, rises to about 100 feet above sea level. Elsewhere, except on the Mississippi Delta, the land gradually increases in elevation and relief toward the interior.

Climate

The Humid Subtropical Climate of the region is characterized by a long growing season (from 260 days on the north to the almost

frostless areas of southern Florida and the Lower Rio Grande Valley), and a heavy rainfall. The total precipitation decreases from more than sixty inches in southern Florida and along the east Gulf Coast to less than thirty inches in the southwest (Fig. 97) where the high rate of evaporation makes irrigation necessary for crop production. The rainfall is evenly distributed throughout the year, but the maximum comes during the summer and early autumn—the hurricane season, which usually brings excessive rainfall and causes considerable crop damage. The torrential rains

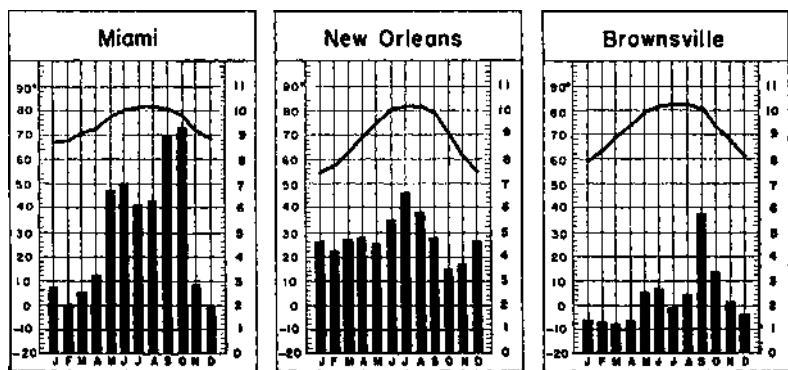


Fig. 97. Average monthly temperature and precipitation for Miami, New Orleans, and Brownsville.

(most stations in this region have experienced more than 10 inches of rain in a 24-hour period) coupled with winds of high velocity have wrought great destruction to many communities at some time or other. Despite their destructiveness, hurricanes rarely strike twice in the same place. Weather forecasting is now so efficient that people can learn of coming storms in ample time to protect themselves and, to some extent, their property. From the psychological standpoint mild, sunny winters largely offset the hurricane menace and thus enable this region to capitalize on climate in its agriculture and resort business.

Soils and vegetation

The Subtropical Gulf Coast is characterized by infertile, sandy soils which predominate everywhere except in the muck lands of the Florida Everglades and other marshy areas, the rolling lands of the Florida lakes area, the Mississippi Delta, and the Rio Grande Delta.

Because of heavier rainfall, the eastern part of the region is

covered largely with forests, mainly slash or longleaf pine, the main exception being the grasslands of the Florida Everglades. West of the Mississippi Delta, coastal marshes appear; the inland areas there, however, are dominated by pine forests. The Texas coast, from about Galveston Bay westward, is a prairie that has long been important in the rearing of cattle.

Sequent Occupance in the Region

The Subtropical Atlantic-Gulf Coast was one of the first regions explored and settled by Europeans. (The oldest city of the United States, St. Augustine, was founded by the Spaniards in 1565.) However, except for a few favored localities such as Mobile and New Orleans, it progressed little until modern times. In fact, this region represents one of the nation's last frontiers.

In colonial times, the entire region belonged to either Spain or France, neither of them good colonizing nations. Florida and West Florida belonged to Spain, Louisiana to France (although for a period it was Spanish territory) and the Texas coast to Spain and later to Mexico. Except for a few settlements such as St. Augustine, Pensacola, and Mobile, the eastern part of this region remained largely unoccupied by white men until acquired by the United States. Furthermore, in spite of its several major ocean ports today, few if any good natural harbors existed. Agriculturally the Cotton Belt to the north was far superior. Since cotton could not be grown successfully, the coastal areas were not desired by colonists.

Because of their commercial significance, New Orleans and the Mississippi Delta became important at an early date. French colonists, supplemented later by Acadians, began the cultivation of sugar cane during the eighteenth century. The Texas Gulf Coast remained largely unoccupied, except on the southwest coastal plain where a few Spaniards had established large "ranchos."

The Anglo-Saxon trek to Texas came almost entirely by land, colonization being confined to the inner margin of this region. After the establishment of the Republic of Texas in 1836 many Mexican (formerly Spanish) settlers abandoned their holdings on the Texas coast and allowed their cattle to run wild. Then followed a long period in which Spanish cattle (longhorns) multiplied rapidly. Before the Civil War, people in this remote coastal area hunted these wild cattle, taking only the hides and allowing the carcasses to become carrion. Later there grew up along the Texas coast some 32 cattle ports that shipped animals "on the hoof" to New Orleans, Havana, and New York.

With the opening of the Great Plains following the Civil War and the westward building of railroads, the Texas coast became the chief source of cattle for new ranching areas, inaugurating the great cattle drives. Between 1866 and 1880, records show that 4,223,497 cattle were driven northward from Texas.¹

When the western ranges proved to be superior for cattle, ranching decreased in importance along the Gulf Coast. The introduction of the hardier Brahman cattle, however, has revived interest in ranching. From Florida to Texas large numbers of cattle now graze on the grasslands scattered throughout the timbered areas and on the coastal prairies.

The major development in the Subtropical Gulf Coast came, however, after the beginning of the twentieth century as a result of the extension of railroads, improvements of coastal ports, discovery of oil, and increased demand for early vegetables and subtropical fruits. Cheap water transportation and the abundance of petroleum and natural gas have recently given rise to an industrial development that bids fair to increase in the near future.

Agriculture

Cotton

Some cotton is grown in the Atlantic-Gulf Coastal Region (Fig. 80-F), but it is nowhere of major importance. Heavy autumn rains make the crop highly speculative, for an entire year's work may be destroyed in a single rain storm.

Since cotton cannot be important, two staple crops—sugar cane and rice—replace it in the Louisiana and Texas portions of this section and to a minor extent elsewhere.

Sugar cane

Sugar-cane growing in the delta country of Louisiana began in 1751 when Jesuits introduced the crop from Santo Domingo. The first successful sugar mill, built on a plantation near New Orleans in 1795, inaugurated the industry in that area.

When the Acadians came to Louisiana in 1757, they took up the raising of sugar cane and spread its production westward. After the decline of indigo in the Carolinas and Louisiana, cane became the leading crop, though little was grown outside the delta for more than 100 years. Toward the close of the nineteenth century produc-

¹ Clarence Gordon, "Report on Cattle, Sheep, and Swine," *Tenth Census of the United States, 1880*, Vol. 3, p. 975.

tion spread into the Texas coastal prairies and on into the Lower Rio Grande Valley. Cane cultivation ceased in the Lower Rio Grande Valley during the first World War, partly because of remoteness from markets and partly because fruits and vegetables became more profitable. In the Sugarland area near Houston, cane remained important until about 1923, when production was discontinued because the large refinery there found it cheaper to import Cuban raw sugars.

In recent years, there has been a considerable development of sugar cane in the Florida Everglades. In 1931 the United States Sugar Corporation acquired and expanded the properties of a small producer near Lake Okeechobee, constructing its large mill at Clewiston. The Florida Everglades area with a longer growing season than that of the Louisiana district can more effectively rival Cuba as a sugar producer than can any other part of the United States. In the Everglades it is unnecessary to replant each year as must be done in Louisiana, where killing frosts occur almost every winter. In Cuba and other tropical cane-producing regions, from 10 to 12 crops may be cut from a single planting; in the Everglades, from six to seven crops may be secured; while in Louisiana the crop must be replanted each year. This, it seems, might enable the Everglades to become the nation's largest domestic producer, but by an Act of Congress (1937) it is actually restricted to .92 per cent of consumption. By this act, Louisiana is allowed 5.35 per cent and the beet sugar areas 23.19 per cent. The balance of 70.54 per cent is allotted to Cuba and the territorial possessions of the United States.² In 1939, Louisiana produced 5,453,000 tons of cane sugar on 256,000 acres, and Florida, produced 744,000 tons on 20,900 acres.³

In recent years there has been a tendency toward consolidation of many small mills into larger mill-plantation units, which have proved to be economical, since most of the small mills were obsolete. A typical example of this is the Sterling Sugar refinery at Franklin, Louisiana, which by purchase secured control of five large plantations in the Bayou Teche country. In this way it could control production and reduce managerial costs. All sugar is transported to the central mill (also the refinery), which further reduces costs.⁴ This type of consolidation has made it possible for many small,

² "Sugar—A Great Florida Product," *Florida Public Works*, May 1939, pp. 1-8.

³ *Agricultural Statistics*, 1940, p. 152. "Washington, D. C.: Government Printing Office, 1940.

⁴ Edwin J. Foscue and Elizabeth Troth, "Sugar Plantations of the Irish Bend District, Louisiana," *Economic Geography*, October 1936, Vol. X I I, No. 4, p. 376.

run-down sugar plantations in the Louisiana delta country to operate today at a profit. The day of the small cane-sugar producer in the United States is definitely at an end; only large well-organized companies can hope to compete with the foreign cane and domestic beet sugar production.

The refining of sugar yields several useful by-products, including molasses and celotex. Molasses is one of the basic sources of in-

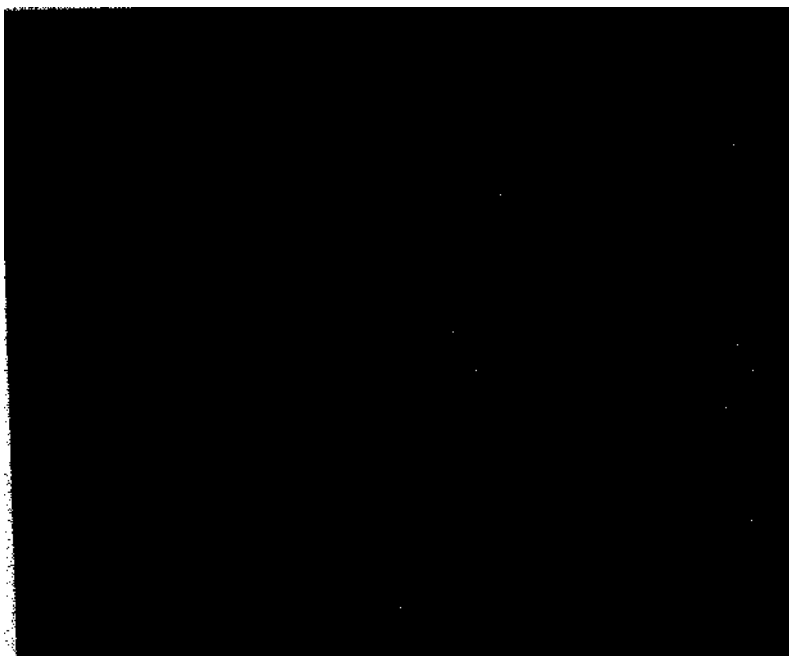


Fig. 98 Sugar cane refuse converted into bagasse from which wall board and insulating material are manufactured. (Reproduced from "Manufacturers Record," South's Resources Issue, September 1940, by permission of the publisher.)

dustrial alcohol. It is also mixed with feedstuffs as a fattener for livestock. Celotex, a construction material made from bagasse (Fig. 98) or waste sugar cane stalks after the juice has been extracted, has proved highly satisfactory in insulating refrigerator cars and cold storage vaults, and as a sound absorber for deadening noises in radio broadcasting rooms, auditoriums, and hospitals. The celotex industry in Louisiana today yields as much if not more profit than sugar. Bagasse also has been used with some success in the manufacture of paper and plastics.

Rice

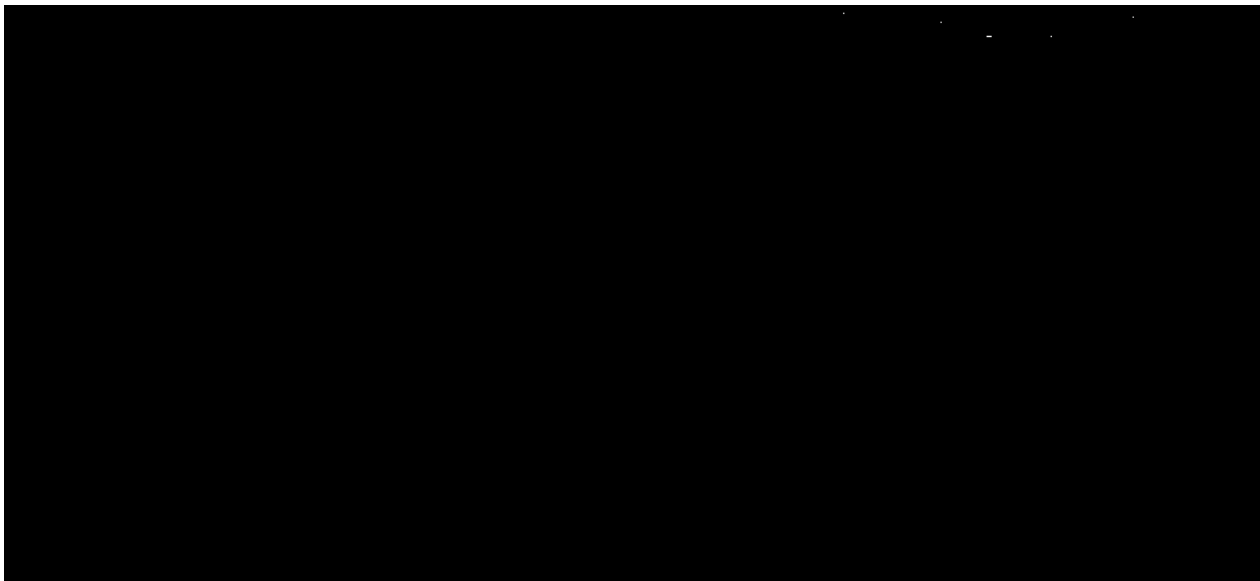
In colonial times the coastal areas of South Carolina and Georgia produced large quantities of rice. Later, rice was replaced by Sea-Island cotton. Although grown in Louisiana for more than a century, rice did not become an important commercial crop until after 1880, when the introduction of harvesting machinery permitted large-scale farming on the prairies of southwestern Louisiana and southeastern Texas. The Mississippi bottoms in Arkansas and the Sacramento Valley of California also produce considerable rice.

When the Acadians spread westward along the coast of Louisiana, they occupied first the higher, lighter, and more easily drained lands along the streams, leaving unoccupied the heavier prairie soils of the interfluves. These prairie areas, whose surface was underlain by an impervious claypan were covered by thousands of shallow ponds that held water after each rain.⁵ When these were drained by ditching, they made ideal areas for the cultivation of rice. The flat relief permits subdivision of the fields by small levees (Fig. 99), a necessity since the field must be covered with about six inches of water during much of the growing period. Heavy rainfall supplemented by artesian wells and surface streams provide ample water. With proper drainage the water can be taken from the fields when mechanical equipment is ready to harvest the crop, or when heavy rains flood the area.

The potentialities of southwestern Louisiana's prairies were recognized by Colonel Samuel H. Lockett in an unpublished survey of the state in 1873. He said that ". . . the Sea Marshes could be used for raising rice and the Bluff Lands for grapes and that the Prairies could support countless droves of cattle and horses of improved stock."⁶ His prediction was not far from correct. Rice and cattle dominate a major part of the lands of the coastal prairie today. When railroads were built across the prairies in the 1880's, they immediately began advertising the value of the land for growing rice. Many of those who came were Middle Western grain farmers. High-powered advertising resulted in rapid settlement by farmers accustomed to using farm machinery. Harvesters, similar to those used in the wheat regions, were employed with great success. First they were drawn by draft animals, later by tractors.

⁵ Lauren C. Post, "The Rice Country of Southwestern Louisiana," *Geographical Review*, October 1940, Vol. XXX, No. III, pp. 574-575.

⁶ *Ibid.*, p. 580.



American Geographical Society.

Fig. 99. A levee in a rice field on the Louisiana Gulf Coast.

The rice is harvested in late summer or early autumn, left in shocks for about two weeks to dry, and then threshed.

Mills, largely concentrated in Crowley and Lake Charles, Louisiana, and in Beaumont, Texas, are equipped with complicated machinery for cleaning and polishing the rice and for utilizing its by-products. Favorable geographic conditions and complete mechanization enable this region to grow rice at a low per "afte cost. Nevertheless, North America produces only a fraction of the world's rice crop.

Truck farming

With increasing demands for fresh vegetables, due largely to widening knowledge of the food value of vitamins and to improvements in transportation and refrigeration, the Subtropical Gulf Coast has become one of the two major early truck-farming regions of the continent. Aside from sections of southern California and the gardens under glass in the North, most of the nation's winter vegetables grown for sale come from this region, Florida alone supplying about one fourth. Other vegetable-producing areas are found along the east Gulf Coast and the southwest Gulf Coast, particularly the Lower Rio Grande Valley of Texas. Climate is the dominant factor affecting the growth of early vegetables, and soils help to determine the specific locations. In Florida, the best truck crops are produced on muck or other lands having a higher organic content than the sandy soils which characterize much of the state.⁷ Vegetable growing in the Lower Rio Grande Valley is confined largely to the alluvial lands of the delta.

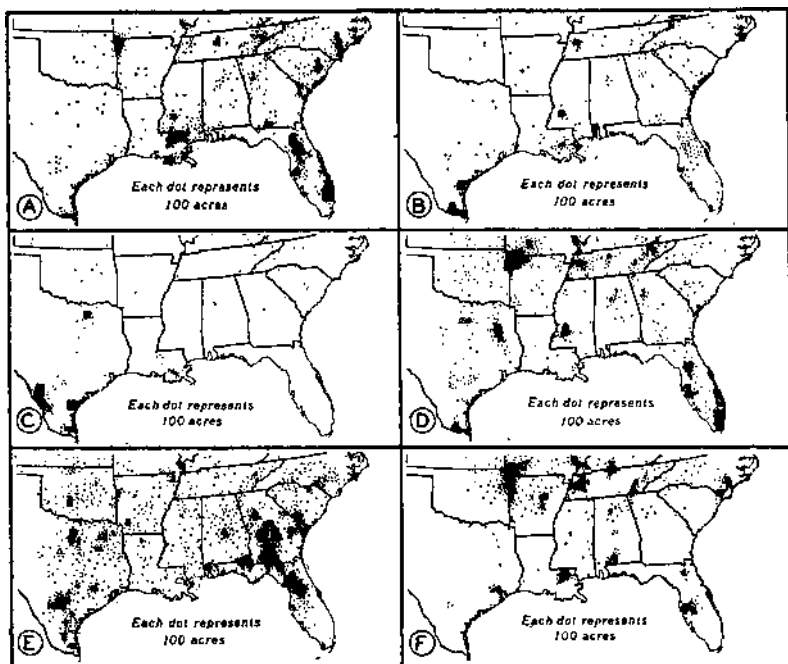
Climatically, most of the region is suited to the production of early vegetables. In the southern parts of Florida and Texas, some winters have no killing frosts. However, even here an occasional norther may sweep down from the interior and kill the more sensitive vegetable crops. Production is limited by economic rather than geographic conditions. Winter markets can consume only a limited amount of truck crops. Therefore, the growing of winter vegetables, even in the most favored places, is highly speculative, although sometimes highly remunerative.

Green beans are grown extensively throughout the Florida Peninsula, as well as in Mississippi, southern Louisiana, and Texas (Fig. 100-A). In Florida, which produces the bulk of the nation's

⁷ John L. Warm, "Where Florida Truck Crops Are Grown," *Economic Geography*, January 1933, Vol. IX, No. I, p. 85.

early crop, the upland area of the north, and the southeast coast predominate.

Cabbage. Early cabbage comes largely from the Lower Rio Grande Valley and the Corpus Christi area of Texas, although southern Louisiana, Mississippi, and Alabama are also producers



U. S. Dept. of Agriculture.

Fig. 100. Production maps of (A) green beans, (B) cabbage, (C) onions, (D) tomatoes, (E) watermelons, and (F) strawberries, showing importance of the Subtropical Atlantic-Gulf Coast Region.

(Fig. 100-B). While the crop is grown in many parts of Florida, it is of minor importance only.

Onions. Commercial production of early onions, particularly the Bermuda variety, is confined to the Lower Rio Grande Valley and the Corpus Christi area (Fig. 100-C). The Laredo area of Texas which lies outside this region is a large producer also.

Tomatoes. Most of the commercial crop of early tomatoes is grown in Florida and the Lower Rio Grande Valley (Fig. 100-D), which together with southern California produce the entire early crop.

Watermelons, especially important in Florida (Fig. 100-E), are shipped from early in April until the middle of July. Although not a winter crop, they add largely to Florida's total truck production.

Strawberries. The centers of early strawberry production are the Tampa district of Florida, southern Alabama, southeastern Louisiana, and the Houston district of Texas (Fig. 100-F). Louisiana, the leading producer, also has an important berry-canning industry.

Other early truck crops and their major producing areas are: (1) *Celery*—the Plant City and Sanford districts of Florida. (2) *early white potatoes*—the Hastings area of Florida, and to a less extent the Lower Rio Grande Valley, (3) *beets and carrots*—the Lower Rio Grande Valley (Fig. 101), (4) *peppers*—the New Iberia district of southern Louisiana, and (5) *cucumbers*—north Florida. *Lettuce, escarole, eggplant, romaine, squash, okra, Brussels sprouts, mustard, spinach, parsley, cauliflower, broccoli, and green corn*, are produced locally throughout the region.

The Subtropical Atlantic-Gulf Coast is also an important producer of figs, particularly in that section of Texas between Houston and Beaumont, which with California produces most of the nation's crop.

Transportation and marketing

Marketing the winter truck crops in this region is a serious problem. Recent improvements in highways and railroads have made possible the shipment of much of the early crop to the northern markets in time to command a high price. Cooperative marketing associations have helped, but as yet the region is not so well organized in this respect as is California. Vegetable canning has aided in utilizing much of the surplus that cannot be marketed fresh, and the recently developed quick-freezing process bids fair to further the sale of much of the surplus crop.

Citrus fruits

Citrus fruit trees cannot endure below-freezing temperatures for even a few hours at a time without serious damage, and hence are grown only in those parts of the United States where killing freezes seldom occur. The major citrus-producing areas of the nation are in southern California, Arizona, the Rio Grande Valley of Texas, the Mississippi Delta of Louisiana, southern Alabama, and nearly all of peninsular Florida.

Oranges, most resistant of the citrus family to cold, are found in all the areas listed above. *Grapefruit*, next in resistance to cold

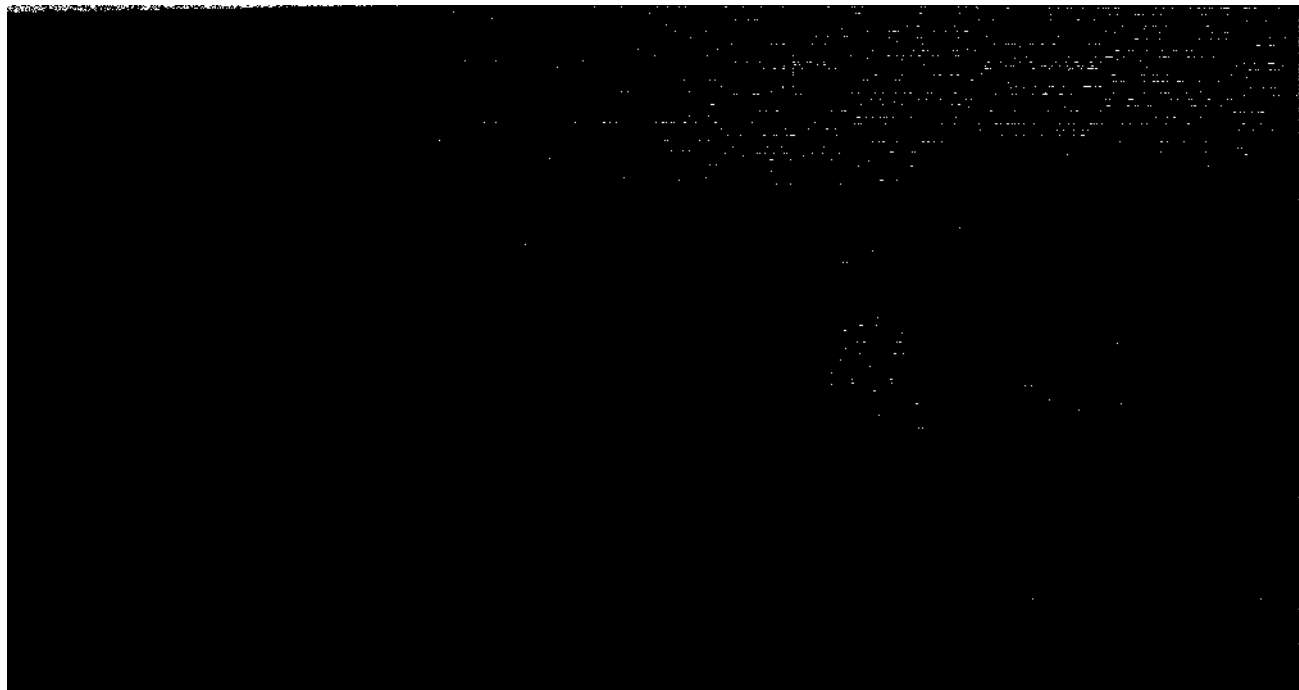


Photo by Edrington, Weslaco.

Fig. 101. Mexicans harvesting carrots in the Lower Rio Grande Valley of Texas. Approximately 20,000 car loads of vegetables are shipped annually to northern markets from this area.

are grown commercially only in Florida and the Lower Rio Grande Valley. *Lemons*, having still less resistance to freezing temperatures, are not produced commercially in this region. *Limes*, the most sensitive of the citrus fruits, cannot withstand frost and hence are grown commercially in the United States only on the frost-free off-shore Florida Keys. Table III gives the production of the leading citrus-growing states for the 4 types of fruit.⁸

TABLE III
PRODUCTION OF CITRUS FRUITS BY STATES, 1939
(Thousands of Boxes)

State	Oranges	Grapefruit	Lemons	Limes
Florida	27,800	15,800	...	95
Alabama	.75			
Mississippi	.59			
Louisiana	.228			
Texas	2,360	13,900		
Arizona	520	2,900		
California	44,820	1,975	12,000	

Great expense and labor are at times required to protect citrus groves from frosts. Even the southern parts of Texas and Florida have destructive freezes. Some years ago extensive groves of the Satsuma orange were planted on the Texas coastal plain near Houston but a severe freeze killed so many of the trees that they never were replaced.

Florida's citrus groves lie on both the Atlantic and Gulf coastal plains, but are most important in the north-central lakes district. Southern Florida is a safer locality since frosts there are less common, but there is relatively little suitable land. The slightly rolling terrain of the lakes district provides some protection from frosts because (1) orchards planted on slopes benefit from air drainage, and (2) the many lakes ameliorate severe winter temperatures. The high humidity stimulates growth of juicy fruits which have little objectionable pulp.

The Texas citrus region is located on the terraces of the Lower Rio Grande Delta in about the same latitude as southern Florida. In contrast, however, practically all production is based upon irrigation, the waters being diverted from the Rio Grande. This area specializes in grapefruit, and in recent years has almost equaled Florida in production.

⁸ *Agricultural Statistics, 1940*, p. 210. Note: citrus-producing areas of all states listed, except Arizona and California, lie within the Atlantic-Gulf Coast Region.

On the rest of the Gulf Coast, between the Lower Rio Grande and Florida, citrus culture is of minor significance, except in southern Alabama and Mississippi and the Louisiana Delta. This last district, relatively free from frost hazards, produces high-quality oranges, but limited area prohibits large-scale production.

Although the citrus crop is confined to a few small areas, it equals in volume the nation's entire apple crop.⁹

The canning of citrus products. During recent years the canning of grapefruit and grapefruit juice has become important in both Florida and the Lower Rio Grande Valley. Numerous small canneries have sprung up in many of the towns in the citrus-producing areas, and the industry continues to grow. Hence the surplus citrus crop can now be preserved to a great extent and be marketed at off seasons and in more distant places. The juice of the grapefruit seems to meet wide market demands, as is shown by the fact that several well-known brands from the Lower Rio Grande Valley may be found on grocers' shelves in most parts of the United States. As yet the canning of oranges and orange juice has not been so successful but when its quality is improved the industry probably will expand.

The tung-oil industry

The first tung trees were planted in a cemetery in northern Florida in 1906.¹⁰ From this inconspicuous beginning the industry has spread westward through the Gulf Coastal Region to eastern Texas. Formerly, the only source of tung oil was China. Production is confined to an area within 100 miles of the Gulf, because the tree cannot stand temperatures below 20°F. for any protracted period. It also requires an annual rainfall of at least 30 inches. These requirements are easily met by those portions of the Gulf Coast Region lying immediately north of the citrus areas, and hence the two enterprises do not compete for land.

The tung tree produces large nuts, from which a drying oil can be extracted. It is a competitor of linseed oil for use in paints and varnishes. After the nuts have been gathered the seeds are extracted, ground, and pressed to release the oil. Mills have been built in a number of places from Gainesville, Florida, to Bogalusa, Louisiana, and new ones are being added. Yields are high, some

⁹ O. E. Baker and A. B. Genung, "A Graphic Summary of Farm Crops," *United States Department of Agriculture Miscellaneous Publication No. 267*, p. 118. Washington, D. C.: Government Printing Office, 1938.

¹⁰ M. Ogden Phillips, "Tung Oil: Florida's Infant Industry," *Economic Geography*, October 1929, Vol. V, No. 4, p. 351.

individual trees producing as many as 4 gallons (32 pounds) of oil per year.¹¹

Tung acreage increased from 140 acres in 1923 to 160,000 acres in 1938. A large part of this increase resulted from heavy plantings in the Lake Pontchartrain area of Louisiana, where several new mills were constructed.¹² Expansion has occurred elsewhere throughout the region with consequent danger of overproduction. However, this new agricultural industry is freeing North America from de-



Courtesy Hudgins Ranch, Hungerford, Texas, and the Beaumont Chamber of Commerce.

Fig. 102. Herd of Brahman bulls on the coastal prairie of Texas.

pendence upon a foreign country for a vital product, and hence its rapid development may be justified on that basis.

The livestock industry

The Gulf Coast Region has been important in the rearing of beef cattle since French and Spanish Colonial times. After the Great Plains were opened to grazing in the 1870's, the poorer pastures of the Gulf Coast found difficulty in competing. For several decades cattle rearing was all but abandoned except in the Acadian French country of southwestern Louisiana, and the coastal grasslands of southwestern Texas. In recent years, through the introduction of

¹¹ *Ibid.*, p. 354.

¹² Melville H. Schmidt, "The Tung-Oil Industry in Louisiana," *Louisiana Conservation Review*, Winter, 1940-1941, p. 32.

new breeds, particularly the Brahman (Fig. 102), the cattle industry has expanded to other parts of the coastal region.

Today, large herds of beef cattle graze in the longleaf pine forests of northern Florida, on the grassy, coastal prairies of Louisiana and east Texas, and the thornbush (chaparral) section of the southwest coast of Texas. In this latter area, the King Ranch, one of the largest on the continent, contains more than 1 million acres of grazing land.¹³ In addition to rearing beef cattle for the rapidly growing urban markets of the South and Southwest, many large stock farms have been established, particularly along the southeast coast of Texas.

The Gulf Coastal region, with large areas of grassland, plentiful rainfall, and mild, open winters, should expand its cattle industry in the future, especially since crossbreeding has produced animals more nearly immune to tick fever.

Lumbering and Forest-products Industries

Originally this region, except for the prairie sections of east Texas and Louisiana, and the Florida Everglades, was forest-covered (Fig. 5). Accordingly, forest-products industries—lumbering, naval stores, pulp and paper—have been important. Since these three industries are common also to the Cotton Belt, they have been discussed in the preceding chapter.

An additional word seems desirable, however, in connection with the pulp and paper industry, since some of the larger mills are located on tidewater within the boundary of this region (Fig. 89). One of the most complete paper mills in the entire South is that of the Champion Paper and Fibre Company located on the Houston Ship Channel at Pasadena, Texas. Representing an initial investment of \$10,000,000, the plant has recently been enlarged to make the glazed paper for *Life* and *Time* magazines. This paper is made from pine pulp, which originally produced only kraft papers.

Mineral Industries

Phosphate rock

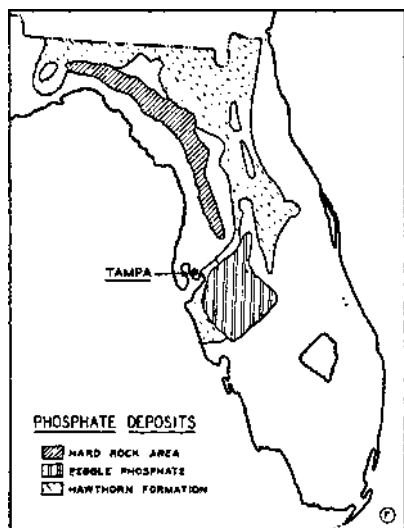
Florida is the continent's most important producer of phosphate rock, accounting for approximately 80 per cent of the total. Most of the remainder comes from Tennessee. Two types of deposits are worked in Florida: (1) the hard rock phosphate of the north-south belt about 100 miles wide and parallel to the west coast of the

¹³ *The Texas Almanac*, 1939, p. 201.

peninsula, and (2) the land-pebble phosphate from the smaller area east of Tampa Bay (Fig. 103). The former, consisting of boulders and lumps mixed with sand and clay, contains 10 to 25 per cent phosphate, while the latter, a pebbled conglomerate, has a much higher phosphate content.¹⁴ Open pit mining is followed in both areas, after which the materials are crushed, washed, dried, and screened for shipping. Most phosphate used in the United States is converted into acid phosphate or superphosphate by treatment with sulphuric acid.

Sulphur

Coastal Louisiana and Texas produce more than 99 per cent of the continent's sulphur. The deposits are found in the cap rock overlying certain salt domes; most of the domes themselves do



After George S. Mansfield.

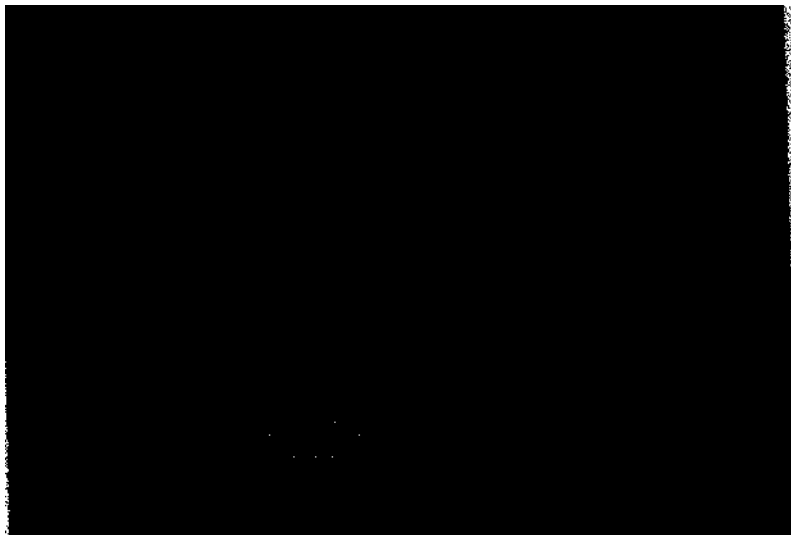
Fig. 103. Phosphate-producing areas in Florida.

not contain sulphur in paying quantities. Although sulphur (brimstone) is found at depths from 500 to 1,500 feet below ground, commercial exploitation by shaft mining proved unsuccessful, because of danger from caving-in of the overlying sands and gravels. When the Frasch process was perfected in 1903, commercial success was assured, and the Gulf Coast soon took first rank among the world's sulphur-producing regions.

The Frasch process is made possible by the fact that crystalline sulphur melts at 240°F., only slightly above the boiling point of water. Wells were drilled into the deposits on top of the salt plugs. Then by

¹⁴ H. Ries, *Economic Geology*, p. 217. New York: John Wiley & Sons, 1937.

1,200 feet long, 50 feet high, and 160 to 200 feet wide. The molten sulphur solidifies immediately upon being poured into the vat and in a short time the gigantic bin is filled. The sides of the vat are then stripped off, exposing a huge block of sulphur which can be blasted. After being shattered into fragments the sulphur, almost chemically pure, is loaded into open freight cars by steam-shovel (Fig. 104) and hauled to the shipping port to be loaded on



Texas Gulf Sulphur Co., photo by Robert Y. Richie.

Fig. 104. Large blocks of sulphur at Newgulf, Texas, after walls of vats have been removed. These blocks average 250 feet x 1,200 feet in area and are 50 feet high.

coastwise or ocean vessels for the large industrial consuming markets. Most Texas sulphur moves out through Freeport or Galveston, while the Louisiana mine has its own port at Port Sulphur on the lower Mississippi River.

At one time or another 11 domes have been worked, but in 1939, only 5 domes in Texas and one in Louisiana were in operation. These were being worked by two large and two medium-sized companies that have a monopoly on production. Practically all sulphur is first converted to sulphuric acid in which form it is used in (1) the manufacture of superphosphate fertilizer, (2) petroleum refining, and (3) making chemicals. It is also employed in the

manufacture of paints, explosives, rayon, pulp and paper, insecticides, and textiles.¹⁵

The sulphur industry of the Louisiana-Texas Gulf Coast is one of the nation's large mineral industries. Known reserves are great enough to insure production for many years.¹⁶

Salt

Rock salt is mined in several places along the Louisiana Coast, making that state one of the leading national producers. The salt, practically pure sodium chloride, is found in numerous domes throughout the west Gulf Coast. The reserves are enormous. Though only 4 domes are being mined in the region at present, they are producing great quantities of salt and none is approaching exhaustion.

The mine usually lies in the top of the salt plug, 600 feet or more below the surface. A shaft is driven down and huge chambers are dug out. By leaving in the supporting columns an amount of salt equal to that removed, no mine props are necessary. The huge chambers are frequently 65 feet in width and height.¹⁷ The rock salt is mined by electrically operated shovels. After being broken up, it is transported to the mine shaft by electric trains (Fig. 105). The walls and ceiling of the chamber are a dazzling white and remain quite dry at all times. Temperature at this depth remains constant throughout the year.

When the salt is brought to the surface by elevator, it goes through the large mill where it is ground, cleaned, and sacked for use. All grades from the most refined table salt to the coarse product used in various industrial plants are produced. While the Gulf Coast has no monopoly in salt production, it has sufficient reserves to make it an important producer for a very long time. There are many known salt domes (some of them now producing petroleum) where salt can be obtained when needed.

Petroleum and natural gas

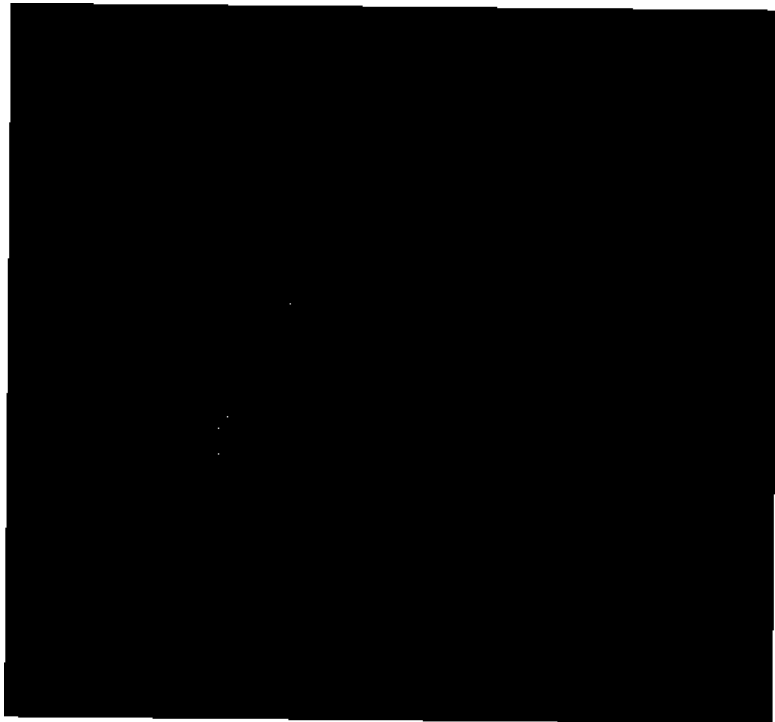
The Subtropical Gulf Coast includes the entire area known as the Gulf Coast Petroleum Province, one of the continent's major oil

¹⁵ Robert H. Ridgway and A. W. Mitchell, "Sulphur and Pyrites," *Minerals Yearbook*, 1940, p. 1289. Washington, D. C: Government Printing Office, 1941.

¹⁶ For further data on sulphur mining the student is referred to: (1) *Modern Sulphur Mining*, published by the Texas Gulf Sulphur Company, and (2) *4,000 Years of Yellow Magic*, published by the Freeport Sulphur Co.

¹⁷ S. E. Evans, "Salt—Louisiana's Buried Treasure," *Louisiana Conservation Review*, **Autumn 1938**, pp. 23-25.

producers. In 1938 it accounted for 182 million barrels out of a total of 1,214 million barrels produced in the United States, approximately 15 per cent of the total.¹⁸ The oil fields, almost exclusively of salt-dome origin, are scattered along the west Gulf Coastal Plain from the mouth of the Mississippi to the mouth of the Rio Grande.



Louisiana Tourist Bureau,

Fig. 105. Interior of the salt mine at Avery Island, Louisiana.

More than 160 salt domes have been discovered in this area most of which have produced oil. Numerous new discoveries are being made and some fields have been developed in the shallow coastal margin of the Gulf of Mexico. This province not only holds the record for the first large gusher but it also holds the record for the largest number of deep-producing wells in the United States. The Gulf Coast Province has about a dozen fields producing at depths

¹⁸ *Minerals Yearbook, 1940*, p. 953. Washington, D. C.: Government Printing Office, 1941.

of more than 10,000 feet and one well which reaches a depth of 13,266 feet.

Some features of this petroleum province¹⁹ are unique: (1) the technique and type of equipment developed in geophysical prospecting here, and (2) the concentration of large refineries along the Gulf Coast.

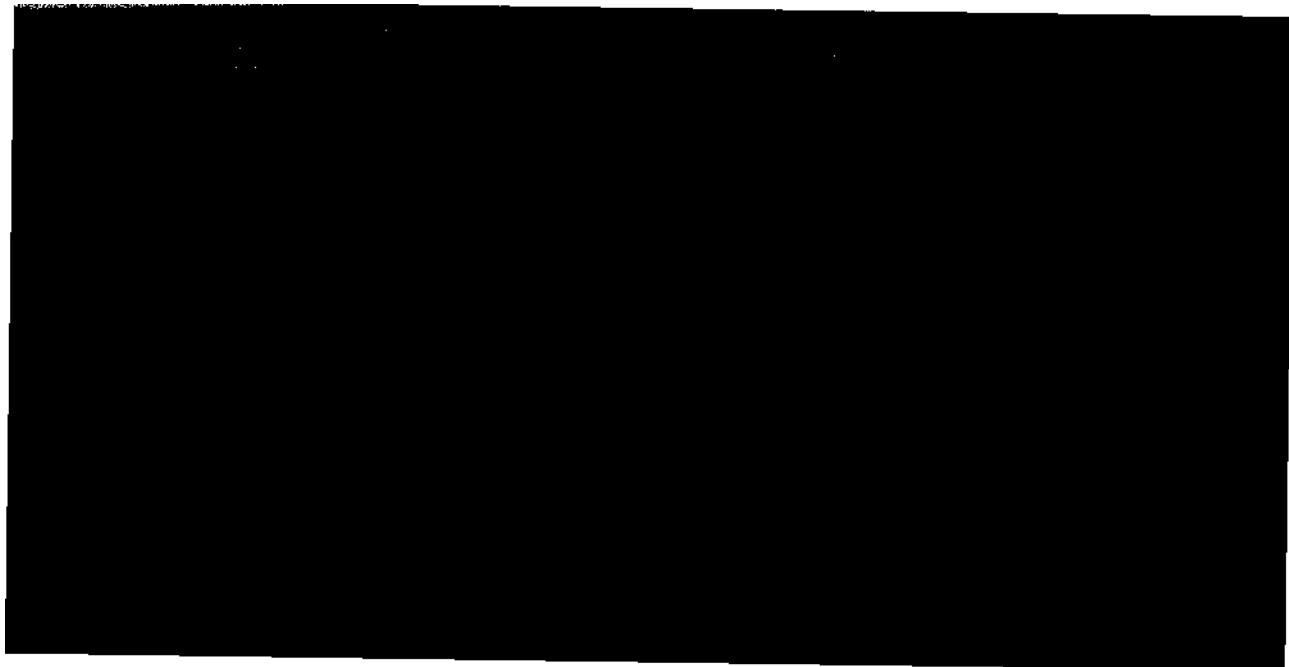
Following the discovery of the Spindletop field in 1901, many other fields in the Gulf Coast were opened. Geologists, however, found it difficult to locate possible oil structures, since no rock outcropped on the flat expanses of prairie, marsh, and forest lands. Some salt domes gave slight surface indications of their presence by forming small hills on the flat terrain and they were drilled first. Further scientific prospecting was impossible until some means could be devised for discovering deeply buried plugs (more than 5,000 feet below the surface). Between 1901 and 1922, this region became a "wildcatter's paradise" for despite the crude methods of exploration employed, 39 of the 46 salt domes discovered during that period were producers.²⁰

Between 1922 and 1924 several types of geophysical instruments were developed for detecting deeply buried plugs. The 3 chief types were (1) the magnetometer, (2) the torsion balance, and (3) the seismograph. The last, which measures the rate of movement of sound through different media below the earth's surface is the most popular of the geophysical instruments today. By its use many deeply buried salt domes have been discovered and large production secured. Although the salt dome structure of the Gulf Coast was most favorable for the development of this type of scientific instrument, geophysical prospecting has been used quite successfully elsewhere.

The geologist and later the geophysicist found great difficulty in traversing the wet coastal terrain and in transporting their heavy scientific equipment over swamps, marshes, and open lagoons. Boats were used in many places but these could not cross marshy areas. They needed a type of amphibian craft capable of navigating dry land, marsh, and water. Several designs of "marsh buggies" were perfected, but the most unique was that developed by the Gulf Refining Company which used giant rubber tires carrying air at 4 pounds pressure per square inch (Fig. 106). These tires support the vehicle and its load of 6 men and their instruments on land or in swamp, and float the machine in water. The "marsh buggy" has

¹⁹ For a detailed discussion of oil-field development, see pages 269-274.

²⁰ Virginia Bradley, "The Petroleum Industry of the Gulf Coast Salt Dome Area," *Economic Geography*, October 1939, Vol. XV, No. 4, pp. 399-400.



Gulf Research & Development Co.

Fig 106 The "Marsh Buggy," on amphibian vehicle which is used in exploration work in the marshes and intervening waters of the Gulf Coast. This vehicle is pneumatic-tired, has a four-wheel drive, and is used for transporting equipment and men in geophysical prospecting.

solved one of the most difficult problems of petroleum exploration in this region.

Since much crude oil is transported today by pipelines, the Gulf Coast port cities have become the termini of most pipelines from the Gulf Coast and Mid-Continent Oil Provinces (Fig. 93-D). These pipelines have permitted the rapid development of the refining industry along the West Gulf Coast between Baton Rouge and Corpus Christi. Enormous quantities of both crude and refined petroleum are also shipped by tanker to the North Atlantic Seaboard or to foreign countries.

Natural gas, abundant in the Gulf Coast, is usually associated with the oil fields. There is more natural gas than can be used for domestic fuel. Hence much of the surplus is available for manufacturing and has been a big factor in bringing heavy industries to the Gulf Coast.

Manufacturing

The processing of local raw materials produced on the Gulf Coast has given this region a diversified group of industries including lumber mills, turpentine mills, pulp and paper factories, agricultural-products industries, and petroleum refineries. All of these have added great wealth to the region and have contributed notably to the growth of its cities. In recent years, however, the Gulf Coast, particularly the western part, has become one of the more important areas for the manufacture of many heavy products. These include heavy chemicals, steel (based upon scrap), tin, and magnesium.

The advantages of the Gulf Coast Region for the development of these heavy industries are (1) an abundant supply of natural gas for fuel, (2) large supplies of several basic minerals including petroleum, sulphur, lime, salt, and magnesium (from sea water), and—most important of all—(3) tidewater location providing cheap ocean rates for the bulky manufactured products.

Although there are other important industries in this region only three types are considered here: (1) those that depend upon petroleum or natural gas for their basic raw materials, (2) the non-metallic chemical industries that utilize sulphur, salt, or alkali for their raw materials, and (3) certain metallic industries located strategically with respect to cheap fuel, raw materials, and ocean transportation.

Petroleum and Natural Gas Products Industries

The demand for aviation gasoline has revolutionized petroleum refining and indirectly created several new products industries. All along the west Gulf Coast leading oil companies have built subsidiary plants to process the by-products of aviation gasoline. Included are butadine plants for the manufacture of synthetic rubber, toluene plants for the manufacture of a basic ingredient for tri-nitro-toluene (TNT), and many others. Recycling plants that "strip" natural gas of gasoline, butane, and other minerals, are found in many places. Another important industrial product made from natural gas is carbon black, about 80 per cent of which is produced by Texas²¹ although not all of this comes from the coastal region. Since these by-product industries have become so important, oil and gas may ultimately have more value as raw materials than as fuels.

Non-metallic Chemical Industries

Although these are newcomers to the Gulf Coast, there is every indication that they will continue to grow in importance. The abundance of sulphur, salt and lime, the cheapness of fuel, and the advantage of cheap ocean freight rates, all conspire to attract those industries which use large amounts of fuel and pay heavy freight costs on their fabricated products. Only a few such plants have yet been built in this region but they have prospered to such an extent that others will follow.

The Southern Alkali Corporation located its plant at Corpus Christi in 1934. The first alkali plant of the "far South," it specializes in soda ash and caustic sodas used in the manufacture of other chemicals, glass, pulp and paper, soaps and enamels, as well as in petroleum refining, water softening, and textile bleaching. It represents an initial investment of 8 million dollars, and has been enlarged within the past two years to care for its increasing volume of business. It is favorably located with respect to fuel and raw materials. Lime, the major raw material, comes from shells dredged from Nueces Bay; salt (sodium chloride), another basic ingredient, is piped in solution form from a large salt dome some miles along the coast; and natural gas for fuel is secured from the company's own wells adjacent to the plant. In addition to these advantages the site affords good railroad and highway connections, and has its own

²¹ *Texas Almanac and State Industrial Guide, 1941-42*, p. 234.

docks to facilitate the loading of ships. Few industrial locations can surpass Corpus Christi for this type of industry. Since this plant was established, others have been located along the Gulf Coast.

Metallic Industries

The lack of suitable coking coal has prohibited development of an iron-smelting industry along the Gulf Coast, although the low-grade iron ores of east Texas could move to the coast and limestone is available.

A large steel industry recently established in Houston uses cheap natural gas and an abundance of iron and steel scrap from various Southwestern sources. This plant is strategically near the oil fields, shipyards, and other secondary users of steel.

At Mobile, a large plant has recently been completed for making alumina from bauxite shipped from Surinam and British Guiana. A zinc smelter has been constructed at Corpus Christi, and a tin smelter at Texas City, the latter utilizing Bolivian ore. These were located on the coast to benefit from cheap fuel and ocean transportation.

The Dow Chemical Company, having completed a 12 million dollar plant at Freeport in 1941, is obtaining metallic magnesium from sea water.

While these are only a few of the many industries that have grown up on the Gulf Coast in recent years, the future of the area industrially seems assured.

Shipbuilding²²

During the first World War several Southern shipyards were established to build wooden vessels, but with the cessation of hostilities, they were abandoned. At that time most of the steel shipyards were located on the north Atlantic seaboard. However, the entry of the United States into the second World War found the Gulf Coast sharing with the Atlantic and Pacific the great increase in steel shipbuilding. Nearness to steel mills at Birmingham and Houston along with cheap water transportation by rivers and Intra-coastal Canal, make possible construction on the Gulf Coast at a price comparable to that of other areas.

Although after 1941 much of the construction was due to Navy demands (the Gulf Coast area is less exposed to attack than the

²²"Gulf Coast Shipbuilding: Vital Industry Booms in South," *Life*, May 26, 1941, Vol. X, No. X X I, pp. 87-95.

other coasts), cargo and passenger ships are being built, and there seems reason to believe that this industry will continue in the future.

Shipyards were in active operation in 1941 at Tampa, Mobile, Pascagoula, and Beaumont, and others were being built at Chickasaw (Alabama), New Orleans, Orange, and Houston. An interesting feature of Southern shipyards is that practically all steel parts are welded instead of riveted.

The Fishing Industry

The Gulf Coast, with the longest of the 3 coastlines of the United States (6,875 miles, counting major indentations), is the least important for commercial fishing. Its accessibility to the great interior of the continent, however, plus the fact that several delectable varieties of fish found in Gulf waters are scarce elsewhere, make this region one of growing importance. The most highly prized fish include sheepshead, pompano, grouper, and red snapper. The last two are caught in great numbers on offshore banks²³ and on the large Campeche Bank off the coast of Yucatan (Fig. 41).

Oyster and shrimp fishing

Almost every small bay or lagoon along the Gulf Coast has an oyster-fishing industry, characterized by its fleet of fishing vessels, large piles of shells, and packing plants (Fig. 107). Two areas, the Mississippi coast and the eastern part of the Texas coast lead. Biloxi is possibly the nation's chief oyster-shipping and packing point. In recent years the cultivation of oysters along the coast of Louisiana has stimulated growth of the industry there.

Shrimp are caught along the South Atlantic and Gulf Coast, but recently Louisiana coastal waters have outranked all others in the volume of the catch. Most of the shrimp (the small ones) are caught in lagoons near the Mississippi Delta, but the industry has invaded offshore banks where the larger (adult) shrimp are caught. Most of the catch is made with trawls, consisting of net bags with wings on each side to direct the shrimp into them. These, dragged along the bottom by tow lines, are hauled to the surface at frequent intervals and dumped into boats. After the catch has been culled to get rid of small and undesirable shrimp, it is taken to plants where the shrimp are further culled and sorted. The shrimp are then iced, if to be sold fresh, or boiled if to be canned. About half

²³ For a discussion of banks fishing, see pages 72-76.



Fig. 107 Oyster boats anchored of one of the many packing plants of Biloxi, Mississippi. Huge piles of shells grow up beside the plants

the catch is canned. Sun-dried shrimp, being lower in quality, are marketed abroad. The by-products of this industry are used to make meal for feedstuffs or for fertilizers.

Sponges

Formerly, Key West dominated the sponge industry of the continent, but in recent years Tarpon Springs has almost replaced it.²⁴ Two methods are used to gather the sponges from the ocean floor, (1) hooking, where the sponge is brought to the surface by a long hook operated by the fisherman from the boat's deck, and (2) diving, where the sponge fisherman goes to the bottom in a diver's suit and by means of instruments tears the sponges from the bottom, depositing them in a bag which is then lifted to the surface. Practically all diving is done by Greek fishermen. After the sponge is brought to the surface, it is pounded with clubs or treaded with bare feet to rid it of the animal matter. It is then washed, strung up, and dried. This process is repeated until only the skeleton (the commercial sponge) is left. Nassau in the Bahamas and Batabano, Cuba are Tarpon Springs' chief competitors.

Sport fishing

Sport fishing has assumed great importance all along the Gulf Coast, particularly during the winter tourist season. The chief game fish include the tarpon, shark (not a true fish), sailfish, and numerous others. Most of these have no food value. After the average fisherman makes his catch and has his picture taken beside it, he has no further use for the fish, unless he plans to have it mounted.

Trapping

Several Gulf Coast areas produce furs including mink, otter, skunk, muskrat, and others. The swamps of southern Louisiana provide the best home for muskrats, and nearly three fourths of North America's supply is trapped there. Louisiana law allows each trapper to operate 250 steel traps, and requires him to inspect them daily. The legal trapping season lasts from November 20th to February 1st. There have been as many as 20,000 licensed trappers in Louisiana, but in recent years this number has been reduced to about 7,000.

²⁴ George S. Corneld, "The Sponge Industry at Tarpon Springs, Florida," *Journal of Geography*, November 1936, Vol. XXXV, No. VIII, pp. 308-316.

The trapper at the end of the day returns to his cabin in the marshes with his load of muskrats. He skins them and hangs their pelts on a rack by the side of the house to dry. Fur buyers visit these trappers, select and grade the furs they wish to buy, and pay cash for the pelts. Despite the fact that traders must carry considerable money with them at all times, there is no record of one having been robbed.

Although little muskrat flesh is consumed at present, the manufacturers of dog food may use large quantities in the future. The muskrat is extremely prolific, and there seems to be little danger of extermination, despite the average catch of more than 6 million a year. Mink and otter are trapped to some extent in Louisiana but the total value of their peltries does not equal that of the muskrat.

Spanish-moss fathering

Travelers along the Gulf Coast from Florida to southeast Texas, are impressed with the quantities of moss that festoon the trees. The moss (usually called Spanish Moss) is an epiphyte, which propagates by fragments of the plant and not by seeds. Deriving nourishment entirely from the air, it will grow wherever sufficient warmth and moisture can be secured. In colonial times this moss was used in making bridles, saddle blankets, and horse collars, and was used also as stuffing for pillows and mattresses.

When commercial production was begun after the furniture and automobile industries discovered its value for upholstery stuffing, a profitable business of moss gathering developed, mainly in the swamp country of the Mississippi Delta. The yearly revenue from this unique industry amounts to several million dollars. Since the supply seems limitless, it can easily be expanded when the market demand increases.

The moss gatherer usually goes through the swamp in a crude flat-bottom boat, and with a long pole tears the moss from the trees. Returning to his cabin (Fig. 108), he soaks the moss in water and hangs it out to dry. The outer green coating rots off, leaving a black-colored moss that resembles horse hair. After the cured moss is ginned and the trash, bark, and other materials removed, it is baled. Since the average price is 2½ cents per pound and the moss is very light, gatherers' earnings are very small; nevertheless, they are thus able to make a living in the coastal swamps with little effort.

Resorts

The Subtropical Gulf Coast is one of the major resort regions of Anglo-America (Fig. 33). In addition to Florida, the coast of Mississippi, and to a lesser extent the Texas coast, have a resort business which is increasing in importance. The entire coast of



Louisiana uept. of Conservation and Fred B. Kniffen.

Fig. 108. Louisiana moss gatherers' cabins.

Mississippi from Pascagoula to Bay St. Louis is almost a continuous resort town. The Louisiana coast, because of its swampy lands, has little resort development. Galveston Island, principal resort area on the Texas coast, has been popular for many years, appealing largely to summer tourists of the Southwest. The same type of development, although on a smaller scale, is found in the Corpus Christi area. Resorts have been established in the Lower Rio Grande Valley but the volume of business has been restricted because of relative remoteness from large centers of population.

The Florida resort industry

The greater part of the resort industry is centered on both coasts of the Florida peninsula and is confined almost entirely to the winter season. The state, however, is trying to increase summer business by offering extremely reasonable hotel rates. Summer is an agreeable season at the beaches of southeastern Florida, but it seems doubtful if many tourists will be attracted at that season in spite of low rates. Tourists want a climatic contrast. Even the Southern summer tourist prefers Northern resorts or mountains that promise a contrast to what he has at home.

Tourists begin coming in large numbers about the middle of January, increase steadily until the last of February, and begin to leave soon after the first of March (although many remain until after April 1st). From then on, the northward migration increases rapidly; by the middle of May most winter visitors have returned to their Northern homes.

During recent seasons, an estimated 2 million people have visited Florida each winter. Visitors come from practically every state and from many foreign countries but the majority are from east of the Mississippi and north of the Ohio and Potomac rivers. They come in all kinds of conveyances—steam yachts, airplanes, streamlined trains, busses, good automobiles, and jalopies. Some even "thumb it" on the highway. The main body of tourists enter by way of Jacksonville, where they break up into three streams—65 per cent go down the east coast, 25 down the west coast, and the remainder into the central Lakes Country. It is estimated that 90 per cent of all Florida tourists visit Miami before they leave the state.²⁵

Florida, south of Jacksonville, was a trackless wilderness occupied by small numbers of Amerinds and whites until, toward the close of the nineteenth century, Henry M. Flagler, a man of great wealth and vision recognized its intrinsic value as a potential winter resort. He built a large modern hotel (The Ponce de Leon) at St. Augustine in the 1890's and made plans for others along the east coast. More important, however, he arranged for the building of the Florida East Coast Railroad, which was gradually extended southward to Palm Beach, Miami, and ultimately to Key West—more than 100 miles beyond the end of the peninsula. This last section cost \$100,000 a mile. Flagler's railroad which stimulated the great east

²⁵ R. E. Turpin, "Florida Rounds Out a Pioneering Epic," *The New York Times Magazine*, January 16, 1938, pp. 1 and 6.

coast development, was financially successful as far as Miami, but the overseas portion never was profitable. In the 1930's a hurricane destroyed some of the bridges causing abandonment of rail service to Key West. Recently, however, the state repaired the bridges and now has a motor highway that extends to the island city. On the west coast, Henry Plant completed another railroad line to Tampa and points south. Although considerable resort business has developed around Tampa Bay, the west coast gets a minor part of the tourist trade.

During the prosperity period of the 1920's, Florida, with its fruit and vegetable farms and its resort areas, experienced a land boom such as the world has seldom seen. The chief thing Florida had to sell was an excellent winter climate for outdoor activities. The highly speculative nature of the land boom encouraged overbuilding. When real-estate purchasers were no longer available the greatest of all land booms collapsed. This happened before the depression of the early 1930's and was further accentuated by that national catastrophe.

The land boom resulted in much distress but it built cities and towns, railroads and highways, and established Florida as a major resort area, and one of the leading early vegetable and citrus fruit-producing sections of the continent. In other words, it "put Florida on the map" and to that extent, was beneficial. During the past two decades the state's population increased from 968,470 in 1920 to 1,897,414 in 1940.

Transportation

The Subtropical Atlantic-Gulf Coast has a number of important ports including New Orleans, Houston, Mobile, Jacksonville, Tampa, and Miami. These in varying degrees carry on an important coastal and overseas trade for this region and for the Cotton Belt. Additional information regarding these ports is presented in the section dealing with cities. It is significant that every outstanding city in this region is a deep-water port.

Rivers, particularly the Mississippi and Tombigbee, have played a relatively important role in transporting freight from the interior to Gulf Coast ports, but coastal waterways have grown in importance in recent years.

The Intracoastal Canal was originally planned to extend from New York to Brownsville as a continuous waterway, utilizing lagoons behind barrier beaches where possible, and cutting through the Coastal Plain where necessary. The link across northern Florida

was never completed. One part of the canal now runs down the east coast as far as Key West and another begins in western Florida, and extends to Corpus Christi (Fig. 109). Between Mobile Bay and New Orleans, and between New Orleans and Galveston Bay, considerable heavy barge traffic traverses the canal, which is linked with the Mississippi River system. Southwest of Galveston some traffic moves as far as the sulphur mines at Freeport but little goes beyond that point. The portion of the canal down the east coast of Florida carries many small pleasure craft, particularly during the tourist season, but little freight moves south of Jacksonville.



Fig. 109. Route of the Intracoastal Waterway.,

Railroads in this region have been built largely to connect the ports with the interior. Few lines run parallel to the coast (Fig. 93-A). The port cities have excellent rail connections with all parts of the country and are well served for both freight and passenger traffic.

Highways have been developed rapidly in recent years and unlike railroads they have tended to parallel the coast (Fig. 93-B) as well as connect port cities with the interior. The Tamiami Trail across the Florida Everglades, the Overseas Highway to Key West and the "Hug-the-Coast" Highway in Texas are among the more spectacular. Most coastal highways are modern paved traffic arteries capable of carrying heavy traffic.

Airways have expanded rapidly in recent years and today all major cities of the coastal region have excellent air connections

(Fig. 93-C). The demand for rapid transportation to the resort areas, coupled with the natural growth of the whole region, have stimulated commercial air development. Moreover, the chief connections with Pan-American Airways are at Miami and Brownsville at the southeastern and southwestern ends of this region. These two cities function as the American customs ports for practically all Latin-American air travel. The Pan-American airport at Miami is one of the largest on the continent.

Pipelines. Since most large petroleum refineries are located on tidewater the Mid-Continent and the Gulf Coastal oil fields are connected with Gulf ports by a maze of pipelines (Fig. 93-D). Through these flows a major part of the petroleum from southwestern fields, as well as considerable quantities of refined gasoline. Practically all crude oil that is not refined at Gulf ports is shipped by tanker either to eastern seaboard cities or overseas. Pipeline transportation has almost completely replaced shipment by tank car in the Southwest.

Cities of the Subtropical Atlantic-Gulf Coast

Except for the small agricultural centers of the Lower Rio Grande Valley, most of the cities are seaports, their major function associated with coastwise or overseas trade. In most cases harbors have been improved at great expense, since few good natural harbors existed on the South Atlantic or Gulf Coast. Some inland cities without deep water outlets have become ocean ports through canalization of rivers, the most notable being the Port of Houston which was connected with the Gulf by a dredged ship canal about 50 miles long.

Though these cities are fundamentally trade centers they have recently become industrialized by reason of heavy industries seeking tidewater location. During the decade (1930-1940) some of these coastal cities were among the most rapidly-growing centers of the United States: Jacksonville increased 33.6 per cent, Houston 50.5 per cent, and Corpus Christi 106.6 per cent. These increases are far above the national average.

In practically every case these cities serve sections of both the Subtropical Atlantic-Gulf Coast and the Cotton Belt. Because of location, however, they are classed as Atlantic-Gulf Coast urban centers.

Charleston (98,711), located on an excellent harbor on the south Atlantic coast is today possibly more important historically than commercially. Throughout Colonial times it was a major seaport,

and as late as the first Federal Census (1790) ranked fifth among the cities of the United States, surpassing Baltimore, the only other important southern city of that day. So long as trade was confined to the Atlantic Seaboard, Charleston held its own with all other Atlantic ports for overseas commerce. When the trans-Appalachian region began to develop, however, it could no longer compete with New York, Philadelphia, or Baltimore to the north, or with Savannah, Mobile, or New Orleans to the south and west. Access to the hinterland was blocked by the highest part of the Great Smoky Mountains. Today, Charleston serves as a deep water outlet for South Carolina and southern North Carolina. Because of an excellent harbor, it has become one of the country's more important naval bases. A long and interesting history coupled with a mild winter climate make it an important resort center. Recently pulp mills and other wood-products industries have been established in or near the city.

Savannah (117,970), at the mouth of the Savannah River, is like Charleston, one of the South's historic old places, and a former dispersal center for the westward movement into the Cotton Belt. Its local trade territory was not so good as that of Charleston during prerrailroad days, but when the lands to the west opened up, it had a better opportunity to contact the hinterland. Today it stands as one of the South's chief ports for the shipment of cotton, naval stores, and lumber. As the home of the Experimental Wood-Products Laboratory, where Dr. Charles Hertty perfected his process for the manufacture of kraft paper and newsprint from Southern pines, the city has become an important manufacturing center for wood-products industries.

Jacksonville (195,619), located on the outside bend and at the head of navigation on the St. Johns River, is the leading seaport on the South Atlantic coast and by far the most important commercial city of Florida. Lying near the northern border of the state, Jacksonville is a port for the forested region of southern Georgia and northern Florida, and has been referred to as "the working son in the Florida family of playboys." For years it has ranked high as a port for shipping lumber and naval stores. Although the tourist gateway to all of peninsular Florida, the city was not greatly influenced by the land boom of the 1920's, and hence did not suffer the after-effects so common to the places farther south. It is a resort city of importance and profits largely from the tourist trade, but tourism does not dominate its activities. Jacksonville had rail connections long before other Florida cities. It functions primarily as an exporting port, but it has several industries, including the

making of cigars of which it contributes about one tenth of those consumed in the United States.

Miami (250,537), including Miami Beach and other near-by resort centers, lies on both sides of Biscayne Bay near the southern tip of the peninsula and is the continent's southernmost large city. It is one of the youngest cities and one of the fastest growing. Before the land boom of the 1920's, Miami was a small railroad town in the midst of coastal swamps. Its population increased 274 per cent between 1920 and 1930, and 56 per cent between 1930 and 1940. Northern capital was spent lavishly in the Miami area (more than \$100,000,000 in building construction during a peak year), and soon an elaborate, ultra-modern resort city developed. For additional building sites, particularly for the large estates (Fig. 110), new lands were made from the materials dredged from Biscayne Bay. Dredging the bay gave Miami a deep-water port. The port is primarily a passenger terminal for tourists between New York, Florida, Cuba, and the Gulf Coast; it handles very little freight. Miami's hinterland is dominated by the unproductive Everglades.

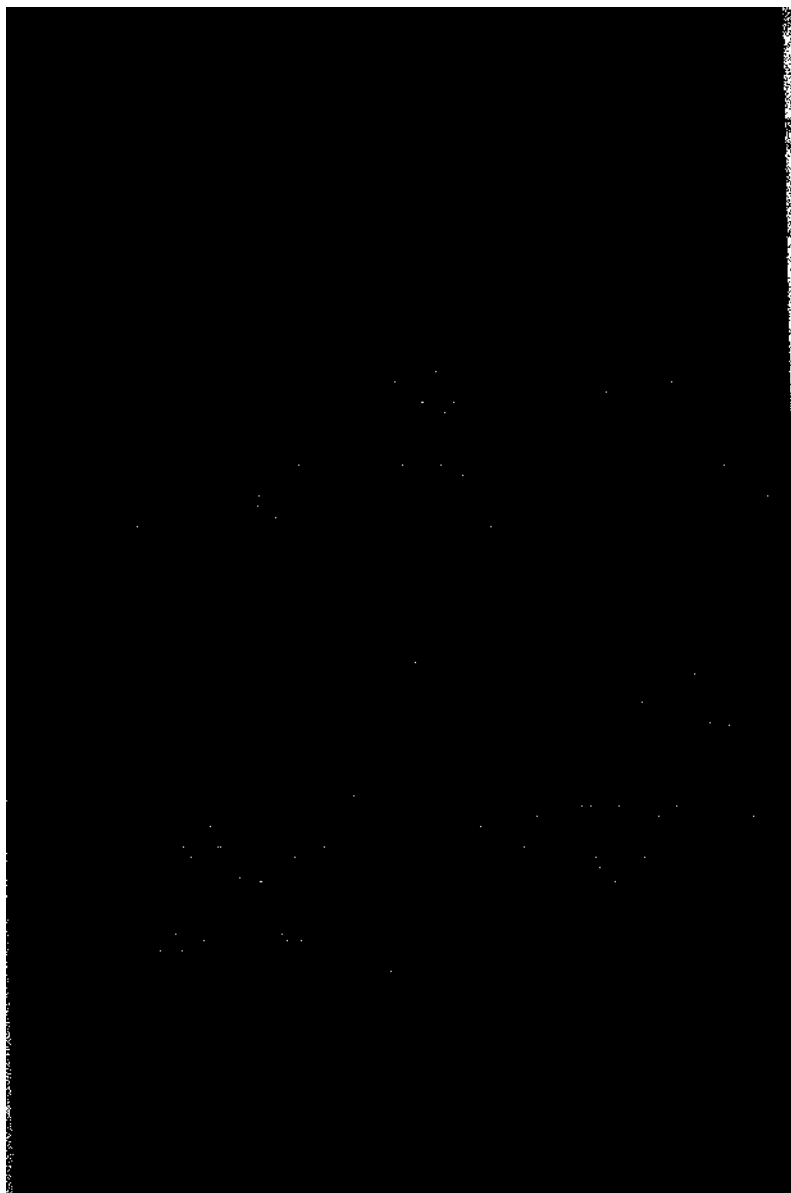
The city's chief and practically only business is tourism, which is confined largely to the four winter months. Miami vies with Atlantic City for first place as a resort center. An estimated 2 million tourists visit the city annually. Hotels and restaurants do a thriving business. Fishing, important in off-shore waters, is primarily for sport, and it is said that half a million dollars is spent each winter season on boat-hire alone.

Miami's southern location makes it a strategic point of entry for air travel with Latin America.

Tampa-St. Petersburg (209,693), considered as one metropolitan district, lie on opposite sides of Tampa Bay and are connected by two long causeways across the water.

Tampa, the older of the two cities, is primarily a business center and commercial port; St. Petersburg, lying nearer the Gulf, is fundamentally a resort center. Considerable rivalry exists between them, particularly for the winter tourist trade, but their functions largely supplement each other. Tampa is one of the older Florida cities, and many of its industries are similar to those of Jacksonville; but, like Miami, this area has profited from the tourist trade and has become the chief resort center of the west coast of Florida.

As a port, Tampa ranks high on the Gulf Coast, particularly because it is the chief outlet for Florida phosphates. When cigar manufactories moved from Havana and later from Key West, Tampa secured most of them. Although machine processes have



Miami News Service and Miami Chamber of Commerce,

Fig. 110. One of the large estates in Miami.

since caused the industry to move northward, the city still holds first rank in the production of high-class hand-made "Havana cigars." Tarpon Springs, to the northwest, also makes this the leading sponge-fishing area of the nation.

St. Petersburg, the resort center of the west coast, ranks second only to Miami in volume of business. The "Sunshine City," to live up to the slogan, has placed benches along the sidewalks of the business district so that winter tourists may bask in the sunshine. Its municipal pier attracts large numbers of fishermen who cannot afford to hire boats.

Mobile (114,906), at the head of deep-water navigation on Mobile Bay, is one of the oldest cities of the South, having been established by the French in 1702. As one of the chief export ports for Southern cotton, it grew rapidly and attained a population of 20,515 by 1850, when it ranked second only to New Orleans among Southern ports. During the steamboat era Mobile was the deep-water terminus for the traffic on the Tombigbee and Alabama rivers. Records show that it accounted for one sixth of all cotton exported. Mobile lost much of its hinterland to the rapidly growing port of New Orleans after the Civil War, and became relatively inactive until after the beginning of the present century. Improvements in harbor facilities, the development of the Birmingham industrial area, and resumption of water traffic on the Tombigbee River largely account for Mobile's revival. Modern office buildings and docks in a city of narrow streets and historic landmarks show that Mobile has become modern in spite of its age. Many industries have located at Mobile in recent years to take advantage of cheap coal carried by barge from northern Alabama and cheap natural gas piped from Louisiana and Mississippi. Today the city has ship-yards, paper mills, fertilizer plants, sawmills, and a \$6,000,000 plant for the manufacture of alumina from Guiana bauxite. It imports bauxite, bananas, and fertilizer ingredients, and exports lumber, cotton, and iron and steel products from Birmingham.

New Orleans (540,030), the South's largest and one of the nation's most historic and unique cities, lies more than 100 miles upstream from the mouth of the Mississippi, at a point where deep water for docking is provided on the outside bend of a large meander. The city occupies both banks of the river and extends northward to the shores of Lake Pontchartrain. As the main port near the mouth of the Mississippi, New Orleans enjoyed a profitable trade during French and Spanish colonial times and grew steadily during that period. The old French Quarter, its narrow streets and unusual houses with their wrought-iron grill-work, are reminders of the days

when the city was a center of Latin culture in the New World. Following the Louisiana Purchase and the rise of steamboat traffic, New Orleans grew as the only water outlet to the rapidly developing upper Mississippi territory. The completion of the Erie Canal, and of the several railroads connecting the Great Lakes with the Atlantic Coast ports, was a blow to the trade of New Orleans, and the decline of river traffic in the 1850's reduced its importance still further.

New Orleans has profited from the recent industrial development in the South. It processes numerous agricultural commodities, ranking high in molasses, sugar, henequin (sisal), and cottonseed-oil products (Wesson oil). With its satellites, Gretna and Algiers, on the right bank of the Mississippi, New Orleans has heavy industries, including shipbuilding and chemicals. Its major activity, however, is that of a great commercial port, an outlet for the commodities that move to it by river boat, rail, and truck from the continental interior, and an inlet for numerous commodities from Latin America. The port ranks second only to New York in trade with Latin America. It is one of the major banana-importing ports of the nation.

Although the Mississippi River at New Orleans does not make an ideal harbor, the city has built many large docks and has improved its waterfront so that today it is a well-equipped port. The so-called industrial canal connects the Mississippi with Lake Pontchartrain, giving the port a second deep-water outlet, although most of the trade continues down the river. New Orleans will always play a prominent role in the commercial and industrial development of the South.

With its historic background, fascinating old French homes, and mild winter climate, New Orleans has become an important tourist center. The city attracts visitors from all parts of the country during the Mardi Gras Carnival, an elaborate pageant celebrated annually since colonial times. The winter social season which precedes this event is one of the most elaborate to be found anywhere. New Orleans has an atmosphere that is different from that of any other American city.

Baton Rouge (34,719), the capital of Louisiana and the home of the State University, is situated on the east bank of the Mississippi, 133 miles by river above New Orleans. As a result of river improvements it is now a seaport of considerable importance and in recent years has become an industrial center. On the northern edge of the city is probably the largest oil refinery and tank farm of the Gulf Coast if not of the United States. Associated with this

refinery are a number of chemical and explosive industries that represent a total investment of nearly 350 million dollars—one of the most expensive industrial spots on the entire continent.

Historically Baton Rouge is associated with New Orleans. The many old plantations of the Mississippi Valley near the city attract many tourists. Its proximity to New Orleans, however, precludes Baton Rouge from ever becoming a really large city.

Beaumont-Port Arthur (138,608), whose centers lie nearly 20 miles apart, are considered as one metropolitan district because of similar locations and functions and because they are tending to grow together along the lower course of the Neches River. Beaumont, the larger and older, is at the head of navigation on the Neches. It developed primarily as a lumber port for the southeast Texas forests. With the discovery of the first Gulf Coast oilfield at Spindletop the city boomed. Port Arthur, on Sabine Lake, a little below the mouth of the Neches, was originally established as a lumber port and the Gulf terminus of the Kansas City Southern Railway. With rapid development of the petroleum industry, however, it became the continent's major pipeline terminus, refining center, and petroleum-exporting port. Although considerable lumber, timber, and rice (from Beaumont) are shipped from these ports, petroleum and its products dominate. The Sabine Lake area is also important for shipbuilding, although most of that is done at the smaller center of Orange a few miles up the Sabine River.

Houston (510,397), one of the fastest-growing and largest cities of the South, is located at the head of the Houston Ship Canal about 50 miles from the Gulf of Mexico. In the early part of the nineteenth century it was a seaport for small craft that could navigate the Buffalo Bayou. With the increase in size of ships, ocean carriers could not reach the port and were forced to stop at Galveston. Thus the growth of Houston was retarded so that as late as 1900 it had less than 50,000 people.

Agitation for a deep waterway to the Gulf began soon after the Civil War, but no definite action was taken until 1905, when the federal government approved a plan and appropriated funds for dredging the channel and turning basin to a depth of 30 feet. Houston might be compared with Manchester or Glasgow in that it became a seaport by its own determination. With the completion of the project, Houston's future was assured. Its population increased more than tenfold between 1900 and 1940. Houston's progress was Galveston's loss, being 50 miles closer than Galveston to products destined for export and to inland markets.

Trade has increased rapidly in Houston in recent years. The city and county have constructed several thousand linear feet of wharf space at the turning basin, and have built cotton warehouses and a large grain elevator. Private industries have built their own docking facilities on the ship canal, and are rapidly turning the district into an important industrial port. Originally Houston handled cotton, petroleum, and wheat as its main items of export. Because of the weight of these commodities, it ranks high among the continents exporters in total tonnage. Recent industrial development is providing a diversity of commodities. Although Houston is an ocean port, its coastwise trade is enormous. As a passenger terminal, however, it is of minor importance.

Industrial and trade development have been largely responsible for the rapid growth of the city, but the increase in wealth of the district has resulted in a business and residential expansion elsewhere in the area. Houston has few equals as a city of beautiful homes. It has also become an important cultural center; it has in Rice Institute one of the best technical schools in the South.

Houston has assumed first place among Texas cities and is crowding New Orleans as the most important city in the South as well as the most important port on the Gulf Coast.

Galveston (71,677), located at the northeastern end of Galveston Island, extends from the Gulf of Mexico to Galveston Bay. Its harbor and docking facilities are located on the bay side while its bathing beach and resorts face the Gulf. Although an old city, its growth has been slow and today it is considered one of the smaller Gulf Coast port cities. The recent competition given by Houston has deprived Galveston of much of its former trade, but for certain products, particularly cotton and sulphur, it still ranks high.

The disastrous hurricane of 1900, which flooded the city to a depth of several feet and caused the loss of more than 6,000 lives, necessitated building a sea wall and raising the city's level some 15 feet along the Gulf shore. A second hurricane in 1915, of probably greater violence than its predecessor, was weathered without serious damage due to the protection of the sea wall.

As a seaside resort, Galveston rivals any place of the Gulf Coast, being surpassed only by Florida's resort areas. The city is connected to the mainland by two long concrete causeways across Galveston Bay and by a ferry across the ship channel to Bolivar Point.

Corpus Christi (70,677), lies at the upper end of Nueces Bay on the southwest coast of Texas. Like Houston, it has secured a deep-water channel only in recent years through dredging. Its port ac-

tivities date from 1925, when the channel was completed. Serving a much smaller and less populous trade territory than Houston, it has, nevertheless, grown rapidly both in trade and population. It exports primarily cotton and ranch products and has become the terminus of several pipelines from the west Texas oil fields. Because of cheap gas from near-by fields, it has attracted several heavy chemical industries. A Naval air base of military equality with the large field at Pensacola has recently been completed.

The valley cities. In the Lower Rio Grande Valley are a number of small agricultural centers that, except for Brownsville, lie along the first terrace level above the river. They all profit from the agricultural development, and tend to form a continuous string of settlements for more than 60 miles. All but Brownsville are new towns and all have grown rapidly within the last two decades. *Brownsville* (22,083), the only old town in the Valley was a port on the Rio Grande until that stream ceased to be navigable. Recently, with the dredging of a canal through the coastal plain to the Gulf, Brownsville has again become a seaport, but since early vegetables and citrus fruits are the chief commodities of the hinterland, it is unlikely that the port will ever become one of major importance. The other valley cities include from east to west, *San Benito* (9,501), *Harlingen* (13,306), *Mercedes* (7,624), *Weslaco* (6,883), *McAllen* (11,877), *Edinburg* (8,718), and *Mission* (5,982). All of these have packing sheds for fruits and vegetables and many contain factories for canning grapefruit juice. Recent oil development in and near the irrigated lands have threatened to change these attractive agricultural centers into oil boom-towns, but as yet this has not happened. Because of the limited supply of irrigation water from the Rio Grande and because of the overcrowded markets for citrus fruits and early vegetables, it seems unlikely that these valley cities will grow much more.

The Outlook

The future of this region is difficult to predict. At present it seems to offer many advantages to industries that require cheap fuel, local raw materials, and low-cost water transportation. The supply of petroleum and natural gas is exhaustible, but known reserves are adequate for many years. Certain minerals, especially sulphur, salt, lime, and phosphate, are so abundant that they seem almost limitless. Location on the least developed seacoast of the United States is perhaps the most important and most enduring factor of the natural environment. Since this coast is nowhere

blocked by mountains but is accessible to the vast and productive continental interior, it should develop in the future, particularly when trade with Latin America becomes more important. All in all the Subtropical Atlantic-Gulf Coast appears to have a bright outlook.

CHAPTER XII

The Agricultural Interior

A REGION OF CORN, SMALL GRAINS, TOBACCO, FRUIT, LIVESTOCK, AND DAIRYING

FIGURE 111 MARKS off the world's greatest storehouse of farming wealth—a region ideally fashioned by nature to become the home of a thriving population. It produces more corn and oats and meat than any other area of equal size. It also produces much hay, winter wheat, tobacco, fruits, and dairy products. The Agricultural Interior falls almost wholly within the United States. Canada has no agricultural Middle West; instead it has the inhospitable

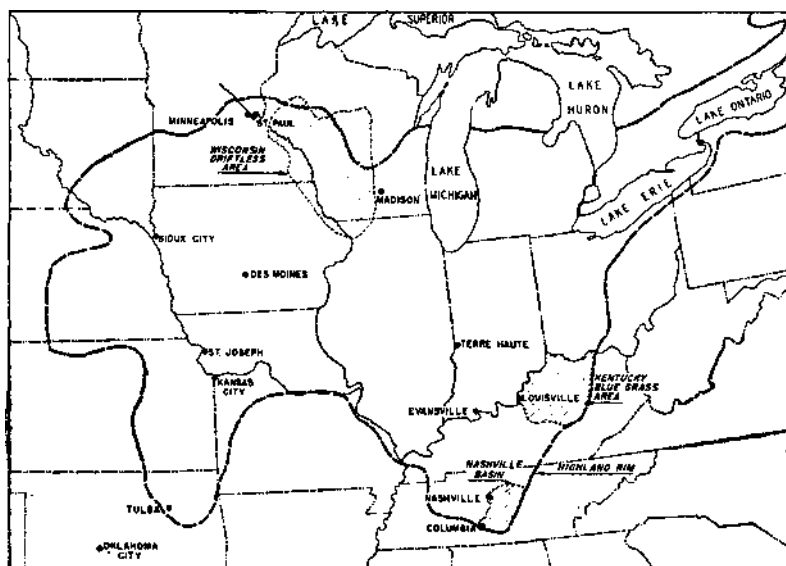
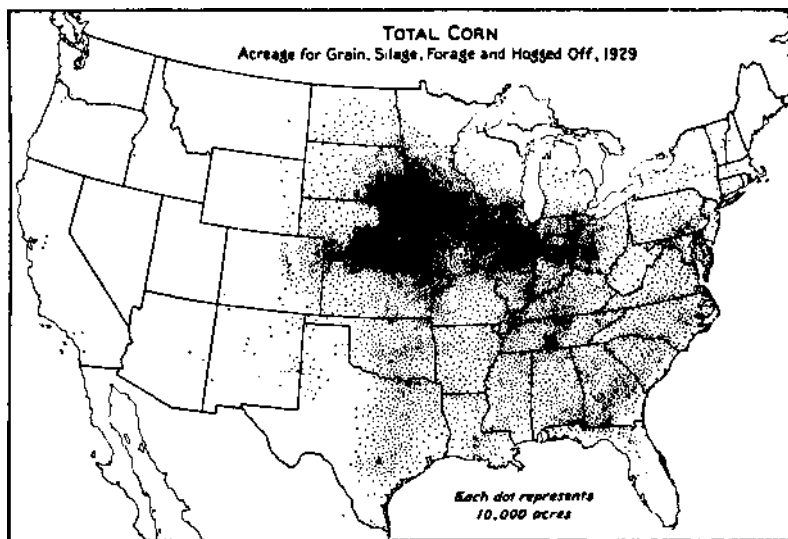


Fig. 111. The Agricultural Interior: a region of corn, small grains, hay, tobacco, fruit, livestock and dairying. It includes the Corn Belt and parts of the Hay and Dairying Belt and of the Corn and Winter Wheat Belt.

Laurentian Upland (Fig. 2). Not until it meets the Manitoba Basin does the stony Upland give way to arable plain.

The Agricultural Interior may be called the most important farming region in the world. Its influence on the United States politically, economically, and socially cannot be overestimated. Of all the regions in Anglo-America (Fig. 12), this one is undisputably the most self-contained and independent. It is basically agricul-



Bureau of Agricultural Economics.

Fig. 112. Corn Acreage in the United States. Corn is the great American cereal and the Agricultural Interior grows the bulk of it. The Corn Belt subregion alone produces nearly one half the total. This crop yields in general about twice as many pounds of grain per acre as wheat, oats, barley, and rye.

tural; it cannot be considered urban or industrial, even though manufacturing is important in the eastern and northeastern parts. Most of the cities are little more than "farm-rimmed factory towns."

Boundaries

The Agricultural Interior occupies only part of the vast interior plain of North America; it is set off from adjoining regions to the west and north by rather indefinite boundaries that have been shifting because of improved strains of corn (hybrid) and earlier maturing varieties of grains.

On the west the region merges with the Great Plains; scanty

rainfall separates the prairie margin from the short grass country of the Great Plains at about the 98th meridian. Here precipitation is inadequate for the profitable production of corn, except in eastern Colorado, and the crop tends to be replaced by those that are more drought-resistant. On the east lies the rugged Allegheny Plateau with its prevalence of relatively infertile sandstone and shale soils which produce little corn for sale (Fig. 112). On the north lies the Northern Continental Forest, characterized by the relatively infertile soils of the Laurentian Shield and a less important agriculture, and by the Spring Wheat sub-region, which is now in a stage of transition. On the southwest, it is bordered by three regions—the Cotton Belt, the Ozark-Ouachita Uplands, and the Hard Winter Wheat Belt. This last boundary is drawn where the rainfall and hot summer winds tend to replace corn by wheat and the grain sorghums.

Appearance of the Region

There is a certain similarity in the landscape from boundary to boundary. The level to gently rolling land from central Ohio and Michigan westward contributed to the original network of roads. The roads are laid out at right angles and cross at one-mile intervals (Fig. 113).

The farms, as a result of the system of homesteading, contain about 160 acres or a quarter of a square mile, but many are larger and many are smaller. The larger ones characterize former prairie, the smaller ones former wooded areas. In the cattle-producing portions the buildings consist of large barns, often painted red, and smaller houses. In this, the richest part of the continent, the farmhouses suffer in comparison to the architectural gems of New England, New York, eastern Pennsylvania, and Maryland. Many of the farmhouses in New England were built on stony hillsides, but they were well constructed and are almost as good now as a century ago. If such was the case at a time when hand labor and poor livestock characterized agriculture, one wonders why in this Mid-western land of generally rich soil and mechanized farming the settlers did not build more attractive houses.

From an airplane, the view is unhampered by hills, highways, rivers, swamps, forests, and farm fences. One notices and is impressed by the wide distribution of the settlements, the high percentage of land under cultivation, the relatively small amount of land in forest, the great amount of land between towns and the paucity of factories west of the Mississippi River.



Courtesy of the U.S. Department of Agriculture, Bureau of Plant Industry, Washington, D.C.

Fig. 113. Characteristic checkerboard arrangement of fields over the interminable acres in the Corn Belt Sub region—heart of America's agriculture. The farms here are more closely spaced than those in the wheat regions to the west and northwest. Note the village in the center foreground and the straight roads.

The Region's Political Power in National Affairs

Probably no single region wields so much power in Washington as this one. During years of prosperity, when prices for agricultural commodities are high, life moves smoothly, and for this condition "the President residing in the White House . . . claims credit, even though the good times be due to rainfall in the Middle West."^x During years of depression, however, or when lack of rain and burning sun bring small crops, or when a lavish nature gives too plentiful harvests with resultant low prices, this region rumbles ominously. In recent years farms generally have yielded well; corn cribs have been filled to overflowing, elevators strained under burdens of wheat, and large herds of beef cattle and swine have dotted the landscape. Partly because of this abundance, prices remained low. In times of low prices, political instability develops and people vote for him who promises the most. Few economic or political panaceas contrived by man have not been tried at some time. It is little wonder then that the "mentality which has dominated American politics for the last generation and more is the socialized mentality of the Corn Belt."²

The Physical Setting

Few if any agricultural regions in the world have a more favorable combination of climate, topography, and soils.

Climate

As a result of interior location, the area has a Humid Continental Climate, which is characterized by a wide range of temperature. Winter temperatures have fallen as low as -30°F., whereas those of summer have soared as high as 108°. *Summers are nearly always hot!* Spells of hot weather occasionally rival and even surpass anything the Rainy Tropics experience. Even the nights are warm; July night temperatures seldom fall below 65°F., except in the northern portions. Winters, especially in the western and northern parts, are severe though changeable. Because winter temperatures are mostly below freezing in the northern part of the region, there is a minimum of soil leaching; in the southern part, where freezing and thawing occur daily, the reverse is true. In

¹ William F. Ogburn, *Machines and Tomorrow's World*, p. 3. New York: Public Affairs Committee, Inc., 1938.

² *Fortune*. November 1935, Vol. XII, No. V, p. 60.

pioneer days, winter storms (blizzards) were things of terror, but with coal for fuel, closed automobiles, cleared roads, and better houses, this is no longer true.

The growing season is long—about 140 days along the northern border and 200 along the southern.

Precipitation varies from about 18 inches near the western boundary to 40 at the eastern border. Rain falls during every month in the year with the maximum in spring and early summer (Fig. 114); about three fourths of the rain falls in the frostless season—a sig-

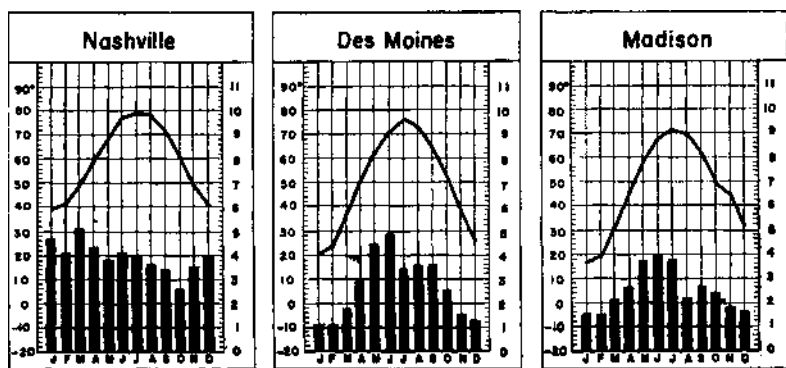


Fig. 114. Average monthly temperature and precipitation for Madison, Des Moines, and Nashville.

nificant factor in a great agricultural region. Summer precipitation is predominately of the thundershower type'. Occasionally severe summer droughts reduce crop yields and turn pastures brown.

In the northern part of this region, snow characterizes the winter precipitation. Although single snowfalls seldom remain long, subsequent ones keep the ground covered practically all winter. Southward the precipitation falls either as rain or snow; the snow generally melts quickly.

Topography

Most of the Agricultural Interior is a plain characterized by level to gently rolling land. From the air it is monotonous, exhibiting no diversity whatsoever (Fig. 113). Exceptions are the lands south of the Wisconsin glaciation which are often quite hilly, the comparatively rugged Driftless Area, and the rims around the Blue Grass Area and the Nashville Basin. The part known as the

Corn Belt is topographically one of the best agricultural areas in the world.

The physiographic uniformity is due in part to the nearly flat-lying rocks and to the fact that most of the region was invaded several times by ice during the glacial period. The glacier left lasting traces; it sometimes planed off the hilltops 100 feet or more and filled up old gorges and deep valleys, covering both with glacial drift often to a depth of 100 feet. In New England with its very old and very hard crystalline rocks, the glacier advancing across hills and mountains wrenched off boulders and stones and scattered them over the lower lands, making agriculture locally difficult. In the Agricultural Interior, with its relatively soft and friable sedimentaries, the glacier had the opposite effect: it mellowed the terrain and left few boulders. The greater part of the Agricultural Interior is indebted in no small part to the ice age for its agricultural importance.

In southwestern Wisconsin and adjacent Minnesota, Iowa, and Illinois lies the Driftless Area—an unglaciated island in a sea of glacial drift. Missed by the continental ice sheet, it differs from the surrounding territory both topographically and economically. In fact, its landscape is like that which existed before the glacier came. The late T. C. Chamberlin, one of the nation's greatest geologists, once said that Wisconsin should have sued the ice sheet for not covering the southwest corner, which is worth millions of dollars less simply because the glacier neglected it.

Soils

No more fertile and productive soils combined with a humid climate exist than those found here. Especially is this true of the region's kernel—the Corn Belt. The Blue Grass Area and the Nashville Basin also are highly productive. Some of the soils, however, as in central Michigan and central Wisconsin, in the Driftless Area and in the Highland Rim, are far from rich.

Most of the region is characterized by gray-brown podzolic soils and prairie soils (Fig. 7). While the former, which develop under deciduous forest in a humid temperate climate, are among the best of the pedalfers, the fact that they are forest soils means that they are in general less productive than the dark-brown to black prairie soils. Nevertheless some of the forest soils, such as those in western Ohio and north-central Indiana, yield about as well per acre as the prairie soils. It may be said that forest soils which develop on calcareous till or on limestone, granite, gneiss, and schist are superior to those which evolve from shale and sandstone. All

forest soils, however, are permanently leached, acid in reaction, and poor in humus.

The true prairie soils are the best of all pedalfers. They develop in cool, moderately humid climates under the influence of grass vegetation, are characterized by a dark-brown to black topsoil underlain by well-oxidized subsoils. Being relatively well supplied with moisture, they are moderately leached and acid in reaction, and they lack a zone of lime accumulation. They are mostly silt loams and clay loams in texture and are derived largely from glacial till. Some are composed of as much as 60 per cent limestone and dolomite mixed with granite, gneiss, shale, sandstone, and other kinds of rock. They are warm, easily tilled, rich in humus, and specially adapted to corn.

In summarizing it may be said that: (1) most of the soils of east-central Minnesota, central Wisconsin, and the northwestern part of lower Michigan are too sandy for the profitable production of crops; these areas also have numerous deposits of peat and muck, which without drainage are unsuited to growing crops; (2) the soils of the Corn Belt, of the Kentucky Blue Grass, of the Nashville Basin, and of western, southern, and eastern Wisconsin, southern Michigan, and southern Ontario, all derived from limestone, are very fertile; (3) the soils of the Driftless Area and of the Highland Rim are of medium fertility.

Natural vegetation

The Agricultural Interior's original vegetation consisted of forest and of grass. The eastern part was forested; western Ohio, southern Michigan and Wisconsin, and southern and west-central Illinois all were a part of the oak-hickory southern hardwood forest, while the Kentucky Blue Grass and the Nashville Basin were a part of the chestnut, chestnut-oak, yellow-poplar southern hardwood forest.³ The forest near the northern boundary of the region was characterized by conifers on the sandy soils and by magnificent stands of hardwoods on the clay lands; elsewhere the forest consisted wholly of hardwoods.

Southern Minnesota, all of Iowa, northern Missouri, eastern Nebraska and Kansas, and northeastern Oklahoma composed the prairie⁴—a vast billowy sea of virgin grass without timber except

³ Hardwoods may be defined as broad-leaved trees which usually lose their leaves in winter. The wood produced from hardwoods may be either hard or soft in texture.

⁴ The French, who had never seen such large areas of grassland, called them *prairies*, which in French means "large meadows."



Fig. 115A. Tall Grass Prairie in the Flint Hills, eastern Kansas. This area is known as the "Bluestem Region." Note the cattle grazing. This posture has been grazed carefully and accordingly has an excellent stand of bluestem grasses and is remarkably free from weeds. It carries livestock at the rate of about one head per three acres on the basis of a six-months grazing season.



Photos courtesy of Kling L. Anderson, Kansas State College.

Fig. 115B. Short-grass steppe typical of central and western Kansas. This pasture, located in central Kansas, is better than most short grass pastures in the West because it has not been seriously depleted.

along the streams (Fig. 115A). It was *tall* grass with long blades and stiff stems, growing to a height of 1 to 3 feet and frequently 6 to 8 feet. Men and horses could be lost in it. The trees growing along the streams were chiefly cottonwoods, oaks, and elms in the western portion with occasional sycamores and walnuts farther east.

The true prairie extended from Illinois (small patches existed in western Ohio and northern Indiana) to about the 98th meridian, where it was gradually replaced by the short grass of the steppe (Fig. 115B). The boundaries of the prairie were never sharply defined. They were not the meeting place of two contrasted vegetation belts; rather were they broad mobile zones within which interfingering was common. Many interesting theories for the origin of the prairie have been advanced, but none as yet has been wholly acceptable to botanists, plant ecologists, and plant geographers.

Minerals

In the world's outstanding agricultural region, mining is in many localities also a cardinal enterprise. Coal, petroleum, natural gas, lead, salt, clay, sand, gypsum, phosphate, and building-stones provide a livelihood for large numbers and simultaneously supply the sinews for rail and motor transport and for manufacturing.

Coal. Coal deposits are widely distributed (Fig. 63) in three of the nation's leading fields—the Northern Interior, Eastern Interior, and Western Interior. While this coal, generally speaking, is not of such good quality as that mined in the Appalachian Province, its location near numerous manufacturing cities insures *cheap* coal and hence supplies a large part of the industrial fuel for the Midlands. The coal mines of Illinois employ about twice as many workers as the meat-packing plants. As the efficiency of power plants is improved, this region's coal may be used more successfully.

Petroleum and natural gas. Important oil and gas reserves have been tapped in Michigan, Ohio, Indiana, and southern Illinois (the Centralia-Salem Field). In 1940 this last field was one of the most active in the entire country and Illinois ranked fourth among American oil-producing states. Petroleum played an important role in establishing Cleveland,⁵ Chicago, and Toledo as early refining centers. The surplus gas from these fields is piped to near-by cities for industrial and domestic uses. Oil experts believe that as a result of deeper drilling this region, especially Illinois and Michigan, will obtain increased production.

⁵ Cleveland was the home of John D. Rockefeller, who founded the original Standard Oil Company.

Lead and zinc. At one time the Galena District in the Driftless Area of Illinois and Wisconsin produced some lead and zinc. The mining of these ores was an important stimulus to the settlement of this area, and for a few years Galena was better known than Chicago. Production is no longer of importance.

Salt. Michigan leads all states in the production of evaporated salt. In the environs of Saginaw Bay and Detroit, rock salt occurs at depths of several thousand feet. It is believed these deposits were formed from sea water—from isolated oceans or pre-historic inland seas which ultimately dried up. Water, piped to these deposits, dissolves the salt and the resultant brine is forced to the surface and evaporated.

Phosphate. Phosphate rock is produced in Tennessee, which ranks next to Florida in American production. The known reserves are placed at 200,000,000 tons of commercial grade—enough to last 200 years at the present rate of consumption. These deposits, which lie south of Nashville, are neither extensive nor rich but are important because of their position relatively near those parts of the country which use most of the commercial fertilizer and because of satisfactory transportation facilities.

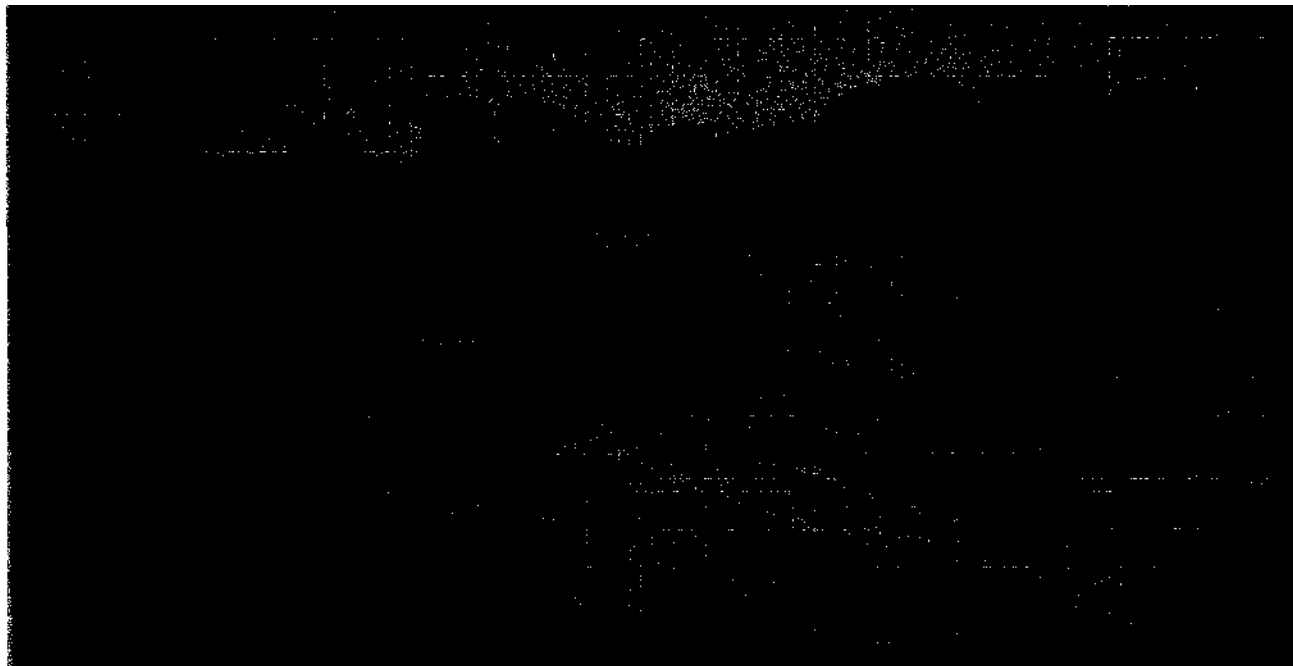
Most of the phosphate rock (61 per cent) is used in making superphosphate. Sulphuric acid is procured from the Ducktown copper smelter. New electro-chemical processes are being devised for producing a more concentrated fertilizer at several plants near Columbia.

Other minerals. Space does not permit discussion of all the minerals being worked in the Agricultural Interior. Gypsum is mined and manufactured over a large part of the area. Silica sand for glass is procured near LaSalle and Ottawa, Illinois, and elsewhere throughout the region. Widely distributed limestone and clay deposits have given rise to an important cement industry; individual plants serve territories within a radius of 100 to 200 miles. Considerable limestone also is crushed for road metal and some is quarried for building stone, especially in the Bedford-Bloomington area of Indiana (Fig. 116). This activity is declining in importance because of the difficulty of competing with cheaper materials—concrete, brick, and lumber.

Settlement

The Amerinds

For thousands of years what is now the Agricultural Interior was Indian land. While many tribes occupied this forested and grass-covered region, only the Iroquois and the Illinois are discussed here.



Building Stone Assn. of Indiana.

Fig. 116. *Quarrying oolitic limestone in the famous Bloomington-Bedford District of Indiana. This is probably the best building-stone in North America. Soft enough to be readily cut, it seasons well—ultimately becoming quite hard. It is also uniform in color and texture. Moreover, as seen here, the stone can be obtained in large blocks, for the beds are not cracked as are so many in other regions. The resource is ideally located in the densely populated part of the United States and the reserves are very great—capable of lasting many years.*

The Iroquois, the most advanced of the forest people, were good hunters and skilled farmers. The power and stability of the Iroquois Federation obstructed the advance of white settlers through the Mohawk Valley till after the Revolutionary War.

The Illinois and other prairie Amerinds lived in the wooded valleys and were not nomadic. From time to time the men hunted on the prairie, and perhaps once or twice a year the whole tribe left the villages for a week or more for the big hunt. By utilizing both wooded valleys and grassy prairies, they lived comfortably by hunting, by collecting roots, nuts, and berries, and by farming. With their primitive tools and no draft animals, these Amerinds could not farm the tough prairie grass. Accordingly they grew their crops—mostly corn, beans, and squash—in the wooded valleys, where they could girdle the trees with stone axes and dig the loose valley soils with primitive hoes and spades. Maize was the dominant Indian crop in that same subregion—the Corn Belt, now the world's center of corn production. Indian trails also marked the routes followed by pioneers and even by many railroads. Their village sites, influenced by geographic factors, foreshadowed the location of numerous present-day cities.

The Amerinds so adjusted themselves to their environment that the prairies and forests were virtually uneroded. Compared with what the white man has done since, the Amerinds left few scars on the land.

It should not be thought, however, that the Amerind did not change the landscape at all, for he burned the prairie each spring, believing this practice improved the land for game. As it became known that the prairie constituted North America's prize agricultural land, the white man transferred the Amerind to the semi-arid Great Plains—less valuable for agriculture but abounding in game. White men generally took the best farm land, leaving the least productive to the Indians. Thus a map showing Indian reservations in North America today indicates that the Amerind has been almost completely removed from the Agricultural Interior.

White settlement

Settlement in the Agricultural Interior flowed from three fountain heads: (1) New England, whose Puritans came by way of the Mohawk Valley to the Western Reserve and elsewhere, (2) the South,⁶ whose frontiersmen broke through the mountains of

⁶Virginia, Maryland, North and South Carolina.

Kentucky and Tennessee via Cumberland Gap,⁷ and (3) Pennsylvania, whose Scotch-Irish and Germans came via Pittsburgh and the Ohio River country as well as via Cumberland Gap. Thus, whereas only a million Americans were living west of the Appalachians in 1800, their numbers had increased by 1820 to 2,500,000 and by 1830 to 3,500,000.

Settlement was not in great hordes as by the Tatars in eastern Europe and adjacent Siberia, but rather by single families, scattered groups, or small companies.

European immigration is commonly divided into two periods: (1) that from northwestern Europe, consisting of English, Germans, Scandinavians, Bohemians, and Dutch—land-hungry people whose goal was a piece of unoccupied land that through tillage would insure a living, and (2) later immigrants—Poles and southern Europeans who settled largely in urban centers of the eastern half of the region to become industrial workers.

The American pioneers had a heritage of forest—not prairie—their forebears having come from humid forested Europe. They were surprised and suspicious of the grasslands, reasoning that soils bearing no timber must be inferior. In 1836 Alby Smith, an Illinois pioneer, lost an election because the voters decided that anyone so stupid as to settle in the prairie should not be entrusted with the responsibilities of public confidence.⁸

The prairie did not furnish the much-needed building materials, fuel, fencing, and water. There was also the menace of prairie fires and the terror of the winter blizzard. Naturally the early settlers first sought wooded valleys for their farms. These they cleared, the trees furnishing wood for house, fuel, and fence posts.

The taming of the prairie was not easy, for the iron plows then in use would not "scour" in the heavy soils and many of them broke. The soil stuck till the plow couldn't move in the furrow. The prairie was really not conquered until 1837 when John Deere, a blacksmith living in the tiny village of Grand Detour, Illinois, invented the steel plow.

The pioneers got the land for almost nothing. The first Homestead Act, that of 1862, enabled farmers to acquire tracts of 160 acres, and the western portion of the Agricultural Interior was mostly homesteaded under this act. Some of the best farmland in

⁷ The absence of a strong tribe at or near the western end of this gap accelerated the westward movement.

⁸ Harlan H. Barrows, "Geography of the Middle Illinois Valley," *Illinois Geological Survey, Bulletin* 15, 1910, p. 78.

Illinois was purchased in the middle of the nineteenth century for \$1.25 an acre.

The present occupance

Figure 131A shows the distribution of population in this region. The average density is higher in the eastern portion than farther west as a consequence of the many large cities and the smaller farms. The larger of these cities, however, owe their importance to the Great Lakes and to manufacturing rather than to agriculture.

Farming has become so highly mechanized that all the children can no longer remain on farms. Hence large numbers of youths annually migrate to the cities and bolster up the low urban birth rate. Without them American cities could not maintain themselves. One out of every three urban workers came from villages and farms during the decade 1920-1930. Rural areas serve as the population seed bags of the nation.

O. E. Baker points out the difference between rural and urban birth rates as follows:

Let us take ten people in our rural regions, where there is now about 30 per cent surplus in children above the number necessary to maintain population stationary. They now have thirteen children. If this ratio can be retained these children, after they grow up, will have seventeen children and these in turn will have about twenty-two children. A century hence such population will have doubled.⁹

Ten adults in our large cities are now raising only about seven children. Should present birth rates persist, these seven will have only five children and the five only three and one-half. If there were no migration between city and country or from abroad, New York City in three generations, or a century, would have only about one-third the people it has today.¹⁰

The population north of the Ohio River contains foreign as well as American stock, the principal nationality other than British in the rural communities probably being German. South of the Ohio, the white stock is almost all native. The large Negro population with its low standard of living has always discouraged recent European immigrants from settling here because they were loath to accept the subordinate social status implied in manual employment where the colored population is large. Lower wage rates have been a contributory factor also.

⁹ O. E. Baker, "The Future Need for Farmland," address for Farm and Home Week, Iowa State College, Ames, Iowa, February 9, 1934, p. 27.

¹⁰ O. E. Baker, "That Other Farm Crop—The Human One," *The New York Times Magazine*, October 25, 1936, n. 3.

Fig. 1 17. New York's provincialism is notorious. Her citizens, losing their perspective with regard to the rest of the country, become ignorant of what lies only a short distance west of the Hudson River. New York, however, is not the United States! It is but the face the nation presents to the world. (Reproduced with permission of copyright owner.)

The Mixing Bowl of America

Some believe that the United States is but the area that lies east of the Alleghenies and that all the territory beyond is wild and uncouth. Some New Yorkers believe New York is synonymous with the United States (Fig. 117). Those who have traveled widely and have studied Anglo-America, however, know that the great ethnic mixing bowl, the part ranking high in "American" quality, past and present—the most completely assimilated part of the continent—is the Agricultural Interior. Here, through migration and westward movement, the first immigrants became in reality Americans rather than transplanted Europeans. The melting pot has melted most here—more in the western than in the eastern part and more in rural than in industrial areas. This people is largely classless and democratic. "Here soil and climate, forests and rivers, transform men of all ranks and origins into the citizens of the [Middle West] . . ." ⁿ

Agriculture

The leading business is farming, for which the natural environment is highly favorable. The land is not too hilly or stony, the precipitation is generally adequate for all crops, the growing season is sufficiently long to mature all products save those needing more than six months free from killing frost, and the soil is generally fertile. But even though agriculture dominates, no simple system of farming such as characterizes the Cotton Belt exists.

Throughout the greater part of this region the country appears to be under complete cultivation, with 4 or 5 farmsteads to each square mile (Fig. 113)—more in the eastern portion, fewer in the western portion. The farms comprise fields based on the subdivision of sections—half-sections, quarter-sections, and 40-acre plots. Nearly all farms are family-operated. Corn, winter wheat, spring oats and hay are almost universal crops, with soybeans gaining annually in acreage. Tobacco and fruits are important locally, and much land is in pasture. The region not only grows tilled crops but supports the densest population of cattle, horses, and swine in North America.

¹¹ H. W. Odum and H. E. Moore, *American Regionalism*, p. 471. New York: Henry Holt & Co., 1938.

Systems of farming

Mixed farming characterizes most of the region, with the major emphasis on corn in nearly all parts. Since the climatic range of corn is more restricted than that of other crops grown, it gets first choice of the land. Corn is a very productive crop, yielding about twice as much feed per acre as wheat and oats. Corn yields the



L I L
Courtesy of John D. Gere, Moline, Illinois.

Fig. 118A. The new mechanical method of harvesting small grains. This combine pulled by a tractor is small when compared with the type used on the Columbia Plateau and in the Hard Winter Wheat Belt. It is well adapted to this region, however, and is replacing the grain binder because it is more economical of time and labor. It cuts 20 to 30 acres a day, threshes and cleans the grain, and delivers it into a tank from which it may be drawn into a truck or wagon.

largest money return of any of the cereals. Other crops are grown (1) to equalize the seasonal distribution of labor, (2) to provide balanced feed for livestock, and (3) to improve the soil—the rotation preferably including a legume.

The most widely used rotation consists of (1) a tilled crop, (2) a small grain, and (3) a legume or grass crop, grown in this order. On the choicest soils a five-year rotation is followed—(1) corn, (2) corn, (3) oats or soybeans, (4) winter wheat, and (5) clover.

The flat to undulating land which favors the use of labor-saving

machines has stimulated the formation of larger farms. By utilizing tractors, drills, multiple-row cultivators, corn pickers, and combines (Fig. 118A), the larger acreage can easily be handled without additional labor. One farmer in 1930 did as much crop work as three in 1830. That American agriculture, centered primarily in this region, has been revolutionized is indicated by the fact that more farm implements and techniques have been invented,



Courtesy of International Harvester Company of America, Inc.

Fig. 118B. The cradle was the most efficient means of cutting grain prior to the invention of the reaper in 1831. It consisted of a broad scythe with a light frame of four wooden fingers attached to it and corresponding in curvature and length to the blade. By a dexterous turn to the left the operator could throw the cut grain into a swath, ready for raking and binding into sheaves. The cradle was introduced into America about 1776 and was in common use as late as 1840. This crew of six men could cut and bind about six acres per day.

discovered, or perfected in the past hundred years Fig. 118B than during all the preceding centuries of human history.¹²

Winter wheat dominates the semi-arid western margin; spring wheat, the northwest border; hay and oats for dairy cattle, the cool moist northern border; tobacco, parts of Kentucky, Indiana, Wisconsin, Tennessee, Ohio, and Ontario. Fruits and vegetables are

¹² H. A. Wallace, "Machines and the Farmer," *Christian Science Monitor*, Weekly-Magazine Section, September 14, 1940, p. 1.

important on the "light soil and lake-locked peninsulas of Michigan and Ontario."¹³

In the southern part of the region, as a result of significant physiographic differences, no one or two crops predominate, though corn, wheat, and hay are most important. In several counties in the **Blue Grass and Highland Rim** subregions, tobacco is the crop of **greatest value**.

Crops

Corn thrives under the favorable conditions of hot, humid summer weather, fertile, well-drained loamy soils, and level to rolling topography. No other country has this favorable combination of growing conditions over so wide a territory. Thus the United States produces one half to two thirds of the world's corn, most of which is grown in this region (Fig. 112). Corn has rigid temperature requirements; it should have an average night temperature above 55°F., an average summer temperature of 70° to 80°F. up to the time of ripening, and a growing season of at least 130 days. Corn benefiting from frequent showers in June and July has been known to grow as much as two inches in 24 hours. Soils should be deep, well-drained, fertile, and rich in humus. The terrain should be level or undulating to permit the utilization of labor-saving farm implements and to retard soil erosion—always destructive on slopes where clean-tilled crops are grown. With this favorable combination of environmental conditions, yields are of 50 to 100 bushels per acre on the richest soils. The high yields obtained in the Corn Belt subregion are partially attributable to the introduction of hybrid corn. The United States Department of Agriculture estimates that, perhaps before 1950, 80 to 85 per cent of the corn acreage in this area will be planted to hybrids.¹⁴

The heaviest concentration is (1) in central Illinois and Iowa, where considerable corn is sold for cash, the growers being grain farmers and not feeders, and (2) along the Missouri River between southern Minnesota and northern Kansas (Fig. 112). Corn is the only important feed grain produced in the southern and southeastern part of the region, oats dropping out because of high summer temperatures.

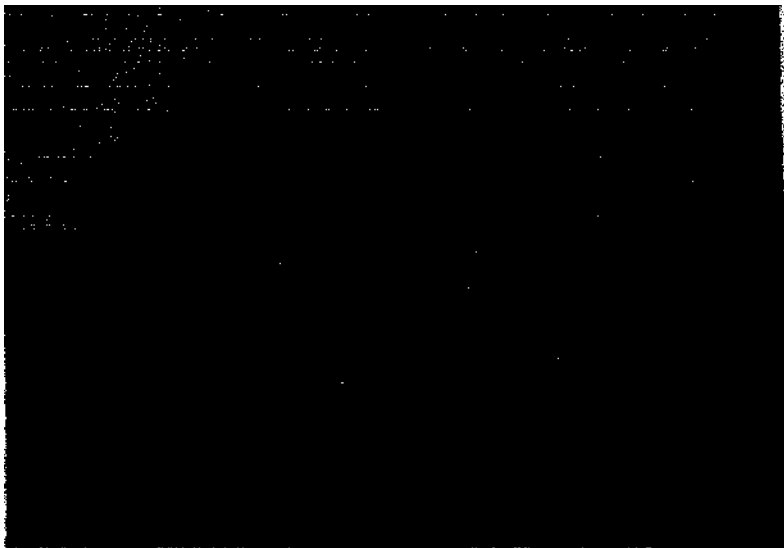
Because corn is bulky in proportion to value, it cannot be shipped as long distances as many other crops. More than three fourths of

¹³ Mabel C. Stark and Derwent S. Whittlesey, *Major Geographic Regions of North America*, p. 31. Bloomington, 111.: McKnight & McKnight, 1923.

¹⁴ United States Department of Agriculture, *Technology on the Farm*, p. 22. Washington, D. C.: Government Printing Office, 1940.

it is fed to hogs, cattle, horses, and poultry, which really made Midwestern agriculture possible. It is patent then that a very close correlation exists between the distribution of hogs and cattle on the one hand and corn on the other.

Only outside the Corn Belt portion of the region is corn put up in picturesque shocks, because this operation requires much hand labor. Instead the crop is hand picked or is reaped by machines,



Courtesy of Farm Security Administration,

Fig. 119. A new way of harvesting corn—the corn picker. This machine operated by two men can harvest as much corn in a week as 16 handpickers. It removes the shucks from the ears two rows at a time and elevates the ears to a wagon attached in the rear. The corn is then ready to be cribbed.

is hogged-down or grazed-off (Fig. 119). Hand picking still leads all other methods.

Winter wheat is the only major cash crop extensively grown. It is secondary to corn which, as just noted, has a more restricted range of adaptation. It also is produced to equalize the seasonal distribution of labor, being seeded in autumn after corn cultivation is over and threshed before corn is harvested. Wheat harvesting interferes slightly with corn cultivation, though the competition is not serious. On the better soils corn is slightly more profitable than wheat, but even where corn finds optimum conditions, wheat remains a strong

potential competitor. Important also in this competition is the fact that wheat yields usually are higher here than elsewhere in North America. Wheat is not so important in the northern part of the region because winters are too severe and there is too much rain in June and July. Nor is it as important in the heart of the Corn Belt as might be supposed, since a spring grain is preferred to follow corn. Oats, therefore, is the choice.

Wheat becomes more and more important in the western and southwestern parts of the region because of the more favorable natural environment and the increasing distance from markets.

Though the entire Canadian production of winter wheat is grown in southern Ontario, it constitutes only 5 per cent of the total Canadian crop.

Oats. The Agricultural Interior is the most important oats-growing region in North America. Unlike other small grains, oats does not compete with corn but fits into the characteristic crop rotation of the region. It is seeded in the spring before work on the corn crop begins and is cut in summer when corn cultivation is about over. Oats, sometimes grown as a nurse crop for clover and alfalfa, provides excellent feed for livestock—milk cows, swine (except in the fattening stage), and especially horses. Motorization of road transport and of farm work, however, has been a big blow to this crop. At the close of the first World War, the 29 million horses and mules in the United States consumed the output of 90 million acres of crop land and pasturage. By January 1, 1934, the number of horses and mules had dropped to 17 million, which released more than one third of the acreage formerly devoted to feed crops. This decrease was most serious in the Agricultural Interior.

The Corn Belt climate is not ideal for the best growth of the oat plant, which, being a cool-weather cereal, cannot stand heat so well as corn. It thrives best in a cool moist climate. Occasional droughts in May and June both reduce the yield and lower the quality of this grain.

Alfalfa, a legume, is well adapted to the region—especially to the prairie portion, where winter rainfall is less abundant and the soils less leached and hence higher in calcium. It thrives only on soils rich in lime.

Since alfalfa is harvested several times each season and recovers quickly after cutting, the per-acre yield exceeds that of any other hay crop. Its water demands are enormous, a ton of cured alfalfa requiring 858 tons of water—two or three times that required for

an equal amount of cereals.¹⁵ Fortunately, alfalfa sends roots deep into the soils in search of water. Its roots grow 6 or more feet per year on some soils and occasionally reach a depth of nearly 30 feet.

Clover, another crop of major importance, is well suited to the hot humid summers, limy soils, and level to rolling terrain. Especially is it important in the northern and eastern sections where precipitation is heavy and where droughts and hot sun do little damage. Ninety-eight per cent of the nation's clover is grown east of the Dakotas, Nebraska, and Kansas.

Soybeans were introduced into the United States as early as 1804 but became a major crop only about 15 years ago. The government sent explorers to the Orient to get thousands of varieties of soybeans for breeding. From these, strains superior to the original were developed. Probably the greatest stimulus came when it was recognized that soybeans could be processed for oil. United States production jumped from 9 million bushels in 1930 to 58 million in 1938. The United States now ranks second only to Manchuria in seed production. The soybean belt extends from Iowa to Ohio, with Illinois the leading producer.

The soybean, a shallow-rooted legume, is a heavy feeder on the elements of plant food in the surface soils. It is ideal for this region because it yields a heavy crop of seeds, is valuable for meal and oil, makes good hay, silage, and pasturage, has few diseases, and is not attacked by pests. Every part of the plant is useful, and a list of its uses fills a page of fine print.

Tobacco. In north-central Kentucky, southwestern Ohio, and northwestern Tennessee lies one of the most important tobacco-growing areas in the country (Fig. 49). Southern Wisconsin and southwestern Ontario also are important areas. Little tobacco is grown west of the Mississippi River.

Soil and climate, the most important factors contributing to the reputation of tobacco, cannot be replaced by any known science.¹⁶ Soil is more important than climate, for upon it apparently depend the aroma and the flavor.

The Blue Grass Area of Kentucky is the most important tobacco-growing area in the Agricultural Interior. Since the labor requirements for tobacco are large and the work back-breaking, a given family cultivates only a limited acreage. Whereas most

¹⁵ T. A. Kiesselbach and A. Anderson, "Alfalfa Investigations," *Nebraska Experiment Station Research Bulletin No. 86*, 1926.

¹⁶ "World Market in Tobacco," *International Review of Agriculture*, November 1928, Vol. XIX, pp. 931-942.

tobacco farms are operated by owners, actual production is in the hands of sharecroppers who rent 5 to 20 acres of land—the size of the tract depending upon the number in the cropper's family or the amount of labor he expects to hire.¹⁷

The limy soils, high in phosphorus, are among the best in Anglo-America. In the Inner Blue Grass, though more than 90 per cent of the land is improved and has been producing for generations, little soil depletion has occurred. Maximum yields of white burley tobacco are obtained on the silt loams and level to undulating terrain. The same type of tobacco is grown under almost identical conditions in the Nashville Basin.

Dark-fired tobacco is grown on the rather fertile rolling lands of the North Highland Rim, whose climate is relatively free from extremes and whose location is favorable with respect to markets. In this area tobacco is the pivot crop, and around it revolves the whole system of farming. The average tobacco farm has, besides some land in pasture, about 12 acres in tobacco and a similar amount in each of corn, hay, and wheat. A 4-year rotation is followed by the more progressive farmers, in which tobacco is followed by wheat, hay (frequently the legume, lespedeza), and corn. In the area as a whole, corn leads in acreage.

While tobacco is not generally considered an important Canadian crop, it is the leading one in several counties bordering on Lake Erie—particularly Norfolk County. The Dominion's first commercial tobacco production (heavy varieties) was on the clay and loam soils in the western counties of Ontario. Now the industry is centered considerably eastward. Three fourths of the soils of Norfolk County are sandy—poorly adapted to most crops but well suited to growing flue-cured tobacco. The climate, too, is favorable; killing frosts are conspicuously rare after the first week in May and prior to the last week in September. In 1932, 850 farms covering 26,000 acres produced 25,000,000 pounds of bright-leaf tobacco. This production was small compared with that of the United States, but it was very important to Canada.

Fruit. The growing of fruit is not a widely distributed enterprise but is concentrated in definite localities—mostly those originally timbered, for tree fruits do not need extremely fertile soil. Tree fruits, more exacting in climate than in soil requirements, suffer from extremes of temperature. Hence areas best suited are those with a minimum of danger from late spring and early fall frosts—notably peninsulas and the leeward sides of large lakes.

¹⁷ D. H. Davis, "The Blue Grass Region of Kentucky," *Journal of Geography*, April 1926, Vol. XXV, No. 4, p. 130.

The Livestock Industry

The Agricultural Interior grows feed for livestock rather than food for man. In few areas elsewhere in the world is the system of farming based to so large an extent upon livestock. For example, about three fourths of the income of Corn Belt farms comes from livestock and only one fourth from the sale of crops. Swine are most numerous where corn, a fat-producing feed, is most abundant

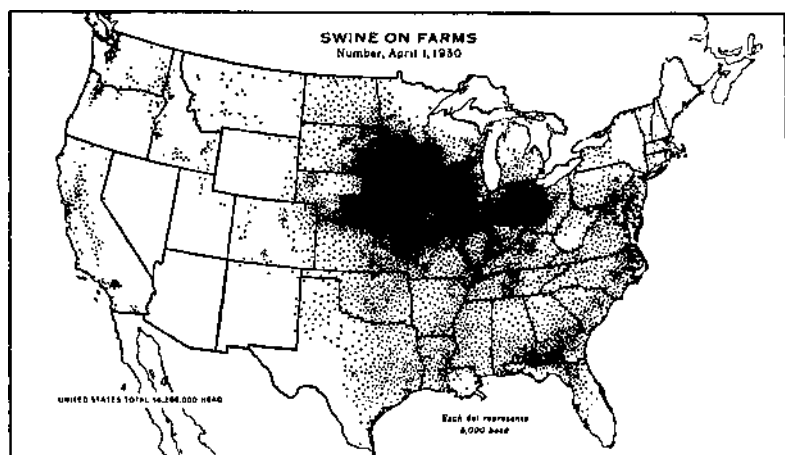


Fig. 120. Distribution of swine in the United States. The Agricultural Interior rears about three fourths of Anglo-America's hogs and pigs, the Corn Belt alone accounting for two fifths of them. As the cool Hay and Dairying Subregion finds the best outlet for its crops in feeding dairy cows, so the warm Corn Belt Subregion finds the best outlet for its crops in feeding swine and beef cattle. Note the close relation of the maps of corn and swine.

and cheapest. They are less important within a radius of 100 miles of Chicago, where the price of corn, because of low freight rates, enables it to be sold as grain. Beef cattle are widely distributed throughout the region but are especially numerous in the prairie portion where pasture is cheapest. Dairy cattle are densest in the northern part, where physical conditions, especially cool summer temperatures, are highly favorable, and in the eastern portion where industrial centers provide large markets for fluid milk.

Swine, of all domesticated animals, convert corn into meat most efficiently. Three fourths of those in the United States are reared in this region, where the density is about 4 times the average of that

in the remainder of the country (Fig. 120). Swine enable farmers to save transportation costs by marketing their corn on the hoof.

The areas of heaviest hog production lie in the western part of the Corn Belt where corn is cheapest and can move to market only in the form of livestock. It is more economical to ship one pound of hog than 5 pounds of grain (roughly the quantity required to produce one pound of live weight).

Beef cattle are most numerous in the central and western parts of the region—in the prairie portion—for, unlike swine, they are essentially grass eaters. Since cattle lose more weight in rail transport than hogs, the tendency is to fatten them close to the main rail line within a single night's journey of the great markets. Few live cattle are now sent from the western part of this region as far east as Buffalo, Cleveland, and Pittsburgh. Slaughtering and meat packing characterize the cities in the western part of the Corn Belt or on its margins—Chicago, Kansas City, Omaha, East St. Louis, St. Joseph, Sioux City, and South St. Paul-Minneapolis (Fig. 121).

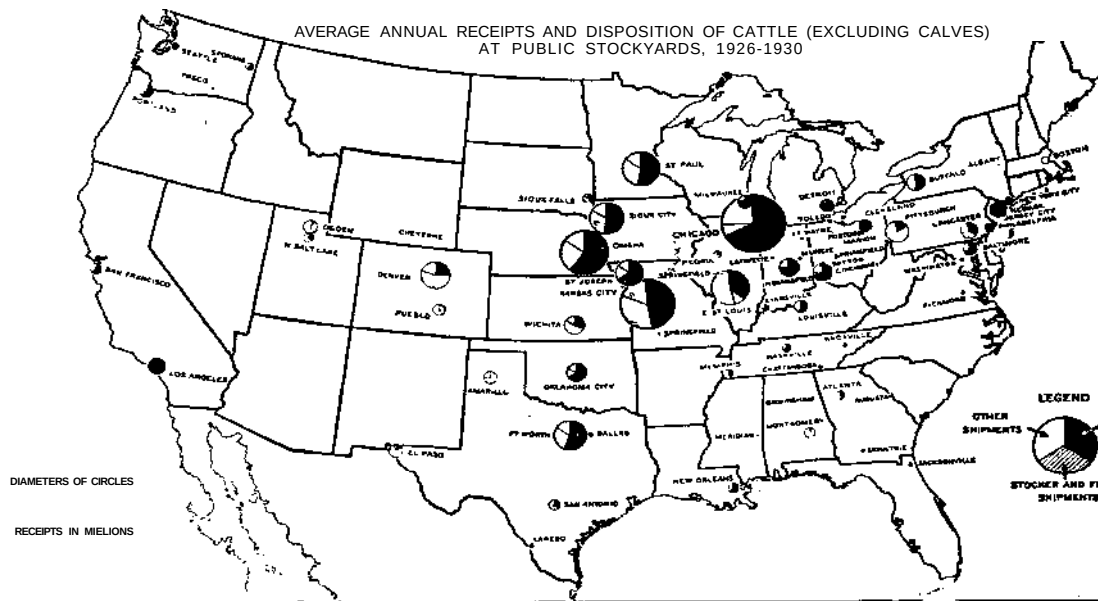
Contrary to the common notion that the range states provide only the grazing and breeding lands and the Corn Belt the fattening areas, the fact is that about two thirds of the animals slaughtered within the Corn Belt are bred within it.

Feeding is a major agricultural enterprise in the western part of the region, the animals being carried through the winter on hay and other home-grown feeds and fattened on corn. Most cattle feeders keep swine, which run with the cattle and act as scavengers. These animals root out of the ground and manure the corn which has spilled from the feeding bunks and which the cattle will not touch (Fig. 122).

Dairy cattle and dairying. In the heart of the Agricultural Interior, mixed farming based on corn and meat animals is the most profitable enterprise, though nearly every farmer keeps milk cows for home supply and to utilize pasturage advantageously. Moreover, dairy cows provide the farmer with profitable winter work which would be impossible if crops only were grown.

The "dairy cow belt," however, lies in the northern and eastern portions of the region—outside the Corn Belt. Dairy farms tend to concentrate there because of favorable climate (cool summer temperatures and heavy summer rains), rough moraine plains covered with glacial drift, thousands of spring-fed streams, good pastures, relatively cheap winter feed,¹⁸ and a concentrated population. While this area is not so well located as New England with respect

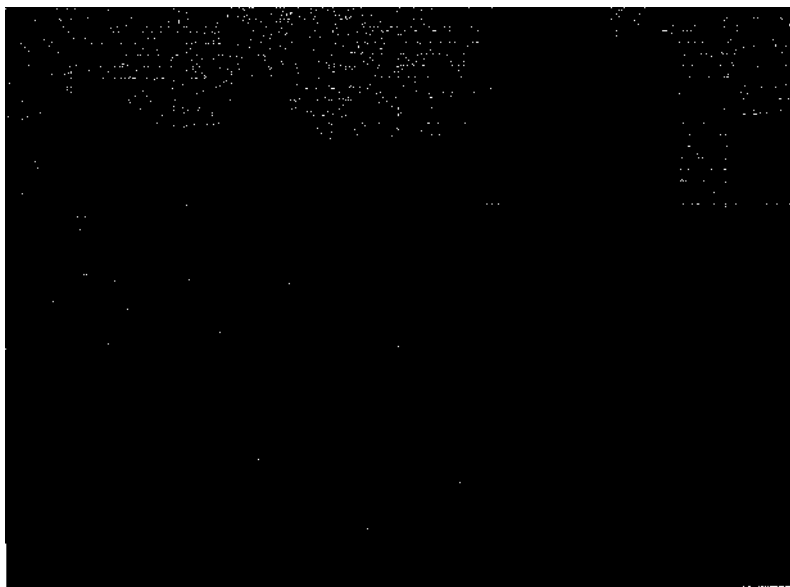
¹⁸ This is the outstanding hay-producing area of the United States.



Courtesy of Bureau of Agricultural Economics.

Fig. 121. Distribution of slaughtering and meat packing in the United States. Because this industry is characterized by a considerable reduction in bulk in the manufacturing process, it has located near the grazing and fattening grounds. Moreover, since two thirds of the livestock is reared west of the Mississippi River and two thirds of the population (consumers) lives east of it, meat should be packed in the livestock-raising areas. Chicago leads with Kansas City, Omaha, East St. Louis, and South St. Paul approximately tied for second place. The five leading meat packing centers are thus located in the Agricultural Interior Region. There are many small plants near every large city and many local abattoirs which draw their livestock from nearby and market the bulk of their products locally.

to markets for fresh milk, feed costs are lower. Except for the fertile level plain on either side of the Illinois-Wisconsin line, which specializes on fresh milk rather than on corn and meat, the portion of this area west of Lake Michigan generally goes in for manufactured dairy products—butter, cheese, evaporated milk and casein. The farther farms lie from cities, the higher the transport cost on



Bureau of Agricultural Economics

Fig. 122. Swine and cattle on a feeder lot in the Corn Belt. When cattle are fed in this region, they are invariably followed by hogs which pick up the corn wasted by the cattle.

fluid milk, which, being 87 per cent water, is the most expensive of all dairy products to ship.

Creamery butter is produced in most of Wisconsin, southern Minnesota, northeastern Iowa, and southern Michigan, because it has high value per unit of weight, can stand costly transportation to the population centers in the East, and does not deteriorate.

Cheese also is manufactured in this dairy belt, but usually in areas with more pasturage and poorer transportation. Formerly the product of small factories, it is now being made in increasing

quantities by corporations. The absence of cheese factories from central Wisconsin and central Michigan is due mostly to sandy soils which do not produce good pastures but do grow quality potatoes and rye. Wisconsin is the leading state in the manufacture of cheese, producing about two thirds of the nation's total—67 per cent of the Swiss, 50 per cent of the Cheddar, 97 per cent of the brick, and 65 per cent of the Limburger.

Condensed milk products are made throughout the "cow belt," Wisconsin alone contributing 28 per cent of the nation's total. Condenseries are generally located in outstanding dairy areas where large quantities of milk are available.

Horses still do the heavy work on the smaller farms and some tasks difficult for tractors to perform on the larger ones. As to which affords the cheaper power on "family-sized" farms, there is considerable controversy.¹⁹ Some farmers do better with power machinery, others with horses, and still others with both tractors and horses. Mechanization has certainly reduced the number of horses in the region and induced some shifts in land use.

Problems of the Farmers

Erosion

Erosion did little damage in this region so long as the Amerind was its custodian. The white man, however, put as much land under the plow as he could and in an amazingly short time erosion had set in on all but the most level parts. As early as 1859 Baron Justus von Liebig, famous German chemist and agriculturist, said of the then prevailing methods of handling the lands:

The American farmer despoils his farm without the least attempt at method in the process. When it ceases to yield him sufficiently abundant crops, he simply quits it, and with his seed and plants, betakes himself to a fresh farm; for there, is plenty of good land to be had in America; and it would not be worth his while to work the same farm to absolute exhaustion.²⁰

The surface soil over much of the region has been removed at an almost catastrophic rate. Illinois, one of the best Corn Belt states, where row crops dominate the farm system, has lost over a large proportion of its area 4 inches of its most productive soil in half a

¹⁹ Dale Cox of International Harvester Company of America states that that company has not been able to arrive at a wholly satisfactory conclusion as regards the farm power issue; that it is impossible to make out a clear case either for the tractor or for the team. *Cleveland Plain Dealer*, June 10, 1941.

²⁰ R. M. Salter and others, "Our Heritage—The Soil." *Bulletin 175, Agricultural Extension Service*, p. 3. Ohio State University, 1936.

century. At this rate the remaining topsoil would disappear in a similar period. Conservation measures, however, are now being practiced by many farmers. With reasonable care, erosion can be checked and soil can become a permanent natural resource.

Inflation of land values and its consequences

The pioneers procured the choice land of Anglo-America for nothing or for as little as \$1.25 per acre. Even as late as 1877 good land in central Iowa could be purchased for \$7 per acre. It increased in value, reaching the top in that state in 1918 at \$100 to \$500 per acre. The goad was the first World War and the terrific demand it brought for bread and meat. By 1921, however, Europe was no longer a heavy buyer of these commodities and prices in the great heart of American agriculture slumped. Thousands of farmers had mortgaged their farms and were heavily in debt. Depressed agricultural prices prevented many of them from paying interest on mortgages and the sheriff "sold them out." Thus did the nation learn a bitter lesson in mortgage foreclosure.

Homesteading is definitely over in this region. No longer is there any *cheap* land that is at the same time *good* land. Even in 1941 the best farms valued at \$100 to \$150 per acre were showing signs of inflation, since land appeared to be a good investment.

Obviously not every country boy can now start for himself as a farmer with only:

... a plentiful supply of grit, a wagon, a team, a plow, and a wife. Land prices are high and modern farming requires stock and tools in considerable amounts. To be successful the modern farm'boy also' needs more than the "3 R's" which constituted almost the entire education of his [grand]father.²¹

So far as his own efforts are concerned, he must be a renter or must find a new vocation. In much of the region only one fourth of the real estate, based on value, is owned by the men who farm it. Tenancy is running high in this region of expensive land.

Transportation

In the Agricultural Interior, which constitutes the crossroads of the nation (Fig. 123), transportation is of the best. Until railroads penetrated and spun a web over the area, interior location was a distinct hardship.

²¹ Warren S. Thompson, *A Handbook of Social Psychology*, p. 68 Worcester. Mass.: Clark University Press, 1935.

Waterways

Because the Great Lakes and the Mississippi River system appear to be more vital to the people in the American Manufacturing Belt (Chapter XIII) and the Northern Continental Forest (Chapter XIV), water transportation is discussed in those chapters.

Railroads

Prior to 1850 the principal avenues for the disposal of farm products were (1) the Mississippi and its navigable tributaries and (2) the Great Lakes with their eastern connections.

The first railroads in the Middle West were not built as competitors to navigable waterways but as links connecting them. The rapid extension and improvement of railway facilities after 1850, however, profoundly changed agriculture and manufacturing and revolutionized the whole course of internal trade. Railroads, by spanning the great interior with a network of steel rails, stimulated the growth of cities and the development of manufacturing (Fig. 123A).

Roads

The truck and the automobile have revolutionized transportation in the twentieth century almost as much as the railway did in the nineteenth. Approximately one third of the nation's total mileage of highest-type surface roads is in the Middle Western states (Fig. 123B). One of the main problems connected with agriculture is the provision of adequately coordinated distribution. Good roads are a prime factor in bringing the farm nearer the major centers of consumption. Nearly every farmer has a car or a truck or both? using the former for pleasure and the latter for hauling farm products to market.

Over much of the region, roads run in east-west or north-south lines 100 miles at a stretch. Most roads follow section lines and are a mile apart. This marvelous highway system can be best seen only from the air.

The lone disadvantage of such a road system is that distance is increased to towns and villages in those cases where the farms are not in one of the cardinal directions from them. A farmstead 3 miles from a village as the crow flies may be $4\frac{1}{4}$ miles from it by highway.

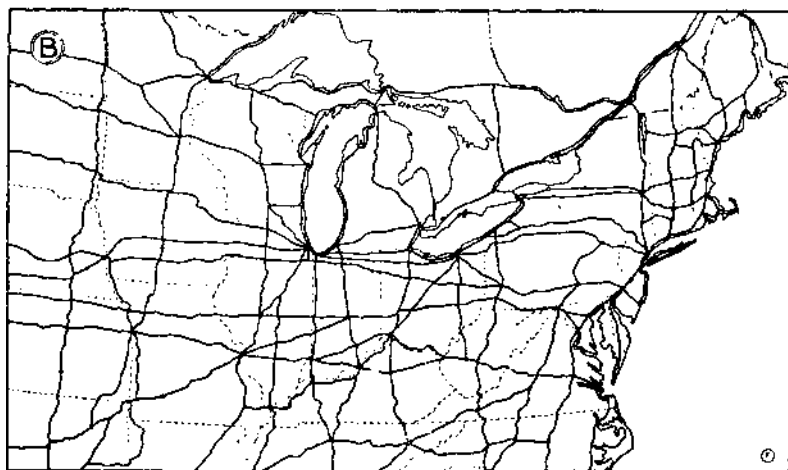
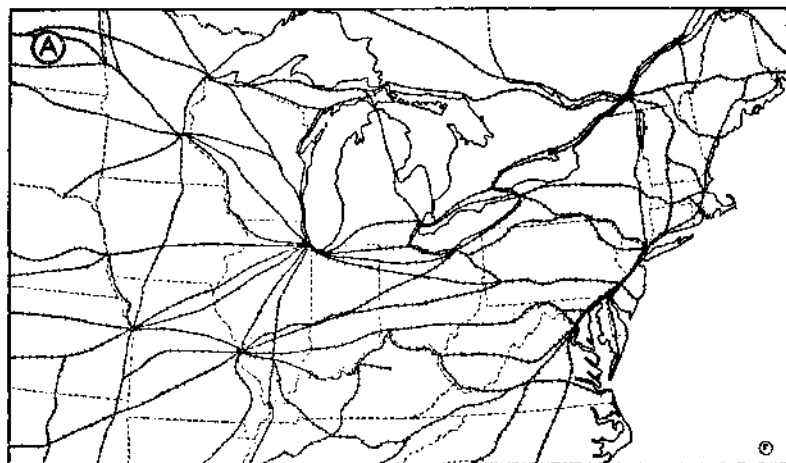
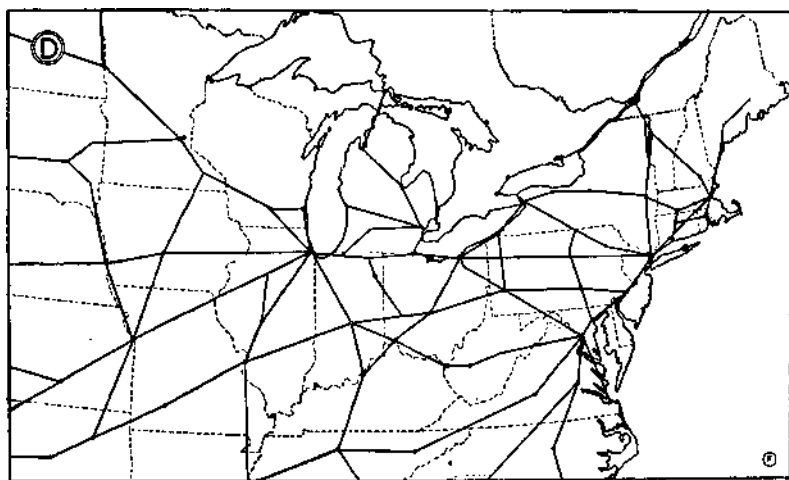
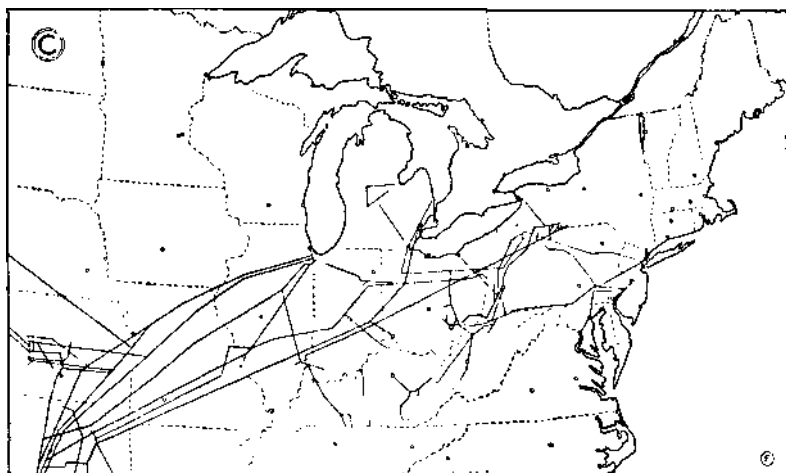


Fig. 123. Transportation: (A) Railroads. (B) Highways.
The Agricultural Interior and the American Manufacturing Belt could



(C) Pipelines. (D) Airways,

hardly be better served than they are now by transport facilities.

Trade

Where commercial agriculture prevails, where types of farming are diverse, there must be great dependence upon distant markets. Accordingly farming in this region is geared into the national economic machine and in some cases into international economy. This trade is greatly facilitated by easy transportation across the flat to undulating plain, which characterizes much of the region.

Manufacturing

Manufacturing is certain to develop in areas rich in varied farm products and useful minerals and favored with efficient transportation facilities and active commerce. Thus the Agricultural Interior is peppered with small cities primarily devoted to industry. Most of the large urban centers in the Middle West are of the American Manufacturing Belt rather than of the Agricultural Interior. Because manufacturing has become so important in the Middle West, it has been stated that "economic and political power has shifted into the hands of the great industrial barons."²²

Nearly every type of manufacturing is well represented, but this chapter considers only (1) industries firmly rooted in the soil—the slaughtering of cattle and hogs, the milling of wheat, the conversion of corn products, the making of shoes, the canning of vegetables, the manufacture of tobacco products—or (2) those having to do with agriculture, such as the manufacture of farm machinery.

The conversion from a rural frontier into a full-fledged urban development occurred in less than a century. It was made possible by the utilization of steam and water-power and the replacement of hand tools. As a result, armies of workers left the farms. The recentness of the movement is shown by the fact that the transmission of electric power over high-tension lines dates from only 1910.^{2a}

A certain amount of decentralization—a movement from the large city to the small town or village—is taking place, in response to lower wages and taxes, fewer strikes, cheap power, efficient transportation (hard-surface roads and motor trucks), and the telephone.

The second World War brought new industries to this region.

²² Progressive Education Association, *The Role of Education in Utilizing Regional Resources*, Chapter X V I, p. 2, 1939.

²³ Percy W. Bidwell, "Industry Goes Rural," *Economic Forum*, Vol. IV, No. 1, July 1937, p. 23.

Because of the great cruising range of bombers, the federal government advocated that many munitions and airplane industries locate in the interior—between the Appalachians and the Rockies. Immediately the airplane industry gravitated from its original bases on the two seaboard into Middle West.

Typical industries

Meat-packing. Prior to the development of big cities, slaughtering was a local enterprise. The first concentration of slaughtering and meat-packing took place at Cincinnati, which predominated as long as its tributary area led in the rearing of livestock. After cattle-rearing developed farther west, meat-packing followed (Fig. 121).

At present about two thirds of the livestock of the United States are reared west of the Mississippi River, though about two thirds of the people live east of it. Meat-packing in recent years has been migrating still farther west into areas where range animals are sent for winter fattening, a response to the proximity of grazing lands, feedlots, and rapid transportation. The refrigerator car, which was developed about 1880, has enabled the industry to overcome the handicap of geographical location. Since only 70 to 75 per cent of a hog is pork and only 50 to 60 per cent of a steer is beef, transportation costs are reduced when slaughtering houses are located near grazing and fattening areas.

Agricultural implements. Until pioneers poured through the Appalachian barrier into what is now the Agricultural Interior, farming methods had changed little from earliest times. The combination of favorable conditions, however, stimulated the invention of remarkable machines that surpassed anything the world had previously known. Cincinnati, the first important agricultural implement center, predominated for about two decades following the Civil War, and then was replaced by Chicago. Since agricultural implements are bulky, this industry located as near as possible to the farmers who used them. The present Anglo-American farm requires about 10 tons of steel in the form of labor-saving machines. Chicago (International Harvester), South Bend (Studebaker), Moline (John Deere), Peoria (Caterpillar Tractor), Racine, Beloit, Janesville and other cities share in this branch of manufacturing.

Shoes. The shoe industry was formerly localized almost entirely in Massachusetts, but by 1935 that state had only 21.7 per cent of the shoe workers of the nation. Because of high freight rates on

both raw materials and finished products, shoe manufacturing is moving toward the center of the continent. St. Louis, the leading shoe center in this region, is near a great supply of hides and is strategically placed with respect to the distribution of population. This industry has developed important centers in southeastern Wisconsin, northeastern and central Illinois, and southern Ohio.

Corn products. About 85 per cent of the 2,500,000,000 bushels of corn grown in the United States in an average year is fed to livestock on farms. A small amount, however, 60 to 80 million bushels, serves as the raw material for a variety of prepared foods and industrial products—corn flakes, corn syrup, corn oil, corn meal, corn starch, dextrose-sugar, alcohol, paper, rayon, fiber board, and stock feed. Chicago is the center of this industry. Northeastern Illinois, within a radius of 100 to 150 miles of Chicago, sells its corn as grain and not in the form of livestock. This proximity results in corn prices being generally 5 to 10 cents higher per bushel than on farms west of the Mississippi River. A similar situation exists in northwestern Iowa and adjacent Nebraska and South Dakota within a radius of 150 miles of Omaha. The world's largest corn-refining plant is at Argo, on the southwest limits of Chicago. Pekin (Illinois), Omaha, Battle Creek, Kansas City (Missouri), St. Louis, St. Joseph, and Cedar Rapids also have important corn-processing plants.

Flour milling. Mills are numerous in Michigan, Ohio, Kentucky, Tennessee, southern Illinois, southeastern Minnesota, southeastern Missouri, and eastern Kansas and Nebraska. Flour mills are thus distributed close to the wheat-growing areas. Between 1899 and 1923 the tendency seemed to be in the opposite direction, however. This was explainable in part by the growing importance of Buffalo and by the increase in wheat production in new areas, notably Kansas and Oklahoma.²⁴ But with the rise of the great milling industry in metropolitan Kansas City, the complementary relationship between flour mills and farms seems to be once more established. Of the three leading flour-milling centers—Buffalo, Minneapolis, and Kansas City—two are definitely in the Agricultural Interior Region.

Considering the enormous production, the number of workers is small, for the industry is highly mechanized. Workers are employed primarily to keep the machinery operating and in repair. The wheat is not touched by human hands from the time it enters

²⁴ F. B. Garver, F. M. Boddy, and A. J. Nixon, *The Location of Manufactures in the United States, 1899-1929*, Employment Stabilization Research Institute, University of Minnesota Press, Vol. II, No. 6, 1933, p. 51.

the first hopper until it has been converted into flour. The machinery is largely self-operative.

The wheat reaches the mills almost entirely by rail, **for** it is best shipped in carload lots. A truck can handle such a small amount that the shipping cost per bushel is prohibitive. Flour, on the other hand, can be shipped advantageously by truck, especially on short hauls.

The tendency in this industry is for large mills located in great cities to displace small ones in scattered towns. Kansas City, with enormous mills strategically located with respect to productive wheat lands and almost incomparable transportation, faces a bright future.

Minneapolis for many years was the world's flour-milling capital. Its industry almost doubled in the 3 years ending in 1884. Minneapolis was surpassed by Buffalo in 1930 as a result of the eastward shift of its mills and capital and of Buffalo's nearness to the great flour-consuming part of the nation, its ability to benefit from cheap transportation of wheat via lake vessel, and its location for grinding Canadian wheat in bond.

Vegetable canning. By taking care of a large part of the perishable products whose growing season is short, canning makes the vegetable-consuming season year-long and greatly increases total consumption. This industry became important only during the past quarter-century primarily as a result of changing standards of living, greater urban dwelling, and the large percentage of married women who work with the consequent demand for hastily prepared meals. Until 1917 most housewives did their own canning, and many years were required to educate them to use products other than their own.

Canning factories are invariably located in the vegetable-growing areas where climate, soil, and topography are as close to the optimum as possible. Of the 10 leading American canning states (based on the number of establishments), 5 lie wholly or in part in the Agricultural Interior: New York, Indiana, Wisconsin, Illinois, and Ohio. It is much cheaper for canneries to ship their product, which is in a concentrated form, than it is for growers to send fresh vegetables to distant markets.

Tobacco manufacturing. It has already been noted that Kentucky, Tennessee, Ohio, Indiana, Wisconsin, and Ontario—all parts of this region—grow tobacco. Thus Kentucky ranks second only to North Carolina in general production. Kentucky alone grows 71.2 per cent of the nation's burley tobacco and with Ohio, Indiana, and Tennessee accounts for about 92 per cent.

Tobacco growing and the manufacture of cigarettes are closely associated. Accordingly Louisville is a leader in tobacco manufacturing, being the center of production for 10-cent cigarettes and for the mentholated brands. In Kentucky, cigarettes are made only in Louisville, which in 1936 produced 11,471,528,790. Louisville also produces much of the nation's smoking and chewing tobacco.

The manufacture of cigars, still largely an unmechanized industry, follows a very different location pattern from that of cigarettes, being much more widely scattered.

Hamlets and Villages

An amazing number of hamlets and villages is scattered at about 5-mile intervals. A hamlet is a small agglomeration of people (20 to 150), at a crossroads, with its houses and work units sufficiently prominent to indicate a node in the rural landscape. The typical unincorporated village, of which there are thousands, consists of a combination of brick and frame buildings irregularly spaced along streets bordered by trees and concrete or brick sidewalks (Fig. 124). It usually contains a railroad station, a post office, one or more schools and churches, a grain elevator, a garage, a cream station, a feed, grocery, hardware, and drug-store, and a livestock dealer. Formerly the inhabitants of villages were largely retired farmers who had sold or rented their holdings. Most of these are now dead, and this fact, together with lower prices of farm products (true till recently) and better transportation to more desirable market centers, has contributed to the decline of the village. The present farm often can no longer comfortably support more than one family.

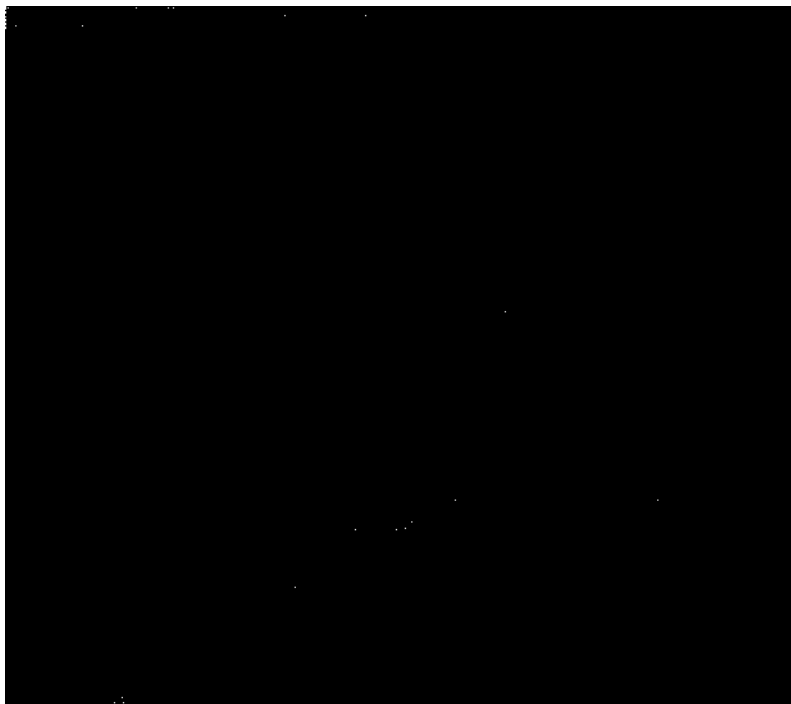
The country-minded village dwellers are little affected by the dogmas of the industrial East.

As a result of the automobile, which enables a person to go 20 miles as easily as he formerly did 5 with a horse, villages have decreased in importance. Moreover, they are definitely declining. The following statement presents an accurate picture of many:

Half the village stores are closed, one freight car a day runs over the railroad track, two of the four churches have consolidated, the inhabitants are broke, and there is, literally, grass growing in the streets.²⁵

Despite their declining importance, however, their role in this particular region should not be underrated. In Illinois alone nearly

²⁸ *Fortune*, August 1936. Vol. XII. No 2, p. 47.



Courtesy of The Daily Pantagraph, Bloomington, Illinois.

Fig. 124. A small village (Graymont, Illinois) in the Corn Belt. Hundreds of such villages with their buildings and trees rise prominently out of the checkerboard fields of crops and pasture. Grain elevators suggest the intimate relation of village and country. Unfortunately the majority of these villages are so "sterile" as to drive their ambitious or sensitive young people into the cities.

half a million people live in villages having less than 1,000 inhabitants.²⁰

Cities

The Agricultural Interior cannot by any stretch of the imagination be called urban. Its cities are closely intermeshed with the earth, that gave them birth and their welfare accordingly is largely contingent upon agricultural prosperity.

Only metropolitan areas are considered in this chapter, and

²⁰ Clarence B. Odell, *The Functional Pattern of Villages in a Selected Area of the Om Belt*, p. 5. Chicago: University of Chicago Libraries. 1939.

space prohibits more than a cursory treatment even of them. They are divided and treated according to location in the eastern and western parts of the region, the artificial division line running southward from Minneapolis-St. Paul.

Cities of the western part

Minneapolis-St. Paul (911,077) form an urban district that is unique in having two almost complete cities in one. Richard Hartshorne says:

Minneapolis and St. Paul are genuine Siamese twins, two cities of coordinate importance, each practically complete in itself, but with immediate and close contact along a common zone.²⁷

Though considered a single urban area, there is some differentiation of function between them. Roughly one fourth of the population of Minnesota and the two Dakotas lives in this metropolitan district. With nearly 1,000,000 people, the district is not only the principal urban unit of Minnesota but is also the economic capital of the entire Central Northwest. Minneapolis owes its early growth to location at the Falls of St. Anthony on the Mississippi—the most convenient river crossing and an important source of water-power. Cheap power enabled the flour mills to prosper. St. Paul, 12 miles below Minneapolis and on the outside of a great bend in the Mississippi, was until recently the head of navigation. Its location forced traffic to choose whether to cross the river at great cost and inconvenience or to go around the bend. St. Paul was the larger up to 1880, when Minneapolis passed it. Minneapolis, with far more natural advantages, is now the head of navigation, as a result of improvements made in the river by the United States government. The Twin Cities prospered until the opening of the Panama Canal, which made Pacific and Atlantic shipments cheaper by water, thus constricting their supporting territory.

Kansas City, Missouri, and *Kansas City, Kansas* (634,093), are really one city separated by an imaginary (political) line. Kansas City, located on an outside bend of the Missouri River, was formerly an outfitting point for wagon trains destined for Santa Fe and other points in the West and Southwest, and it still is outstanding in distributive trade with the Southwest. Strategic location later made it a focus for many railroads.

Situated in the western Corn Belt near the grazing lands of the Great Plains, the Kansas City metropolitan district has become a

²⁷ Richard Hartshorne, "Geography of the Minneapolis-St. Paul Area," Chapter I in George M. Schwartz, *The Geology of the Minneapolis-St. Paul Metropolitan Area*, Bulletin 27, Minnesota Geological Survey, p. 9. Minneapolis: 1936.

major slaughtering and meat-packing center. This development was made possible by cold-storage and refrigeration, which permit shipment of dressed meat rather than of live animals to the densely



Omaha Chamber of Commerce.

Fig. 125. Part of the stock yards at South Omaha. There are separate divisions for hogs, cattle, and sheep and the pens in each division are built and arranged for the different classes of stock. This city vies with Kansas City, East St. Louis, and South St. Paul for second place in slaughtering and meat-packing. Omaha is well located with respect to the grazing lands of the West and the fattening lands of the Corn Belt.

populated industrial East. Proximity to the Hard Winter Wheat Belt has enabled Kansas City to become America's largest market for winter wheat and to attain high rank in flour-milling. It also is a leader in the manufacture of airplanes.

Qmahor-Countil Bluffs (287,698), situated on the west and east banks of the Missouri River, comprise a major urban district in the western part of the region and are important railway centers.

Prior to 1884 western stockmen were clamoring for a market for

their cattle, hogs, and sheep that would be nearer to them than Chicago. Omaha by reason of its accessibility filled this requirement, and has become one of the principal markets for stocker and feeder cattle. Stockyards were built and opened for business in 1884, but for some time they functioned only as a feeding station for range animals en route to more easterly markets. When Omaha's natural advantages were ultimately recognized, the city attracted buyers and dealers and became a major packing center (Fig. 125). More than half the livestock reaching Omaha yards now comes by truck. Additional industries are those making butter, breakfast foods, spaghetti, flour, and airplanes.

Council Bluffs was selected in 1863 as the eastern terminus of America's first transcontinental railroad—the Union Pacific. It is important today as a railway and highway center. The city, by reason of its location in the great grain-growing region, has many large elevators.

Des Moines (183,973), the state capital and largest city of Iowa, shares the meat-packing industry with Omaha, Kansas City, and many other places and is an important manufacturer of cement, flour, brick, and tile. It is one of the leading distributing points in the Middle West and certainly the center for the publication of farm journals.

Sioux City (87,791), at the junction of the Big Sioux and Missouri rivers, is one of the most important cities in the western part of the region. Surrounded by productive farmlands and served by excellent rail and water transportation, the city is important as a distributing center for a large part of South Dakota and northwestern Iowa. Its industries include flour, cereal-milling, meat-packing, brick-making, and railroad-car repairing.

St. Joseph (86,991) is situated north of Kansas City on the Missouri River in that part of the region where corn and hogs are most important. Of great importance is the city's wholesale trade and its slaughtering and packing of meat. It is too near Kansas City to be a serious rival in distribution. St. Joseph is a major market for stocker and feeder cattle from the central plains.

Lincoln (88,191) is located in southeastern Nebraska about 50 miles west of the Missouri River. It lies in an elliptical basin in which occur saline deposits—the basis for its earliest industry, the production of salt. Above the basin rise hills which merge with the fertile prairie—hills mantled with loess and glacial till. The site was chosen as the capital for Nebraska at a time when it seemed to be a central location. Like most American state capitals, Lincoln is not a large city. It benefits from no outstanding commercial

or industrial advantages, though it does possess several important manufactories, the leading plant making lightning rods in the United States, one of the largest factories producing gasoline engines west of the Missouri River, and one of the most productive creameries in the United States. Lincoln gives little promise of ever becoming a large city. It "still smacks of the soil; its people are at heart farmer folk, and the talk of crops and weather is never-ending on the streets."²⁸

Lincoln is, however, one of the major cultural centers of the state, being the home of the University of Nebraska, several other institutions of higher education, the State Historical Museum, and the state capitol building. The last, unique among those of the nation, is a great shaft 400 feet high which rises from a spacious square.

Topeka (77,749) began in the late 1850's as a ferry crossing on the Kansas River. In no sense is it a true industrial city, growth resulting largely from its being the state capital. Topeka does, however, have important meat-packing plants and flour mills and has the general offices and repair shops of the Santa Fe Railroad.

Tulsa (188,562), located on the north bank of the Arkansas River close to the borders of 4 geographic regions (Fig. 12), is included in the Agricultural Interior because corn and oats are the major crops of its trade territory.

Strictly speaking, however, Tulsa is the oil capital of the North American continent and really belongs to no region. Productive wells dot its tributary area on all sides. It is the outstanding refining center of the Mid-Continent Oil Province and national headquarters for numerous petroleum companies and allied industries. Tulsa also is the leading publishing center for oil and gas trade journals and headquarters for the American Association of Petroleum Geologists.'

Cities of the eastern part

Most of the largest cities lie in the eastern and northeastern part of the region where it overlaps with the American Manufacturing Belt (the boundary is very indefinite). Cities belonging definitely to the Agricultural Interior are discussed below.

Madison (78,349), located between two lakes, is Wisconsin's capital, leads in higher education and is a major market center for the rich dairy region of southern Wisconsin. Its manufactories make agricultural machinery and miscellaneous products.

²⁸ Federal Writers' Project, American Guide Series, *Lincoln City Guide*, pp. 6-7. Lincoln, Nebr.: Woodruff Printing Co., 1937.

Terre Haute (83,370), located in western central Indiana, was founded in 1816. Its early growth was stimulated by the National Road and the Wabash-Maumee Canal. *Terre Haute* is well located with respect to the Eastern Interior Field, which ranks next in importance to the Appalachian Province in the production of bituminous coal. Mining has long been an important industry in the area. Low-cost fuel attracted many manufacturing plants. Among the leading manufactures are clay products, especially sewer pipe and paving bricks, glass bottles, chemicals (particularly alcohol and baking powder), and machinery. Slaughtering, meat-packing, and the canning of vegetables are also important enterprises. *Terre Haute* has excellent railway facilities.

Evansville (141,614) was located on the Ohio River in southwestern Indiana to serve as a port for interior towns and to benefit from water-power available on near-by Pigeon Creek. (In early days when transportation was costly, the presence of enough power to operate a flour mill was highly desirable.) Though it carried on much river trade, *Evansville* grew slowly until the arrival of the Wabash-Maumee Canal in 1853. Several railroads were attracted, and the city has one of the few railway bridges across the lower course of the Ohio. *Evansville*, in the heart of an important coal-mining area, ranks high industrially. Here is made one of the most popular refrigerators—the Servel Electrolux, which uses gas rather than electricity; and also furniture, automobile bodies and parts, agricultural implements, stoves, tobacco products, and flour.

Louisville (434,408), lying on the bend of the river below the Falls of the Ohio, is Kentucky's largest and most important commercial and manufacturing city. It deals heavily in farm products, especially tobacco. The low river floodplain is lined with tobacco warehouses, mills, stockyards, and distilleries.

The city was founded by George Rogers Clark in 1779. Its early population came mostly from the South—Virginia, Maryland, and the Carolinas. A larger group later came down the Ohio via Pittsburgh from New England and the Middle Atlantic states. Thus *Louisville* blends the thriving commerce and industry of the North with the zest for living of the South.

Ready access to great supplies of timber early made *Louisville* a leading market for hardwoods and the center of the nation's veneer industry. Additional important industries are furniture, paint and varnish, tanning, shoes, cement, brick and tile, tobacco products, flour, and whiskey.

Nashville (241,769), lying in the fertile, productive Nashville Basin and at the southernmost point of the great bend in the Cumberland River, occupied a dominant position in the pioneer development and trade of the trans-Appalachian South. Prior to the Louisiana Purchase, when Natchez was the southernmost American port on the Mississippi, a lively overland trade grew up between that point and Nashville via Natchez Trace. With the development of steamboats which permitted upstream traffic, Nashville became a river port and the Natchez Trace ceased to be important.

Because of the basin-like structure of the Nashville area, all railways and highways focus upon the city.

Among the most important industries are flour milling (utilizing soft wheat for making hot biscuits), coffee roasting, printing and publishing, and the manufacture of fertilizer (using Tennessee phosphate as a raw material), hardwood-flooring, boots and shoes, furniture, and clay products.

Rockford (105,259) is one of the Rock River Basin cities. Located 75 miles west of Chicago on important railways and highways, it is a manufacturing city—making agricultural implements, furniture, and hosiery.

Peoria (162,566), because of its location at a narrow place on the Illinois River, afforded an easy crossing which early gave rise to the establishment of a ferry.

From earliest settlement, Peoria has been the leading city of the Illinois Valley. It benefits from water transportation and is the chief rail center of interior Illinois. It lies in the heart of the Eastern Interior Coal Field. Peoria's leading industries, which are located on a plain running back 200 to 5,000 feet from the river to bluffs 200 to 400 feet high, are engaged in distilling liquors and in making stock feeds, corn products, agricultural implements (tractors), and washing machines. Situated in the area of most concentrated corn production, Peoria is the headquarters of the National Swine Show.

Decatur (65,764) lies in the rich agricultural portion of central Illinois and is underlain with coal. In fact, coal is mined within the city. Among the more important manufactures are corn products (starch, syrup, hominy, meal, oil, feed), brass plumbing goods, structural steel, and office fixtures. It is served by the Baltimore & Ohio, the Illinois Central, the Pennsylvania, and the Wabash railways, the Wabash having its principal repair shops here.

Springfield (89,484) is the capital city of Illinois and to this circumstance owes much of its growth and importance. It is a coal-

mining, railroad, and manufacturing center. Among the more important products of its factories are agricultural implements, tractors, cast-iron pipe, road graders, and miners' lamps.

Davenport, Rock Island, Moline (174,995), the Tri-Cities, are located on the Mississippi just above the mouth of Rock River in the heart of the richest agricultural area of North America. They accordingly benefit from barge transportation. This district also is a leader in the country's strip coal-mining industry. The fact that Davenport in Iowa and Rock Island and Moline in Illinois really form a single metropolitan district indicates how artificial political state lines may be. The Tri-Cities comprise one of North America's leading farm-machinery manufacturing centers.

Cedar Rapids (73,219), located on the Cedar River in the heart of a rich agricultural area, has excellent railway facilities. It is said to have the largest cereal mill in the world (Quaker Oats), which mills flour in addition to making breakfast foods. In addition the city has starch mills, meat-packing plants, and factories for making farm implements.

Waterloo (67,050) on the Cedar River occupies a strategic location in Iowa's rich, farming and stock-rearing area. The city does some manufacturing, contributing farm implements, gas engines, cream separators, and tractors. It also has corn canneries, flour mills, and meat-packing plants. The Illinois Central (whose large repair shops are here), the Chicago, Rock Island & Pacific, and the Chicago Great Western railways all serve Waterloo.

The Outlook

The future of the Agricultural Interior as a whole must depend upon agriculture more than upon any other activity. In the past, agriculture has been based upon disposal of the surplus primarily to industrial northwestern Europe. With the world-wide sweep of autarchy whereby European countries attempted to become agriculturally self-sufficient, United States and Canadian farmers have had to rely more and more upon the domestic non-agricultural market to absorb their surpluses at a profit. This has not been easy. For example, United States farms, as a result of mechanization and improvements in agronomy, produce 12 to 25 per cent more than the country consumes. When production increases faster than population, prices fall. No one knows at this time what will come after the termination of the second World War. There may develop a period of peace characterized by a revival of free or at least freer trade between nations. In that event the domestic

market would not need to absorb all our agricultural products. Regardless of what the post-war situation is, however, less dependence should be placed upon corn and wheat and more upon the protective foods—those rich in vitamins, minerals, and the proper proteins—such as milk, eggs, pork, tomatoes, and beans. These, of course, will require more work from the farmer, for he must expend 5 to 10 times as much energy to produce a pound of dry matter in poultry, dairy, or meat products as on a pound of dry matter in wheat.

' So long as there was free land, most problems could be solved, because the roving, the dejected, and the poor could move and take care of themselves. As civilization caught up with them, they could sell out at a nice profit and homestead again. But there is no longer any free land that is good land. The fact that tenancy is increasing does not augur well for the future of agriculture in the great Midwest.

Since domestic requirements for agricultural products are relatively inelastic, the government should spare no effort or reasonable expense to raise the living standards of farmers. Provided restrictions on foreign immigration are not relaxed, America's future population will come largely from farms and small towns; and, therefore, country life should be made more attractive and kept at a high level of culture. The United States and Canada erred when, by centralizing manufacturing and population in great cities, they drained from the rural areas their "best blood and brains." America's pioneer apostle of industry, Alexander Hamilton, knew how fundamentally important agriculture is, when he said:

It ought readily be conceded that the cultivation of the earth as the primary and most certain source of national supply; as the immediate and chief source of subsistence to man; as the principal source of those materials which constitute the nutriments of other kinds of labor; as including a state most favorable to the freedom and independence of the human mind—one, perhaps, most conducive to the multiplication of the human species; has intrinsically a strong claim to preeminence over every other kind of industry.²⁹

As a result of rural electrification, it is possible to develop "parts" industries in many hamlets and villages, where men can work in factories and at the same time maintain their families on the land. This is "rurbanism," which, according to O. E. Baker, ought to be feasible throughout most of the Agricultural Interior and the American Manufacturing Belt. By thus combining factory work with

²⁹ Quoted by William L. Cheney, *Industry and Human Welfare*. New York: The Macmillan Co., 1922.

part-time farming, a buffer would exist to cushion the dire results of fluctuations in industrial employment. To date, however, there has been no definite trend toward dispersion of industry.³⁰

Agriculture in this region has been more truly dynamic in the last 25 years than at any other time in history. But progress has not been limited to machines alone; it has been achieved also in growing farm crops, and in processing and using them. Hybrid corn, for example, is as important an achievement among plants as the tractor is among farm implements. As this volume goes to press, the country is all-out for war and changes in agriculture as great or even greater than those during the first World War may be in the making, for now as then large numbers of young people are leaving the farms to work at high wages in the war industries of cities.

³⁰ National Resources Committee, *The Problems of a Changing Population*, p. 71. Washington, D. C.: Government Printing Office, 1938.

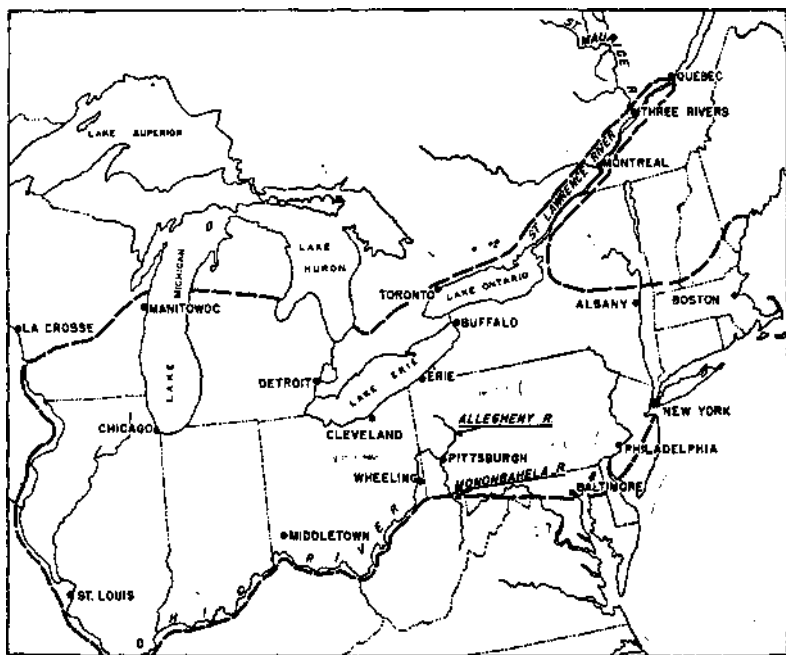


Fig. 126. The American Manufacturing Belt: an urban region of diversified industries.

CHAPTER XIII

The American Manufacturing Belt

AN URBAN REGION OF DIVERSIFIED INDUSTRIES

THE AMERICAN MANUFACTURING BELT is the great workshop of the nation (Fig. 126). It is located mostly in northeastern United States and includes also parts of the provinces of Ontario and Quebec. A map showing the distribution of cities, which indirectly portrays reservoirs of labor and the degree of industrialization, emphasizes the fact that manufacturing in Anglo-America has, for the most part, tended to concentrate in big cities. Urban agglomerations here, therefore, are predominantly industrial.

The Region

The American Manufacturing Belt is characterized by many areas of high manufacturing activity. Its dominant traits are urban interest and mode of life—themselves results of transport advantages and proximity to raw materials, power, labor, and markets. It differs from the Agricultural Interior, with which it is in part intermeshed (Fig. 12), for in the latter manufacturing is a more localized phenomenon. Even the prevailing type of industry in the two regions is different. In the Agricultural Interior, products are made mostly for the local market, whereas here they are made for markets essentially national in scope. There, while manufacturing is by no means unimportant, agriculture is dominant in contributing to the general economic atmosphere. Agriculture here, by comparison with manufacturing, is relatively unimportant.

It would be a mistake to believe that the *total* land area of this region is occupied by cities and towns, for much farm land separates the different urban centers, as is shown by the excellent agricultural area between Toledo and Dayton, or between Toledo and Chicago. On the other hand, in the Mohawk Valley, city follows city in close, juxtaposition—the intervening farmland supplying the urban centers with fluid milk, vegetables, and fruits. Manufacturing causes an intensive but spotty utilization of the land within any region

3 THE AMERICAN MANUFACTURING BELT

ominated by it, in contrast to agriculture, which uses broad acres and covers them with a continuous pattern of farms.

Manufacturing districts may be composed of either closely spaced centers or widely scattered ones united by common characteristics or common interests. Within a given industrial region, much less land is actually occupied by factories and mills than is usually supposed.

To a certain extent long rows of industrial cities are to be found along major transportation routes. One major route runs from New York Harbor up the Hudson to Albany and west to Buffalo. Here it breaks into two branches, one going north of Lake Erie through Canada to Detroit and Chicago, the other south of Lake Erie through Cleveland and Toledo to Chicago. At Chicago routes fan out, though major stems extend northward to Milwaukee and southwestward to St. Louis. Coastwise routes extending from Baltimore to southern Maine early stimulated the growth of industry, making their tributary areas the original home of the American factory.

Boundaries

On the south the boundary coincides closely with the Ohio River west of Wheeling and the Baltimore & Ohio Railroad east of Wheeling; on the west, with the Mississippi River from St. Louis to La Crosse. On the north the line extends from La Crosse through Manitowoc, Saginaw Bay, and the Ontario Peninsula, to but not including the city of Quebec, then doubles back around the Adirondack Mountains and moves eastward across the southern part of New Hampshire to the southeastern corner of Maine. On the east the boundary extends along the coast from southern Maine to New York City (excluding Cape Cod and most of Long Island), south of which it follows the direct rail line to Philadelphia and Baltimore (Fig. 12).

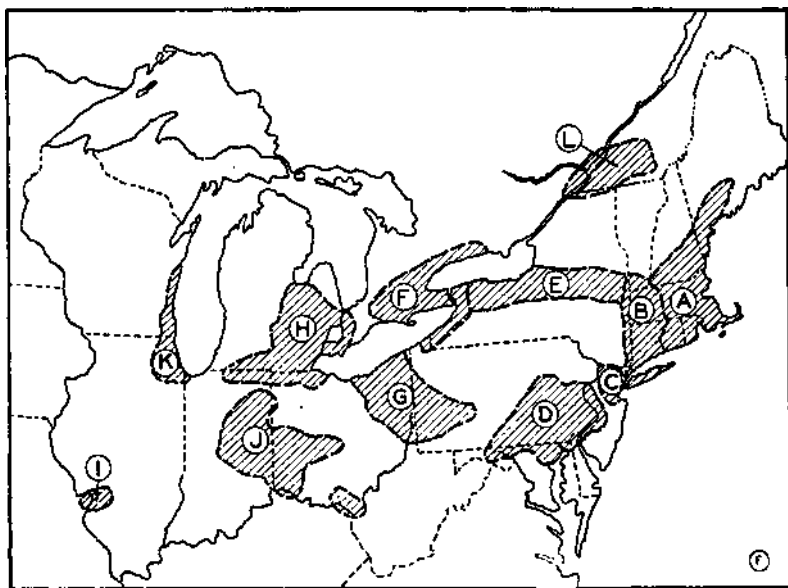
There are, of course, some important manufacturing areas outside this region (for example, the Southern Piedmont), but they are islands of manufacturing separated from the shores of the American Manufacturing Belt by considerable nonindustrial terrain.

Subregions ¹

Though manufacturing has put its stamp on the entire region, parts differ one from another to a great extent (Fig. 127). It is

¹ The subregions used in this chapter are based largely on those of Richard Hartshorne, "A New Map of the Manufacturing Belt of North America," *Economic Geography*, January 1936, Vol. XII, No. 1, pp. 45-53.

impossible to give much detail regarding the manufacturing carried on in each subregion, though certain salient features are presented by text, map, and photograph. Before discussing the subregions, let us consider first the evolution of manufacturing and of cities in Anglo-America.



Based on map by Richard Hartshorne.

Fig. 127. Principal subregions of the American Manufacturing Belt. (A) Eastern New England. (B) Southwestern New England. (C) New York Metropolitan District. (D) Southeastern Pennsylvania. (E) Mohawk Valley and the Ontario Plain. (F) Buffalo-Niagara-Erie-Hamilton-Toronto subregion (Niagara Frontier). (G) Pittsburgh-Cleveland subregion. (H) Southern Michigan automobile subregion. (I) St. Louis District. (J) Inland Ohio-Indiana subregion. (K) Chicago-Milwaukee subregion. (L) Montreal-Ottawa-Three Rivers District.

1. INDUSTRIAL DEVELOPMENT IN THE UNITED STATES

Manufacturing in this country was at first a household enterprise, each family trying insofar as possible to meet all of its requirements. Four families out of every five lived upon the land and were wholly or partly supported by it.

As villages grew, here and there a man developed great skill in making some specific article. As his reputation spread, people in the community wanted him to supply their needs for this article. He did so, but eventually was unable to do all the work himself

and was compelled to hire help and train apprentices. Ultimately his workmanship became known far beyond the village, and the volume of work so increased that a separate building had to be erected. Soon other enterprising men with capital, wishing to engage in the same business, located near the original factory in order to get skilled labor. So did industrial birds of a feather flock together.

The small and simple industries at first met only the needs of the villages and the neighboring farmers, but soon they began to go farther afield. Before the Massachusetts colony was 30 years old, it was selling hand-made shoes in the other colonies.

All fabricated articles were made by hand until about the close of the eighteenth century, when Samuel Slater, an Englishman, set up at Pawtucket the first power cotton machinery in the Western Hemisphere. Forbidden to take out of his homeland either machinery or drawings of machines, he came to America relying entirely upon his memory both to build and operate such devices. For power he used the falling waters of the Blackstone River. It was not long until similar developments were to be found on nearly every stream where some natural obstacle or declivity in the stream bed had resulted in swift current. With the coming of steam, many of the smaller riverside mills decayed; only those persisted that were on the larger power sites, as at Lowell and Lawrence. In Fall River and New Bedford, which were situated on tidewater, water-power was supplemented "by power from sea-borne coal.

Until about 1860, because of slow and costly transportation, manufacturing enterprises consisted meetly of small units located in communities fringing the Atlantic Seaboard. After the War Between the States, however, active minds began to develop the nation's great store of natural resources, which until then had hardly been touched.

With the adoption of power-driven machinery, manufacturing migrated westward, following the frontier and the established transportation routes—primarily railroads. This westward movement was retarded, however, after 1890. The tendency at first was for concentration in relatively few places. Cities specialized in their products. Akron made rubber; Paterson, silk; Holyoke, paper; Fall River, textiles. These places were not particularly advantageous or scientifically selected centers for manufacturing. Few sites indeed were chosen on the basis of locational studies. Though Cyrus McCormick did carefully consider the market for the reaper before locating his factory in Chicago, most early industries came into being almost entirely by accident.

The Relation of Manufacturing to Urban Growth

Until quite recently the United States had few large cities, For instance in 1830, only one city had more than 100,000 people.² In 1940, however, there were 92, of which 53 were in the American Manufacturing Belt, and about one fourth of the people were dwelling in cities of more than 100,000 population. Up to 1920, the leading factor making for population concentration was the centralization of industry, for an unmistakable relation exists between the development of urbanism and the growth of manufacturing. Factory workers were constantly recruited from rural areas which, because of the mechanization of farming, had large surplus populations.

Two Recent Stages of Industrial Evolution in the United States

Once the experimental period is past and commercial production has begun, manufacturing goes through two stages: (1) pronounced and increasing concentration in a given area during industrial youth, and (2) a redistribution or decentralization away from that area during maturity.

Concentration

Concentration occurs when industry is young and fast-growing. Plants tend to focus in cities or regions either because a market is near or because skilled labor, power, and raw materials are readily available. For instance, this has been the case in the development of New England's shoe, textile, and brass industries, and of Akron's rubber industry. The big advantage of concentration was the low cost of manufacturing, whereas the big disadvantage, once the entire country became the market, was the high cost of distribution.

Another drawback of concentration became especially evident during the depression beginning about 1930. Dependence upon a single industry, when such an industry shut down, meant suffering for the entire city as well as for the people of near-by farms and mines. Actually, comparatively few cities are wholly dependent upon a single industry; yet the condition of the dominant industry profoundly affects the life of the entire community. Thus Detroit,

² Robert A. Leshner, "National Arteriosclerosis," *Survey*, October 1, 1932, Vol. LXVIII, No. 13, p. 460.

with its growing automotive industry prior to 1929, flourished with a most reckless abandon, but after this date it encountered the toughest kinds of depression problems.

Decentralization³

During recent years, industries which have reached maturity seem to be less tied to the region originally occupied than was formerly the case. Concentration of an industry in any given locality is becoming somewhat less marked. Even its location within a general region is apparently becoming less necessary. The reasons appear to be the following:

1. Shifts in population.
2. Wider distribution of electric power.
3. Increased freight costs.
4. Ease of moving raw materials by truck over hard-surface roads.
5. High cost of living in congested centers.
6. Inequalities of the tax burden.
7. Standardization of industrial processes.
8. Labor troubles.
9. Cramped and inefficient plants and sites. Originally most industries were small and huddled close together with little room to grow.

It is well known that both industries and people get least for their money in big cities. Hence many a new factory is being located in suburban-districts and some even in the open country where rent is lower and the general environment more attractive. This does not mean, however, that industry is migrating from cities to country. The movement to date is merely one of diffusion or spreading into suburban areas rather than of dispersion to remote locations.

The decentralization movement will probably not, however, result in the complete scattering of factories all over the country, for there is always a tendency for people in the same line of business to group themselves together; but the groupings need no longer be so close as to result in the undesirable congestion we experienced in the past. According to present indications, the "factory districts" of the future will be large areas, such as that part of New Jersey lying

³ There is some confusion regarding the real meaning of "decentralization." "Diffusion" and "dispersion" both relate to "decentralization" but are not synonymous. "We should no longer attempt to cover the removal of an establishment from Cincinnati to Ivorydale, for example, with the same term that we should apply to a movement to Reedsville in the West Virginia hills." Daniel B. Creamer, *Is Industry Decentralizing?* p. vi. Philadelphia: University of Pennsylvania Press, 1935.

between New York and Philadelphia—areas containing numerous factories in close touch with each other and with the neighboring cities, and yet with ample open space and ideal living conditions.*

Workers who produce small parts for complicated machines no longer have to live in congested manufacturing districts. Inter-changeable parts can be brought easily by truck or train from small towns or cities. Henry Ford was the first American industrialist to advocate decentralization. As World War I came to a close, he moved part of his valve production from Highland Park to the little town of Northville, where he rehabilitated a small factory, gave several hundred men employment, and began production on a farm-factory basis. Ford also established plants in the small Michigan towns of Waterford, Plymouth, and Newburg, and scattered branch manufacturing and assembly plants at strategic points all over the country and even abroad.

In decentralization, industry looks for attractive smaller communities and suburban areas where workers can get close to the land and supplement their factory wages. As Henry Ford has said, "The farm and factory are natural allies."⁵ This attempt to combine the best in urban and rural life is called "rurbanism." Rurbanism has flourished for about a hundred years in southern New England. Its monuments are to be seen in comfortable old farm and village houses—the products of agriculture and industry.

Inertia

Despite the trend towards decentralization, a strong force tends to perpetuate manufacturing in a given place once it has become thoroughly established. This is known as the "momentum of an early start" or the "inertia of invested capital." The situation is thus well stated:

It is very easy, on paper, to overrate or underrate the advantages or disadvantages of any producing district. Freight rates may be made to appear of paramount importance, for the thing is done on every working day of the Interstate Commerce Commission. The steel industry is largely a fixed thing. Plants cannot be moved, and the relative production of different districts can change only gradually, chiefly by growth at one point and decadence at another, a slow process at most.⁶

⁴ A. W. Robertson, "Modern Transportation and Power Aid Decentralization," *The Iron Age*, Vol. CX XVII, No. 2, January 8, 1931, p. 223.

⁵ *Cleveland Plain Dealer*, April 8, 1936.

⁶ Editorial, *The Iron Age*, Vol. CXXI, No. 24, June 14, 1928, p. 1704.

Major Factors in the Location of Manufacturing

Most great manufacturing industries in the United States were, with few exceptions, not purposely located in their present situations. They sprang up for the most part in the home town of some individual who had sufficient capital to start a factory. Transportation was poorly developed, raw materials had to be procured near the plant, and the market was local. The better situated of these enterprises prospered, but many of those badly located lost money, withered, and finally disappeared. Thus manufacturing as much as agriculture has been and is influenced by favorable or unfavorable environmental conditions. "A deserted or dismantled factory is a pathetic tribute to human incompetence or changing economic conditions. Mistakes are often irrevocable and moves always costly."⁷ On the other hand, it is unthinkable that the great iron and steel industry of North America, in which billions of dollars are invested, emerged as a result of chance or human whim; yet so rapid have been the industrial changes that some steel-plant locations represent definitely maladjusted loci under present conditions. Where this is the case, however, it is usually because subsequent changes, unforeseen when the plants were started, have occurred. Industrial locational factors are both complex and numerous.

Proximity to raw materials has been and still is a major location factor for certain types of manufacturing. Since the cost of transporting raw materials is so very important, certain kinds of manufacturing find it imperative to be near their raw materials. Especially does this hold for 2 types of industries—those handling perishable commodities and those fabricating heavy or bulky products. Canning, cheese-making, and sugar-milling are simple but good examples of the first, since their raw materials could not be shipped far without spoilage. Cement-making is a good example of the second type.

Proximity to market, according to many authorities, is the most vital location factor in the success of any manufacturing plant. Types of industries that located near their markets are:

1. The expansional ones, which make products more bulky than their raw materials, for example: agricultural implements, pianos, boxes, and barrels.

⁷ C. Langdon White, and George T. Renner, *Geography: An Introduction to Human Ecology*, p. 639. New York: D. Appleton-Century Co., 1936.

2. Those which make fragile or perishable products—ice cream, bakery goods, glass, and china ware. (Improved techniques of packing and shipping tend to make location less important.)

3. Those which cater to rapidly changing technological devices—textile machinery, for example.

4. Those which supply a whimsical market—women's millinery.

Some students of industrial location believe that the relation of markets to plant location has received too much emphasis. Generally speaking, however, the importance of this factor is in direct ratio to the transportation rate on the products.

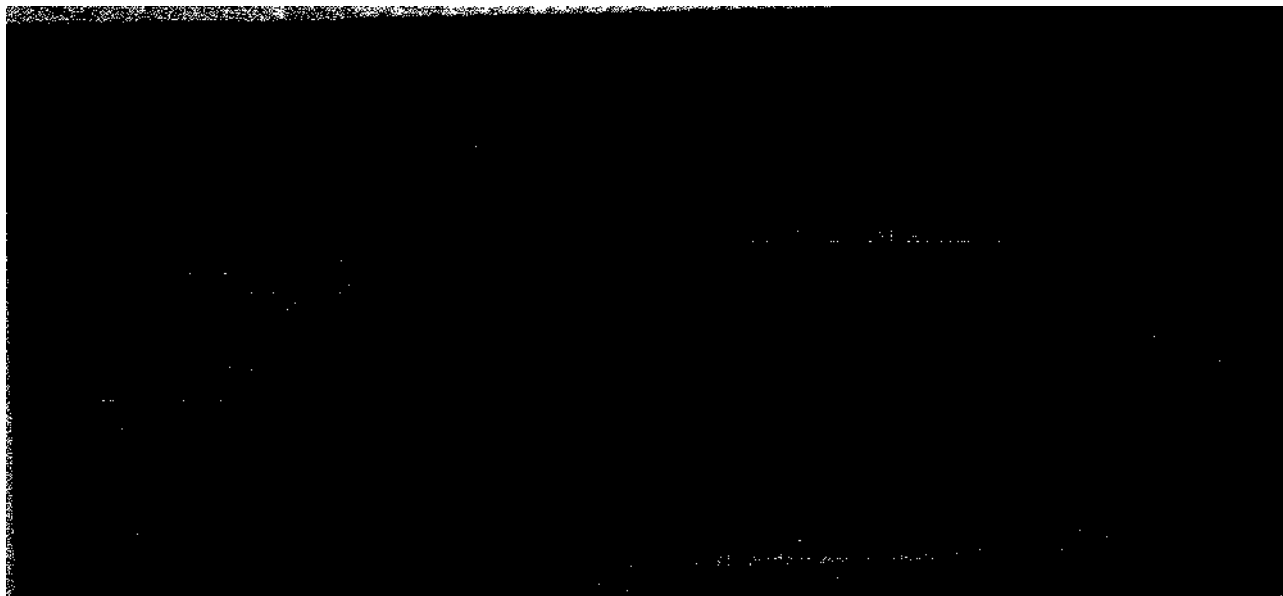
Proximity to fuel and power was, after machine manufacturing began and until 20 or 30 years ago, the dominant factor in locating a plant, because, before the era of electricity and its transmission, industries had to be near a source of stationary power. The first iron furnaces were erected in the heart of a forest—the source of charcoal (Fig. 128); when the timber was mined out, the furnace was abandoned and a new one constructed elsewhere in a tract of virgin timber. Another example was New England's widely scattered pioneer textile mills, which squatted beside almost every waterfall except in valleys too narrow and too steep to provide a site. Water-power was indisputably the basic physical factor in establishing cotton manufacturing in New England. Still another example is the aluminum-smelting industry, which is a voracious consumer of power—using 20 times as much per ton as does the iron and steel industry. Demanding cheap power, the aluminum industry has frequently gone into areas rich in hydro-power but remote from large urban markets.

The wider distribution of electric power has no doubt been the principal cause of industrial migration, for wherever a power line runs, there manufacturing and labor can make their home.

Proximity to reservoirs of man power and skills is, next to inherent natural resources, a manufacturing city's greatest asset. Availability of labor, however, does not generally fix the geographic location of industries, except for those employing skilled rather than unskilled labor. Steel-making, for example, demands a high degree of skill; 93½ per cent of the total number of employees are classified above common labor.⁸

Labor normally constitutes a factory's largest single item of expense and savings in wages are quickly reflected in the profit account. Hence cities where labor is militant and highly organized tend to lose ground. Labor organizations have been a dominant

³ *Steel Facts*, No. VI, May 1935, p. 2.



American Iron and Steel Institute.

Fig. 128. Making charcoal in the early days. Up to 1840, charcoal was universally used as fuel for smelting iron ore. It was consumed in enormous quantities, a typical furnace requiring 5,000 to 6,000 cords of wood a year—the cut from at least 240 acres of woodland. Hickory and oak were preferred but ash, chestnut, and pine were satisfactory.

The charcoal burners stacked the sticks on end in a pile about 25 feet in diameter at the base and 6 feet high. They plastered turf and loose earth over it, leaving a small chimney in the center. They then lighted the pile, smothering any sign of a flame, for their idea was to drive off the volatile elements and not burn the wood. From 3 to 10 days were required to do the charring—the difference depending on the type of tree used and the weather.

factor in the decentralization of industry. However, labor, like manufacturing, is fast becoming nationally organized. Moreover, minimum wage laws passed by the federal government are leveling out local and sectional differences.

Labor has become so mobile that almost any place in the American Manufacturing Belt can recruit it with little difficulty. Large cities always have great reservoirs of labor; towns and villages can draw theirs from near-by farms.

Significance of transportation. Every modern industry is located with proper regard to the "zone of minimum transportation cost." Several years ago Charles M. Schwab stated that the basic reason for manufactural decentralization away from one-industry cities was the desirability of median points between markets and raw materials.⁹

The significance of climate upon labor. The greatest amount of factory work is performed when the temperature is between 40° and 70° F. Output is then constant. Above 75° output falls progressively. Twice as much work is done at 70° as at 93°. ¹⁰

Before steel mills became greatly mechanized, workers became inefficient during the several weeks of "close" weather in July and August. Factory discipline suffered; workers became nervous, irritable, and tired; production suffered accordingly. Steel-mill workers now benefit from various appliances installed to make their tasks more comfortable, and modern machinery has made the work much easier, especially in summer.¹¹

Minor Locational Factors

Cost of land. Not infrequently an old well-established company, which started with what it considered an abundance of room, suddenly finds itself cramped. Unable or unwilling to purchase additional land at higher prices, it migrates. In Pittsburgh, some of the steel companies, hedged-in by river, steep hills, railroads, or neighboring plants, moved as far as 40 miles down the Ohio River.

Sometimes a firm profits by moving. One company, for example, bought its Chicago site in 1879 for \$147,000, which it sold for

⁹ John A. Piquet, "The Effects of Industrial Plant Relocation," *Industrial Management*, Vol. LXXI, No. 6, June 1926, p. 376.

¹⁰ Massachusetts Development and Industrial Commission, *In Black and White: The Facts Concerning Industrial Advantages in Massachusetts*, p. 56. Boston: 1937.

¹¹ "Mechanization Aids Summer Work," *The Iron Age*, Vol. CXXIV, No. 5, August 1, 1929, p. 296.

\$2,500,000 (enough to build the new factory) in 1908 when it moved to a suburb.¹²

A human factor. Difficult indeed is it to dissociate certain men from their industries and their cities. The following list is typically representative but by no means complete:

Andrew Carnegie	steel—Pittsburgh
H. C. Frick	coking coal, steel—Pittsburgh
Henry Ford	automobiles—Detroit
B. F. Goodrich	rubber—Akron
Cyrus McCormick	agricultural implements—Chicago
Ambrose Swasey	machine tools, telescopes—Cleveland
E. D. Libbey	glass—Toledo
David Buick	automobiles—Flint
R. E. Olds	automobiles—Lansing
J. A. Dagr.	shoes—Lynn
John Deere	steel plow—Moline
Samuel Slater	cotton textiles—Pawtucket
Gustavus F. Swift	meat—Chicago
P. D. Armour	meat—Chicago

Taxation. Tax policies vary widely from state to state and from city to city. In order to secure lower taxes as well as more favorable conditions, Henry Ford, whose original factory was in Detroit, moved to the then small village of Highland Park.

Two Ohio cities, Cleveland and Lorain, vied for a steel plant: one to retain it, the other to acquire it. Though several factors were involved, taxation was paramount. Cleveland's tax rate was \$2.76 per \$100 valuation, Lorain's \$2.20—a differential of \$0.56. Cleveland lost.

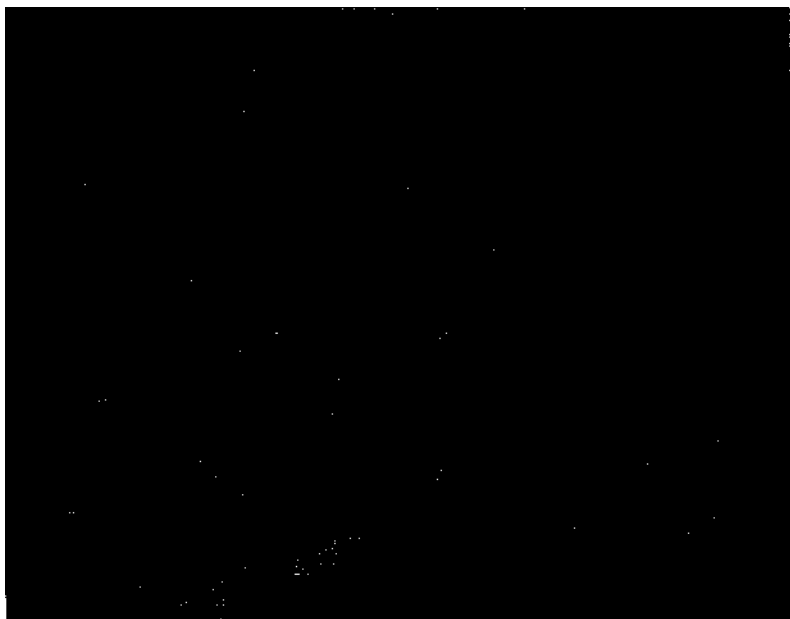
Industrial water supply. Water is critical in many industries, particularly those engaged in manufacturing rubber goods and iron and steel. Four billion gallons are utilized each day by the metallurgical industry of the United States.¹³ Thirty tons are required to produce a single ton of pig iron. Most manufacturing districts have adequate water, but some are better off than others. Thus Buffalo's iron and steel industry which utilizes water from Lake Erie, is less handicapped than Youngstown's, which depends largely upon the Mahoning River (Fig. 129).

Cost of living. High cost of living makes high wages imperative. Accordingly, many industries have been moving from large cities to

¹² John A. Piquet, "Is the Big City Doomed as an Industrial Center?" *Industrial Management*, Vol. LXVIII, No. 3, September 1924, p. 142.

¹³ *Steel Facts*, No. XV, September 1936, p. 5.

suburbs, small cities, towns, and villages, for labor is invariably cheaper in the smaller places. The cost of living presses hard upon city workers; the general cost of living—food, fuel, rent, and amusements—being at least 50 per cent higher than in smaller communities.¹⁴



Youngstown Chamber of Commerce.

Fig. 129. A superb example of the massing of industry—iron and steel mills along the Mahoning River in the heart of Youngstown. Everything has been subordinated to the furnace, mill, and factory; industry had to have the best sites. In this area of rough terrain, only river bottoms afford ample space for the big mills.

Mass Production and Its Effect upon Labor

One of the most controversial subjects in industry is whether or not the introduction of machinery steps up or reduces employment. In order to prove that the machine has not displaced man, W. J. Cameron of the Ford Motor Company said:

In 1870 it required only 324 out of every 1,000 of the population to produce what the consumers demanded; in 1930, with the machine predominant, it re-

¹⁴The big-city dweller is by force of environment dependent daily on a thousand others for everything—food, heat, transit. He is supplied by middlemen at a price—a price that seems to increase with the size of the city.

quired 400 persons out of every 1,000. . . . The charge that the machine makes fewer jobs is completely refuted.

It always surprises people to learn that most of the machinery in use is not labor-saving machinery at all. Most of it is labor-creating or labor-serving; it enables men to work at tasks that never would have been attempted otherwise.¹⁵

On the other hand, the unemployment of the 1930's was caused in part by the installation of labor-saving machines. With markets curtailed and labor unions demanding higher wages and shorter hours, industrialists had to rely upon machinery. For example, when one of Cleveland's great steel companies installed a wide continuous strip mill, large numbers of workers were promptly dropped from the payroll. Thus, while machines make for lower costs of manufacture because of increased output per man, they also result in reducing the cost of goods. In the long run not only more goods are sold but more labor is needed, both to make the machines and to operate them.

Proper and Improper Location: The Scientific Survey

Meat-packing plants are located in Omaha, flour mills in Buffalo, blast furnaces and steel mills in Gary and Pittsburgh, automobile plants in Detroit, and clothing establishments in New York City. These are, in each case, excellent locations.

Every industrialist is vitally interested in having his plant well situated. He must scrutinize each possible locus and compare production costs in all parts of the country. If the plant is badly located, he may consider relocation, which always involves risks and uncertainties. Never should a move be undertaken without careful analysis of all advantages and disadvantages. These can be determined by means of a survey by a trained personnel who go into the field and compare the advantages of a number of potential locations. A foreign rubber-tire manufacturing company, contemplating spending a million dollars on a new plant in the United States, knew it should locate somewhere in the American Manufacturing Belt. A careful scientific survey was made of some 20 cities—all possible locations. Each was graded for specific requisites of the tire industry. Buffalo, with more points of advantage than any other city, got the plant.¹⁶

³⁵ W. J. Cameron, *Machines and Jobs*. Radio Address, Ford Sunday Evening Hour, Columbia Broadcasting System, December 1, 1935.

¹⁶ Some of the considerations which led to these conclusions were as follows:

"There are fourteen lines of railroad operating into Buffalo and half the popu-

Business is beginning to find out that in this great country of varied resources, markets, people, and distances, the man who knows his economic geography is going to prosper exceedingly more than the one who simply locates anywhere. . . . For the New Geography . . . is a fascinating record of the earth's opportunities and of man's activities amongst them.¹⁷

2. A REGION OF CITIES¹⁸

Never in the world's history have cities developed so rapidly as in the United States during the past half-century. The nation, but particularly the American Manufacturing Belt, has shifted from a fundamentally rural to a predominantly urban status. Three factors seem responsible for this urbanization.

1. Agriculture has been mechanized and transformed from a subsistence to a commercial basis, thereby releasing large numbers of people from the soil.

2. Manufacturing has reinforced commerce and increased employment, thereby stimulating the growth of cities.

land of the United States lies within a circle whose center is Buffalo, and whose radius is one night's journey by rail.

"Buffalo is within easy access of power, fuel, and markets. The great Niagara Falls plants have been supplemented by the new General Electric plant and the power is turned into the same lines. The coal mines of Pennsylvania and West Virginia are close at hand. Our greatest port of entry and the largest rubber-importing port as well, New York City, is within easy access.

"Buffalo enjoys stable business conditions and its growth has been steady and normal over a period of years, free from booms and mushroom growth of many other cities.

"Finally, Buffalo is a 'city of homes' and crowded conditions of many other cities do not prevail.

"The factory is situated a mile north of the city and is separated from the Niagara River by the Erie Canal and a strip of fore-shore. Two hundred and fourteen (214) acres of land were secured—stretching back from the river, with a water front which will give the Company access to wharves, and make it possible for us to take advantage of any development in water transportation.

"With regard to water supply, we have our own pumping station and pump water direct from the Niagara River. You are no doubt aware that a rubber plant is one of the largest users of water. This is because every mill which is used for mixing and frictioning the rubber compounds has a flow of icy cold water going through the rolls to prevent premature cure of the rubber." (R. M. Rudy, Dunlop Tire & Rubber Corporation, personal communication.)

¹⁷ J. A. Piquet, "Geography's Part in Factory Sites," *The Nation's Business*, April 1927, Vol. XV, No. 4, p. 40.

¹⁸ The United States Census regards all incorporated places of over 2,500 population as urban. Mark Jefferson would use the figure 100,000 and this seems far more logical, since it definitely excludes most towns that are products of a strictly local region. (Mark Jefferson, "Distribution of The World's City Folks," *Geographical Review*, July 1931, Vol. XXI, No. 3, p. 447.) In this volume the word *urban* indicates a density of population at least high enough to preclude agriculture as the chief occupation.

3. Improvements in communication, transportation, and distribution of power have permitted enormous numbers of people to live and work in restricted areas.

In the pre-steam era, because of the crude, inefficient and expensive means of transportation which man had at his disposal, the provisioning of large cities was difficult, as was the supplying of raw materials and the distribution of finished products over a wide area. Consequently most manufacturing was local.¹⁸

The city, of course, cannot stand alone; its greatness depends upon the region in which it finds its human, economic, and social resources. The richer and more extensive the region, the larger the city can grow.

Rise and Growth of Cities

Cities grow up in places having great advantages of location—usually where commerce breaks bulk and the agent of transportation is changed, where land and water routes converge. Some large cities in the United States are exceptions, for they are not on the Atlantic or the Pacific, nor on the Great Lakes, nor on the Gulf of Mexico, nor on a major river.

Most cities are centers of manufacturing and commerce and grow only where they benefit from strategic position; in only 15 of the 48 states is the capital the largest city, and only Boston ranks among the 10 leading great cities (that is, *political* cities; not metropolitan districts).

The growth of most cities has not been planned. Cities grow as a result of commerce, transportation, and manufacturing (Fig. 130).

The growth of the typical American city has been without any plan. It has been characterized by waves of exploitation and speculation in real estate and gambling in transit franchises; by unnecessary pre-emption of our water fronts by industrial enterprises, railroad yards and tracks, and slaughter houses. Its beaches and waters have been rendered unusable for recreation by industrial sewage.²⁰

The history of the city

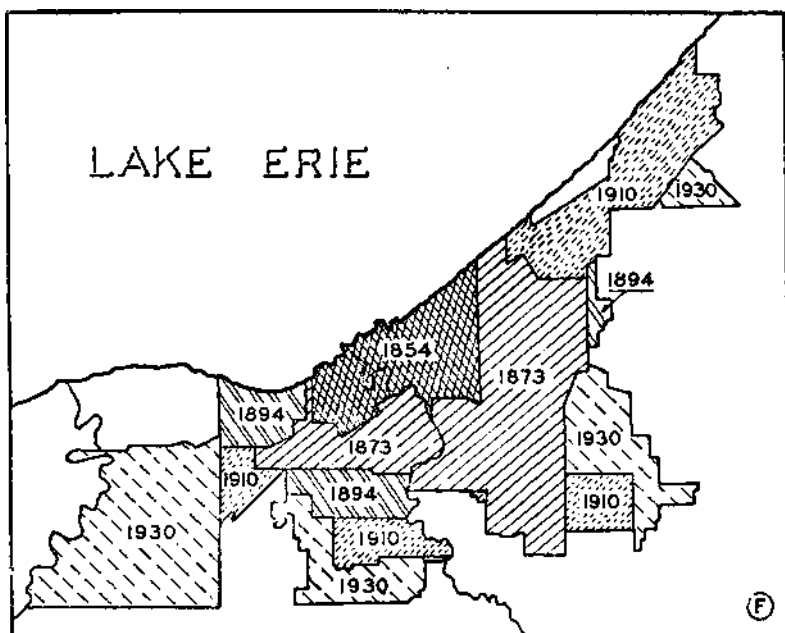
Urbanization is most common in regions of industrialization. The growth of large cities is "the most remarkable social manifestation of modern times . . . the concentration or agglomeration of

¹⁹ National Resources Committee, *Our Cities, Their Role in the National Economy*, p. 30. Washington, D. C: Government Printing Office, 1937.

²⁰ Albert Mayer, "Seeking the Pattern for a Future New York," *The New York Times Magazine*, January 2, 1938, p. 8.

people in and around cities is at once our proudest boast and (our) acutest problem."²¹

The great city is not new. Carthage, Alexandria, and Rome all had populations of a half-million or more. But they were political creations of great empires; modern cities are the product of economic-geographic conditions. Prior to the era of steam, few



After Harold E. Adams.

Fig. 130. The growth of corporate Cleveland, like that of all great cities, has been piece by piece. Most cities began as self-sufficing villages, developed into small trading centers (towns) and then into cities. The next step is the metropolitan district.

cities exceeded 100,000 and it is doubtful whether any city, even such renowned centers as Rome, Nanking, and Peking, ever reached 1,000,000 in population. It was not until great social and economic changes were wrought by the Industrial Revolution that the modern city became possible. On the other hand, the *wholesale* growth of cities is quite recent, because the strategic quality of a place is measurable solely in terms of transportation and communication,

²¹ A. W. Atwood, "The Great Cities," *Saturday Evening Post*, August 4, 1928, Vol. CCI, No. 5, p. 23.

and these have come into being only in modern times. So long as transport facilities were backward, large numbers of people could not be confined to a small area and at the same time be fed and clothed.

The principal difference between urban growth in the Old World and in the United States is the slow evolution of cities in the former and their rapid growth in the latter. There they grew over a period of centuries from a town economy to their present urban caste. Here they started as a wilderness community on the outskirts of civilization, taking the leap from primitive agriculturalism to mature urbanism in little more than a century.²²

The Typical American Manufacturing Belt City

Viewed from an airplane, the typical city of the American Manufacturing Belt appears as a sprawling mass of structures of varying size, shape, and construction, criss-crossed by a checkerboard street pattern which here and there assumes irregularities. The blocks into which the city is divided seem to lack any organic grouping into units. The general impression is that of stereotyped monotony. Portions consist solely of green open spaces or parks. The city is built up more at the core, where bizarre and fantastic skyscrapers mark the business district. The scene flattens out abruptly toward the edges, where light manufacturing and warehousing take place. Here also are some of the blighted areas and slums. Adjacent to this belt are the tenements and workingmen's homes, and beyond them the apartment houses, and finally the single homes with small yards.

Beyond the built-up parts are great open spaces characterized by market gardens, greenhouses, country clubs, and abandoned or unsuccessful real estate projects, marked by pavements, sidewalks, and other improvements but showing no new or scattered buildings. At especially favorable sites, partly obscured by woods, nestle imposing mansions.²³

Congestion in Cities

The American Manufacturing Belt is the most densely populated region on the North American continent, a consequence of the great number of cities and the enormity of many of them (Fig. 131A and B). One would expect to find congestion and slums—those

²² National Resources Committee, *Our Cities, Their Role in the National Economy*, p. 2. Washington, D. C.: Government Printing Office, 1937.

²³ *Ibid.*, p. 6.

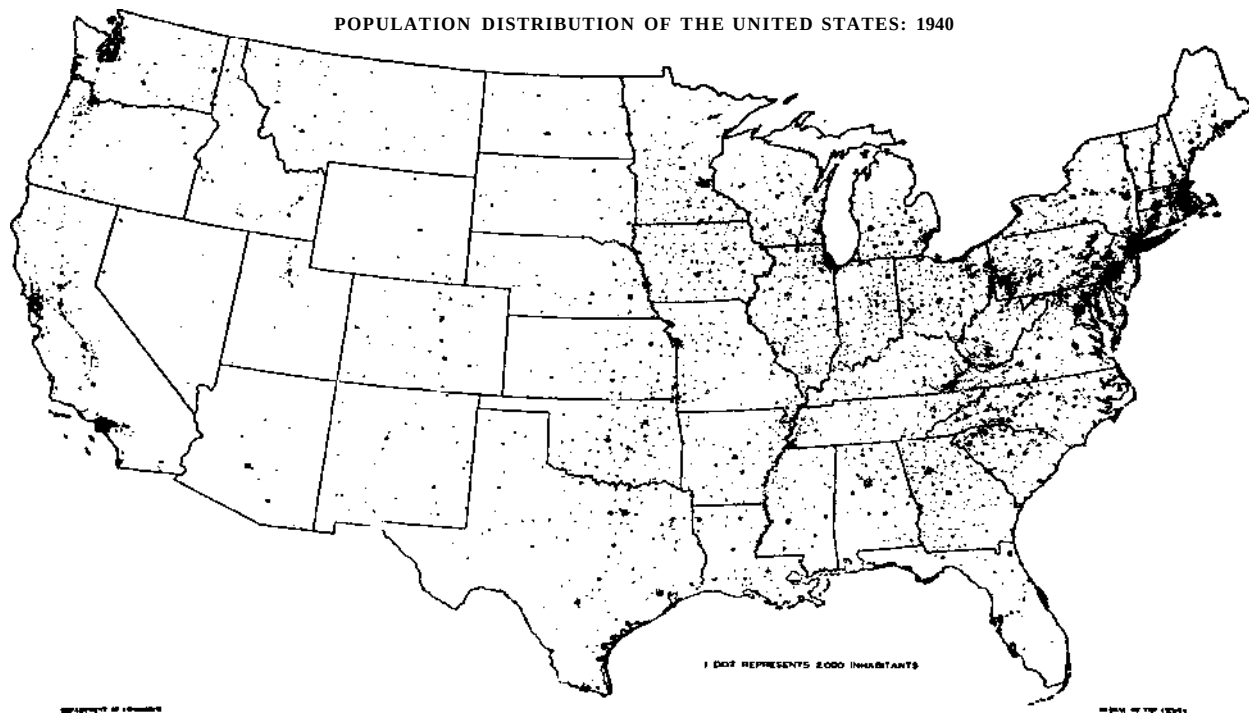


Fig. 131 A. The distribution of population in the United States—1940.

festering and frequently forgotten sections of great cities (Fig. 132). One would expect also the rotten political machine. Much of the land is held by speculators who count upon their lots being wanted for skyscrapers and bought at inflated prices. Tenements, invariably crowded and in disrepair, lack adequate sanitary facilities. Rent is cheap, but the people cannot live decently and the cost of living presses hard upon them. To make matters worse is the constant display of extreme wealth with its arrogance, frivolity, and sinister power over social welfare flourishing side by side with the most cruel poverty and industrial dependence.²⁴ It is little wonder that the laboring class becomes restless and dissatisfied, driving many manufactories away from the industrial overgrown cities.

The Foreigner and the Negro

American industry, which does about one half of the world's manufacturing, would have been impossible without immigrants who supplied the muscle essential to the building of the modern city. To our ports they came by the millions, seeking employment in shops, factories, and mills. They and their offspring are today concentrated almost entirely in urban centers—particularly in the largest ones. In fact, the foreign-born and their children constitute nearly two thirds of all the inhabitants of our cities of 1,000,000 or more.²⁵ Many of them, however, have not become Americanized.

Never before in the history of the world have great groups of people so diverse in social backgrounds been thrown together into such close contacts as in the cities of America. The typical American city, therefore, does not consist of a homogeneous body of citizens, but of human beings with the most diverse cultural backgrounds, . . . a motley of peoples and cultures forming a mosaic of little worlds which in part blend with one another, but, in part and for a time, remain segregated or come into conflict with one another.²⁶

In such places social intermingling does not happen; enclaves of foreign speech dot the urban landscape, and all the evils of caste make their appearance (Fig. 133).²⁷ Foreigners present, therefore, a real problem in Americanization, education, and assimilation.

Racially and culturally, the immigrants of the "New Immigration" are far different from their predecessors. This does not mean

²⁴ John A. Piquet, "Is the Big City Doomed as an Industrial Center?" *Industrial Management*, September 1924, Vol. LXVIII, No. 3, p. 140.

²⁵ National Resources Committee, *op. cit.*, p. 9.

²⁶ *Ibid.*, p. 10.

²⁷ Mabel C. Stark and Derwent S. Whittlesey, *Major Geographic Regions of North America*, p. 40. Bloomington, 111.: McKnight & McKnight. 1923.

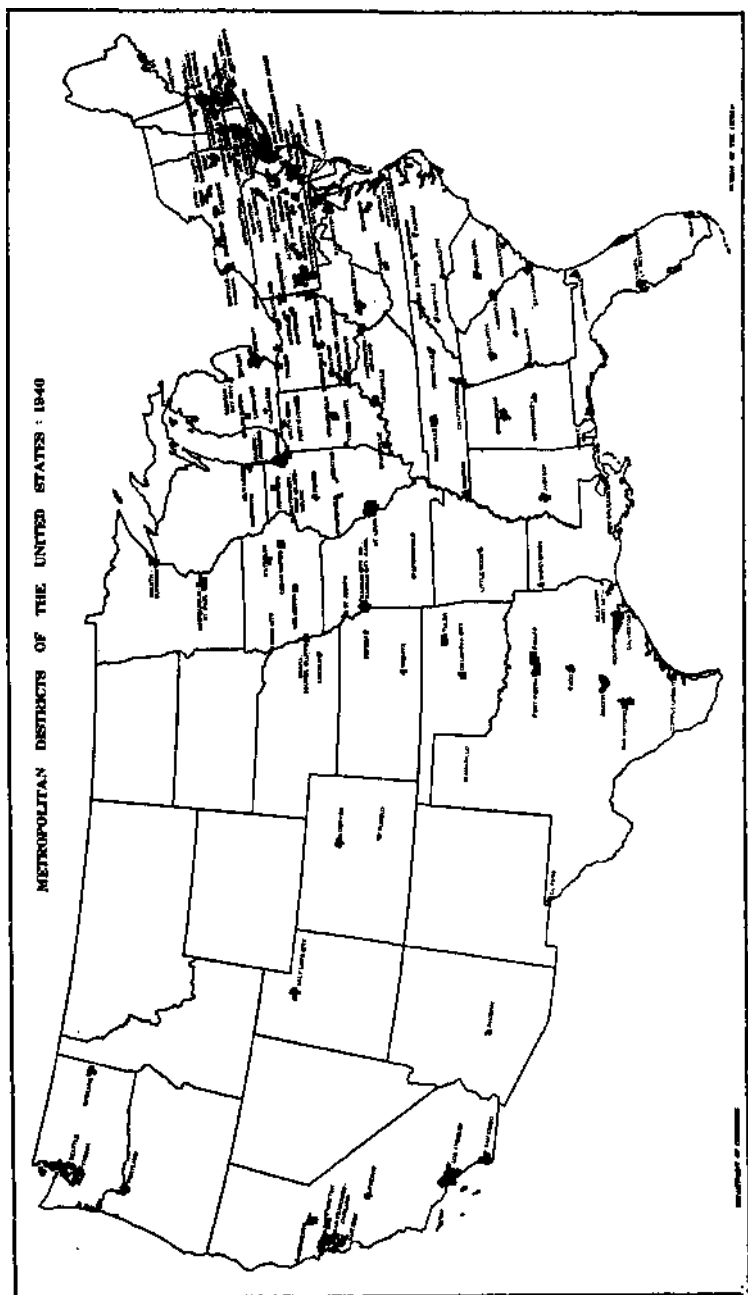
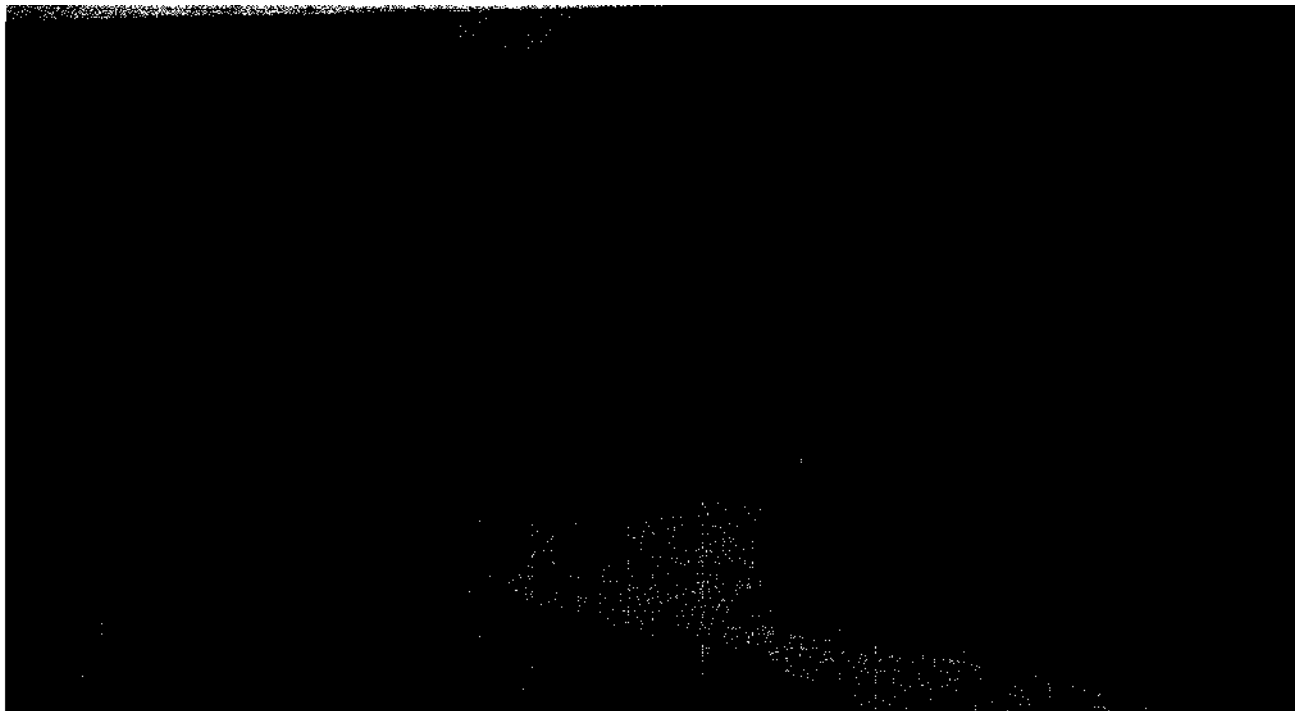


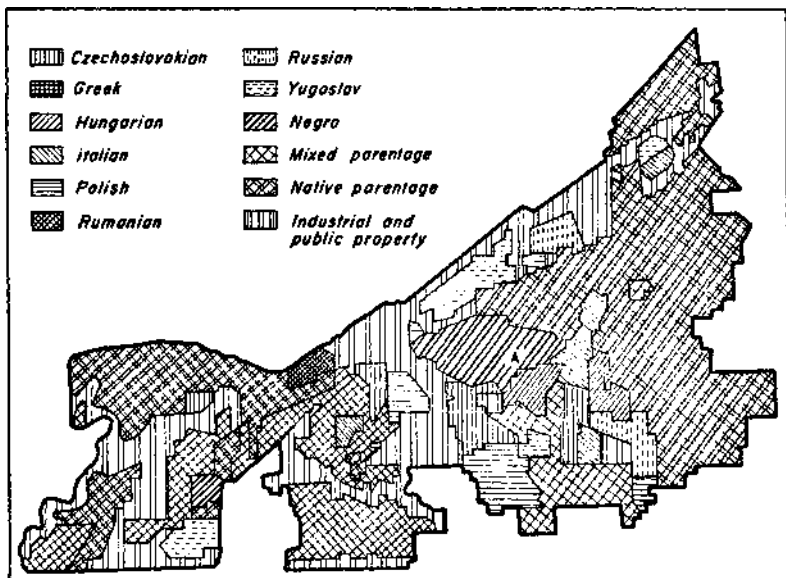
Fig. 131B. Distribution of metropolitan districts in the United States—1940.



U. S. Housing Authority.

Fig. 132. A slum on Chicago's South Side under the "L." A zone of deterioration invariably develops around the central business district of a great city because of congestion, lack of open space for play and recreation, noise from traffic, and the invasion of trade and manufacturing.

that they have made no contributions to American life, for the "natural and often brilliant abilities of these many races" are great. Especially should it be noted that some of our outstanding leaders in science and art come from them. Descendents of the old stock, however, consider the new immigrants less desirable than their predecessors. Early settlers coming to exploit a virgin soil endured



After W. G. Fordyce.

Fig. 133. Foreign colonies in Cleveland. Foreign-born and their children constitute nearly two thirds of all the inhabitants of cities in the million-and-over class. Note the large and well-defined areas occupied by Hungarians, Italians, Yugoslavs, Poles, Russians, and Slovaks. In addition to these, the great city is made more racially heterogeneous by large numbers of Negroes. The segregation into distinct neighborhoods is partly from choice and partly from outside pressure. Thus far these great lumps have not been digested.

the risks and toil of pioneering. They were the *real* pioneers. The newer immigrants, instead of heading for the great open spaces of the agricultural interior, congregated in the ports or in the industrial and mining centers of the East.²⁸

It is in the Little Italy, Little Hungary, Little Russia, Little Poland, and Little Yugoslavia, almost without exception, that the highest birth rate is to be found.

²⁸ Andre Siegfried, *America Comes of Age*, p. 7. New York: Farrcourt, Brace & Co., 1927.

In the American Manufacturing Belt, differences in language, culture, wealth, and consequent opportunity greatly hinder the leveling processes.

Negroes have been moving from the South into the large industrial cities of the North in tremendous numbers. This migration, most pronounced during and following the first World War, took the plantation Negro into an inhospitable urban environment to which he may perhaps be maladjusted, as indicated by his higher death rate. Roughly 85 per cent of the Negro population in the North is urban and is concentrated primarily in the larger cities.

It is little wonder then that the old stock fears it is being slowly but surely overwhelmed from within by these great hordes of foreigners and Negroes. As early as 1720, Christopher Lodowick wrote from New York: "Our chief est unhappiness here is too great a mixture of nations."

Suburbs and Satellite Cities

No one thing connected with urban centers has been more important in recent years than the spilling out of people into the suburbs. In many ways suburbs are as much a part of the city as though they shared in its municipal government. The big city everywhere is losing out today to its satellites, garden cities, and outlying tributary areas; it is growing outside rather than inside.

Had a master plan been followed, suburbs probably would not be the magnets they are. When cities were laid out, no one could foresee the great industrial growth or improvements in transportation the nation was to experience.

Suburbanization has been made possible by improvements in transportation, especially the automobile. The automobile was a mere curiosity in 1900, but in 4 decades it transformed cities, created metropolitan areas, attracted people from remote districts into the urban trade territory, and enticed city populations into suburbs.

The suburb must rely upon the central city for its economic and social well being:

The model suburb, whether it is industrial or residential, however superior, aloof, and detached it may believe itself to be, has its basis of existence and draws much of its sustenance from the noisy, grimy city of which economically and culturally it is an integral part, but from which it has managed to remain independent politically.²⁹

²⁹ National Resources Committee, *Our Cities, Their Role in the National Economy*, p. 35.

Nevertheless, most of the cities are suffering because so many leading citizens live outside their limits while carrying on their business within; it is for this reason that the political destinies of cities increasingly reside in the "gas-house" type of voter.

Metropolitan Districts

A metropolis, a city which has grown to gigantic proportions, includes formerly independent towns and villages along with new ones it has created. The United States Census says:

Metropolitan districts have been set up for use in the 1940 Census in connection with cities of 50,000 or more, two or more such cities sometimes being in one district. In addition to the central city or cities, the general plan has been to include in the district all adjacent and contiguous minor civil divisions (townships, etc.) having a population of 150 or more per square mile. The metropolitan district is thus not a political unit but rather an area including all the thickly settled territory in and around a city or group of cities. It tends to be a more or less integrated area with common economic, social, and, often, administrative interests.³⁰

Of the 140 metropolitan districts in the United States (Fig. 131B), the American Manufacturing Belt has 65; of Canada's 9 this region has 5.

Many cities have grown too large for the good of their inhabitants. Some chambers of commerce that for years strove to get industries by offering all sorts of inducements are responsible for many industrial maladjustments. It was estimated a few years ago that American cities were spending \$10,000,000 a year to attract new industries.

America has gone in for big cities, big buildings, big factories, big machines, big everything. "This worship of size, regardless of quality, is a very serious thing. There are grave perils in size. . . . Urban megalomania is just as regrettable a disease as elephantiasis."³¹ Thus at one time New York City planned for 30,000,000 people, but decreased immigration, decelerated birth rate, and the depression of the 1930's at least delayed this growth.

A metropolitan area includes far more land than is confined within its political or city limits. For example, New York and Chicago even spill over into adjoining states. To an aviator, however, the whole constitutes one city. New York City has expanded far beyond its city limits, crowding the arms and tributaries of New

³⁰ Sixteenth Census of the United States, *Metropolitan Districts of the United States: 1940*, p. 1. Washington, D. C: Government Printing Office, 1941.

³¹ A. W. Atwood, "The Great Cities," *Saturday Evening Post*, August 4, 1928, Vol. CCI, No. 5, p. 44.

York Bay and Long Island Sound in both New Jersey and Connecticut.

Chicago is not just the city incased within definite political limits, but extends along the shore of Lake Michigan for more than 100 miles and includes Waukegan, South Chicago, Whiting, and even Gary—all as much a part of it as the "loop."

Pittsburgh, capital of the world's iron and steel industry, means not the city *per se* but the Pittsburgh District, which includes the cities, townships, and boroughs of its 3 river valleys. Here is a district with almost 2 million people, all with much the same economic interests. Pittsburgh defined politically has roughly only about one third of this number. Pittsburgh is a splendid example—though an extreme one—of an actual city spreading beyond the municipal corporation.

The Big City—Is It Doomed?

Large cities are not reproducing themselves. Moreover, they have grown so big that the poor people live under tragic conditions (Fig. 132). Most of the big ones are ailing to a greater or lesser degree, yet the average one seems to concern itself more with growing larger than with curing its sickness. Louis Mumford stated in one of his books substantially the following:

We cut a steel gash in the bowels of the earth and call it a subway. Every morning we hurl from the Harlem to the Battery, within a concentrated period of time, several hundred thousands of people under disgraceful conditions of crowding. Every evening we repeat the process in the reverse direction, and that is what we are pleased to call civilization.

There are many persons who believe that the great city is doomed—that it is a "dinosaur." One of these, Oswald Spengler, says that as civilization dries up it concentrates in a city. As the ancient Mediterranean civilization dessicated in Carthage and in Rome, so its modern counterpart is drying up in New York, Chicago, and Pittsburgh.³²

The authors do not concur in this belief that large urban centers will die or disappear, for cities seem to be going through a new stage in their evolution made possible by the automobile—that of spilling out from the center and over the corporate boundaries. It would appear that "with all its evils, the city is with us as a practical problem."

³² Benton MacKaye, "End or Peak of Civilization?" *Survey Graphic*, October 1, 1932, Vol. LXVIII, No. XIII, p. 441.

Rurbanization

Rather than have three fourths to four fifths of our population reside in great cities, O. E. Baker recommends *rurbanism*—an attempt to attain a balance between agriculture and industry. Model suburbs, garden cities, and suburban homesteads represent variations of this ideal. Certainly there are advantages in combining in the same community the best in urban and rural life. Workers then could live close to the mill and yet enjoy the benefits of semi-rural environment.

Baker uses southern New England as an example of rurban life, where part-time farms are numerous and most full-time farms, though small, are possibly more highly improved than anywhere else in the country. He stresses the fact that this is not a matter of superior natural environment but rather of a philosophy of life exemplified by frugality rather than extravagance, culture rather than consumption, and the home as the ultimate measure of success. He thinks New England has developed a civilization that should be studied and adopted elsewhere in the United States.

3. PRINCIPAL SUBREGIONS OF THE AMERICAN MANUFACTURING BELT

Eastern New England

Included within this subregion are the industrial parts of Maine, New Hampshire, Rhode Island, Massachusetts, and Connecticut; in the last two states only those parts east of the Connecticut River are considered. Boston obviously is the dominating center. Of considerable importance also are Providence, Fall River and New Bedford.

This is an area of diversified light industry. Formerly some type of manufacturing was followed in almost every village. Today most of these small mills are abandoned, but this subregion will not become one of ghost cities, for it offers attractive conditions for the types of manufacturing that specialize on high-grade products that utilize skilled labor and are made from non-bulky or imported raw materials.

The metal-goods industry

The manufacture of small metal wares finds almost ideal conditions here, for this industry utilizes skilled labor, caters to a national

and international market, consumes little fuel, and assembles raw materials at comparatively low cost.

The textile industry

Cotton. New England was long the center of the nation's cotton-textile industry but it has yielded supremacy to the South in the manufacture of coarse and medium goods. Between 1919 and 1929 New England textile mills declined in number from 324 to 241. However, the New England textile industry is still nationally important, especially in the preparation of finer fabrics. Today 31 per cent of the industry, based on spindlage, is in Massachusetts, Maine, New Hampshire, and Rhode Island. The textile industry employs about one third of all New Englanders engaged in manufacturing.

Among New England's early advantages were (1) damp air, which was essential to prevent fuzzing of the cotton fibers (in dry air frictional electricity results in the yarn twisting and snarling), (2) excellent water-power facilities, and (3) skilled labor. The two principal reasons for the collapse of the industry are (1) the failure to keep the plants modern and in condition to operate efficiently, and (2) costlier labor and shorter working hours.

Wool. New England is the undisputed leader in wool-manufacturing industries. Its mills make both woolens and worsteds—specializing in one or the other. The industry located there because New England was rich in water-power, in clear, soft water, and in wool. New England no longer produces the wool for the industry, but the fact that about 60 per cent of all wool used in the United States moves through Boston is a compensating factor.

Woolen manufacturing is more concentrated than cotton manufacturing. Outstanding centers are Lawrence, Providence, Woonsocket, Holyoke, and Lowell, the first three being especially active in worsteds.⁸³

Unlike cotton-textile manufacturing, the woolen branch has not migrated from New England, a circumstance attributable to the fact that the region is the style center for woolens and that the markets for both woolens and worsteds are in the North.

⁸³ In making worsteds the fibers are combed prior to spinning, leaving only the long fibers, whereas in making woolens the fibers are merely carded. Worsteds have a tighter weave and harder finish than woolens. Worsteds mills are invariably larger. So greatly do the two processes differ that they are usually regarded as separate and distinct enterprises.

The shoe industry

New England leads in shoe manufacturing, with eastern Massachusetts possessing the greatest concentration of plants in the world. The chief locative factor is skilled labor, though access to leather and other materials and proximity to markets are important. Brockton, Haverhill, and Lynn are definitely shoe towns—the first two concentrating on men's shoes, the last on women's. The North Shore has always specialized on women's shoes, the South Shore on men's. North Shore communities were primarily interested in fishing. The wives, daughters, and sisters of the fishermen obviously preferred to work on women's shoes, which were lighter in weight than men's. The South Shore, on the contrary, with few good harbors but better farmland, turned to agriculture. Men were home the year round and preferred to do the heavier work required on men's shoes.³⁴

New England cannot indefinitely retain supremacy over other areas having large local markets and better access to raw materials. New York, Ohio, Illinois and Wisconsin all have become important in this industry—a response to the westward migration of the center of population.

Cities

Boston (2,350,514) is located in the Boston Basin—a rolling low-lying plain. The harbor, dotted with grassy islands—drum-lins—that open into the unbroken reaches of Massachusetts Bay, is commodious and deep and has an irregular shoreline with numerous long, narrow peninsulas.

The first settlements took place on these peninsulas or "necks." Since early days men have filled in the bays and torn down the hills, building much of the city on "made" land.³⁵ Boston early became New England's outstanding port. It outstripped Salem because it was nearer the interior of Massachusetts.³⁶

Boston harbor is open the year round and is closer to northwest Europe than New York, Philadelphia, or Baltimore. However, it is primarily an importing port, owing to the fact that its hinterland

³⁴ Malcolm Keir, *Manufacturing Industries in America*, pp. 225-226. New York: Ronald Press, 1920.

³⁵ Irving B. Crosby, *Boston Through the Ages*, p. 103. Boston: Marshall Jones Co., 1928.

³⁶ William Morris Davis, "The United States of America," in *The International Geography* edited by Hugh R. Mill, p. 722. New York: D. Appleton & Co., 1900.

is confined to New England by the Berkshires, which impeded communication with the Middle West. Of the 4 major Atlantic seaboard ports, only Boston failed to complete a railroad into the Middle West, contenting itself with a connection between its Boston & Albany Railroad and those railroads beyond the Hudson River. In 1930 the value of its exports was only one-fortieth that of New York City, one-third that of Philadelphia, and less than two-thirds that of Baltimore.³⁷ Ships frequently unload at Boston before proceeding to New York to take on a load of products that originated in New England. In other words, Boston deals less with New England traffic than does New York City.

Providence (711,500) is located at the head of Narragansett Bay. In spite of access to the sea, its growth is the result of railway traffic. It has always been dwarfed commercially by Boston. Providence, the second-largest city in New England, with its satellites Attleboro and North Attleboro, manufactures most of Anglo-America's jewelry. It also produces hardware, tools, and expensive light-weight textiles.

Worcester (306,194), 40 miles west of Boston in hilly central New England, is the second most important industrial city in Massachusetts. With the opening of the Blackstone Canal in 1828, it became the leading industrial city of the United States not on a *natural* waterway. Its industries, diverse and well-balanced between metal products and textiles, produce wire, looms (William Crompton of Worcester invented the fancy loom), grinding wheels, envelope-making machinery, rugs, leather belting, and shoes.

Lynn (98,123), located between Salem and Boston, early became a great shoe-manufacturing center because fishing vessels carried a part of their catch from these harbors and brought back hides as a part of their return cargo. Lynn, unlike other places in New England, never suffered from a scarcity of raw materials. It continues as a great shoe center largely because of its early start. Nevertheless, it was one of three American cities to drop below 100,000 between 1930 and 1940. Doubtless a major reason for this decline was competition with the Middle West in the shoe industry.

Fall River-New Bedford (272,648), neighboring cities and both great textile centers, comprise a single metropolitan district.

Fall River, occupying the crest of a long steep hill, was named by Amerinds for the river (falling water) which flows through the

³⁷American Geographical Society, *New England's Prospect: 1933*, p. 372. New York: 1933.

city and supplies power for its mills. Although its name was synonymous with cotton manufacturing from 1871 to 1929, Fall River has been the hardest hit of all New England cotton cities.

New Bedford, at the mouth of a small river, became the world's leading whaling port about 1820. At one time 10,000 seamen manned its ships. The textile industry started in 1846 and boomed from 1881 to 1883. It continued to be important until 1921, when some mills closed, others curtailed production, and still others migrated to the South.

New Bedford is today an important fishing center. With the advent of trucks and hard-surface roads, it has also attracted many boats that formerly made Boston and New York their ports.

Lowell-Haverhill-Lawrence (334,969). *Lowell*, America's *oldest industrial city*, is definitely a mill town. Located at the junction of the Merrimac and Concord rivers, it early benefited from abundant water-power. Ease of developing this power and nearness to the port of Boston with which it was connected via the Middlesex Canal were primary considerations in its selection by textile companies prior to 1840. It also had soft and clear water, with little suspended material—an aid in the dyeing industry. For a long time Lowell was the leading cotton-manufacturing center of the nation.

In addition to its early start, probably the main advantage of Lowell is its proximity to New York City, the primary cotton-goods market, and the fact that spot business * has become more important. Lowell's future rests upon lowering taxes and reducing the relief load.

Haverhill is located like Lawrence in the Merrimac Valley but is famous for shoes, specializing in high-fashion styles for women. In this industry only Brockton among Massachusetts cities surpasses it. Its other manufactures are paper, woolen goods, chemicals, and hats.

Lawrence lies in the narrow trough along the Merrimac River north of Boston. It early became an outstanding wool-manufacturing city, primarily because of its water-power. Its great red brick mills are strung out along the river banks. It still is predominant because of nearness to clothing manufacturers and because the high value of wool enables it to stand transportation charges from the far corners of the earth. In recent years Lawrence has begun to manufacture soap and paper.

*The term "spot cotton" is used to designate actual cotton on the market, and a "spot market" is one dealing in spot or actual cotton. In a "future market" the trading is done in contracts to deliver at some future date.

Southwestern New England

This subregion includes the parts of Massachusetts and Connecticut that lie west of the Connecticut Valley. Here factories specialize on light products requiring high mechanical skill—machinery, tools, hardware, firearms, electrical goods, watches, and clocks. These are all products of high value and small bulk, which require little raw material and power, and can easily stand transport charges to distant markets. From early days towns making the same products were in the same river valley, because expansion logically takes place along "topographic lines of least resistance." Thus the brass industry is strung along the Naugatuck Valley in Connecticut from Torrington to Bridgeport. The manufacture of metal products, especially electrical machinery and hardware, predominates in this subregion. The market center is New York rather than Boston.

The *Spring field-Holyoke* metropolitan district (394,623) includes Chicopee, West Springfield, Westfield, and Northampton. *Springfield* lies on the east bank of the Connecticut River and is most famous of the alluvial terrace towns of the valley. Every city and town whose name ends in "field" was founded because of its distinct advantage over sites on the floodplain. Springfield owes its commercial importance to the fact that the Boston & Albany Railroad crossed the Connecticut Valley at that point. Its principal industries make electrical goods, motorcycles, machine tools, radios, and refrigerators.

Holyoke is built on numerous canals that have provided cheap power. It is famous as a producer of quality writing paper, made of rag scrap from near-by textile mills. It also makes fine textiles—woolen, worsted, silk, cotton, and rayon.

New Haven (308,228), at the confluence of three small rivers, is situated on a shallow harbor difficult to navigate except at high tide. Accordingly there is little commerce except incoming coal and petroleum.

Essentially an industrial city specializing in light manufacturing, New Haven produces hardware, tools, firearms, wire, railroad equipment, clocks, and toys. It is probably best known, however, as the home of Yale University.

Bridgeport (216,621) lies at the mouth of one of the small rivers flowing into Long Island Sound. It was formerly an important whaling port, but the arrival of the first railroad in 1840 diverted all interest to manufacturing.

Bridgeport probably is not surpassed in the manufacture of diversified products. Its acres of factories pour out brassware, brake linings, electrical equipment, hardware, machinery, munitions, pharmaceuticals, rubber goods, tools, sewing machines, and typewriters.

Hartford-New Britain (502,193), on the Connecticut River, early became important as a bulk-breaking point for the upper valley. The river navigation that was so important in the early commercial life of the cities never recovered after the War of 1812. Only barges and coal carriers use the Connecticut today.

Hartford lies in the heart of the rich farming country of the Connecticut Valley and handles much agricultural produce, especially tobacco. It is the largest city in Connecticut and the most important insurance center in the world. It produces brushes, castings, electrical equipment, firearms, machinery, precision instruments, tools and dies, typewriters, and aircraft.

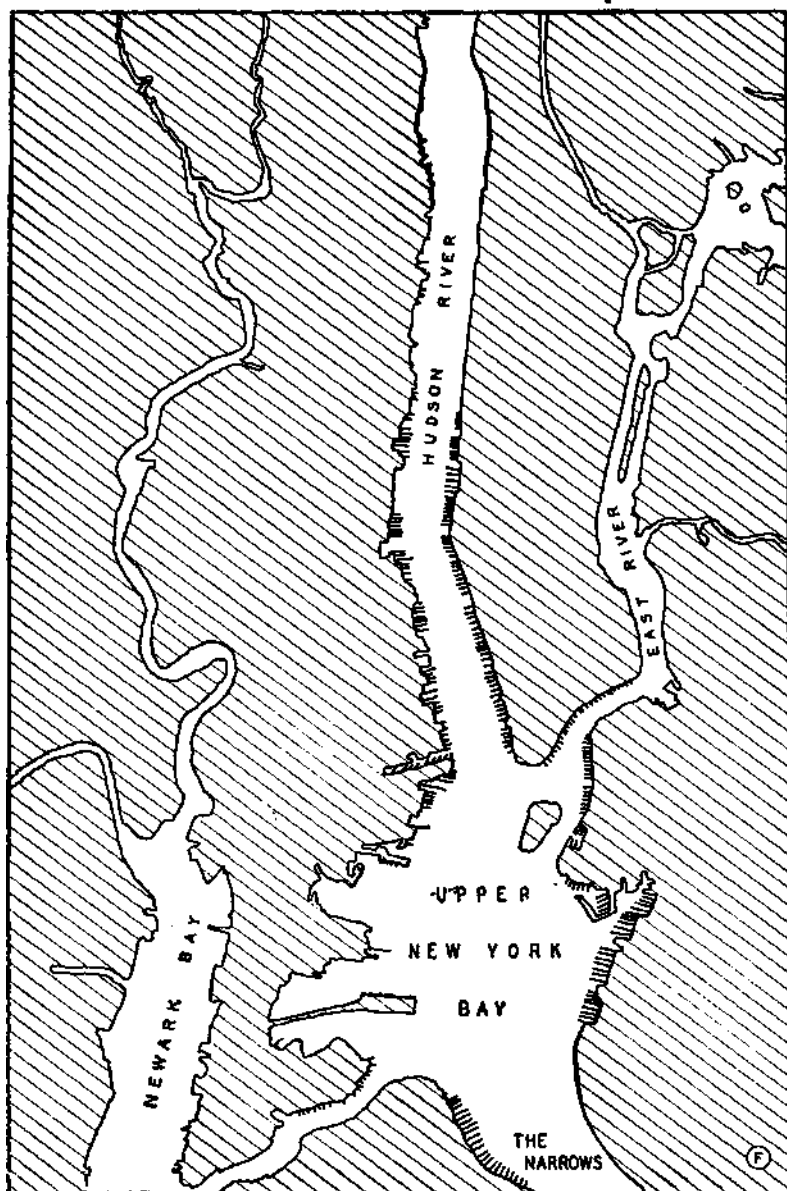
New Britain is the hardware center of the North American continent, producing half the hardware made in Connecticut and about one tenth of that made in the United States. Its first articles—sleigh bells—were sold by Yankee peddlers about 1800. This business created a demand for other light articles—such as cutlery and edge tools, which were made in small shops. Industrial New Britain did not come into its own until the era of steam power, for this city had inadequate water-power.

Waterbury (144,822) occupies the valley of the Naugatuck and Mad rivers. This typical Yankee industrial town is the center of the brass industry of the North American continent, and is known for its clocks and cheap watches. .

The New York Metropolitan District

The New York area (11,690,520) is one of superlatives. It is North America's most populous and cosmopolitan district and the most intense mixing-bowl. It has the best harbor and is the largest port, and it leads in commerce, manufacturing, and finance. It also dictates the nation's styles and attracts the greatest number of tourists.

This area is located at the mouth of the navigable Hudson River on a well-protected deep-sea harbor and at the focus of major land and sea routes. By value it handles approximately one half of the nation's commerce. Its harbor consists of 7 bays, 4 rivers, 4 estuaries, and 42 different channels (Fig. 134). The Hudson River scours out the mouth of the bay, keeping the channel deep. The



Port of New York Authority.

Fig. 134. New York Harbor north of the Narrows. This harbor, one of the best in the world, has been a major factor leading to the development of the City of New York to its present greatness.

direct waterfrontage is 771 miles, and 347 of it have been developed. The harbor includes the Hudson River, the Upper Bay, the Narrows, the Lower Bay, Newark Bay, Kill Van Kull, Arthur Kill, the East River, Flushing Bay, the Harlem River, Buttermilk Channel, Bay Ridge Channel, Gravesend Bay, Sheepshead Bay, Sandy Hook Bay, and Raritan Bay (Fig. 134). Most of these channels are deep enough to accommodate the largest ships afloat. The channel leading to the Atlantic is direct. The tidal range is so narrow that ships may come and go at almost any time. Ice never blocks the harbor, though fog occasionally holds up traffic. (At times the fog is so thick that ships and ferries cannot stir for several days.)

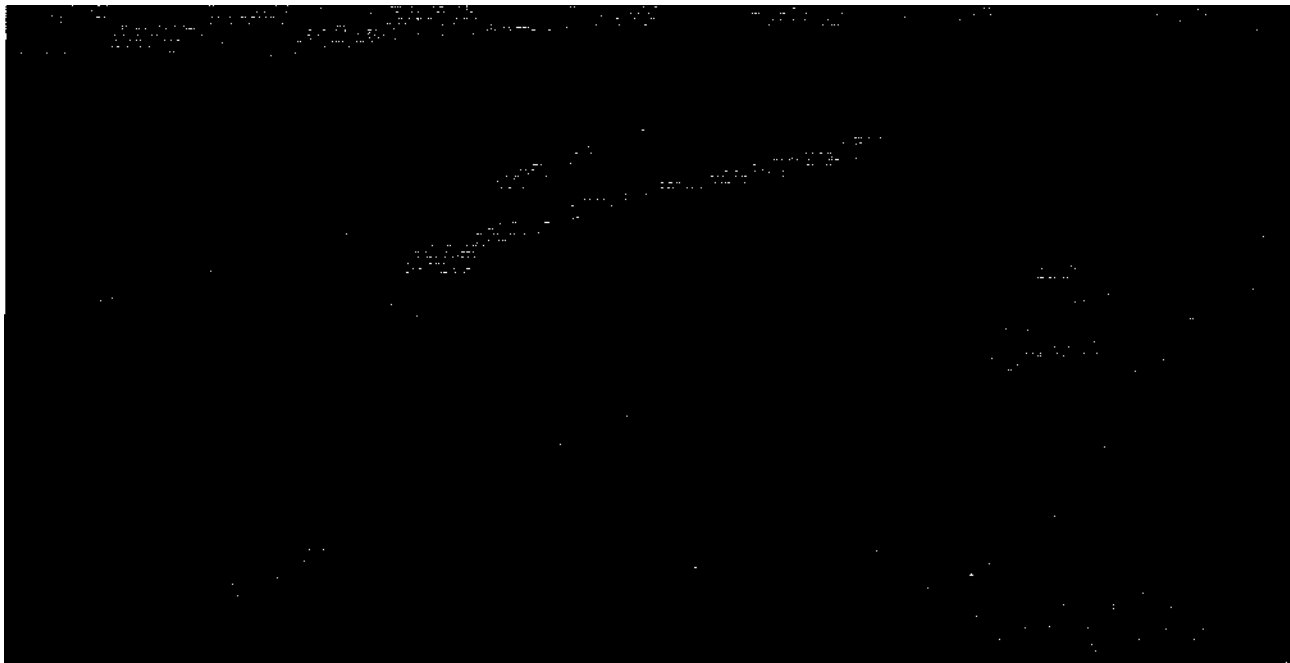
New York is the only Atlantic port with an easy route into the interior—the Hudson-Mohawk Depression (Fig. 135). The Erie Canal (now the New York State Barge Canal) more than any other single factor contributed to New York's greatness as a port, for it made all the country between the Great Lakes and the Ohio River and between the Mississippi and the Atlantic tributary to the Atlantic Seaboard and largely to New York City. The New York Central Railroad, following the route of the Erie Canal, by 1851 had brought the steel rails from the Middle West almost to the tip of Manhattan. Other railroads have established marine and rail termini on the west side of the Hudson as near to the New York Central as possible. As a result, the Port of New York has 12 railroads.

Congestion

The great amount of water, while advantageous to commerce, is a barrier to traffic between Manhattan and the rest of the New York area. For decades attempts have been made to mitigate the traffic congestion in and about New York City. In 1936 New York's subways, elevated lines, surface cars, busses and taxis handled 3 billion passengers.³⁸

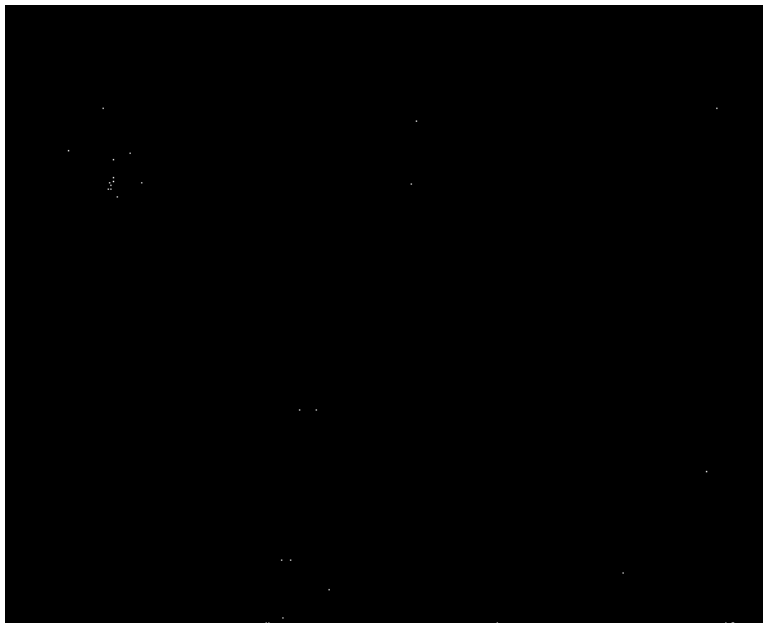
-Because of the small area and the hordes of human beings that come and go into the city daily, the most elaborate subway system ever conceived has been built, while above ground is operated an extensive bus system. Vehicular tunnels have been built—the longest in the world; great suspension and steel-arch bridges have been built across the rivers. Railroads enter Manhattan via tubes under the Hudson and East rivers. Ellsworth Huntington in 1916

38 H. I. Brock, "The Rare Show That Is New York," *The New York Times Magazine*, March 27, 1938, p. 16.



New York Central Lines.

Fig. 135. Scene in the Mohawk Valley—outstanding route into the interior. Note the concentration of parallel transportation facilities; from left to right are a two-track railway/ the New York State Barge Canal, the Mohawk River, the four-track main line of the New York Central Railroad, and a hard-surface road. In its advertising the New York Central emphasizes the fact that it uses the only water-level route through the mountains.



Eistern Airlines,

Fig. 136. Part of the financial and business district on lower Manhattan Island—area of greatest concentration of economic activity in the New York subregion. In the foreground is Brooklyn; in the background, the Hudson River and New Jersey. The skyscraper is an adjustment to a paucity of room. Since nowhere is there a spot so crowded, it is logical that Manhattan should have the world's greatest concentration of skyscrapers. Here within a radius of 20 miles are more than three times the population of the Dominion of Canada.

estimated that the water barriers of Manhattan cost each New Yorker \$10 per year. With the added bridges and tunnels built since then the per capita cost must be considerably more.³⁹ The cost of ferrying a ton of freight across New York harbor would take that same ton 200 to 600 miles by rail.⁴⁰

Skyscrapers

Most urban sites permit almost indefinite lateral expansion. Southern Manhattan, with a restriction of space, is an exception,

³⁹ Ellsworth Huntington, "The Water Barriers of New York City," *Geographical Review*, September 1916, Vol. II, No. 3, p. 178.

⁴⁰ Robert A. Leshner, "National Arteriosclerosis," *Survey*, October 1, 1932, Vol. LXVIII, No. 13, p. 460.

for "nothing less than a thickly populated skyscraper can meet ground rent and taxes." Fortunately, Manhattan consists almost entirely of solid rock and hence provides the foundations for the skyscrapers which make New York's jagged skyline the most awe-inspiring sight in the world (Fig. 136).

Population

The population (white) of New York in 1626, the year Manhattan passed from the Amerinds, was less than 200. In 1940 the population of New York City had reached a total of 7,454,995. If we add to this population that included in the metropolitan area—out to and including New Brunswick (New Jersey), Peekskill (New York), and Norwalk (Connecticut)—the total approximates 12,000,000.⁴¹ The population is mostly in Manhattan and Long Island and in the peninsulas of the Bronx and Bayonne.

New York's foreign-born population, representing every part of the globe, is extraordinarily high, being 73 per cent as against 31 per cent for the nation. Should these foreigners and the 440,000 Negroes be removed, "whole cities within New York City (including the slums) would be deserted."⁴² Of the 5 million foreign-born whites, more than one half came from eastern and southeastern Europe and less than a third from northwestern Europe. The city is peppered with Little Spains, Little Italies, Little Rumanias, and so forth.

New York City also draws heavily on the native white population of all 48 states, approximately three quarters of a million New Yorkers having been born outside New York State.⁴³

Commerce

New York, the greatest port in the world, has a ship entering and a ship leaving every 10 minutes of the daylight hours. In 1938 the value of its tonnage was \$9,258,000,000, or more than 40 per cent of that of the nation.⁴⁴ With its hundreds of steamship piers, it accommodates more than 9,000 vessels (foreign and coast-wise) each year. Some of the piers exceed 1,000 feet in length and are equipped with the most modern types of loading and unloading machinery (Fig. 137).

⁴¹ "A Baedeker of Business in New York," *Fortune*, July 1939, Vol. XX, No. 1, p. 109.

⁴² "The Melting Pot," *Fortune*, July 1939, Vol. XX, No. 1, p. 73.

⁴³ *The New York Times*, October 2, 1938.

⁴⁴ J. E. Ramsey, "New York, The Wonder Port," *The Westsider, Magazine of New York Business*, April-June 1941, Vol. VI, No. 2, p. 10.



Photo by Fairchild Aerial Surveys. Courtesy New York Dock Co.

Fig. 137. A study in facilities for commerce in which New York excels. A part of the waterfront looking north from Pier 46. This view along the East River shows the Atlantic Basin.

The Hudson River, including the New Jersey side, handles more than half the port's business based on value, and yet it occupies only about 10 miles out of a total of 771 for the entire port. The imports include chiefly fuel oil and gas, crude oil, raw sugar,

fruits, coffee, flaxseed, rubber, raw silk, gypsum, and paper, whereas the principal exports are iron and steel scrap, refined petroleum products, automobiles and parts, wheat and flour, and livestock feeds. The chief commodities in the coastwise trade are crude oil, gasoline, and bituminous coal.

Finance

New York City has become the financial center of the world, having replaced London following the first World War. Its banks had deposits in 1938 of \$17,617,000,000 and cleared checks to a total of \$163,000,000,000—53 per cent of the country's total.⁴⁵

Because New York is the financial center of the United States, many national concerns have selected New York as their headquarters. This is true of the big oil, steel, and automobile companies whose actual manufacturing operations are carried on elsewhere.

Industry

Unlike Chicago, Pittsburgh and Cleveland, the New York area, because of the competition for available land, does not manufacture heavy products such as pig iron and steel. Its industries are clothing, printing, oil refining, chemicals, tobacco, metal products, fertilizer, asphalt, metal smelting and refining, soap, silk manufacturing, sugar refining, and slaughtering.

The garment industry

The garment industry, America's fourth largest based on value of products, operates in all but 7 of the 48 states. This industry, New York's largest, is highly concentrated in the center of the city between Times Square on the north, Twenty-fifth Street on the south, Eighth Avenue on the west, and Fifth Avenue on the east. Three quarters of the 200,000 Manhattan garment laborers work in an area 200 acres in size. This indicates that, unlike the steel and automobile industries, garment factories, which thrive in the crowded conditions of a city, do not need huge plants. The shops are generally small and there are 7,000 of them, the average employing only about 30 workers. New York promises to remain the capital of the garment industry so long as it can maintain itself as the style and buying center of the United States.

⁴⁵ "A Baedeker of Business in New York," *Fortune*, July 1939, Vol. XX, No. 1 p. 109.

The clothing trade is inextricably bound up with immigration. Irish and Germans, constituting the first reservoir of labor (up to and through the 1880's), were followed by Russians, Bohemians, Poles, and Italians. Hardly a nationality exists that is not represented, though Italians predominate at present. These immigrants worked under deplorable conditions until they were organized into powerful unions.

About 74 per cent of the nation's women's clothing and about one third of the men's wear is made in New York City.

The chemical industry

The New York area is the continent's largest single chemical center, with between 15 and 20 per cent of the industry. Most plants are large and are growing larger.

The most important branch produces heavy chemicals including acids, ammonia, sodas, and potash. The harbor location enables raw materials to be assembled from widely scattered areas. Furthermore, the finished products find a huge market at hand.

The roomier New Jersey part of the area is most important for heavy chemicals. The finer chemicals, particularly pharmaceuticals, are made mostly in Brooklyn.

Oil refining

The New York metropolitan area is the outstanding petroleum-refining center in the world. Since it is cheaper to ship crude oil than refined products, almost every major oil company that carries on business in the metropolitan area has a plant on New York harbor. Vast quantities of crude are brought to this area by pipeline from the interior and by tanker from California, the Gulf Coast, and Caribbean Latin America. Much of the refined products, particularly gasoline, is distributed by barge, although gasoline pipelines are becoming increasingly important. New York's oil refineries are located on the New Jersey side of the Hudson River because of storage-space demands, the obnoxious fumes, and fire and explosion hazards. Five New Jersey plants have plots averaging a square mile or more in extent. Bayonne is one of the world's largest refining centers (Fig. 138). All plants in this area are situated on the waterfront to facilitate imports of crude oil and exports of finished products.

Southeastern Pennsylvania

Southeastern Pennsylvania comprises the area from Philadelphia to Wilmington, together with Baltimore and smaller areas in



Standard Oil Co. of New Jersey.

Fig. 138. Standard Oil refinery, Boyonne, New Jersey. This is one of the largest and best-located refineries in the world. It is strategically located for serving an enormous market, for receiving crudes (mostly by tanker), and for exporting refined products. Metropolitan New York is the largest petroleum-refining center in the world; the industry is confined mostly to the Jersey side because of the great space demanded for storage and because of the difficulties involved in extending pipelines across the Hudson.

New Jersey, Delaware, and Maryland. No other subregion shows such a combination of heavy and light manufacturing—everything from iron and steel to silk. Though Philadelphia is the hub, much business and trade, especially in the Lehigh Valley, flow to New York City. Baltimore, southeasternmost point of this subregion as well as of the entire American Manufacturing Belt, is noted both for commerce and manufacturing. Since more than one third of its employed citizens are supported by manufacturing, however, the city is considered as essentially industrial.

Philadelphia (2,898,644), on the outside of the major bends of the Schuylkill and Delaware rivers, occupies a narrow neck of land between them and accordingly benefits from deep water. The Schuylkill passes from the Piedmont to the Coastal Plain, in a series of falls which end just northwest of the apex of the great bend of that river.⁴⁶ Philadelphia thus may be considered both a Piedmont and a Coastal Plain city. We shall include it in the American Manufacturing Belt because the area from Boston to Baltimore is so highly industrialized.

Philadelphia is not so old as either New York or Boston. However, it surpassed both in trade and population about the middle of the eighteenth century, primarily because of its local tributary area, which is larger than that of other Atlantic Seaboard cities. This was significant before the day of fast transportation—when cities were fed by their immediate tributary areas. Philadelphia, the nation's first planned city, was laid out on the familiar checkerboard pattern.

As the population of the Atlantic Seaboard spilled over the mountains following the Revolutionary War, the attack upon the natural resources of trans-Appalachia began. All 4 main Atlantic ports attempted to reach back beyond the mountains and bring as much trade as possible within their influence. New York completed its Erie Canal to the Great Lakes; Philadelphia had to supplement its Pennsylvania Canal with a railroad that lifted the boats over the mountains; Baltimore's Chesapeake & Ohio Canal was halted at Cumberland, where the mountains form a wall 2,000 feet high; and Boston, with 2 uplands to cross, realized that the building of a canal was impossible.

From early days Philadelphia has ranked high in manufacturing, being favored by:

⁴⁶ "Philadelphia—Its Site and Situation," *Bulletin of the Geographical Society of Philadelphia*, January 1935, Vol. XXXIII, No. 1, p. iii.

1. Superior locational advantages—(a) at the head of navigation and (b) on deep water at the outside bends of its two rivers.
2. Power—(a) hydro at the Fall Line and (b) anthracite in near-by northeastern Pennsylvania.
3. An abundance of flat land.
4. Energetic and able people—Quakers, Germans, Dutch, and Scotch-Irish.

The industries are highly diversified. Textiles, the first important enterprise, still lead. Leather tanning, a pioneer industry, has been favored by a plentiful supply of soft water and formerly by forests of oak and hemlock. Now that the United States depends much on imported tannins, Philadelphia's location as a port is advantageous. Philadelphia also leads in sugar refining, cigar-making, and in the production of rugs and carpets, locomotives, tools, and chemicals. It is the nation's largest ship-building center, with 4 different concerns. The metropolitan district is also a leading oil-refining center and petroleum products constitute about 60 per cent of the exports.

Philadelphia, a great seaport, has a navigable waterfrontage of 38 miles, about half of which is developed. It is also well served by railroads—the Pennsylvania, Baltimore & Ohio, and the Philadelphia & Reading together serving the greater part of the country east of the Mississippi River. The principal imports are crude oil, raw sugar, bananas, fertilizer ingredients (potash and nitrate), wood pulp, and china clay. The principal exports are petroleum products, iron and steel scrap, coal, and coal tar.

Camden lies opposite Philadelphia on the Delaware River. Because it is economically a part of Philadelphia, it is included in that city's metropolitan area. As a manufacturing city it is famous for its canning factories, ship-building yards, and phonograph factory. It is the home of the Campbell Soup Company, the largest maker of canned soups in the world, whose plant consists of 42 buildings covering 8 city blocks. Camden is advantageously located with respect to the important truck-farming region near by. This city is the leading manufacturing, commercial, and industrial center of southern New Jersey.

Wilmington (188,974), on the west bank of the Delaware River at its broadest point, occupies a commanding location on the low hills overlooking the river. It also occupies a strip of low land between the river and the hills.

Wilmington, Delaware's only city of over 5,000 inhabitants, has in its metropolitan district considerably more than half of the

state's population. It is important industrially, with machine shops, foundries, paper and textile mills, and plants that produce hydraulic jacks and leather-working machinery. It leads all other areas in Anglo-America in the manufacture of glazed kid and is especially noted for hard fiber and rubber hose.

Wilmington is also the headquarters for the 3 largest explosives manufacturers in North America—DuPont, Hercules, and Atlas. Contrary to general opinion, however, no explosives are made in Delaware. The DuPont Company is probably the world's largest diversified chemical manufacturer.

As the commercial center for a productive truck-farming area (the Chesapeake Peninsula), the city is well served by the Pennsylvania Railroad and a super highway from Cape Charles.

Trenton (200,128), most northerly of all Fall Line cities, lies at the head of navigation on the Delaware, where the river turns abruptly to follow the Fall Line past Philadelphia and Wilmington. The river was deepened in 1932 to accommodate sea-going vessels, but it is little used except by sand and coal barges.

Trenton's location on the direct land route between Philadelphia and New York has brought to it many industries, especially those engaged in making secondary steel products such as cables and steam turbines. Since 1850 it has been one of the nation's great pottery centers, specializing in fine china (Lennox ware). The pottery industry uses some of the common clays from New Jersey and Pennsylvania, but the better clays are procured from Florida, North Carolina, and Cornwall, England. More important than local clays are the markets and skilled labor. Trenton has long been the Mecca for immigrants trained in ceramics.

Baltimore (1,046,692), America's eleventh-largest metropolitan district and its seventh-largest city, as well as one of its leading industrial and commercial centers, lies at the very limit of tide-water navigation on the Patapsco River, about 12 miles from Chesapeake Bay and 170 statute miles from the Virginia Capes. Baltimore is a striking example of that class of cities able to penetrate far inland as a result of the drowning of river mouths. The harbor, consisting of the dredged Patapsco River and its tributaries, has about 40 miles of deep-water frontage.

Baltimore has always looked seaward; shipping and trade have been in its blood from the beginning. Its kinship with the sea goes back to the day when foreign marts were imperative to take care of the surplus agricultural commodities of colonial Maryland.

Baltimore is one of the 4 principal gateways from the Atlantic to the interior. It ranks first in intercoastal service with the

Pacific Coast via the Panama Canal. Baltimore's outstanding advantages are (1) location on the enlarged Chesapeake & Delaware Canal, which links the 2 bays and brings Baltimore 24 hours closer to New England and northwestern Europe than formerly, (2) nearness to the important coal fields of Pennsylvania and West Virginia, (3) superior railroad facilities (America's first railroad, the Baltimore & Ohio, was started here in 1827), and (4) an east-bound freight differential of 3 cents per 100 pounds under the New York rate.

Baltimore has, in the Sparrows Point plant, the world's largest and America's only tidewater iron and steel industry. The plant was located here after a careful engineering study had indicated that Baltimore was the most desirable site on the Atlantic Seaboard. Though all of its raw materials come from some distance (limestone from Pennsylvania, coal from the Virginias, and iron ore from Chile and Cuba), Sparrows Point has probably the lowest pig iron costs outside of Birmingham.

Other outstanding industries are the manufacture of food and kindred products—the second-largest meat-packing plant on the Atlantic Seaboard being located here. Canning and preserving have since the beginning of this industry been outstanding in Baltimore. The treatment of non-ferrous metals (Baltimore is the largest copper-refining center in the world), the manufacture of transportation equipment, especially airplanes and of textiles, wearing apparel, and machinery of various kinds, all are important. Petroleum refining is outstanding because of the port's advantageous position for receiving crudes and distributing refined products to the Middle Atlantic and southeastern portions of the country. Baltimore ranks high in the manufacture of commercial fertilizer; it had the first factory in the country and is well located for gathering the ingredients from all over the world, and for supplying quickly and economically those parts of the country that use fertilizer most extensively.

The Mohawk Valley and the Ontario Plain

The Mohawk Valley and the Ontario Plain occupy the great water-level route from Troy to Buffalo and are traversed by the main line of the New York Central Railroad, the New York State Barge Canal, and U.S. Highway 20. Most of the industries are secondary rather than primary and in many ways are similar to those of Southwestern New England. The subregion is almost completely urbanized. Each city tends to specialize on several

products. Thus Rochester makes cameras, optical goods, and men's clothing; Schenectady makes electrical equipment and locomotives; Cohoes, knit goods. Like the output of southwestern New England, these products require skill. Few areas are so well located as this subregion with respect to (1) efficient and economical transportation facilities, (2) raw materials which are brought easily and economically by railway, truck, or barge, (3) power—hydro-electric and coal, (4) dense population, which assures an abundance of skilled labor, and (5) large markets. This subregion, lacking a capital of its own, lies within the orbit of New York City.

Albany-Troy-Schenectady (431,575) lie close enough together to form a single metropolitan district. Albany, at the great bend in the Mohawk Route, near the head of deep-water navigation on the Hudson, and between New York City and Montreal, has long been an important transportation center. It began as a commercial city and has so remained, ranking high today in the trans-shipment of wheat, soda ash, and petroleum. Albany's factories produce goods of all kinds, a few of which are chemicals, foundry products, automobile accessories, sheet-metal specialties, paper products, and clay goods.

Troy, on the opposite bank of the Hudson and 6 miles north of Albany, lies at the head of tidewater and is the eastern terminus for the New York State Barge Canal. Formerly the national center for the manufacture of collars and cuffs, it still ranks high in men's wear, especially shirts and collars.

Schenectady, 15 miles northwest of Albany on the delta of the Mohawk, is a major industrial center. It is the home of the General Electric and the American Locomotive Company. The materials required for making electrical equipment and locomotives, as well as the principal markets for the output, are accessible to Schenectady.

UOca-Rome (197,128), despite their inclusion by the Census in the same metropolitan district, differ economically. Rome's industries produce steel wire, cables, and tubes, as well as articles of copper and brass, whereas Utica produces mainly textiles and clothing. About one third of Utica's labor is employed in knitting factories.

Syracuse (258,352), lying in the Mohawk Valley midway between Albany and Buffalo, dominates the central portion of the subregion. It is connected with Lake Ontario by the canalized Oswego River, a branch of the New York State Barge Canal.

As a major manufacturing city, Syracuse leads in foundry production, tool steel, automobile parts, ceramics, and shoes. Syra-

cuse china and Nettleton shoes are famous for their high quality. In its soda industry, Syracuse utilizes a local resource—salt—and in this respect is unique, since almost every other manufacturing enterprise in the city makes use of raw materials from distant sources.

Rochester (411,970) gained early prominence as a result of its site at the falls of the Genesee. This water-power, along with the city's location in the heart of the early American wheat belt (especially in the first half of the nineteenth century), enabled Rochester to become the leading flour-milling center of the continent. Rochester also shared in the important east-west transportation along the Hudson-Mohawk route via canal and rail. The city was and still is the economic center for much of the Finger Lakes District.

Rochester is better known than most cities, regardless of their size, because of its national prestige in the manufacture of cameras, optical goods, scientific instruments, and certain types of electrical equipment, all requiring highly skilled workers. It also takes high rank in the manufacture of men's clothing.

The Buffalo-Niagara-Erie-Hamilton-Toronto Subregion (Niagara Frontier)

This subregion lies between lakes Ontario and Erie in western New York and adjacent Ontario. It is complicated by the international boundary which, as a result of the tariff, plays a vital role in causing manufacturing to be more important on the Canadian side than otherwise would be the case. In the entire British Empire, the Province of Ontario ranks second only to the United Kingdom in manufacturing. The power from Niagara Falls is widely used on both sides of the border and has played an important part in the development of chemical, metallurgical, and other industries. Because of the international border there are 2 capitals—Buffalo on the American side and Toronto on the Canadian.

Iron and steel

At Lackawanna, a part of metropolitan Buffalo, is one of America's greatest iron and steel industries. The Lackawanna Iron and Steel Company moved here from a location it had occupied at Scranton for 60 years. Like other Lower Lake cities, Buffalo is an economic meeting place of coal, iron ore, and fluxing limestone. Its blast furnaces and coke ovens are so located on a ship canal that lake carriers can deliver economically to them iron ore, limestone.

and coal. Lying in the heart of a great iron- and steel-consuming area, Buffalo plants can deliver their finished products by barge[^] lake freighter, railway, and truck. Besides the Lackawanna plants there are several others in Buffalo.

In Hamilton, Ontario, is one of Canada's leading iron and steel industries. Its chief advantages for making steel are:

1. Location on Lake Ontario, which facilitates the assembly of* raw materials and the marketing of finished steel. The largest lake carriers can reach Hamilton via the new Welland Canal.
2. Excellent rail facilities. The city is on Canada's 2 transcontinental railroads, while a third connects with railways in the United States.
3. Central location in the most densely populated part of" Ontario, the logical market for Hamilton's products.
4. Proximity to the Northern Appalachian coal field.
5. Cheap electric power.
6. Ample water of good quality and temperature.
7. An abundance of flat land for expansion and growth.

Flour-milling

Buffalo is the world's leading flour-milling center, having displaced Minneapolis in 1930. This is a reversal of the trend of early days when mills grew up in the wheat-growing regions—Rochester (New York), Kansas City—or on the market sides of them (Minneapolis). Buffalo's mills reap the advantages of cheap water transportation on the Great Lakes, nearness to the large consuming markets of the East, low power costs, excellent transportation facilities in all directions, and the milling-in-bond privilege.⁴⁷

Electro-chemical and metallurgical industry

The Niagara Frontier ranks as one of the world's leaders in the production of alloys, aluminum, abrasives, and so on. Its advantages are (1) an abundance of cheap hydro-power, (2) the

⁴⁷ The milling-in-bond privilege is one that is offered by the United States Government to any place that can economically make use of it. Unless a city is in the line of transportation followed by Canadian grain, it cannot economically make use of the privilege. The mill has to pay the salaries of government inspectors, and the plan can be operated only on a large scale. The milling of flour in bond simply means that the wheat is milled in transit and that the flour is bound for foreign markets. The flour cannot be sold in the United States. The advantage to, Buffalo is that it enables the mills to employ³ workers who would not be employed if flour for export were not produced.

availability of raw materials, (3) the meeting of rail and water transportation, and (4) the presence and proximity of a large consuming market.

Cities

Buffalo-Niagara (857,719). Buffalo, on Lake Erie at the mouth of Buffalo Creek, owes its early growth to a strategic location at the foot of lake navigation, where Lake Erie discharges into the Niagara River. It commands the eastern end of Lake Erie. Major factors in its growth were the old Erie Canal and later the railroad which connected it with New York City. Few cities in the Western Hemisphere are its equal in the combination of modes of land and water transportation.

Buffalo benefits industrially by being near Pennsylvania coal and Niagara Falls hydro-power. It shares equal rates with Chicago, Detroit, and Cleveland on Lake Superior iron ore. It also lies near the center of North America's heaviest consuming markets.

Buffalo is the logical point of trans-shipment for lake-borne traffic destined for New York or Boston. It is the great American shipping point for wheat—Canadian and American. Since wheat is an excellent filler for a general cargo on liners, huge tonnages are transferred from lake carriers at Buffalo and sent to Atlantic ports. Especially does this city handle much wheat during winter when the St. Lawrence cannot be utilized.

The city of Niagara Falls has unrivaled power resources which have drawn to it a special group of industries—electro-chemical and electro-metallurgical¹—which demand *huge quantities of cheap power*. A few of the important products are aluminum, carborundum, and synthetic nitrogen.

Toronto (900,491) on the north shore of Lake Ontario, is Canada's second-largest city and the only great one whose population is homogeneous. It commands the easiest and shortest route to Georgian Bay and the Upper Lakes country. Toronto is strategically located also with respect to the rich agricultural lands of the Ontario Peninsula and the productive mining districts of the Laurentian Upland. Because of proximity to Niagara Falls, the city has access to an abundance of cheap power and has become the chief manufacturing center of Ontario, making clothing, electrical equipment, and machinery. It is also the leading meat-packing center of the Dominion.

The Toronto harbor front, a marvel of engineering, has played a dominant role in the growth and development of the city. On it

two modern industrial areas were created from poorly drained land. Coal and coke, petroleum, grain, and general merchandise comprise the principal items in the water-borne trade.

Hamilton (176,110) is located at the western end of Lake Ontario on a deep, protected, and commodious harbor at the base of the Niagara Escarpment. It ranks fifth in population but third in manufacturing among Dominion cities. It is the most representative manufacturing city of all, with about one half of its workers employed in factories and mills. Hamilton made its harbor completely modern to take advantage of the benefits of the new Welland Canal.

Besides its great iron and steel industry, Hamilton ranks high in the production of textiles, chemicals, rubber goods, soaps, electrical equipment, and canned foods.

Erie (134,039) is included in the Niagara Frontier because it is too small to comprise an independent subregion and because the American iron and steel industry considers it a part of the "Buffalo District." Erie is located at the only place on Pennsylvania's straight and uninviting Lake Erie shore where there is a good protected harbor. This is made possible by the hooked spit of Presque Isle. Occupying an area of flat to undulating land on Presque Isle Bay, the city has been free to spread in 3 directions.

With a restricted hinterland, Erie has been unable to keep pace with Cleveland and Toledo; nevertheless it is today Pennsylvania's sixth-largest metropolitan area, being surpassed only by Philadelphia, Pittsburgh, Scranton, Reading, and Harrisburg.

Though Erie is an important trading center (millions of tons of coal, iron ore, and wood pulp move over its docks), it is essentially an industrial city, its factories supporting more than two thirds of the population. A few plants are located on the waterfront, but most of them are strung out along the railroads. The most important industries are those engaged in making metal products and paper. Erie is especially noted for mechanical refrigerators.

The Pittsburgh-Cleveland Subregion

The Pittsburgh-Cleveland subregion is the continent's outstanding metallurgical center. It also has a diversity of other industries, such as rubber tires, electrical machinery, motor vehicles, machine tools, airplane parts, paints and varnish, clay products, clothing and textiles, and glass. The dominant centers, Cleveland and Pittsburgh, are followed closely by Youngstown, Akron, and Wheeling. This area supplies southeastern Michigan and most of Ohio

and eastern Indiana with the raw and semi-finished steel used in their secondary industries.

The area is strategically located for heavy industry, since it lies between Lake Erie on the north, over whose waters move the millions of tons of iron ore and limestone, and the productive Northern Appalachian coal field on the south.

Iron and steel

A large part of North America's metallurgical industry is located in this subregion (Fig. 139).

Through concentration of production the steel industry has been able to reduce its costs below what would have been possible if steel plants were scattered throughout the country with primary thought given to location of consumers' plants and secondary consideration to the costs of assembling raw materials.⁴⁸



American Iron & Steel Institute.

Fig. 139. Location of plants manufacturing steel products. The greatest concentration is in the American Manufacturing Belt, particularly in the Cleveland-Pittsburgh subregion. Taking the value added by manufacture in blast furnaces, steel works, and rolling mills, this subregion accounts for about 46 per cent of the national total.

⁴⁸C. E. Wright, "The Geography of Steel: Factors Governing Location of Main Producing Areas," *The Annalist*, Vol. XLIX, No. 1269, May 14, 1937, p. 766.

It would not be economical, for instance, to manufacture steel in quantity at points in the great Mid-Continent oil province, nor tin plate for cans in every canning center. The consumer's chief hope is for cheaper transportation costs. No one steel-producing area is ideal, all being affected by influences favorable and unfavorable, natural and artificial.⁴⁹

Most iron and steel manufacturing is still carried on near sources of raw materials. Though proximity to market is an ever growing factor, assembly costs are the more compelling. Unfortunately, nature seldom places raw materials in accord with consuming centers. The ideal location for iron and steel manufacturing is at that point where raw materials and markets for the finished products both are available. No single steel center in North America combines these, though Chicago and Detroit approach this condition most closely.

In the United States iron ore usually moves toward the coal fields (Fig. 140), the main reason being the presence of general manufacturing districts—the largest markets for most steel products—in or near the coal fields. To produce 1 ton of pig iron requires about 1.7 tons of iron ore, .9 tons of coke, and .4 tons of limestone. The problem of fluxing stone is less important than that of ore and coal because limestone is widely distributed. Two states, Pennsylvania and Michigan, supply 62 per cent of the country's metallurgical stone. The world's largest quarries, those at Calcite on Lake Huron, provide 27 per cent of the steel industry's requirements.

So long as Lake Superior ores are in general use, the bulk of the industry will be located on or near the lower Great Lakes, and the Pittsburgh-Cleveland subregion will occupy a prominent place.

The geographic assets and liabilities for making iron and steel in Pittsburgh, Cleveland, Youngstown, Wheeling, Johnstown, Canton, and Massillon are presented in the discussion of those cities.

By-product coke. No discussion of the iron and steel industry is justifiable without mention of the manufacture of coke—the chief fuel used in blast furnaces. Before the development of by-product ovens, coke was made in "bee hive" ovens from which the valuable volatile materials escaped into the open air. Coke, almost pure carbon, is made by driving off certain volatile materials.

The "bee hive" industry was virtually dead until the time of the second World War. It then provided a reserve source of coke when

⁴⁹ Marion Worthing, "Comparative Assembly Costs in the Manufacture of Pig Iron," *Pittsburgh Business Review*, Vol. VIII, No. 1, January 31, 1938, p. 21.

by-product ovens could not meet the demand. The most famous "bee hive" coke center was Connellsville, southeast of Pittsburgh, where coal from the Pittsburgh seam made superior coke. Accordingly, myriads of ovens sprang up in its tributary area. "Bee hive"



Fig. 140. Principal sources of iron ore, coal, and limestone for the iron and steel industry of the American Manufacturing Belt west of the Appalachian Mountains. Close stipples show the Appalachian coal field; heavy black stripes coking coal; open stipples non-available coal.

coke was made at the mines, since the by-products (gas, tar, oils, and chemicals) were not saved. By-product coke, on the contrary, is made in or near cities—manufacturing centers, where the by-products not used by the iron and steel industry itself are available. The largest by-product plant in the world is located at Clairton at the southern end of Pittsburgh on the Monongahela River.

The rubber industry

The rubber industry and Akron have long been synonymous to the average American. Rubber *made* Akron. This city along with its suburbs manufactures about one half of the nation's tires.

Akron's first rubber factory was established in 1870—the result of sheer accident. B. F. Goodrich, dissatisfied with his business prospects at the close of the Civil War, engaged in the oil business. Being unsuccessful, he went to New York and dealt in real estate. In his dealing he came into possession of a rubber factory at Hastings-on-the-Hudson. Handicapped by lack of funds, he was encouraged to go to Akron by a friend who lent him money. His small factory there became the nucleus of the great Akron rubber industry.⁵⁰ Shortly other rubber enterprises came.

Concentration of rubber manufacturing was a good thing during the industry's infancy, for buyers and sellers could get together conveniently. Akron was also a central spot for skilled labor. Now that the industry is mature, however, concentration is no longer desirable. Mills have sprung up in Alabama, California, Maryland, Mississippi, New England, and New York, as well as in foreign countries. This decentralization is the outgrowth of the serious sit-down strikes of the 1930's and of the trend of automobile production away from Detroit.

The clay-products industry

The industry whose products include brick, china ware, clay refractories, porcelain, terra cotta, tile, pottery, and vitrified sewer pipe is especially important in the Upper Ohio Valley of Pennsylvania and Ohio. The high degree of concentration, despite the fact that clays are widely distributed throughout North America, indicates that the raw material as a factor of location is less important than fuel, access to large markets, and skilled labor. The Ohio River area is especially well located with respect to fuel—both coal and natural gas.

The stoneware industry, centered at East Liverpool—the continent's leader in pottery, procures its clays from Georgia and Florida (kaolin), Maine and Canada (feldspar), Kentucky and Tennessee (ball clay), and Illinois and Pennsylvania (flint). The clay refractories or heat-resisting products industry is located principally in the Allegheny Plateau of Pennsylvania, where the fire clay is inter-

⁵⁰ National Youth Administration in Ohio, *The Rubber Industry in Ohio*, p. 3. Columbus: 1937.

layered with bituminous coal. This clay is procured underground rather than from surface pits. Clay refractories are in demand by the iron and steel industries near by.

Because of the high tariff on imported china, the Havilands, after much research on American clays, selected Shenango, Pennsylvania, as the site for their American factory.

The glass industry

For 5,000 years glass-making was a handicraft—the workers being highly skilled. About 1908, machines began to perform the operations and, except in the non-standardized and small-volume business, glass-making has become a mechanical industry. Glass is made by fusing sodium sulphate, calcium carbonate (pure limestone), and quartz sand. The chief locative factors are, in order of their importance:

1. Fuel, especially natural gas.
2. Proximity to market (glass is fragile and bulky and takes high freight rates).
3. Efficient transport facilities.
4. Access to raw materials.
5. Availability of labor.

Charcoal, the first fuel used, was later displaced by coal, and finally by natural gas. At first glass-making was concentrated east of the Appalachians, but the adoption of the new fuels resulted in western Pennsylvania, southeastern Ohio, and northern West Virginia becoming the chief center. Natural gas is the ideal fuel because it is clean and inexpensive and produces very high and uniform temperatures. An immense amount of heat must be available to melt the raw materials. Glass? sand and other materials invariably travel to where cheap fuel is located. Thus central Pennsylvania, with great quantities of excellent glass sand but lacking natural gas, has no glass industry. Natural gas, then, is the major factor contributing to the location of this manufacturing enterprise.

Machine tools

The machine-tool industry came into being as a separate entity about 1870, when industrialists were widely adopting mass-production methods. New England had been the source of most of America's machine tools. As manufacturing migrated westward, it had to have metal-cutting machines, and New England's factories were

too far away to supply them. The first plant in Ohio was established in Cincinnati shortly after the Civil War. Cleveland, which today ranks next to Cincinnati, did not get started until the early 1880's. The manufacture of machine-tools tends to locate close to its raw materials and its market. Machine-tool plants are scattered throughout the entire American Manufacturing Belt, from Connecticut and Massachusetts to Wisconsin and Illinois, though Cincinnati and Cleveland still lead-
Electrical equipment

The American Manufacturing Belt produces the bulk of all electrical machinery, and Pittsburgh is one of the largest centers. Here is located the enormous Westinghouse plant, which employs about one fifth of all the secondary metal workers in the city. Cleveland, too, ranks high, with Lincoln Electric (outstanding in the manufacture of electric welders and welding wire) and General Electric, with its world famous laboratories at Nela-Park.

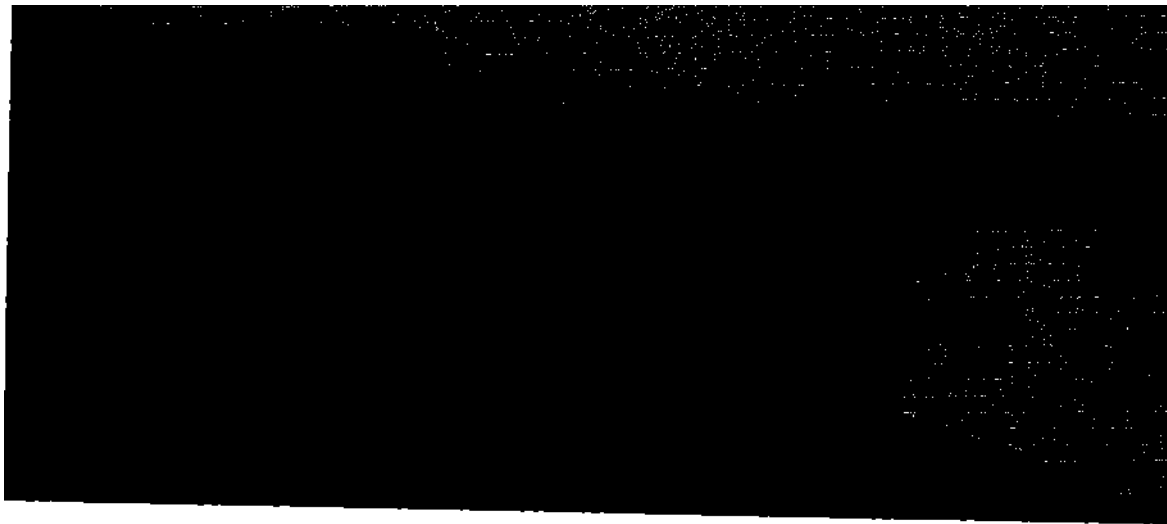
Cities

Pittsburgh (1,994,060) occupies a low peninsula between the Allegheny and Monongahela rivers where they converge to form the Ohio. This strategic location caused the city to become the early trading center for western Pennsylvania and the outfitting point for settlers moving into the New West. Until 1825, the Ohio River was the major route of communication and transportation into the trans-Appalachian region.

Pittsburgh is today the world's outstanding iron and steel center. This distinctive rank is consequent upon (1) the momentum of its early start, (2) proximity to coal fields whose fuel is superior for coking and steam, (3) excellent location astride three navigable rivers which extend north, south, and west, (4) its location at an important gateway through the Appalachian barrier, (5) proximity to Lake Erie ports, to which iron ore is cheaply transported, (6) nearness to important steel markets, and (7) an abundance of skilled and semi-skilled labor.

Waterways have been much used by Pittsburgh's industries. Coal is hauled by barge (Fig. 141). Much finished steel is shipped down the Ohio. Manufacturing plants are concentrated along all three rivers.

So long as pig iron must be made in a blast furnace, the Pittsburgh district, with its vast deposits of high-grade coking coal ac-



Pittsburgh Chamber of Commerce.

Fig. 141. Coal barges, gondola cars, and tipples on Monongahela River. Many mines in this subregion *are located along this river*. Each barge carries 1,000 tons and fleets of barges operate day and night, summer and winter, in all conditions of weather. It is the low cost of transporting coking coal by barge that has enabled Pittsburgh to compete with districts more scientifically located. The hazy background is not exceptional: probably in no other area in the world is so much bituminous coal burned and so much smoke emitted into the *air*.

cessible by improved waterways, is likely to remain a major iron and steel center.

Pittsburgh is more than a great primary iron and steel center, however. Its secondary metal industries employ even more workers. Among the more important of these are the making of electrical machinery, apparatus, and supplies (by the Westinghouse Electric & Manufacturing Company in East Pittsburgh); railroad supplies, including air brakes, switches, signals, and cars; aluminum products made from pigs and ingots shipped from Alcoa, Badin, and Massena (by the Aluminum Company of America at New Kensington); hardware of all kinds, castings, and structural shapes. Other classes of manufacturing represented include food products (by the H. J. Heinz Company), paper, glass (large plants at Arnold, Creighton, and Glassport), coke and by-products (Clairton), chemicals, cork, clay products, and refined petroleum.

The urban development, originally restricted to the limited area of flat terrace near the confluence of the rivers, has spread over much of the upland, for in areas of rough topography only the river valleys afford ample space for big mills. These of necessity then have preempted the best sites.

Cleveland (1,214,943), located at the mouth of the Cuyahoga River where steel rails meet the water's edge with comparative ease, provides an outlet on Lake Erie for the natural lowland route from the Pennsylvania coal fields. It has an outer harbor consisting of the lake front, protected by a breakwater and given over to commerce, and an inner harbor, formed by the Cuyahoga River and devoted to manufacturing.

Though founded in 1796, Cleveland grew very slowly: in 1800 it had but 25 inhabitants; in 1820, 600; and as late as 1850, only 17,034.

As the Middle West developed, Cleveland first became prominent when the Ohio Canal, opened in 1834, connecting it with central and southern Ohio. As the northern terminus for the canal, the city soon became the most important trans-shipping point between the Ohio River and Eastern markets via Lake Erie and the Hudson River. Then came the railroads; the lake shore provided convenient transit for east-west lines, as did the Cuyahoga Valley for those from the south. After 1850 manufacturing became important. Cleveland is a city of diversified industries, but iron and steel manufacturing, concentrated in the "Flats" of the Cuyahoga Valley, predominates. The cost of assembling raw materials for the blast furnaces is low, since iron ore and limestone are brought all the way by water. Cleveland also has a large local market for

fabricated products and is accessible by water to the great market in the Detroit area. Besides iron and steel, Cleveland has other important industries: it is the second machine-tool manufacturing city in the nation; it ranks high in men's and women's clothing, rayon, salt, clay products, Diesel engines, storage batteries, refined petroleum, motorcar parts (all Chevrolet coach bodies are made in Cleveland), and paints and varnishes. Cleveland today rivals Pittsburgh as a center for the manufacture of electrical equipment. It also is an important petroleum-refining center, the work being done on the same property as when John D. Rockefeller organized the original Standard Oil Company in 1870. At that time Cleveland was the oil capital of the world. The city is a leader in the paint and varnish industry, being the home of the Sherwin-Williams Company. This industry is one of the most highly competitive in the nation, and successful operation requires that it be well located for assembling raw materials from all parts of the world and for supplying the market, though the former is secondary to the latter. It must also have unexcelled transport facilities.

Akron (349,705) is located on the divide between the Lake Erie Basin and the Ohio River drainage. During Indian times, it was on the 8-mile portage path between the Cuyahoga River to the north and the Tuscarawas to the south. When the Ohio and Erie Canal was opened for traffic in 1827, Akron, which occupied the canal summit, was guaranteed a prosperous trade.

Today, as the rubber capital of the world, Akron is a city of factory workers, nearly one third of whom are immigrants or their children.⁵¹

Like that of many American industrial cities, Akron's population has been declining. Formerly the nation's tire production was centered in Akron, with the 3 big producers and many small ones located there. Recently the geographic trend of tire production was away from Akron; branch factories were built in many states and in foreign countries. The city's 2 big advantages were an early start and proximity to Detroit; its disadvantages were constant serious labor disputes and strikes, and high-cost production—according to the rubber manufacturers, the highest in the United States.⁵² In addition to rubber, Akron also manufactures break-fast foods, matches, and clay products.

Youngstown (372,428) straddles the Mahoning River, which unfortunately is not navigable. This river valley is a part of the

⁵¹ Stuart A. Queen, and Lewis F. Thomas, *The City: A Study of Urbanism in the United States*, p. 131. New York: McGraw-Hill Book Co., 1939.

⁵² Dale Cox, *Cleveland Plain Dealer*, February 27, 1936.

easiest rail route connecting Pittsburgh with the shore of Lake Erie. South of Warren all routes follow the Mahoning Valley, whose railroads carry some of the heaviest tonnage in the country—mostly iron ore and coal.

Youngstown is a city dominated by the iron and steel industry, the plants of which line the river for 20 miles (Fig. 129). Nowhere else in North America is the local importance of this basic industry so great. Iron and steel alone account for 55 per cent of the total factory products and give the district third rank in North America. Nevertheless, Youngstown has been slipping metallurgically—a consequence of its *land-locked* location. Railroad transportation of either coal or ore is so expensive in comparison with water movement that distributing and assembly costs rise sharply as soon as these commodities are transferred to railroad cars. Youngstown has urged the United States government to canalize the Beaver, Mahoning, and Shenango rivers, to enable it to benefit from water transportation and compete more favorably with Pittsburgh. One of the largest steel companies has overcome the district's physical handicaps by superior management, but another is solving the problem by decentralization.

Like many iron and steel districts whose plants lie along rivers, Youngstown suffers from an inadequate water supply during the drier months, even though it built Lake Milton with a capacity of 9,500,000,000 gallons against such an emergency. Steel mills utilize millions of gallons of water daily; one of the principal uses is to cool the huge furnaces, which operate at temperatures near 2,200° F. From the time a gallon of water leaves Lake Milton until it leaves the plant of the Youngstown Sheet & Tube Company, it has been used and re-used about 20 times.⁵³

Wheeling (196,340) lies on the Ohio River 90 miles below Pittsburgh at the debouchure of Wheeling Creek. Here the Ohio has carved a real gorge in the Allegheny Plateau. The current clings to the left bank, facilitating anchorage and terminal construction. The old Cumberland or National Road which crossed the Ohio River at Wheeling had much to do with the city's early growth. Later railroads came, among them the Baltimore & Ohio, which followed in general the route of the National Road.

With an abundance of coal and satisfactory transport facilities by river and rail, Wheeling early became an important steel center. One of its chief handicaps has been a dearth of level land. Accord-

⁵³ N. Yassanye, "Lake Low, Steel Output Periled," *Cleveland Plain Dealer*, May 21, 1941.

ingly, not a single open-hearth furnace has ever been built in Wheeling. Many plants are engaged in making secondary metal products, especially tin plate. Clay products and glass, by reason of natural gas, coal, raw materials and proximity to large markets, play a significant role in the economic life of the metropolitan area.

Johnstown (151,781), at the eastern extremity of the subregion, lies some 60 miles east of Pittsburgh on the principal transportation route to the Atlantic Seaboard, in the maturely dissected Allegheny Plateau. In the early days it was the head of the western branch of the Pennsylvania Canal. It is strategically situated at the confluence of 2 major tributaries of the Conemaugh River. The streams have cut through rich beds of bituminous coal, thereby stimulating coal mining and contributing to the development of the iron and steel industry.

Dearth of level land has forced the city to grow up partly on the valley floors and partly on the plateau surface above, but all the mills are located in the valley. Johnstown is, industrially, a miniature Pittsburgh. Iron and steel contribute normally about three fourths of the net manufacturing value. The Bethlehem Steel Corporation employs two thirds of the wage-earners engaged in manufacturing.

Canton-Massillon (226,996), whose centers are 8 miles apart, vie for supremacy in the processing of miscellaneous steel products. Both cities are in a fertile farming area. In early days Massillon was more fortunate in being on the Ohio & Erie Canal (now abandoned). Being close to coal deposits, both cities early developed important farm-implement industries.

This district is the center of the American quality-steel (alloy) industry, and is a processor rather than a manufacturer of steel; it makes mechanical tubing and cold-finished steel bars. Additional products include aluminum cooking utensils, drillers' supplies, metal stampings, turbines, and roller bearings.

The Southern Michigan Automobile Subregion

The automobile subregion, including besides metropolitan Detroit-Windsor the "inner" and "outer" rings of cities (Fig. 142), contains the heart of the automotive industry. The other products made here are definitely secondary.

Included in the semi-suburban inner ring are Mount demons, Pontiac, Ann Arbor, Ypsilanti, and Monroe. Included in the outer ring are 8 cities definitely in the orbit of Detroit's great industry—Flint, Lansing, Owosso, Jackson, Adrian, Port Huron, Toledo, and

South Bend. One of the more outstanding phases of manufacturing here is the relative unimportance of basic-materials production—iron and steel.

The automotive industry

The automotive industry is centered at Detroit. It is not, however, a single industry, for the automobile is an assembled product.

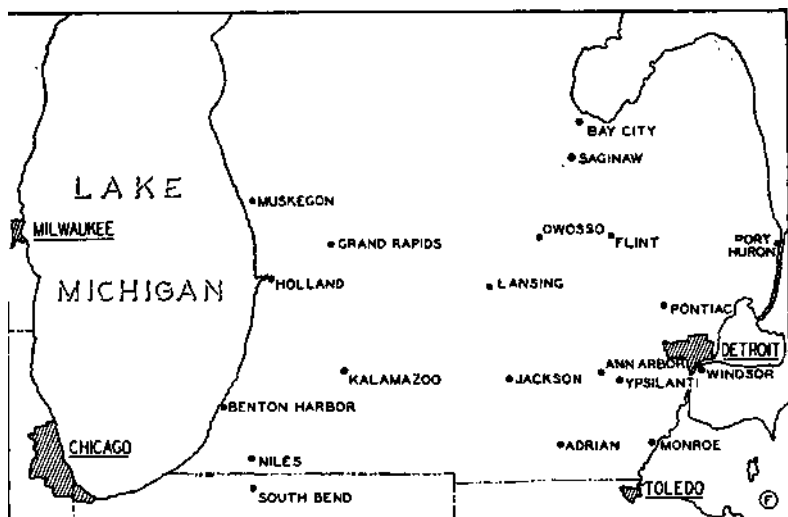


Fig. 142. The southern Michigan automobile subregion. Detroit is the natural center of the automobile industry but it is not the industry. Neighboring cities and towns in Michigan, Indiana, Ohio, and Canada (particularly Windsor, Ontario) produce many of the bodies and parts. Southern Michigan alone has about one half of all the automobile workers in the United States.

Thus factories making parts but definitely tributary to Detroit reach out for a considerable distance. Detroit became the first great 'motorcar center' "by the accident of being the hub of a circle within which were located the pioneers of the industry,"⁵⁴ R. E. Olds and Henry Ford. Ford developed an automobile cheap enough for all; he developed standardization and interchangeable parts, thus making mass production possible. He raised capital among local bankers.

Geographic and economic conditions have justified the selection

⁵⁴ John A. Piquet, "The Factor of Plant Location in Automobile Production," *Industrial Management*, Vol. LXVIII, No. 5, November 1924, p. 297.

of Detroit as the automotive center (Fig. 143). The industry had to be strategically located with respect to steel. In the American Manufacturing Belt are concentrated 92.5 per cent of the finished-steel producing capacity of the United States and 88 per cent of the automobile manufacturing plants. Detroit is well located for getting steel cheaply by water from South Chicago, Gary, Cleveland, Lorain, and Buffalo. If Cleveland's pioneer inventors—Stearns, Winton, and Gaeth—had gone in for mass production of inexpensive cars and if Ford had done just the reverse, in all probability Cleveland and not Detroit today would be the hub of the automotive industry.

The motorcar industry is "decentralizing all the way to both coasts, to Canada, and overseas, following the twin principles of modern relocation: first, regional plants; and second, production in well-balanced communities where labor efficiency is high."⁵⁵

The industry is dominated by 3 large corporations which together supply nine tenths of the automobiles in North America and are among the world's leading industrial corporations in size and organizational complexity. Largest of the three is General Motors Corporation which, with its subsidiaries, contributes about two fifths of the total production. In order of size following General Motors are the Ford Motor Company and the Chrysler Corporation.

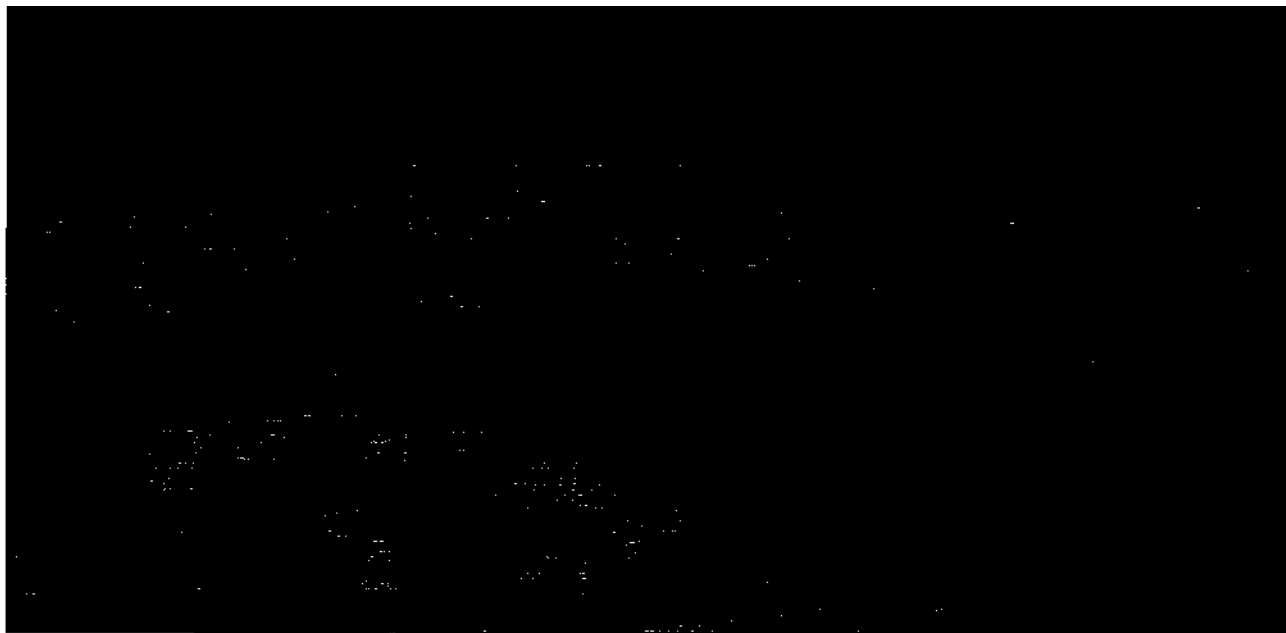
Cities

Detroit-Windsor (2,416,979). Detroit, oldest of the lake ports, early became an important trading post. It is strategically located on the Detroit River through which traffic passes from the upper to the lower lakes and at one of the few easy crossings into Canada. It thus lies on the great water route connecting Lake Superior iron ore and Appalachian coal (Fig. 140). -Detroit grew quickly, carelessly, fantastically, and hence without a plan. Workers by the thousand came from farm, hamlet, village, and town, but could not be assimilated quickly. The fluctuation of the automobile industry has always caused the population to ebb and flow, and one has the feeling that Detroit is a city of transients.

Though little primary iron and steel are made there, Detroit may become a major metallurgical center, because it can assemble raw materials economically and it is a major market.

Detroit is industrially a young and progressive city, and is able

⁵⁵ John A. Piquet, "Is the Big City Doomed as an Industrial Center?" *Industrial Management*, Vol. LXVIII, No. 3, September 1924, p. 140.



Ford Motor Co.

Fig. 143. Ford River Rouge plant, Dearborn, Michigan—the world's largest integrated industrial unit—produces in normal times some part of nearly everything that goes into a Ford car. Many of the items used are produced entirely within its confines. It has two blast furnaces. Steel is made here as well as glass and tires. Iron ore arrives in Ford ships.

In the foreground is the beautiful rotunda which houses many fascinating exhibits.

to attract various types of enterprises; for example, those making machine-tools, mechanical refrigerators, radios, and airplanes.

Windsor is treated as a part of Detroit though statistically and politically it is a separate city. It is the largest automobile center in the British Empire, a situation attributable to the international boundary and to the desire of automobile manufacturers to locate Canadian branches as near as possible to Detroit. Windsor also has important salt and chemical industries based on the thick salt deposits underlying the city.

In 1938, 800,000 American cars entered the Dominion at this point under touring permit. Total passenger crossings of the Detroit River by automobile exceeded 6,750,000 each way.

Saginaw-Bay City (153,388), famous old lumber towns located on the Saginaw River near Saginaw Bay, are important producers of automobile parts for Detroit. They also make furniture and refine beet sugar. They lie in the only important coal field in Michigan, as well as in the petroleum and salt-producing area.

Flint (188,554), situated on the Flint River 70 miles northwest of Detroit, ranks next to that city in the production of automobiles. It is in the outer ring of cities. Flint is also Michigan's third-largest city. The city's industrial life centers around the Buick and Chevrolet factories. Flint was recognized as a "vehicle city" long before the era of the automobile.

Lansing (110,356), on the Grand River some 85 miles northwest of Detroit, is, like Flint, one of the outer ring of cities dominated by the motor industry. Besides being the home of the Reo and Olds motor companies, Lansing factories make Diesel engines, hoists, pumps, and air compressors. Lansing is also the state capital.

Grand Rapids (209,873), at the southern end of the big bend of the Grand River, is an important manufacturing center. It early benefited from water-power made available by the rapids in the river. At first it was famous as a sawmill town; then it became the furniture center of the world; now it ranks high as a supplier of automobile parts. Furniture still leads the list of factory production, but it is much less important than in the past. Grand Rapids persists as the furniture "style center," for styles in furniture are as fickle as those in clothing. In the early days of furniture-making, trees from the lake states supplied the timber; today very little native wood is utilized. An important furniture exhibition is held 4 times a year in enormous buildings erected for the purpose. The furniture industry brought many accessory manufacturing plants to Grand Rapids—those making mirrors, locks, latches, knobs,

handles, brass trimmings, and varnishes. The automobile-parts industry is capitalizing on the skills being released by the declining furniture industry.

Kalamazoo (77,213) occupies a site on the Kalamazoo River between Chicago and Detroit. Like other small cities in southern Michigan, Kalamazoo makes parts for motors; also paper, stoves, furniture, and pharmaceuticals. It is well served by railway and highway. The city's tributary area is important agriculturally—being famous especially for celery, fruits, and peppermint.

Toledo (341,663), which commands the west end of Lake Erie, is not located directly on the lake but on the Maumee River near its confluence with Maumee Bay. The Maumee is the largest river flowing into the Great Lakes. Toledo is said to have the best harbor on the lakes—certainly the most commodious. On the right bank are nearly all the facilities for handling coal and iron ore, which are the principal items outbound and inbound.

Since 1929 Toledo has ranked second only to Duluth-Superior in the volume of tonnage handled. Its commercial lifeblood, coal, is drawn from the great mining areas of West Virginia, eastern Kentucky, and southeastern Ohio, and dispatched by lake carrier to Duluth, Chicago-Gary, Milwaukee, and Detroit. In fact, it handles more than two fifths of all the bituminous coal shipped from Lake Erie ports. It even claims to be the largest soft-coal port in the world. Toledo's importance as a coal port depends upon the fact that, in the maturely dissected Appalachian Plateau, railroads must follow nature-made grooves, and in this case the groove is the Kanawha River, which flows northwest toward Toledo through the rich coal-mining region. From the Ohio Valley the tracks follow the Scioto Valley, whence they arrive in a flatter area and assume a more direct path. West Virginia today mines as much coal as Pennsylvania but is much less important industrially. Hence the bulk of its coal is sent out of the state.

Toledo is the third-largest railroad center in the country. It is on the main east-west route connecting Chicago with New York; also, four of the largest coal-carrying railroads meet Lake Erie here.

Toledo since early days has been a leader in the glass industry, producing containers and special glass for automobiles. It also refines petroleum, makes automobiles, and manufactures a famous brand of scales.

South Bend (147,022), the site of an old Indian portage connecting the St. Joseph and Kankakee rivers, lies only 80 miles east of Chicago and is on the main rail routes between that city and New York. Stimulated by an abundance of hardwoods, its first

great industry was the making of farm wagons and carriages. With the passing of horse-drawn vehicles, South Bend soon became an automobile-manufacturing center. Additional industries make sewing machines, airplane engines and parts (best-known supplier in the continent is Bendix), fishing tackle, paints, varnishes, and shirts, the last industry having moved from Troy, New York, to benefit from cheap female labor.

The Inland Ohio-Indiana Subregion

This subregion is distinctly removed from the Great Lakes, but is strategically located with respect to the Ohio River. It lies between the coal fields to the east and the productive farm lands to the west. Its industries are diversified—machine-tools, cash registers, electric refrigerators, soaps, meat, tobacco, iron and steel, beer, shoes, radios, and clothing. The most important part is the Miami Valley from Piqua or Springfield to Cincinnati. Indianapolis is the major center in the western part; Cincinnati, in the eastern.

Eastern part

The eastern part of the Ohio-Indiana subregion, still is important for its agriculture. In the early days farm products were so low in price they were fed to cattle and swine, which in turn were driven over the Appalachian Mountains to Baltimore. By the 1850's Cincinnati had become so important as a meat-packing center (called "Porkopolis") that it put an end to droving.

The real stimulus to manufacturing was the Miami & Erie Canal. Along its route developed a string of cities and towns which later became great centers of industry. This area is unique in that it lacks raw materials and power. It is strongly individualized by (1) the high value of its manufactures, (2) an emphasis upon precision machinery, and (3) a widely ramified market.⁵⁶ This area has become a reservoir of skilled labor.

Columbus (365,796), unlike most capital cities, is a great manufacturing and transportation center. Columbus is located in almost the exact geographical center of Ohio. This was an all-important factor in the location of state capitals before the days of railroads and automobiles. At the confluence of the Scioto and Olentangy rivers, Columbus lies at the eastern edge of the Corn

⁵⁶ Alfred J. Wright, "The Industrial Geography of the Middle Miami Valley, Ohio," *Papers of the Michigan Academy of Science, Arts and Letters*, Vol. XXI, 1936, p. 427.

Belt subregion of the Agricultural Interior in an exceedingly productive area. The city itself, which was incorporated in 1834, has grown in population from 3,500 to more than 300,000.

Columbus supports a variety of manufacturing enterprises, including iron and steel, machinery, food products (especially meat-packing), leather, and paper and printing. The country's largest manufacturer of mining machinery is located here. Because of cheap fuel from near-by southeastern Ohio and West Virginia, its industrial potentialities are great. The rich agriculture of Pickaway County near by was a factor in Columbus' growth.

Springfield (77,406) lies in one of the richest agricultural valleys of Ohio. Its land-locked position retarded development and growth between 1815 and 1830, forcing it to trade exclusively with a moderately prosperous local market. The Miami & Erie Canal, which did so much to develop western Ohio between Lake Erie and the Ohio River, passed by Springfield, though the prosperity brought to its tributary country was reflected in that city.

Springfield, long important in industry, was by 1855 a leader in the manufacture of agricultural implements, one of its factories for a while being the largest in the world. After 1900 this industry shifted westward with the agricultural frontier; only one plant remains. Springfield, with four well-known magazines having a combined circulation of 2,000,000 copies a month, ranks high as a magazine publishing center. Other industries include the making of automobile bumpers, gas engines, road rollers, steam boilers, and water turbines. The turbine was invented here.

Dayton (271,513), on the Miami River, owed much of its early importance to its location at the point where the old Miami & Erie Canal crossed the National Road, which connected Cumberland, Maryland, with Vandalia, Illinois, and was a great highway over which products moved between the East and West before the advent of the railroad. Dayton lies also in a rich agricultural region.

The-city is a great manufacturing center and one that has been growing faster than the national average during the past three decades. Between 1919 and 1929 it ranked second in percentage of gains in industrial wage earners—a growth attributable largely to the production of mechanical refrigerators.⁵⁷ Dayton is a highly specialized industrial center making primarily consumers' goods, of which the most important are mechanical refrigerators (invented

⁵⁷ Glenn McLaughlin, *Growth of American Manufacturing Areas*, p. 118. University of Pittsburgh, 1938.

in the Miami Valley), computing machines, cash registers, lighting systems, and airplane parts.

Wright Field near Dayton was named for the inventors of the airplane, who, after their successful flight at Kitty Hawk in North Carolina, moved to Dayton and laid the foundation for the aviation industry. Wright Field is the Army aviation experimental center. Here also were developed the earth-induction compass, radio beam, blind-flying instruments, and modern aerial photography.

Hamilton-Middletown (112,686), which lie 10 miles apart in the highly fertile Miami Valley, were early favored by productive farms and the Miami Canal, and are today famous for their iron and steel industry. As small cities they are unique among American metallurgical districts, because the trend of industry for a century was toward concentrating factories and financial resources in large cities. Moreover, they do not benefit from location on a navigable waterway for securing raw materials or distributing finished products. Their advantages lie in important patent rights,⁵⁸ efficient operations, and more satisfied labor than is to be found elsewhere. This last factor no doubt is a result of location in smaller cities with better living conditions for the working man.

The district is unusual in that its blast furnaces and coke ovens are in Hamilton and its steel mills in Middletown. Blast furnaces usually adjoin steel plants in order to utilize molten metal. As a means of delivering pig iron in a molten state, the company devised a ladle car with a capacity of 150 tons which is taken by rail from Hamilton to Middletown (Fig. 144). This district ranks among the leaders in production of sheet steel and tin plate.

Cincinnati (789,309), strategically situated on the northernmost point of the great bend of the Ohio River near its junction with the Miami, opposite Licking Valley in Kentucky, became an outstanding river town when the Ohio was one of the country's great commercial highways. In fact, in 1850, next to New Orleans, it was the chief city of the West. The deep channel and the favorable river bank helped Cincinnati to become a great commercial center during the steamboat era. Its history is inextricably bound up with that of the river. In 1832 Cincinnati was connected by canal with Toledo near Lake Erie, enabling it to secure products for its breweries, flour mills, and packing houses.

As agriculture moved westward, industries using grain as their

⁵⁸ The American Rolling Mill Company, which operates the industry here, contributed the world's first continuous rolling mill in 1923, a machine conceived by John Tytus, son of a Middletown paper manufacturer, who was determined to apply the efficiencies of continuous paper manufacturing to steel.



American Rolling Mill Co.

Fig. 144. Armco ladle car at Middletown, Ohio. In order to keep the molten pig iron (made in Hamilton) hot, huge ladle cars are used to transport it to the open-hearth furnaces at Middletown.

raw material, as well as meat-packing industries, tended to desert Cincinnati for Chicago and other cities near the Great Plains. As steel rails superseded the river and canal, Cincinnati, especially after 1890, became a slow-growing city.

Cincinnati ranks as a leading industrial center especially in the production of clothing, machine-tools, playing cards, radios, shoes, soap, and textbooks. It is the machine-tool center of the world and

alone contributes one third of Ohio's tremendous output. Its Procter & Gamble plant at Ivorydale covers 11 acres and is one of the largest soap-manufacturing plants in the world.

Western part

As in the eastern part of the Ohio-Indiana subregion, agriculture in the western part remains important. Nevertheless, manufacturing is outstanding. The leading products are agricultural implements, chemicals, glass, automobile parts, electrical machinery, steel forgings, pharmaceuticals, hosiery; airplane accessory parts, engines, and propellers; and wood products, particularly furniture. Flour-milling, meat-packing, and vegetable-canning are especially outstanding. Indiana is a leader in vegetable-canning, which began in Indianapolis as early as 1861. Madison County alone has 43 canneries. More than 100,000 acres are devoted to tomatoes alone in this state. At Elwood is held an annual pageant in honor of the tomato. Other vegetables that are canned include corn, kidney beans, pumpkin, and cabbage (sauerkraut).

Indianapolis (455,357) is the largest city in Anglo-America not located on a navigable waterway—ocean, lake, river, or canal. While it is centrally situated—a locational asset for a state capital—it has little or no local geographic advantage. It developed as an important crossroads for trunk-line railroads connecting Pittsburgh and Buffalo with St. Louis and Chicago. Dominating a trade territory within a radius of about 100 miles, its industries are typically concerned with the needs of the agricultural *umland*. It is near the eastern interior-(the Indiana-Illinois) coal field (Fig. 63).

Fort Wayne (134,385), at the head of the Maumee River, is an important manufacturing center. In 1815 it was a leading depot in the fur trade. Its rapid growth in early days, however, was the result of economic activity brought about by the Wabash-Maumee Canal. When steel rails superseded the artificial waterway, Fort Wayne became an important railway center. Among its more important industrial products are electrical equipment, castings, airplane engines and accessories, machinery, and automobile parts.

Other cities

With only two metropolitan districts in this part of the subregion, one might minimize its industrial importance. There are, however, a large number of small cities whose variety and combined output of manufactured products are very great—Huntington, Peru, Marion,

Kokomo, Elwood, Muncie, Anderson, Newcastle, Richmond, Connersville, and Shelbyville.

The Chicago-Milwaukee District

The Chicago-Milwaukee district occupies the western and south-western shore of Lake Michigan from Gary to Manitowoc and includes satellite towns and cities extending a short distance inland. Heavy industry predominates, South Chicago-Gary constituting the best-balanced primary metallurgical district in North America and the one that threatens ultimately to displace the Pittsburgh district in production. Other major enterprises pack meat, refine oil, and make electrical equipment, airplane engines and accessories, agricultural implements, railway cars, automobiles and trucks, clothing and shoes. Most manufacturing in Wisconsin and Illinois is confined to this subregion. Chicago is the economic capital of this subregion, as well as of the entire Middle West.

Meat-packing

Meat-packing and the manufacture of corn products, though more important in Chicago than in any other North American city, are treated in Chapter XII, "The Agricultural Interior," because of their close association with agriculture.

Petroleum-refining

Whiting, Indiana, which lies in the Chicago Metropolitan area, is one of the 3 largest refining and storage centers in the American Manufacturing Belt, most of the major oil-producing companies being represented. When Whiting began to refine oil, proximity to market was the major locational factor, and only crude oil was pumped through pipelines. The increasing use of pipelines for transporting gasoline during the past decade, however, has resulted in a shift of refining activity to the oil fields, and today Texas and California refine more than half the nation's total.

Iron and steel

Chicago-Gary, comprising one of the outstanding manufacturing districts of the world, is strategically located for making iron and steel, for iron ore and limestone can be brought directly to the blast furnaces by lake carrier, and coal is not far distant in southern Illinois, though some coking fuel is brought in from West Virginia and Kentucky. This district has the best balance between produc-

tion and consumption of any iron and steel area in the United States. With the removal of "Pittsburgh Plus,"⁵⁰ it almost equals Pittsburgh in production. In fact it did equal it in 1934.

Gary is one of the few examples of a scientifically planned industrial location. For more than 30 years its metallurgical industry has been built up step by step. In 1905 the United States Steel Corporation needed a new plant to serve the rapidly growing Mid-western market. What is now Gary was then an area of sand dunes and swamps. Its intermediate location between the Northern Appalachian coal field and the Lake Superior iron-ore deposits enables this area to assemble its three raw materials economically.

Gary's location with respect to markets is unsurpassed. Near enough to deal conveniently with Chicago's manufactories, it is at the same time far enough away to escape high land values and ruinous taxes. Labor is plentiful. Cold, clear water of good quality is available from Lake Michigan. The terrain is level and there is plenty of room for industrial and residential expansion. Moreover, the soil is sandy and unproductive, and consequently land is cheap.

Furniture

The plentiful supply of lumber of the Great Lakes area gave rise to an important furniture industry. Chicago still ranks first in the manufacture and distribution of furniture.

Agricultural implements

Because agricultural implements are bulky and heavy, they should be made as close to market as possible. The industry has, therefore, migrated westward with the agricultural frontier—from western New York through Ohio and Indiana to Chicago, which is now the world center in this industry.

Cities

Chicago (4,499,126) is so important as to color the entire Middle West; in fact the whole Agricultural Interior has been called

⁵⁹ By "Pittsburgh Plus" is meant the practice of quoting prices with the idea of perpetuating the superiority of the Pittsburgh District as a steel center. Thus steel was sold throughout the United States, regardless of where it was made, at a delivered price equal to the Pittsburgh prices plus freight from Pittsburgh. Because producing districts and customers located outside Pittsburgh complained, the Federal Trade Commission in 1924 issued its famous edict to cease "selling in the course of interstate commerce rolled steel products upon any other basing point than that where the products are manufactured or from which they are shipped." This meant the abolishment of "Pittsburgh Plus."

Chicago's hinterland. Without this hinterland, Chicago could not be the city it has become.

Chicago is located near the southern end of Lake Michigan where the Great Lakes system dips deepest into the heart of American agriculture. J. Paul Goode enthusiastically claimed that Chicago was born great, that it inherited a "generous list of geographic advantages and [was] destined from the beginning to play a great role."⁶⁰

The specific site of Chicago, like that of sister cities on the Great Lakes, was determined by a river—in this case the small, inconsequential Chicago River, which provided protection for lake boats.

Chicago has grown sensationally. Whereas a century ago it was merely a remote and inconspicuous trading post, its population has increased a hundredfold since 1850. Today the city proper has 3,396,808; the metropolitan area, 4,499,126. It is now the greatest receiving, distributing, and manufacturing center in the Middle West.

No city on earth has the railroad net of Chicago and no other place can hope to rival it in this respect. The city grew primarily during the era of east-west trade development. Its preeminence in transportation is derived from the fact that it lies near the southern tip of Lake Michigan, which extends 330 miles in a north-south direction, diverting all northwest, west, and east rail lines around its southern end. Thirty-three trunk lines which radiate to all parts of the country have their terminals at Chicago. Had there been no lake, the route between the Northwest and the North Atlantic coast would have been considerably north of Chicago. The building of railroads and roads has been greatly facilitated by the flat terrain of the Chicago region.

Milwaukee (790,336) lies on Lake Michigan at the mouths of three small rivers 85 miles north of Chicago. Because of its propinquity to Chicago, which dominates the entire Midwest, Milwaukee never will be able to capitalize on its favorable commercial location.

The rivers are navigable and the harbor, one of the best on the lakes, is capable of accommodating the largest freighters. Accordingly, Milwaukee ranks high in commerce—especially grain and coal. Moreover, it dominates the commercial activities of all but the northwestern part of Wisconsin. Nevertheless, Milwaukee is classed as an industrial city, and to manufacturing it owes most of its growth. A city of diversified industries, its plants make

⁶⁰ J. Paul Goode, *The Geographic Background of Chicago*, p. 1. University of Chicago Press, 1926.

products ranging from farm implements to silk hose and from beer to shoes. Especially important are its heavy machinery industries—those producing cranes, hoists, steam shovels, excavators, ore crushers, mining equipment, and agricultural implements.

Racine-Kenosha (135,075), on Lake Michigan between Milwaukee and Chicago, benefit industrially from this location because their automobile plants have easy access to steel mills whence they can procure sheets, strips, and bars.

The St. Louis District

The St. Louis District has its center in the city of St. Louis (mostly in Missouri but partly in Illinois). It is the largest city between Chicago and the Pacific Coast and is one of North America's leading centers of diversified industry. Especially does it exert strong influence in the Middle Mississippi Basin. A strategic river location enabled St. Louis to dominate much of the river trade during the steamboat era. The city later became a railway center, ranking second only to Chicago. The metropolitan district, which includes East St. Louis, Alton, Belleville, and Granite City, contributes heavily to the nation's total output of shoes, beer, meat, electrical equipment, airplane engines and accessories, chemicals, alumina, glass, refined petroleum (the towns of Wood River and Roxana), and iron and steel.

St. Louis (1,367,977), lying on the first high ground south of the mouth of the Missouri and near the confluence of the Ohio and Illinois with the Mississippi, started as a fur-trading and outfitting point for trappers and traders. It is still an important river town; many tugs and barges are to be seen at the riverside. The railroads have made it a great distributing and manufacturing center. In the early days St. Louis was a gateway to the Far West, as Pittsburgh was to the Middle West.

Metropolitan St. Louis is an agglomeration of many towns and cities clustered about the confluence of the Mississippi and Missouri rivers. The terrain consists of broad, flat bottom troughs separating smooth, undulating uplands. It is a major manufacturing center.

The Montreal, Ottawa, Trois Rivieres District

The Montreal, Ottawa, Trois Rivières district, widely separated from the Buffalo, Niagara Falls, Erie, Hamilton, Toronto subregion, is Canada's outstanding industrial area. All but two of the Dominion's manufacturing cities and all of its distinctly industrial

ones are located in these two subregions. Located at a crossroads where the Ottawa, St. Maurice, and Champlain valleys meet the St. Lawrence, this subregion is the heart of the entire St. Lawrence Valley. Half the total trade of Canada passes through it, and many exports and imports are processed or manufactured there. Cheap hydro-power, an abundant supply of intelligent labor at a reasonable price differential, a rapidly growing market, a good supply of industrial water, and ample room for the establishment of new and for the expansion of old industrial plants have made this area more interested in manufacturing than in shipping. Its chief industries are engaged in the production of flour, pulp and paper, textiles, shoes, sugar, chemicals, gasoline, railway equipment, lumber, aluminum, and cement. Many of these industries, of course, could not exist if it were not for the tariff on products made south of the border. Only the cement industry needs coal, and this is delivered cheaply by water. The combination of raw materials, low-cost power, and access to markets is certain to make this area one of the great industrial and distributing centers of the world.

The pulp and paper industry is mentioned specifically because it is so important along the north shore of the St. Lawrence between Montreal and Quebec (Fig. 22). This area's principal advantages are the navigability of the St. Lawrence, which enables deep-draft vessels to bring raw materials to the mills and take manufactured products to the markets of the world, and the location of many mills at the mouths of streams coming down from the Shield (tributaries of the St. Lawrence), down which logs are cheaply driven and on which huge and economical water-power is developed (Fig. 161). Occupying such a location is Trois Rivières, which is said to be the world's leading pulp and paper manufacturing center (Fig. 165).

Montreal (1,139,921), by virtue of its position on an island at the head of navigation for large steamers, and at a point where the St/Lawrence is most easily bridged, is the logical junction for North America's lake and river traffic. It eclipsed Quebec in importance when ocean navigation was extended farther upstream to its docks. Montreal is also a crossroads where the Champlain and Ottawa valleys meet the St. Lawrence.

As a port for the greatest wheat lands of the world, Montreal has warehouses and grain elevators with enormous capacities.

The city is one of the Dominion's leading manufacturing centers with important flour, iron and steel, pulp and paper mills, clothing and textile industries, and sugar refineries.

The greatest expansion in population has occurred since 1901. Today greater Montreal has about one tenth of the Dominion's inhabitants. Nearly two thirds of the total population is French-Canadian.

Ottawa (215,022), on the broad Ottawa River, is known mainly as a political city—the Dominion capital. It is also the center of Canada's pulp and paper industry; numerous large timber rafts are floated down the Gateneau and other rivers from logging camps in the coniferous forests of the Laurentian Shield. The hiss of steel teeth biting into logs is a common sound in Ottawa. The lumber mills procure cheap hydro-power from the Chaudiere Falls nearby.

Trois Rivières (41,811), an important pulp manufacturing center, is situated at the confluence of the St. Maurice and the St. Lawrence rivers 78 miles southwest of Quebec and 92 miles northeast of Montreal. It is served by both the Canadian Pacific and the Canadian National railways. Founded by Champlain in 1634, it is one of Quebec's oldest towns. By reason of its relation to the enormous water-power of the St. Maurice River, *Trois Rivières* has become the center of a great woodpulp industry and of a large lumber trade.

Summary of the Manufacturing Region and Its Subregions

Each of the principal subregions in the American Manufacturing Belt, whose cities are predominantly industrial, has now been presented. This does not mean, of course, that manufacturing within this main belt is confined exclusively to these areas, for there are within it many small, relatively isolated industrial districts. There are also some industrial districts just outside the regional boundaries. Examples of these are the Ironton district, the Lower Wabash Valley, the bridge cities—Evansville (Indiana) and Paducah (Kentucky)—on the lower Ohio, the Rock River cities, the Fox River district, and Berlin (New Hampshire). All are manufacturing centers in essentially nonindustrial areas. The relative unimportance in manufacturing of much of the northern Appalachian coal field is possibly the result of unsatisfactory railway facilities through the mountains. But even here there is considerable manufacturing in isolated centers.

All in all, the subregions comprise a region where manufacturing dominates, and no one can travel through it without noting that the cities and their factories lie relatively close together. The

American Manufacturing Belt is indisputably North America's industrial workshop.

4. TRANSPORTATION

In a region where manufacturing is predominant, cities numerous, and population dense, transportation must be superior. The American Manufacturing Belt has an unsurpassed network of railways, highways, airways, and waterways that bind it together and link it with other regions (Fig. 123).

Some significant changes in the relative importance of the several types of transportation took place during the depression of the 1930's. Railroad transportation declined in relative importance, whereas that by motor gained. That by pipeline declined while that by water gained.⁶¹

Ocean Transportation

Brief reference must suffice for this topic since New York, Baltimore, Philadelphia, and Boston have already been treated and it was seen that as port cities they all excel. All are connected with the far corners of the earth and all have ready access to the food, industrial raw materials, and markets of interior Anglo-America.

The Great Lakes

The Great Lakes comprise the most valuable system of inland waterways in the world. For 1,700 miles they extend in an east-west direction, connecting the great raw-materials producing Central Northwest with the fuel, industries, and markets of the East. Few barriers to navigation now exist between Duluth and Montreal. The lakes seldom experience severe storms, but they are closed by ice normally from December to May. The shores of the lakes are dotted with great industrial and commercial cities.

Most of the traffic consists of bulky products—iron ore, coal, wheat, and limestone. These are handled economically by specially designed boats capable of carrying enormous cargoes. Speedy loading and unloading facilities have been installed at the ports (Figs. 145 and 146).

The Great Lakes-St. Lawrence Seaway

For some years this project has been widely discussed throughout both the United States and Canada. It would link the Great

⁶¹ *Cleveland Trust Company Business Bulletin*, February 15, 1937, Vol. XVIII, p. 3.

Lakes and the St. Lawrence River with the Atlantic, permitting ocean-going ships to penetrate the continent 2,350 miles to Duluth. It would also provide an abundance of hydro-power. In 1934 the United States-Canada Treaty to complete the seaway received a majority vote in the United States Senate, but failed to be ratified



Wellman Engineering Co.

Fig. 145. Unloading iron ore at a Lake Erie port. Although the boats are loaded by gravity at Upper Lake ports, they must be unloaded by mechanical means. These great machines seize from the vessel's hold as much as 20 tons at a single bite and disgorge it into storage piles of the rear for shipment inland during the winter, or into waiting railway cars under the machines for immediate shipment to the furnaces. Vessels are customarily unloaded in 4 to 5 hours.

because a two-thirds vote was required. As a result of World War I I, the issue is again before the people. Said President Franklin D. Roosevelt in December 1940:

Seacoast shipyards are already overtaxed with uncompleted construction. Shipyards on the Great Lakes with access to the ocean yet close to the sources of supply of labor, raw and finished material, further removed from possible attack may be a vital factor in the successful defense of this continent.

To complete the seaway, specified channels would have to be dredged to a depth of 27 feet and locks would have to be constructed to by-pass certain sections (Fig. 147).

Since the greater part of the seaway is on the international boundary, Canada and the United States must agree on a plan before work is begun. The estimated cost is \$655,372,000, of which \$324,771,000 would be paid by the United States, \$240,601,000 by

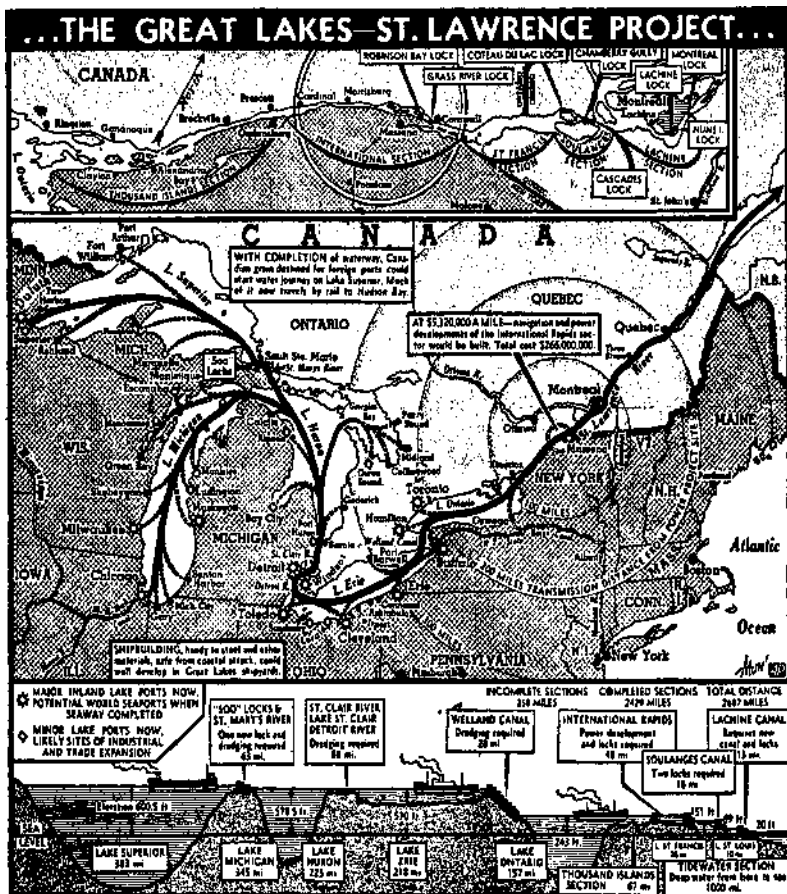


Courtesy of Cleveland Plain Dealer.

Fig. 146. Loading coal at a Lake Erie port. This machine picks up railway cars and empties their contents into lake vessels at the rate of 30 cars per hour.

Canada, and \$90,000,000 (approximately) by the New York State Power Authority.⁶²

Statistics are used effectively by both proponents and critics of the project. This much is undeniable—the cost would be enormous and the waterway could be used only during 42 per cent of the year.



Courtesy Associated Press and Hon. L. C. Rabaut of Michigan.

Fig. J47. The proposed Great Lakes-St. Lawrence Seaway and Power Project—a joint effort of the United States and Canada to harness the potential water-power and provide the heart of the continent with a deep-water outlet to the Atlantic. Because of the strong arguments advanced for and against this project, it has for decades been one of the most hotly contested issues in Anglo-America.

⁶² B. D. Tallamy and T. M. Sedweek (The Niagara Frontier Planning Board), *The St. Lawrence Seaway Project*, p. 33. Buffalo: 1940.

Rivers

Rivers were the great highways of colonial days, having been used whenever possible in preference to the hard and slow overland routes. Their chief advantages as highways were low cost and convenience. Many a stream that now seems too small or shallow to have served was very extensively used, and many a settlement would have died out had there been no stream over which to float products to market. All large western communities in the period 1800 to 1850 were located on the Ohio or the Mississippi. Steamboats on the rivers were of outstanding importance until about 1860, when they were largely replaced by railroads, which could make trips in a quarter of the time.

The Detroit (a link in the Great Lakes system), Monongahela, Ohio, Great Kanawha, Hudson, Mississippi, and Illinois are the principal rivers of the American Manufacturing Belt. Most important are the first three.

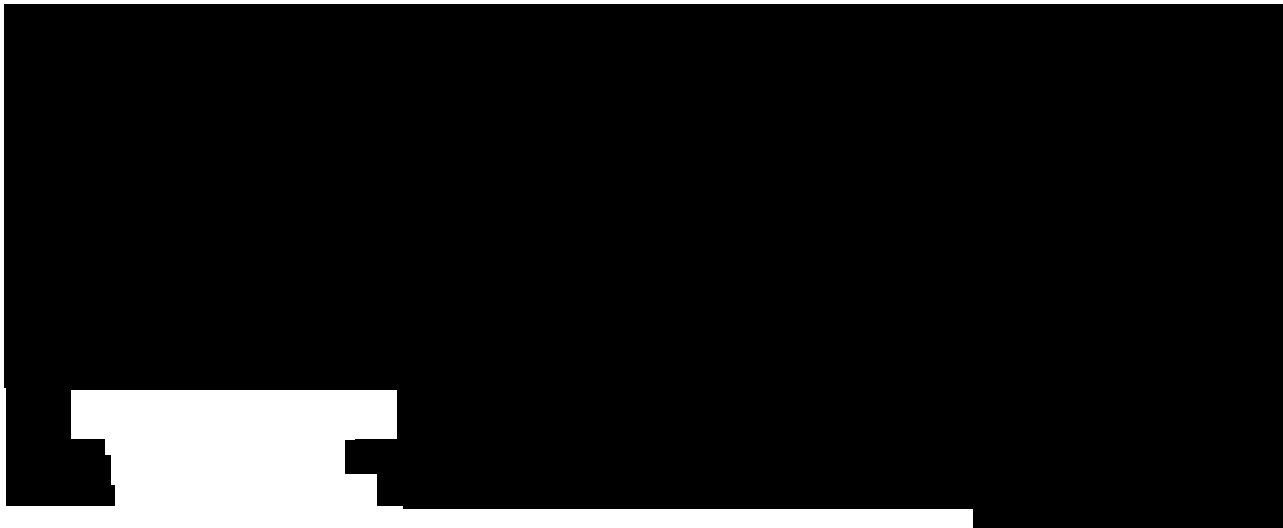
The Detroit River

The Detroit River, which drains Lake St. Clair into Lake Erie, is 28 miles long and $\frac{1}{2}$ to 3 miles wide. A shoal that formerly blocked its entrance from Lake St. Clair has been cut through. About three fourths of the tonnage moving down the lakes passes through the Detroit River—more than moves through the Suez and Panama canals combined.

The Monongahela River

The Monongahela, a deeply entrenched river, is unique in two respects: (1) it is the most used in North America, averaging more than 20,000,000 tons per annum, and (2) it is one of the few important streams flowing northward.

Because the Monongahela, which flows through an area richly endowed in coal, focuses upon Pittsburgh, the world's leading iron and steel center, and because it was handicapped by annual drought and floods, it was the first river in the United States to be improved for navigation. Canalization of the river was accomplished by the construction of dams and locks for passage of boats (Fig. 148). These improvements have overcome the natural handicap of low water in late summer and autumn and of floods in spring. Before improvements were made, only rafts and boats of one-foot draft could navigate it. Today it is navigable from Fairmont, West Virginia, to Pittsburgh.



Corps of Engineers, U. S. Army,

Fig. 148. Looking upstream at a lock on the Monongahelo River. This stream, formed near Fairmont, West Virginia, flows 128 miles through a productive coal area to its mouth at Pittsburgh. Ninety per cent of the coal originating on American waterways is loaded for shipment on the Monongahelo. Millions of tons of coking coal are floated economically to riverside coke ovens. Iron and steel mills line the banks of the Monongahelo for many miles.

Pittsburgh's principal competitive advantage in the iron and steel industry is the low-cost barge transportation on coking coal from river tipples to by-product coking plants without trans-shipment (Fig. 141).

The Ohio River

The channel of the Ohio River was not navigable during the droughts of late summer until the federal government established a permanent 9-foot stage with a system of more than 50 movable dams which back the water into a succession of pools deep enough for navigation. Locks permit the boats to get around the dams.

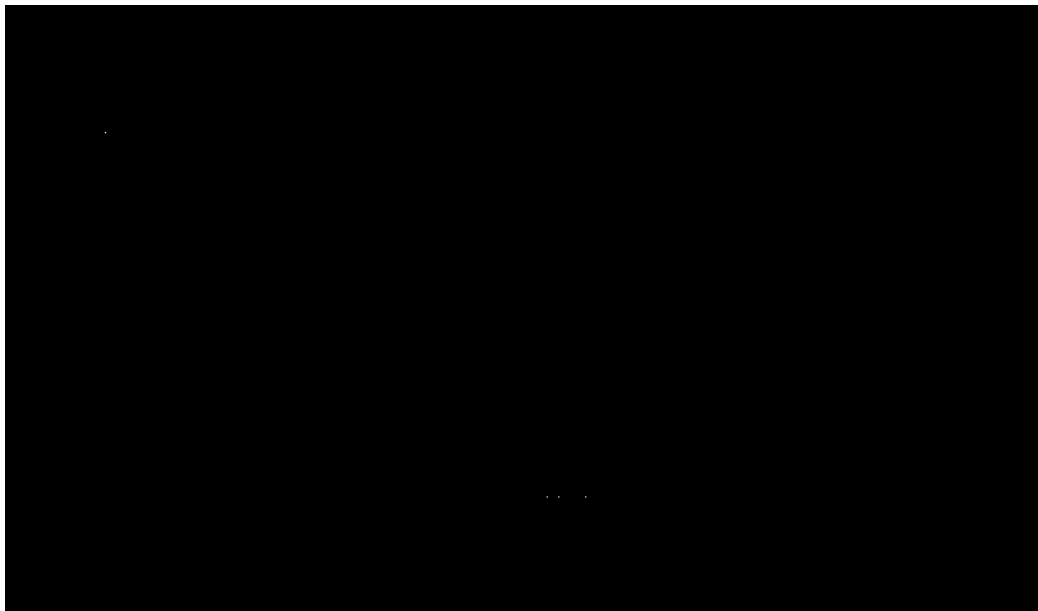
The Ohio accordingly has become one of the continent's leading carriers of freight. Thousands of commodious barges, shackled in tows, are propelled over the river at all seasons, except for several days in spring when the water is too high or in winter when ice is objectionable (Fig. 149). The tonnage is several times greater now than it was at the height of the steamboat period. Ninety-five per cent of the total freight consists of bulk> products—coal, coke, ore, sand and gravel, stone, grain, pig iron, and steel. Increasing quantities of gasoline are being shipped. Most of the traffic is in the hands of contract and private carriers.

The Mississippi River

The Mississippi, while a transportation artery of some importance, suffers the handicap of flowing in the wrong direction—from north to south rather than from west to east, the main direction of traffic. It suffers further from sand bars and snags, and from having a channel that is not uniformly deep. Except for the part of the river below St. Louis, most of the commerce is of only local importance and contributes little to national production and distribution.

The Illinois River

This stream is formed by the joining of the Des Plaines and Kankakee rivers and enters the Mississippi 22 miles above the mouth of the Missouri. It has a depth of 9 feet from its mouth to Utica. It forms, with the Sanitary and Ship Canal and other rivers, a continuous waterway across the state of Illinois which joins Lake Michigan and the Mississippi. A considerable tonnage of bulky products passes over its waters.



Barge Line.

Fig. 149. Typical mode of moving freight on the Mississippi and its navigable tributaries in the 1940's, when traffic reached a new high level, especially on the Ohio River along whose banks are many of the continent's greatest industries. This is one of the few American waterways that parallel the great transportation routes. Many of the tows carry only steel products or sand and gravel or coal or petroleum. The one shown here has a mixed cargo. Whereas the boats of the Mark Twain period were called "pockets" because they carried package freight from town to town, the modern fleet of barges carries mostly heavy, bulky, non-perishable products for long distances.

The Hudson River

The Hudson River reaches the Atlantic Ocean at New York City, where it is called the North River. It is tidal up to Albany. It is used by barges, tows of which move over its waters laden especially with crushed stone, bricks, cement, and lumber. Large numbers of tankers carry gasoline from seaboard refineries to Great Lakes cities; other craft carry refined sugar, returning with automobile parts and iron and steel.

The Hudson River channel, including the west side of Manhattan and the adjacent New Jersey side, comprises the most important part of the Port of New York, handling 50 per cent by value of the business.

Canals

Space forbids adequate treatment of the fascinating and romantic subject of canals. Though most of them proved inadequate, particularly because they were closed by ice for several months each year, they did, nevertheless, play a vital role during the decades when people depended primarily upon inland water transportation. Canals were built to connect natural waterways. The famous "Soo" Canals are discussed in Chapter XIV, pp. 530-531; those inland from Atlantic ports, in Chapter VII, pp. 163-165. Abandoned canals (Fig. 150iY) will not be discussed. Among the outstanding canals in this region today are (Fig. 150B) the Welland, the New York State Barge, the Chicago Sanitary & Ship, and the Chesapeake & Delaware.

The Welland Canal

Most important in this region is the Welland Canal, built to avoid Niagara Falls and connecting Port Colborne on Lake Erie with Port Weller on Lake Ontario. First built in 1829, it was a tortuous ditch with 25 locks. Nevertheless, it did a tremendous business and during the boom grain year of 1928 handled 131,531,000 bushels. Unfortunately, the large lake carriers, which constitute about 90 per cent of those on the lakes, could not navigate the canal; cargoes had to be unloaded at Port Colborne, the Canadian terminal harbor 25 miles west of Buffalo, and placed aboard smaller ships. These required about 16 hours to make the trip, against 8 hours today. The greater economy and efficiency attained by larger lake vessels led to a desire to enlarge the canal; the work was begun in 1913 and completed in 1931. The new

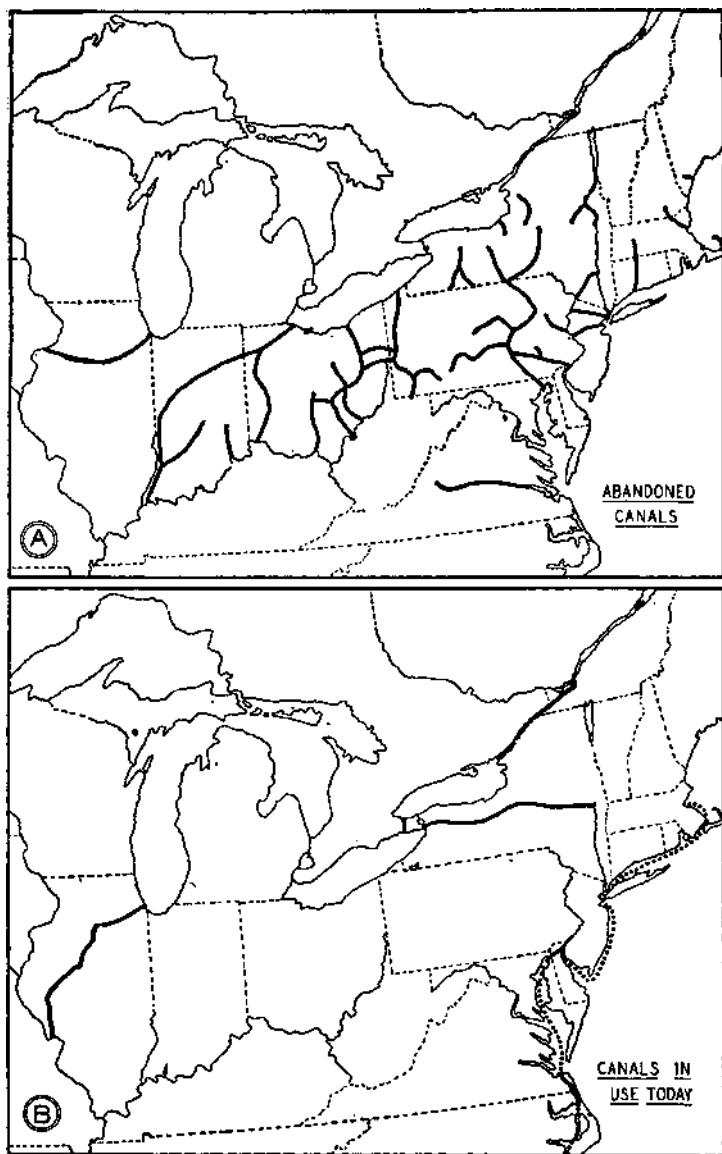


Fig. 150. New York, Philadelphia, and Baltimore all came down with "canal fever" in an effort to share in the trade of the interior, but only New York had a practicable route and only its canal remains. The Chesapeake & Delaware Canal is a link in the Intracoastal Waterway (dotted line). The Welland route is justifiable on economic grounds. The Chicago Sanitary & Ship Canal is a link in the Illinois Waterway System.

Welland Canal can handle any ship on the lakes. Whereas the old canal had 25 locks, the new one has but 7. Though 30 miles long, it has few curves and no bad ones.

New York State Barge (Erie) Canal

This canal, which connects Lake Erie with the Hudson River was opened in 1825. It follows the only practical route through the Appalachian barrier—the Mohawk Gap and the Ontario Plain. Freight rates between Buffalo and New York immediately dropped from \$100 to \$5 per ton and the transit time was shortened from 20 to 8 days. The Erie Canal, probably more than any other single factor, made New York City the greatest port on the Atlantic Coast. Traffic from the interior poured into New York Harbor. The Erie was financially successful, and it was the busiest inland waterway in the world for many years.

In 1875, however, its traffic was surpassed by the railway. Tolls were abolished in 1883, but this was a temporary solution. By 1895 the tonnage fell to 3,500,000 as against 19,000,000 for its competing railroad. The solution appeared to be a larger canal—the New York State Barge Canal, which was completed in 1918. It followed the route of its predecessor most of the way. It is 353 miles long from Buffalo to Waterford (near Troy) on the Hudson. But the canal is a disappointment. It is used only by self-propelled vessels or tows propelled by them. Traffic has been increasing in recent years but only slowly. The leading commodities transported are grain, sand, stone and gravel, sulphur, and petroleum. The canal is more than seven eighths unused, primarily because of (1) the absence of common carriers, (2) lack of traffic agreements with the railroads, and (3) the effects of ice in winter.

The Chicago Sanitary & Ship Canal—A link in the Illinois Waterway System

As early as 1673 the explorers Joliet and Marquette spoke of the advantage of a canal that would connect the Illinois and Des Plaines rivers with the Chicago River. Construction on the Illinois & Michigan Canal was not begun until 1836, however, and it was not open for traffic until 1848. The waterway was 6 feet deep, 48 feet wide, and 97 miles long. It connected the South Branch of the Chicago River, about 7 miles from Lake Michigan, with the Illinois River at La Salle. Fed in part by Chicago River water, it also aided in solving Chicago's sewage problem, which had been critical, since no current could carry the waste away from the dead end of

Lake Michigan. In 1871 Chicago deepened the summit level of this canal in order to reduce the pollution of the lake. In 1911 the Chicago Drainage Canal, which paralleled its predecessor to Joliet, was opened. Since it had a depth of 21 feet, it soon drew away all through traffic from the old canal.

The old Illinois & Michigan Canal flourished for about 20 years until railway competition became too severe. Despite paucity of traffic, this canal did not experience the fate of most others because of its strategic position between the Great Lakes and the Mississippi. In the 1920's the Illinois Waterway System was further improved, and it is now a 9-foot barge waterway from Lake Michigan to the Illinois River. Traffic is definitely increasing.

The Chesapeake & Delaware Canal

The Chesapeake & Delaware Canal (Fig. 150B), connecting the Delaware River on the east with an arm of Chesapeake Bay on the west, is 19 miles long and 27 feet deep. It was completed in 1829, thus providing an all-water route from Philadelphia to Baltimore. Tideless and toll-free, it constitutes an important link in the Intra-coastal Waterway, which has been owned and operated by the United States government since 1919. Accommodating all but the very largest ocean-going vessels, it shortens the route from Baltimore to Philadelphia by 316 miles.

Traffic has increased steadily and greatly since 1929, the chief items handled being petroleum products, ores, metals and their manufactures, chemicals, lumber, and vegetable food products.

Railroads

Though the United States has but 6 per cent of the world's population and 5 per cent of its area, it has nearly one third of the railroad mileage. Most cities in the United States developed simultaneously with railroads; 73 per cent of all rail traffic terminates in urban areas. As early as the 1850's, far-seeing men felt certain that the West would be developed by railroads rather than by rivers and canals. By 1860 railroads had triumphed over inland waterways, and since then port rivalries have been expressed in the competition of the railroads serving them.

The American Manufacturing Belt has a real rail web—the most important in the United States. Its railways carry more than half the passengers and tonnage handled by all American railroads. This volume of traffic is attributable to the fact that so large a part of the population dwells in the Manufacturing Belt that most

of the products of the farm, the mine, and the factory must be consumed there. Most of the lines run east and west. In this region no one, be he an inhabitant of a city, town, village, hamlet, or farm, is more than a few miles from a railway.

Highways

The roads of the colonies were little more than cleared paths and were made mostly for local traffic. Toll roads were built by private companies between 1790 and 1840. The federal government began construction on the National Road in 1811, opening it in 1817. Since then this nation, but more particularly the American Manufacturing Belt, has been spider-webbed with roads, because hard-surface highways and heavy traffic are synonymous with dense population and high productivity. Without automobiles and motor trucks speeding over the roads day and night, urban dwellers would experience difficulty in securing food. Trucks benefit from low capacities and high speed and can, therefore, provide frequent shipments at low cost. They also have a distinct advantage over railroads in short hauls. As yet they have played only a small part in long-distance transportation. Trucks have been a potent factor in decentralizing industry.

Unfortunately the highway system in the region under discussion is glutted with bottlenecks, especially in and around cities. By-passes, parkways, and turnpikes are relieving the congestion in metropolitan highway systems. A single outstanding example is the Merritt Parkway from Westchester almost to New Haven, by which for ten cents a car may sweep over the Connecticut Hills for 52 miles at sustained speed and safety and with only one stop. Entrance highways into New York City from the west are marvels of efficiency. The Pennsylvania Turnpike is discussed on page 193.

Pipelines

Crude oil and gasoline

Petroleum, when first discovered, was transported in barrels by wagons, and somewhat later by railroads. As production skyrocketed, a new method of getting petroleum to market had to be found. The pipeline resulted. Pipeline routes have been chosen, with great care—often with the aid of aerial surveys. Sharp valleys, ridges, and rivers are avoided whenever possible, and even soil, climate, and vegetation are considered. The routes usually go directly to their destinations except when skirting urban centers.

The American Manufacturing Belt has attracted many of the trunk pipelines from the Mid-Continent Province to refining and marketing centers on the Great Lakes, the Mississippi River, and the Atlantic Seaboard, and from the Appalachian Province to refineries on the Atlantic Coast (Fig. 123).

Formerly only crude oil was shipped, and this still is largely the case. Recently, however, gasoline pipelines have been constructed from the Mid-Continent area to the Great Lakes, from the Atlantic Seaboard to the Great Lakes, and from the California fields to markets. The Great Lakes Pipeline, the longest in North America, was built by the producing and refining interests of the Southwest to retrieve the markets in the Middle West, which they were losing to refineries with better locations.⁶³

The pipeline, now firmly entrenched as a part of the American transportation system, is superior to any other land device for handling liquids, though it cannot compete in cost with the ocean tanker or the fresh-water barge. The ton-mile cost of shipping bulk petroleum is 8.3 mills by rail, 3.2 mills by pipeline and 1.25 mills by tank vessel.⁶⁴

The chief advantages of pipelines, in addition to the low cost of transporting the oil, are that (1) movement is continuous, (2) there is no problem of the return of empty equipment, and (3) rights of way are relatively inexpensive.

Natural gas

Much natural gas, frequently associated with the oil industry, has blown off and been wasted. That in the East Texas, West Texas, and Oklahoma City pools amounted to uncounted billions of cubic feet. In the first half of the nineteenth century, some natural gas was piped in New York State and Pennsylvania. After 1870 much of it was piped in Ohio and Pennsylvania. Formerly the movement was largely from Pennsylvania and Ohio to near-by cities, and later from West Virginia. More recently Oklahoma, Texas, California, and Louisiana have become the leading centers, with lesser ones in Montana and Wyoming.

In 1937 pipelines carried 687 billion cubic feet of gas across state lines, of which 67 per cent emanated from Texas, Louisiana, and West Virginia. Illinois and Ohio are regularly the most important consumers of natural gas.

⁶³ Ronald B. Shuman, *The Petroleum Industry; An Economic Survey*, p. 109, University of Oklahoma Press, 1940.

⁶⁴ *Ibid.*, p. 100.

Air Transportation

In 1941, for the entire country, 358 planes were used by commercial companies and these carried 4,500,000 passengers and 22,500,000 pounds of express. The distance flown was 150,000,000 miles. The great size of the United States and Canada, along with the demand for speedy transportation, stimulated the rapid growth of airways particularly since 1930.

Airline routes of the United States and Canada are confined to fairly well defined lines of travel, since they connect leading cities and depend upon ground aids. The natural environment of the region over which planes fly has much influence on weather conditions and hence on safety. Especially is this true of mountains and of areas affected by fog, heavy rain and snow, thunderstorms, surface winds, and upper winds. It is indeed significant that topography has exerted little influence in the laying out of airlines.

The concentration of traffic is greatest along routes between New York and Washington, New York and Boston, New York and Chicago, and Chicago and St. Louis. The service here is much more frequent than in the South and West. Roughly speaking about 70 per cent of the nation's entire air traffic originated and 60 per cent was received in the American Manufacturing Belt.⁶⁵

5. AGRICULTURE WITHIN THE REGION

In the American Manufacturing Belt, most of the agriculture is of the city-supporting type, providing factory workers with perishable foodstuffs such as fluid milk, eggs, fruits, and vegetables. In other regions cities exist to serve near-by farms; in this region farms exist to serve near-by cities.⁶⁶ There is a localization of farm types around the urban centers—first, market gardening, then whole-milk dairying and poultry raising, butterfat dairying, livestock feeding, grain growing, and livestock grazing.⁶⁷

The agriculture of the northern and eastern parts of the region consists primarily of dairying, crop specialties (fruits, vegetables, and tobacco), and mixed farming.

⁶⁵ Stuart Daggett, *Principles of Inland Transportation*, p. 153. New York: Harper & Bros., 1941.

⁶⁶ Harold Hull McCarty, *The Geographic Basis of American Economic Life*, pp. 484-485. New York: Harper & Bros., 1940.

⁶⁷ Bureau of the Census, *Types of Farming in the United States*, p. 142. Washington, D. C.: Government Printing Office, 1933.

Dairying

Some of the leading dairying areas of North America are concentrated in this region because of (1) plentiful hay and pasture, (2) soils insufficiently productive to grow cereals in competition with the states farther west, (3) cool climate and short growing season, which are favorable for hay and pasture but not for most crops, and (4) rough terrain (in some areas) ill-suited to the extensive use of machinery. The large amount of hay, silage, and manufactured feeds supplies the basis for an economical dairy ration. Finally, the proximity of the area to the important population centers insures a steady demand.

The greater the city, the greater is the distance to the outer edge of its milkshed—the source of its fluid milk supply. Thus New York secures the bulk of its milk by fast freight from parts of 7 states. Cleveland, Dayton, Buffalo, and Columbus, however, rely exclusively, and Detroit, Pittsburgh, Baltimore, and Chicago largely, on transportation by motor truck. Special tanks and refrigerator bodies are used in hauling milk.

One area, the St. Lawrence Lowland, converts much of its milk into cheese, for its own population is not sufficiently large to absorb the heavy production as fluid milk, and the New York City and New England markets are not available by reason of the international boundary (tariff) and distance.

Mixed Farming

One fourth of the nation's crop of dry edible beans, as well as large amounts of potatoes and sugar beets, are produced in southern Michigan. All are well suited to the light soil and the short growing season.

The St. Lawrence Lowland between Montreal and Quebec is quite level, and mixed farming is important there. Vegetables, fruits, and cereals are grown for local consumption, along with such fodder crops as barley, hay, and mangels.

Fruits

Orchards and vineyards are very important in the southwestern corner of Michigan, along the Lake Erie shore of Ohio, New York, and Pennsylvania, in the Niagara Peninsula of Ontario, on the southern shore of Lake Ontario, and in the Finger Lakes district of New York. Most orchards and vineyards are placed on slopes to

benefit from air and soil drainage, or on the lee sides of lakes, which ameliorate the temperatures. Fruit is commercially unimportant where late spring and early fall frosts prevail. For this reason more than any other, important fruit areas adjoin large bodies of water, such as Lakes Michigan, Erie, and Ontario (Fig. 151).



Welch Grape Juice Co.

Fig. 151. Vineyards along the south shore of Lake Erie, New York. This area benefits because the lake moderates the cold waves of winter and cools down the warm waves of spring that might cause damage to the vines before the danger of frost is past. The flat land and the loamy soil also favor grape-growing. Much of the fruit is sold fresh in near-by large cities and much is sold to plants making grape juice.

Vegetables

Market gardening—the growing of vegetables for sale in near-by cities—characterizes the environs of every metropolitan area. Cultivation is very intensive. Much fertilizer is used, and one crop follows another on the same plot of land until the end of the growing season. In the Cleveland area old ridges—shorelines of former glacial lakes—are widely used for this purpose, their soils being light

and warm. The heavier soils on sloping lands closer to the lake are devoted to vineyards.

Growing of vegetables on muck soils. Four types of soils have exerted tremendous influence on the distribution of the continent's vegetable industry. One of these, black muck, occurs in the general area about the Great Lakes in northern Indiana, Illinois, Michigan, Minnesota, New York, Ohio, and Wisconsin. Muck soils lie primarily in glaciated areas—in depressions where lakes and swamps formerly existed or about the margins of existing lakes. Their suitability for growing vegetables was discovered by Hollanders in southwest Michigan near Kalamazoo. Such soils when reclaimed are especially suited to celery, onions, mint, lettuce, cabbage, and potatoes.

The growing of vegetables on muck is as localized as the distribution of the soil. The most prosperous districts are those located near large population centers.

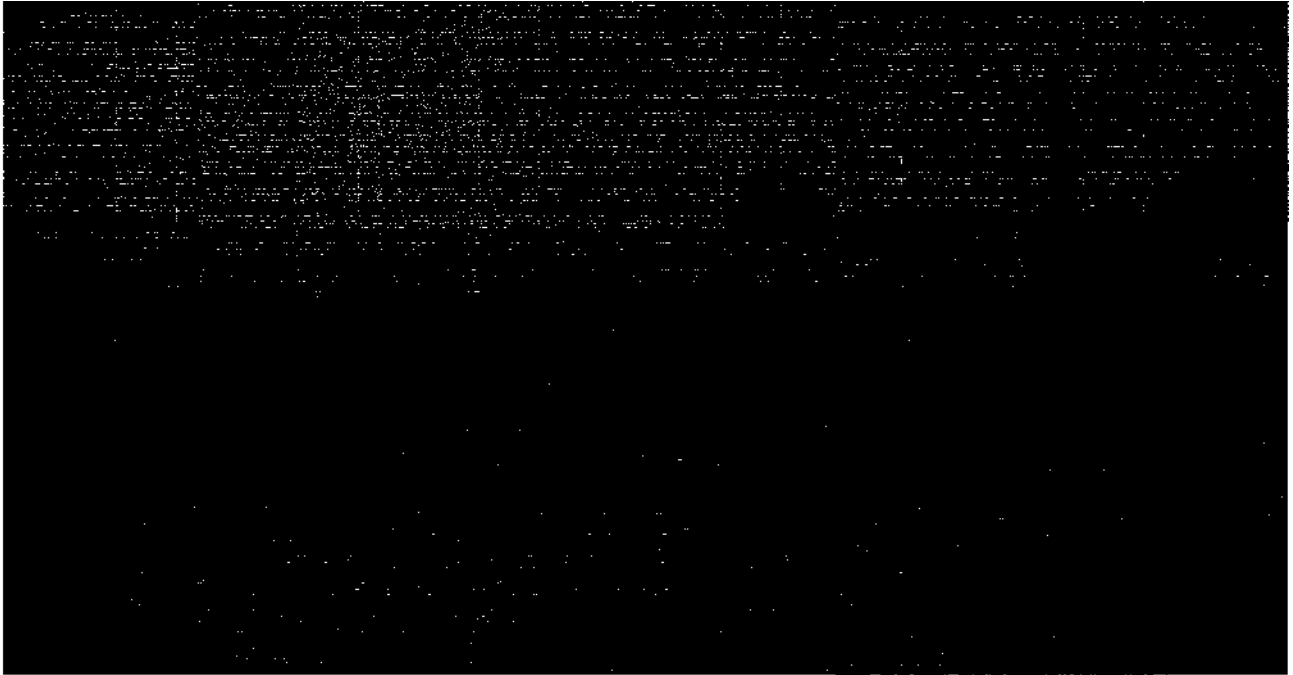
Growing vegetables under glass. The south shore of Lake Erie between Ashtabula and Toledo is the continent's center of glass-covered farms. Vegetables are grown during the cold winter months *but only at high cost*, for it is expensive to build greenhouses and heat them. Approximately \$28,000 is required to place an acre of land under glass, and 200 to 500 tons of coal are burned to maintain this acre at a suitable temperature for the season.

Commercial growing of vegetables began in this area about 1890 but has reached its present proportions mostly since 1915 (Fig. 152).

The Cleveland area, with 10 million dollars invested in some 275 acres, is the only one in the United States where new greenhouses are being built. Individual growers have as many as 10 acres under glass. For the most part the glasshouse industry competes successfully with the same crops grown in warmer parts of the country, because of higher yields, superior quality, and nearness to market. Head lettuce is an exception, however, little being grown now because of the superior product and low price of that from the Imperial Valley 2,000 to 3,000 miles from large markets. Artificial refrigeration and fast transportation have made these shipments possible.

Cleveland sends out each year about 4 million baskets of tomatoes, 250,000 of cucumbers, and 1,000 of radishes, most of which are sold within 150 miles of the city.

Operating costs are so great that the land must produce almost the year round. Several crops are grown on the same piece of land. The soil rests only one month in twelve; even then it is sterilized by injections of live steam and revitalized by commercial fertilizer and bumus. Liberal applications of fertilizer must be used to procure

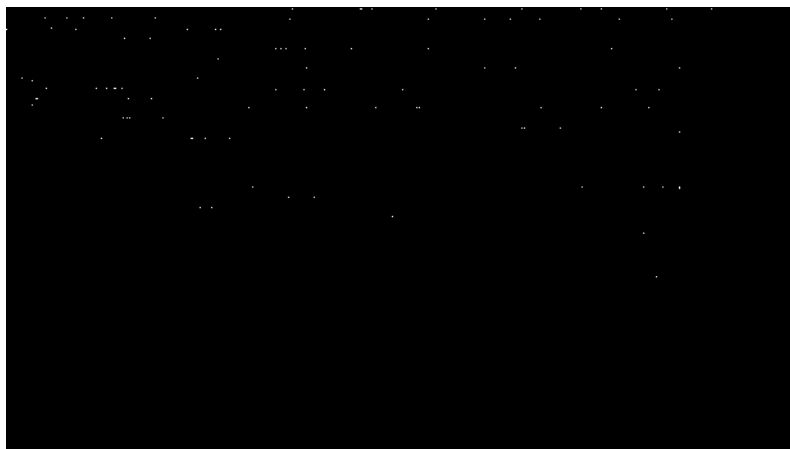


Courtesy of Walter Preiser and Ruetsch Gardens.

Fig. 152. Growing vegetables under glass near Cleveland, largest and most concentrated greenhouse area in the United States. In summer, vegetables are also grown out-of-doors under irrigation (note overhead pipes).

high yields (for example, 48 tons of tomatoes per acre). Most glasshouse farmers grow additional crops of celery, corn, carrots, beets, and beans out of doors in summer.

The chief advantages of the Lake Erie shore for this enterprise are central location with respect to the larger consuming centers (which means lower transport costs) and proximity to sources of glass, steel, and fuel. Tomatoes, the principal crop, are superior to



Courtesy of Tobacco.

Fig. 153. Growing Samatra tobacco under shade in the Connecticut Valley. In order to reduce wind pressure and maintain temperature, the sides as well as the tops are covered. Shading results in a thinner leaf and prevents damage from hail. Only about one sixth of the tobacco in the Connecticut Valley is grown under shade, but its value is about equal to that of all the other, since its price per pound is four to five times that of the binder leaf.

those sent from great distances because they (1) are not harvested until ripe, (2) can be marketed within a few hours after they are picked, and (3) are free from attacks by insects and diseases, by reason of careful control.

Tobacco

The *Connecticut Valley*, especially the lower central part, is a leading tobacco-growing area. Five sixths of the crop is of the cigar-binder type and one sixth is Sumatra. The value of the latter, however, is almost equal to that of the first.

Sumatra tobacco is grown under shade (Fig. 153); this results

in a thinner leaf with less gum and little damage from wind and hail. Much of it is grown by large corporations whose scientific methods are not surpassed anywhere. Because tobacco is grown on the same land continuously, liberal applications of commercial fertilizer must be used to insure satisfactory yields.

The Outlook

It has been noted that the American Manufacturing Belt (Fig. 126) in 1940 had approximately 45 per cent of the total population of the United States and 28 per cent of that of Canada (1931). The region also had 46 per cent of the metropolitan areas and 51 per cent of the cities of 5,000 or more inhabitants in the United States. It had 50 per cent of Canada's *greater cities*. In addition, the American Manufacturing Belt provided 70 per cent of the wage jobs and contributed about 65 per cent of the manufactured products of the United States. In short, this relatively small region contains a disproportionate share of North America's population, metropolitan areas, cities, manufacturing plants, and wealth. It is a region of *industrial cities*.

This region's future probably will continue its present, but it is hazardous to make a prediction. Labor-saving machinery on farms in the Agricultural Interior and elsewhere, which released so large a part of the farm population, has enabled the rural areas to serve as the population seed bags for cities of this region. In the 1920's about 6 million persons, nearly all from farms, transferred from rural to urban areas. Further mechanization will enable still fewer people to produce the food, clothing, and other agricultural raw materials needed by the nation. Thus whereas agricultural workers in 1840 comprised 77.5 per cent of the gainfully employed, they had decreased to 21.5 per cent by 1930 and 19.9 per cent by 1940. Unable to remain on the farms, the rural surplus population will, as now, migrate to the cities. No one as yet knows what the future of big cities will be, though during the past few decades they have grown less rapidly than the total urban population. The National Resources Committee believes urban growth in the future will be slower and more uncertain than in the past.⁶⁸

The large cities—those of more than 100,000—do not have a birth rate sufficiently great to maintain them, and without immigration from farms and small towns, they would decline to one third of that

⁶⁸ National Resources Committee, *The Problems of a Changing Population*, p. 7. Washington, D. C.: Government Printing Office, 1938.

population in 3 generations. Thus, if cities, large or small, are to grow in the future, there must be migration from other areas.

Economically and socially, the small town is a better place to live in than the large city; the cost of living is not so high and the comforts of life are greater for the masses. Hence it would appear that people connected with manufacturing industries would do better to locate in small communities from which they could derive greater benefits in material comforts. Industries are becoming less closely tied to the regions where they began, but no one knows precisely how important rurbanism will become. There is no evidence of a marked dispersion of manufacturing establishments from city to country, but there is definitely a movement from the centers of metropolitan areas to their peripheries.

Most of the farmers in the American Manufacturing Belt are not subsistence farmers; they live on the proceeds from the sale of specialties, being "cogs in a great regional economic machine whose major function is to turn out two thirds of the nation's manufactured goods."⁶⁹

Though manufacturing is increasing in other parts of the continent, especially in the South, Southwest, and the Far West, the American Manufacturing Belt bids fair to continue as North America's great workshop, for no other region benefits so much from proximity to markets and to raw materials—the deciding factors in the location of industries—and no other is so well served with transport facilities. Its cities should continue to supply the bulk of the fabricated products needed elsewhere throughout the continent, insofar as these are not produced locally.

As Canada and the United States threw themselves into the second World War in an all-out effort to win, strategic sites in that part of the American Manufacturing Belt lying west of the Appalachians—the part presumably least vulnerable to enemy bombing—were selected by many war industries for making all kinds of war materials.

⁶⁹ Harold Hull McCarty, *The Geographic Basis of American Economic Life*, p. 523. New York: Harper & Bros., 1940.

CHAPTER XIV

The Northern Continental Forest

A REGION OF LOGGING, TRAPPING, MINING, AND RESORTS

ANGLO-AMERICA'S largest and least-known region (Fig. 154) is largely an interminable coniferous forest, with a sprinkling of broad-leaved trees, covering an area of flat to rough terrain. A map showing distribution of population superimposed on a map indicating regional boundaries will show the area's relative emptiness. Maps of topography, soils, and climate show *why* there is a paucity of human beings. Much of this region consists of the Laurentian Shield (Fig. 2)—a land of crystalline rock, rounded hills almost devoid of soil, fast-flowing rivers, and innumerable lakes, swamps, and muskegs. Long cold winters characterize most of the region; its amazingly short growing season makes agriculture relatively unimportant. On the mainland proper, agricultural settlements persist only in the clay belts (Fig. 154). From boundary to boundary, most of the inhabitants whether they be French-Canadians, Anglo-Canadians, Labradorians, Newfoundlanders, Amerinds, or "Americans," are engaged in *extractive* pursuits. The natural environment discourages most other types of enterprises. A considerable part of the population is semi-nomadic.

The Laurentian Upland has experienced a certain amount of ecological succession, having passed from fur-trading to mining to logging; and in a few small areas even to farming. Fishing has been commercially important in coastal Labrador and Newfoundland. Except in the extreme southwest or east, the greater part of this region remains as it was originally—a land of the Amerind. The small number of whites live in industrial symbiosis with the Amerinds.

Newfoundland and Labrador

This subregion occupies a strategic position across the mouth of the Gulf of St. Lawrence and along the trade route connecting

America and northwest Europe. It is advantageously situated with respect to important fishing grounds (Fig. 41). Newfoundland, the most important part of this subregion, has long been the western terminus for trans-Atlantic cables, wireless stations, steamer lanes, and airplane crossings. More recently the island has

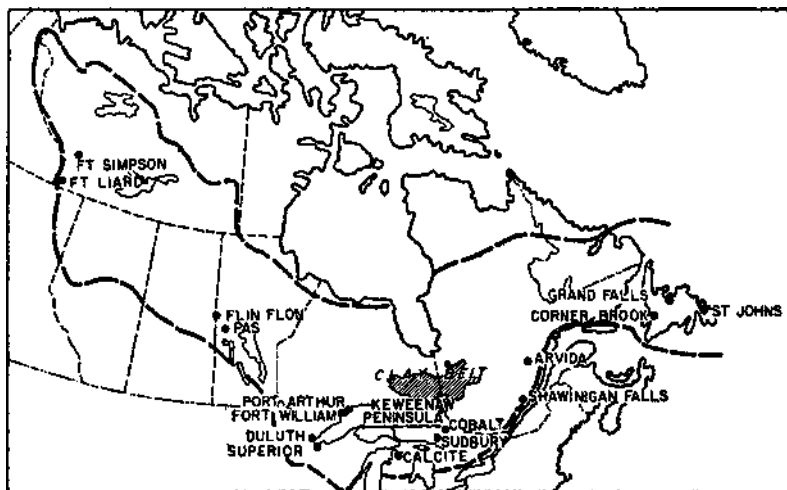


Fig. 154. The Northern Continental Forest: a region of logging, trapping, mining, and resorts.

become one of the most important places for naval and air bases in eastern North America. During the second World War these new bases, along with developments in Bermuda, largely protected the industrial part of the continent.

Topography

Newfoundland and Labrador consist of a glaciated low-rolling rocky terrain broken here and there by mountains. Glaciation left it studded with lakes, almost soil-bare, swampy, and with a fjorded shoreline. Southeast of Newfoundland, the ocean bottom consists of a submarine plateau or tableland—one of the major fishing banks of the entire world (Fig. 41). Geologists affirm that Newfoundland had a small independent ice cap of its own and that only the southern part of Long Range and a portion of the northwest escaped glaciation.

Climate

The climate is largely dominated by the ocean. As a result of the deeply serrated shoreline, no point in Newfoundland is more than 70 miles from the ocean. Altitude plays its role, as evidenced by the replacement of forest by *tundra* at elevations exceeding 1,000 or 1,200 feet.

Because the ocean waters are above the freezing point of salt water, winter temperatures are higher than would be expected for

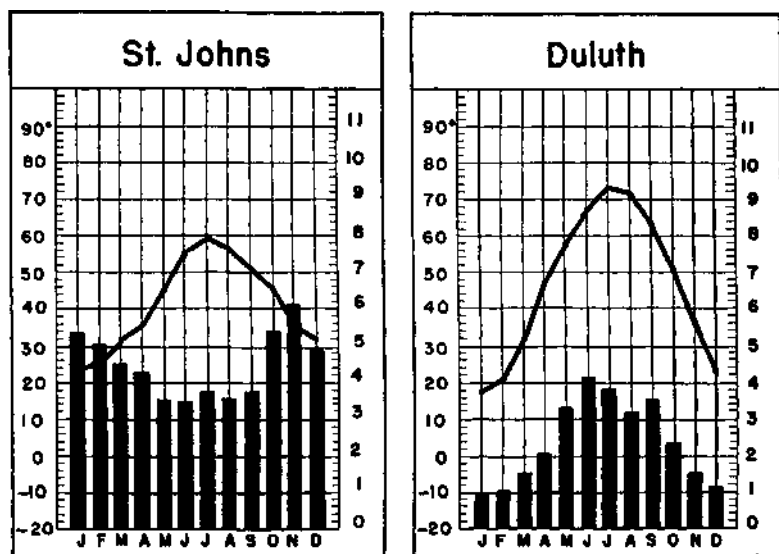


Fig. 155. Average monthly temperature and precipitation for St. Johns and for Duluth.

the latitude. In the Gulf of St. Lawrence, however, all harbors freeze over, the Strait of Belle Isle being completely locked by ice. The bays on the Labrador coast and large areas of the adjacent sea freeze solid. Summers everywhere are cool, because the Labrador Current, laden with floe-ice and icebergs, moves southward along the east coast.

Since meteorological records have not been kept, little definite information is available on the climatic conditions of the interior. But the relative proximity of the Atlantic precludes extremes of temperature.

Precipitation is heavy—St. Johns receiving 54 inches as an annual average (Fig. 155). Considerable snow falls in the north-

western part of the subregion in winter. Ice storms, more common here than elsewhere in North America, occur when a south wind sets in. Rain freezes as it contacts the ground, which is below freezing. To aid pedestrians during such storms, St. Johns has provided some of its streets with iron railings. Fog is prevalent on the Grand Banks but not over Newfoundland, which with only 40 to 45 foggy days a year is less plagued than southeastern Nova Scotia.

Winds from all points on the compass which change direction suddenly, are sometimes so strong that houses must have double walls, double doors, and double windows to keep the wind and fine snow out.¹ Even trees on the shores of Labrador and Newfoundland are stunted by these winds.

Natural vegetation

The natural vegetation consists largely of coniferous forest though grass rather than trees characterizes the more poorly drained areas—the muskegs—which are very extensive. The coast of Labrador is almost completely lacking in forest, though the sheltered stream basins support some tree growth.

Minerals

Newfoundland contains considerable mineral wealth. At Bell Island is one of the 8 great iron-ore reserves of the world. The ore, high-grade hematite containing 54 per cent metallic iron, extends a great distance under the sea.² Only here in all Anglo-America can iron ore be mined close to the ocean. Valuable lead and zinc ores lie near Red Indian Lake in Newfoundland's interior. In addition, the island has one of the World's most extensive deposits of fluorspar.

Settlement

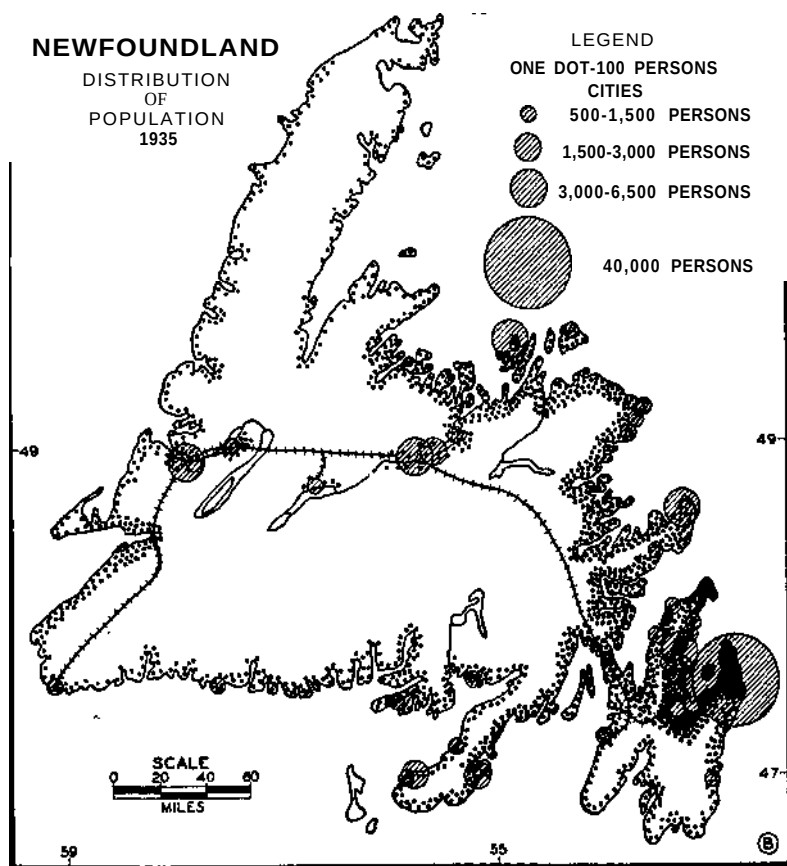
The Newfoundland and Labrador subregion was the first part of Anglo-America to be discovered and used by white men. Though Newfoundland is England's oldest colony, for many generations it was considered unfit for human occupancy. Moreover, settlement was discouraged because the mother country wished to use it exclu-

¹ Clarence E. Koeppel, *The Canadian Climate*, p. 188. Bloomington, 111.: McKnight & McKnight, 1931.

² Edwin C. Eckel estimates the total reserves at 10 billion tons.

sively for the fisheries, which in turn served as "a school of seamanship" for the British Navy. Speaking of a batch of naval recruits which arrived in England in the summer of 1941, Wallace Reyburn said:

There could be few men better fitted to take on the duties of the Navy than these hardy Newfoundland lads. Having spent all their lives in this island colony off the east coast of Canada, they have the sea in their very bones. At an age when the average English youngster is attending preparatory school, their boys are out in their tiny fishing boats off the coasts of Newfoundland and Labrador,



Courtesy Earl B. Shaw and Economic Geography.

Fig. 156. The trans-insular railway and the distribution of population in Newfoundland. Ninety per cent of the people dwell near the coast where the principal occupation, fishing, can be carried on most easily.

living up to the Newfoundlanders' claim of being the best fishermen in the world.⁸

When occupation finally did get under way in the eighteenth century, practically all the population settled along the coast near the fishing grounds. Today more than 90 per cent of the inhabitants live there (Fig. 156).

Contrary to much popular opinion, Newfoundland is not now and never has been a part of Canada. It is now a Crown Colony, having lost its dominion status in 1935, a situation attributable to a desperate financial condition following loss of markets for its products—fish in Italy and Spain and iron ore in Germany.

Most Newfoundlanders are small in stature but wiry, of English, Scottish, and Irish extraction. Their standard of living is low; families are large and incomes small. The interior is unsuitable for farming and is visited by myriads of mosquitoes during the two or three warm months. Among Britain's North American possessions, Newfoundland alone failed to become primarily a colony of settlement.

Economic conditions

Fishing, logging, and mining are not sufficiently important to make Newfoundland and Labrador prosperous. In 1933 Newfoundland, unable to withstand the impact of the depression, had to be saved from default by Great Britain.

Countries dependent upon one or two exportable raw materials have a precarious economy. Newfoundland's dilemma was further caused by a whole series of unfortunate circumstances. She lost her foreign markets for fish; prices dropped; and there was a succession of bad fishing seasons. The second World War caused the loss of the German market for iron ore. Then there was the enormous expense involved in building the trans-insular railway (Fig. 156), which, except for strategic reasons, has little reason for existence. The large indebtedness incurred in building this road bore too heavily when other adverse factors developed.

Fishing

Some authorities declare that French and Portuguese fishermen came to the banks before Columbus reached the New World.⁴ Cer-

³ The British Library of Information, *Bulletins from Britain*, No. XL, June 4, 1941, p. 4.

⁴ Sir Wilfred Grenfell, *The Romance of Labrador*, p. 76. New York: The Macmillan Co., 1934.

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tainly commercial fishing goes back to the days when small sailing vessels carried to Europe commodities having immediate sale and bringing large returns. Codfish could be caught off the Grand Banks and at the mouth of the St. Lawrence. Fishing was solely a summer enterprise.

Fishing today employs probably one quarter of the total population and about 15,000 craft. Shore fishing, now more important than banks fishing in Newfoundland, accounts for about 75 per cent



Courtesy Edwin W. Mills.

Fig. 157. A typical section of Newfoundland's rugged coast. At the water's edge are flakes for drying and curing split cod. This photograph goes far to indicate why the sea is in the blood of the men of Newfoundland.

of the cod. Whereas 8,000 Newfoundlanders in 330 "bankers" fished on the banks in 1888, only 1,000 in 40 vessels did so in a recent year.⁵ Fish products, until recently accounting for more than half the value of Newfoundland's exports, are now exceeded by newsprint and paper.

In the early days a demand for better-quality fish led to the catching of smaller cod and the development of "dry fishing," the product of which was sold in the Mediterranean.⁶ Drying is still carried on but, compared with Iceland, Newfoundland is at a disadvantage, because it is more humid. It is the fresh-fish industry that is increasing in importance.

⁵ Earl B. Shaw, "Population Distribution in Newfoundland," *Economic Geography*, July 1938, Vol. XIV, No. 3, p. 242.

⁶ Harold A. Innis, *The Fur Trade in Canada*, p. 5. New Haven: Yale University Press, 1930.

To hold their part of the fishing business, many vessels keep in touch by wireless with their markets. Since March 1939, the Broadcasting Corporation of Newfoundland has provided isolated and remote settlements far up the coast with important information on fisheries (Fig. 157).

Logging and lumbering

Newfoundland's best timber lands lie in the interior, extensive tracts of which have not been completely surveyed. The trees, however, are inferior to those grown along the Pacific Coast, in the Lake States, or in New England. Trees cannot attain large proportions when temperatures are low and winds strong. Though some logging and lumbering are carried on, the bulk of the forest is better suited for pulp and paper. Fortunately, title to most forested land is vested in the Crown, though licensees such as paper mills possess large holdings of good timber and the railroads have received extensive grants.

At Northwest River in Labrador a large industrial sawmill has been located.⁷

Pulp and paper

The forest, dominated by spruce and fir, supplies the raw materials for pulp and paper, the exports of which, based on value, now surpass those of fish. Laws prohibit the exportation of unmanufactured pulpwood so as to give employment to the local inhabitants. The first paper mill was built at Grand Falls in 1909; now there are several. One of the largest, situated at Corner Brook on Newfoundland's west coast, has leased from the Crown 12,000 square miles or almost one third of the entire island. Newfoundland's numerous rivers provide transportation for logs, water-power, and access to export markets.

Mining

The only mining of commercial significance in this subregion is carried on in Newfoundland at Bell Island in Conception Bay, where iron ore was discovered by accident. Some sailors, having picked up heavy stones for ballast, left them in their dories while at anchor in St. Johns. A canny Englishman suspected these stones were iron ore, had them assayed, and found they ran about 55 per cent metallic iron. Unfortunately, Wabana ore is "widow

⁷ *The Geographical Review*, July 1940, Vol. XXX, No. 3, p. 489.

ore," lying some distance from the nearest coking coal in Nova Scotia.

In normal times production fluctuates between 1 and 2 million tons. At the close of the first World War, Germany's loss of Lorraine forced her to purchase large supplies of Newfoundland ore. Small amounts have been sent to Sydney, Nova Scotia, and a trickle to America's great tidewater plant at Sparrows Point, Maryland. In the future, when Lake Superior deposits have declined, the United States will no doubt draw heavily upon this ore.⁸ Production of other minerals is unimpressive, though some lead and zinc are mined.

Agriculture

Agriculture could never be more than a small-scale enterprise in an area with so hostile a natural environment (short growing season, acidic soil, and rugged topography) and where the planting and fishing seasons conflict. Farming, largely of the subsistence type, is carried on almost exclusively by the families of fishermen and loggers. Hay and potatoes, along with hardy vegetables (cabbages, beets, carrots, and parsnips), and fruits (currants, gooseberries, raspberries, and strawberries), are the leading crops. In 1932 less than one half of 1 per cent of Newfoundland's land was devoted to crops. The country will never be a great farming land, but the fishing population should give more attention to gardening. Vegetables, especially, are badly needed to combat beri-beri and other nutritional diseases. The extension of the railway has stimulated some agricultural settlement in the interior. Since the spring of 1936, the government has encouraged the clearing of land and the planting of crops under its supervision. The large areas in bog land suitable for draining should prove valuable for pasturage and hay.

Trade

Newfoundland is absolutely dependent upon trade for its existence. The fish, lumber, pulp and paper, and iron ore are exported, but unfortunately the prices of all, especially of fish, upon which the bulk of the people depend, fluctuate widely, and poor prices enforce a standard of living dangerously low.

³ Charles Hart, "Known Iron Ore Reserves of the World and Their Significance," *Iron and Steel Eng-ineer*, May, 1939, p. &

Transportation

Railways and highways have been discouraged by the rough topography, numerous streams and lakes, poorly drained uplands and abrupt cliffs, along with meager natural resources and sparse population. Not a single mile of railway exists in Labrador and southeastern Quebec, and only one line taps the interior of Newfoundland (Fig. 156). There are only 490 miles of first-class and 385 miles of second-class roads in Newfoundland. Except in Newfoundland, travel in summer is largely by canoe and in winter by dog team. Transportation by water is good except during winter. The fjorded coastline, with its numerous harbors, invites ships. During winter, however, ice completely closes the harbors of the mainland, but those on the Atlantic side of Newfoundland may remain open.

Cities

Cities are strikingly few.⁹ When colonization began, each group of fishermen sought an indentation to be used as a base for fishing operations. The many small villages are separated by considerable distances. More than 90 per cent of the population lives along the coast, forming a "black border" (Fig. 156).

St. Johns (39,886), capital city of Newfoundland, founded in 1580, lies within a few miles of the most easterly point of North America. It has a pouch-shaped harbor that was used as a fishing base long before settlement. Salted cod may be seen on spruce boughs on almost any day during the fishing season. The chief port and nerve center of the island, *St. Johns* has the only drydock in this part of North America. The harbor is rarely frozen over in winter and has sufficient depth to accommodate vessels of 30 feet displacement. The port handles 80 per cent of the imports and exports of the island and is the eastern terminus of the trans-insular railway.

Corner Brook (6,374), on the Humber River in the Bay of Islands, is a one-industry town with an important newsprint mill. The town lies in a semi-circle around the mill. Because the harbor freezes over in winter, newsprint cannot be exported to the United States until the ice breaks up in early summer. *Corner Brook* also lies on the main line of the trans-insular railway.

⁹ Cities and towns much smaller than those discussed in Chapters IV and XIII are included here. These places are just as important to this subregion as many great cities are to their densely populated regions.

Botwood (1,090), on the Bay of Exploits, formerly served only as the summer shipping port for the paper mills at Grand Falls and the mines at Buchans. It is now a large seaplane base and has taken on added significance because of the measures for warfare in the Western Hemisphere.¹⁰

Grand Falls (4,244), an inland paper town on the Exploits River, belongs to the Northcliffe interests. It exports pulp to Britain, where it is converted into newsprint. The company built and owns the greater part of the town—hotels, schools, libraries, hospitals, and many of the houses. So high is the birth rate in Grand Falls that a genuine problem is being created, since the paper mill can give only a limited amount of employment.

The outlook

The economic and strategic value of Newfoundland and Labrador is lessened by their disagreeable climate. The coasts of Labrador and western Newfoundland are frozen solid from December till late in June, though the Atlantic coast of the island affords shelter during most of the year. The pulp and paper industry has favorable prospects but does surprisingly little for the majority of the population, whose living standards are low. Some experts believe mining has a future even in Labrador. Despite sparse population, the whole subregion, because of meager resources, seems overcrowded. Since improved conditions depend more upon fishing than upon anything else, the economic outlook appears to be unfavorable. The political outlook, too, is far from bright. It has been pointed out that Newfoundland recently relapsed from the status of a self-governing dominion to that of a Crown Colony. Self-government means self-financing—a difficult accomplishment in a country whose resources are meager and of the type whose prices depend upon the vagaries of international trade and hence oscillate widely on the world market.

The Laurentian Shield

For a long time this huge area of some 2 million square miles was, except for the furs it supplied, considered to be worthless wilderness. It was practically unknown except to the trappers and fur-traders, to lumbermen, prospectors, and sportsmen—people whose numbers always are small. So inhospitable was much of the Shield that,

¹⁰ A. Handle Elliott, "European Colonies in the Western Hemisphere," *Foreign Policy Reports*, August 15, 1940, Vol. X V I, No. 11, p. 143.

despite determined efforts to put roads across the rocky, shallow soil and the filigree of lakes and rivers, Canadian expansion was deflected around the southern rim. But this situation has changed in recent years with the tapping of the Shield's wealth of forest, minerals, and water-power. Even its soils are being utilized locally, especially in the Clay Belt (Fig. 154), though for agriculture the area is precariously marginal.

The Upland, though enormous in size, is isolated. Its location has been and ever will be a handicap to development. Its thin soil, poor drainage, hostile climate, and pestiferous insects add to its unattractiveness to the average immigrant. It is a magnet only to the pioneer type of human being.

Isolation

Charles Camsell gives a capital example of isolation for an area west of the Shield but in the Northern Continental Forest.

Today, the modern person with the radio, the motorcar and the aeroplane,, does not know what isolation is. At Fort Liard, where I was born, our next door neighbors were at Fort Simpson, 180 miles away to the north-east, and at Fort Nelson, some 150 miles to the south-west, perhaps 20 people in all; while to the north, west, south, and east, were hundreds of miles of densely forested wilderness, of mountain or plain, occupied only by a few roving families of Indians. The nearest doctor was 1,500 miles away, and it would have taken six months to get him. . . . Contact with our neighbors and through them with the outside world was made only twice a year, once in summer when the York boat brigade came in with supplies of trading goods and provisions; and again in winter when the mail was brought in by dog-team.¹¹

Topography

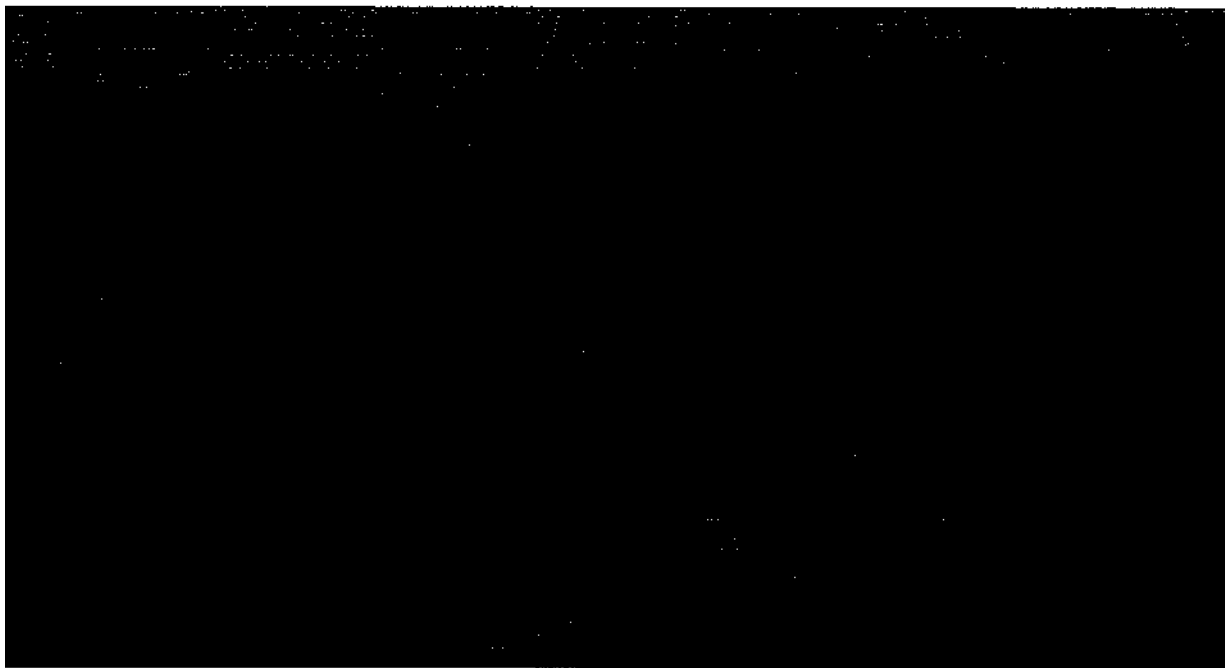
The Laurentian Shield, a vast Ushaped peneplain of ancient crystalline rocks (granites, gneisses, and metamorphosed sedimentaries), covers two thirds of Canada, its rim towering above the St. Lawrence and Ottawa valleys and the Coast of Labrador and reaching south of Georgian Bay, Lake Huron, and Lake Superior. It was so thoroughly glaciated that its rivers were dammed, forming lakes. Drainage is poor; swamps or muskegs are extensive. Lakes are so numerous that "the country might almost be described as water with land between it" (Fig. 158). The rocks have been reduced to a peneplain of uniform height. Though there are local hills and valleys, there is little difference in elevation, the average being approximately 1,000 feet. The landscape should be con-

¹¹ Charles Camsell, "My Home Town," *Canadian Geographical Journal*, September 1940, Vol. XXI, No. 3, p. 109.



Royal Canadian Air Force-

Fig. 158. A harsh wilderness of rock, muskeg, and water comprises the Laurentian Shield. As shown here, a large port of this Upland is lake-bestrewn. There is little prospect for ogriculture.



Royal Canadian Air Force.

Fig. 159. Ice-scoured rock on the Clearwater River, Richmond Gulf, Quebec. The stand of trees here is thin, for the area is near the northern limit for trees and close to the tundra.

sidered *hummocky*. In addition, the ice left an irregular but thin mantle of glacial drift in some places and scraped bare extensive areas in others (Fig. 159).

Climate

In so enormous an area, important differences of climate from north to south or east to west might be expected, but actually the differences are slight. *Everywhere the climate is continental*—largely a result of interior location, distance from oceans, and of the barrier influence of the Rocky Mountains, which keep out the moderating effects of the Pacific Ocean. Winters are cold and long; summers short and warm to hot; no other part of the Dominion records such wide ranges of temperature. The total precipitation is light, and most of it falls during summer. Only in the vicinity of Hudson Bay and the Great Lakes is the influence of water felt; here winters are less severe and summers cooler.

Soils

Generally speaking, the soils are sandy and poor, "second- and third-rate in quality . . . ," but over most of the area they are 3 to 4 feet deep. Contrary to popular belief, Griffith Taylor asserts that only 5 to 10 per cent of the Shield is bare rock, the rest consisting of forests and swamps.¹² The better soils lie in the Clay Belt (Fig. 154), where the clay soils are derived principally from limestone.¹³

Natural vegetation

The distinctive natural vegetation of the Shield is coniferous forest with a deciduous admixture (Fig. 5). From south to north the trees become smaller, those in the extreme north being "worthless little trees." The forest has been known in detail only since the advent of aerial photography. The northern limit is determined mostly by climate and partly by drainage. The poor drainage which characterizes the flat land south of James Bay and the west coast of Hudson Bay makes this area so waterlogged that tree growth occurs only along the rivers.¹⁴

¹² Griffith Taylor, "The Canadian Environment in Relation to Resources," lecture, Western Reserve University, June 26, 1939.

¹³ John R. Randall, "Settlement of the Great Clay Belt of Northern Ontario and Quebec," *Bulletin of the Geographical Society of Philadelphia*, January-October 1937, Vol. XXXV, p. 65.

¹⁴ A. R. M. Lower, "Settlement and the Forest Frontier in Eastern Canada," in *Canadian Frontiers of Settlement*, Vol. IX, p. 21. Toronto: The Macmillan Company of Canada, Ltd., 1936.

A scientific inventory of the *taiga* or great northern forest has been progressing since the development of aerial photography, which is making every locality accessible regardless of distance from settled areas or difficulty in land transportation. From aerial photographs, even the heights of the trees can be determined by measuring the shadows, and from the density of the forest the volume of the standing timber can be estimated. Not only is this method faster but it is more economical, the cost being about \$7.75 per square mile as against \$70 or more on the ground.¹⁵

This forest is characterized by relatively few species, those of greatest commercial value being pine and spruce—pines in a broad belt north of the Great Lakes and the St. Lawrence River; spruce north of it, and scattered and slow-growing spruce of little commercial value in the sub-Arctic belt before it merges with the *tundra* (Fig. 160).

There is a stand of hardwoods in the southeastern part of the Shield, but, since hardwood logs cannot be river-driven, this forest until recently was little utilized. The increased demand for hardwood lumber and mechanical improvements in logging equipment are, however, enabling these forests to be tapped. The leading hardwood tree is yellow birch.

Native animal life

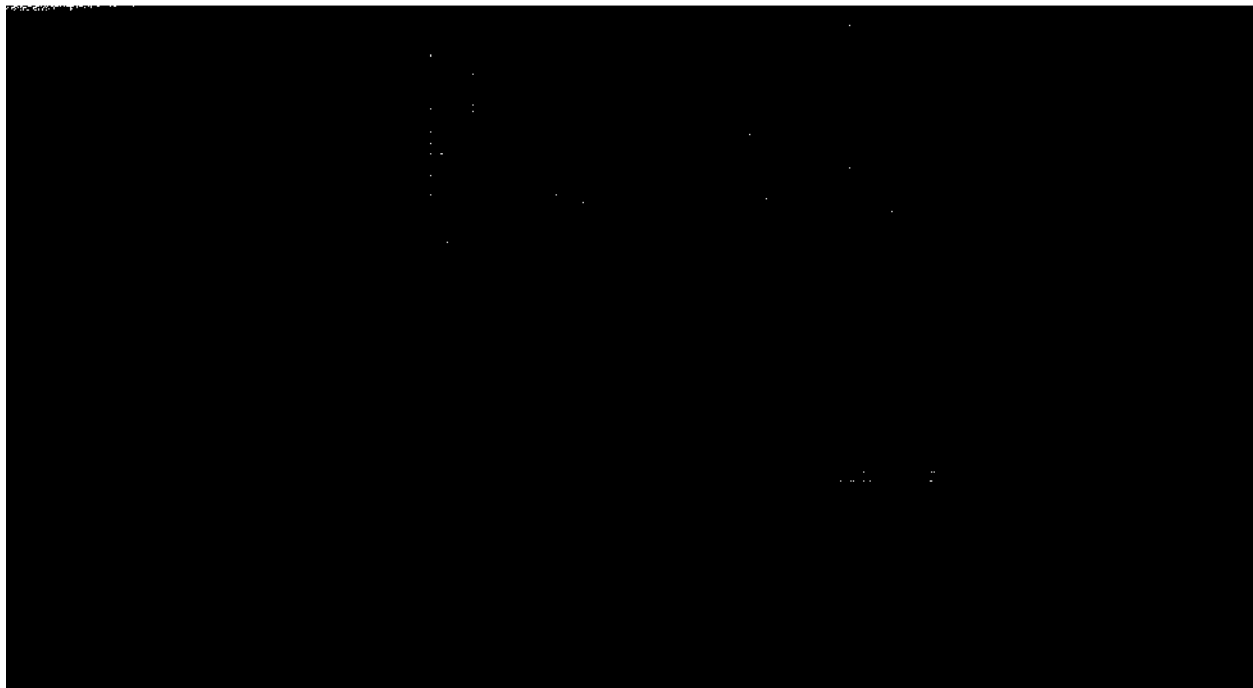
Native animal life was originally abundant. This meant a relatively scant human population which could not be increased materially by resort to agriculture. Among the numerically more important animals are the beaver, marten, mink, muskrat, otter, caribou, moose, deer, wolf, fox, bear, and rabbit. Fish, too, are abundant, and insects, especially flies and mosquitoes, are so numerous as to make life almost unbearable. Insects constitute the outstanding handicap to settlement and exploitation.

Water-power

Few areas in the world have better water-power sites than the Canadian Shield. Large rivers and small rivers seldom run more than a few miles without tumbling over a fall or rapid. Moreover, they have their sources in lakes which serve as excellent storage reservoirs. Eighty-two per cent of the developed and roughly 60 per cent of the Dominion's potential water-power are in the coal-less provinces of Ontario and Quebec.¹⁶ Much of this water-power lies

¹⁵ *Agricultural and Industrial Progress in Canada*, April 1938, Vol. XX, No. 4, p. 52.

¹⁶ Department of the Interior, *Canada as a National Property*, p. 47. Ottawa: 1926.



Royal Canadian Air Force.

Fig. 160. Fine stand of block *spruce* of pulpwood size with scattered white spruce, poplar, and white birch along the river and on the higher elevations near Abitibi, Quebec.

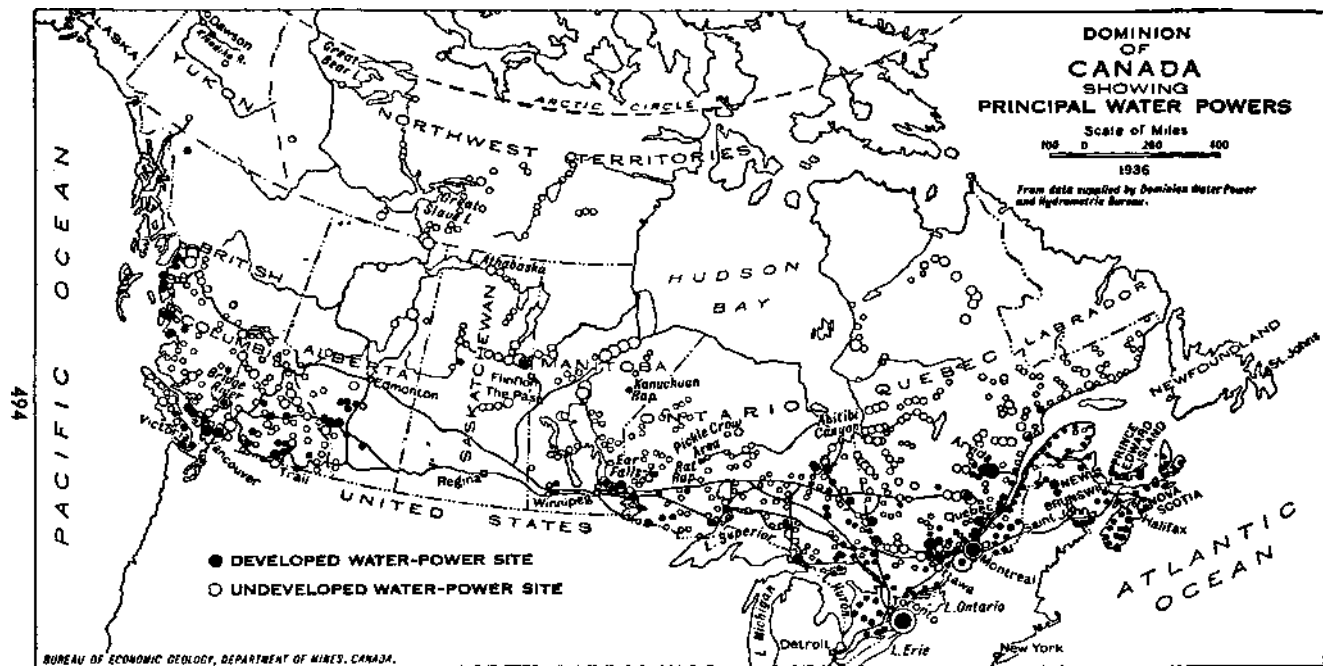


Fig. 161. Water-powers of Canada. Note the abundance, especially on the Shield, which constitutes roughly two thirds of the area of the Dominion. The power resources are greatest in the south and east, where the annual precipitation is higher and where the winters are shorter and less intense. The water-power resources of the Shield aggregate about 20,000,000 horsepower of which about 18 per cent is installed. The low price of hydro-power and its strategic location with respect to the centers of mining activity and the forests, have been dominant factors in the development of the mining and the pulp and paper industries.

far from centers of population (Figs. 161 and 13), but much of it is connected by transmission lines with the Great Lakes and St. Lawrence areas. A great disadvantage is the cold winters, during which the streams freeze over and power is not available. Ontario reserves its water-power as a public property, while Quebec does the opposite. Therefore, competition is keen and agreements on conservation practices are difficult to obtain.

The abundance of this power and its low cost have stimulated the development of manufacturing and mining in the Laurentian Shield.

The occupance

The Amerind. Before white men came, the Shield was occupied by nomadic Amerinds who subsisted by hunting and fishing. It is not known whether they ever tried agriculture, but if they did it was unsuccessful, since the climate is too severe for maize.

Their numbers were small—possibly 500,000 for all North America north of the Great Lakes.¹⁷ The density of population has been estimated for that time at approximately 2 to 5 people per 100 square miles. It is significant that these inland Amerinds were by area even less numerous than the Eskimos along the shore of the Arctic.¹⁸ This relative emptiness of inhabitants was due to a "war-like social tradition"¹⁰ and to the fact that hunting and trapping always preclude a dense population, since they entail the great disadvantage of uncertainty: today game may be plentiful, tomorrow it may be lacking. Hence life was precarious, poverty extreme, and starvation not uncommon.

These Amerinds, backward Algonkins in the east and south, Athabascans in the northwest and Crees in the Clay Belt²⁰ (Fig. 8), were highly mobile both within and between their tribal areas. Marking off their hunting grounds by blazing trees, they never encroached on one another's territory until after the arrival of white men.

Culture here was lower than in the Southwest. The paucity of formidable barriers east of the Rockies meant in general terms a similarity of environment and culture.

With the coming of white men, trapping for furs became important. So keen was the competition between the French and English traders that Indian tribes warred upon one another.

¹⁷ A. L. Kroeber, *Cultural and Natural Areas of Native North America*, p. 164. Berkeley: University of California Press, 1939.

¹⁸ *Ibid.*, p. 145.

¹⁹ *The Geographical Review*, January 1941, Vol. XX XI, No. 1, p. 158.

²⁰ A. L. Kroeber, *op. cit.*, p. 194.

The submarginal portions of the Laurentian Shield remain the land of the Amerind, whose culture demands a thorough knowledge of the habits of wild animals and ability to move over wide areas in pursuit of food and peltries. Large tracts are now specifically reserved where only Amerinds may hunt and trap.²¹ In certain areas where airplanes might be used to transport furs, they have not been encouraged, because they would cost the Amerind his "spring and summer employment—carrying furs out of the interior and bringing in supplies. Steady employment of the native is the crux of the matter."²²

White settlement. The wide scope of this book does not permit a detailed treatment of white settlement on the Laurentian Shield. Two motives actuated those who dared enter the wilderness: (1) to gain and plunder the natural resources, and (2) to make homes there and build new societies.²³ The fur-trader exemplified the first, the farmer the second.

Though the land never can accommodate many settlers, nevertheless, much money and time have been spent in a fruitless effort to push the frontier beyond its natural limits. By 1855 the better lands of eastern Canada had been acquired and settlement was "washing the shores" of the Shield. At this time and for decades afterwards the Shield was known only superficially.

As in the Intermontane Basins and Plateaus (Chapter XVIII) two interests were working against each other: one, trying to administer the natural resources in the wisest way, was desperately attempting to keep settlers from those areas where they would do more harm than good, whereas the other used all its power to encourage settlement. That the Shield is a restrictive environment seems proved by the fact that after almost a century following pioneer penetration, the Crown still has title to all but a miniscule percentage of the land.²⁴ Many who did settle have moved away from the pines and rocks. It is now generally believed that pioneers should be discouraged from engaging in "hot-house colonizing." Public acceptance of such an idea is difficult to obtain, for one of the deepest-seated human instincts is that "the land is for the people."

²¹ "Indian Population Increasing," *Canadian Geographical Journal*, May 1940, Vol. XX, No. 5, p. xv.

²² *The Geographical Review*, January 1930, Vol. XX, No. 1, p. 153.

²³ A. R. M. Lower, "Settlement and the Forest Frontier in Eastern Canada," *Canadian Frontiers of Settlement*, Vol. IX, p. 28. Toronto; The Macmillan Company of Canada, Ltd., 1936.

²⁴ *Ibid.*, p. 49.

The impact of the white man upon the Amerind. The history of the fur trade is the history of the contact of two civilizations—the European and the Amerindian. The limited cultural background of the latter provided a considerable demand for products from Europe. With guns, iron axes, and iron needles, the Amerind could gain a livelihood more easily. With European weapons more animals fell before him, but he became economically dependent upon white men, since gun-repairing and ammunition manufacturing were beyond his knowledge.²⁵ Thus the old cultural traits began to disappear, the old ways of getting a livelihood were forgotten, and the delicate balance which had existed so long between the Amerind and nature was destroyed. Have the natives benefited or lost? Authorities overwhelmingly agree they have lost and that they are now actually threatened by their imported civilization. Both their racial character and health have suffered.

Present population. The first whites were French explorers and fur-trappers who did not settle on the land. Later French immigrants whose descendants comprise the present French-Canadians occupied the St. Lawrence Valley between Montreal and Quebec as well as several tributary valleys. As a result of the limited arable land and the high birth rate, some of these spilled over into adjacent areas and now comprise a considerable part of the Shield's population. Later came English fur-trappers and traders—rivals of the French. The transfer of Canada by France to England increased the number of Anglo-Saxons in Canada, though most of these went into southern Ontario or later into the Prairie Provinces. Some, however, were drawn onto the Shield by its timber, minerals, and, to a lesser degree, its agriculture. More recent immigrants are the Germans, Finns, Hungarians, Italians, Russians, Poles, Slovaks, and Swedes. On the Shield these nationalities tend to segregate into blocks, as they do in the large metropolitan centers of eastern United States.

The introduction of mining started an influx of peoples from all types of climates, some well fitted and some poorly fitted to cope with the harsh environment. Those who remained had to develop initiative and resourcefulness.

The Shield, which is largely marginal and submarginal, is supporting a mere fraction of the total population of Canada (Fig. 13).²⁶ This will change little in the future.²⁷

²⁵ *The Geographical Review*, January 1941, Vol. XXXI, No. 1, p. 160.

²⁶ Isaiah Bowman, *Limits of Land Settlement*, p. 71. New York: Council on Foreign Relations, 1937.

²⁷ Griffith Taylor, "Fundamental Factors in Canadian Geography," *Canadian Geographical Journal*, March, 1936, Vol. XII. No. 3, p. 170.

Economic development

Regardless of whether man has engaged in fur-trading, lumbering, mining, or farming, his activities have been dominated by the forest. The explorer and fur-trader, unable to go cross-country on foot or horseback as did their American contemporaries, had to take to the canoe and river because of the forest. To lumbermen the forest was a great natural resource from which they desired to keep out all but themselves. The prospector and the farmer, on the other hand, did not look kindly upon the forest; to them it was an enemy that had to be destroyed. It is no coincidence that the "Ontario farmer cordially hates a tree." The prospector sees in the forest simply a covering that prevents his knowing what kind of rock underlies his feet. Extractive industries then have and probably always will hold sway on the Shield. Agriculture will expand briefly but will be relegated to a secondary place unless science makes contributions now unknown.

Trapping

Fur-trading began along the coast, but it never attained great proportions there because the short rivers were poorly suited to transportation and because the population was concentrated along the coast. The enterprise really became important and migrated onto the Shield in the latter part of the sixteenth century when beaver hats became fashionable in Europe. Beavers were most numerous in the more northerly forested parts of the Shield, where agriculture and manufacturing had little chance of success and where the environment provided a favorable habitat for fur-bearing animals. The beaver was not a migrant, and its destruction in any locality forced the hunters to enter new areas. Prime furs were taken only in winter and in the more northerly parts of the forest.

Fur-hunting still is important here; about two thirds of Canada's peltries based on value are from animals trapped in this area and one third from those raised on farms throughout the Dominion.

When possible the animals are caught in snares or traps to avoid damaging the pelts (Fig. 162). Because fur is longer and thicker in winter, Amerinds and half-breeds at that time scatter out along the streams, sometimes going hundreds of miles to get their peltries. The more desirable animals—the beaver, otter, and muskrat—live along the streams. Moreover, waterways are highways (Fig. 163), even in winter, when they form ready-made hard roads.

When ice melts in the spring, hunters take their catch down-

stream to trading posts. Birch-bark canoes and larger boats are used. Many of the fur-trading posts belong to the historic Hudson's Bay Company (established in 1670), which accounts for nearly half of Canada's furs. It has 221 trading posts strategically located with respect to navigable water. Most of the raw furs



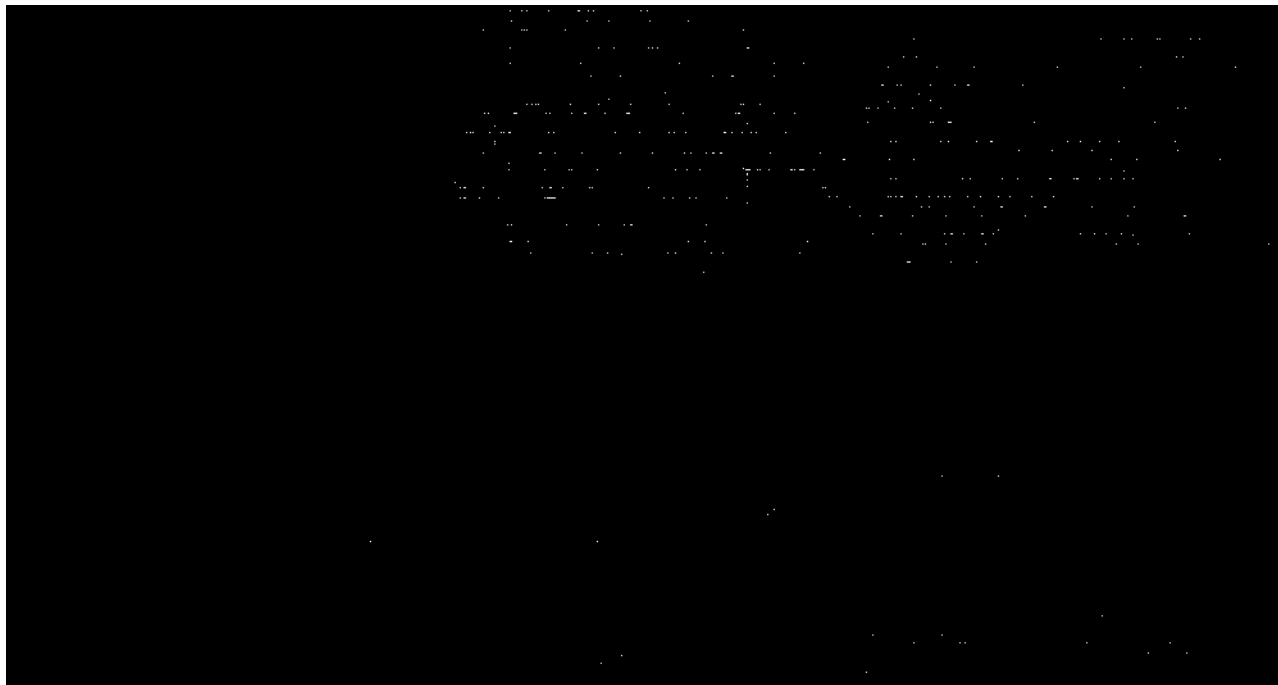
v Hudson's Bay Co.

Fig. 162. Amerind covering a deadfall trap with balsam brush. Note the weighted log. While it is true that the value of furs which the Amerinds contribute is declining as a result of a diminution in the number of wild fur-bearing animals, the success of fur farms and the absorption of Amerinds into other occupations, nevertheless the amount still reaches the appreciable figure of about \$1,500,000 a year.

move to St. Louis and Montreal, the continent's leading markets, though the Hudson's Bay Company crop is sold at special auction in London.²⁸

The railway, motorcar, boat, and airplane have made some changes in the fur business during recent years. The advance of lumbering, mining, and agricultural settlement, along with more efficient methods of trapping, has driven the frontier of fur-bearing animals farther afield and has greatly reduced their numbers.

²⁸ "Furs," *Fortune*, January 1936, Vol. XIII, No 1. p. 68.



Courtesy Hudson's Bay Co.

Fig. 163. A canoe brigade. These Amerinds take supplies to interior posts and return with the season's catch of furs. The canoe is a contribution of the hunting Amerinds of the Shield.

Wild life destruction and conservation. The Canadian government has set aside national parks, game sanctuaries, beaver and mink farms, and has put into effect closed seasons where natural conditions provide suitable habitats. It has organized preventive patrols and is issuing hunting and trapping licenses with special care in order to retard excessive exploitation.

This conservation is intermeshed with the safeguarding of the future of the Indian population. Fur resources must remain adequate for the thousands of Amerinds whose livelihood is almost entirely dependent on trapping.

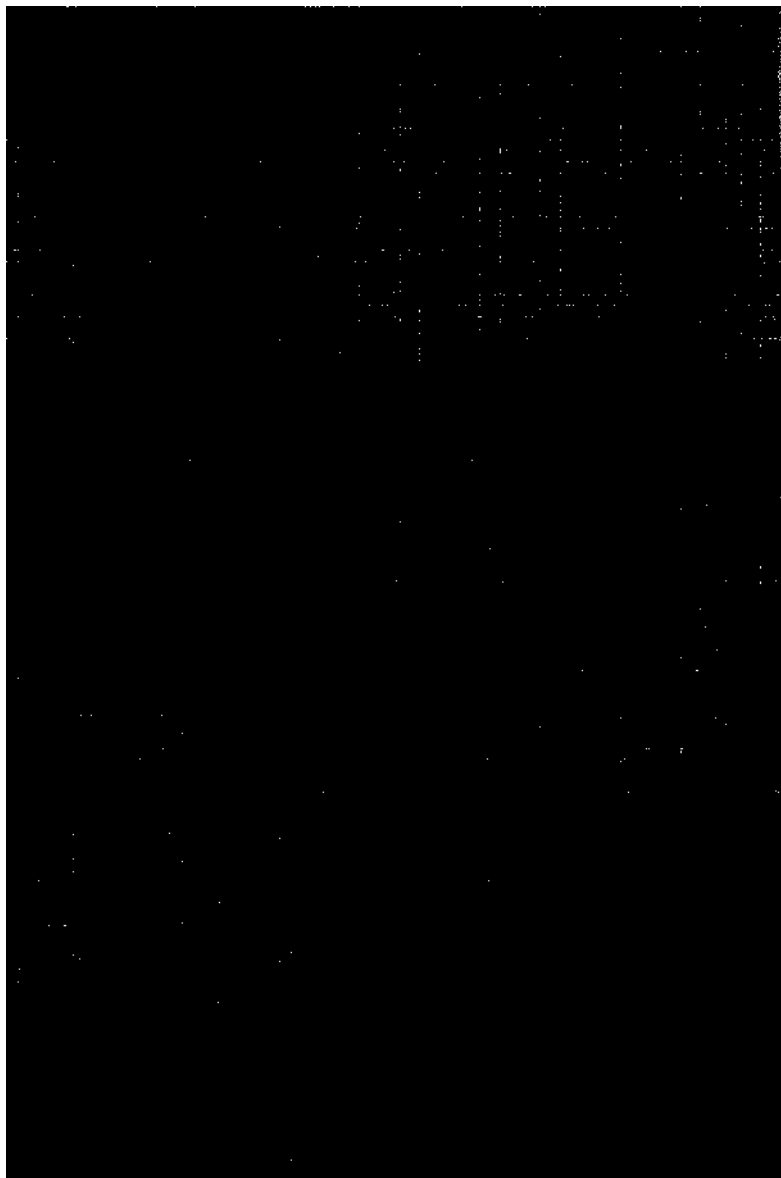
Logging and lumbering

Logging and lumbering superseded trapping in the more accessible territory when the beaver was destroyed. The industry has been based largely upon the pines which grow as far north as the Hudson Bay drainage. Trees grow slowly in cold, windy climates and on thin, rocky soils and poorly drained land. Thus about 100 years are required for a tree in such a habitat to reach sufficient size to be used for saw timber.

Lumbering on the Shield has declined in importance in recent years because of (1) the competition of British Columbia and of northern Europe, whose forests are more accessible, (2) the exhaustion of the best pine near the St. Lawrence, and (3) the high tariffs in the United States. When the forests of British Columbia have been removed as have those of the St. Lawrence Lowland, the Shield should become a more important source of lumber, though in the northern part species dwindle in number and size.

Logging and lumbering depend upon snow in this region of long cold winters. Tractors and horses pull sleds laden with logs that were cut in early autumn. The logs, upon being delivered at a stream, are dumped on the ice to await the spring thaws and the freshets, which transport them by the hundreds of thousands to strategically located sawmills (Fig. 164). River-driving is an economical method of transporting logs, though this applies almost entirely to softwoods. Logging employs the workers (Slavs, Swedes, Finns, and French-Canadians) only about 100 days per year. Some of the lumberjacks are farmers who must supplement the living they eke from the land by other means.

At present *the* lumber industry of the Shield is relatively unimportant. Many abandoned mills are moldering, numerous villages have been deserted, and "a derelict and hopeless population [is]



Courtesy of S. J. Wayward,

Fig. 164. A log drive. Logs by the hundreds of thousands are driven on streams in the great northern forest.

marooned in the backwoods."²⁰ With the exhaustion of much of the better-situated pine, spruce and inferior woods such as jack pine and hemlock are being used more and more for lumber.

Pulp and paper is eastern Canada's leading industry and Canada is now the world's largest manufacturer of newsprint (Figs. 22 and 165). Beginning in 1866, the industry grew steadily until the termination of the first World War, then boomed between 1920 and 1930, when new towns sprang up over night, huge hydro projects were installed, and thousands of persons were employed. Much of the industry is controlled by American capital. The United States, the world's largest consumer of newsprint, is interested in Canada and the Shield in particular because it is near by and because newsprint since 1911 has been admitted free of duty. Some pulpwood also is exported (see p. 76).

At first the paper companies, which engaged only in manufacturing, purchased their pulpwood. So great, however, became the demands that they were unable to meet the requirements by purchase and hence were obliged to get either freehold or Crown grants. Fortunately for Canada, 90 per cent of the forested area is retained by the Crown, whereas in the United States 80 per cent is in private ownership. Canadian pulp and paper manufacturing, however, is not restricted to the Shield (Fig. 22).

A close correlation exists between the location of the pulp and paper industry, the spruce-balsam forests, and the distribution of water-power. Spruce, though growing as far north as trees can, really reaches its optimum along the Hudson Bay Divide. So extensive is this forest that it would appear to be able to supply present needs in perpetuity, provided reasonable conservation is carried on.

The method of transporting pulp logs is similar to that used by the lumber industry (Fig. 166).

Relation between water-power and pulp and paper mills. Cheap power is an important factor in the location of newsprint plants, as is shown by their distribution. A string of mills (all water-driven) lines the southern edge of the forest from the mouth of the St. Lawrence to Lake Winnipeg (Fig. 22). If, in addition to proximity to pulpwood and power, the mill lies on navigable water so that other raw materials can be secured cheaply and finished products be shipped economically, its location is strategic. A paper mill is a

²⁰ A. R. M. Lower, "Settlement and the Forest Frontier," *Canadian Frontiers of Settlement*, Vol. IX, p. 115. Toronto: The Macmillan Company of Canada, Ltd., 1936.



Courtesy Pulp and Paper Magazine.

Fig. 165. The old town of Three Rivers at the junction of the St. Maurice and St. Lawrence is today the world's leading pulp and paper center. The St. Maurice is one of Canada's richest streams in water-power, the resource that plays so vital a part in transforming spruce into pulp and paper. Three Rivers has an additional advantage in that ocean vessels coming up the St. Lawrence can berth alongside



Caterpillar Tractor Co,

Fig. 166. A fleet of Caterpillar tractors hauling pulp logs on sleighs in the great northern forest. This is the latest method of logging. The tractor, which has the advantage of being strong, sturdy, efficient the forest in the relatively short logging season. less difficulty than horses in snow 24 to 30 inches deep and is ideal for getting logs

huge and costly plant which cannot afford to migrate even if its tributary area is denuded of forest cover (Fig. 165). The practice now is to follow reforestation as a means of insuring a continuous and permanent supply. A company having a large area with trees at all stages of growth has little to worry about if fires can be avoided. Moreover, the large-scale processes and the enormous cost of the plants have a good psychological effect upon the people who live in the region, for they look upon this industry as a permanent one—one not out to exploit or mine the forest, as has been the case with too many sawmills.

Mining

The Laurentian Shield is world famous for its mineral wealth. Prospecting over much of the area is facilitated by (1) bareness of the rock, (2) accessibility by canoe routes, and (3) the existence of an accurate geological map for areas along stream courses. Had the region not been glaciated, prospecting would have been far more difficult. Many of the outstanding mineral deposits were discovered by chance—mining beginning as a by-product of railroad-building, the fundamental purpose of which was the development of agriculture in the Clay Belt of northern Ontario.⁸⁰ Much prospecting today is done by airplane, the greatest single aid to the extension of mining.

Power, essential for operating the mines and mills, was at first supplied by wood, but as near-by areas were cut off, the cost became greater. Water-power replaced it, being first used by the mines in Ontario in 1906. Among the Shield's more important minerals are nickel, copper, platinum, gold, silver, and iron.

Nickel, one of the more important ferro-alloys, gives steel certain physical properties such as hardness, toughness, and strength. Certain combinations of nickel and copper are exceedingly resistant to corrosion.³¹

Canada, whose ores were discovered about 50 years ago, is the largest producer of nickel, accounting for about seven eighths of the world's supply. The entire output comes from the Sudbury district in Ontario (Fig. 167), an area about 550 square miles in extent lying some 35 miles north of Lake Huron. The area is well located with respect to the United States market. The deposits

⁸⁰ Harold A. Innis, "Settlement and the Mining Frontier," *Canadian Frontiers of Settlement*, Vol. IX, p. 372. Toronto: The Macmillan Company of Canada, Ltd., 1936.

³¹ J. W. Furness, "The Marketing of Nickel," *Trade Information Bulletin* No. 685, p. 9. United States Department of Commerce, 1930.

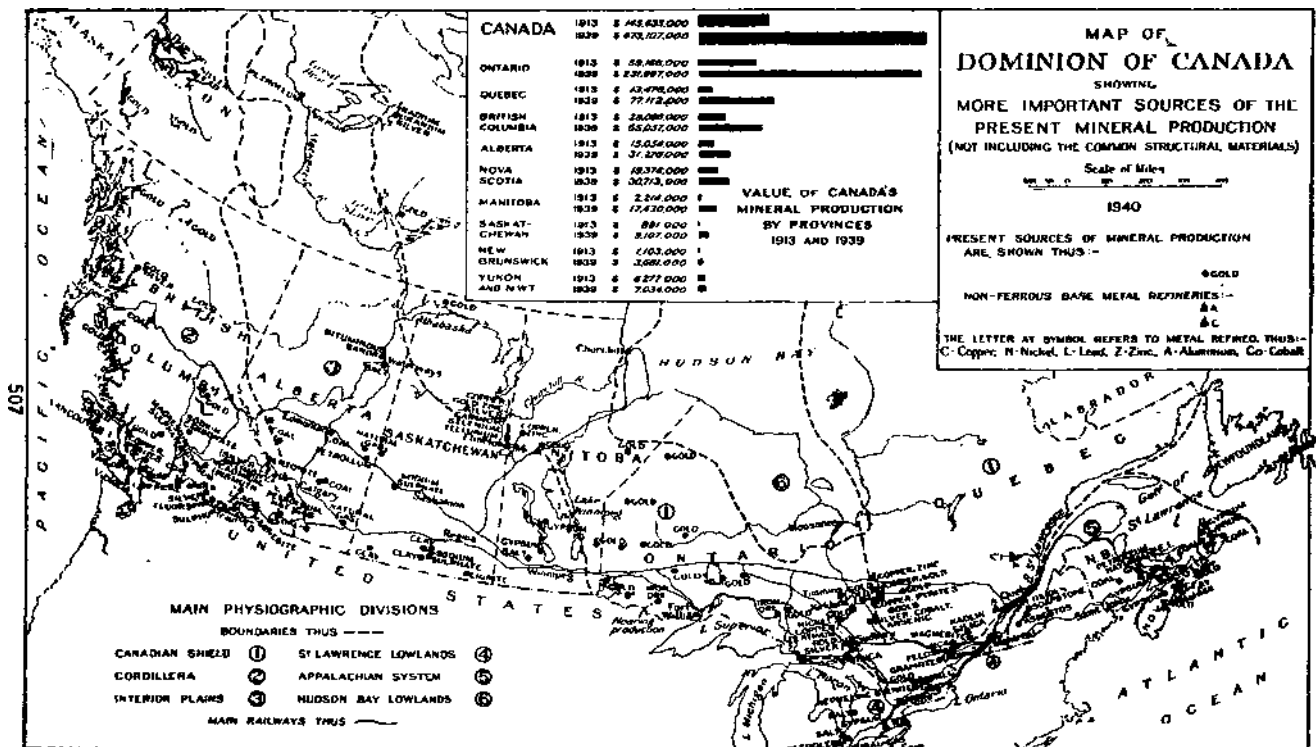


Fig. 167. The Laurentian Shield (1), mostly non-agricultural, is the Dominion's chief source of mineral wealth.

Department of Mines, Canada.

are sufficiently extensive to meet world requirements for at least a century at the normal rate of consumption.

Copper of high grade occurs with nickel in the Sudbury district; for every pound of nickel procured, there is a simultaneous yield of about two pounds of copper. Today Canada is an important copper producer, but most of the output has to be sold overseas, since the United States, the world's largest producer, imposes an import duty of 4 cents a pound.

Platinum is procured as a by-product of nickel, and today Sudbury accounts for about one half of the world's output. Russia, South Africa, the United States, and Colombia are the other platinum-producing countries.

Canada is now the world's fourth largest producer of *gold*. Most of the gold workings are being developed in the Shield, and the area between the Great Lakes and Hudson Bay is peppered with mines. Gold-mining has been so successful as to have stimulated prospecting from the eastern to the western ends of Ontario and Quebec, and important discoveries have been made some hundreds of miles from railways. Many authorities believe that prospectors have barely scratched the surface. The two most famous districts are the Porcupine and the Kirkland Lake (Fig. 167), whose 20 mines contribute 58 per cent of Canada's gold.

Silver. Cobalt (Fig. 167) is the great silver center of the Shield. High-grade ore (some of it native silver) is found close to the surface in small exposed veins ranging in width from 1 to 20 inches. In the early stages of development this could be picked out and shipped to smelters, little capital being required. Later on substantial returns received from working high-grade ores were reinvested to furnish capital for more expensive undertakings.

Much silver is recovered in refining copper, lead, zinc, and gold. In fact, the total amount from this source exceeds that from so-called silver mines.

Agriculture

It has been reliably estimated that 85 per cent of Canada is unsuited to farming. Nevertheless, following the common belief that all forest lands could be used for farming, Canadians during the nineteenth century pushed into the northern wilderness—the Laurentian Shield—which someone has called "an agricultural no-man's land." Most settlers believed that the plow would immediately follow the woodsman's axe. Accordingly, enormous tracts of forest were cleared that have since proved to be ill-suited even for subsistence farming.

The agricultural pioneer has actually penetrated the Shield in only a few favored places, such as the Clay Belt (Fig. 154). In the future, farming must be subordinated to trapping, mining, lumbering, and pulp- and paper-making, because of poor soils and severe climate. Only the French-Canadians are willing to fight nature on her terms, to clear the forest, and to withstand the possibilities of repeated crop failures. They will undergo these hardships if they can remain permanently near their native parishes. With a low standard of living, they till precariously marginal land that most, other nationalities would avoid. Farming is the preferred way of life and the safest from the Anglo-Saxon influences that go with industrial life.

There is, of course, an ulterior motive for settlement in Quebec—the authoritarian basis for extension on behalf of a creed. The Quebec government, noting the heavy emigration of French-Canadian farmers to the urban centers of northern United States, urged active colonization as a means of keeping them in Canada. These farmers grow "a few simple necessities, live in a rude log shack without any pretensions to comfort, bring up [their families] of ten or even twenty children and send them off to work in 'the camps' as soon as they grow old enough."³²

The climate is not conducive to farming. Winters are long and extremely severe, and the growing season, always short, varies in length from year to year. The rainfall, though ample in amount (24 to 34 inches), is badly distributed, falling largely during the harvest period. Accordingly, many crops are ruined as they stand in the field. There are cases, though they are extreme ones, of farmers who have harvested only four crops out of nineteen.³³ If livestock are kept, the long, cold winters necessitate costly feeding.

Most of the farming (except where local markets exist) is of the subsistence type. Fifteen to twenty acres are broken and comprise the average farm. The mining and the pulp and paper industries have brought in their wake an increased population which has stimulated agricultural development in near-by areas. The principal crops, hay, barley, oats, potatoes, and vegetables, are of the hardy type. Since it is extremely difficult to live solely from the land, nearly every farmer works during the winter (his off-season) in a lumber camp, in a mine, or in a pulp mill.

³² A. R. M. Lower, "Settlement and the Forest Frontier in Eastern Canada," *Canadian Frontiers of Settlement*, Vol. IX, p. 130. Toronto: The Macmillan Company of Canada, Ltd., 1936.

³³ *Ibid.*, p. 135.

Agriculture in the Clay Belt The Clay Belt (Fig. 154) remained almost empty for 2 centuries following discovery. This area, like an island in the ocean, is separated by the wedge of the Shield from Toronto (450 miles), Montreal (600 miles), and Winnipeg (M)00 miles); without the railway and airplane it could not possibly be reached. Its isolation may always be a distinct handicap. Unfortunately, the Clay Belt produces crops precisely like those grown in the older parts of Quebec and Ontario, areas which are much closer to markets. The mining districts, located near the margins of the Clay Belt, have a population of only about 60,000.

The Clay Belt is more than a pocket. It is estimated that some day 29,000,000 acres may be available for agriculture—16,000,000 in Ontario and 13,000,000 in Quebec. This is probably too large a figure, for much of the land is no doubt marginal. Today not more than 5 per cent of the Clay Belt is occupied.

Many middle-latitude crops cannot be produced because of the short growing season. John Randall, commenting on the future of the Clay Belt, says:

[It will] not become a "rural slum" as are some other sections of the Shield* likewise it is as certain that the region will not become an agricultural area of primary importance to the Dominion. . . .³⁴

Manufacturing

The aluminum industry, like that of pulp and paper, is dependent upon an *abundance of cheap power*. No other electro-metallurgical operation consumes so much electricity. To make one ton of aluminum requires electrical energy equivalent to that of 16 tons of coal; this amount would produce 18 tons of newsprint. The aluminum industry then, "a hog for power," of necessity seeks out cheap electricity. The Shield, with its riches of water-power, has enabled Canada to rank third among all the countries in the world in the manufacture of aluminum. The importance of power can best be appreciated by the fact that all the raw materials must be imported (Fig. 168).

Canada's industry is located at *Shamnigan Falls* and *Arvida*, Quebec (Kg. 168). The plant at Arvida is reputed to be the largest in the world. It uses one and one-half times as much power as does all of greater Montreal. Since it is not on navigable water, terminal facilities are at Port Alfred, 20 miles from the head of

³⁴ John R. Banda], "Settlement of the Great Clay Belt of Northern Ontario and Quebec," *Bulletin of the Geographical Society of Philadelphia*, January-October 1937, Vol. XXXV, p. 65,

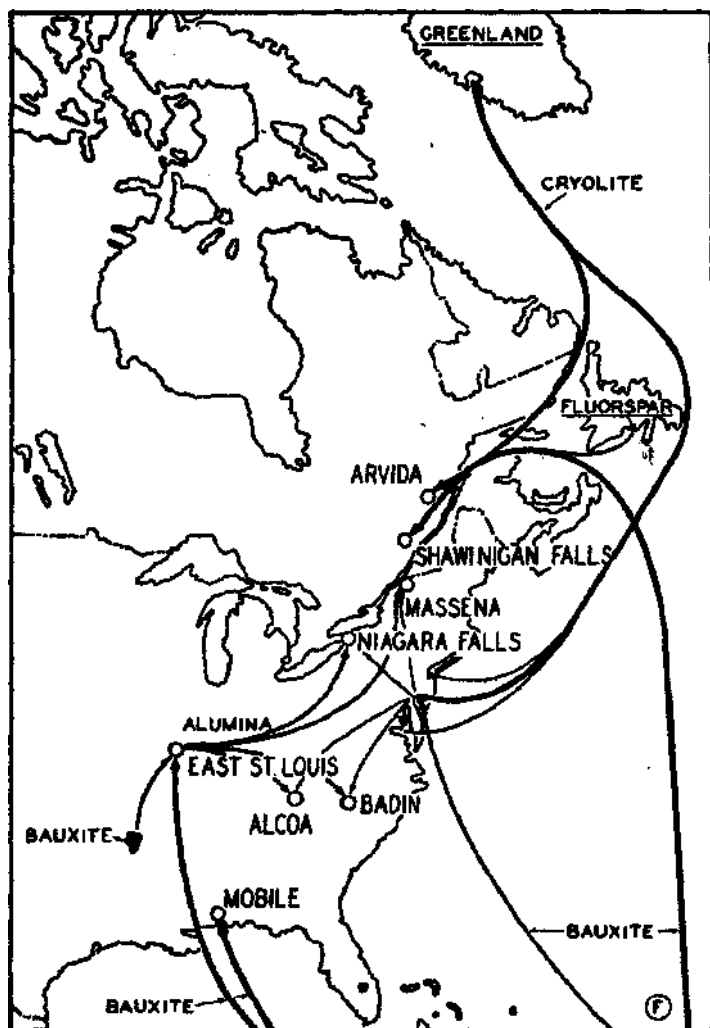


Fig. 168. The aluminum industry of Anglo-America: sources of raw materials and places of manufacture. The production of primary aluminum is carried on in only a few large plants strategically situated with respect to markets, transport facilities, and particularly large supplies of low-cost water-power. The plant at Arvida is the largest of its kind in the world, normally producing more than half the aluminum of Anglo-America. Low-priced power gave Arvida its birth and is the magnet that draws raw material (bauxite) all the way from British Guiana. East St. Louis treats bauxite from Dutch Guiana and Arkansas, sending alumina to the four reducing plants at Alcoa, Bodin, Massena, and Niagara Falls, where it is reduced to metallic aluminum.

ocean navigation on the Saguenay River, with which it is connected by railway.

The smelting and refining of copper and nickel constitute a major enterprise on the Shield, employing labor and capital on so large a scale as to give them rank among the Dominion's leading industries.

Noranda, 350 miles northwest of Montreal, is Quebec's leading base-metal producer. Its products include copper, gold, silver, selenium, and tellurium.

The *Sudbury* area's smelters and refinery handle most of Ontario's base metals. Here the International Nickel Company operates a smelter at Coniston and a smelter and refinery at Copper Cliffs. The copper electrolytic refinery at the latter place is the greatest in the British Empire. Formerly nickel was refined in the United States; but, because of a strong feeling that it should be done within the Dominion to enable Canadians to share in the returns, the work is now done at *Port Colborne*.

Flin Flon, 400 miles northwest of Winnipeg on the boundary between Manitoba and Saskatchewan, has both a smelter and a refinery. Its products are copper, zinc, gold, silver, and selenium.

Transportation

The first transportation in this area was by canoe in summer and by dog team and sledge in winter. The maze of waterways with only short portages enabled the canoe to go unbelievable distances, and the accumulation of snow due to the absence of thaws in winter made sledging easy. The Hudson's Bay Company, because of its policy of relying largely on Amerinds, has been little interested in the transport business.

Railway construction was begun as a means of encouraging agricultural settlement and, in the case of the Hudson Bay Railway, to enable the wheat growers of the Prairie Provinces to compete more favorably with Argentina and Australia. Where construction has penetrated mining districts, the government has had to assist—the Temiskaming & Northern Ontario Railway, and the more recent lines to Flin Flon, Noranda and elsewhere being notable examples (Fig. 169A). Yet the mining industry creates a demand for high-grade produce, supports an important traffic, and tends to encourage mixed farming in its tributary area insofar as nature permits. Though the Hudson Bay Railway did not have as its primary purpose the opening up of mineral lands, the line serves as the key to the mineral possibilities of a vast stretch of the Shield

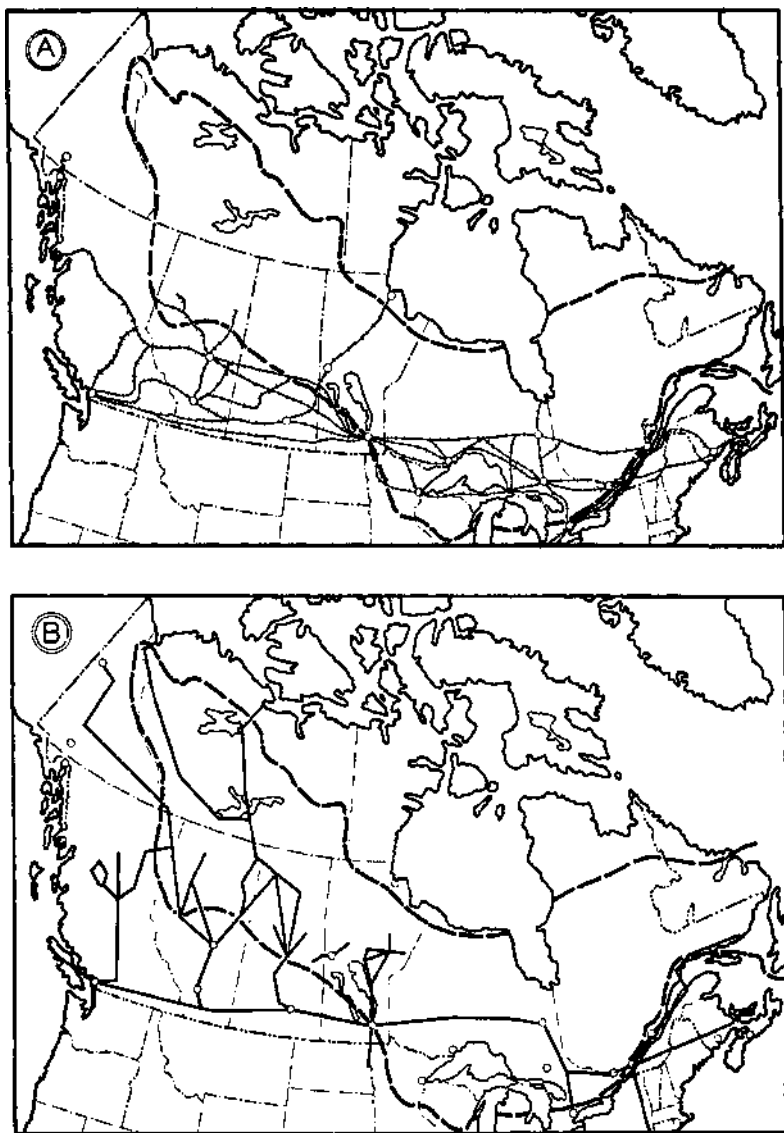


Fig. 169. Transportation on the Shield: (A) Railways. (B) Airways. Despite the paucity of railways, the traffic possibly has not justified operation of some lines. The airplane becomes increasingly important because it brings the far-flung outposts into the sphere of civilization. Transportation always has been the major problem and probably always will be in this country of enormous distances.

For a long time after mining was developed in the Upland, the traffic was heavy only one way—inbound, and it was not until 1918, with the boom of the pulp and paper industry, that outbound or southbound traffic became more important than inbound or northbound traffic.⁸⁵

The airplane is revolutionizing transportation on the Shield (Fig. 169B). A plane can cover more distance in one hour than a canoe in 5 days.

In winter, by using skis and "nose warmers," airplanes can penetrate the most remote parts of the Shield, placing prospectors on the ground before the spring breakup. In summer, pontoons are used.

Even some prospecting is done from airplanes, because the lack of overburden on the Shield permits the geologist to detect rock structures.

Tractors are being used more and more, summer and winter (Fig. 166), in both the mining and the forest industries.

Trade

The products of the Shield are those badly needed by great industrial nations. Either they are necessities, such as minerals, lumber, pulp, and paper, or luxuries such as furs.

Recreation

The Laurentian Shield is excellently adapted to recreation. Because of its relative nearness to population centers of southern Canada and northeastern United States, this subregion is building each year an increasing number of summer hotels and cottages to accommodate tourists who want the solitude of the great "North Wood." As motor roads are built, the summer population of the Shield should increase. Fishing, hunting, and canoeing all are excellent. This subregion also is world-famous for its winter sports. Near Montreal are numerous centers catering to skiers (Fig. 170).

Cities and towns

Nowhere in the Laurentian Shield are there great cities. Northern Quebec and Ontario have about a dozen cities of more than 10,000 inhabitants, and a number of towns with 1,000 to 4,000.

⁸⁵ Harold A. Innis, "Settlement and the Mining Frontier," *Canadian Frontiers of Settlement*, Vol. IX, p. 372. Toronto: The Macmillan Company of Canada, Ltd. 1936.

With the exception of *The Pas* (3,153), a thriving commercial center in west-central Manitoba on the Hudson Bay Railway, nearly all towns and cities are inseparably linked to the mining industry. *Flin Flon* (6,821), on the raw edge of the frontier in Manitoba, is a one-industry town, its importance being due more to the quantity than to the quality of its copper and zinc ores.

Sudbury (31,888), located north of Lake Huron and on important rail routes, exists only because of the nickel-copper ores. Sudbury attained the rank of a city in 1930.

Shawinigan Falls (20,237) is situated on the St. Maurice River 21 miles north of Three Rivers. It is on both the Canadian Pacific and the Canadian National railways. Its strategic location on the St. Maurice gives it an abundance of cheap water-power, which operates great electro-metallurgical and chemical industries. Shawinigan Falls is one of Canada's major pulp- and paper-manufacturing centers.

Among the other important towns are Timmins (28,544), Cobalt (2,332), Kirkland Lake (17,340), Noranda (4,538), Amos (2,835), Copper Cliff (3,695), and Arvida (4,564).

The outlook

The railway, highway, and airplane have made the Shield accessible. In only a very few places can settlements be anything more than small isolated pockets of varying size. It is not known what science may permit in the way of agriculture in the future. There have been many failures to date, but the pioneer stock attempts to hold on. Undoubtedly new mineral discoveries will be made, and these will tend to boom local areas. They will, however, increase the population of the Shield only in a small way and for a relatively short time.

The real future of this area depends upon the forest because it provides water storage, a permanent refuge for fur-bearing animals and the Amerindian population, and a primeval wilderness for the vacationist.

Probably the destiny of much of Canada is locked within the fastnesses of the Canadian Shield.

The Upper Lakes Subregion

The Upper Lakes subregion, often called the "cut-over area," includes northeastern Minnesota, northern Wisconsin and Michigan, and the part of Ontario that lies north of lakes Huron and Superior (Fig. 154).

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Like the major region, the Upper Lakes subregion is a land of extractive industries—fishing, trapping, logging, and mining.

Topography

The "cut-over area" was largely scraped bare by the continental glaciers. The ice gouged out the softer rocks, the depressions later forming thousands of small lakes; it also deranged the drainage and threaded the area with a filigree of rivers. It mellowed the terrain over which it moved. Thus low hills characterize much of the land, though high steep hills locally called "mountains" lie along the western and southern shores of Lake Superior.

The rocks are much like those noted in the Laurentian Upland of which this area is a part; they are ancient, tightly compressed, and severely metamorphosed.

Climate

The climate, being Continental, is subject to the severe variations that characterize the interiors of large land areas in middle latitudes (Fig. 155B). Winters are long and cold, summers short and cool. Extreme temperatures may range from -50° to 105° F. The growing season varies from 90 to 100 days, though at Marquette and other places on the south shore of Lake Superior it is 158 days long. There are large sections where the first autumn frost arrives early in September. Precipitation varies from 25 to 35 inches, falling mostly as rain. Though only 10 to 20 per cent is snow, the whole area is snow-covered for 90 to 120 days—a longer period than in any other area of comparable size in the United States.³⁶

Soils

The soils, like those elsewhere in the region, are poorly suited for growing standard crops. They are also distributed in intricate patterns with pockets of fertility scattered here and there in the huge wilderness of non-productive land. All soils, gray podzols, are light in texture and acid in reaction, since they are derived from crystalline rocks and lie in a humid climate. Some areas are strewn with glacial granitic boulders, while others are characterized by deep, sterile sand or peat and muck.

When the frontier was moving over the Upper Lakes subregion,

³⁶ National Resources Committee, *Regional Planning Part VIII, Northern Lakes States*, p. 9. Washington, D. C: Government Printing Office, May 1939.

no soil surveys had been made and nothing was known regarding its suitability for crops. Accordingly, settlers took anything that was cheap, believing that crops would grow wherever trees did. The result was an irregular, inefficient, and illogical pattern of land use. Public agencies are now trying to do the best they can for the people who settled in this area of meager resources.

Natural vegetation

When the explorers and fur-traders broke into this subregion, they found a virgin forest consisting of conifers in the northern and northwestern part and mixed forest in the southern part (Fig. 5). White pine was the principal commercial tree, but jack and Norway pine and even spruce and fir were associated with it. In the southern portion were beech, birch, and maple, interspersed with the conifers. The hardwoods grew on the better soils; the conifers, in the more sandy sections.³⁷ The best of the forests was in northern Michigan, northeastern Wisconsin, and central and northern Minnesota.

Native animal life

The forests and streams abounded with wild life. Such fur-bearers as the beaver, marten, fisher, and otter thrived. Deer, moose, and bear were numerous, as were the ubiquitous wolf and fox. Migratory waterfowl and fresh-water fish were abundant.

The occupancy

During the first half of the nineteenth century, settlement spread rapidly over the trans-Appalachian region so far as rainfall would permit crop production. The Upper Lakes area was less fortunate, remaining an unbroken forest for 2 centuries after its discovery—the only development of any sort being the trapping and trading of furs.

Lumbermen rather than farmers finally opened it. They bought the land, built transport facilities, cut off the timber, and got out. Their business was timber, not land.³⁸

³⁷ National Resources Board, *Regional Planning Part VI, Maladjustments in Land Use in the United States*, p. 27. Washington, D. C: Government Printing Office, 1935.

³⁸ Charles Davis, "Unprofitable Pioneering," *The Quarterly Review of the Michigan Alumnus*, December 4, 1937, Vol. XLIV, No. 10, p. 45.

Ecological succession

Few areas in Anglo-America better exemplify ecological succession than this one. Its kaleidoscopic evolution has witnessed the dominance of trapping, fishing, lumbering, mining, and farming.

Trapping

The virgin wilderness abounded in wild life, with winters long and cold enough to put the furs in prime condition. The early *voyageurs* who came by way of the Great Lakes found ideal conditions for their vocation.⁸⁰ The interior location and the great distance from Europe meant that only products that were valuable, easily conveyed, and in great demand could bear the costly transportation. This enterprise was the principal business for 2 centuries after the discovery of the subregion.

Fishing

Fishing was a flourishing industry in lakes Huron, Michigan, and Superior, antedating lumbering and mining. White fish and lake trout in 1880 made up 70 per cent of the catch. During the past 50 years, however, they have declined steadily as a result of over-fishing, destruction of immature fish, and the fouling of waters by city sewage and industrial waste. Even so, these three lakes still account for 60 per cent of the fresh-water fish caught commercially in the United States. In 1934, 5,900 men were employed and the catch was valued at \$3,500,000. Nearly all of the fish are caught during the summer months.

Logging and lumbering

This subregion had North America's largest and densest stand of white pine. When forests of this highly prized tree had been "mined out" of New England and the Middle Atlantic States, lumbermen led the onslaught into the northern Lakes area. Contributing factors were the rapid urbanization of the Middle West and improvements in transportation—the Erie Canal and the building of railroads. Yet the real mass attack on the forest did not begin until the termination of the War Between the States. By 1870, Michigan ranked first in the production of lumber and reached its

³⁹ National Resources Committee, *Regional Planning Part VIII, Northern Lake* States*, p. 9. Washington, D. C.: Government Printing Office, May 1939.

peak in the decade 1880-1890. In 1896 a traveler covering 40 counties and going 2,000 miles wrote that:

The heart of the white pine country, from Manistee on the west to Saginaw on the east [is] an almost continuous succession of abandoned lumber fields, miles upon miles of stumps as far as the eye can see. . . .⁴⁰

The horde then moved into Wisconsin and finally into Minnesota, which took leadership, attaining its peak in 1900.⁴¹ This army of lumbermen had one-track minds: they sought but one resource—*pine*. They cut any tree so long as it was big and they were not concerned when young growths were ruined by the fall of the tree they were cutting. Stripping the forest, leaving only slashings and stumps in their wake, they moved on.

Whereas in 1890 these three Lake states produced 35 per cent of the nation's total, by 1910 they could not supply their own needs, and today they produce only 4 per cent, the bulk consisting of hardwoods. By 1920 even the best hardwoods had been cut off.

Reforestation was hardly considered. Everyone thought that with so vast an area of dense growing timber and with much yet to be cut, the forest was inexhaustible. Accordingly the land was repeatedly burned over (Fig. 171). These fires destroyed the seedlings and the forest litter and so ruined the topsoil that in many localities white pine can no longer grow. Carl Sauer, one of the pioneers in land-utilization surveying in Michigan, estimates that these sand-pine lands will require 500 years undisturbed by man to produce a pine forest like the original one.⁴²

The mining industry

The Upper Lakes subregion is one of North America's richest in minerals—not in variety, but in quantity, and of the type most in demand by industry. South and west of *Lake Superior* lie the continent's best, largest, and most favorably located iron ores. On the Keweenaw Peninsula are the richest and oldest, though not the most profitable, copper accumulations. On the west shore of Lake Huron are most valuable deposits of metallurgical limestone.

Mining is the outstanding economic enterprise in this area today.

⁴⁰ W. N. Sparhawk and W. D. Brush, "The Economic Aspects of Forest Destruction in Northern Michigan," *Technical Bulletin*, No. 92, United States Department of Agriculture, January 1929. Quoted in Katherine Glover's, *America Begins Again*, p. 148. New York: McGraw-Hill Book Co., 1939.

⁴¹ National Resources Committee, *Regional Planning, Part VIII, Northern Lakes States*, p. 10. Washington, D. C.: Government Printing Office, May 1939.

⁴² J. Russell Smith and M. Ogden Phillips, *North America*, p. 463. New York: Harcourt, Brace & Co., 1940.

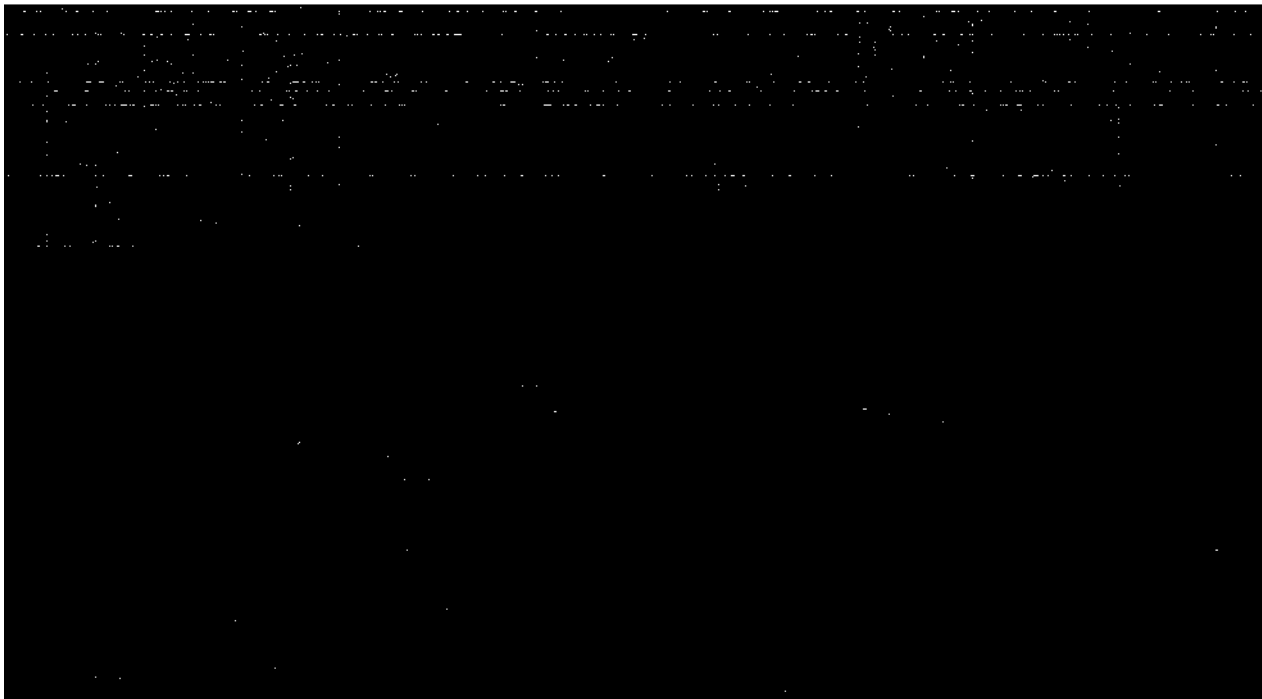


Photo by W. 7. Hutchinson, Courtesy U. S. Forest Service.

Fig. 171. A burned over place in Minnesota. Back of these charred stumps and trunks, one m

The removal of copper, but more particularly of iron ore, caused the redrawing of much of the industrial map of the United States, for the center of the iron and steel industry migrated from the Ohio River to the shores of the lower Great Lakes.

Billions of tons of red hematite ore have been found in the Lake Superior district. These deposits do not lie in mountains, as the word "ranges" suggests, but in elongated east-west extending beds (Fig. 172). They were formed during an ancient mountain-building period, but erosion has long since worn down the mountains and the terrain is now almost flat.

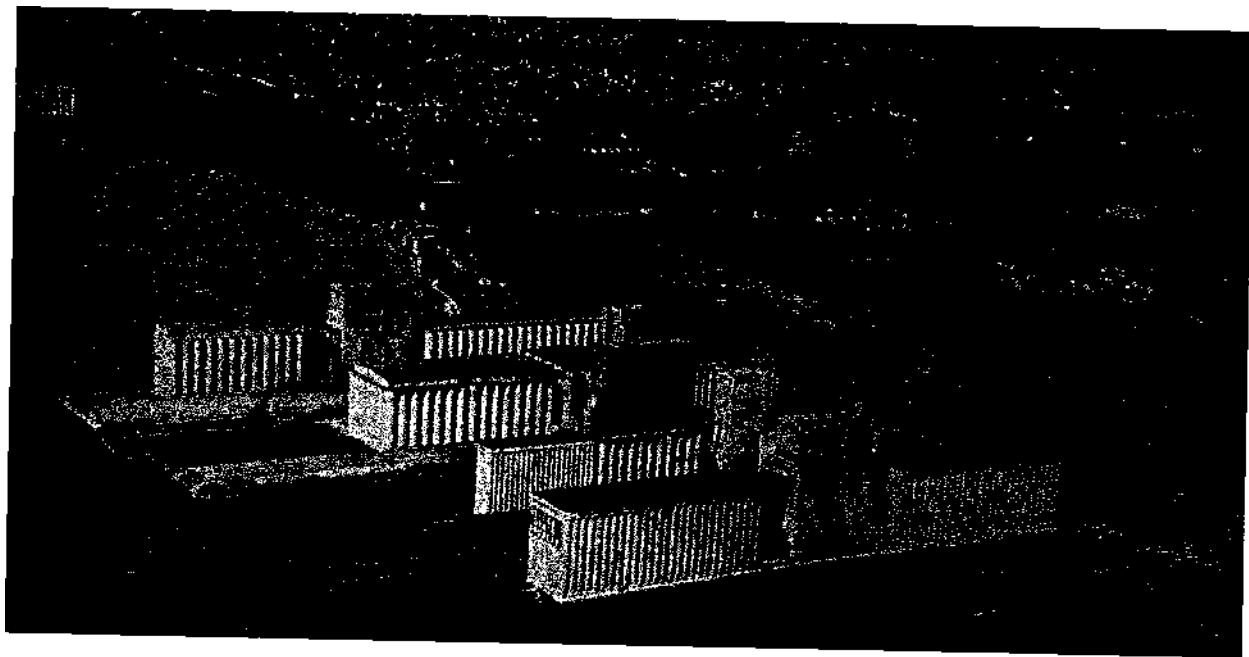
In the Mesabi Range, the ore deposits, shallow and extensive, are covered by glacial till to a depth of 10 to 150 feet. Mesabi ore is an example of deposition and concentration of ores in small valleys between hills (Fig. 172).

On the Gogebic Range, the iron deposits lie hundreds of feet below the surface. Its ores exemplify the deposition and concentration of ore by circulating waters in underground channels (Fig. 172). Eleven counties (3 in Minnesota, 5 in Michigan, and 3 in Wisconsin) comprise the famous "Lake Superior iron ore region" which accounts for 85 per cent of American production. Minnesota alone contributes 61 per cent of the total. Without Lake Superior iron ore, the American industry would possibly have drifted to the Atlantic Seaboard and to Alabama. Upon the Mesabi Range (the greatest body of iron ore in the world) has been built the extensive iron-ore and lake-shipping business, and indirectly most of the steel manufacturing of the Lower Great Lakes area. Billions of tons already have been removed, but at the present rate of mining—about 60 million tons per year (79,827,335 gross tons in 1941—an all-time high), the ore should last at least 25 years. Data on reserves are not dependable, for the steel companies give out no more information than necessary, since they report no more taxable property than the pumic authorities choose to recognize.⁴⁸

Production on a large scale began about the time the lumber industry was declining. Shipments from the Marquette Range (the only producer until 1877) started in 1854, and those from the Mesabi in 1892, when the first railroad reached it.

At first, mining in the Lake Superior area was done underground. In time large deposits of high-grade Mesabi ore in loose form were discovered near the surface. These ores could be mined with power

⁴⁸ Marion Worthing, "Iron Ore Reserves and Their Relation to the Steel Industry," *Pittsburgh Business Review*, Vol. VI, No. 10, October 28, 1936, p. 21.



American Iron & Steel Institute.

fig. 172, At the left is a generalized cross-section of an iron-ore deposit in the Gogebic Range. At the right is a cross-section of an ore deposit in the Mesabi Range. The six principal iron ranges comprising the so-called "Lake Superior Region" are shown on the map in the center.

shovels after the glacial overburden had been removed. Thus open-pit mining, the fastest and most economical method known, came into use (Fig. 173). This mode of mining can be followed only in summer. Underground mining is carried on the year round, the ore being stock-piled during winter.

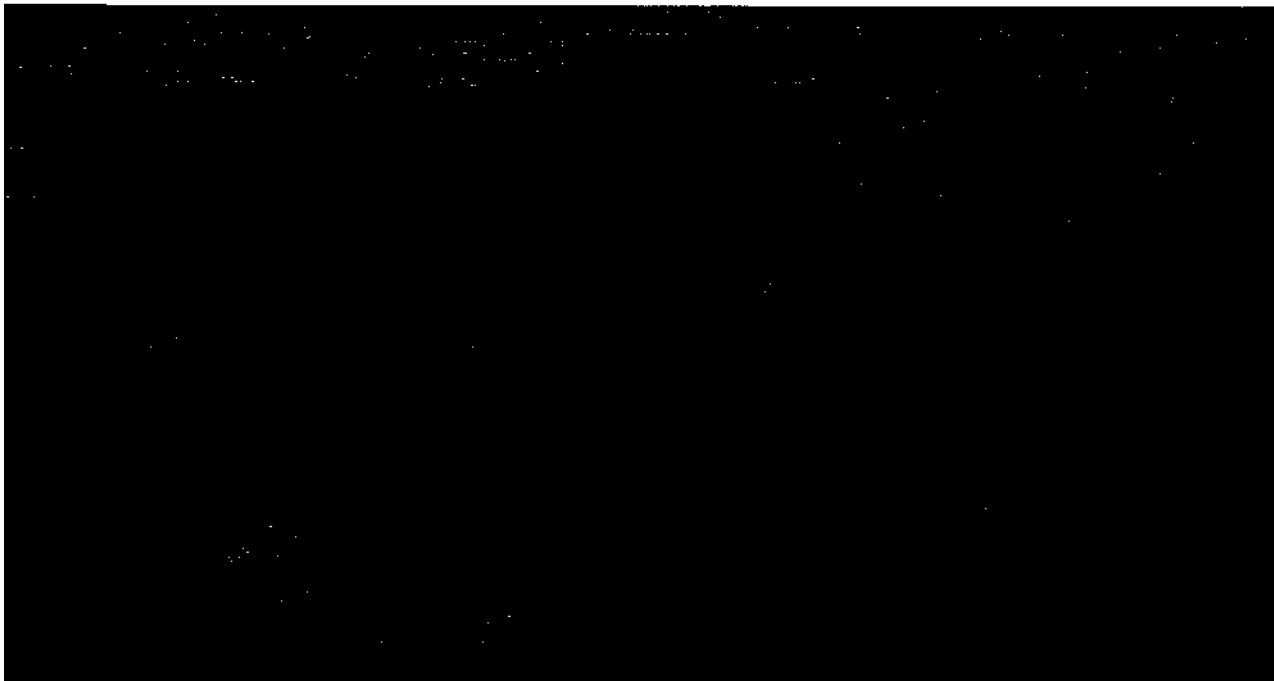
As mining went forward, the richer and better ore was removed. Today, in order to send high-grade hematite down the lakes, it must first be *beneficiated*—much earthy material being removed prior to shipment.

The Mesabi Range contributes about three fifths of the total production of the Lake Superior area. Since 1892, it has sent down the lakes approximately a billion tons of ore. The greatness of the Mesabi Range is due to (1) large size, (2) nearness of ore to the surface, (3) quality of the ore, (4) proximity to Lake Superior, and (5) ease of mining. The ore was first recovered with hand shovels; later came steam and finally electric shovels, which remove 16 tons at a single bite. Railway tracks are built into the pits. More recently, crawler trucks on giant rubber tires have been used. The world's greatest single mine, the Hull Rust at Hibbing, Minnesota, is 350 feet deep, from $\frac{1}{2}$ to 1 mile across, and $2\frac{1}{2}$ miles long, with an area of 1,100 acres.

Taxation of iron ore. Most of the inhabitants live in mining communities, and the mines are largely owned by steel interests in the East. Minnesota counties, especially, have been taxing these absentee owners heavily. As a result, tourists are amazed at the fine roads and well-equipped schools in an otherwise exceedingly poor region. The state of Minnesota has a commission of experts in mining accounting, mineralogy, geology, and mining engineering who permit no discovered ores to escape assessment. The iron and steel manufacturers complain bitterly, pointing out that Minnesota's mining tax is 10 times as great proportionately as that for the nation as a whole.

On the other hand, public sentiment in Minnesota, whence comes 60 per cent of the ore, is averse to sending millions of tons of the red metal down the lakes each year, leaving in place of the rich heritage vast holes in the ground. Ore shipped down the lakes means only a dollar or so to the state but is worth \$8.00 to \$200.00 and more when converted into iron and steel at Gary, Cleveland, or Pittsburgh. Minnesota used this as a major argument in getting the United States Steel Corporation to construct the plant at Duluth.⁴⁴ It seems certain that the iron and steel industry will

⁴⁴ Langdon White and George Primmer, "The Iron and Steel Industry of Duluth: A Study in Locational Maladjustment," *Geographical Review*, January 1937, Vol. XXVII, No. 1, p. 83.



Courtesy U. S. Steel News.

Fig. 173. Open-pit mining in the Mesabi Range at Eveleth, Minnesota, where huge electric shovels seize 14 tons of iron ore **at a bite**. This is both fast and economical mining.

remain largely where it is so long as the chief source of ore is the Lake Superior district. The influence of the ore-producing area never will be strong enough to draw the iron and steel industry to it. Moreover, the large steel markets lie hundreds of miles to the southeast, and the restraining influence of freight rates from the coal fields of Pennsylvania, West Virginia, and eastern Kentucky will keep most of the steel plants where they are.⁴⁵

Whereas Minnesota taxes all known high-grade ores, Michigan levies only against the exploited ones, those adjacent to them, and those most evident. It would appear that the different mode of taxing in the two states is (1) a political expression of Minnesota's predominant agrarianism—indicated by the fact that the taxation of a dollar invested in a mine is twice the rate on a dollar invested in a farm, and (2) a desire on the part of Michigan ore owners to compete with Minnesota ore, which has certain natural advantages.

Copper, mined by the Amerinds long before white men reached the New World, was even then an important article of trade. Commercial exploitation did not begin with the Amerind but with the white man. Michigan was the leading copper state from 1847 to 1887—until the great porphyry deposits in the West were developed. Native copper in a chemically pure state is found in the Keweenaw Peninsula.

Reserves are not well known, since the mineralized zone—a narrow belt 2 to 4 miles wide and 100 miles long—is by no means thoroughly prospected. For a long time practically the entire supply of the United States came from here—96 per cent in 1849. After years of continued output, however, the mines have had to go deeper and higher production costs have resulted. In addition, lower prices and new techniques for handling the low-grade surface ores in the West so adversely affected the Michigan industry that by 1930 it accounted for only 9 per cent of Africa's output. Some mines are now nearly a mile below the surface.

Limestone. In Alpena County, Michigan, lies North America's leading source of metallurgical limestone. The quarries lie so close to the lake shore that, despite the fact that they are geographically 300 miles from the blast furnaces, they are economically only 30 miles away, since water rates are only one tenth as much as rail rates. Accordingly, this area has become the largest and the cheapest source of stone for the great iron and steel plants of the Great Lakes area. About 14 million tons move down the lakes

⁴⁵ Marion Worthing. "Iron Ore Reserves and Their Relation to the Steel Industry," *Pittsburgh Business Review*, Vol. VI, No. 10, October 28, 1936. p. 19.

each year. Limestone is used in blast furnaces to remove from the ore such impurities as silica and alumina, which have a stronger affinity for lime than for iron.⁴⁶

The quarry of the Michigan Limestone & Chemical Company at Calcite has 9½ miles of vertical quarry side from which electric power shovels of 23 tons capacity remove the stone. This company has its own harbor with a loading slip. As the stone is brought from the quarry, it is crushed into pieces less than 9 inches in their maximum dimensions. Conveyor belts then carry it to storage, separate piles receiving that to be used for open-hearth furnaces, blast furnaces, and cement plants and chemical companies. Even in the same pile the stone is graded both as to size and chemical composition. The boats used to transport this particular limestone are "self-unloaders." One of these—the Steamer Bradley—is 639 feet long and has carried cargoes exceeding 16,000 gross tons.⁴⁷

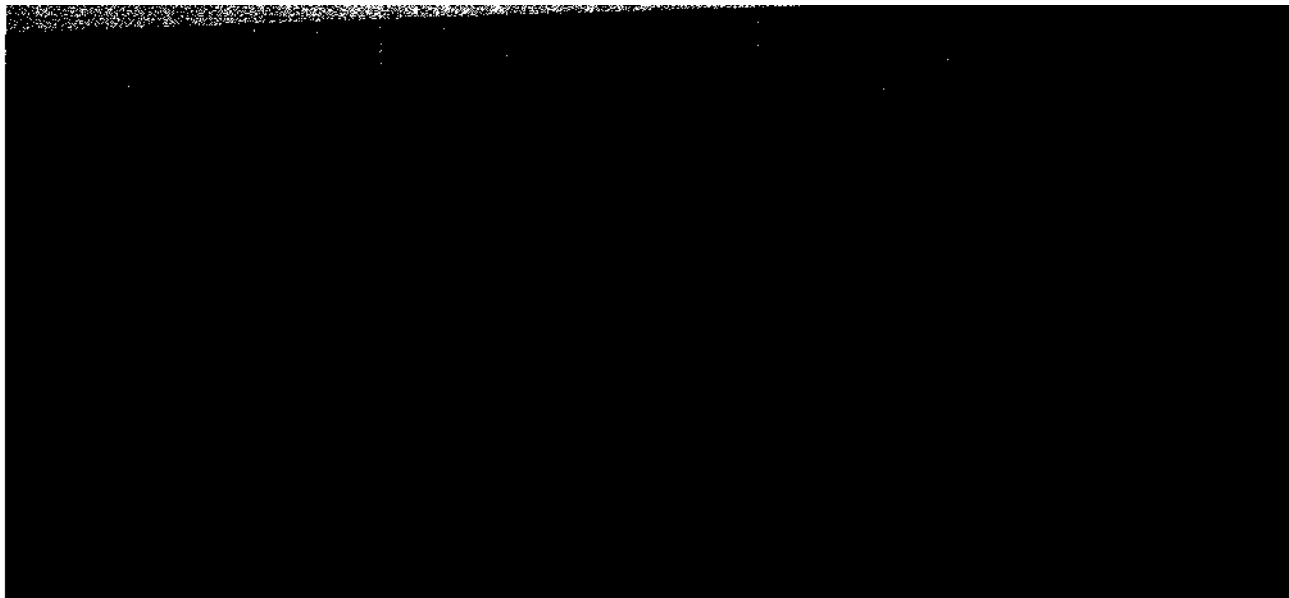
Moving iron ore down the lakes

Ore from the Minnesota mines is loaded into cars, which are made into trains of 125 or 160 cars and taken to weighing and classification yards before continuing on their way to Duluth, Superior, or Two Harbors. The distance from the mines to Duluth is only 60 to 80 miles and the trains coast much of the way. The railroad charge for delivering ore from mines to boats, a distance of 79 miles, is more than that by freighters which carry it 10 times as far. If iron ore had to be transported by rail to lower Lake ports, the freight alone would be more than \$8 per ton. Aside from a very small amount moving by rail to St. Louis, all three states—Minnesota, Michigan, and Wisconsin—ship, their ore to lower Lake ports by water; there is no other choice.

The docks jut out into the lake like huge peninsulas. The trains, after being moved onto the docks, dump their ore into "pockets," from which it drops by gravity through hatches into the holds of the lake vessels (Fig. 174). The docks are 72 to 84 feet above water level. Ordinarily 3 to 4 hours are required to load a vessel, but the job has been done in much less time. In 1919 the steamer D. G. Kerr loaded 12,689 gross tons of ore in 30 minutes' actual loading time. When a boat reaches a lower Lake port, the ore is discharged in 4 or 5 hours by means of huge clam-shaped unloaders (Fig. 145). The Great Lakes can be utilized for only 7 or 8 months, because

⁴⁶Oliver Bowles, *The Stone Industries*, p. 390. New York: McGraw-Hill Book Co., 1939.

⁴⁷77 S. *Reel News*. July 1941 Vol. VI. No. 3. pp. 8, 9, 11.



Courtesy U. S. Steel news.

Missabe & Northern

Fig. 174 One of the seven ore-loading docks at Dufuth-Superior. This particular one, belonging to the Fig. way is 2,304 feet long, 80½ feet high to water to base, at 0.1. has a length of approach of 3,222 feet, and has 384 pockets each capable of holding 300 tons. The capacity of the dock is 115,200 tons. Thither the ore is brought from the

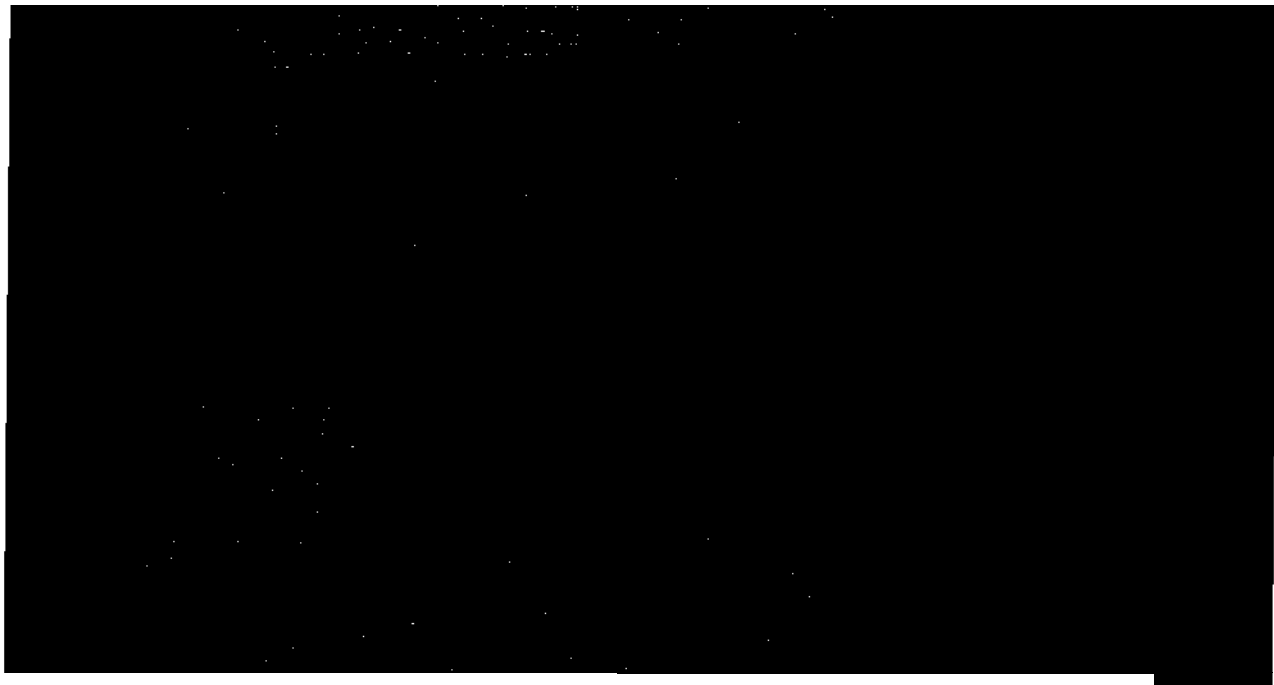


Photo by Don Walker, Courtesy the

Fig. 175. Ore boats locked in ice. Sub-zero temperatures froze the St. Marys River, trapping downbound cargo ships in 6-inch channel

the connecting links such as the "Soo" Canals are locked by ice (Fig. 175). No time is lost by a vessel during the season of navigation. Every effort is made to complete as many round trips as possible—the number usually being 23 to 30. It is a race against time to accumulate enough ore at the lower Lake ports to keep the mills operating throughout the year. Numerous collisions occurred prior to 1911 in hot summer months when fog was bad. Vessels on the down trip are now required to follow a slightly different course from those on the upbound voyage. Thus steamers passing on the open lake are at least 5 miles from each other, and are also separated so far as possible in rivers and channels.

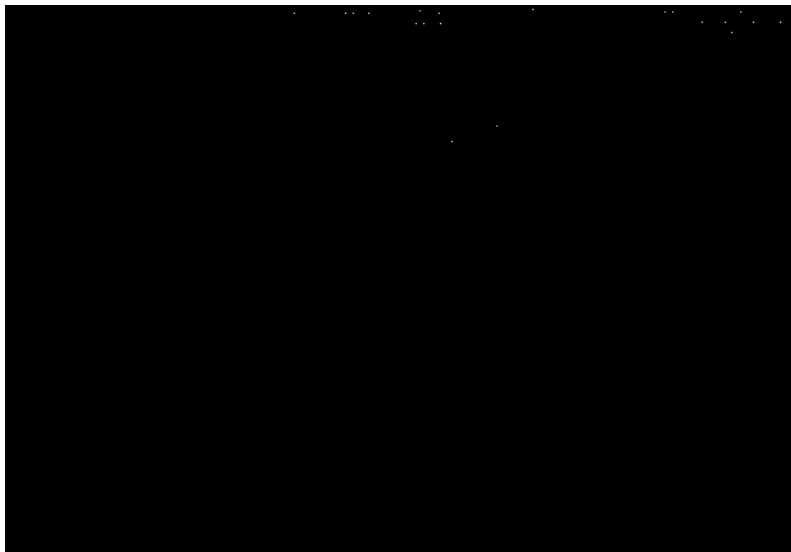
The traffic tonnage moving through the "Soo" Canals is almost unbelievable. In a normal year it exceeds that of the Panama, Suez, Welland, and New York State Barge canals combined. Nowhere else in the world is so much bulk traffic handled—about 111,000,000 net tons in 1941—an all-time high.

In an effort to procure a return cargo, principally coal, a much lower rate is offered by northbound carriers. Most coal moving northbound from Toledo and other Lake Erie ports, however, is destined for such industrial areas as Detroit, Chicago, and Milwaukee, or for Canada rather than for the upper Lake ports.

The "Soo" Canals, from the standpoint of tonnage, are the most important artificial waterways in the world. The St. Marys River, connecting lakes Superior and Huron, is about 63 miles long and at Sault Ste. Marie has a stretch of rapids $\frac{3}{4}$ of a mile long and a fall of 17 to 21 feet, depending on the stage of water in the two lakes. In order to afford passage for deep-draft vessels, canals and locks having a water depth of 24 feet had to be built through this barrier. So important are they that when the canals freeze in winter, Great Lakes traffic closes.

The first "Soo" Canal was built on the Canadian side for the passage of small boats by the Northwest Fur Company in 1797-1798. The first canal on the American side was built by the state of Michigan in 1853-1855, following the discovery of iron ore in the Lake Superior area. This canal was transferred to the United States Government in 1881 when the Weitzel Lock was built. So great has lake traffic become that 4 locks have been built on the American side (Fig. 176). A new one is being built on the site of one of the old locks—the Weitzel. It will be 800 feet long, 80 wide, and 30 feet deep. It will eliminate congestion and loss of time awaiting lockage, permit deeper loading of vessels, and assure adequate locking capacity for reasonably prospective commerce. The Dominion government constructed a lock and canal on the Canadian

side in 1895, but nearly all the lake carriers use those on the American side. During the season of navigation a vessel is locked through the Soo Canals about every 15 minutes day and night. In 1941 the average was 14.4 minutes, and a record was established when 25,865 vessels passed through.



Corps of Engineers, U. S. Army.

Fig. 176. Locks on St. Marys Falls Canal. The "Soo" Canals have borne more traffic than any other artificial channel in the world. The St. Marys River is the only outlet of Lake Superior connecting it with Lake Huron. The locks, through which boats pass endlessly during the season of navigation, were built to enable deep-draft vessels to go around the rapids near the head of the St. Marys River, which blocked navigation by all but canoes and bateaux. The "Soo" Canals are in operation about eight months during the year and are ice-bound for about four.

Transportation

The Great Lakes provide the finest system of inland waterways in the world. Their traffic consists almost entirely of bulky products—iron ore, coal, wheat, and limestone. In 1940 during the 7½ months of lake shipping, these four commodities reached a net tonnage of 142,436,806. The boats that move them are built solely for service on the Great Lakes and their connecting waterways. They would be useless for ocean service, as severe storms would break them in two. A single ship of the largest class can carry 15,000 to 16,000 tons. Some are self-unloaders. These boats aver

age 11 to 13 miles per hour, making a round trip in approximately: a week if they are engaged exclusively in the iron-ore trade and if they carry no coal upbound. If coal is carried, the time is increased by one day. Since large carriers are more economical than small ones, those being constructed now are of the more efficient 600-foot type. These are also speedier and can be loaded and unloaded in faster time. Such a vessel involves an investment of from \$1,000,000 to \$1,500,000.-

Rail and highway transportation are available, though the former is relatively unimportant, since there are few main lines.

The net of branch lines built during the lumbering era is now largely abandoned, and in many instances the rails have been removed and sold for scrap. The significance of iron-ore shipments is well indicated by the fact that 99.75 per cent of the cars return empty to the mine area. This traffic situation probably will not change, since much of the mining country appears incapable of important agricultural or other development.

Hard-surface roads have had a remarkable development in the past 35 years, though much remains to be done if the subregion is to capitalize on its recreation possibilities. Especially must attention be given the scenic roads along the shores of lakes Superior, Michigan, and Huron.

Agriculture

Not more than 10 per cent of the Northern Lakes subregion is in crop land now, and possibly not more than 20 per cent ever can be Utilized for agriculture.⁴⁸ The crop acreage per family is too low and the tax burden too high to permit successful farming. Paucity of markets is a severe handicap in this essentially forest environment.

Unfortunately, poor lands as well as good lands were sold through high-pressure salesmanship to all kinds of people—miners, factory workers, former city white-collar employees, and Corn Belt farmers. Some accidentally obtained good land but most did not, since they "found themselves in possession of (1) outcrops of crystalline rock, of undrainable peat bogs and marshes, or of stump land covered with granite boulders [or] of (2) soil so light and sandy that, when cleared, it was blown about by the wind."⁴⁹

⁴⁸ Natural Resources Committee, *Regional Planning, Part VIII, Northern Lakes States*, p. 9. Washington, D. C: Government Printing Office, 1939.

⁴⁹ National Resources Board, *Maladjustments in Land Use in the United States, Part VI*, p. 27. Washington, D. C: Government Printing Office, 1935.

The majority of early farmers worked part-time in mines, mills, or logging camps. The amount of improved land on most farms (25 to 30 acres) has been so small that a complete living could not be made solely by growing crops.

It is unfortunate that no soil maps or agricultural experiment farms preceded immigration. Knowledge came only through trial and error and the crushing of human beings by a relentless nature (Fig. 177). A large proportion of the farmers remaining are foreign-born or of foreign parentage, being mostly Scandinavian, Slavic, or Finnish. The Finns assert that they came into this area because they were shipped up to supply labor. They took to agriculture during periods of industrial inactivity. As "part-time" farmers they have made a fair living from the soil despite the short growing season, and they usually do better than most other nationalities⁵⁰ as indicated by their rejuvenation of farm lands abandoned by settlers of other ethnic stocks.

The Finns grow primarily hay, potatoes, and root crops and leave much land in pasture. Wheat, formerly of considerable importance, is no longer grown because the area cannot compete with better lands to the, west and south. Most of the feed grains used on the farms are raised locally but practically none is produced for market. A typical clearing carved out of the forest consists of 20 to 30 acres planted largely in hay, with smaller plots in barley, oats, potatoes, and other vegetables. Cows and pigs are kept, the latter being fattened on skim milk. Dairying is not prosperous, because the cows require expensive winter housing. Moreover, all farm production suffers from the dearth of near-by markets;⁷ Much of the farming is submarginal. Away from the lakes, the short growing season is more of a handicap than the soils, for even on the better lands frost precludes the growing of most crops. Moreover, the operators are faced with tax loads exceeding the earning power of their lands. It is just as necessary to supplement the farm income now as it was in the beginning, and most farming is "part-time." Many farmers cut pulpwood, ties, and poles from their land. The income on the average farm is too low to maintain the American standard of living. There is a dearth of doctors, nurses, and hospitals. Medical and dental care are largely neglected, and what service there is must be largely at public expense. Few homes have electric lights or running water.

⁵⁰ Lynn Halverson, Marquette, Michigan. Personal communication.



Farm Security Administration.

Fig. 177. An abandoned farm in the cut-over area. This extreme example of rural poverty shows well the futility of trying to farm lands not fit for cultivation.

Recreation

Recreation is important* now and undoubtedly will be the leading industry in the future. In the 1920's it was first realized that too much time, effort, and money had been wasted in farming worthless lands and that agriculture had no future. On the other hand, the area has all the necessary features for a great playground—woods, lakes and streams, fish, game, cool summer climate, many good roads, and resort facilities. Eighty per cent is forest land, nearly half being publicly owned. The "cut-over area" is within easy driving distance from the densely populated centers of the Middle West, whose summer climate is so unbelievably trying as to drive people to the "North Woods." But the tourist season is short, lasting only from the Fourth of July to Labor Day. Hay fever sufferers often remain somewhat longer.

The recreation industry gives employment to a large number of people: to farmers who furnish milk, eggs, and vegetables, and to others who sell petroleum products, rent cottages, boats, and fishing tackle, or act as guides. It is, however, a highly seasonal industry.

Manufacturing

Manufacturing is not well developed in the Upper Lakes sub-region because of the small population and the great distance from the continent's principal markets for fabricated products. The chief industries are those making lumber, pulp and paper, iron and steel. Throughout the entire subregion, the general trend of industrial employment is downward.

Iron and steel are made at Duluth, Minnesota, and Sault Ste. Marie, Ontario. Neither district is a major development, despite low assembly costs. ' Whereas most North American iron and steel districts are located close to coal and have iron ore brought to them, these do just the reverse. Their low assembly cost is a result of the desire on the part of ship-owners to have a return cargo; ⁵¹ accordingly, the cost of shipping coal up the lakes is 45 to 55 cents per ton as against 70 to 80 cents for bringing ore down. ⁵² It is a truism that the location of iron manufacturing is primarily a matter of freight charges, not on raw materials alone but also on the finished products to points of consumption.

⁵¹ In busy seasons such as 1941, lake vessels frequently return to upper Lake ports with water ballast rather than coal, for they can then make more trips carrying ore.

⁵² The Lake Carriers Association, *The Great Lakes: A Specialized Trade*, p. 9. Cleveland: 1938.

The Duluth District. In 1915, when the plant was completed in Duluth, many journalists enthusiastically wrote, "Pittsburgh is moving west." Yet in 1942 Pittsburgh continued as the undisputed capital of America's and of the world's iron and steel industry, whereas Duluth carried on as a minor producer and a keen disappointment. The United States Steel Corporation, which built the plant, did not wish to do so, realizing that Duluth was not a scientific location. Before construction, it stated that the total demand for steel in Duluth's tributary area would not keep the plant busy 3 months in the year. Public sentiment in Minnesota, however, threatening higher taxes, forced the issue. The district's failure is the result of remoteness from great markets.

The Sault Ste. Marie District, Canada. A steel industry was established here about 1898. The main plant, occupying an area of 185 acres at the junction of lakes Huron and Superior, is strategically located for assembling raw materials and shipping finished products by water. The ore is imported from the United States because the quality and location of Canada's ore do not permit profitable exploitation at the present time.⁵³ .•

Pulp and paper. With an abundance of pulpwood, hydro-power, and clear water, this area manufactures a large quantity of pulp and paper (Fig. 22). The industry, however, is not as important as that on the Shield. Pulp mills increase the value of the wood from 3 to 6 times and are invariably located close to the forest as a means of converting a bulky product into one easily transported.⁵⁴ The pulp mills on the south shore of Lake Superior, as at Munising, get much of their pulpwood from Canada in huge rafts pulled by tugs. An effort is made to deliver these rafts during that part of the summer when winds are weakest. Without interference from storms, the rafts move at the rate of about 2 miles per hour.

Following the first World War, the pulp and paper industry, along with hydro-electric power, expanded considerably in the area tributary to Fort William and Port Arthur, thereby stimulating agriculture and creating markets for agricultural commodities.

Cities

Few large cities are to be found in the Upper Lakes subregion. With the exception of Duluth, there is not a single one of more than 50,000. Most of them started as sawmill towns.

⁵³ Desmond Killikelly, "The Steel Industry of Canada," *Canadian Geographical Journal*, May 1938, Vol. XVI, No. 5, p. 214.

⁵⁴ National Resources Committee, *The Structure of the American Economy, Part I, Basic Characteristics*, p. 47. Washington, D. C: Government Printing Office, 1939.

The *Duluth-Superior* (157,098) metropolitan district is located on the western tip of Lake Superior. Its commerce, consisting of iron ore, wheat, and lumber, surpasses that of all other Great Lakes ports. These cities have grown because they are bulk-breaking points.



Duluth Chamber of Commerce.

Fig. 178. A part of Duluth harbor. In the left background is the downtown section of the city. The narrow strip of land, which juts across the picture at the upper right, is a portion of Minnesota Point, 9-mile long natural breakwater which shelters the harbor from Lake Superior. A lift bridge can be seen over the Duluth Ship Canal, which provides an entrance to the harbor. The protected anchorage which lies between the breakwater and the grain elevators is Duluth Harbor Basin. The port facilities serving the city of Superior, Wisconsin, on the south side of the harbor, are not shown.

Duluth and Superior, lying just across from one another at the drowned mouth of the St. Louis River, are twins. A high bluff rises immediately behind the Duluth waterfront, confining its business district to a narrow bench of land (Fig. 178).

Considering the huge tonnage handled, one would expect these cities to be larger. All cities on Lake Superior, however, are points

of *transfer* rather than points of distribution. J. Russell Smith aptly calls them "funnel towns,"⁵⁵ since their job is to pour bulky raw materials from gondola car to lake vessel and from lake vessel to gondola car. To become outstanding distributing centers, cities must have populous as well as productive hinterlands, which Duluth-Superior possibly never will possess.

Fort William-Port Arthur (54,587), twin cities lying near the western limit of navigation, vie with Minneapolis for first place in ability to store grain. Gigantic concrete edifices line their waterfront with storage facilities for 90,000,000 bushels of grain (Fig. 179). Here the bulk of the grain from Canada's Spring Wheat Belt is transferred from rail to ship. Since only about 20 per cent of the wheat can get to Montreal before the navigation season closes, the rest must be stored until the following spring and summer. As many as 60 vessels, some carrying more than half a million bushels of wheat, start from Fort William and Port Arthur when navigation begins in the spring. The ports are served by both of Canada's transcontinental railways and by several highways.

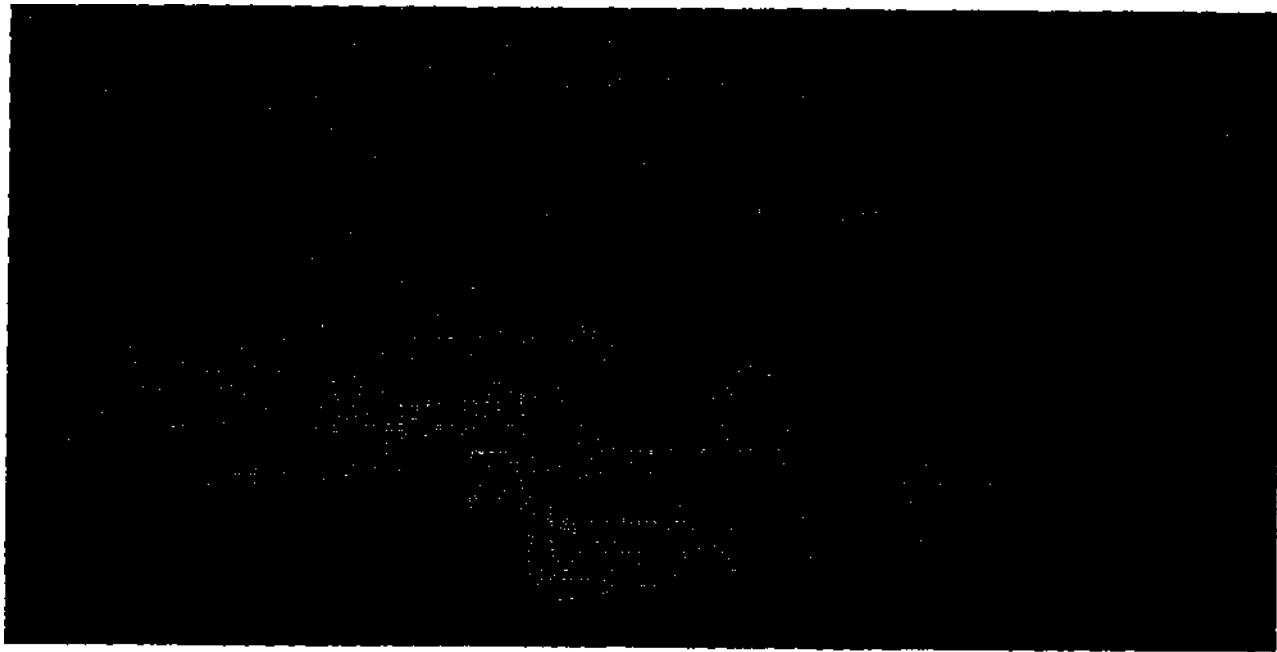
Other cities are "funnel towns"—*Two Harbors* (4,046), *Ashland* (11,101), *Marquette* (15,928), *Escanaba* (14,830)—or are mining centers—*Hibbing* (16,385), *Eveleth* (6,887), *Virginia* (12,264), and others.

The outlook

The Northern Lakes subregion is a problem area. Both from a state and a national viewpoint, these poor lands will be with us always. Many people migrated after removing the timber and finding the land ill-suited for farming. Others, mostly unemployed miners, stayed on in the cut-over areas and now comprise stranded populations. The cost of local government in this land of few people and large open spaces is too high to justify isolated rural living, since it requires about 3 times as much as a farmer pays in taxes merely to get his children back and forth to school, not to mention other school costs.

The maintenance of schools, roads and other improvements, owing to the small number of taxpayers, exerts a problem for the states and nation. Many counties are on the "verge of insolvency." The population should not rely upon relief permanently, for this brings little improvement in the basic condition. A way must be found to make the region self-sustaining again.

⁵⁵ J. Russell Smith, *Men and Resources*, p. 326. New York: Harcourt, Brace & Co., 1937.



Courtesy Canadian Geographical Journal.

Fig. 179 A few of the 30 waterfront elevators at the twin ports of Fort William and Port Arthur on Lake Superior. These terminal warehouses (13 at Fort William and 17 at Port Arthur) have a capacity of about 98,000,000 bushels of grain the largest ranging up to 7,000,000 bushels. On November 28, 1922 a daily record was established when nearly 7,000,000 bushels were delivered to 28 lake freighters. These ports are 1,220 miles from Montreal by water.



Dept. of Conservation, State of Minnesota,

Fig. 180. **The red terror—a forest fire.** Each year fires burn millions of acres of forest, doing untold damage, causing untold waste. **Nearly** all of the fires in this region are caused by man.

The major problem, that of unemployment, has been brought about by shrinkage of the principal enterprises—logging and lumbering, mining, and farming. In the case of mining in certain areas, unemployment has been caused by improvements in technology which permit 50 per cent more ore to be removed by half as many men. Some believe that forest-development work offers the only large-scale employment possibility for thousands of families in the cut-over area; this is possible with reforestation and protection from fires (Fig. 180). Minerals are not replaceable and therefore, regardless of how great the reserves may be, eventual decline is certain, and most mining towns must become ghost towns. The future mode of living will be rural, but settlements will be less scattered and less isolated.

CHAPTER XV

The Interior Grain Belts

A REGION OF WINTER AND SPRING WHEAT, GRAIN SORGHUMS, AND LIVESTOCK

ANGLO-AMERICA, since the 1880's, has been the chief source of **the** world's surplus wheat. The streams of wheat from America are what brought about rural depopulation in Europe—particularly in Great Britain. The United States still leads the world in wheat production, but it has surrendered first place in foreign trade to Canada (Fig. 181).

Wheat is grown widely throughout Canada and the United States. The two most important areas are the Hard Winter Wheat Belt and the Spring Wheat Belt (Fig. 182). In these areas the farmer has a narrow range of crops and he must specialize. He is far more dependent upon a few crops than is the farmer in a humid area, and he faces many problems: blistering droughts, hail, black blizzards (clouds of black dust), locusts, chinch bugs, army worms, and blights. He is concerned also with freight rates, for his interior location makes it difficult to compete with the farmer in Argentina and Australia in the exportation of wheat.

The two wheat-growing subregions are not co-terminous; between them is a belt (in southern South Dakota and northern Nebraska) where little wheat is grown (Fig. 182). Here the climate is badly suited to wheat; winters are too cold and have too light a snow cover for winter wheat to survive, and summers are too hot for spring wheat. Moreover, the competitive position of corn as against wheat is too strong, since the former cannot be harvested until too late for seeding the latter. Spring-sown oats is grown instead.

The whole region is enormous, extending as far north as 58 degrees and as far south as 33 degrees (Fig. 183).

The Hard Winter Wheat Subregion

The Hard Winter Wheat Belt lies wholly within the United States in Kansas, Nebraska, Colorado, Oklahoma, and Texas (Fig.

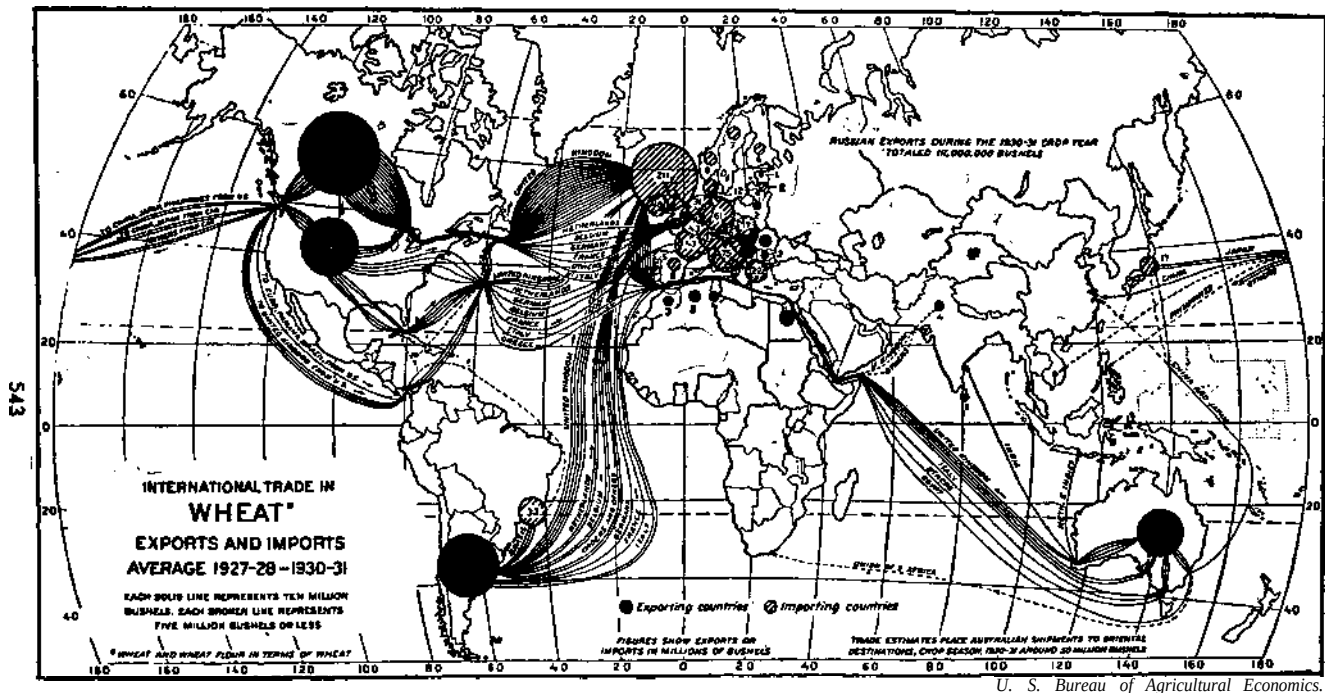
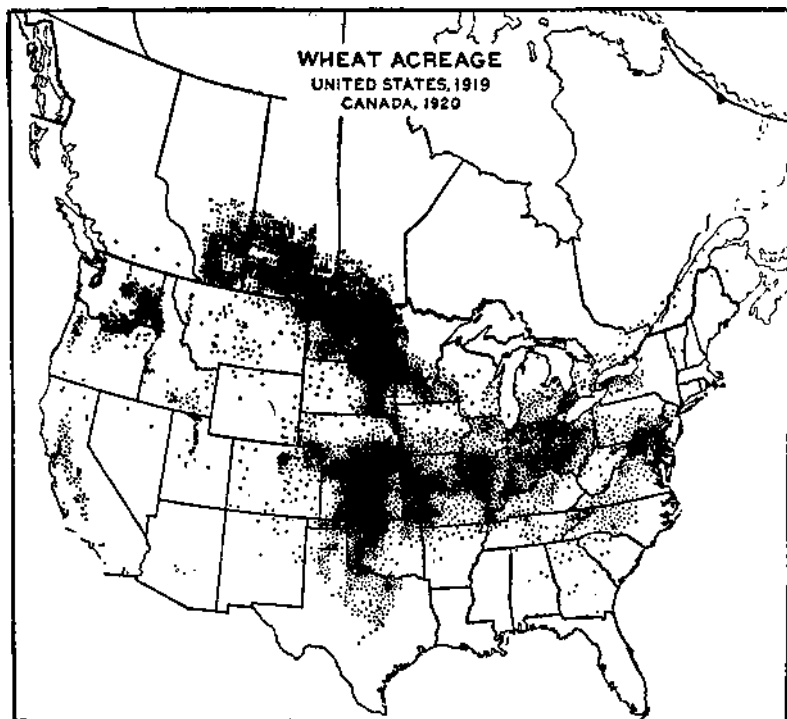


Fig. 181. International trade in wheat—imports and exports—1927-28-1930-31. Anglo-America has been the great exporter, western Europe the great purchaser. Canada, the world's largest exporter, normally accounts for 40 per cent of the world wheat exports, sending abroad about 75 per cent of its total production. The world market for wheat has been restricted in recent years by reason of the contraction in world trade, which in turn was consequent upon the economic depression and autarchy.



U. S. Bureau of Agricultural Economics.

Fig. 182. Wheat acreage in Anglo-America. Each dot represents 10,000 acres. Note the importance of the Hard Winter Wheat Belt and of the Spring Wheat Belt. Ninety-five per cent of Canada's wheat is of the spring variety and is grown in the Prairie Provinces. Wheat more than any other single product has been a vitalizing force in the material progress of the Dominion. Kansas is the leading wheat producer in the United States; in the central and western parts, nearly every farmer and businessman is dependent directly or indirectly upon the wheat crop for his livelihood.

183). The boundaries are determined primarily by climatic factors—rainfall and temperature. The eastern border is one of land occupancy, where corn, because it is more profitable, displaces wheat as the major crop. On the south the region terminates where wheat gives way to cotton. On the north cold winters and light snowfall make winter wheat-growing practically impossible. The western boundary, the least permanent, is set by drought and is the 15-inch isohyet in Kansas and the 19-inch in the Texas Panhandle. This boundary migrates westward and the wheat area expands when the rainfall is above average. When the rainfall is below average it migrates eastward and the wheat region shrinks.

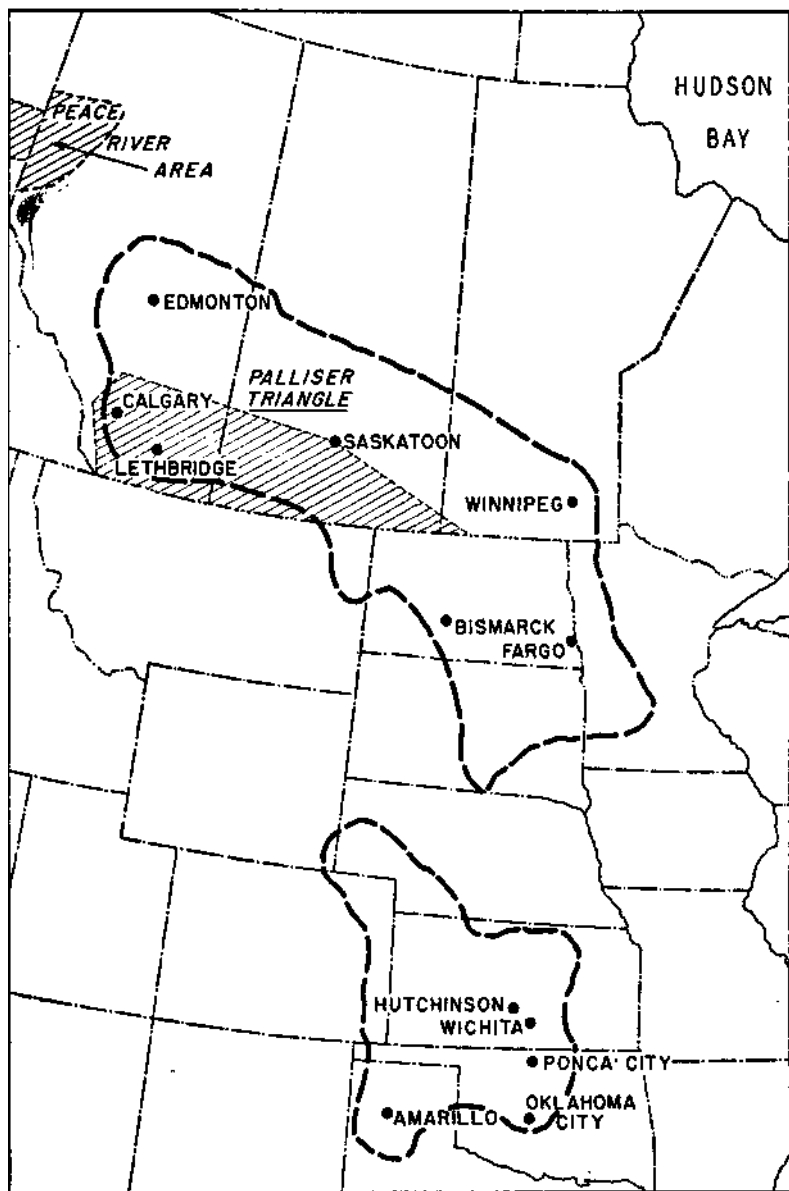


Fig. 183. Interior Grain Belts: a region of winter and spring wheat, grain sorghums, and livestock.

The land was originally "Indian country." Though the Amerinds were not at first mobile, they became so after acquiring horses introduced by the Spaniards. With the arrival of the white man, the Amerinds were dispossessed. Their game was killed off and cattle were introduced. After the era of the cattle man on the open range, that part of the Great Plains now included within the Hard Winter Wheat Belt was homesteaded.

The first farmers believed that country unable to grow trees could not be good for agriculture. They shunned the prairie as they migrated westward, and they clung to the woodlands and river bottoms. The eastern part of the Hard Winter Wheat Belt was originally tall-grass country. Once crops were grown successfully on the prairie, newcomers arrived in large numbers; but settlement on a large scale had to await the arrival of the railroad.

No part of the world before had been conquered so rapidly for agriculture; clearing was unnecessary. True prairie soils, however, were not successfully turned over until the advent of the steel plow.

Adjustment was difficult. The settler encountered extremes of temperature and variable rainfall. Except at the edge of the forest, firewood and logs for homes were scarce or procurable only on a distant river bank. Where timber was scarce or lacking, a house made of sod had to meet the immediate need. But even this called for some wood. From the aesthetic point of view, the sod house was bad, but it was warm in winter, cool in summer, and it cost practically nothing. In some areas even water was unobtainable at ordinary depths.

The westward movement was in full swing and soon pioneer farmers had pushed beyond the tall-grass into the short-grass country. Their failure to understand the significance of short- vs. tall-grass proved to be an important factor, for they soon learned that rainfall on the steppe was inadequate for most crops and that tragedy would be widespread. The steppe was to prove itself less desirable for agriculture than the prairie.

The natural environment

Climate in the Hard Winter Wheat Belt is continental, the precipitation ranging from 15 inches in the northwest to 35 in the southeast (Fig. 184). Moreover, it is variable—the variability exceeding 20 per cent in most areas. There are periods of dry years when the westerly margins become almost desertic. The growing season varies from about 130 days in the north to about

200 days in the south. Summers are terribly hot; the maximum temperature for a typical station (Alton in Osborne County, Kansas) is 121° F. and it is the maximum rather than the average which harms crops. Thus whereas temperature and growing season are adequate for most staple crops, the low rainfall, combined with hot dry winds, discourages the growth of most crops other than wheat. Along the western boundary, however, wheat gives way to pasture, and along the southwestern boundary to the grain sorghums. Even in west central Kansas the rainfall often is inadequate to grow wheat successfully. Moisture deficient for germination in the fall and during the growing season is a serious difficulty.

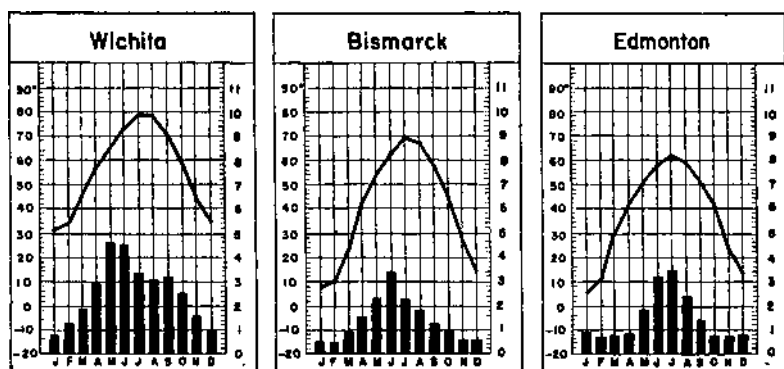


Fig. 184. Average monthly temperature and precipitation for Wichita, Bismarck, and Edmonton.

Windbreaks. Summer winds are so hot and dry and those of winter so biting and cold that nearly every farm needs and has a windbreak. A good one consists of tall trees, such as cottonwoods, in the center, and of short trees, such as hackberry and red cedar, on each side (Fig. 185). Windbreaks reduce the surface wind velocity 10 to 50 per cent for a distance thirty times the height of the trees.

Besides protecting farm gardens, which in recent years have attained real importance in this area where formerly only cereals were grown, windbreaks catch the drifting snow which, upon melting, contributes moisture for the gardens. They also prevent strong winds from blowing soil and they encourage wild life.

The topography is mostly level to rolling, the slight relief being attributable in large part to the almost horizontal strata and to peneplanation. The fact that 90 per cent of the subregion can

be farmed by labor-saving machinery indicates that there is little rugged or rough land, though there is some—the "Breaks"—in the valleys of the North and South Canadian rivers and along the eastern face of the Staked Plains in the Oklahoma and Texas panhandles.

The soils, among the most fertile in North America, are mostly chernozems, though black prairie soils characterize the eastern margin and chestnut soils the northwestern portion. Chernozems

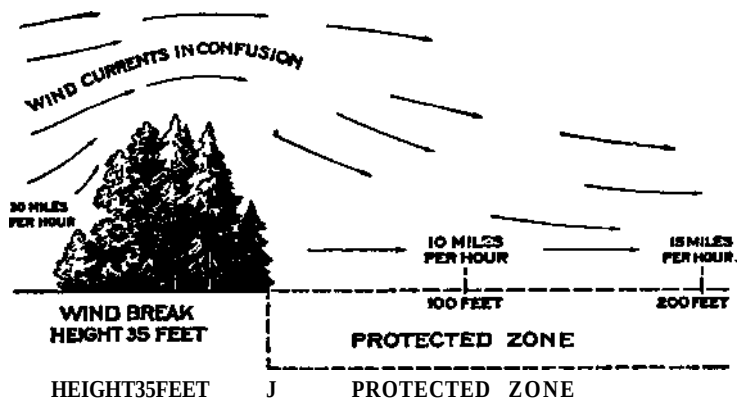


Fig. 185. Effect of a windbreak on wind velocity. U. S. Dept. of Agriculture. The primary purpose of a windbreak is to reduce the destructive effects of wind—to prevent soil from being blown away and to conserve moisture. Windbreaks also protect livestock in winter, furnish wood products for farm use, and provide shelter for wildlife, especially birds.

are probably the most fertile soils in the world. They have a *lime zone*, a layer of calcium carbonate, at two to five feet beneath the surface within reach of plant roots. Because of the scanty rainfall, these soils have not had the lime leached from them. As was brought out in Chapter XII, "The Agricultural Interior," the prairie soils are the best of the pedalfers and are nearly as fertile as the chernozems. Their fertility combined with greater rainfall makes them the most productive zonal soils in the world. In the chestnut-soil area the lime layer is nearer the surface (one to two feet), the rainfall is more uncertain, and the grass is shorter. Hence there is less humus than in the two types of grassland soils to the east.

Natural vegetation. Between the forests on the east and the mountains on the west lie the prairies and the steppe (Fig. 5). The prairie, whose grasses attain a height usually of one to three feet but occasionally as much as ten feet (Fig. 115A), characterizes areas with 20 to 25 inches of precipitation in the north and 35 to

40 inches in the south. Merging with it on the semi-arid fringe to the west is the steppe, composed of grasses of low stature (Fig. 115B) and characterizing areas with less than 20 inches of rainfall.

Errors made in settlement

It is always easy to see errors *after* they are made. Settlers coming into the area homesteaded quarter-sections, the amount permitted the head of a family in accordance with the Homestead Act of 1862. They ploughed up the grass on land never meant to be cultivated. They soon learned that they could not make a satisfactory living growing wheat on 160 acres, especially in the western margin. A family here needed more land than in humid regions where intensive methods were practicable. Accordingly thousands of families met disaster—losing their money, their labor, and finally even hope. They had gambled and had lost.

These lands here are . . . marginal lands—lands which have virtues, maybe, but which ain't good enough for farming. The soil is good, but there's not enough rain. . . . It sure beats hell with bread so cheap and meat so dear in the world, why people keep on breaking their hearts trying to raise bread on meat land. . . . The same weather that will cure grass will shrivel wheat. Why, I've seen good years for grass when the wheat didn't head out; I've seen years when money was made with cattle and horses when wheat didn't even come up.¹

In 1904 the Kincaid Act increased to 640 acres the amount that could be homesteaded in western Nebraska, and in 1909 the Enlarged Homestead Act established the 320-acre homestead over a large area. But even these enlarged homesteads, including those made possible by the Stock-raising Homestead Act of 1916, proved to be little more than gestures in the right direction. The great weakness of all these acts was that they did not fit conditions west of the 100th meridian—the 20-inch rainfall line. The desire for small farms within semi-arid Anglo-America was tenacious but untenable.

The Mennonite settlers of Kansas were a notable exception to these failures, for they brought with them from Russia drought-resisting varieties of wheat. Up to this time only the varieties adapted to the humid East had been grown.

Possibly the biggest mistake of all was made during the first World War when the price of wheat skyrocketed and it was every farmer's patriotic duty to feed the Allies and win the war. This meant growing wheat and more wheat. Millions of acres that had

¹ Horace Kramer, *Marginal Land*, p. 84. Philadelphia: J. B. Lippincott, 1939.

never been anything but grazing land were attacked with tractor-drawn plows and seeded with wheat. Improved machinery enabled large amounts of power per man to be employed in crop production. The increase in wheat acreage took place mostly as a western extension outside the so-called Winter Wheat Belt. The yield was favorable at first, for the soil was fertile, rains were plentiful, and there was much moisture in the subsoil—the accumulation of countless centuries. Farmers grew wheat year after year. Before long, however, the soil-binding quality of the humus became depleted by continuous cropping. Livestock were turned in to graze the poorly developed crop, and their hoofs pulverized the ground. Then in the spring of 1934 winds, mostly from the south and north, began to blow the soil. Great clouds of dust swept eastward from this land largely devoid of anchoring vegetation. Thus must the nation pay a high price for having grown wheat on grazing land. Yet that is what might be expected from a people who had inherited the deeply rooted idea that in America land was practically unlimited and soil inexhaustible.

The Dust Bowl at its greatest extent covered 16,000,000 acres. Here during the months December to May (the blow season), fine fertile soil particles were whisked hundreds of miles away, forming "black blizzards" (Fig. 186). The heavier particles remained as drifts and hummocks. Sand dunes attained heights of 20 feet. The atmosphere was choked with dust; in some areas people had to put cloth over their faces when going out of doors. The vegetation in the fields was coated and rendered inedible for cattle, and whole groups of counties became unlivable. As one refugee farmer put it: "Section after section dried up and blowed away." "Gone with the wind" was a reality here!

But the "Dust Bowl" has been shrinking—from 16,000,000 acres to a bare 800,000. The Kansas segment has almost completely disappeared. This shrinkage is due to greater and better-distributed rainfall, to the regressing of extensive areas, and to the soil-erosion preventive measures or new farming techniques of the Soil Conservation Service and other federal and state organizations. These new techniques, especially contour plowing and strip cropping, have been devised to utilize all the rain that falls.

The "Dust Bowl" has been one of the most uneconomic farming areas in all Anglo-America. The average farm—683 acres in the western or semi-arid part—should contain at least 1,000 acres. The drier and sandier portions of the "Dust Bowl" certainly should be returned to grass, as a means of controlling soil drifting. Grass more than anything else ties down the soil during the years of recur-

ring droughts. Efforts are being made to revive buffalo grass pastures in specific areas and to withdraw from cultivation all submarginal lands. "The plains [thus have been] the classic ground for last stands—bison, Indian, bad man, cowpuncher having in turn faced their final destiny there. And now the dry-farmer. . . ." (Fig. 187.)



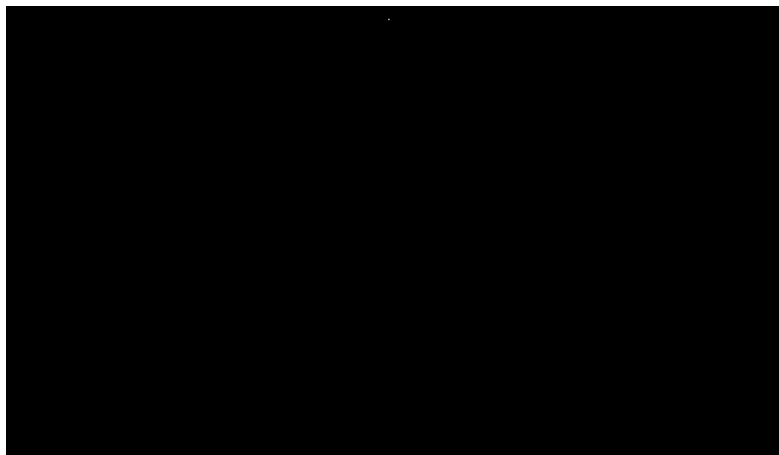
Photo by Rothstein. Farm Security Administration,

Fig. 186. A block blizzard rising over the Texas Panhandle, March, 1936. Dust frequently deprived the night of stars, and automobiles drove with headlights on in the middle of the day.

Hazards of wheat farming

Since the Hard Winter Wheat Belt practices a high degree of specialization, its farmers face two big problems: (1) will they get a crop, and (2) if they do, will they be able to sell it? The first depends upon physical hazards—blistering heat, inadequate precipitation, hail, heavy rain, freezing and thawing without a snow covering, a grasshopper or Hessian fly invasion, rust or smut. **If one or more of** these occurs, the yield is usually reduced. The an-

swer to the second question depends upon world conditions, since the price farmers receive, at home or abroad, fluctuates with world wheat prices. Thus the price in England dropped from \$2.28 in 1917 to 52 cents (expressed in gold) in 1932-33, the lowest crop-year average price in more than half a century and probably the



Farm Security Administration,

Fig. 187. "Gone with the wind"—farmer and sons walking in the face of a dust storm in Cimarron County, Oklahoma. Sustained heat and drought had so desiccated the vegetative cover that the topsoil—sand or loam—was ready for an aerial journey.

lowest in more than three centuries.² The minimum price at which "contract" wheat (wheat deliverable on futures contracts under the regulations of the Chicago Board of Trade) has been sold at Chicago since the War Between the States was on December 27,

² For yearly prices of wheat in England, 1259 to 1921, see *United States Agricultural Yearbook*, 1922, pp. 605-606.

1932, when the price fell to 44½ cents per bushel. The lowest average *farm price* for wheat in Saskatchewan (Spring Wheat Belt, not Winter Wheat Belt) between 1920 and 1938 was 35 cents in 1932. The farm price of wheat, however, excludes certain fixed charges of about 20 cents a bushel for freight, elevator handling, inspection and grading, commissions, and so on. The lot of the American winter wheat farmer, however, is better than that of the Canadian spring wheat farmer, for he at least has a large home market. Yet from 1929 to 1934 before the New Deal's machinery became well oiled and farmers were paid not to grow wheat, his plight was exceedingly bad.

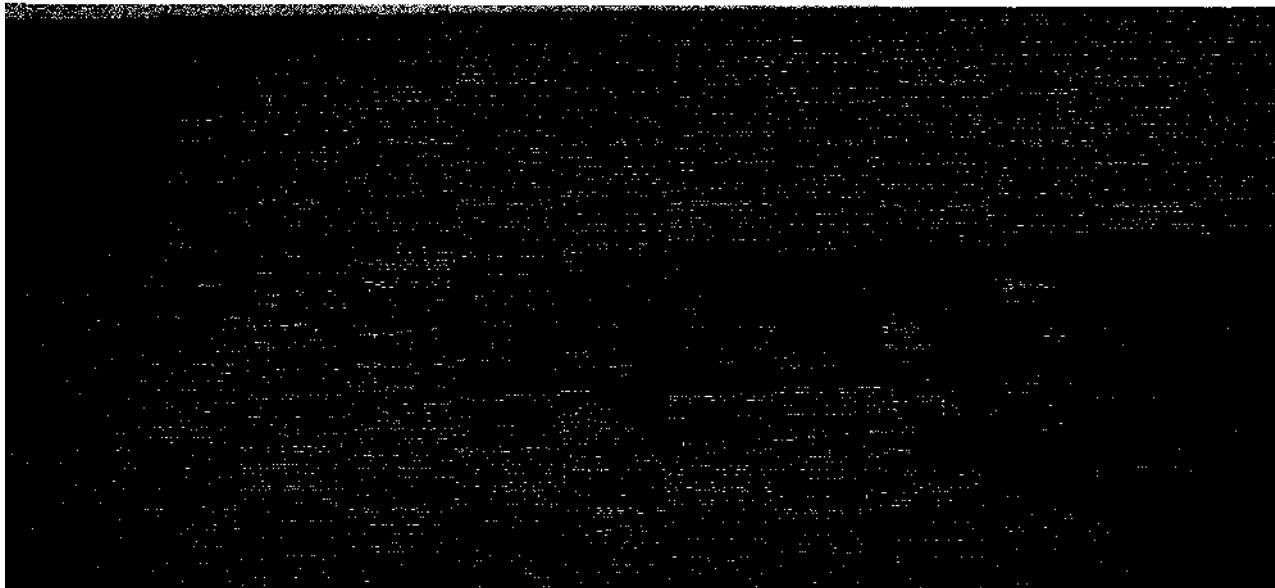
A typical wheat farm

The typical farm in the Hard Winter Wheat Belt is large (Fig. 188)—it has to be. The size is greater in the western than in the eastern part. In central Kansas, the heart of the area, farms vary from 300 to 400 acres. Many farmsteads have windbreaks on their windward sides, and these are conspicuous features of the landscape. Windbreaks offer, among other advantages, protection from the cold, dry northwest winds of winter and the hot southwest winds of summer.

Most of the land in crops is in wheat, though grain sorghums are probably more important on those farms in the southwestern part of the area. One may look in any direction and see little else in the fields than wheat (Fig. 188). Actually only about a quarter of the land is in such crops as grain sorghums, alfalfa, and barley. Alfalfa and sorghums remove so much water from the subsoil that they cannot be grown continually on the same land.

Systems of farming

It has been pointed out that *commercially* this is a one-crop area dominated by wheat. The heaviest concentration is in central southwestern Kansas and in northwestern Oklahoma, where the cereal is grown on a large scale. Drought-resisting grain sorghums, introduced from semi-arid parts of Africa, have grown in importance in the southwestern segment of the Hard Winter Wheat Belt (Fig. 189), where they are being used for fodder and recently as binder crops in strip and terrace cultivation. In drought years they produce a partial crop for feed and cover, whereas wheat withers and dies. Grain sorghums have been known to yield a crop on as little as 10 inches of annual rainfall. Moreover, the stubble stands erect against the wind, thereby reducing erosion. Since the



International Harvester Co.

Fig 188 Harvesting in the Hard Winter Wheat Belt. The harvesting of wheat has developed from the sickle and scythe through the reaper and self-binder to the combine—a huge machine which harvests and threshes in one operation. The growing of wheat once was an intensive form of agriculture with yield per man as the criterion; now it is an extensive form with yield per acre as the criterion. Here twelve 16-foot harvester-threshers are cutting a swath 192 feet wide—640 acres per day. These machines reduce the cost of harvesting and normally enable the grower to make a profit even when the price of wheat is low. Such machines were first used here about 1917.

sorghums require much heat, they become less important north of the Arkansas Valley.

All systems of farming wherever followed show man's attempt to obtain maximum returns from the land. Of America's five leading crops—cotton, corn, oats, hay, and wheat—only the last is impor-

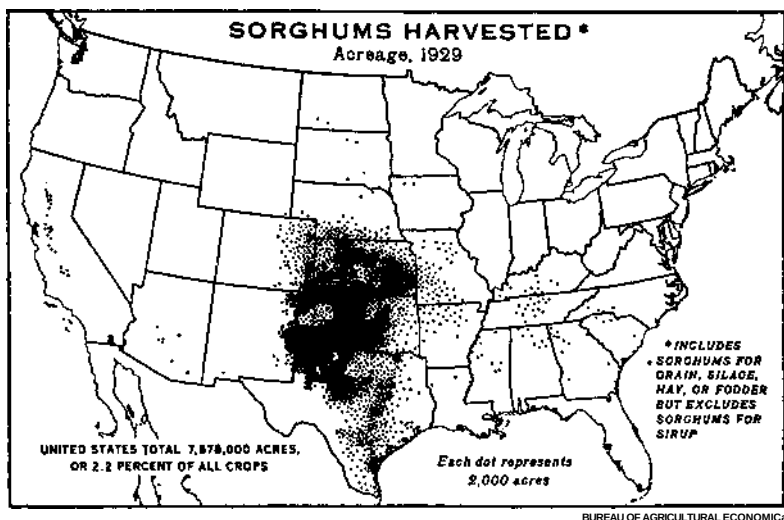


Fig. 189. Distribution of grain sorghums in the United States. In lands too dry for corn, farmers turn to the grain sorghums for forage feed. The stalks and leaves supply roughage while the grain compares favorably with corn in feeding value. The grain sorghums, because of the fibrous root system, are a fine crop in areas susceptible to blowing. In the worst parts of the Dust Bowl, seeding of alternate strips of wheat* and sorghum, 100 to 200 feet wide, ended all soil blowing.

tant here. Accordingly, farmers build up their systems of farming around wheat. The best ones diversify, producing feed crops for livestock on part of the acreage. Diversification gives employment throughout the year, brings in constant returns, and maintains the fertility of the soil. Rotation in the eastern and central parts of the Hard Winter Wheat Belt includes alfalfa, sorghum, corn (on the better lands), oats or barley,³ and wheat, in this order, and invariably results in higher yields.³ Alfalfa should be followed by a crop which can endure drought, since it (alfalfa) leaves the subsoil dry and induces excessive vegetative growth, which is easily damaged by hot winds and drought. Rotations are more difficult and

³ S. C. Salmon and R. I. Throckmorton, *Wheat Production in Kansas*, Bulletin 248, Agricultural Experiment Station, Manhattan, Kansas, July 1929, p. 14.

less satisfactory in the western part of the subregion, for here wheat may be grown for a longer period on the same land without suffering losses in yield, and fewer other crops can be raised. The best rotation consists of one year each of a grain sorghum, preferably kafir or milo, and fallow, followed by two or three years of wheat. This system is worthwhile because (1) fallow is a rather satisfactory insurance against a total loss of the wheat crop, and (2) sorghum and wheat seldom fail in the same year.⁴ Where wheat is the only crop, probably the best system consists of one year of fallow and two or three years of wheat. About one third or one fourth of the acreage intended for wheat should be fallowed. When land is in fallow, it is cultivated but not sown. Weeds are thus controlled and moisture is conserved. Care must be taken not to pulverize the soil, for a surface of clods absorbs water more effectively than a surface of mulch and is less given to blowing. Fallowing is advantageous because it increases yields and, since the land is prepared before harvest—a slack period—it better equalizes the seasonal distribution of labor.

Pasture. In the semi-arid parts, four to seven times as much land is in pasture (mostly short grass), as in crops. The monetary return from an acre of pasture is much less, however, than that from an acre in wheat. Pasture is used primarily for grazing beef cattle.

Livestock. Despite the fact that wheat is the dominant farm enterprise in the Hard Winter Wheat Belt, beef cattle are very important, with more than 90 per cent of the farms keeping them. Moreover, the area is one of the nation's principal beef-cattle producers—ranking second only to the Corn Belt in number of head per square mile.

Varieties of wheat

Hard wheat is a variety having more "strength" than *soft wheat*. The same amount of hard wheat will produce a larger loaf and will stand more severe treatment in mechanical mixers. It is more desirable for bread, though less desirable for hot biscuits and pastries. Other advantages of hard wheat are that it usually brings a higher price and it is more productive.

The leading varieties of hard wheat are Turkey, Blackhull, and Kanred, which together constitute about nine tenths of the acreage. They are all high-quality wheats and are admirably suited to the subregion: they are not easily winter-killed, they are early-ma-

⁴ *Ibid.*, p. 16.

turing (and so avoid hot winds, drought, and rust), they have stiff straw, and are resistant to plant diseases and insects.

Turkey, including *Kharkof*, was brought to Kansas by Mennonites in 1873. In 1919 it comprised 99.4 per cent of the total acreage of hard red winter wheat, but by 1934 it had fallen to 56.7 per cent.⁵ Nevertheless it still is the leading variety.

Blackhull was developed in 1912 by selection from *Turkey*, which had been imported from Russia. It ranks next to *Turkey* in acreage. This variety is limited largely to south-central and south-western Kansas, western Oklahoma, and the northern Panhandle of Texas because of its lack of winter hardiness. *Blackhull's* advantages are a coarser, stiffer straw than other hard wheats, an earlier spring ripening period, and a higher test weight. Its chief disadvantage is that it is softer and hence millers object to it.

Kanred (contraction of Kansas Red) was first produced in 1906 by the Kansas Agricultural Experiment Station from Crimean, one of the *Turkey* types imported from southern Russia. It is said to be better adapted than its competitors to a larger part of the Hard Winter Wheat Belt. It develops earlier, is slightly more winter-resistant, and is remarkably rust-repelling. It comprised 11 per cent of the hard red winter wheat acreage in 1934.

Harvesting problems

To equalize the seasonal distribution of labor is difficult anywhere but particularly in a one-crop region. In the early days of wheat growing here, labor was scarce, especially during harvest. Accordingly migratory workers—lumberjacks, hoboes, and college students—tempted by substantial wages and a relatively short working period, poured into the area. They went first to the Texas Panhandle and Oklahoma, where the harvest begins in early June, and moved northward at the rate of about 100 miles a week. They arrived in Nebraska in early July and in the Dakotas in August. Some of them even went as far north as the Prairie Provinces of Canada, where the harvest begins in September. Such labor was expensive, but when the kernels are ripe, wheat must be harvested, threshed, and put under cover before rain falls. The upward trend of wheat prices from 1896 to 1920 was terminated by the close of the first World War. Falling prices necessitated a saving in cost of production, and machinery, especially the combine, was the

⁵ J. A. Clark and K. S. Quisenberry, *Distribution of the Varieties and Classes of Wheat in the United States in 1934*, United States Department of Agriculture Circular No. 424, April 1937, p. 45.

solution (Fig. 188). Thus today a farmer, by economizing on the expensive factor—labor—and making the most of his cheap factor—land—does as much work as did three a century ago. Having reduced by more than one half the per acre cost with only one fourth the man-power, combines have been a potent factor in increasing the size of farms and in opening up to wheat growing those lands near the southwestern border of the area.

Transportation

Since the population in this region is so small and wheat production is so great, the bulk of the crop is shipped elsewhere. Accordingly wheat regions must have good transport facilities (Fig. 208). The crop is first carried by wagon or truck from the farm to one of the many small country elevators distributed throughout the wheat belt alongside the railroads. From there it goes by rail to some large primary market.

Getting the grain to elevators before rains set in has long been a major problem necessitating the bringing in of freight cars by the tens of thousands.

The magnitude of this movement is indicated by the maximum shipments for 3-day periods during a period of peak movement. Maximum receipts of grain at Kansas City for the 3-day period July 3-5, 1941, were 3,698 cars; at Wichita, July 8-10, 812 cars; at Hutchinson, July 10-12, 1,541 cars; at Salina, July 3-5, 613 cars; at Enid, June 18-20, 1,089 cars.

Daily receipts during the peak movement of June 15 to August 1 are shown in Table IV.

TABLE IV
DAILY CARLOAD RECEIPTS OF WHEAT IN SELECTED CENTERS
DURING PEAK MOVEMENT (1941)

Date		Kansas City, Missouri	Wichita, Kansas	Hutchinson, Kansas	Salina, Kansas	Enid, Oklahoma
June	15.		.85	133	39	
	16.		.38	53	23	
	17.		.62	119	45	227
	18.		.90	104	80	396
	19.		.167	174	92	313
	20.		.210	169	141	380
	22.	.1236	450	346	385	580
	23.	610	260	185	213	387
	24.	616	305	217	209	281
	25.	.853	225	168	176	247
	26.	.835	124	114	156	202
	27.	.742	240	180	154	213

<i>Date</i>		<i>Missouri Kansas City,</i>	<i>Kansas Wichita,</i>	<i>Kansas Hutchinson,</i>	<i>Kansas Salina,</i>	<i>Oklahoma Enid,</i>
	28	1669	294	275	358	357
	29					
	30	466	160	263	165	.232
July	1	848	253	304	200	256
	2	1031	134	427	180	200
	3	1809	304	542	293	339
	4					
	5	1889	409	639	320	243
	6					
	7	755	248	227	113	158
	8	910	304	301	155	214
	9	1208	275	410	143	216
	10	1110	233	590	182	176
	11	925	251	428	114	131
	12	1377	370	523	184	326
	13					
	14	403	181	132	53	71
	15	333	124	160	44	199
	16	303	168	128	50	
	17	247	114	200	57	
	18	296	104	202	75	
	19	502				
	20					
	21	221				
	22	200				
	23	307				
	24	353				
	25	348				
	26	603				
	27					
	28	148				
	29					
	30	201				
	31	273				
	31	258				
August	1	184				

Milling

Between 1855 and 1870, flour mills of three types evolved:

1. *Custom Drills*, which ground the farmer's grain, making a definite charge per barrel.

2. *Exchange mills*, which exchanged flour already ground for wheat. The farmer usually got about 25 to 30 pounds of flour for a bushel of wheat. Most of the mills were of this type prior to 1870 and were largely a response to the extremely bad and often impassable roads of winter.

3. *Merchant mills*, which bought the grain and sold the flour and by-products outright. The roller process of milling sounded the

death knell of the small mill. Today nearly all, if not all, are of the merchant type—either (a) *interior*, which mill flour for the local market, or (b) *terminal*, which mill flour for distant markets, including those in foreign countries. Until recently about 20 per cent of the flour of Kansas was exported.

Prior to 1892 the bulk of the Hard Winter Wheat Belt's grain was shipped to the ultimate market for milling, since "freight rates were so regulated that wheat could be shipped more cheaply than flour." Some milling took place within the area but it was mostly confined to the eastern part, to the larger cities, and to the transportation terminals. To a certain extent this is still true. The dominant centers today in the Hard Winter Wheat Belt are Wichita (strategically located for this industry), Salina, Topeka, Hutchinson, and Oklahoma City.

Mining

The Hard Winter Wheat Belt ranks high in mineral output—the three states comprising most of it ranking among the first seven in output—Texas first, Oklahoma fourth, and Kansas seventh.⁶ In each petroleum predominates, followed by natural gas.

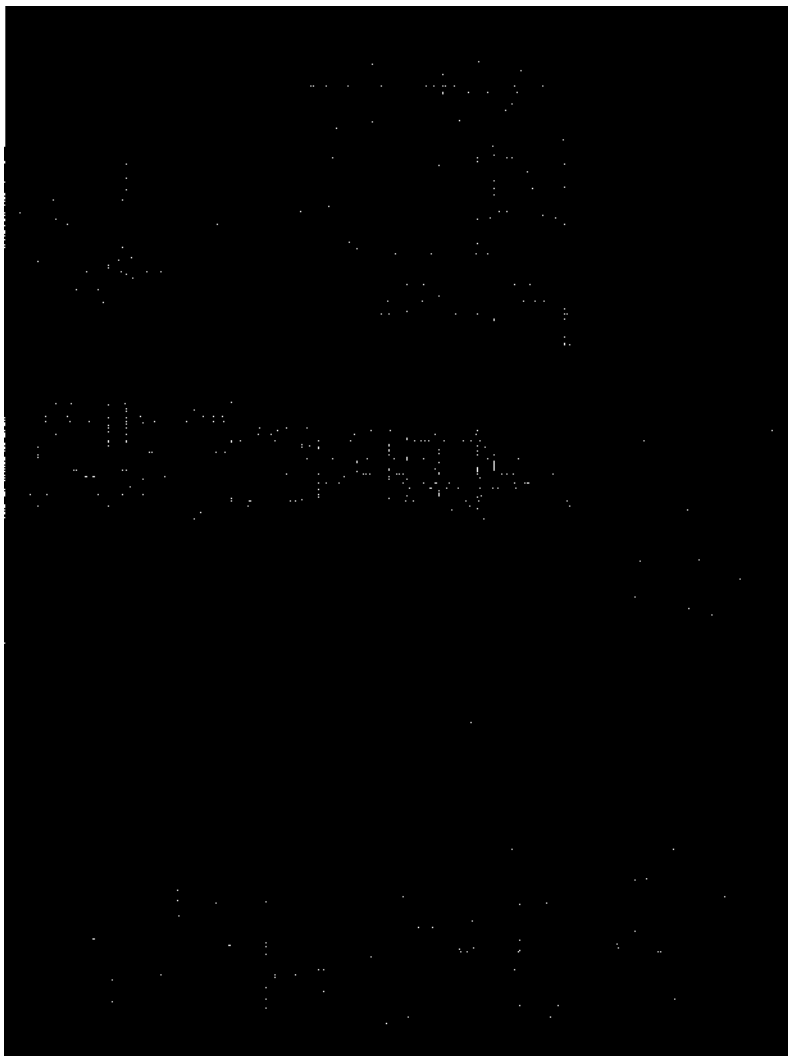
As the mineral industry increases in importance, the region, the individual states, and the local communities become better off, for in the past too great dependence was placed upon agriculture, especially on wheat. Other minerals of commercial importance are stone, sand, clay, and salt.

Cities

Cities are few in the Hard Winter Wheat Belt, every place sharing with every other place the advantages and disadvantages of the whole area. The sparse population and the unimportance of manufacturing, except for local markets, are further deterrent factors. The few cities and towns are widely spaced, owing their existence more to railroads than to anything else.

Oklahoma City (221,229), on the north fork of the Canadian River, is a crossroads city and the largest urban center in the area. Although near the southern boundary of the subregion, Oklahoma City is definitely of the Hard Winter Wheat Belt. It is an important transportation and trade center. Northward and westward stretch interminable fields of wheat, southward the

⁶ K. K. Landes and O. R. Bingham, *Resource-Full Kansas*, p. 1. Lawrence: University of Kansas, 1940.



Oklahoma City Chamber of Commerce.

Fig. 190. Oil derricks on capitol grounds, Oklahoma City. This photograph shows as no word picture could the nature of oil—"its mobility!" Because oil was proved to exist on adjacent property, the state leased its land in self-protection and accordingly derives a substantial income from the operations. Ultimately the wells will become exhausted and will be abandoned. There will be no scars, however, and no one will be able to tell that the building was once surrounded by oil wells.

world's greatest cotton fields, and northeastward lands productive of minerals and cattle.

It is a youthful city and one that is growing fast. Though it got its start from cattle and wheat, the city's present importance and size **derives from location** in the heart of the Mid-Continent Oil and Gas Province. In fact, one of the nation's major producing fields lies within the heart of the city, some of the wells being on the grounds of the state capitol (Fig. 190). Its industries—petroleum-refining, flour-milling, cotton-seed oil extracting, and meat-packing—reflect the city's close relation to the ranch, the range, the oil field, and the mine.

Wichita (127,308), in some respects the economic capital of the Hard Winter Wheat Belt, lies at the junction of the Arkansas and Little Arkansas rivers. In the early days it was on one of the famous cattle trails which had been beaten hard by the hundreds of thousands of northward-moving Texas steers. By 1880 this trail had been criss-crossed with barriers of barbed wire, and shortly thereafter *Wichita* ceased to be an important cattle center.⁷ Wheat ranches soon dominated former grazing lands and *Wichita* became a great trade and milling center. During the rush of harvest in the early days, wheat-laden wagons in lines 10 blocks long stood on the street for 36 hours waiting to be weighed and emptied at mills.

Towns like *Wichita* that became agricultural centers were entirely different from those that remained cattle towns. "Where cattle had built dance halls and gambling houses, wheat built churches and schools."⁸ The most unique street in the city is called "Tractor Row"—so named because it is devoted exclusively to dealers handling tractors and other farm power equipment.

Wichita ranks fourth nationally as a milling center and sixth as an interior market for grain. It is also a leading meat-packing center. Other industries include the manufacture of leather products, agricultural machinery, airplanes, and oil-field equipment.

Salina (21,073), in the heart of the hard-wheat country, is the metropolis of central Kansas. On Saturday nights large numbers of farmers crowd the sidewalks. With five mills, *Salina* is the third most important flour-milling center of Kansas and the fifth of the United States. It has storage facilities for 7 million bushels of wheat. The city makes flour-mill machinery, gravity pumps, agricultural implements, cement, and clay products. *Salina* is within 40 miles of two important oil fields.

⁷Federal Writers Project, *Kansas*, p. 297. New York: Viking Press, 1939.
⁸6w*, p. 298.

Hutchinson (30,013), on the north bend of the Arkansas **River** in south-central Kansas, lies in the heart of the most concentrated wheat-growing section of this region. It became an important milling center when it was learned that Turkey Red wheat was particularly suitable to the immediate tributary area. It also is an important elevator town, with storage facilities for 10 million bushels of wheat.

Hutchinson is also one of the country's leading producers of salt, and it lies strategically with respect to oil and natural gas fields.

Dodge City (8,487), on the Arkansas River in the heart of the short-grass country, is the metropolis for southwest Kansas. It is well located in one of the greatest wheat-producing areas in the world; hence Dodge City has important facilities for distributing agricultural implements and machinery and for transporting grain.

In the early days it was the center for shipping buffalo hides. Millions of bison grazed in Dodge City's tributary hunting territory. This era was short-lived, however, since the herds were practically exterminated by 1875. Then followed the cattle industry and Dodge City, midway between the breeding grounds of Texas and the feeding grounds of the north, became an important "cow town." Cattle came northward over the Texas Trail to Dodge City and were shipped east for fattening and slaughtering, and herds en route to grazing lands of the central Northwest were rested here.

To stamp out Texas fever, the Kansas legislature in 1884 prohibited the importation of Texas cattle between March 1 and September 1. This action sounded the death-knell of the cattle industry. Dodge City, one of the most colorful towns of the plains, is no longer of major importance.

Enid (28,081), in the heart of the Oklahoma portion of the Winter Wheat Belt and in the great Midcontinent Oil Province, is one of the leading cities of Oklahoma and of the area. It ranks very high nationally in oil-refining.

Amarillo (53,463), in the Texas Panhandle, is an important market center for an extensive area. Though its trade territory includes many large cattle ranches and wheat farms, its recent development has resulted from oil and gas. The large gas field near by in a region of sparse population has caused Amarillo to be a major distribution center for that product to urban centers in the Northwest, North, and Northeast. The world's chief supply of helium is made from the gas of this field. Amarillo's industries include oil-refining, flour-milling, meat-packing, and zinc-smelting.

Ponca City (16,794), in the north-central part of Oklahoma, is

a typical oil center whose economic life is focused around the \$13,-000,000 refinery and tank farm of the Continental Oil Company.

Political unrest

Lying astride the great climatic frontier between the arid West and the humid East, but belonging strictly to neither, the Hard Winter Wheat Belt has time and again faced a situation assuming the aspects of a regional calamity. Much of the soil in this region never should have been cultivated, and possibly none of it by the methods used on forested lands. As a result of plowing in the ordinary way and "leaving the surface smooth during periods of drought or near-drought, the surface soil began to blow." Especially was this severe during the 1880's and 1930's. After each serious drought there followed troubles—struggle and abandonment of thousands of farms. It has been pointed out that man has not yet adapted his system of farming satisfactorily to this subregion. The Hard Winter Wheat Belt accordingly became a problem area. Discouragement, failure, and social and political discontent followed. Those who remained, unable to do anything for themselves, called upon the government for aid as their passions became aroused—passions known collectively in politics as "sectionalism." Their representatives in Washington represent this region and its problems rather than a political system. The plight of a large part of the population, along with its insistence for help, has induced the federal government to spend millions of dollars trying to improve economic conditions here. The farmers themselves, however, especially in the western margin, go farther and ask "why the government doesn't somehow manage to raise the price of wheat."

The outlook

In the foregoing pages of this chapter it was pointed out that in the Hard Winter Wheat Belt crops frequently were burned up by hot winds, eaten by grasshoppers, and destroyed by rust; that a large proportion of the farmers in the early 1930's watched their livelihoods blowing away into the sky; that many farmers went bankrupt; that mortgages were foreclosed in very large numbers; that wholesale migration occurred; and that there was almost universal discontent among those who remained on the land.

Perhaps the Hard Winter Wheat Belt will shrink in size, the shrinkage taking place along the western and southwestern margin—the part that possibly should have been left in grass. Perhaps the area, despite its rather sparse population, is actually over-

populated, considering the character of the land. On the other hand, science and technology may triumph, ultimately turning this area of uncertain and undependable wheat production into one of dependability.

Gradually, as the impossible load of debt, mostly accumulated during the 'twenties, may be lifted, the size of farms increased, the soil unsuitable for crops returned to grass, and proper methods of cultivation developed, this area can come to a stable agriculture.

Spring Wheat Subregion

The Spring Wheat Subregion lies both in Canada and the United States (Fig. 183). There is, of course, no sharp contrast in the natural environment north and south of the border. Few persons would know whether they were in Canadian or American wheat country were signs bearing *Ltd.* or *Inc.* absent. Most northerly of the wheat-growing areas, but detached from the main part of the Spring Wheat Belt by high land and by low temperatures, is the Peace River Country. Natural phenomena bound the Spring Wheat Belt on all sides: on the east, the largely non-agricultural Laurentian Shield, which covers all of northern Manitoba and a strip south and east of Lake Winnipeg; on the north, an average temperature for June, July, and August of 57° F. or less, and a growing season too short for wheat to mature; on the south winters too cold for winter wheat and summers too hot and humid for spring wheat; and on the west, the Rockies in Canada and inadequate and uncertain rainfall in the Dakotas and Montana.

The natural environment

Climate within the Spring Wheat Belt varies from sub-humid to semi-arid. The precipitation is about 13 to 15 inches in the west, 15 to 16 inches along the northern border in Canada, and 22 in northwestern Manitoba. This is a surprisingly small amount for so important an agricultural region. More significant, however, than the amount of rainfall is the seasonal distribution. Forty to 50 per cent of the precipitation falls in the three summer months, June, July, and August, greatly favoring the growth of wheat and other small grains. September, the principal harvest month, receives less than May.

Winters are bitterly cold and dry, and therefore very hard on

⁹ Charles E. Kellogg, *The Soils That Support Us*, p. 119. New York: The Macmillan Co., 1941.

perennial products such as tame hay and fruit trees. Winter wheat cannot be safely grown. The differences in temperature between winter and summer are so great as to give this region the distinction of having the greatest range (170 degrees) of any region in North America. The July temperature along the northern margin averages 63°, and along the southern, 60° to 70°; the January temperature averages -10° along the northern margin and 10° to 20° above zero along the southern. Temperatures as low as -60° and as high as 110° (105° in the Canadian segment) have been recorded in the Spring Wheat Belt.

The growing season varies from 120 days in Montana to 140 in South Dakota and 90 to 100 in Canada. Sometimes in Canada frost precedes the harvest and snow falls before the wheat is ripe. Generally speaking, however, the crop may be harvested in three out of every four years.

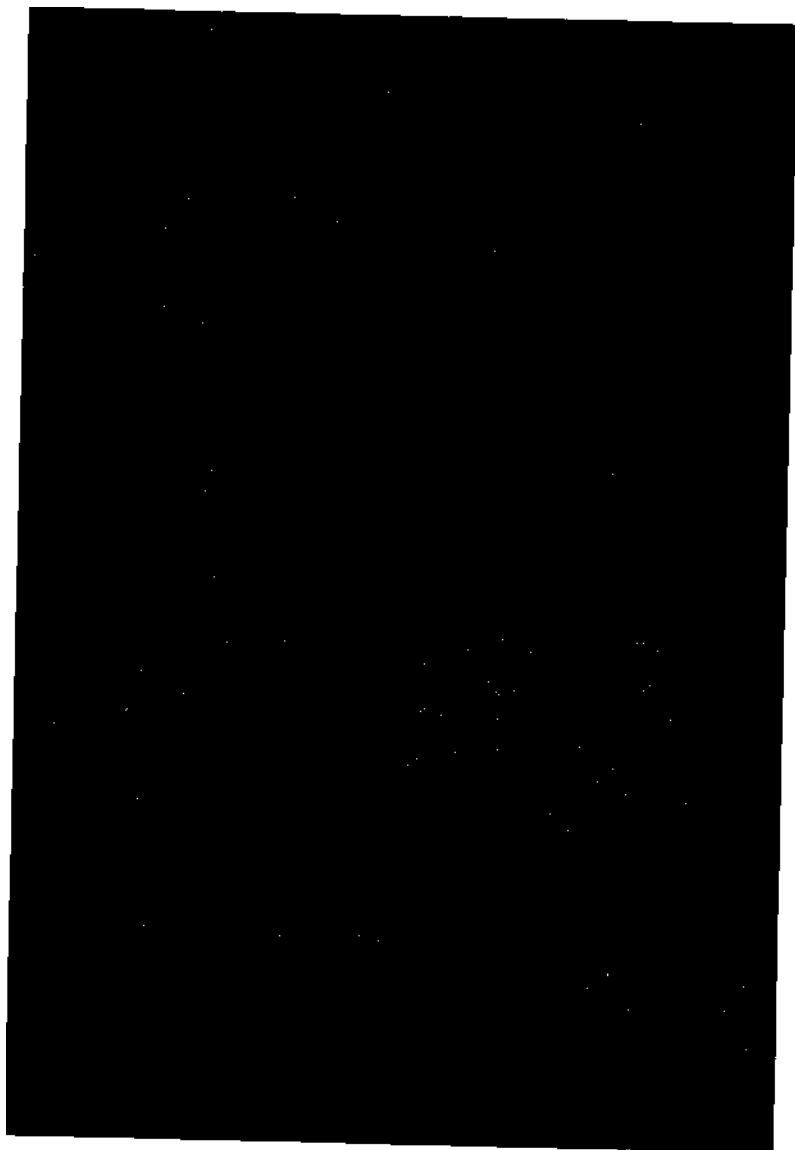
Topography. The land here is mostly plain, considerably dissected in the semi-arid section. In the sub-humid part, nearly all the land is level to gently rolling and hence is arable. In the semi-arid part, however, many of the streams have cut deep valleys and there is much "bad land" terrain. Accordingly there is considerable non-arable land here.

Much of this area was once the bottom of shallow, glacial Lake Agassiz, which is reputed to have been as large as or larger than the combined area of all the Great Lakes today. Lake Agassiz came into existence when the continental ice sheet covered the country north of the present Lake Winnipeg, thereby forming a natural dam across the Red River of the North. A lake resulted which covered the land in front of the glacier until it overflowed to the south via the Minnesota and Mississippi rivers. When the ice retreated, the lake drained away, leaving an extensive plain. So level is much of it that a farmer can plow "league-long furrows in straight lines."

The soils here resemble closely those in the Hard Winter Wheat Belt to the south (Fig. 7). Along the forest margin, the layer of lime accumulation appears at a depth of four or five feet; half-way across the sub-humid prairie, at two to three feet (Fig. 191); where the prairie and steppe overlap, at 18 inches; at the desert edge, 6 to 9 inches.

The soils consist of black or nearly black soils in the sub-humid part (except where there is forest vegetation), chocolate brown along the margin of the semi-arid portion, medium brown in the middle of the semi-arid belt, and light brown along the desert edge.

These soils, derived largely from limestone and shale and altered



U. S. Soil Conservation Service,

Fig. 191. Profile of a mature soil in the North Dakota portion of the Spring **Wheat Belt**. This very fine sandy loam shows a fairly deep dark surface soil, brownish **upper horizon**, and a light gray zone of lime enrichment in the lower horizon.

during the ice invasion, are mostly fertile. The closed winter and light winter precipitation prevent leaching at this season and vegetation exerts a similar influence during summer. Moreover, decaying grass roots have added much humus. According to O. E. Baker, only the central and western Corn Belt among North America's regions has better soils.¹⁰ Not all soils throughout the region are equally good, since considerable areas possess types ill-suited to wheat or any other cereal. Thus in southern Saskatchewan, within a radius of 20 miles, occur the provinces's most productive lands as well as those that may have to be abandoned for crops.¹¹

A very close correlation exists between the distribution and density of population and soil types. Thus the population is densest on the excellent black soils which lie north and northeast of the brown soils. It is relatively sparse on the brown soils (many of which are submarginal) of the open semi-arid treeless plains which extend from as far north as Edmonton, to southwestern Saskatchewan and southern Alberta and on across the border into adjacent parts of the United States.¹²

Though the quality of wheat is little influenced by soil, the crop, for successful production, requires better soils than any other small grain.

The natural vegetation is practically identical with that of the Hard Winter Wheat Belt except that there is a "park area" where bluffs of poplar and willow are interspersed with the heavy growth of grass in the northeastern portion in Canada. It is upon the basis of vegetation that the belt is divided into two parts: (1) one covered with tall grass (sub-humid) and (2) one clothed with short-grass sod (semi-arid). The two types are separated by an annual precipitation of about 15 inches in Canada, 17 inches in central North Dakota, and 20 inches in east central South Dakota.

The occurance

The lands included in the Spring Wheat Subregion were originally inhabited by Amerinds who carried on some farming in the more favored spots but depended mostly upon the hunting of buffalo for a living. The Hudson's Bay Company later controlled the area.

¹⁰ O. E. Baker, "Agricultural Regions of North America, Part VI; The Spring Wheat Region," *Economic Geography*, Vol. IV, October 1928, p. 412.

¹¹ J. G. Taggart, "The Maintenance of Dry Land Farming in the Southern Prairies," *Canadian Society of Technical Agriculturists Review*, September 1935, p. 332.

¹² W. J. Waines, *Prairie Population Possibilities: A Study Prepared for the Roy al Commission on Dominion-Provincial Relations*, Ottawa: 1939.

No fairer record in dealing with Amerinds exists than that of the Hudson's Bay Company, which remained clear of major conflicts for more than two centuries.¹³

The Dominion of Canada in 1870 took over the territories which the Hudson's Bay Company held by Royal Charter. The settlers had to learn by trial and error the agricultural possibilities of their country. It was known that the climate was dry, that the soil was fertile, that there were few obstacles to cultivation, since neither stumping nor stoning was required, and that crops might suffer from late spring and early summer frosts; but it was not known how variable the rainfall would be from year to year.

Settlement in the real sense did not begin until steel rails made their way across the continent. The Canadian prairie was settled long after its American counterpart—the lag being due to the dearth of wagon trails across the sterile Laurentian Shield.

As a result of natural barriers, the older settled province of Canada appeared to have reached its limit of agricultural expansion even before Confederation. The so-called "Northwest" offered the only possible outlet to the area hemmed in by the Great Lakes on the west and the Laurentian Shield on the north. As late as 1870 the Northwest area contained a scanty population, all but a handful being half-breeds. Settlement was limited largely to the shadows of the trading posts.¹⁴ The Canadian Pacific Railway which became the great colonizer, did not span Canada from the Atlantic to the Pacific until 1885. "What the birch canoe was to the fur-trader, the railway is to the farmer of Western Canada."¹⁵ To speed up settlement, agents were sent out. They enticed settlers by promising them free land. The railway here did not follow population; instead population followed it.

Sometimes the railway jutted out into the unsettled districts in anticipation of the farmer who was to come; sometimes the pioneer built his sod hut on the lonely plain in the confident assurance that the railway would soon follow. But regardless of whether railway or settler led the way at the moment, there would have been little permanent settlement without the railway, actual or potential. The railway was one of the prime factors in the growth of that vast region.¹⁶

¹³ A. S. Morton and C. Martin, *History of Prairie Settlement and "Dominion Lands" Policy*, Vol. II of *Canadian Frontiers of Settlement*, pp. 209-210. Toronto: The Macmillan Co. of Canada, Ltd., 1938.

¹⁴ James B. Hedges, *Building the Canadian West*, p. 3. New York: The Macmillan Co., 1939.

¹⁵ W. A. Mackintosh, *Prairie Settlement: The Geographical Setting*, Vol. I of *Canadian Frontiers of Settlement*, p. 57. Toronto: The Macmillan Co. of Canada, Ltd., 1934.

¹⁶ Hedges, *op. cit.*, p. 2.

Thus for a half a century the Canadian Pacific worked feverishly to spread settlers over the prairie. It alone of all Anglo-America's land-grant railroads actually colonized; the others merely sold land.

Struggling against scanty and irregular precipitation and a short growing season, the settlers ultimately triumphed and, by means of the moisture-conserving practice of dry-farming, produced quicker-maturing varieties of wheat than Red Fife, e.g. Marquis, Garnet, or Reward, thus making possible the northward migration of wheat. At times rust played havoc with their crops, but again they triumphed by developing Thatcher, Renown, and other rust-resisting wheats which, for example, in 1939 constituted 58 per cent of the crop of Saskatchewan.

Errors made in settlement

The governments of Canada and the United States, along with their railroads, so encouraged immigration, although little was known of the area, that thousands of people poured into the Spring Wheat Belt and began to grow wheat. For example, 50,000 farmers moved into the detached Peace River segment soon after the first World War (Fig. 183) and found much of the area to be marginal. The growing of crops here at a profit is problematical. Yet these inhabitants demand good roads, schools, medical attention, and almost free transportation of their crops to exporting ports.

Another mistake made by many was to locate too far from railroads. The price of wheat determines how far the crop can be hauled. In 1932 it cost twice as much to get wheat from farms 80 to 90 miles from elevators as the crop was worth. The practical distance wheat can move from a farm to a railroad in Canada is considered to be 10 miles.

Moreover, during unusually favorable years when good crops could be grown, many immigrants settled on what later proved to be submarginal land.¹⁷ With the return of normal weather, crops failed and much land had to be abandoned. In 1937, the worst year of the drought, the average yield of wheat in Saskatchewan was reduced from the usual 15 bushels per acre to a mere 2.6.

Considering the numerous difficulties that have had to be overcome, the Spring Wheat Belt—American and Canadian—was transformed rapidly and on the whole successfully from the domain of

¹⁷ W. J. Wainos estimates that of the 112,900,000 acres that have already been occupied in the three Prairie Provinces, 23,800,000 are submarginal. *The Geographical Review*, April 1941, Vol. XXXI, No. 2, p. 327.

the fur-trader to that of the farmer. The population of the **Prairie** Provinces had reached 2,398,587 by 1941.

Types of wheat

The entire Spring Wheat Subregion grows hard wheat, which contains more and a better quality of gluten than soft wheat. Great progress has been made in both plant-exploring and plant-breeding, scientists having been challenged to develop high-protein¹⁸ types which mature early, yield well, and resist drought and rust. Men whose names will ever be remembered in this connection are Carleton, who introduced frost and drought-resisting varieties, and Saunders, father and son, who bred quick-maturing types peculiarly adapted to Canada. Efforts have been and still are being made to develop varieties that will grow farther north in the Spring Wheat Belt and will be more resistant to disease and drought.

Canadian spring wheat is mainly of the hard red type, though considerable durum is grown in the east where the hazard of rust is greatest. Canadian spring wheat is considered the world's best because it provides a higher flour yield, a bushel outweighing by several pounds one bushel of American spring wheat, and because it has also a higher protein content, which makes a stronger flour and a larger loaf of bread.

The strongest wheat is grown in Alberta.

The leading varieties of hard wheats grown in this area are Marquis, Ceres, Garnet, Reward, and Thatcher. Considerable durum wheats also are grown.

Marquis was developed in 1909 by Charles E. Saunders. It spread rapidly over the whole Spring Wheat Belt. For several years it had no rivals and was the finest spring wheat known. Even in recent years it has comprised 80 per cent of the Canadian and 60 per cent of the American acreages. It is a cross of Red Fife and Hard Red Calcutta.

Garnet was evolved also by Canadians in their effort to get earlier ripening varieties and push the wheat belt farther north. It too is the result of crossing. *Garnet* matures 10 to 12 days earlier than *Marquis* in some districts, is a heavy yielder, and gives a strong flour.

Reward, developed from a *Marquis*-Prelude cross at the Experi-

¹⁸ The percentage of protein is commonly employed for determining the milling and baking qualities of wheat. The protein content is said to be dependent upon climatic conditions—being high if dry weather prevails during the six weeks preceding harvest.

mental Farm at Ottawa, was grown first in Canada in 1927, and then in the United States the following year. Its advantages are early maturity and large plump kernels of high quality. It has one weakness—it is vulnerable to smut. Until this weakness can be overcome, Reward will experience difficulty competing with Ceres, Garnet, and Marquis. By 1934 Reward was the third leading variety of hard red spring wheat.

Ceres, a selection from a Marquis and Kota cross, was developed at the North Dakota Agricultural Experiment Station at Fargo and was first distributed to farmers in 1925. This variety has grown in popularity at the expense of Marquis, particularly in the American part of the area. Thus whereas Marquis constituted 87.4 per cent of the acreage in 1929, its share had fallen to 60.2 in 1934; *Ceres* during the same years increased in acreage from 2.6 per cent to 31.5 per cent. *Ceres* is also growing in popularity in Manitoba and Saskatchewan. Its advantages are resistance to stem rust and drought and an ability to produce high yields.

Thatcher, a stem-rust resistant variety, was bred in cooperative experiments in Minnesota. In 1940 it occupied 17,500,000 acres. Authorities claim that if Thatcher had occupied such an acreage in 1935, 1937, and 1938, the stem-rust epidemic, which caused an annual loss exceeding 100 million bushels, would not have occurred.

Durum wheats, brought from southeastern Russia by Mark Carleton, are quite resistant to stem-rust. They are not used for bread but are almost exclusively employed in making alimentary pastes such as macaroni and spaghetti. Some 35 to 40 million bushels are grown annually, mostly in the eastern part of the Spring Wheat Belt, where stem-rust is most prevalent. *Durum* is losing out, however, as a result of the introduction of rust-resistant varieties of spring wheat, notably *Ceres* and *Thatcher*.

Specialization

The spring-wheat farmer, particularly the Canadian, reaps the advantages and disadvantages of specialization. His production costs (land and labor) are low; at the same time he is a great gambler, since he "carries all his eggs in one basket." Moreover, the Prairie Provinces suffer because of their dependence on foreign markets; about 75 per cent of Canada's wheat is exported in normal years. Autarchy abroad has resulted in the abandonment of thousands of Spring Wheat Belt farms, especially in the poorer parts. The number of vacant and abandoned farms in the drought area of Saskatchewan alone reached 9,431 in 1936.

In the eastern part of the region, particularly the American seg-

ment, the wheat acreage is being reduced in favor of diversified farming with emphasis on dairying. This is true also in the Winnipeg area where longer settlement, more moisture, and larger population are encouraging mixed farming and dairying. Diversification is also developing in the western part of the subregion as far north as Edmonton and especially in the foothills. Here crops are grown under irrigation; alfalfa forms the basis of important winter feeding of range cattle and sheep. Sugar beets, too, are grown, there being two sugar factories at Lethbridge. The growing and canning of vegetables, especially peas, is also being developed.

Specialization has encouraged soil deterioration, weeds,¹⁹ plant diseases, and reduced yields. Accordingly scientific farming is becoming increasingly urgent.

Systems of Farming

Wheat gets first choice of the land though oats, barley, hay, flax and corn (for silage) are grown as rotation crops. In the very dry areas the rotation followed (if it may be called a rotation) is summer-fallow and wheat. Strips from 6 to 20 rods wide are placed at right angles to the prevailing wind (Fig. 192). In preparing summer-fallow, the mould-board plough has been replaced by some form of cultural implement that destroys vegetational growth, but leaves the stubble, and so forth, on the surface to aid in the control of soil drifting. Only during about the last decade has this "trash cover" method of cultivation in the drier areas been generally adopted. It is proving very effective in checking soil drift.²⁰ In the more humid parts oats and barley may follow the wheat. Because of the difficulty of growing row crops and controlling weeds, fallow is more popular north of the international boundary than south of it. In North Dakota where corn does not thrive, two thirds of the crop area is devoted to wheat.

As in the Hard Winter Wheat Belt to the south, labor-saving machinery is widely used (Fig. 193).

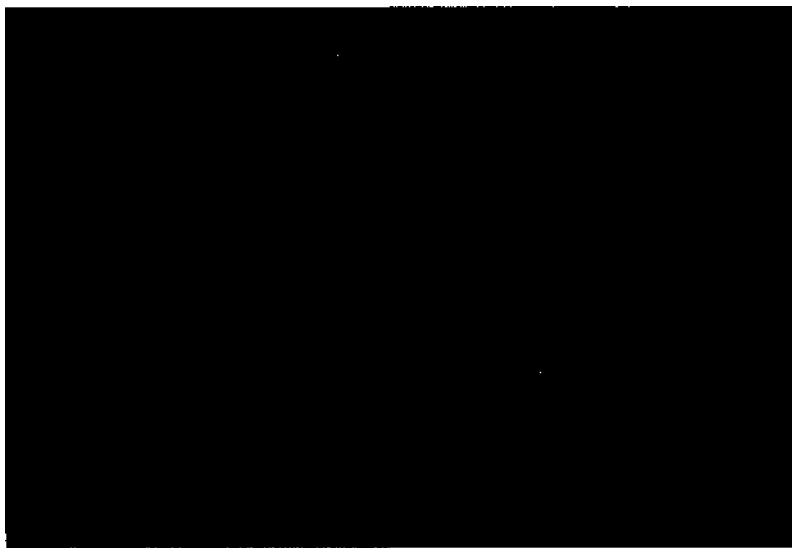
Atypical farm

Farms here are large but they are larger south than north of the border. They also increase in size from east to west. The tendency is toward still larger holdings. Farms in the American part

¹⁹ Spring wheat is sown when weeds are taking growth and they infest the ripe grain at harvest time.

²⁰ W. H. Fairfield, Superintendent of the Agricultural Experiment Station, Lethbridge, Alberta, Canada. Personal communication.

average 393 acres (sub-humid) to 590 (semi-arid), whereas those in Canada average 325 (sub-humid) to 440 (semi-arid).²¹ In the drier part, however, three, four or sometimes as many as seven sections are required to support the family unit. This means, of course, a thinner population in the western than in the eastern por-



Courtesy W. H. Fairfield'

Fig. 192. Growing wheat in Alberta. Note the large acreage under summer fallow, which characterizes the dry-land farming in this area. Fallowing is practised here as a means of controlling weeds, of storing moisture in the soil, and of checking wind erosion. In short, it is insurance against abnormally dry seasons.

tion. Few sentences better illustrate the large farms, small population, and paucity of towns than the following:

That treetop standing like a semaphore ten miles beyond your radiator cap means a farmhouse and that gray smudge ten miles beyond the tree, a town.²²

Labor and harvest

In the early days of wheat growing, labor was scarce in both the Hard Winter and the Spring Wheat belts. Especially was this the case during the harvest season, August to October. Accordingly,

²¹ O. E. Baker, "Agricultural Regions of North America, Part VI, The Spring Wheat Region," *Economic Geography*, Vol. IV, October 1928, p. 427.

²² *Fortune*, February 1940, Vol. XXI, No. 2, p. 146.



Canadian Government Motion Picture Bureau.

Fig. 193 Large-scale farming in western Canada. General view of a field of shocked wheat. Note the paucity of farm buildings in this
 Fig. 193. Large-scale farming in western Canada. General view of a field of shocked wheat. Note the paucity of farm buildings in this here is low.

there was an invasion by migratory workers, railroads helping with special low-cost excursions. However, power machinery is supplanting the migratory worker. Whereas in 1901, 25,000 men were required to harvest the Canadian crop of 55,000,000 bushels, in 1927, with power machinery, the same number harvested 440,000,000 bushels.

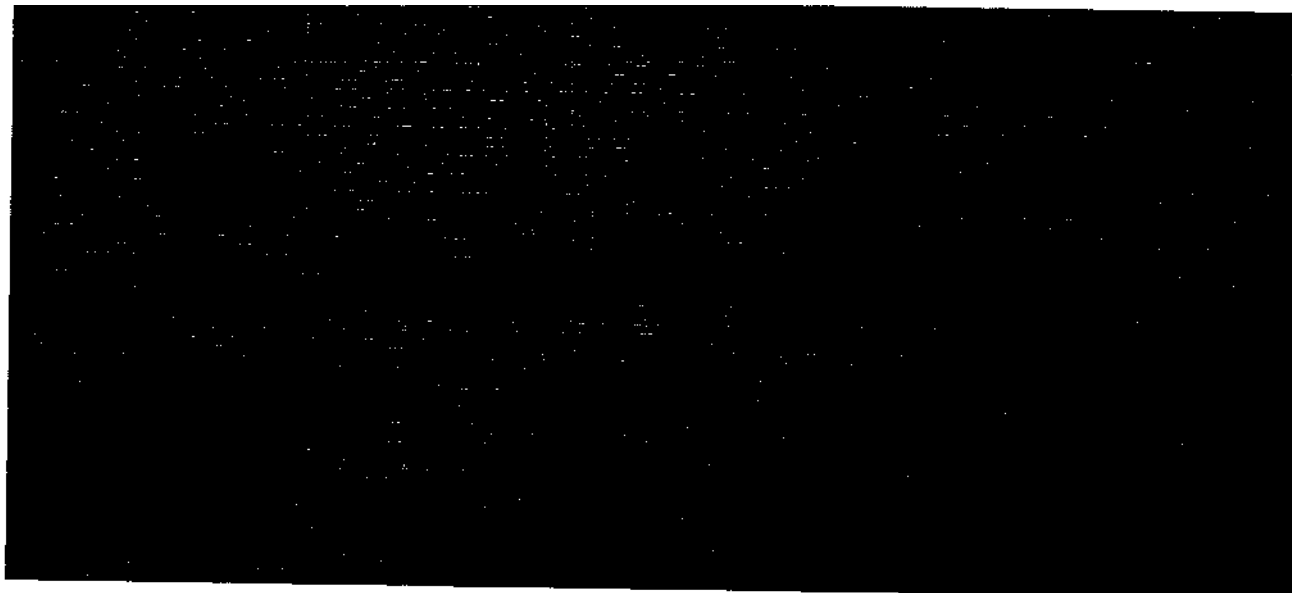
Transportation of wheat

The Prairie Provinces ship most of their wheat from field to country elevator, nearly 6,000 of which dot the Canadian Prairie. Elevators occupy railroad sidings, and many small towns consist of little else (Fig. 194). A large part of the grain moves to Winnipeg for grading whence it is hauled to Port Arthur and Fort William for shipment by lake carrier to Montreal or Buffalo. From September 15 to December 15 wheat flows through Winnipeg, the world's largest primary market, en route to Fort William and Port Arthur at the rate of 1,000 to 2,500 cars daily, trains departing every 20 minutes. From Montreal, and also Sorel, Quebec, St. John, and Halifax, the grain is exported to Europe; from Buffalo it goes to New York City by barge or railroad for trans-shipment. An appreciable quantity of Alberta wheat is exported from Vancouver (51,301,182 bushels in 1934r-1935) as well as from Victoria and Prince Rupert via the Panama Canal to Europe. Some also travels over the Hudson Bay Railway to Churchill (see p. 512). Much of America's spring wheat goes to Minneapolis, which, with about 70 elevators and a capacity of 94,052,000 bushels, is the leading terminal storage center.²³ Some also moves via lake carrier to Buffalo.

Because of the Spring Wheat Subregion's interior location and because water transportation is cheaper than rail, enormous grain elevators have been built at strategic points on navigable water; for example, Fort William and Port Arthur have some of the largest and finest elevator equipment in the world (see Chapter XIV, p. 539). Duluth and Superior also are well equipped as are Montreal, Vancouver, and Churchill.

Rail rates in Canada are lower, distance for distance, than are those in the United States. This is a matter of charter provisions; in return for a subsidy and a land grant the Canadian Pacific Railway agreed to reduce rates from western Canada to Lake Superior wheat ports by three cents per 100 pounds and maintain these rates

²³ *Eighty-third Annual Re-port of the Trade and Commerce of Chicago for the Year Ended December 31, 1940*, Chicago, 1941, p. 153.



Canadian Government Motion Picture Bureau.

Fig. 194. Internal grain elevators situated along railway tracks amid fields of wheat at Champion, Alberta, Some 5,651 of these country elevators mark the skyline in Canada's Spring Wheat Belt. In them millions of bushels of wheat are stored preparatory to movement into the channels of international trade- They thus serve as emergency stations during the busy autumn, when the railways groan under their great burden.

in perpetuity. Thus for one cent Canadian railways haul 100 pounds 41 miles whereas American railroads haul the same amount only 23 miles.

Milling

The great flour-milling centers of the past—Richmond, Rochester, and St. Louis—were characterized by grist mills which used the millstone of "song and story." When Minneapolis became the world's leading milling center, the grist mill "struck a snag." Whereas soft winter wheat made a beautiful white flour, hard spring wheat and hard winter wheat made a dark, distasteful flour. This was attributable to flinty particles and to friction caused by the buhrstones, which completely crush wheat kernels.

The hard-wheat flour, therefore, was sold at a great disadvantage in the East, and even the wheat from which it was made sold for about 20 cents a bushel below soft winter wheat. Something had to be done, and the roller mill resulted. The steel-roller process, which revolutionized flour-milling, was invented in Budapest (1820), then the world's leading milling center. It was a trade secret, but Hungarians were induced to come to Minneapolis. The essential feature of the roller process was the use of iron or porcelain rollers instead of buhrstones. Smooth rolls were unsuccessful, however, and porcelain was given to chipping. Accordingly, a corrugated roll was perfected which produced more flour from the wheat and performed 30 per cent more work on 47 per cent less power. Other contributions to milling were the dust collector for preventing explosions; the purifier for eliminating middlings (flinty particles); the "middlings purifier" for separating the dust and fluffy particles or bran from the middlings; and the bolting machine, which passes the flour through a very fine silk cloth. .

Although Minneapolis is still a very important milling center, it has been surpassed by Buffalo. Moreover, Minneapolis is no longer considered as being in this region; it definitely lies in the Agricultural Interior. While Minneapolis enjoys an advantage in procuring American spring wheat, Buffalo has the advantage of being nearer the consuming market.

Though this region is the world's leading producer of wheat, it is not outstanding in milling, because (1) the domestic demand (Canada) for flour is small, (2) ocean freight rates are lower on wheat than on flour, and (3) foreign countries, the principal markets, want the by-products for animal feed.^{2*}

One-fourth by weight of each bushel of wheat goes into by-products.

Political unrest

The spring-wheat farmer is periodically at the mercy of frost, drought, dust storms, hail, rust, grasshoppers, or chinch bugs. He must also take for his crop what the world will pay. At times thousands of acres mature and are either abandoned or harvested at a loss. Obviously the farmer cannot cope single-handed with all these physical and man-made problems. He therefore organizes and demands help from his government.

So strongly has Canada's economic progress been a reflection of agriculture in the Prairie Provinces that wheat plays a dominant role in that nation's foreign policy. These provinces alone possess 95 per cent of the total Canadian wheat acreage. With a population of only 11,419,896, Canada can use but 20 per cent of its crop; the nation must, therefore, trade with the world or the Prairie Provinces will perish.

Furthermore, there is little else besides wheat growing that the farmer in the western Prairie Provinces can do. If he switches to cattle-rearing, holdings must be enlarged, population decreased, and many towns and villages abandoned. The economic map of the prairies would have to be completely redrawn. It is easy to understand, therefore, why the Dominion government is so strongly influenced by the problems of the Prairie Provinces.

As the world shrank economically, following the first World War, the Canadian wheat grower's situation became desperate. If, after the second World War, international trade should become free-flowing or at worst have to surmount only slight barriers, the Canadian wheat farmer should benefit.

Cities

The Spring Wheat Belt is rural, not urban. Its few cities engage largely in some phase of handling the wheat crop.

Some, though not all, of the more important cities are Winnipeg, Sioux Falls, Fargo, Bismarck, Grand Forks, Lethbridge, Regina, Saskatoon, Edmonton, and Calgary. Moreover, the universal use of the automobile has reduced the necessity for small cities with the result that little or no increase in their size or number seems likely.

Winnipeg (290,540),²⁵ capital of Manitoba, is located on a flat plain at the confluence of the Red and Assiniboine rivers. It is

²⁵ *Eighth Census of Canada, 1941.*

one of the world's largest grain markets as **well as the chief financial, wholesale, and manufacturing center** between the Red River and the foothills of the Rockies. To the west and northwest **for 1,000 miles** lies Canada's vast wheat empire. Because the city's location near Lake Winnipeg resembles that of Chicago on Lake Michigan, it is called the "Chicago of Canada." All east-west railways must go through the city as they bend southward around the **lake, making Winnipeg** the center of many converging lines.

Of the lesser cities south of the border, *Sioux Falls* (40,832), like Minneapolis, benefited early from water-power. It is now an important meat-packing center. *Fargo* (32,580) on the west bank of the Red River is the largest city in North Dakota. Because it was difficult to cross the river in early days, Fargo proved to be a natural transportation center, first for a road and later for a railroad. *Bismarck* (15,049) was one of the principal starting points for freight and stage lines to the Black Hills following the gold rush into them beginning in 1876. It early became a railroad terminal and has since maintained this advantage over neighboring prairie settlements. *Grand Forks* (20,228) was formerly at the head of steamboat navigation on the Red River.

The Canadian cities other than Winnipeg owe their growth to agriculture and politics and are local distributing points. Not one is large or promises to become so, for the farm population does not seem likely to resume its earlier rate of increase. *Regina* (57,389) dates from 1882, when a canvas town was set up about a mile west of the present city, the site being chosen jointly by the Canadian Pacific Railway and the Dominion Government. It has become the principal distributing point for this part of Canada. *Saskatoon* (42,320), located on the South Saskatchewan River, lies in the heart of Canada's wheat-growing region. *Edmonton* (92,404), on the North Saskatchewan River, was a depot of the fur trade a few decades ago. Today it is on the main line of the Canadian National Railway, is the center of a flourishing agricultural area, and is the capital of Alberta. *Calgary* (87,267), at the junction of the Bow and Elbow rivers, is the dominant center of the farming and ranching industry for southern Alberta. On the main line of the Canadian Pacific Railway, it has become increasingly important with the development of Vancouver. Lying near the outer border of the dark-soil belt, it is the center both for dry-farming and irrigation. Coal and oil are produced near by. *Lethbridge* (14,343), located on the South Saskatchewan River in southern Alberta, is a typical Spring Wheat Belt city. It is well served by

railways, and it has sugar-beet and vegetable-canning factories and an agricultural experiment station. It is obvious from what has been said that each of these cities owes its existence and importance primarily to one product—wheat.

The outlook

Because of political differences it seems wise to discuss separately the possible future of the Canadian and United States wheat areas. The Canadian segment, staggering under the shock of lost world wheat markets, has suffered also from protracted drought, rust, hail, and grasshopper infestation. Many believe that the only solution lies in removing the farmers and allowing the country to revert to range. The authors do not concur in this belief because soil, climate, and economic conditions conspire to make cereal-growing the chief enterprise of this area. Moreover, a mass exodus is hardly probable. A way of life must be found that will fit *with* nature rather than suffer *from* nature. According to Griffith Taylor, the Prairie Provinces should be the most important part of the Dominion. In all probability farms will become larger and population thinner in the drier parts. What is needed is a new farm technique that will enable the area to absorb the effects of variable and hazardous physical conditions. As early as 1857 after having explored for the British Government the region between Lake Superior and the Rocky Mountains, Captain John Palliser concluded that 100,000 square miles in the south-central section ought not to be used for agriculture because of aridity and infertile soil. This area is now known as the "Palliser Triangle" (Fig. 183).

In the American segment, the eastern portion of the Spring Wheat Belt (*the more humid part*) is being absorbed by the Agricultural Interior and dairying is displacing wheat-growing as the major enterprise. Dairying appears to be more profitable and helps the farmer employ his labor to better advantage. Moreover, the United States is consuming less wheat but considerably more dairy products than formerly. By 1931 the per capita consumption of milk had risen one third above the prewar level. The western part seems to be best suited for ranching with the major emphasis on beef cattle.

The agricultural problems of the western part of the area arise largely out of its semi-arid climate and its distance from markets. What is needed more than anything else is scientific progress. What ultimately happens in the Interior Grain Belts—Winter and Spring—will depend largely upon the accomplishments of scientific

research. Great advances have already been made with quick-maturing and drought-resistant varieties of wheat, and with crop rotations including fallow, which have increased average yields of wheat 87 per cent over the best method of continuous cropping. Science is also winning its fight against rust and grasshoppers.²⁶ Until it has definitely triumphed, however, the warning of Major John W. Powell, Director of the United States Geological Survey, made before the North Dakota Constitutional Convention in 1889, must be remembered:

Up and down the temperature of agriculture will rise and fall with the seasons. . . . The only practical thing to do is to look the thing squarely in the face and remember that in middle Dakota, agriculture will always be liable to meet with failure unless you provide against it. . . . Years will come of abundance, and years will come of disaster. . . . You hug to yourselves the delusion that the climate is changing . . . you may as well not hope for any improvement in this direction.²⁷

Probably population will decline throughout the entire region. It is indeed significant that no part of the United States had so precipitous a decline in population in the decade 1930-1940 as the block of states consisting of Oklahoma, Kansas, Nebraska, and South and North Dakota.

²⁶ R. M. Scott, "The Battle Against Wheat Rust," *Canadian Geographical Journal*, Vol. VII, No. 2, August 1933, pp. 75-86.

²⁷ Glenn K. Rule, "Soil Conservation Districts in Action on the Land," United States Department of Agriculture Miscellaneous Publication No. 448, July 1941, p. 3

CHAPTER XVI

The Great Plains

A REGION OF GRAZING, IRRIGATION AGRICULTURE, AND MINERALS

THIS REGION comprises only the western parts of the Great Plains physiographic province (Fig. 2) where the grazing of livestock—goats, sheep, and cattle—takes precedence over dry farming (Fig. 195). Irrigation agriculture with its highly diversified crops—onions, cotton, alfalfa, and sugar beets—is also important.

The Great Plains Grazing Region extends from the Rio Grande on the south to the Spring Wheat Belt on the north. Except in the extreme southwest, the western boundary is marked by the abrupt rise of the Front Range of the Rocky Mountains. Sometimes as much as 8,000 feet difference in elevation occurs within a few miles, and there is a pronounced contrast in climate, vegetation, soils (Figs. 4, 5, 7), and human responses to the environment.

The eastern boundary (Fig. 196) is drawn where grazing prevails over cropping, but so vague is it that a traveler never realizes when he passes from one region into the other. It is therefore probably the least satisfactory of all Anglo-American regional boundaries (Fig. 12). Furthermore, the boundary tends to fluctuate with the amount of rainfall and the price of wheat. During wet years and during seasons of high-priced wheat it migrates westward; in drought years and seasons of low-priced wheat, it retreats eastward.

The Physical Setting

The terrain¹

The Great Plains were formed by the retreat of the Cretaceous Sea following the close of the Mesozoic Era. Subsequent erosion

¹ N. M. Fenneman, *Physiography of Western United States*, pp. 1-91. New York: McGraw-Hill Book Company, 1931, and Wallace W. Atwood, *The Physiographic Provinces of North America*, pp. 253-277. Boston: Ginn & Co., 1940.

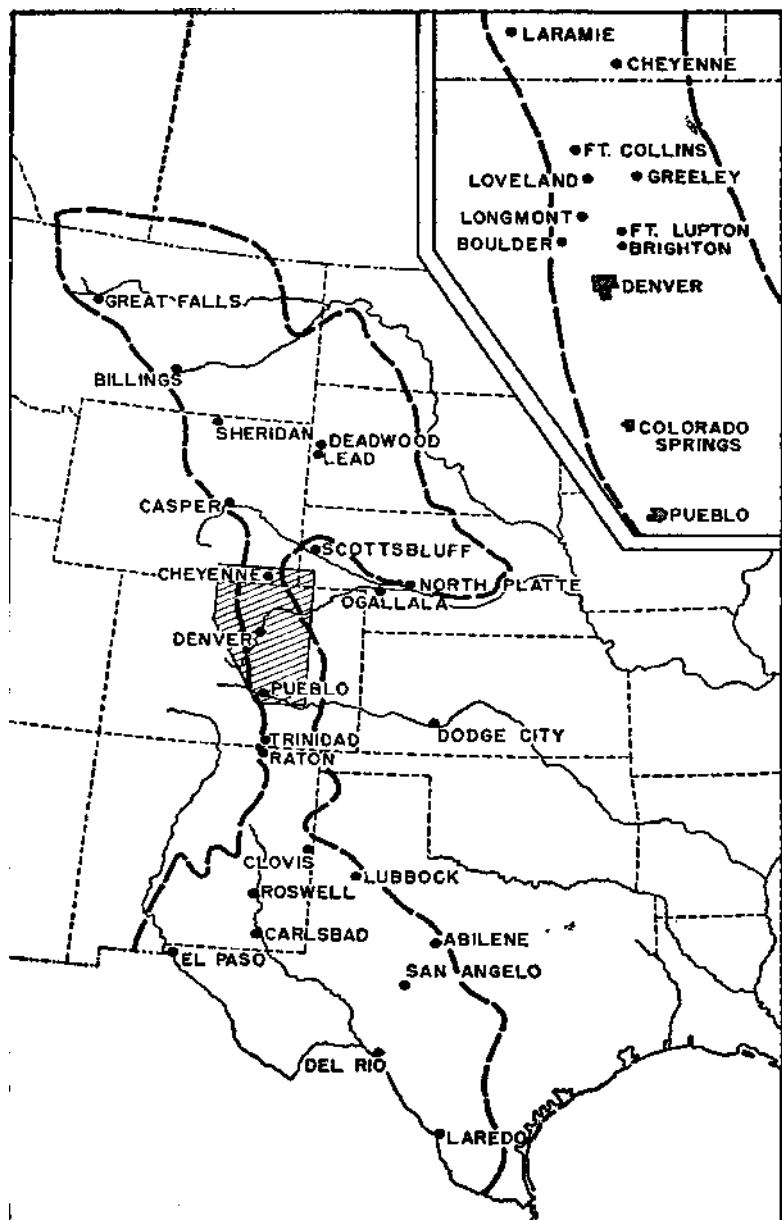


Fig. 195. The Great Plains: a region of grazing, irrigation agriculture, and minerals. The insert is an enlargement of the shaded area on the main map.

and deposition modified the original landscape. The heavier rainfall and more severe erosion in the mountains to the west have deposited thick layers of sediment on the Great Plains in broad overlapping alluvial fans. Near the mountain front, some of these deposits have been removed by later erosion so that a broad trough appears between the mountains and the High Plains to the east. This trough is locally known as the Colorado Piedmont. The southern part of the Great Plains (the High Plains), with an average elevation of 4,000 feet, is dissected by several through-flowing rivers: (1) the North and South Platte, (2) the Republican, (3) the Arkansas, (4) the Cimarron, and (5) the Canadian. Almost all these streams have cut their valleys several hundred feet below the plain surface. South of the Canadian River, in western Texas and eastern New Mexico, is an area of more than 20,000 square miles (the Llano Estacado) which is practically untouched by erosion.

Considered geographically, the physiographic subdivisions of the Great Plains Grazing Region are (1) the Rio Grande Plain, (2) the Edwards Plateau, (3) the Trans-Pecos Highland and Basins, (4) the High Plains, (5) the Raton Mesa, (6) the Sand Hills, (7) the Black Hills, (8) the Bad Lands, and (9) the Northern Great Plains. Of these the Trans-Pecos area, the Raton Mesa, the Sand Hills of Nebraska, the Black Hills of South Dakota, and the Bad Lands of the Dakotas have distinctly hilly to mountainous terrain where mining activities are important. Though some of them belong geographically and physiographically to other provinces, they are included within this geographic region, either because of their location in the center of the region or because grazing activities dominate.

The *Rio Grande Plain*, although physiographically a part of the Coastal Plain Province, is included in this geographic region because grazing dominates. Lying south of and below the Balcones Escarpment, which separates it from the Edwards Plateau, this subregion is a flat to gently rolling plain covered with dense chaparral. Commonly known as the "brush country," it has always been important for cattle, and was the nation's chief ranching area prior to the opening of the High Plains to the northwest. Within this subregion lie several irrigated oases: the Winter Garden, the districts around Del Rio and Laredo, and the Lower Rio Grande Valley, the largest of all, which was discussed in the chapter on the Subtropical Atlantic-Gulf Coast.

The *Edwards Plateau* occupies the extreme southern end of the High Plains, but it is considered a separate physiographic subregion because it does not have the fluvial mantle that covers the **High**

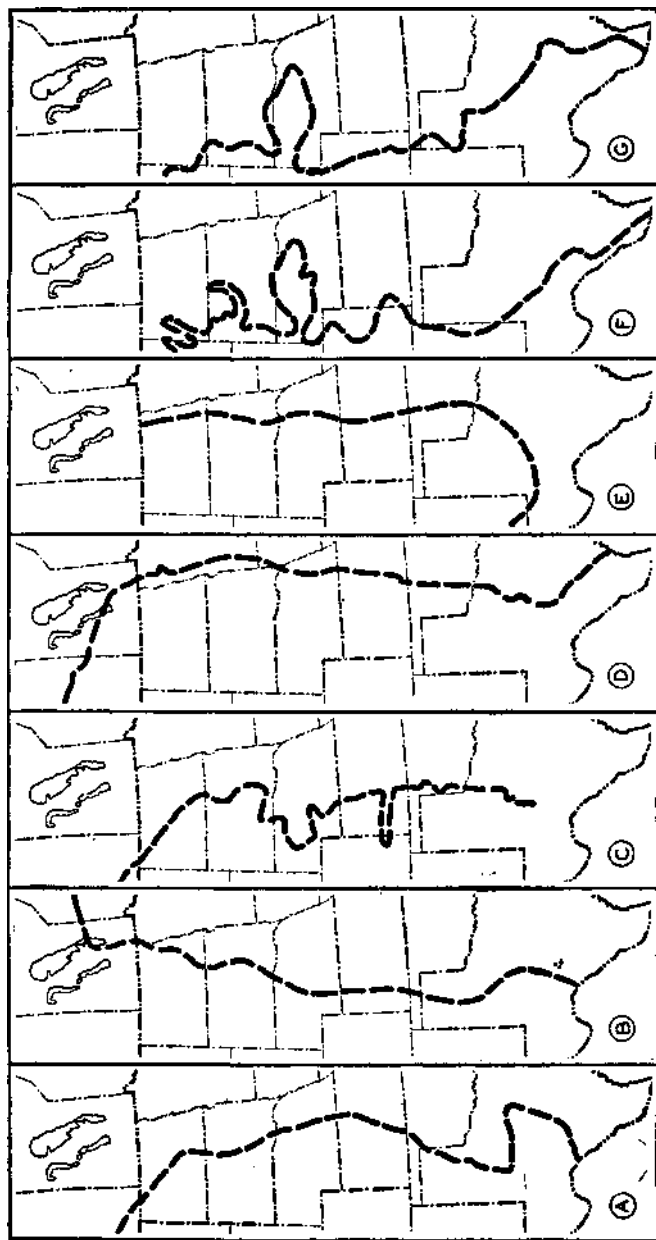


Fig. 196. The indefinite eastern boundary of the Great Plains Region.

(A) Physiographic boundary (after Fenneman).

(B) Rainfall line of 20 inches.

(C) Line between tall grass and short grass vegetation.

(D) Line between pedocals and pedalfers.

(E) Boundary marked by the Great Plains Committee.

(F) Agricultural regions boundary by O. E. Baker.

(G) Regional boundary used in this volume.

Plains and a separate geographic subregion because its dominant activity is ranching, primarily the rearing of sheep and Angora goats. This is the greatest mohair-producing section of the continent. Its chief cities, Del Rio and San Angelo, reflect largely these ranching activities. The area is quite dry, with a few acres under irrigation and with little cultivated land.

The *Trans-Pecos Highlands and Basins* subregion is probably the most difficult to describe. The Stockton Plateau, usually considered a part of the Edwards Plateau seems to belong geographically with the Trans-Pecos country. The rest of the subregion consists of partly buried mountains and filled basin areas, many with only interior drainage. The rainfall over the area is low except in the higher altitudes of the Chisos and Davis mountains, where higher slopes support a fair stand of trees. The vegetation of the lowlands is semi-desert to desert.

The carrying capacity of the range is extremely low and ranches of necessity are large. The only city in the entire subregion is El Paso, which is located in the heart of a large irrigated area along the Rio Grande. Some mining is carried on in the mountains, and a small resort industry appears to be developing in the Davis Mountains area.

The *High Plains*, possibly the largest subregion of the Great Plains Grazing Region, extends from the southern Panhandle of Texas to the Pine Ridge of northern Nebraska. It is North America's most extensive high-plains area, averaging 4,000 to 5,000 feet in elevation. In the southern portion, where the high plains drop off into the Interior Lowland, abrupt "breaks" mark its eastern boundary. To the west lie the Pecos Valley in New Mexico and the Colorado Piedmont in Colorado, considered parts of the High Plains subregion because of similar economic activities. Irrigation is important around Roswell and Carlsbad in New Mexico, and especially on the Colorado Piedmont.

The *Raton Mesa* lies along the New Mexico-Colorado border at the western boundary of the Great Plains physiographic province. It has a greater altitude than the High Plains to the east, being capped with an ancient lava flow into which deep canyons have been cut. The chief enterprise of the area is coal-mining. The famous Raton Pass crosses through this tableland.

The *Sand Hills* of central Nebraska, an area of more than 18,000 square miles, are characterized largely by dune topography. Lying farther east than other parts of this region, the Sand Hills receive more rainfall, but because of porosity the surface remains quite dry and grass predominates. Where the water table comes near the sur-

face, a few trees are found. The excellence of the pasture early attracted cattlemen, and the Sand Hills continue as a ranching region of major importance.

The *Black Hills*, really mountains, rise some 4,000 feet above the surrounding plains. They represent a domal type of mountain that has been pushed up through the plains, having a granitic core and being surrounded by the upturned edges of the sedimentary rocks. Erosion has reduced most of this mountain mass to steep slopes and jagged summits. Because of their altitude and the resultant heavier rainfall, the Black Hills are forest-covered. Their attractive mountain scenery has made them an important resort area. Mineralized veins found in the granitic rocks have enabled the Black Hills to rank high in mining since the late 1870's. In the vicinity of Lead-Deadwood is found one of the greatest gold-mining sections of the continent.

The *Bad Lands* east of the Black Hills are an extensive area of greatly eroded sloping land. They comprise a unique and picturesque area of considerable tourist interest but of little economic value.

The *Northern Great Plains* lie north and west of the Black Hills. Because of lower evaporation, much of this land is in extensive wheat farms. Only the drier western part is included in this subregion, which lies largely in northern Wyoming and central Montana. It extends beyond the international border into southern Saskatchewan and Alberta, where it is known as the "Palliser Triangle." Ranching is the dominant activity, cattle and sheep being the leading range animals.

Climate

Precipitation is the most important climatic factor of the Great Plains. The rainfall is less than 20 inches annually throughout the entire area (hilly and mountain regions excepted), and it has wide annual variations. For a 50-year period (1872-1922) the annual rainfall of the northern part of the region varied from 23 to 13 inches, the middle section from 29 to 12 inches, and the southern from 26 to 10 inches.² In a humid area an annual variation of approximately 15 inches would not be significant, but, here where the average is less than 20, a decrease of only a few inches may create an extremely critical situation. Wet and dry years tend to

² Joseph B. Kincef, "The Climate of the Great Plains as a Factor in Their Utilization," *Annals of the Association of American Geographers*, June 1923, Vol. XIII, No. 2, p. 72.

run in periods of varying lengths and intensities, but data are not yet sufficient for climatologists to determine the exact nature of them nor to forecast future conditions with any degree of reliability. Evidence indicates that the period between 1825 and 1865 was relatively dry with few wet years. After settlers began keeping meteorological records in the late 1860's and early 1870's, an increase in rainfall was observed. Pioneers concluded that their settlements were responsible and offered many fantastic theories to prove their contention.³ Then came the dry cycle during the 1880's and early 1890's, causing great distress among settlers, and whole-

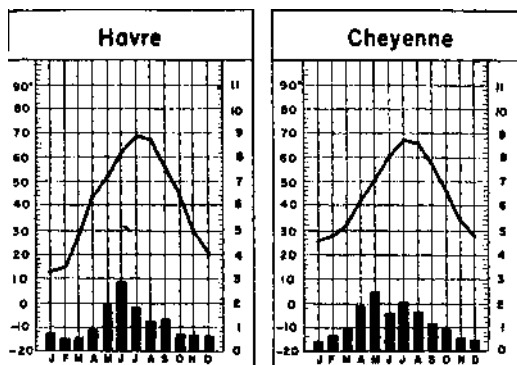


Fig. 197. Average monthly temperature and precipitation for Havre and Cheyenne.

sale land abandonment. Since that date wet and dry periods have alternated and the variations have always been serious. The last dry period (1933-1938), which probably caused the most widespread damage, created the Dust Bowl.

The high evaporation, ranging from 68 inches in southwest Texas to 37 inches in northern Montana, is due to high wind velocities and to a maximum of sunshine. These factors also reduce the precipitation effectiveness. Except for the uplands, all lands between the eastern edge of the Great Plains and the Cascade-Sierra Nevada suffer from a moisture deficiency at all seasons. Under such conditions crop cultivation is hazardous at best. Except where irrigation is possible, the entire Great Plains Region should remain ranch land.

Temperatures vary widely (Fig. 197) but despite the region's

³ Walter Kollmorgen, "Rainmakers on the Plains," *The Scientific Monthly*, Vol. 40, No. 2, February 1935, pp. 146-152.

latitudinal extent of approximately 25 degrees, practically all stations have recorded summer temperatures above 100° F. and winter temperatures below freezing. Northern Montana, with a maximum above 110° F. and a minimum below -50° F. has probably the greatest annual temperature range on the North American continent. Throughout the winter season these low temperatures come with little warning and cause great losses of livestock through freezing.

The high winds, besides increasing evaporation and reducing rainfall efficiency, frequently assume destructive velocities, especially in the "Dust Bowl" area.

Soils and vegetation

The Great Plains Grazing Region lies entirely within the pedocalic soil group (Fig. 7), but local soils vary widely in physical characteristics, particularly in their moisture-holding capacity. In general Great Plains soils have good texture and high fertility and need no lime or other commercial fertilizers. However, moisture deficiency prohibits their being used successfully for crops.

The native vegetation is dominantly short grass, with Grama and Buffalo grasses most conspicuous (Fig. 5). Along stream courses and on higher elevations such as the Black Hills, trees appear. Before the introduction of beef cattle in the 1870's, luxuriant native grasses (mainly western wheat grass) covered extensive areas. Overgrazing, however, has reduced thousands of square miles to a semi-desert dominated by sagebrush. Extensive wheat farming during the first World War period ruined additional grazing land, which may never again be suited to livestock. The white man seems to have done everything possible to make this region a desert.

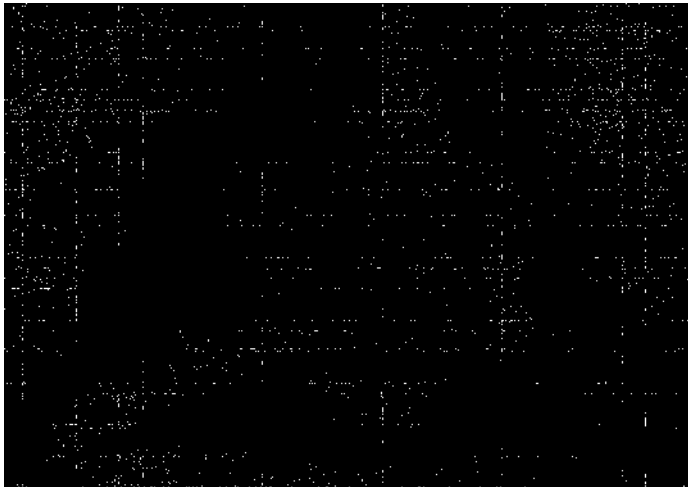
Sequent Occupance'

Fossil remains of the early horse, elephant, and camel prove that grazing animals lived on the Great Plains in prehistoric times. When the region was first traversed by European explorers, they found millions of buffalo, antelope, and other animals grazing on the vast steppe. The Amerind had not disturbed the balance of nature by destroying either the native animal life or the grassland vegetation. Had this simple type of land occupance continued, no wind-erosion problems such as we know today would have affected the region.

The coming of the white man⁴

Following the Spanish explorers in the sixteenth century, few people attempted to cross this vast steppe, then considered a part of the Great American Desert. At first, the plains proved only a barrier to the westward movement that was seeking lands in Utah and Oregon. The first large party, the Astorians (1811-1813), followed the Missouri River to a point north of the Black Hills and then crossed westward into Wyoming. The following year a second group crossed the plains along the route of the North Platte River and established the Oregon Trail. The next major trek was that of the Mormons (1846-1847), who followed the valley of the Platte from Omaha westward, but turned southwestward into the Salt Lake area after crossing the mountains. The difficulties encountered and the slowness of travel at that time is well shown in Figure 198. Soon after the Mormon trek came the California Gold Rush

⁴ Everett E. Edwards, "American Agriculture—The First 300 Years," *Yearbook of Agriculture*, 1940, p. 227. Washington, D. C: Government Printing Office, 1940.



Utah Photo Materials Co.

Fig. 198. A pioneer sign post. The buffalo skull made about the only marker that could be left along the trail at the time of the Mormon trek.

of 1849 and succeeding years. In addition to the well-established Oregon Trail, several others were used, but intermittent rivers with their strings of water-holes always marked the route (Fig. 10). The rapidly growing population in California and the demand for closer contacts between the east and west coasts, resulted in several interesting means of communication—the stage-coach, the pony express, and, most interesting of all, the camel caravans across the southern part of the Great Plains in Texas.

The completion of the Union Pacific Railroad in 1869, followed by several others in the 1870's and 1880's, ushered in the cattle era. A brief stage of buffalo hunting intervened, when for a few years white men with high-powered rifles all but exterminated the vast herds. By 1889 not more than a thousand head remained:⁶ The thousands of square miles of pasture lands left vacant immediately encouraged cattle drives from the Texas Gulf Coast. Although many cattle were driven northward to railheads at Abilene and Dodge City, during the 1880's large numbers also were driven into the northern Great Plains to establish the industry there.

The cattle era on the Great Plains was the most romantic stage in its utilization. Before the advent of barbed wire and its general use on the plains, the land was entirely open range. Individual cattle were branded and then allowed to run with the herds until the next season, when surplus animals were cut out and sent to market and calves were branded. Many interesting designs of cattle brands were developed.

From the close of the Civil War period until about 1886, large herds grazed on the open range—a single open pasture thousands of square miles in extent. The increasing demand for meat both at home and abroad and improvements in transportation and refrigeration made the rearing of livestock on the open range a highly profitable activity. Money poured into the region to establish large ranches and to increase and improve the herds. Much of this came from Europe, particularly from England and Scotland. Renewed interest in the range industry brought a demand for better strains of beef cattle, and several new varieties were introduced. Increasing numbers of cattle were being pastured and the open range was approaching its capacity. In some sections herders pastured large numbers of sheep on the open range. The closer grazing of sheep led to clashes between sheepmen and cattlemen over water holes and pasture rights.

⁵ B. W. Allred, "Range Conservation Practices for the Great Plains," *U. S. Dept. Agriculture, Misc. Publication, No. 410*, p. 2.

The series of dry years which began in 1886 inaugurated a period of large fenced ranches. Before the development of barbed wire, fencing of the range would have been impossible even had it been desirable. A barbed-wire fence does not involve so much material as to make its cost prohibitive even on extremely large pastures.

The "cattle barons" attempted to secure from the government all the land around a water hole; they had their cowhands do likewise. They would then fence in the entire area, sometimes more than they had title to. Frequently they completely enclosed small ranchers or farmers within their fences who retaliated by "fence cutting." The large ranchers then ordered their cowhands to ride their fences and shoot anyone found cutting them. Conditions became so bad that laws were passed to prevent "fence-cutting" and "fence-riding," and the large rancher was required to provide gates at intervals.

There was only a slight increase in cattle on the plains after 1890. The encroachment of the wheat farmer on the eastern margin curtailed the amount of land available for cattle ranches, and overgrazing on the drier western parts still further reduced the area. Range cattle on the Great Plains numbered more than 12 million in 1920 but were reduced to 10 million by 1935 when the region was estimated to have been nearly 100 per cent overstocked.⁶

After 1910, several new influences were making themselves felt in the region. The development of the tractor, combine, and other power machinery made possible the planting and harvesting of a much larger acreage of land than had ever before been possible. Numerous drought-resisting crops, especially wheat, were planted on the plains. The high prices of the first World War resulted in further expansion of the wheat area; many overstocked and overgrazed native pastures were plowed up and planted. One of the most notable of these areas is the Jordan Country of eastern Montana.⁷

The Range Livestock Industry

Cattle, sheep, and Angora goats dominate the range of the Great Plains Grazing Region. Although cattle are the most widely distributed, overgrazing has resulted in their elimination from some areas. Sheep, introduced later than cattle, were pastured on the

⁶Great Plains Committee: *The Future of the Great Plains*, p. 4. Washington, D. C.: Government Printing Office, 1936.

⁷Isaiah Bowman, "Jordan Country," *Geographical Review*, Vol. 21 (1931), pp. 22-56.

poorer lands, but have become dominant in parts of Montana, Wyoming, and southwest Texas, where formerly only cattle were considered of value (Fig. 199). Many cattlemen, especially in southwest Texas, found it more profitable to run sheep than cattle on their ranches, although it hurt their pride to do so. Angora goats are reared almost exclusively on the Edwards Plateau of central Texas (Fig. 200).

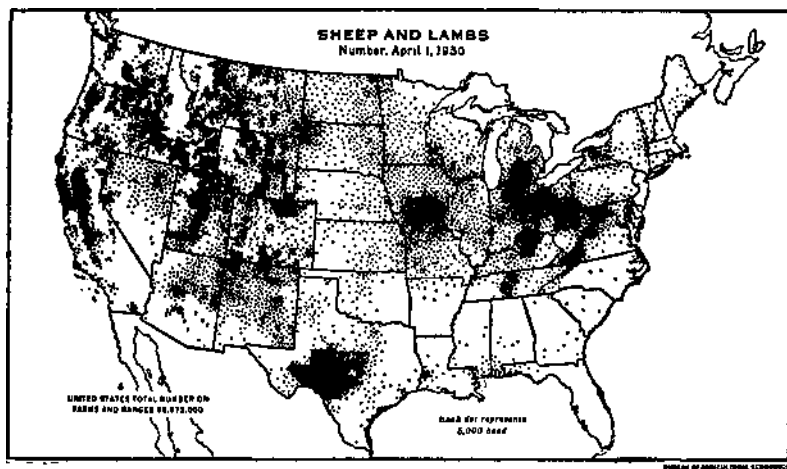


Fig. 199. Distribution of sheep and lambs in the United States. The Great Plains, particularly in Montana, Wyoming, and southwest Texas, have many of the range sheep of the nation.

The range-cattle industry

Despite the fact that the Great Plains Grazing Region has fewer range cattle today than formerly, ranching is still dominant. The demand for better quality meat and the practice of fattening stock on farms before slaughtering them has resulted in the Agricultural Interior having more cattle than the western ranges.

Throughout the Great Plains the carrying capacity of the range varies from 15 to more than 75 acres per animal. Practically all the region has been overstocked—a temptation that becomes greater during years of high prices, particularly if the rainfall has been good and pastures are greener than normal. Conservative cattlemen, however, have learned the approximate carrying capacity of their land and do not run more cattle than can be fed in dry years.

The size of the cattle ranches varies from less than 2,000 acres to more than 100,000 acres. The small ranches are usually located

near the eastern margin of the region or in irrigated areas, and they grow much of their own feed. Some of these fatten their cattle and market them directly at the packing houses. The bulk of the range cattle, however, are produced on large ranches (Fig. 201).

The Great Plains Region has year-long grazing. North of the Texas Panhandle, snows temporarily interrupt winter grazing, necessitating supplemental feeding to prevent or reduce losses. In dry years, however, feed must be supplied both summer and winter

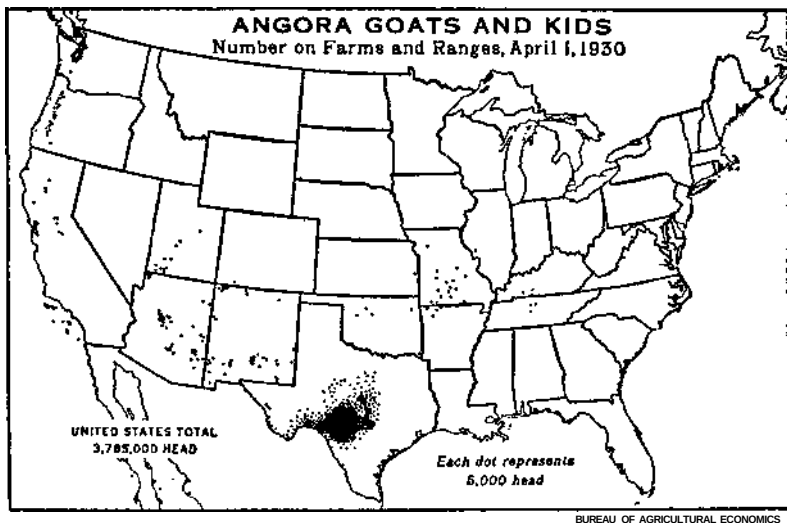
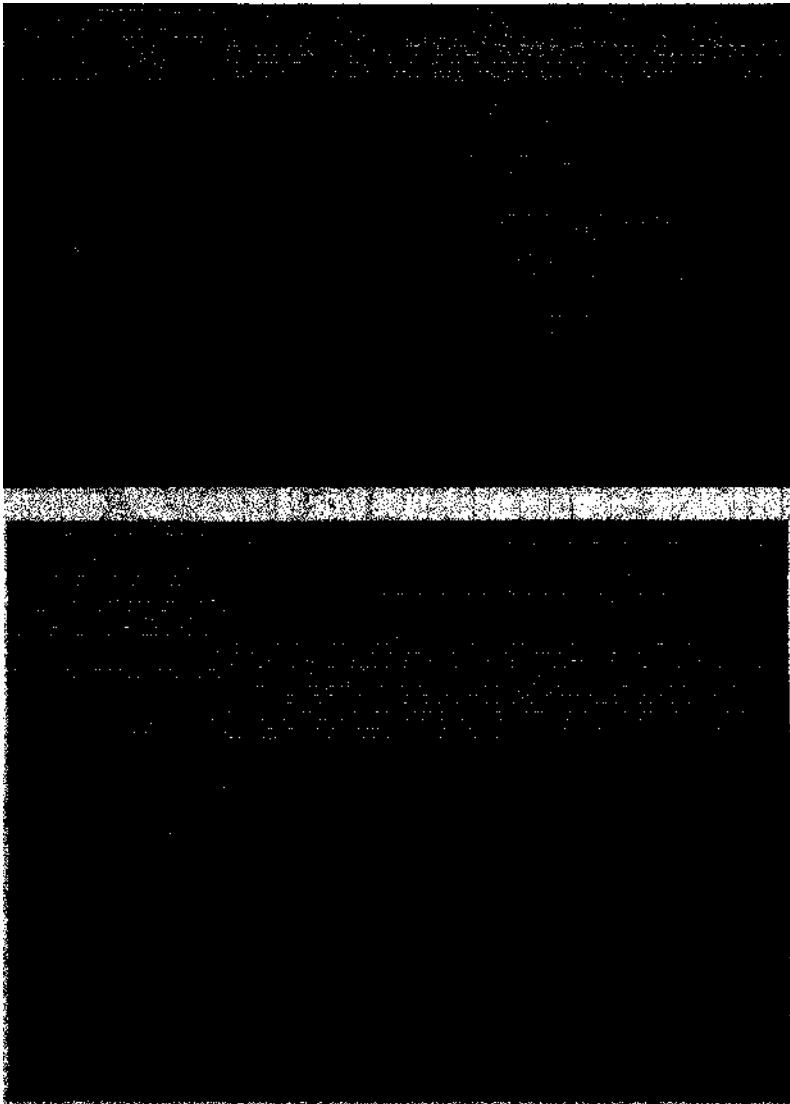


Fig. 200. Angora goats and kids are found mainly on the Edwards Plateau in southwest Texas.

to prevent wholesale starvation. During those periods the cattle industry is anything but profitable.

Throughout the region, stockmen utilize native pastures so far as possible in order to reduce the expense of supplying hay or cottonseed cake. If beef cattle can be shipped out to the Agricultural Interior with little or no expense for supplemental feed, the ranchman can, as a rule, make a fair profit.

A typical large cattle ranch. A prime requisite for successful ranching is a good supply of water. An insufficient water supply prevents the utilization of thousands of acres of grazing land. At first ranchmen supplied their reservoirs (tanks) from natural sources—springs, seeps, and surface streams. The development of cheaper drilling methods and the perfection of the windmill (Fig.



Courtesy The Dallas News and Soil Conservation Service,

Fig. 201. Ranching scenes on the Great Plains. The upper photo shows a typical water hole in west Texas; the lower picture is a grazing scene in Montana. Note the contrast in the quality of the pasture.

202) added many square miles to the ranching area of the Great Plains. Water is piped to a dirt tank or watering trough some distance from the well or natural spring to prevent the cattle from contaminating the supply. At the Jornada Range Reserve in southern New Mexico (a very dry area), it was found that watering places should be not more than 5 miles apart with one to supply each 500 head of cattle.⁸

Winter care of stock is an important item. In the southern Great Plains timber and broken terrain (breaks) afford sufficient protection. In the northern Great Plains, however, protection is provided by sheds, usually constructed with an open side. These open sheds face away from the direction of the prevailing winds, and they suffice for even the most severe blizzards. Other desirable equipment includes (1) pens for branding, (2) chutes for cutting (separating) cattle from the herd for shipment, and (3) dipping vats for treating animals affected by ticks, lice, or other pests.

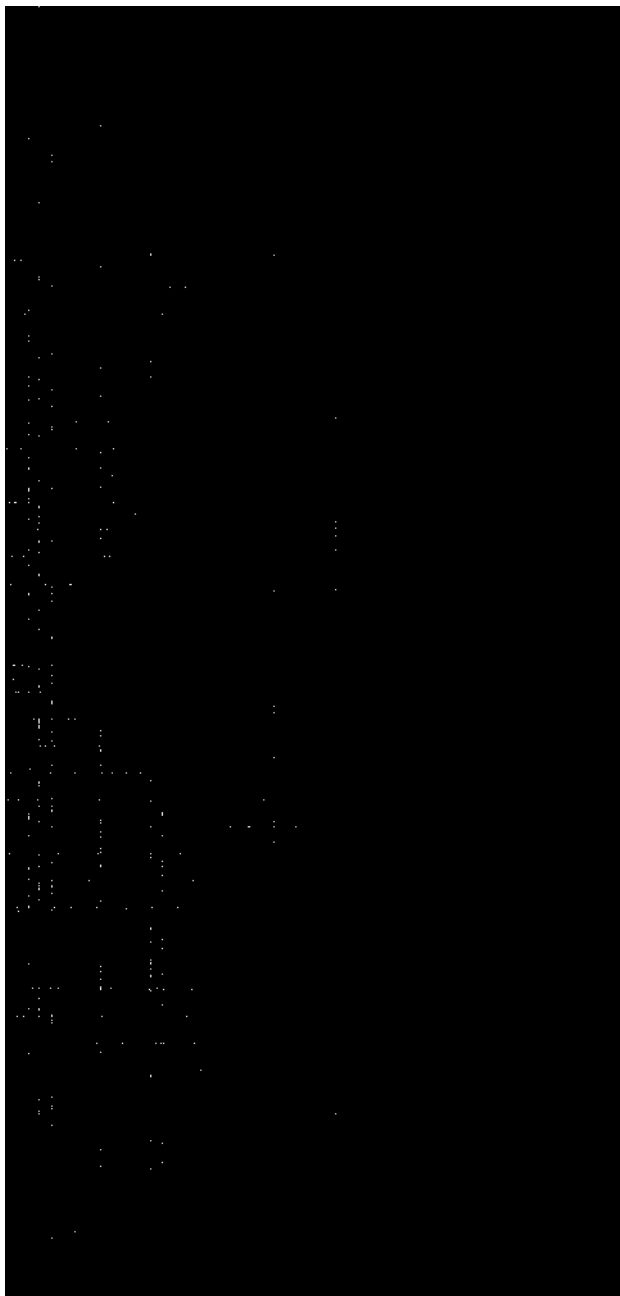
In early days each cowhand furnished his own "outfit"—horse, saddle, bridle, blanket, and bedding. Today, however, most large ranches furnish horses and equipment. While well-trained horses and good equipment may add to the initial investment, they decrease expenses in the long run. At the time of the roundup, cowhands must use a number of horses, sometimes two to four a day. Horses are usually of all types—good, bad, smart, and tricky. The good cowhand knows all the horses by name as well as their characteristics.

Working on the range. In small pastures or on ranges bounded by natural barriers, cattle cannot become widely scattered; hence comparatively little labor is involved. On large ranches, however, the annual or semi-annual roundup is a big job. Often neighboring ranches combine their cowhands. In this way cattle on the unfenced range which belong to different ranches can be separated, and driven back to their owners' ranges or to some shipping point.

Roundup time varies with different sections of the Great Plains Region. If the ranch ships grass-fat cattle instead of feeders, the roundup is scheduled to hold cattle a minimum of time prior to shipment as a means of preventing loss of weight.

A considerable part of the cowhand's time on a big ranch is spent in "cutting-out" steers that are to be sent to market or to northern feed lots and in branding calves. On the better equipped ranches, branding is usually done in "corrals." The brand must

⁸ Virgil V. Parr and E. W. McComas, "Beef-Cattle Production in the Range Area," U. S. Dept. Agriculture, *Farmers* Bulletin* No. 1395, pp. 13-14.



Goodloe Stuck photograph.

Fig. 202. A typical west Texas ranch house, Note the windmills for pumping water for stock and for domestic use.

be recorded according to the laws of the state in which the ranch is located. To be successful the brand must not burn the hide but must mark the animal permanently.

Shipping to market. When beef cattle destined for market have been cut from the herd, they are driven to loading chutes built along the railroad tracks. Formerly long drives over cattle trails were necessary. As railroads were built throughout the Great Plains cattle country, the drives were reduced and today they are seldom more than a few miles long. Upon reaching the loading chute the animals are driven up an incline into waiting cattle cars. Formerly cowhands rode the cattle trains to their destination in order to supply the animals with feed and water, prevent their being trampled, and assure their arrival in good condition. The railroads now take care of the animals.

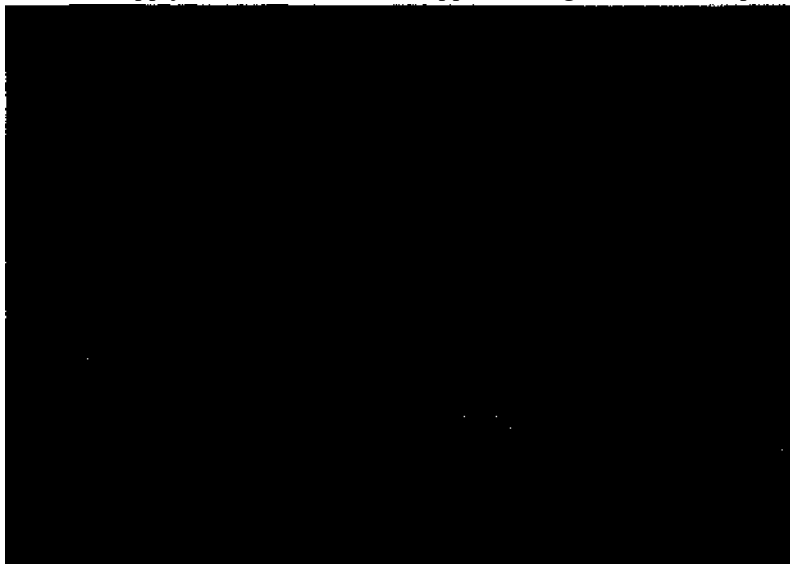
The sheep industry

Sheep ranches on the Great Plains are similar to cattle ranches; in fact, many cattle ranches today also run large numbers of sheep. The sheep industry, most concentrated in southwest Texas and northern Colorado, is also important in Montana (Fig. 199). Since sheep graze closer than cattle and require less water, they can be pastured where the latter would die. In some respects sheep are easier to handle. In the northern Great Plains, however, they must be driven in summer long distances to mountain pastures and returned in winter to the plains. The ranchman works hard throughout the winter to protect and feed his flocks. Constant vigilance is necessary during extreme cold and heavy snow to prevent sheep from drifting with the wind and perishing in the deep snows.

Shearing. The sheep of the Great Plains are reared chiefly for their wool. The period of greatest activity on a ranch, therefore, is shearing time, which usually takes place in late spring or early summer, after all danger of further freezes has passed. In the Southwest a second shearing is sometimes made in early autumn, but the wool is never so good as that cut at the close of the winter season. The wool is sorted, cleaned, and baled before it is shipped to market. In some respects sheep ranching is less a gamble than cattle ranching, but sheep need more individual care and the price of wool fluctuates greatly on the world market.

Angora goats

The Edwards Plateau of southwest Texas yields more than 80 per cent of the nation's mohair. Goat ranching is similar to sheep ranching. However, the goats, being browsing animals (Fig. 203), can subsist on pastures not good enough even for sheep. Most of the pasture land used by Angora goats is in the chaparral country of southwest Texas where scrub oak and other small trees and shrubs supply browse. Goats are clipped during March and April



Goodloe Stuck photograph.

Fig. 203. A herd of Angora goats on a ranch in southwest Texas.

and again in September and October. The mohair is shipped mainly to New England, though some is exported. Since 1927, Texas alone has produced more mohair than the Union of South Africa, the former leader.⁸ Mohair is used mainly in upholstering furniture and automobiles.

Agriculture

Since the extensive growing of wheat, grain sorghums and other cereals was discussed in Chapter XV (The Interior Grain Belts),

⁸ T. R. Hamilton, "Economic Phases of the Mohair Industry in Texas," *Texas Agricultural Experiment Station Bulletin No. 444*, P. 8, 1932.

the only type of agricultural production considered here is that based upon irrigation.

Irrigation was practiced in the Southwest long before the coming of white men but, except for that developed by the Spaniards in the middle Rio Grande Valley, the reclaimed area was increased only slightly. The first irrigation project to be established on the Great Plains dates from 1870 when the Greeley Union Colony irrigated a large tract of land in northern Colorado by using water from the South Platte and Cache la Poudre rivers.

Irrigation projects are developed under 4 types of ownership and management: (1) mutual irrigation companies, such as the Greeley Union Colony, where every farmer is automatically a part of the organization, (2) commercial irrigation, where privately-owned companies construct all facilities and sell services to water users at a profit, (3) irrigation-district movements, involving public support but depending upon private capital for construction financing, and (4) federal irrigation districts, organized under the National Reclamation Act of 1902, where the government bears all construction costs, and the settlers pay for their land and water rights on easy terms.¹⁰ Of these, the first and fourth have been the most successful, although much land in the West is also irrigated under the third. Federal Reclamation Projects have cost about 250 million dollars or approximately \$265 per capita for the people living on them; about \$55 of this per capita cost, however, has been repaid. The President's Great Plains Committee (1936) found that counties with adequate irrigation systems had only 5 per cent tax delinquency while adjacent counties had as high as a 95 per cent tax delinquency, despite the fact that irrigated lands had tax valuations ten times as great as dry farming or grazing lands.

Great Plains irrigation districts

The irrigation districts of this region are too numerous to mention, since almost every stream flowing from the Rocky Mountains provides water for some project. The Federal Bureau of Reclamation has under construction or active operation on the Great Plains some 13 projects, but there are many more under other types of ownership. In Texas where the federal government does not own public lands, the Bureau of Reclamation has made no improvement. However, some land in Texas is supplied from the federal Rio Grande project. The irrigated area of Texas, comprising more

¹⁰ Wells A. Hutchins, M. R. Lewis, and P. A. Ewing, "Irrigation in the United States," *Yearbook of Agriculture*, 1938, p. 694.

than 500,000 acres, is scattered throughout the arid part lying almost entirely within the Great Plains Grazing Region. On the High Plains some 90,000 acres depend upon shallow wells. In south Texas, the Winter Garden area utilizes artesian water, and the Laredo district draws upon the Rio Grande.

All irrigated areas have much in common, but there are many varied problems involved in their construction and maintenance. To illustrate, the following is a brief consideration of two federal projects: (1) the Rio Grande near El Paso, and (2) the Colorado-Big Thompson in northeastern Colorado.

The Rio Grande Project. The Middle Rio Grande Valley, above and below El Paso, constitutes one of the oldest irrigated areas on the continent, having been developed by pre-Columbian Indians. Three centuries of Spanish dominance did not materially change the systems nor extend the area "under the ditch." When the land became a part of the United States, some improvements were made by private capital. Since the federal government did not own any land in the area, it was not interested in development even after the passage of the Reclamation Act in 1902. As more and more water was diverted from the Rio Grande, it became a dry stream immediately below El Paso. As a result, a considerable part of the total irrigated area—the Juarez Valley—was rapidly reverting to desert, and the Mexican Government threatened suit unless their lands were provided with water and again made irrigable. After considerable negotiation, Elephant Butte Dam in southern New Mexico was constructed and a treaty signed guaranteeing the Juarez Valley 60,000 acre-feet of water a year delivered to the head of the International Diversion Canal. The Rio Grande Project then developed rapidly under federal auspices. Today it contains some 175,000 acres. At first it produced fruits and alfalfa almost exclusively. Its major crop now is long-staple cotton.¹¹

*The Colorado-Big Thompson Project.*¹² The more than 600,000 acres-in this project lie in northeastern Colorado and include the lands of the Greeley Union Colony that have been "under the ditch" since 1870. Water shortage in the area led the Bureau of Reclamation to undertake construction of this project (to be completed about 1944) at an estimated cost of \$44,000,000, one half to be assumed by the federal government for power development, and the other half to be repaid by farmers in the Northern Colorado Conservation

¹¹ Edwin J. Foscue, "The Mesilla Valley of New Mexico: A Study in Aridity and Irrigation," *Economic Geography*, January 1931, Vol. VII, No. 1, pp. 1-27.

¹² Data supplied by the Denver Office of the Bureau of Reclamation.

District. Aside from comprising the largest irrigated area on the Great Plains, this project has several unique features. The natural watershed of the Big Thompson River could not meet the needs of the irrigated lands, and since the waters of other streams on the east slope were already appropriated, it was necessary to tap sources on the west slope of the mountains. This required the drilling of one of the longest tunnels in North America. The tunnel is 13.1 miles long, has a diameter of 9.5 feet, and is capable of carrying 550 second-feet of water. Under the summit of the Continental Divide it is nearly 4,000 feet below ground. To prevent water users on the western slope from losing their water supply, reservoirs are necessary to supplement the volume of Grand Lake so that it can be maintained at a constant level. All reservoirs and tunnels lie outside the Great Plains, but the irrigated lands are within the region. In the area to benefit from this project live 175,000 people who derive their livelihood directly or indirectly from farming. The assessed value of properties amounts to more than 200 million dollars exclusive of nontaxable irrigation systems, and educational and religious institutions. Because of the severe water shortage during the 1930's, farmers in this area suffered an annual loss of nearly 5 million dollars. This project will be able to meet all irrigation needs.

The major irrigated crops

The length of the growing season within this region varies from more than 260 frost-free days in the Winter Garden and Laredo districts of south Texas to less than 120 in northern Montana and southern Canada. The most extensive crop grown is *alfalfa*, which is used for supplemental winter feeding of livestock. Alfalfa occupies the largest acreage of any irrigated crop from southern Colorado northward. The Winter Garden and Laredo areas in the extreme south produce winter truck crops. The Laredo area is the nation's leading producer of early *Bermuda onions* (Fig. 100-C). *Spinach* has become so important in the Winter Garden area that Crystal City (a small town in the heart of it) has erected in its city park a life-sized monument to "Popeye."

In the middle Rio Grande Valley around El Paso, and on the several irrigated areas of the Pecos Valley in southern New Mexico, *cotton* has become dominant, although considerable acreage is devoted to alfalfa.

From Colorado northward, in addition to alfalfa, sugar beets occupy a large acreage. This crop is grown throughout the irri-

gated West, but northeastern Colorado and western Nebraska are outstanding (Fig. 204).¹³

Sugarcane belongs fundamentally to a cool-summer region, where summer temperatures do not average above 70° F. Beets produce best on dark colored silt and clay loams. The major requirement, however, is moisture, and since a uniform supply is needed at all times, the crop in this region must be irrigated. Unlike sugar cane, the raising of sugar beets requires considerable farm equipment. The principal implements needed are beet-seed drills, beet culti-

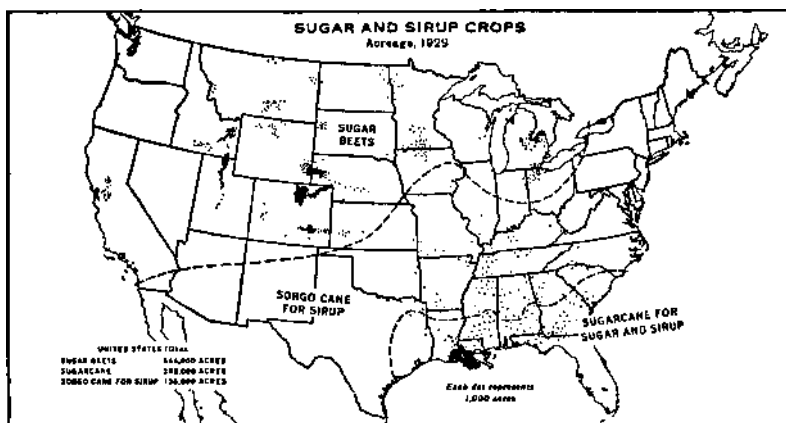


Fig. 204. The Great Plains of eastern Colorado and western Nebraska account for a large part of the beet sugar production of the nation.

vators, beet lifters, and special wagons or trucks for hauling the roots to the mill. Beet seeds are planted with drills in rows about 18 inches apart and covered to a uniform depth. As soon as the rows can be followed, they are cultivated and the beets thinned out so as to stand 10 to 12 inches apart. During the early growing period beets are cultivated to keep down weeds. When the plant becomes large enough for the leaves to cover the ground, the crop is "laid by," and no further work is done until it is fully grown. Warm days and cool nights are essential for satisfactory maturing of the beets.

The crop is harvested by lifting the roots from the soil and putting them in piles. They are then topped, loaded into wagons or trucks, and transported to the sugar mill or loading station.

¹³ E. W. Brandes, and others, "Sugar," *Yearbook of Agriculture*, 1923, pp. 49-80.

Beets should not be hauled more than 4 or 5 miles. If farms are more remote from the mill, loading stations are provided by the railroads.

Sugar beets, an intensively grown crop, require a large amount of labor, especially during thinning and harvesting. Most beet areas depend on migratory Mexican labor for these activities. The Mexican brings his entire family and all of them work in the fields.

In the sugar mills, which are large establishments, the beets are cleaned, sliced, and placed in cylinders for the extraction of the sugar. Ultimately the sugar is separated from other liquors or molasses. At most mills the beet pulp (wet or dry) is sold to stockmen for feed. The tops and crowns left in the field are also used as stock feed by ranchmen in Colorado and other parts of the Great Plains.

The beet-sugar industry is an exacting one, but it has proved to be very remunerative in irrigated areas throughout the West.

The Mineral Industries

Since the Great Plains Grazing Region consists of two types of terrain (1) flat to gently rolling land, underlain by sedimentary rocks, and (2) hilly to mountainous areas composed of intruded igneous masses, the minerals in the first include fuels and other non-metallics (gas, oil, coal, and potash); and in the second, metallics (gold, silver, lead, zinc, and mercury).

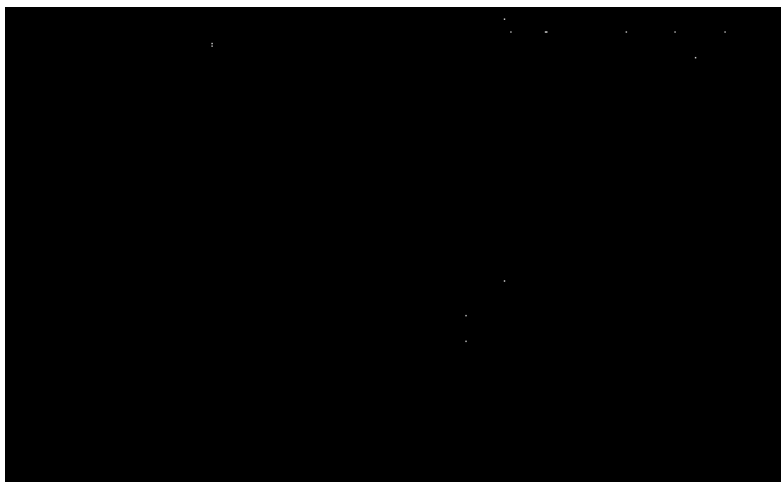
Fuels and non-metallics

Oil and gas. The major producing districts include (1) west Texas and southeastern New Mexico, (2) central Wyoming, and (3) northern Montana and southern Alberta. Of these the first is by far the most important. These districts contain several famous oil fields such as the Yates and Big Lake pools in Texas, the Hobbs and Eunice fields of New Mexico, the Tea Pot Dome, Salt Creek, and Lance Creek fields of Wyoming, and the Cut Bank of Montana.

Coal. The Great Plains Coal Province contains several large fields of sub-bituminous or semi-bituminous coal and an enormous deposit of lignite (Fig. 63). The lignite is found in the Dakotas, eastern Montana, and Saskatchewan. Despite domestic demands for fuel in that area of severe winters, little is mined.

The bituminous deposits, although of low grade, are worked in several places for local use. The most important bituminous-producing areas are the Assiniboine district of Saskatchewan and Montana, the Judith Basin of Montana, the Powder River district

of Wyoming, the Denver area of Colorado, and the Raton Mesa area of southern Colorado and northern New Mexico. The coal in most of these areas lies in thick seams near the surface and is strip mined (Fig. 205), particularly in the Montana and Wyoming districts. In the Denver field, coal seams lie some distance below the surface and are therefore shaft mined. In the Raton district, seams have been exposed on the eroded sides of the mesa and a type of drift mining, similar to that of West Virginia, is practiced.

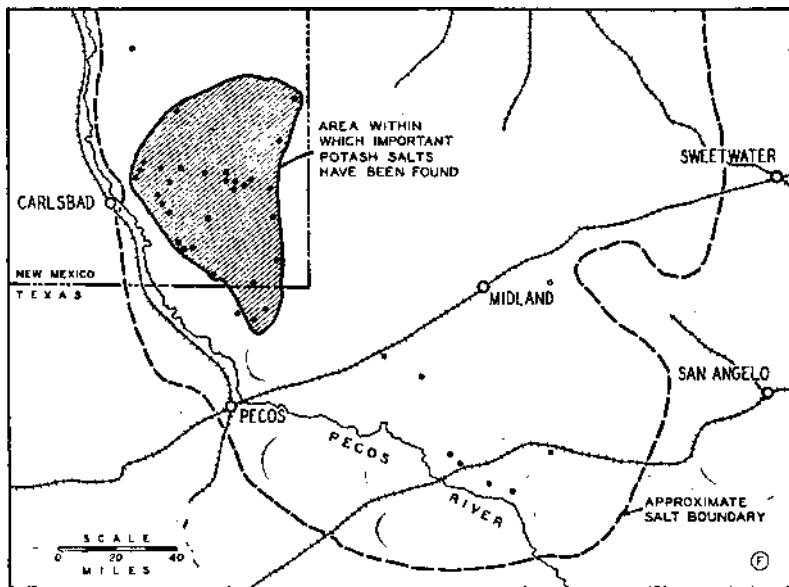


Bureau of Mines, Dept. of the Interior.

Fig. 205. Mining coal with steam shovel on the Great Plains near Gillette, Wyoming.

Potash. The Great Plains Region in west Texas and southeastern New Mexico (Fig. 206) contains the major supply of potash salts in North America and one of the largest deposits in the world. For nearly a century the Stassfurt mines of Germany and the deposits in Alsace dominated the world market. At the outbreak of the first World War, the United States, lacking potash, began searching desperately for a domestic source. The price jumped from \$40 to \$500 a ton. Large investments were made in plants to extract the mineral from certain salt lakes in Utah and California and in the western Sand Hills of Nebraska (a part of the Great Plains Grazing Region). When the war ended, however, Germany and France (which then controlled Alsace) again dominated the world market and most American production was discontinued.

Congress did, however, appropriate a small sum (\$2,000,000) to continue the search for potash within the United States. The western Texas deposits of polyhalite (the best known potash producing salt) had been known since 1912, but because of the German monopoly and because of remoteness from the large consuming area, little development took place. Even during the emergency of the first World War, the government felt that extraction of potash from salt lakes and even from kelp (seaweed), was more satisfactory



After Mansfield & Lang.

Fig. 206. Potash deposits in west Texas and New Mexico. (Modified from a map published in "The University of Texas Bulletin 3401," 1934.)

than working the Texas deposits. Later, oil prospectors discovered sylvite deposits more than 250 feet thick in Eddy County, New Mexico, at depths of from 1,200 to 1,400 feet. Sylvite is a potash-bearing mineral containing more than 60 per cent potassium-oxide. Germany's famous Stassfurt deposits consist mainly of polyhalite carrying less than 20 per cent potash. Moreover, the German area extends over only about 24,000 square miles, whereas that in Texas-New Mexico covers more than 70,000.¹⁴ While this new area

¹⁴ "The Possibilities of an American Potash Industry," *Commerce Monthly*, Vol. 10, No. 8 (December 1928), p. 16.

should have developed rapidly into the major potash-producing district of the world, such has not been the case. The second World War should bring about a marked expansion in this district, but it remains to be seen whether the district can compete with cheap European potash in a normal world market.

Metallic minerals

Metallic minerals are found mainly in the Trans-Pecos Highlands of Texas and the Black Hills of South Dakota. The Trans-Pecos Highlands have never been considered an important mineralized zone; yet at Shafter is the nation's tenth largest silver mine, and at Terlingua is located one of the most important mercury mines of the United States.

The *Black Hills* of South Dakota have produced small quantities of silver, copper, lead, and tin, but gold is most important.

The first gold discoveries in the Black Hills (1874) were placers. The news of the strike, widely publicized in eastern newspapers, created a gold rush. Conflicts with the Amerinds in the Black Hills, at that time a part of the Sioux Reservation, caused the federal government to attempt to exclude whites. Prospectors did enter the Reservation, however, and before they could be ejected had succeeded in extracting considerable placer gold. A persistent demand to open the hills to prospecting led to a withdrawal of military regulation. In 1877, the entire area was thrown open to legal white occupation. The first settlements were made around the placer deposits near Custer, but when richer strikes were made at Deadwood Gulch, Custer's population of 11,000 fell to about 100. Deadwood at that time grew from nothing to a population of 25,000.¹⁵ This rich placer ultimately led to the discovery of lode gold.

The Homestake Mine. The original Homestake claim, made in 1876, was purchased the following year for \$70,000 by George Hearst, who organized the Homestake Mining Company. This mine, the largest gold producer in the United States, has operated continuously and its production has exceeded 440 million dollars. Owing to isolation, mining was greatly handicapped during the first decade, but in time railroads built into the area. In the early part of the twentieth century when the cyanide process was introduced, the Homestake Mine improved in efficiency. Deep-shaft mining prevails, operations at present being carried on from the 3,200- to the

¹⁵ Paul T. Allsman, "Reconnaissance of Gold-Mining Districts in the Black Hills," *Bureau of Mines Bulletin* 427, pp. 6-7, 12-13. Washington, D. C.: Government Printing Office, 194a

5,000-foot level. In hauling ore from the stopes to the mine shafts, 73 miles of narrow-gauge railroad track and 36 compressed-air locomotives are used.¹⁶ In addition to its mining property at Lead, the company holds extensive water rights, owns a coal mine in Wyoming, and has large timber holdings. It is easily the major industrial establishment of the Black Hills and probably of the entire Great Plains Region (Fig. 207).

Numerous other mining properties have been developed in the Black Hills but in most cases they have failed after a short period of prosperity or hope. The names of some of these describe the wild and adventurous life of the early mining community: Dead-broke, Two Bit, Gilt Edge, Holy Terror, and Legal Tender. Some of these still are worked from time to time but the majority are only memories of the wild and glorious days of the gold rush.

Transportation

The Great Plains Region has always served primarily as a transit land. Most of the freight and passenger traffic passes through the region enroute to the Pacific Coast or vice-versa. The transportation lines of the region (Fig. 208A, B, C) show a predominance of east-west railways, highways, and airways. The only important north-south traffic flows along the western edge, at the foot of the Rocky Mountains, where the major population is concentrated. Most of the cities, though lying entirely within the Great Plains Region serve the mountains as well as the plains.

Cities

In spite of the large size of the Great Plains Grazing Region the Bureau of the Census lists only 5 metropolitan areas of more than 50,000, two being on the Mexican border and three in the Colorado Piedmont.

Laredo (39,274),¹⁷ located on the north bank of the Rio Grande, is the most important port of entry on the Mexican-United States border. It lies on the most direct rail route between St. Louis and Mexico City. Laredo also has become an important tourist center as a result of its location on the new highway to Mexico City. It

¹⁶ Charles W. Henderson and A. J. Martin, "Gold, Silver, Copper and Lead in South Dakota," *Minerals Yearbook, 1940*, pp. 436-437. Washington, D. C.: Government Printing Office, 1940.

¹⁷ Laredo, although not listed as a metropolitan area by the United States Census Bureau, is here considered as such since the combined population of Laredo and Nuevo Laredo, on the Mexican side of the Rio Grande surpasses 50,000.

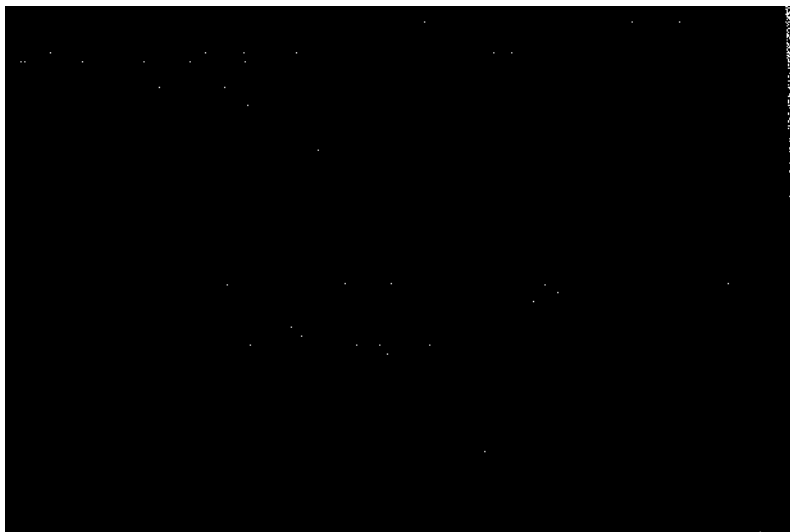
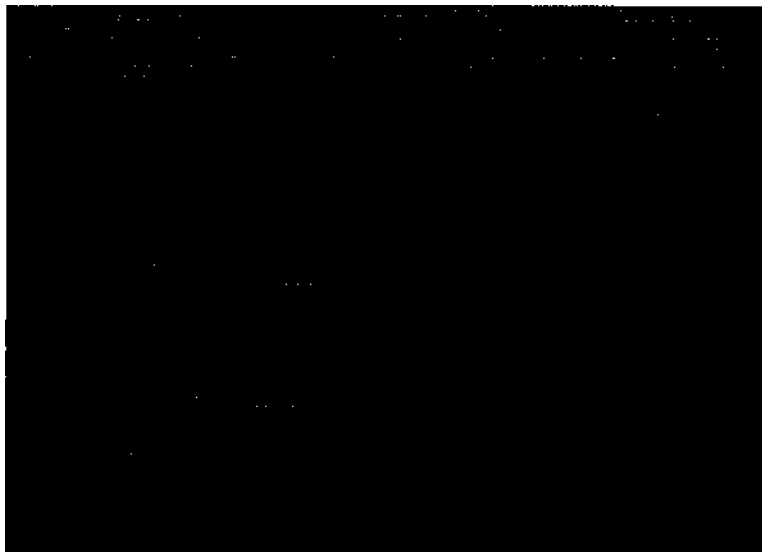


Fig. 207, The Homestake Mine

is in the center of a large irrigated area that specializes in the production of early Bermuda onions. The refining of oil and the smelting of antimony from Mexico are the two major industries.

El Paso (115,801) lies on the middle Rio Grande at the point where that river cuts through the mountains from central New Mexico. The pass thus formed was early recognized by the Spaniards as the best route through the mountain barrier between Mexico City and Santa Fe—hence the name. *El Paso* is an important railroad center; upon it north-south and east-west lines converge. The city also serves as a focal point for highways and airways. Products of irrigated lands, ranches, and mines from west Texas, New Mexico, Arizona, and northern Mexico focus on the city, and have been instrumental in developing its industries, which include a copper smelter and refinery (ore from Mexico and Arizona), oil refineries, cotton gins, and a cotton textile mill. As a border city, it ranks second only to Laredo in volume of trade with Mexico. With its most interesting Mexican counterpart, Juarez, *El Paso* attracts a large number of tourists. A few miles southeast of the city lies the village of Ysleta, which was founded by the Spaniards in 1682, and is the oldest settlement in Texas. *El Paso* is also the headquarters for the border patrol and the site of a large military reservation at Fort Bliss.

*Homestake Mining Co.*

at Lead, South Dakota.

Pueblo (62,039), on the Arkansas River a few miles east of the Front Range of the Rockies, is an important focal point for railroads. Proximity to coking coal from southern Colorado, along with iron ore deposits in the mountains to the west and southwest and from southern Wyoming, permitted the development of a sizeable iron and steel industry. Although ranking far below the major iron and steel centers in the East, Pueblo's industry is important among the few steel centers in the West. Despite its industrial development, the city is growing slowly. Pueblo, definitely of the plains, is less favored as a resort center than Colorado Springs and Denver.

Colorado Springs (36,789) lying a few miles out on the plains near the foot of Pikes Peak (elevation, 14,039 feet above sea level), represents the interests of the Rocky Mountains more than those of the plains. Because of its scenic attractions, Colorado Springs has developed into a major resort city of the West. Its numerous hotels and auto courts do a large business during the summer season. The city also profits from the rich gold mines at Cripple Creek in the mountains a short distance to the southwest. Today, one of the largest gold smelters in the West is located within the city limits,

Denver (384;372), the capital of Colorado, and the largest city of either the Great Plains or the Rocky Mountain regions, owes its

original site to the discovery in 1857 of placer gold in the sands of Cherry Creek, a small tributary of the South Platte River. When vein deposits were found in the mountains to the west, Denver ceased to be a mining center of importance. With the building of the railroads across the plains, the city became the terminus for several lines and the distributing center for an extensive mining territory. In the 1870's, when the cattle industry began to develop on the Great Plains, Denver was in a position to profit from that development as a distributing center. Although the city was not on a through railroad route to the Pacific, it outgrew its rivals, Cheyenne to the north, and Pueblo to the south, both of which dominated major gaps through the mountains. In recent years, as a result of the completion of the 6-mile Moffat Tunnel, Denver now has a railroad line across the Rocky Mountains to Salt Lake

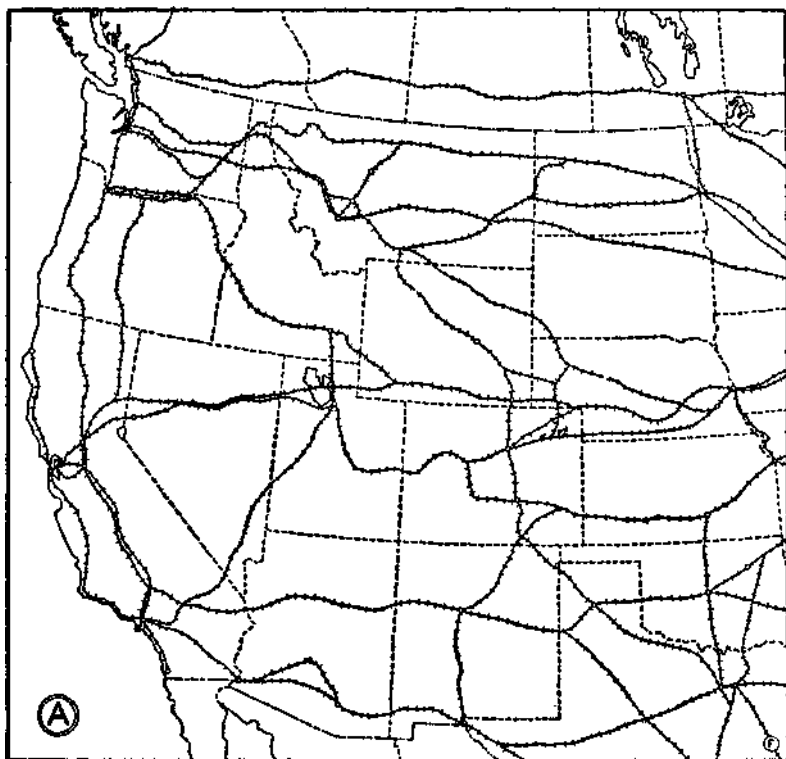


Fig. 208A. Railroads in western United States.

City. This, however, has not been a profitable venture, since the railroad carries little through traffic.

Denver is today the major commercial and financial center between the Missouri River and the Pacific Coast and is the leading livestock and packing center of the West. The city is the major agricultural market for the irrigated area to the northeast.

In addition, it is the headquarters for many mining operations in the mountains to the west. Formerly it had a large smelter, but this has long since been abandoned for those located nearer the mines. Denver's importance in the metallic mineral industry is reflected in its having one of the three United States mints.

Denver serves as the major resort center of the Rocky Mountain area. The Front Range that rises in bold relief a few miles west of the city limits offers vacation opportunities equaled in few places.

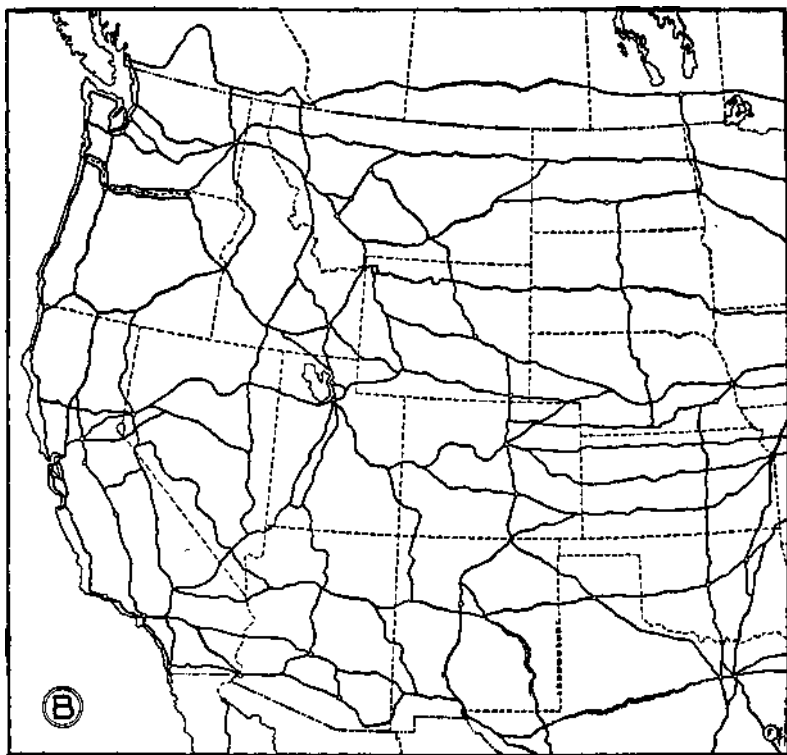


Fig. 208B. Highways in western United States.

The excellent railway and highway connections between Denver and these resorts and between Denver and the populous centers to the northeast, east, and southeast, cause a major part of the tourist traffic to focus upon it (Fig. 208-A).

The smaller centers. The Great Plains Region contains numerous small cities that can only be mentioned here (Fig. 195). In southwest Texas lie *Del Rio* (13,343) on the Rio Grande, a border entry port, and an important mohair market; *San Angelo* (25,802) the agricultural and ranching center for the Edwards Plateau; and *Abilene* (26,612) and *Lubbock* (31,853), important agricultural and ranching cities for the southern High Plains. *Hobbs* (10,619), *Roswell* (13,482), and *Clovis* (10,065), lie along the western side of the High Plains and in the Pecos Valley of New Mexico. Hobbs, owing its existence to petroleum, is a typical oil

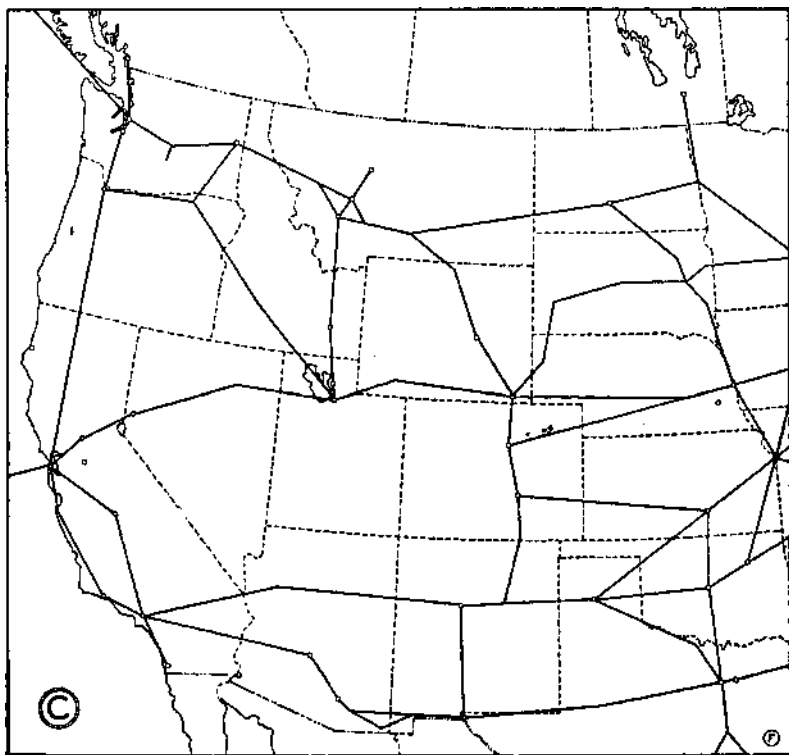


Fig. 208C. Airways in western United States.

town, while Clovis and Roswell are primarily agricultural centers. *Trinidad* (13,223), at the northern edge of the Raton Mesa area, is primarily a coal mining center, although it serves as a market for ranches and irrigated areas of southern Colorado.

In the Piedmont District of northern Colorado are a number of < progressive little cities that derive their livelihood largely from irrigated crops of the district, although some are supply depots for the mining and resort areas in the mountains to the west. These cities include *Boulder* (12,958), *Longmont* (7,406), *Loveland* (6,145), *Ft. Collins* (12,251), and *Greeley* (15,995). They have become important cultural centers as well, with the University of Colorado at Boulder, the Colorado Agricultural College at Ft. Collins, and the State Teachers College at Greeley. In addition, in the Piedmont area at Golden, is the School of Mines; at Denver, the University of Denver; at Colorado Springs, Colorado College; and just across the state boundary at Laramie, the University of Wyoming. Nowhere else in the West are so many institutions of higher education concentrated in so small an area.

The chief cities in Wyoming include *Cheyenne* (22,474), its state capital, an important cattle town, and its major airport; *Laramie* (10,627) an agricultural center and the seat of the University of Wyoming; *Casper* (17,964) formerly important for ranching but now for oil; and *Sheridan* (10,529) an agricultural and stock market in the northern part of the state.

In Nebraska, *North Platte* (12,429) and *Scottsbluff* (12,057) derive their chief business from the extensive irrigated areas surrounding them, as well as from the ranches of the Sand Hills and eastern Wyoming.

In South Dakota are only two centers of importance: *Rapid City* (13,844) important for agriculture and ranching, and *Lead-Deadwood* (11,620) the major mining center of the Black Hills.

Montana has *Billings* (23,261) near the southern border and *Great Falls* (29,928) near the northern border. Both cities are important for agriculture and ranching. Because of the great amount of hydro-electric power developed near the latter city, it now refines most of the copper from the Butte-Anaconda district.

The dry Canadian part of this region contains no center comparable with those listed. The cities of the Prairie Provinces all lie to the north in the Spring Wheat area.

Resorts

The Great Plains Grazing Region offers few attractions for tourists, though the Black Hills and, to a less extent, the Trans-

Pecos Highlands have developed a fairly large resort business. In southeastern New Mexico, however, in an area where the surface is as unattractive as any part of the arid West, lies the popular Carlsbad Caverns National Park with its extensive subterranean caves which attract thousands of tourists each year.

The Outlook

Little more land in the Great Plains Grazing Region can be placed under irrigation, but new mineral discoveries, particularly oil and gas, will tend to develop new urban centers. Over the greater part of the region, however, ranching will continue to dominate. In the "Dust Bowl" and elsewhere along the eastern border, the area devoted to extensive grain farming will probably shrink, much of the land reverting to pasture.

The region has been and will continue to be an important transit land, because it lies directly across the path of all transcontinental railways, highways, and airways.

CHAPTER XVII

The Rocky Mountains

A REGION OF MINING, GRAZING, FARMING, LOGGING, AND RESORTS

THE ROCKY MOUNTAIN Region is an extensive upland lying between the Great Plains to the east and the Intermontane Region to the west (Fig. 209). The general trend of the mountains, which consist of a series of linear ranges with intervening basins, is from south-southeast to north-northwest.

Origin of the Rocky Mountains¹

During the Cretaceous Period most of the area of the Rocky Mountain Region as well as that of the Great Plains was covered by a shallow sea that extended from the Gulf of Mexico to the Arctic Ocean. At the end of that period the entire Rocky Mountain area was uplifted and the waters drained off. Sediments with a thickness of at least 20,000 feet were involved in this first great uplift.

A long period of erosion followed this early uplift during which time much material was removed from the summits and deposited in the basins. Sometime later (late Eocene Epoch) the Rocky Mountains were subjected to another period of growth, accompanied by considerable volcanic activity, and followed by still another period of leveling. The region's master streams, flowing over sediments that had buried the mountain ranges, established courses which they continued to hold after they had cut into older rocks forming the major gorges and canyons through the front ranges. Mountain glaciation followed, which further deepened the valleys and greatly eroded the peaks. Glaciation was most severe in the Northern Rockies and still is active there. In the Southern Rockies it was not quite so severe and only a few small remnants of glaciers exist today.

¹ Wallace W. Atwood, *The Physiographic Provinces of North America*, pp. 294-328. Boston: Ginn & Co., 1940.

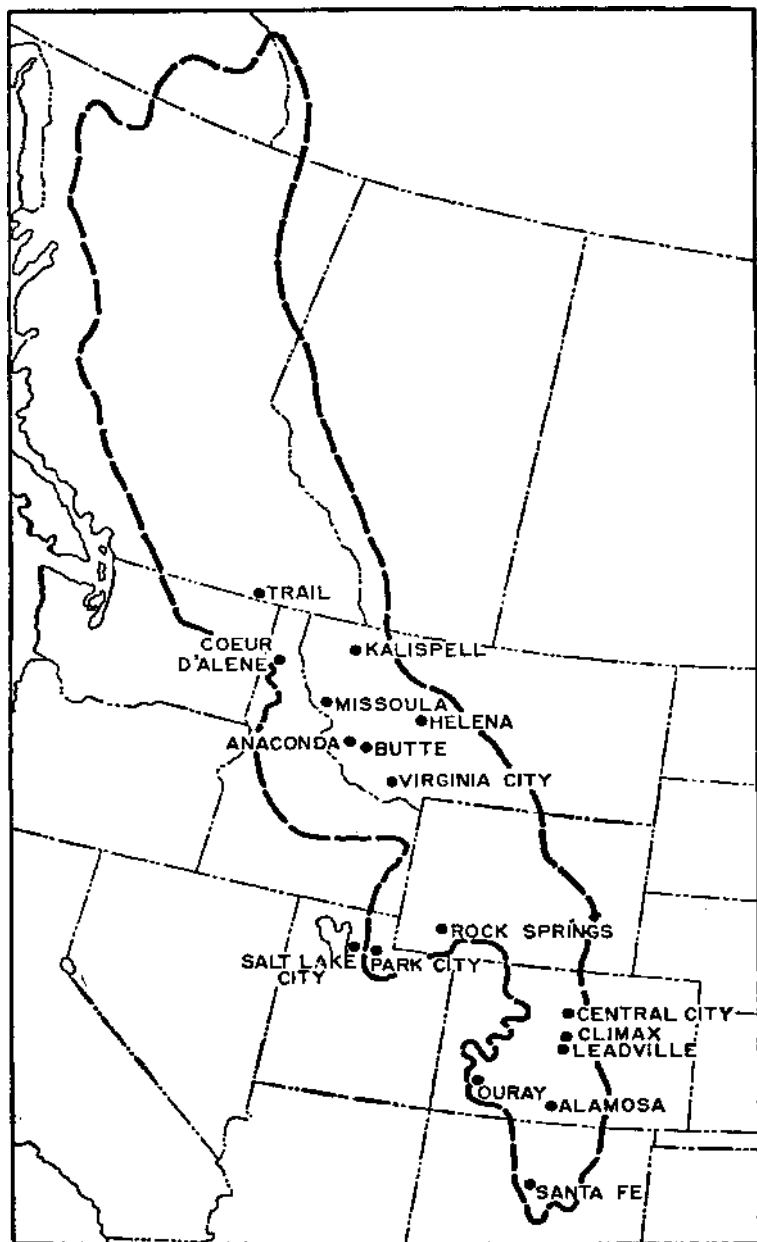


Fig. 209. The Rocky Mountains: a region of mining, grazing, farming, logging, and resorts.

The Rocky Mountains may be subdivided into four sections: (1) the Southern Rockies, (2) the Middle Rockies, (3) the Northern Rockies, and (4) the Basins and Parks. The Southern and Middle Rocky Mountains appear quite different from the Northern Rockies, which begin north of Yellowstone National Park and continue into Canada. The ranges of the southern and middle divisions are for the most part linear features with their granitic



Photo by Hileman, Glacier National Park,

Fig. 210. The glaciated Rockies of northern Montana.

cores generally flanked by steeply dipping strata forming hogback foothills such as the Flatirons of the Boulder area in northern Colorado. In contrast, the Northern Rocky Mountains are not linear, but appear more like lofty plateaus that have been severely carved into majestic alpine peaks and deep U-shaped valleys by valley glaciers (Fig. 210).² The basins vary greatly in size.

Climate and Natural Vegetation

Altitude modifies temperature and rainfall to a great extent in this region (Fig. 211). In the southern and middle divisions, the

²Nevin M. Fenneman, *Physiography of Western United States*, pp. 92-93. New York: McGraw-Hill Book Co., 1931.

mountains have sufficient precipitation to support dense forests of pine and other conifers, whereas the adjacent plains have a short grass or desert vegetation. The basins in these areas are usually clothed with grass and are suitable for ranching. The timber line decreases in altitude from 12,000 feet in southern New Mexico to 11,000 feet in northern Wyoming. In the Northern Rocky Mountains the contrast in vegetation between the lowland and the upland is not so great. In these more northerly latitudes timber appears also on the plains and floors of intermontane basins. The timber line in the Northern Rocky Mountains decreases from

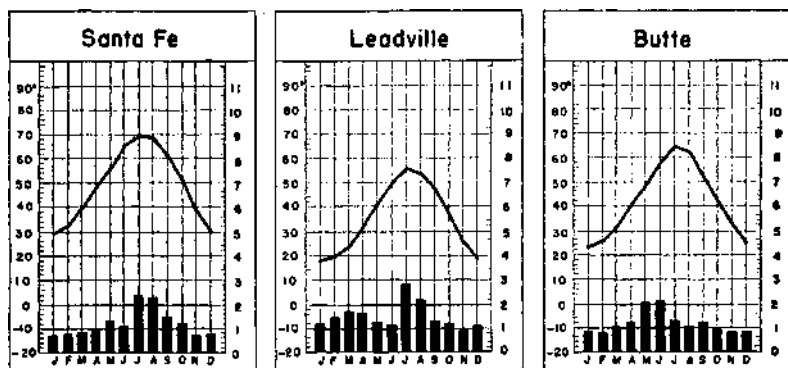
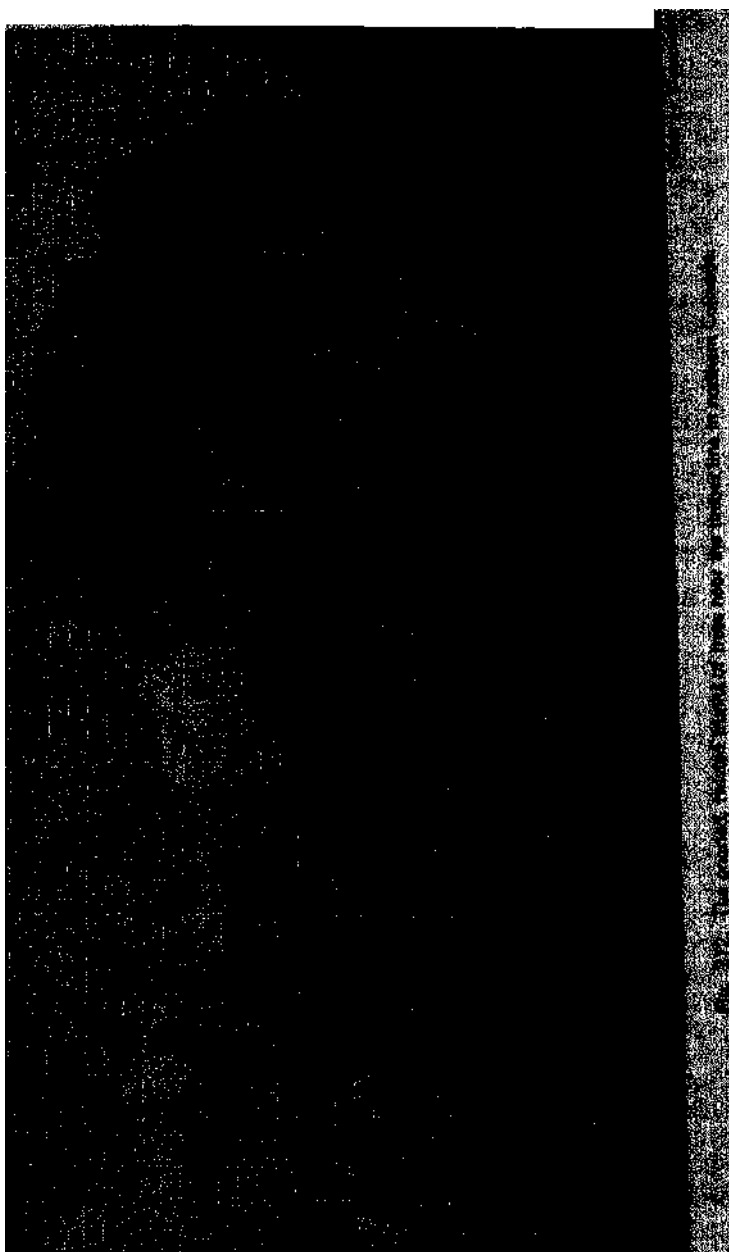


Fig. 211. Average monthly temperature and precipitation for Santa Fe, Leadville, and Butte.

10,600 feet in Montana to the level of the adjacent plains in northern Canada.

Because of the great contrast in altitudes and its wide latitudinal extent, this region presents a range of plant formations varying from the Sonoran to the Tundra. The various plant zones that may be seen in any part of the mountains is well shown in the Rocky Mountain National Park in northern Colorado. The valleys or basins (Estes Park) are covered with short grass. As one ascends the lower slopes into the mountains, large western yellow (ponderosa) pines appear. These trees are replaced at higher altitude by the smaller Engelmann spruce, lodgepole pine, and limber pine. Still higher is an intermediate zone between the forest and alpine meadows—the timber line (Fig. 212). Ellen C. Semple describes this transitional region as follows:³

³ Ellen C. Semple, *The Influences of Geographic Environment*, p. 206. New York: Henry Holt, & Co., 1911.



In the struggle for existence in the vegetable world, the tree line pushes as far up the mountain as conditions of climate and soil will permit. Then comes a season **of fiercer** storms, intenser cold and invading ice upon the peaks. Havoc is wrought, and the forest drops back across a zone of border warfare;—for war belongs to borders—leaving behind it here and there a dwarfed pine or gnarled and twisted juniper which has survived the onslaught of the enemy. Now these are the stragglers in the retreat, but are destined later in milder years to serve as outposts in the advance of the forest to recover its lost ground. Here we have a border scene which is typical in nature—the belt of unbroken forest, growing thinner and more stunted toward its upper edge, succeeded by a zone of scattered trees, which may form a cluster perhaps in some sheltered gulch where soil has collected and north winds are excluded, and higher still the whitened skeleton of a tree to show how far the forest once invaded the domain of the waste.

Above this border zone lies the alpine meadow and tundra, surmounted by bare rocky peaks.

The forests not only retard the runoff on watersheds, and provide raw material for lumbering in the more accessible sections, but also go far to sustain the resort industry.

Soils

Because of steep slopes and excessive erosion, only the basins and valley bottoms within the Rocky Mountain Region have true mature soils. Despite the lack of true soils, however, the alluvium in most basins is comparatively fertile and becomes quite productive when water is available either through natural rainfall or through irrigation. The lower mountain slopes, although rocky and almost devoid of soil, usually support a good stand of timber.

Boundaries

The eastern boundary is marked by the break between the Great Plains and the Rocky Mountains (Fig. 12). JProm central New Mexico to northern Alberta the mountains rise abruptly from the plains, except in central Wyoming where the Wyoming Basin merges almost imperceptibly into the Great Plains. The western boundary, which marks the transition from the Rocky Mountain Region to the Intermontane Basins and Plateaus Region, is fairly definite in the southern and middle divisions, but becomes somewhat vague in the northern Rockies, where it merges with the Cascade Mountains in the complex Selkirk Range. The western boundary of this region in the Canadian section extends to the edge of the coastal Range and includes the Interior Plateau of British Columbia.

White Settlement

The first white men to explore and exploit the resources of the Rocky Mountain Region were trappers who as early as 1811 were active in the Middle Rockies in the vicinity of the Teton Mountains. From that date until about 1840, when the value of beaver fur declined, the trapper and the American Indian were the only occupants of the region.

In 1849 the world learned of the discovery of gold at Sutter's Fort in the newly acquired territory of California. The news immediately started a mad westward rush of gold seekers from the East and from Europe. Many went by boat around Cape Horn or by boat and caravan across Panama or Nicaragua, but large numbers set out over the shorter but more difficult overland routes. In crossing the Rocky Mountains some of them prospected for gold in the streams and found traces of the precious metal. Most of these went on to California but some of the less successful returned within a few years to prospect further in the numerous mountain gulches.

The Mining Industry

The history of Central City, Colorado, illustrates the early mining activity characteristic of the mountain region. Central City sprang up in a rich mineralized zone that a "Forty-niner" discovered on his return to this region in 1859. Within a few months thousands of gold prospectors had come to the region. Overnight they also built the mining towns of Black Hawk and Nevadaville, but these did not reach the importance of Central City, which in the early 1870's was the largest urban center in the Rocky Mountain Region. Its growth and prosperity continued for a decade or two, but toward the close of the century the decline began. Little by little holdings were abandoned and the miners moved on to more productive areas. Nevadaville, abandoned completely, became a "ghost town." Black Hawk and Central City still have a few inhabitants. Central City's famous Opera House, which was said to have been the West's finest show-house in the 1870's, has recently been reopened as a summer theatre by the University of Denver. The attempt to revive the town is interesting, but the thriving metropolis of the gold-mining days can never return. The increase in the price of gold is stimulating mining activities to a limited extent, but with modern transportation, Central City will

benefit little from this revival, as the ore will move directly to smelters in the larger cities.

Wherever mineralized zones were found, mining camps developed. Colorado was especially important with its Ouray, Cripple Creek, Leadville, and Silver Plume. Wyoming and New Mexico were relatively unimportant. The southern part of the Northern Rocky Mountains, however, produced important minerals around Virginia City in southwestern Montana, in the vicinity of Butte and Anaconda, and in the Coeur d'Alene of northern Idaho. While gold was the mineral chiefly sought, valuable deposits of silver, lead, copper, tungsten, and molybdenum have been found.

Mining today

In a region so complex as the Rocky Mountains, with its many mineralized zones, a discussion of all districts is impossible in this volume. Therefore only five leading districts are selected: (1) Leadville, Colorado—a gold, silver, lead, zinc, and molybdenum district, (2) Park City, Utah—silver and lead, (3) Butte, Montana—copper, (4) Coeur d'Alene, Idaho—gold, silver, lead, and zinc, and (5) Trail, British Columbia—lead and zinc.

The Leadville District, one of the oldest and most important mining areas of the entire Rocky Mountain Region, is located in a high mountain valley near the headwaters of the Arkansas River at an elevation above 10,000 feet. Following the discovery of gold in the Central City area, prospectors searched the numerous mountain valleys of practically all highland Colorado. In the spring of 1860 placer gold was found in California Gulch near Leadville. News of the discovery immediately spread and by July of that year more than 10,000 people were in the camp. The first gold vein was discovered in 1868, and soon after that the first stamp mill was put into operation.⁴

In 1874 silver-lead mining began and gold soon ceased to be the dominant metal. With waning gold production most of the 10,000 miners departed and Oro City (Leadville), the original settlement, was practically deserted. At that time the site of the present city of Leadville was an unbroken wilderness, the existence of the rich silver-lead and zinc ores there being unsuspected. The rich discovery at Fryer Hill led to the rapid development of the district.

⁴ Charles W. Henderson, "Production, History, and Mine Development," *Geology and Ore Deposits of Leadville Mining District, Colorado, United States Geological Survey Professional Paper 148*, pp. 109-137. Washington, D. C.: Government Printing Office, 1927.

The first shipment of lead carbonate went out from the region in 1875, by wagon to Colorado Springs, and thence by rail to St. Louis. Five years later 10 million ounces of silver and 66 million pounds of lead were produced with a total value of nearly \$15,000,000. Following this the real mining boom began. Railroads were completed into the city in 1880 and 1887. The decline in the price of silver in the early 1890's from \$1.17 an ounce to 61 cents curtailed production, but silver-lead mining was revived somewhat after the Panic of 1893.

Copper production began in the 1880's but never became very important. Zinc, although discovered in 1885, was unimportant until after the close of the nineteenth century. In 1902 the zinc output exceeded that of lead and in 1903 that of silver.

In 1877 Leadville had a population of 200 persons, the business houses of the town consisting of a grocery store and two saloons. Within two years it had an estimated population of 15,000 and an assessed property valuation of \$30,000,000. In 1880 the city had 14 smelters and 30 producing mines. Since then its population has fluctuated, as shown by the following census figures:

1890	10,384
1900	12,455
1910	7,508
1920	4,959
1930	3,771
1940	4,774

Leadville continues to be an important mining district, producing all of its former metals and adding molybdenum from the rich ores of the Fremont Pass area. In 1939, with eighty-two lode and nineteen placer mines producing in the district, Lake County (Leadville) did not lead in a single mineral except molybdenum, although it ranked third among Colorado counties in the production of lead and zinc. The great development in recent years of the Climax Molybdenum Company at Fremont Pass, 13 miles north of Leadville, deserves special consideration.

The Climax Molybdenum Mine. Molybdenum became important in recent years only after it was discovered that the metal possessed properties of toughness and fatigue strength when used with certain iron and steel alloys for machine-tools and for automobile and airplane motors. As a result there was a concentrated effort by various manufacturing companies to find workable deposits of molybdenum. The Climax Mine, holding the world's

most valuable deposit of molybdenum, is at an altitude of more than 11,000 feet. Because of the difficulties of working at that level the mining company built a model town in the hope that more comfortable living conditions might induce the miners to stay longer on the job. Unlike most mining boom-towns, Climax was established by a single producing company that owned all the land and constructed all the buildings. Instead of typical miners' shacks, well built brick and stone residences house the miners. The company also has a large hotel, gymnasium, and recreation hall for its workers and their families.

The company has a rated daily milling capacity of 12,000 tons of ore and is the world's largest producer, accounting in 1939 for 66 per cent of the world's and 72 per cent of the domestic output.⁵ The rearmament program of the second World War has caused the United States to make huge demands on the mine.

The known reserves at Climax are estimated to be at least 95 per cent of all known deposits in the world, and are valued at close to one billion dollars.⁶

*The Park City District.*¹ The discovery in 1872 on the east side of the Wasatch Mountains of northeastern Utah of a rich vein yielding an ore assaying 100 to 400 ounces of silver to the ton led to the staking out of the Ontario claim that has since produced over 50 million dollars in silver, lead, and gold. The ores, primarily silver-lead, but containing some zinc, copper, and gold, occur as lode and as bedded deposits in sedimentary and intrusive rocks.

The leading producer is the Silver King Coalition Mine (Fig. 213), whose properties have been under constant development since 1882. With more than 4,000 acres of mineral-bearing land, it has produced over 90 million dollars worth of gold, silver, lead, copper, and zinc. After being closed down for a period, the mine and the 800-ton flotation plant of the Silver King Coalition Mines Company were reopened in May, 1939. This mine, employing more than 700 men, is one of the leading silver producers of the nation.

The Butte-Anaconda District, Montana. In the mountains of western Montana is located a copper-mining district that was surpassed in 1940 (national production) only by Bingham, Utah.

⁵ Robert H. Ridgway and H. W. Davis, "Molybdenum, Tungsten, and Vanadium," *Minerals Yearbook for 1940*, pp. 617-619. Washington, D. C.: Government Printing Office, 1940.

⁶ *Fortune*, October 1936, Vol. 14, No. 4, p. 105.

⁷ J. M. Boutwell and others, *Geology and Ore Deposits of Park City District, Utah, United States Geological Survey Professional Paper 77*, pp. 13-37. Washington, D. C.: Government Printing Office, 1912.

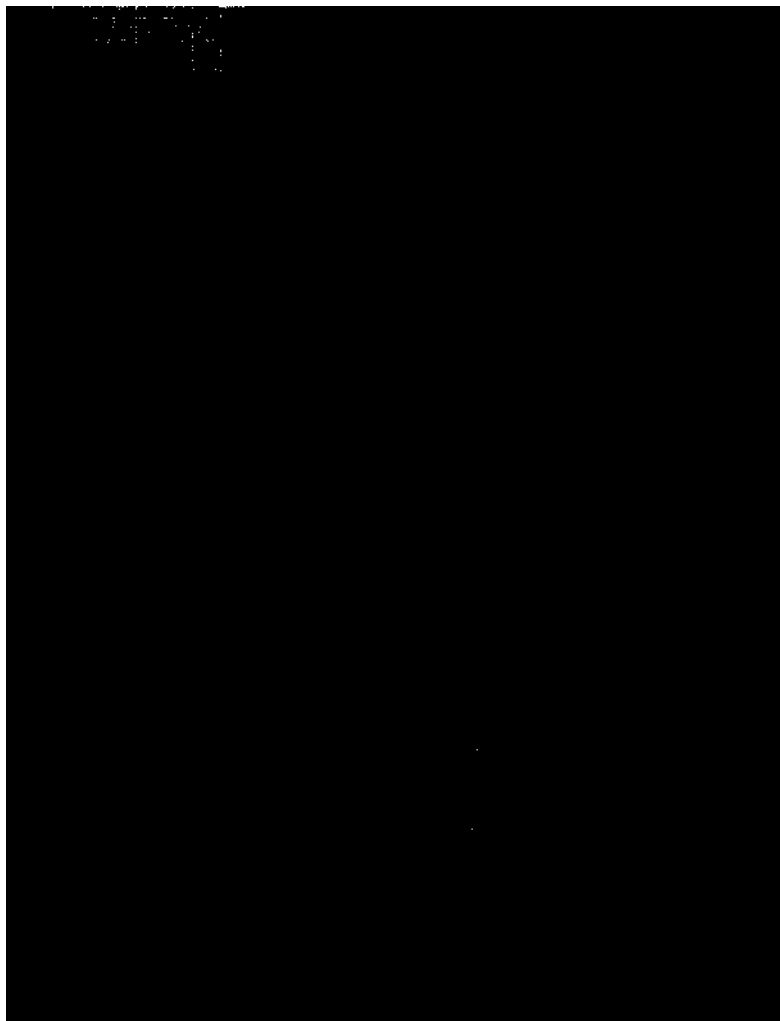


Silver King Coalition Mines CO.

Fig. 213. Silver King flotation settling tank and staff buildings near Park City, Utah.

The Anaconda Copper Company, which owns the mining properties at Butte and the large smelter at Anaconda, dominates the Montana copper production and also produces most of its silver, lead, and zinc.

The large hill upon which Butte is built is honey-combed with mine tunnels that have produced more than 2 billion dollars worth



Anaconda Copper Mining Co,

Fig. 214. Copper converters in the interior of the Anaconda smelter.

of metal within the 70 years of operation, giving it the name "The Richest Hill on Earth."⁸ For a long time the smelter was located at Butte, but injurious fumes from its stacks destroyed so much vegetation in the city that it was removed to Anaconda, 23 miles to the west. The Anaconda smelter, famous for having the world's tallest smokestack (585 feet), throws the gasses high into the air. Since the smelter's removal from Butte, the city has had some success in growing trees and grass.

Mining at Anaconda Hill in Butte goes on 24 hours a day. Electricity is used in all operations including the hauling from stopes to mine shafts. The ore brought to the surface is transported to the Anaconda smelter where it is converted into blister copper (Fig. 214). In 1939 the mines at Butte shipped more than 2 million tons of ore to the smelter. The metal is further processed at the Great Falls refinery on the Great Plains, where cheap hydro-electric power is available.

The Coeur d'Alene District, one of the richest mining areas of the Northern Rocky Mountains, lies in northern Idaho. In 1940 it produced 89 per cent of the state's silver and more than 89 per cent of its zinc. It also is an important producer of lead, accounting for nearly one fourth of the nation's output. Since Coeur d'Alene became active in 1884, minerals to the value of almost 900 million dollars have been extracted.

The lead, silver, and zinc ores of the Coeur d'Alene District are so complex that effective recovery has been difficult. The gravity process used before 1922 was extremely wasteful because of the close specific gravities of lead and zinc. In 1922 the selective-flotation process was introduced, which made possible the extraction of the metals through their varying affinities to oils and chemicals after the ores had been ground to a fine powder. The concentrates are smelted either in the district or in the Pacific Northwest.

Because of its relative isolation, the Coeur d'Alene District has had difficulty in competing with the Ozark lead and zinc areas. Recent industrial expansion on the Pacific Coast, however, is providing an increasing outlet.

The Trail District. Across the international boundary at Trail, British Columbia, lies an important lead and zinc mining district. The treatment of its ores has been responsible for a critical international problem, because the sulphur fumes are blown down the narrow Columbia Gorge into United States territory. Fumes from Trail drift into the State of Washington at least 20 days out

⁸ *Fortune*, December 1936, Vol. 14, No. 6, p. S3.

of each month providing a continuous hazard for vegetation in that state. The sulphur content of the fumes also adds to the acidity of the soils and restricts the range of crops that can be grown on the Columbia Plateau. Furthermore, the dead foliage of the area increases the fire hazard. The International Joint Commission rendered a verdict in favor of the state of Washington, allowed an indemnity of \$350,000, and forced the smelter to reduce the sulphur content of the fumes.⁹

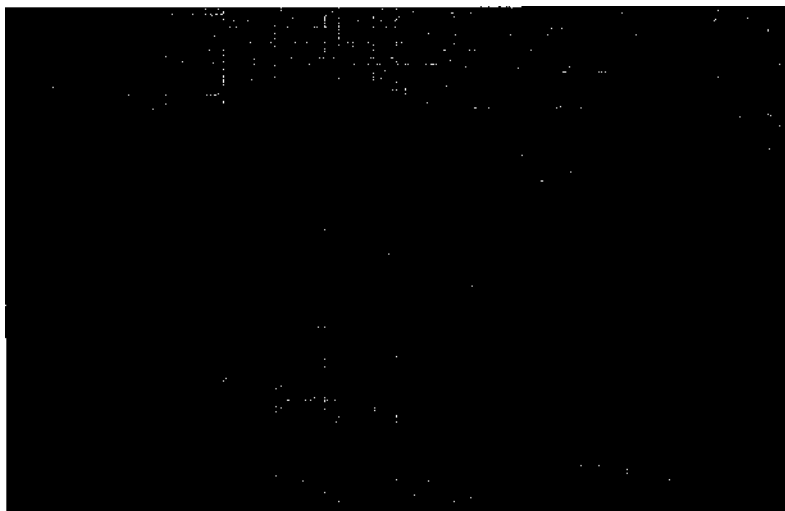


Photo by Clatworthy,

Fig. 215. A miner's cabin in the "high country" of Colorado.

The mining industry has been declining throughout the Rocky Mountain Region for several decades. Some think that most of the valuable deposits have been extracted while others insist that only the surface has been scratched. However, if the latter theory be true and new discoveries are made, it seems unlikely that new boom towns will evolve. The ghost town, the abandoned mine shaft, and the dilapidated miner's hut (Fig. 215) located far in the mountain fastness provide mute romantic reminders of a picturesque phase in the occupancy of the Rocky Mountain Region.

⁹ "The Trail Smelter Question," *Geographical Review*, July 1932, Vol. XXII, No. 3, pp. 485-486.

Forestry

The lumber industry has never been as important in this region as in the Upper Lakes area, the South, or the Pacific Northwest, but logging has occupied the time of man in a number of places. Probably the best developed lumber camps are in the Northern Rockies where large trees occupy the lower slopes and are easily accessible. Owing to the steady demand for mine timbers and railroad ties from the great mining developments in the Butte and Coeur d'Alene districts, northern Montana and Idaho have carried on a profitable lumber business for some years. Most mills are large—13 in western Montana account for more than 90 per cent of the cut. Important lumber towns include Missoula, Poison, and Kalispell. The timber consists mainly of western yellow pine and larch. Only about one fourth of the merchantable stand is privately owned, the bulk being in the national forests. This section is traversed by three trans-continental railroads that provide a large market for cross-ties.

Throughout the Rocky Mountain Region most of the timber cut was used for mine props and for dwellings—frame houses in the mining camps and log cabins in the more remote areas. As a result of the limited market, large areas are still covered with virgin timber. Since most of the land never was occupied or claimed by individuals, it remained in the hands of the federal government, which made it comparatively easy to establish national forests. Today there are probably more square miles of national forests in the Rocky Mountain Region than in any area of equal size on the North American continent. Fig. 216 shows the locations and areas of the Rocky Mountain national forests of the United States.

The establishment of national forests has done much to preserve the natural beauty of the region as well as to protect the trees from reckless logging and destructive fires. Despite government vigilance, fires frequently burn over considerable areas before they can be checked. Almost anywhere in the region one can see the charred remains of a former great forest. While many fires are started by lightning and hence are unpreventable, far too many are due to sparks from trains and sawmills, incendiaryists, careless campers, and cigarette smokers. If the summer visitor to the mountains would observe the rules of the Forest Service in regard to fire protection both inside and outside the national forests, damage could be materially reduced.

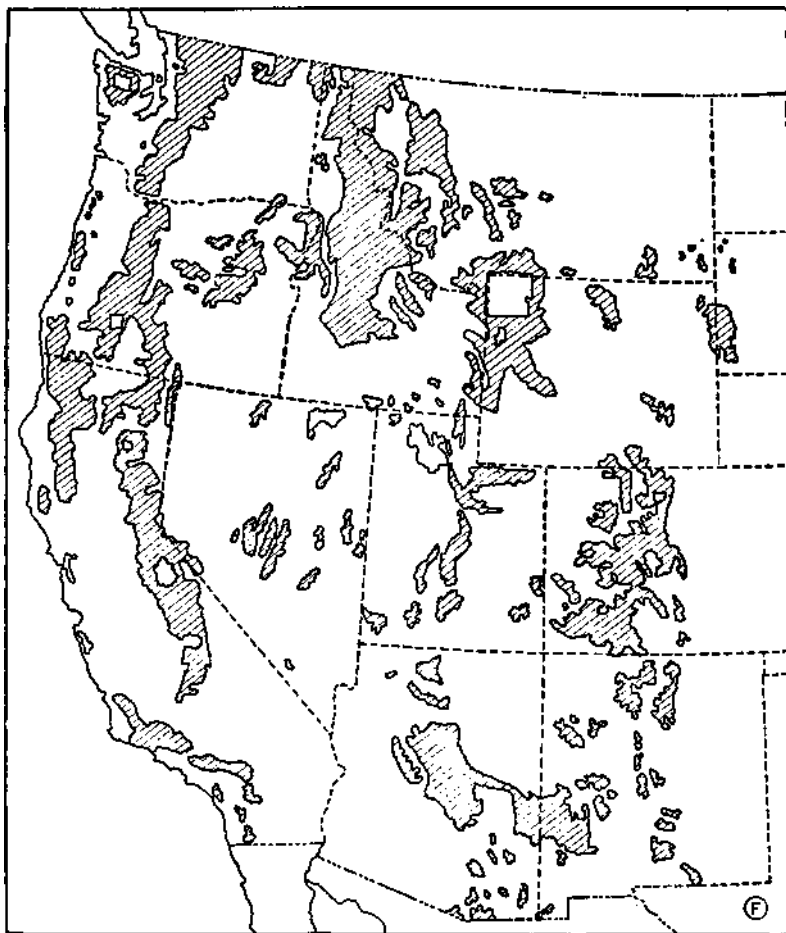


Fig. 216. The national forests of western United States.

Agriculture and Stock Raising

In any consideration of Rocky Mountain agriculture and ranching, it must be remembered that the region consists mostly of forested or bare rocky slopes. The occasional level areas are intensively utilized for irrigation, dry farming, or ranching, and thus attain an importance out of all proportion to their size. Such intensive land utilization is typical of mountain regions throughout the world.

When Spaniards settled in the Sante Fe area of the Southern Rockies at the beginning of the seventeenth century, they were primarily prospecting for gold and silver. Finding little mineral wealth, they soon turned to ranching in the broad basins in the upper Rio Grande Valley. They received large land grants in the San Luis Valley from Spain and for the next two centuries the area was dominated by "cattle barons." After the close of the Mexican War and the annexation of this territory by the United States, the large land holdings were broken up. Because of semi-aridity, however, ranching has remained the dominant occupation of the San Luis Valley although considerable acreages are irrigated. Most crops, however, are supplemental to ranching, native grasses and alfalfa being dominant. Because of the high altitude (above 7,000 feet) and the resulting short growing season, corn cannot be grown. This was a great disappointment to settlers from the Corn Belt. In the absence of corn, wheat and potatoes became the chief crops. Though profitable at first, wheat yields have declined and potatoes now constitute the main cash crop. Sorting and bagging are done by migratory Mexicans who come to the area for that purpose, and leave when the harvest has ended. In recent years, however, many have remained "on relief" throughout the winter, and they constitute a heavy burden for the taxpayers.

Ranching began much later in the valleys and basins to the north, as most of this land remained unexplored and unoccupied by white men until trappers and prospectors entered the mountains. In time each grassy plot in the Middle and Northern Rockies was homesteaded and turned into a ranch. Many areas, however, have been given over to dry farming or to irrigation agriculture. As is the case elsewhere, the best lands were the first to be cultivated and the poorest and most inaccessible remained in pasture. In the Northern Rockies and in the higher mountain valleys where the growing season is short and frosts are common even during summer, ranching has remained the major activity since it is the best adaptation to the environment. On most ranches both cattle and sheep are reared. In many places sheep have become more important since they are better adapted to the short grasses and can graze the higher slopes in summer. The government through its permit system cooperates with ranchmen, allowing them to pasture sheep and cattle within the national forests, but it is careful to see that the land is neither overstocked nor overgrazed. This *transhumance*—the driving of grazing animals to high mountain pastures in summer and back to lower valleys in winter—is almost universal throughout the Rocky Mountain Region.

The ranching industry has recently received a great stimulus through the development of the "dude ranch." Dude ranches, neither summer hotels nor farms, are usually located in scenic areas containing mountains, lakes, and streams. They appeal to a summer clientele from the East who enjoy riding, hiking, fishing, hunting, and "roughing it" in the great open spaces of the West. The visitors are respectfully called "dudes," the ranch owner a "dude wrangler," and his cowhands and business associates the "outfit." The Jackson Hole country of western Wyoming is especially noted for its many excellent dude ranches.

Some ranches which do not cater to summer tourists profit by renting saddle horses to summer visitors at near-by lodges or hotels.

Irrigation agriculture

The establishment of mining towns throughout the Rocky Mountain Region and their isolation from the agricultural areas of the East enabled some of the more favored areas to be taken out of pasture and profitably planted in wheat and other staple crops. High prices and the great demand for vegetables stimulated their production by irrigation in the more favored valleys. Wherever water could be diverted for irrigation, additional land was placed under cultivation. At first all irrigation projects were either privately developed or under state supervision, but ultimately the United States Bureau of Reclamation established several projects within the region. One of the most interesting of these is the Uncompahgre Project in southwestern Colorado, where waters from the Gunnison River, which has considerable volume but little land suited to irrigation, were diverted through a mountain range via a 6-mile tunnel. The broad flat semi-arid valley of the Uncompahgre River was thus made irrigable. A more recent project of this same type is the Colorado-Big Thompson Project which will divert by a 13-mile tunnel the waters of the Grand River on the west slopes of the continental divide to the Big Thompson River on the east slope. Most of this water will be used to irrigate additional lands on the Great Plains east of the Front Range.

Great sums of money have been invested by the federal and state governments and by private concerns in the development of irrigation projects throughout the Rocky Mountain Region, but with the climatic handicap of a short growing season, it is doubtful whether some of the money has been wisely spent. In many cases these irrigated mountain farms are producing at greater cost the same crops as the Middle West with which their surplus must com-

pete. In the Northern Rockies little agriculture has been developed because of the short growing season, ranching being the activity in any occupied mountain valley.

The Resort Industry

In new countries such as the United States and Canada people tend to become so materialistic that all other phases of life are neglected. Toward the close of the last century and during the first two decades of the present one, many large industries developed, large fortunes accumulated, and everyone worked at a feverish rate to acquire additional economic goods. Americans were accused by the older European civilizations of being "money mad"; their entire existence seemed to be aimed at making money and accumulating wealth. Then came the financial crash of 1929. Many large fortunes were swept away overnight; lesser fortunes and small family "nest-eggs" were lost in the economic chaos that followed. People who had worked and saved all their lives, denying themselves minor luxuries including some leisure for play, saw their financial "air castles" crumble. As a result, out of the depression of the 1930's came a new people—a people determined to play as well as to work.

The Rocky Mountain Region with its high rugged mountains, spectacular scenery, extensive forests, and cool summer temperatures, provides the natural setting for resorts (Fig. 33). The location of the region between the Great Plains on the east and the Intermontane and Pacific Coastal areas on the west, places it directly across lines of travel. With the building of transcontinental railroads, most of the Rockies have been made reasonably accessible.

The development of specific resort centers depended upon accessibility; thus the first resorts were those sponsored by the railroads. Others were developed after highways were built through the region. Only when some unusual natural or scenic feature presented itself were resort hotels and lodges built in remote areas.

Space does not permit a description of even the major resorts of the Rocky Mountain Region. New Mexico has in recent years provided many interesting spots for summer travel and is rapidly improving its mountain highways. Colorado, for years a leading resort state, has made many improvements, while Wyoming, Idaho, and Montana are rapidly making their resort areas more accessible. The same holds true to some extent for the Canadian sections in Alberta and British Columbia, although much of this territory still

is accessible only by railroad. The establishment of national parks in the region by the United States and Canadian governments has greatly stimulated the resort industry (Fig. 217).

Rocky Mountain National Park. Following many years of agitation by the people of Colorado for the establishment of a national park in the northern part of the state to preserve the scenic beauty of that section of the continental divide, a rugged section of 400 square miles was set aside by Congress in 1915, as Rocky Mountain National Park. It includes some of the highest and most picturesque peaks, glacial valleys, and canyons of the region, as well

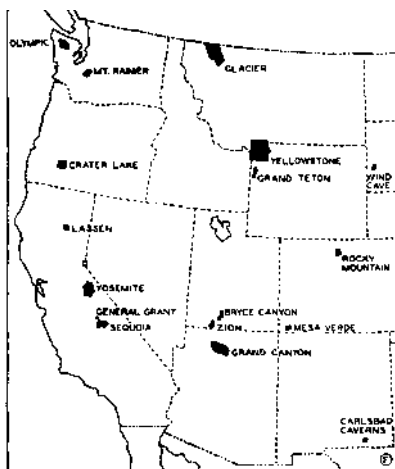


Fig. 217. National parks of Western United States.

as extensive forested tracts which provide protection for numerous native wild animals. This park, one of the most accessible in the country, ranks next to the Great Smoky National Park of North Carolina-Tennessee in the number of people passing through its gates each year. It may be reached by excellent highways from Denver, Boulder, or Loveland on the east, or from Grand Lake on the west. The Trail Ridge Road that traverses the park, connecting Estes Park with Grand Lake, crosses the continental divide at an elevation of 12,185 feet above sea level.

Grand Teton National Park, in northwestern Wyoming, one of the first parts of the Rocky Mountain Region to be explored by fur trappers during the early nineteenth century is, nevertheless, one of the youngest national parks, having been established in 1929. It contains only 150 square miles of territory, but within that area is found some of the most magnificent scenery in North America. Grand Teton (13,766 feet above sea level), the dominant peak of the range, is 7,000 feet above the surface of Jenny Lake in the Jackson Hole area.

Yellowstone National Park, oldest and largest of all the national parks, established in 1872 and added to from time to time, now includes nearly 3,500 square miles of wild natural scenery. While its mountains are neither so high nor spectacular as those of other parks, Yellowstone has a magnificent forest containing many species

of wild life, a large lake (139 square miles of water surface at an elevation of 7,730 feet above sea level), spectacular canyons and waterfalls, and the only true geysers on the North American continent. If the park had nothing else to offer, the Norris Geyser Basin with its many fumaroles and the Upper Geyser Basin with Old Faithful, would be worth the tourist's trip across the continent. Yellowstone is very accessible. Branch lines of the Northern Pacific, Burlington, Union Pacific, and the Milwaukee railroads provide access to the north, east, and west entrances, where connections are made with motor stages. The park is easily reached by automobile through 5 entrance highways.

Wat er ton-Glacier International Peace Park, in northern Montana and southern Alberta, has recently been made (1932) into an international park. Glacier National Park within the United States was established in 1910, after considerable land had been bought back from the Blackfoot Indians on the eastern slope of the continental divide. Until recently it could be reached only on the Great Northern Railroad whose line runs along the southern border of the park. The recent completion of the Going-to-the-Sun Highway across the continental divide at Logan Pass and the building of connecting highways to the east and west has made this park accessible to automobile traffic. The Waterton section is connected with the American section by motor highway and derives most of its trade from American tourists. This park contains some of the most magnificent glacial scenery in North America. Sheer cliffs (Fig. 210) formed by intense glacial erosion rise abruptly 3,000 or more feet from glacial lakes.

The Canadian national parks. Lying across the continental divide in the wildest portions of the Canadian Rockies are several national parks quite similar to each other and very much like the Water ton-Glacier Park. Developed largely by the two transcontinental railways of Canada, they are now accessible by automobile but still are most easily reached by rail. Banff National Park, the oldest in the Canadian system, contains the famous Lake Louise area. It is crossed by the Canadian Pacific Railway which operates some of the largest and most famous resort hotels on the North American Continent (Fig. 218). Jasper National Park, with an area of 4,200 square miles in a region of magnificent mountains, canyons, and glaciers, is served by the Canadian National Railway.

Transportation

Like the Great Plains, the Rocky Mountains have been a major barrier to east-west travel. The early trails across the Rockies

passed either around the southern end in New Mexico, or crossed through the one low break (South Pass) between the Southern and Middle Rockies. The first "transcontinental" railroad (the Union Pacific) used South Pass through Wyoming. Railroad surveying parties explored all possible routes but in the end only 9 lines succeeded completely in crossing the mountain barrier (Fig. 208-A).



Canadian Pacific Ry.

Fig. 218. Banff Hotel at Banff Springs, Alberta.

Two of these, the Southern Pacific and the Santa Fe, were built through New Mexico south of the mountains. Only the Denver and Rio Grande Western crossed the highest part through Colorado. Later, with the completion of the 6-mile Moffat Tunnel, another line, the Denver and Salt Lake, succeeded in reaching the western slope. Three "transcontinental lines," the Northern Pacific, Great Northern and Chicago, Milwaukee and St. Paul, crossed the mountains in Montana. In Canada only 2 lines were built: the Canadian Pacific to the south and the Canadian National farther north. Only these two are true transcontinental railways in that they link the Pacific ports of Vancouver and Prince Rupert with the Atlantic ports of Montreal, Halifax, St. John, and Sydney.

Highway development later followed similar routes (Fig. 208-B). Again the two southern routes and the one through South Pass carry most of the traffic.

Although the Rocky Mountains were less of a barrier to airplanes than to either railways or highways, the southern and central routes, with their lower mountains, attracted most of the airways (Fig. 208-C).

Cities

Because of its rough mountainous terrain, this region has comparatively few cities. Those lying within the region (Fig. 209) are dependent upon (1) mining, (2) agriculture and ranching, or (3) tourism. In the first group belong a number of cities varying from the size of Butte to completely abandoned "ghost towns" (Fig. 219). The second class includes a large number of medium sized centers that serve as markets for individual mountain basins; few of these have populations in excess of 10,000. The third group comprises small centers which thrive in summer with a large temporary population but hibernate during winter after the tourists leave.

As has been noted, immediately east of the Rockies lie a number of cities that derive a part of their economic support from the mountains and are frequently classed as mountain cities. These centers (Pueblo, Colorado Springs, Denver, Cheyenne, Great Falls, and others) all are located on the Great Plains, however, and have been considered with that region (pp. 609-615).

Of the urban centers lying strictly within the boundaries of the Rocky Mountain Region, the following seem to merit further consideration.

Santa Fe (20,325), by far the oldest city of the entire region, was founded by the Spaniards in 1605 to serve as a northern outpost for their civilization in the Southwest. After considerable trouble with the Amerinds in which the Spaniards lost control of the territory, the city was reoccupied in 1695, and remained in Spanish or Mexican hands until transferred to the United States in 1848. Extreme isolation from other Spanish settlements caused it to remain a part of "old Spain" throughout the intervening centuries. Although a part of Mexico from 1821 to 1848, it actually had little contact with that country. During that period it prospered greatly as an important frontier center and trading post at the end of the "Santa Fe Trail."

Santa Fe is located toward the southern end of the Rockies in a

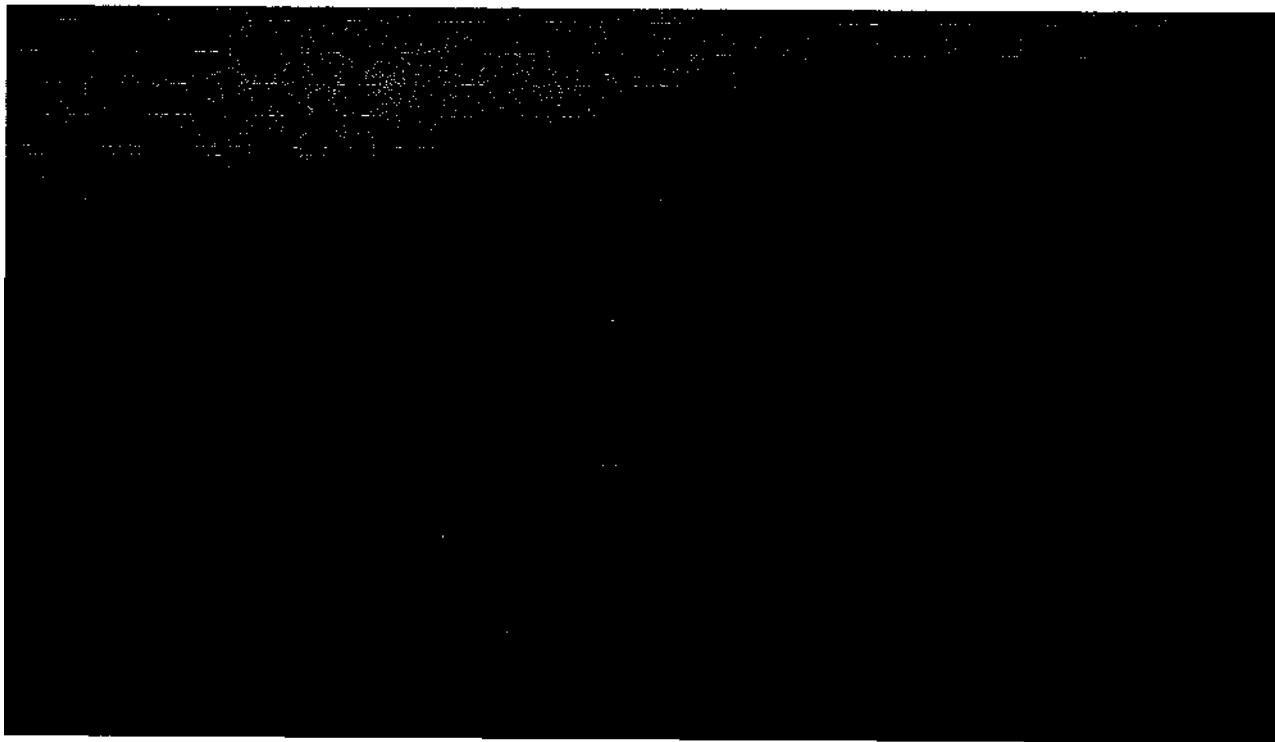


Fig. 219. A typical "ghost" mining town in Montgng. Only one family lives here at the present time. *U. S. Forest Service.*

high mountain valley more than 7,000 feet above sea level. During stagecoach days it occupied a strategic position in the trade of the West, but when railroads were built, the main line of the Santa Fe went farther south around the mountains, leaving the city to be served only by branch lines. Santa Fe remained a small place (less than 8,000) until after the development of modern highways, which again put the city on a main route. Most of its growth has come since 1920. The city is the capital of New Mexico and serves as an important trade center for the northern part of the state. It is also developing rapidly into one of the major resort centers of the Southwest.

In the resort business Santa Fe is outstanding. Fortunately its citizens have had the foresight to keep the place picturesque, continuing to use the Pueblo style of architecture even for business buildings (Fig. 220). Each year an important fiesta is staged to commemorate the return of the Spaniards to the city after its recapture from the Indians. The 1940 performance was the 229th. During this celebration the townspeople, many of whom are of Spanish descent, dress in costume, and tourists from all parts of the country come to see the performance.

Alamosa (5,613), lying near the center of the San Luis Valley in southern Colorado, is the chief trading center of the extensive valley and derives most of its income from ranching and irrigated crops. It is an important potato-shipping point.

Leadville (4,774), at an altitude of more than 10,000 feet, occupies the upper end of the Arkansas River Valley in central Colorado. The city dominates one of the richest mineralized districts of the entire region, but its population has fluctuated with mineral production (p. 625). Although today it has less than 5,000 people, Leadville should be considered as an important Rocky Mountain city.

Rock Springs (9,827), the chief trade center of the extensive Wyoming Basin, derives most of its business from ranching within that area. Rock Springs is also an important center for the shipment of coal from the extensive deposits of the Wyoming Basin. Coal has been sent by rail to points as far east as Omaha and as far west as Salt Lake City. Being located on one of the major transcontinental routes for rail, automobile, and air travel, the city profits from a lively through tourist trade in summer, particularly from those bound for the Tetons or Yellowstone.

Butte (37,081), the largest city of the Rocky Mountain Region, lies in a valley to the west of the continental divide in southwestern Montana. Located astride "The Richest Hill on Earth" (p. 629),

to



Courtesy Fred Harvey.

Fig. 220. La Fonda Hotel at Santa Fe. The pueblo style of architecture is typical of most buildings in the business section of the city.

Butte has profited from the immense value of its copper mines. Although its interests are mainly with the mining of copper and other metals, the city is located on two of the three transcontinental railroads crossing Montana, and it derives considerable trade from the mountain area and the Great Plains to the east. The city, although modern in many respects, is typical of all mining centers—a "bit of the old West." Most of its business buildings were constructed during the boom period of the latter part of the nineteenth century and exhibit the architecture of that period. The city is also a "wide-open" town with all types of gambling devices. To one side of the business district lies Anaconda Hill, which completely dominates the landscape.

Anaconda (11,004) lies in a mountain valley 23 miles west of Butte. Its chief industry is the large copper smelter and reduction works of the Anaconda Copper Company. But since it is near one of the largest wilderness areas of the United States, it has been able to develop an important tourist trade, particularly in winter when Montana's Annual Winter Sports Carnival is held in the near-by mountains.

Helena (15,056), in a mountain valley on the eastern slope of the continental divide, is the capital of Montana. In its early days it was an important gold and silver mining center. Today, however, its chief interests in mining come from a lead refinery located within the city. Helena serves a medium-sized trade territory along the eastern slope of the mountains that is primarily ranching country. Being located on a fault, the city suffered a severe earthquake in the 1920's, from which it has not fully recovered.

Missoula (18,449), is in a valley in western Montana, on the main lines of the Northern Pacific and the Chicago, Milwaukee, & St. Paul railroads. As the chief trade center for the western part of the State, it derives considerable business from ranching, lumbering, farming, and resorts. It is also the home of the University of Montana.

Kalispell (8,245), lies in the Flathead Valley of northwestern Montana a few miles south of the main line of the Great Northern Railroad. It is the center of an important lumbering district. During the summer season, it is a tourist resort of some importance, since it is the nearest city to Glacier National Park.

Coeur d'Alene (10,049), the chief city of northern Idaho, lies in the heart of a rich mining district and derives a large part of its business from mining and lumbering (p. 629). Its picturesque setting on the shores of a lake by the same name has served as a magnet to attract summer tourists. Its relative nearness to Spokane, however, will prevent it from growing much larger.

Within the Canadian Rocky Mountains are no cities comparable with those above. The few mountain villages are mainly of the resort type and their populations are seasonal.

The Outlook

In a region as extensive and as undeveloped as the Rocky Mountains it is quite difficult to forecast the future. Mining will undoubtedly continue to fluctuate in importance as new discoveries are made and as old mines become exhausted. New discoveries are always possible and may add materially to the development of any individual area. The ranching, farming, and lumbering activities, although capable of some further extension, are developed almost to capacity and should experience no great progress in the future. The resort business, however, will continue to grow as more areas are made accessible through the building of new highways and the construction of more and better housing facilities. This resort industry, now confined largely to summer trade, will eventually expand into winter sports, which will greatly increase tourist patronage.

CHAPTER XVIII

Intermontane Basins and Plateaus

A REGION OF MINING, GRAZING, FARMING, AND RESORTS

THE FEW OCCUPANTS in this huge region (Fig. 221) dwell mostly in valley oases and occasional mountain mining camps, which appear like islands in the desert wilderness. It is one of the most colorful regions in all Anglo-America.

By many regionalists it is considered several regions rather than one. Here, however, it is treated as one, since the whole is intermontane and every part *arid or semi-arid*. Water is problem number one to every form of life be it plant, animal, or man. Moreover, the following types of human adjustment recur from north to south and from east to west:

1. Where water is available for irrigation and where the land is sufficiently level, intensive farming prevails.

2. On bench lands and plateaus where sufficient rain falls for a crop once in two years, wheat and a few other crops are dry-farmed.¹

3. Where sources of irrigation water are wanting, where insufficient rain falls for dry-farming but where there is adequate precipitation for grass, grazing prevails—cattle and sheep utilizing the semi-arid areas and sheep and goats the strictly arid ones.

4. In mountains and on higher plateaus (Utah, Arizona, and New Mexico) too rugged for farming but receiving enough rain for trees, a limited amount of lumbering is carried on.

5. Where minerals occur in paying quantities and where they are accessible to railways or highways, mining is locally important.

6. Here and there throughout the whole region are scenic attractions, such as the Grand Canyon, which have no counterparts anywhere else in the world. Most of these are now national parks, national monuments, or national forests which attract hundreds of thousands of tourists each year.

¹ For a discussion of dry-farming, see pages 669-673 in this chapter.

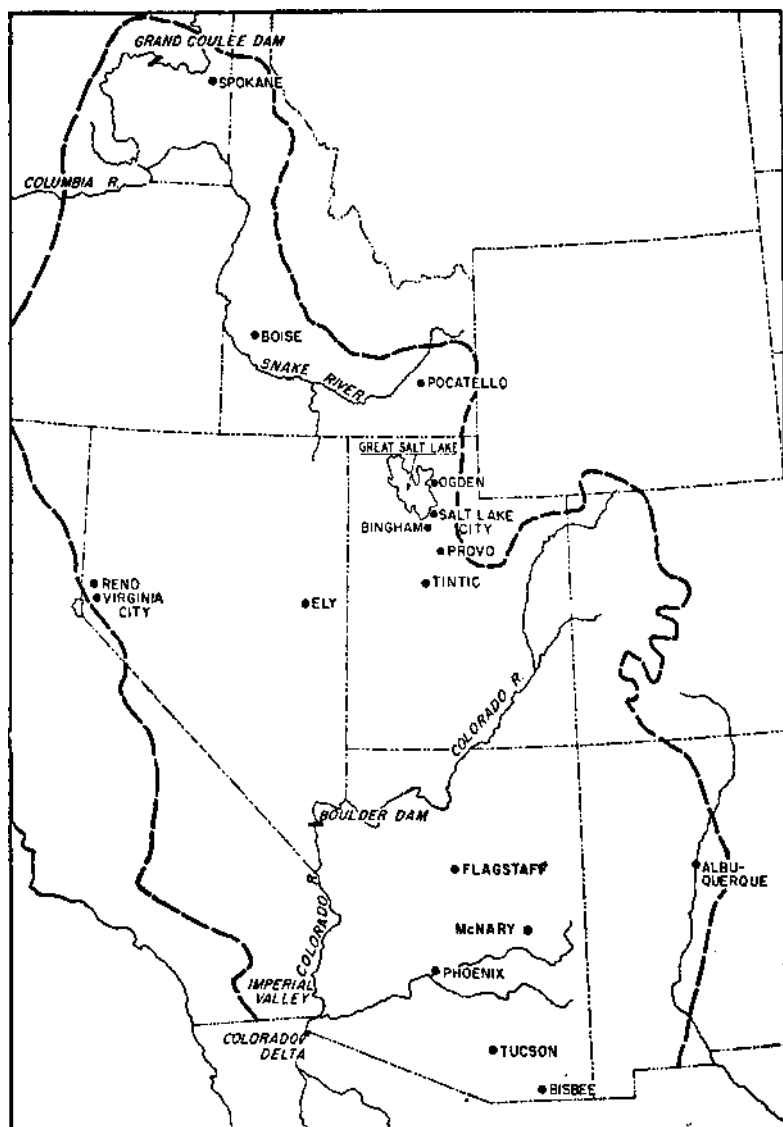


Fig. 221. The Intermontane Basins and Plateaus: a region of mining, grazing, farming, and resorts.

Climate

The greater part of this region, which constitutes almost one fourth of continental United States, is desert or semi-desert. Despite elementary geographies and the movies, this does not mean that it is everywhere a region of sand dunes and barren desolation. A desert is an area whose water supply is so small that agriculture is impracticable. "It is poor but not dead."

The climate is varied (Fig. 222), but in each subregion evaporation exceeds precipitation over a period of time. Climatically the

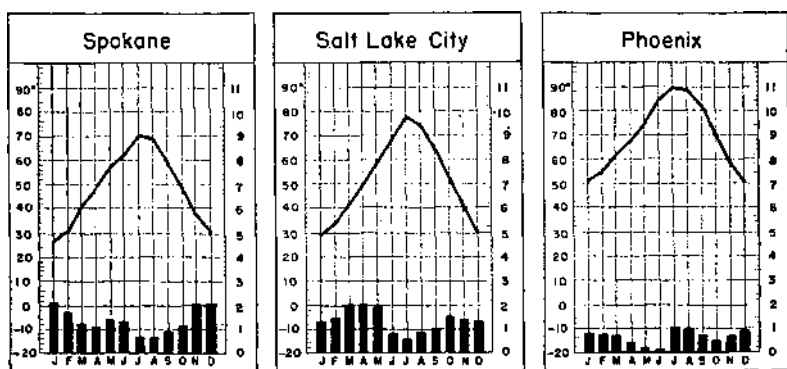


Fig. 222. Average monthly temperature and precipitation for Spokane, Salt Lake City, and Phoenix.

region falls into three realms: (1) the *semi-arid*, (2) the *normally or moderately arid*, and (3) the *extremely arid*.

The *semi-arid* is typified by the Columbia Plateau (except along its western and eastern borders which are arid and sub-humid respectively); precipitation ranges from 10 to 20 inches per year and falls largely in the late autumn, winter, and spring (Fig. 222). The growing season varies from less than 100 days in the higher elevations to nearly 365 on the Colorado Delta.

The *normally arid*, characterized by most of the Great Basin, has a periodic rainfall—a season of fairly regular, though limited precipitation, during which vegetation bursts into life and the water table is replenished.

In the *extremely arid*, the rainfall is episodic, coming only in summer at irregular intervals and invariably as cloudbursts.² The

² The cloudburst results from maximum convection. Ascending air currents support the rapidly forming raindrops until the accumulation of water is extraordinarily

Mojave-Gila Desert exemplifies this type. Its annual precipitation is less than 5 inches—too little even for grazing. Almost the entire annual rainfall may come in a single downpour lasting but a few moments. So much water falls that little can penetrate the soil.

The diurnal range of temperature throughout the region is high. The days become generally very hot and the nights quite cool, even in summer. This results from the small amount of cloud and water vapor in the air which permits the sun's rays to reach the earth promptly in the morning and hastens radiation after sunset. Elevation is a factor, too—the Colorado Plateaus experiencing less-hot days and cooler nights than the Great Basin. Latitude also must be considered; thus the Columbia Plateau is less hot in summer and colder in winter than the Great Basin. The highest official shade temperature ever recorded in the United States was 134° F. at Greenland Ranch in Death Valley.

Surface Features

Physiographically this region consists of the Great Basin, Colorado Plateau, Colorado Delta, Arizona Highlands, and Columbia Plateau.

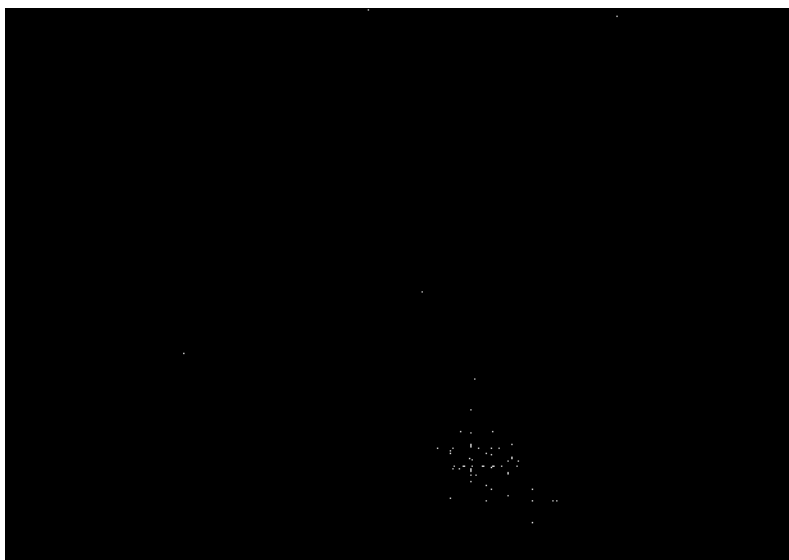
The *Great Basin*, as large as France, lying between the Sierra Nevada-Cascade ranges on the west and the Wasatch Mountains and high plateaus of Utah on the east includes most of Nevada and much of Utah. It is truly a basin, the most characteristic aspects of its physiography being the great number of isolated and broken north-south trending mountains and its interior drainage.

The Basin Ranges have resulted from the faulting of great blocks of the earth's crust, the blocks having been turned up on edge to give the mountains a sharp crest with steep slopes on one side and gentle slopes on the other. They rise abruptly from the flat valley floors, which have the appearance of level plains. This abrupt change is due to the extensive deposition of alluvium. The streams of the region are largely intermittent, losing themselves in shallow filled basins or alkaline flats. So slight is the rainfall and so rapid the evaporation that adequate water cannot accumulate to reach the sea.

Lying near the west foot of the Wasatch and the east base of the Sierra Nevada are low areas occupied by permanent bodies of

great—possibly 300,000 tons in a single storm. The sudden collapse of the air column accounts for the cloudburst. Charles F. Brooks, *Why the Weather?* p. 59. New York: Harcourt, Brace & Co., 1935.

salt water—Great Salt Lake and lakes Carson and Pyramid. They are saline because they have no outlet and because the streams which feed them, like all streams, carry minute amounts of various salts. Great Salt Lake expands and contracts according to (1) the amount of precipitation in the mountains, which supplies the streams feeding it, and (2) the quantity of water diverted from



U. S. Forest Service.

Fig. 223. The Wasatch Mountains at the mouth of Ford Canyon, Centerville, a few miles north of Salt Lake City. Note the upper level of ancient Lake Bonneville. The flats at the base of the mountains are composed of very fertile soils and are used for nurseries and truck gardens. They are part of the floor of the old Lake Bonneville, which once occupied the basin. The light colored material in the middle foreground is mud-rock flow which, during severe rains in July, 1930, was brought down from the canyon mouth as a mass of "flowing mud"—thick and bouldery. Some of the boulders weighed as much as 200 tons. Great damage was done to many acres of valuable land. Heavy grazing in the mountains, which resulted in a depleted vegetal cover and accelerated run-off, was responsible for the flood.

the streams for irrigation. It is a shrunken remnant of Lake Bonneville—a great body of fresh water as large as Lake Huron, which existed during Pleistocene times. Though Lake Bonneville disappeared thousands of years ago, the old beach lines still remain strikingly clear on the sides of the mountains (Fig. 223). The highest shoreline—the Bonneville—lies about 1,000 feet above Great Salt Lake.

A unique part of the Great Basin is Death Valley, in the southeastern part of California near the Nevada border. More than 130 miles long and from 6 to 14 miles wide, it is a desert that came into existence when a slice of the earth's crust sank forming a rift valley. Its bottom lies 276 feet below sea level. Long ago the rainfall was much heavier and a lake in the Valley had formed, into which rivers dumped great quantities of earthy materials and minerals.

The *Colorado Plateau*. This enormous area, consisting of several strongly differentiated parts but with sufficient unity to justify separation from adjacent subregions, stretches outward from the Colorado River and its branches in Arizona, New Mexico, and Utah. The greater part consists of a rather flat summit area, slightly warped or undulating as a result of earlier crustal movements, interrupted by erosion scarps in the eastern portions and fault scarps in the western parts. Physiographically, the area is distinguished by:

1. Great elevation: all but the bottoms of canyons and the highest peaks lie between 4,000 and 8,000 feet. The higher areas comprise the plateaus of Utah, the San Francisco Peaks, White Mountains, Chuska Mountains, and Zuffli Uplift.

2. Remarkable canyons, hundreds of which thread the Canyon Lands of southeastern Utah and Mesa Verde. These make the Colorado Plateau the most dissected, most difficult to traverse, and least known of all the regions of the United States.

3. An amazing amount of erosion extending through thousands of feet; nowhere in the world is there so impressive an example as the Grand Canyon.

4. Numerous arroyos (Fig. 224) which cut the region into a maze of steep-sided chasms, dry during most of the year but filled from wall to wall during the rare rains. (Not to be confused with bad lands.)

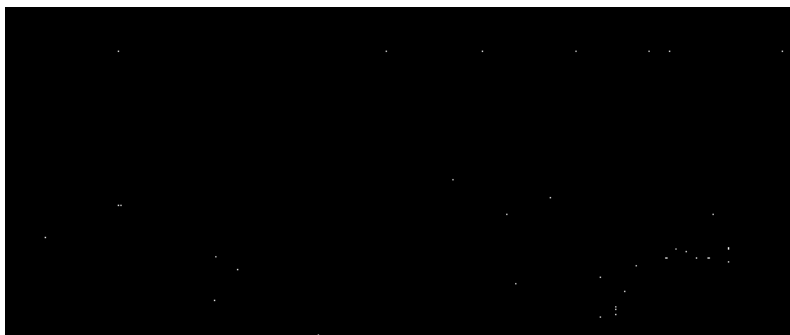
5. Mesas—flat-topped islands of resistant rock found only on the borderline of arid and humid climates.

The *Colorado Delta* including the Imperial Valley and the lower courses of the Colorado and Gila rivers is a waste-filled area with many small mountain ranges rising above the alluvial plains.

The Imperial Valley, along with southwestern Arizona, the southern tip of Nevada, and southern California east of the mountains, is a part of the Colorado Delta, whose floor consists almost entirely of alluvium. The delta proper lies mostly in Mexico. Engineering operations begun in 1901 for making the Imperial Valley available for agriculture resulted in a huge inflow of water to the Salton

Basin. As the result of floods in 1906 the river got out of control and remained so until February, 1907, during which time the Salton Sea came into existence.

The Imperial Valley, which slopes from sea level at the United States-Mexican border to about 270 feet below on the deepest part of the depression, is separated from the actual basin of the Colorado by a deltaic ridge built by the river itself. The Salton



U. S. Office of Indian Affairs,

Fig. 224. An arroyo on the Navajo Reservation. Thirty years ago there was not even a gully here. Dry during the greater part of the year, arroyos flow violently during occasional rains, carrying great quantities of range soil.

Basin which occupies about a million acres lies more than 250 feet below sea level.

The Colorado carries much silt—0.6 per cent by volume. It is estimated that as much silt goes down the Colorado each year as was excavated during the entire construction of the Panama Canal.

The *Arizona Highland*, American portion of the Mexican Highland, lies south of the Colorado Plateau. Structure and erosion have made it a far different land from the plateau. Fenneman includes it in the physiographic Basin and Range Province, for like that area it consists of mountain and plain and many of its moun-

tains, though smaller, are typical basin ranges.³ It is drained by the Gila River and its branches, especially the Salt River, which carries water from great distances all the way to the sea. This is the part of Arizona which possesses much of the commercial mineral wealth—especially copper ore.

The *Columbia Plateau* lies between the Cascade Mountains on the west and the Rocky Mountains on the east and north, and grades almost imperceptibly into the Great Basin to the south. While popularly called a plateau, which suggests a rather uniform surface, the area has quite varied relief features of mountains, plateaus, tilted fault blocks, hills, plains, and ridges. In general, this intermontane area is covered with lava flows which originally were laid down in a nearly horizontal position and interbedded with a considerable quantity of silts that were deposited in extensive interior lakes. After the outpouring of the sheets of lava and the deposit of the lake beds, the surface of much of the region was strongly warped and faulted so that the present surface of the lava varies from a few hundred feet above sea level to nearly 10,000 feet in elevation. Numerous tilted fault blocks and upfolded ridges, called somewhat ineptly the Blue Mountains, extend from southeast Washington across Oregon to within 40 miles of the Cascade Mountains and nearly divide the lava covered region into two halves. The balance of the subregion consists predominantly of basins surrounded by plateaus, hills, and ridges. Thus in southeastern Washington is the Columbia Basin surrounded by a rim of higher uplifted lava-covered country. The eastern part of the Columbia Basin consists of rolling hills covered with loess. This area, called the Palouse, receives sufficient rainfall to make it a very productive farming region. The Deschutes-Columbia Plateau is a triangular shaped area in north-central Oregon that slopes in general from the Blue Mountains to the Columbia River. The Snake River Plain or Basin extends across southern Idaho in a broad arc. In central Oregon, the Harney Basin and the High Plains or Great Sandy Desert are shallow interior basins and flats between the Blue Mountains and the Great Basin. They may be considered a transition area between the so-called Columbia Plateau and the Great Basin.

Soils

Most of this region has not been carefully mapped and little can be said of its soils except that they are all pedocals.

³ Nevin M. Fenneman, *Physiography of Western United States*, p. 380. New York: McGraw-Hill Book Co., 1931.

Columbia Plateau soils vary from heavy silt loams to fine sand and sandy loams, the former predominating. They are well supplied with potash and phosphorus but are deficient in nitrogen and humus. In the driest parts there is considerable damage from blowing. Palouse soils, true chernozems, and the most important in the Columbia Plateau, are exceptionally fertile, and, before their structure is destroyed by farming, absorb moisture readily. They are presumably of loessial origin.

Palouse topography is unique—wavelike in appearance. It is believed that this topography is largely the result of wind action and snow drift erosion or nivation which scoops out cirque-like forms on northeast-facing slopes. The hills are asymmetric, the northeast slopes being more concave and steeper than the southwest ones. Although this unconsolidated material is extremely deep, erosion has been comparatively slow due to the cohesive qualities of loessial material, the fine particles being bound together with grass roots. When this humus is destroyed by continuous cropping and fallowing, the soils erode readily.

Most true soils in the Great Basin lie on alluvial fans, piedmont alluvial plains, and playas.⁴ With water, the first two become highly productive. The Basin Ranges have either a thin layer of soil or none whatsoever. The soils at the foot of the Wasatch (the Salt Lake Oasis) are dark-colored because the benches received enough precipitation to cause a vigorous growth of shallow-rooted vegetation. They were deposited originally in ancient Lake Bonneville. Similar lacustrine materials occur around the eastern border of the Snake River Plains.

Much of the Colorado Plateau is devoid entirely of soils. Where present, they are limy, light grayish-brown or gray in color, and contain little organic material. Where water is available for irrigation, those that are deep, well drained, and free from an excess of salts, become highly productive. Considerable areas containing too much alkaline salts to produce crops have economic value as range for livestock, especially sheep.

The soils in the southern part of the Colorado Plateaus are reddish in color and, like most desert soils, are rich in lime. When irrigated they are highly productive and capable of growing a wide variety of crops such as alfalfa, barley, corn, cotton, grain sorghums and wheat.

⁴ Playas—both "wet" and "dry"—form in the lowest parts of desert basins. The latter contain shallow bodies of water during rainy spells and are apt to be moist even during the nonrainy season. The former occupy nonwatertight basins and their surfaces consist of hard sun-baked clay.

Natural Vegetation

In so large an area and in one varying so greatly in topography and hence in climate, marked differences in the natural vegetation occur. Some variations, however, as in the Great Salt Lake area of Utah, are due to physical and chemical properties of the soil.

Forests, consisting of western yellow pine and Douglas fir, are confined mostly to the higher elevations where the rainfall is relatively heavy. As precipitation declines forest changes to woodland, then to types associated with inadequate moisture—pin on and juniper and finally to chaparral.

More than half the Colorado Plateau is clothed with trees of some kind, though the forest area containing merchantable timber is limited.

Western yellow pine contributes most of the saw timber on lands lying at altitudes of 6,000 to 7,500 feet in Arizona and New Mexico. Pinon and juniper along with chaparral occupy the belt below yellow pine but are most common in southern Arizona and southern California. For the most part they are not found north of latitude 44°. The forests in the higher western and southern margins of the Plateau are included in national forests (Fig. 216).

Grasslands, more numerous than might be supposed, characterize the highlands of southeastern Arizona. Mesquite grass grows where temperatures are high, evaporation excessive, and annual precipitation low. Short grass characterizes large areas in the high plateaus of New Mexico and Arizona as does bunch grass in the Columbia Plateau.

Desert Shrub. Xerophytic plants characterize deserts—those areas where irrigation is essential to permanent settlement. Vegetation grows in even the driest parts. Most desert plants, largely dwarfed in size, possess small leaves—nature's protective device against excessive transpiration. *Sage brush*, which dominates as far south as southern Nevada, grows in pure stands where soils are relatively free from alkaline salts. Especially is it abundant on bench lands which skirt mountains and on alluvial fans at the mouths of canyons. *Shadscale*, a low, gray, spiny plant with a shallow root system, grows on the more alkaline soils but never in dense stands. Much bare ground lies between the plants. It is especially prominent in Utah and Nevada and is believed to cover even more land than sage brush. *Greasewood*, bright green in color and occupying the same general region as sage brush and shadscale, grows from one to 5 feet in height and is tolerant of alkali. *Creosote bush*, dominating the southern Great Basin as sage brush does

the northern, merges into the *chaparral* zone where it draws moisture from deep down under the surface. It is a large plant attaining a height of 10 to 15 feet. *Mesquite grass* also occupies a large acreage in southern New Mexico and Arizona and is especially abundant on the fertile soils along drainage channels. *Cactus* and *yucca* grow over much of the Arizona Highlands at slightly higher elevations⁵ than creosote bush. They characterize the loose soils covering the rough rocky hills and low mountains that have been badly eroded. Their grazing value is slight.

Most desert plants stand in lonely isolation and have to fight to live: "In the warfare which is perpetual and of a ferocity elsewhere unequaled, water is the key, for water is life/⁷

Indianland

American Indians formerly lived over much of this region, but as a result of white pressure, they are now restricted to the very poor lands.

In the Southwest the Amerind reached his apex in culture and civilization. Here he made considerable progress prior to the white man's arrival and it is here that he is making his strongest stand today. So far as the United States is concerned, this is the only part that remains true Indian Country.

One cannot generalize on the American Indian beyond saying that all are dark-skinned and have high cheek bones, dark hair, and flat features. Tribes vary: the Navajos, tall, active and alert, are nomadic or at least semi-nomadic, the Hopi and Zuni are smaller and less active. Figure 8 portrays the distribution of Indian tribes in this region.

The Navajo country

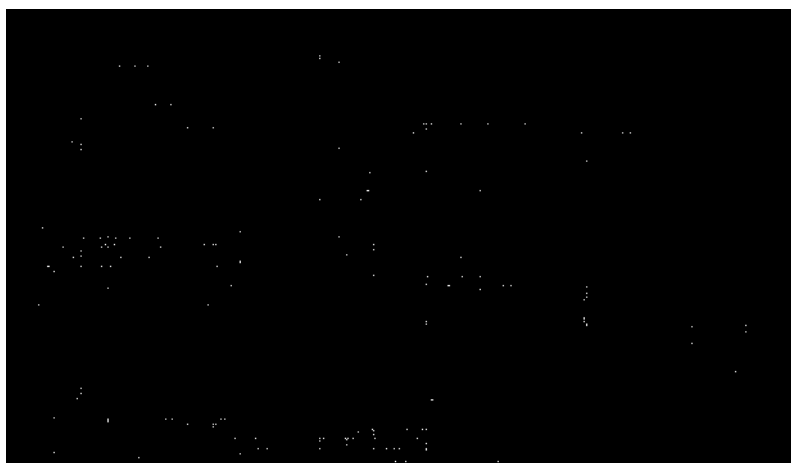
The scope of this book precludes treatment of all the tribes in the Southwest; hence only the Navajos, who typify the nomadic type, and the Hopis and Zunis, who typify the sedentary type, are discussed.

The Navajo country is a reservation comprising some 16,000,000 acres. For the most part it is a sun-scorched, water-sculptured land—one of "high plateau, flat-topped mesa, high, inaccessible butte, sharp, deep canyon, and sandy and gravelly wash"⁶ (Fig. 225). It is larger than the state of West Virginia.

⁶ Below 3,500 feet.

⁷ J. Russell Smith and M. Ogden Phillips, *North America*, p. 569. New York: Harcourt, Brace & Co., 1940.

The rainfall, of about 3 to 15 inches, comes in the winter and summer seasons (Fig. 222-C). Summer rains, mostly torrential, have stripped the topsoil from scores of square miles, which are now almost naked. Aside from the main arteries used by trans-continental tourists, motor roads are few and poor. Motorists from outside this region who have been caught on a dirt road in a summer



Santa Fe Railway.

Fig. 225. Indian country in the Southwest. This is Zuni, a pueblo with about 2,000 inhabitants. The Zunis were the people whom the Spaniards found when they were seeking the "Seven Cities of Cibola." *FoYmerly one house was built against another and the pueblo had several stories. Ladders were used to get to the upper stories; there were no inside stairways. Since protection is no longer a major problem, the situation has changed as can be seen here. **The houses are constructed of mud and stone.**

afternoon downpour do not soon forget their nightmare. This then is more the land of the horse than of the motor car.

Water is scarce. Only 5 per cent of the Navajo country has permanent streams; man and beast depend upon pools, water pockets, or tanks. Every native automobile carries its water bag.

Though most of the land is classed as marginal by the land economist, little indeed is so desertic as to be positively worthless to sheep and goats (Fig. 226),

When the Navajos first turned to the rearing of livestock, the range was in good condition. But with increasing population, more animals were needed and with more livestock came overgrazing. This has diminished the carrying capacity of the range and erosion has attacked it—gnashing it with gullies and seaming it with arroyos. Springs have dried up and the Navajos have been threatened with starvation or with becoming public charges.



Santa Fe Railway

Fig. 226. A Navajo tending his sheep in Arizona. Since less than 1 per cent of the Navajo Reservation is suited to agriculture, the Navajos are essentially pastoralists. They did not graze sheep, however, until Coronado introduced this animal into the Southwest in 1540. The Navajos have used their land hard and the reservation has been stocked beyond capacity. Unless they take better care of their land, their future is not bright. Hence range wastage through overgrazing and erosion must be halted.

Distribution of Amerinds. The Navajo Reservation, which looks almost deserted to the traveler, has a population density of about 2 persons to the square mile. Yet, with hardly 10 inches of rainfall and with a dearth of other natural resources, *it is overcrowded*, and the Navajos are frantically urging the federal government to give them more land.

Not all the Amerinds are Navajo: 46,000 are, but 3,000 are Hopi and 100 are Piute.⁷

Much has been said about the Amerinds as the "vanishing Americans." This statement certainly is not applicable to the Navajos—the largest Indian tribe in the United States, which has increased from less than 10,000 in 1870 to more than 45,000 in 1940. This increase may be credited primarily to the lowering of the death rate, especially among infants, as a result of better medical attention.

Religion

The religion of the Amerind is a practical one designed to aid him whenever he needs help on earth rather than in the uncertain future. Since life in the dry plateau is at the mercy of sun and rain, the Amerinds are extremely religious. Their religion was from the beginning woven about their intimate observations of nature.

In the Southwest among those Amerinds who were farmers, as for example, the Hopis and the Zufiis,⁸ a deep reverence developed for those natural forces that control weather, especially rainfall. Following a custom inaugurated by their forebears at least 2,000 years ago, these Amerinds pray for rain by dancing; the dances, little modified since first seen by whites 400 years ago, are held when crops are suffering from drought or when rain is needed to germinate newly planted corn. When, as often happens, rain begins to fall in the midst of the dance, the Indians whoop it up and prance with triumph.

Charles F. Lummis, eminent authority on the archaeology and history of the Southwest, said that rain follows a rain dance within 24 hours in fully three fourths of the cases and that he who journeys to witness a rain dance had better take along his umbrella.⁹

Every pueblo has one or more rain priests, who begin their training in boyhood, inheriting all the accumulated weather knowledge of some 20 centuries.¹⁰ To those who know something of the

⁷ J. W. Hoover, "Navajo Land Problems," *Economic Geography*, July 1937, Vol. XIII, No. III, p. 281.

⁸ The Zufii Reservation lies just outside the Navajo Reservation—south of Gallup, New Mexico.

⁹ "Pueblo Rain Dances," *Taylor-Rochester*, Second Quarter, 1938, p. 43.

¹⁰ "Albert, 26-year-old Zuni Indian rain priest, has been given a deferred classification under selective service. Fellow tribesmen appeared before the local draft board to plead that Albert's services were needed at Zuni to bring rain not only for their semi-arid western New Mexican reservation, but for the whole world. The board held that the rain priest was entitled to the same consideration given ministers of other religions." From Albuquerque, New Mexico, *The Tribune*, January 24, 1941, quoted in *Indians At Work*, May 1941, Vol. VIII, No. IX, p. 24.

climate of the Southwest it is significant that rain dances ordinarily are held during one of the area's rainy seasons and are announced less than 24 hours in advance.

What do they do for a living?

The Amerinds in the Southwest are either agriculturalists or graziers. Their ancestors were probably driven out of their own lands by more powerful neighbors and forced into this inhospitable land. They supported themselves by hunting despite the Southwest's poverty of game—a consequence of sparse, thorny, bitter vegetation. Even the Pueblo Indians, who became farmers, did some hunting as is indicated by the great number and variety of bones recently found.

Navajo grazing. North America was poor in domesticable animals: the bison, antelope, deer, and elk were not tractable and have never been domesticated. The Spaniards who settled in New Mexico attempted to domesticate the bison but failed.

Since grazing was a leading enterprise in their homeland, it was natural that the Spaniards should have brought their animals to the New World. Especially valuable to the Indian was the horse which for the first time assured mobility.

Today the Navajos are essentially pastoralists (Fig. 226), their flocks of sheep and goats being driven into the higher timber areas in summer and back into the valleys in winter. In arid areas with small relief, they drive the flocks into the highlands in winter because at that season water is available only in the higher places.

There are too many head of livestock on the reservation. The Navajo sheep are hardy, subsisting throughout the year on the open range; their wool is easy to card, spin, and weave by hand, and it makes a high grade rug; however, the fleece is light, weighing but 4 pounds per head as compared with 8 pounds for the entire country. Furthermore, these sheep are poor meat animals. As a means of enabling the Navajos to reduce the size of their flocks and thus improve the grazing lands, the government is attempting to improve the breed. Early in 1942 it announced progress: the Navajo ewe, which weighed about 60 pounds in 1934, with laboratory selection and good range management, now weighs about 100 pounds; her fleece which weighed 2 to 4 pounds now weighs 5 pounds; and her lambs, which weighed 40 pounds at weaning time now weigh 60 pounds.

Agriculture. Deserted settlements prove that the Colorado Plateau supported far more people in the past than at present.

Miles of stone irrigation canals testify that grain waved in fields where now only rocky and sandy desertic wastes prevail.¹¹

Hopi agriculture. Among the best farmers of the Colorado Plateau are the Hopis, who occupy lands in the southwestern part of the Navajo Reservation. Long ago they realized that their rainfall was inadequate for agriculture. In order to grow crops they learn the location of all moist soils for miles around their pueblos, and practice flood-water farming—placing their crops in valley bottoms near washes, or wherever moisture is available. The fields often lie far from their pueblos.¹²

They plant their corn in hills about 6 feet apart to conserve water and 6 to 8 inches deep to keep it from sprouting until rain falls. They also put 15 to 20 kernels in a hill. Occasionally they erect small windbreaks about 30 feet apart in parallel rows and at right angles to the prevailing winds. Because of the short growing season (the result of altitude) they have developed quick-maturing strains.

The Hopis, reputed to be the most skillful of all dry-land farmers, cultivate intensively, each farmer handling only 2 to 10 acres. Seldom is their land in one continuous piece.

Indian dwellings

Whether dwellings in the Colorado Plateau are individual *hogans* (Fig. 227) or *pueblos* (communal homes)¹³ (Fig. 225) depends on whether the occupants are (1) nomadic hunters or graziers or (2) sedentary farmers.

Navajo hogans. The Navajos have never been a pueblo people, have never lived in towns, and have never farmed very much. This is understandable, since formerly they were hunters and even now are mainly pastoralists. Their homes are well-adjusted to the surroundings; so widely scattered are their hogans and so well do they melt into the landscape as to be seldom seen by unobservant passers-by. The *winter hogan* is constructed of logs, the cracks on the outside being chinked with earth; a hole is left in the roof for the escape of smoke. The door, formerly a blanket, is now made of wood. There are no windows. Hogans differ in size, the largest

¹¹ In the Salt River Valley there are about 150 miles of main irrigation ditches, some of which have been incorporated into the modern project by government engineers.

¹² J. W. Hoover, "Tusayan: The Hopi Indian Country of Arizona," *Geographical Review*, July 1930, Vol. XX, No. 111, p. 434.

¹³ The Spanish word *pueblo* means *people*; apparently, then, a pueblo had to be large enough to accommodate a sufficient number of people to justify the use of the term.

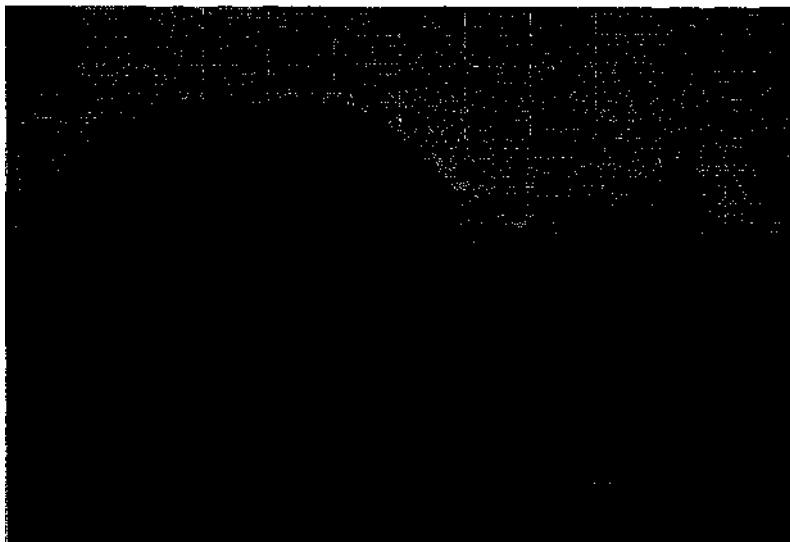
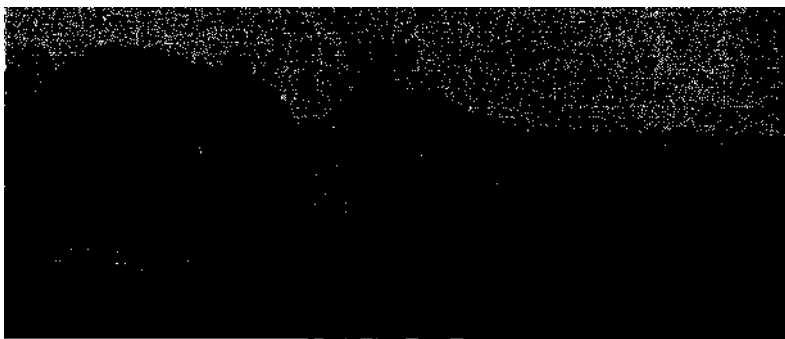


Fig. 227A. Winter hogan—the so-called permanent home. The Navajos build these round or octagonal dwellings with mud and stone, timber being scarce. Though abandoned temporarily, their owners return to them some time during the year. The Navajos, the only Indian shepherds in Anglo-America, build their corrals close to the hogans, driving their sheep into them each night.



Photos courtesy J. W. Hoover.

Fig. 227B. Summer hogan—the temporary lodge. This rather well-built dwelling consists of upright stakes covered with brush. It serves well as a temporary shelter except during the occasional rains.

being about 15 feet across. They are dry, warm, and well-ventilated. Sheep skins cover the floor, serving as beds by night and seats by day. The *summer hogan*, made of brush closely piled against upright stakes, is shady and open to breezes but is unsatisfactory during rains. For religious reasons all hogans face the east.

Hopi pueblos. The Hopis have been compared to the wild sheep which were compelled to move to mountain peaks because of fierce animals. Surrounded by the more numerous Navajos, the Hopis perched their picturesque pueblos atop lofty steep-walled mesas accessible only by one or 2 tortuous trails, which they could defend against enemies. Here, too, they kept food and water.

The Hopi house, made of stone and adobe bricks, is easily constructed, easily repaired, and inexpensive. Thick walls make it warm in winter and cool in summer. Roofs are always flat.

Tribal crafts

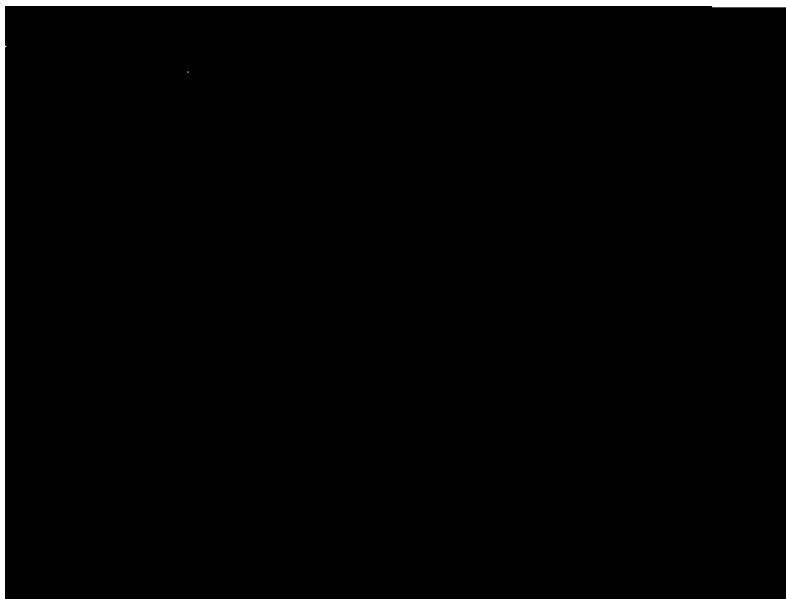
The Amerinds of the Southwest are skilled craftsmen. They get a considerable part of their living from the sale of art wares to tourists. For example, when a Navajo mother needs provisions and clothing for her babies, she makes a rug of the size that can be exchanged for the bill of goods. Though machine-made articles have to some extent destroyed native arts, the federal government, through the Office of Indian Affairs, is trying desperately to prevent the extinction of Indian crafts by acquainting the public with the richness of the wares, by developing markets, and by encouraging the Amerinds.

Pottery making is seldom practiced by primitive peoples because nomadism discourages the use of fragile household utensils; sedentary life, on the contrary, encourages it. Clay, mixed with temporary ingredients, sand, pulverized stone or shells, is used and the vessels are shaped and worked by hand. Though the potter's wheel was never used, many pieces are so nearly perfect that the naked eye can detect no irregularity of shape. Baking is done in the open in smothered fires or crude furnaces. Women are the potters. Each tribe has its own distinctive type and decorations.

Silver and turquoise. The Amerinds, always fond of ornaments, made them of turquoise, a blue or green stone common to the Southwest. When the Spaniards came, they taught the natives to work with silver, and today the Indians make superb bracelets and rings set with turquoise.

Weaving, now done by all Amerinds in the Southwest, was begun by the Pueblo tribes. The Navajos learned the art from Pueblo

women taken in raids. The Pueblo Indians originally used cotton, wool being unavailable until the Spaniard arrived with his sheep. After the Navajos became herders, they became the Southwest's most skillful and proficient weavers of blankets. A Navajo woman catches a sheep, from which she pulls a few handfuls of wool, cleans, spins, cards, and dyes it, and then works it into her blanket. The



Santa Fe Railway,

Fig. 228. Navajo squaw making a blanket on the Navajo Reservation. The weavers take raw wool, which they then clean, spin, card, and dye. Ordinarily they dye at one time only enough yarn to make one blanket. Originally all Navajo blankets were colored with natural dyes, but when the white man began to use the blankets for rugs, the weavers used commercial dyes. Today the tendency is to return to the old vegetable dyes. Rug-making contributes greatly to the tribal welfare.

Note that the Amerind in the right foreground wears a "Navajo blanket" made by machinery. -

looms used today are the same kind as were used in the days of Coronado (Fig. 228). The Navajos have developed a type of sheep which produces the most suitable wool for blankets.

Basketry, one of the oldest and most distinctive Amerindian arts, was followed over much of North America.¹⁴ Baskets are of two

¹⁴ The few exceptions were tribes living in the buffalo country of the Great Plains where skin containers, cured and decorated, were substituted for baskets.

types, coiled and woven. Depending upon a given tribe's location, the basket makers chose from a wide variety of materials—cane, woodsplints, bark, grasses and reeds—and utilized contrasting colors and dyes. Machine-made containers threaten to destroy this ancient art.

Historical Settlement

The Spaniards arrive

It is not definitely known when the first Spaniards came into the Southwest. About the middle of the sixteenth century, however, those in Mexico heard tales of a people living to the north who occupied multistoried houses, wore fine clothes and precious stones, and used weapons of gold and silver. These settlements were presumed to be the "Seven Cities of Cibola." Since the Spaniards were intensely interested in precious metals, they decided to locate these cities, Coronado setting out in 1530. But instead of finding what he sought, he encountered only mud homes built one atop the other—the pueblos of Zuni (Fig. 225). Later on, the Spaniards explored the entire Southwest and were responsible for the conquest of nearly one third of what is now the United States. Unable to find precious metals, some remained to convert the Amerinds.

The Spaniards left an indelible influence on the history of the Southwest as well as upon American civilization. Their livestock formed the basis of the later American cattle and sheep industry and their horses gave mobility to the Amerind, the importance of which can hardly be overestimated. Small Spanish settlements and trading posts such as Santa Fe made up the population of the Southwest until the middle of the nineteenth century.

American explorers and trappers

American explorers began to filter into the region in the early nineteenth century. Lewis and Clark entered the Pacific Northwest in 1804-1805; the Astorians, in 1811-1812 and again in 1813; Smith explored the Great Basin in 1828; and Wyeth, the Pacific Northwest in 1832-1833. Bonneville in 1832 and 1836 traded in furs and casually explored the area drained by the Bear River, while Fremont in 1845-1846 entered the Salt Lake Basin by way of the Bear River, becoming the first (Fig. 10) to explore it systematically.

Trapping, a powerful incentive to exploration, was, as a matter

of fact, the main object of many of the men who explored the West in the early nineteenth century. They were largely freebooters, groups of whom constantly strove to outwit their rivals, supplant them in the good will of the Amerinds, and mislead them in regard to routes.

The farmer invasion

The outstanding example of farmer invasion was the Mormon migration to Salt Lake Valley in 1847. The Mormons had trekked from Ohio, Missouri, and Illinois to escape persecution and to find a sanctuary where they might maintain their religious integrity. To accomplish this, they felt impelled to establish themselves on the border of the real American Desert. The agricultural fame of the Utah colony was soon known far and wide. Utah is the only state in the Union that was systematically colonized. The leader, Brigham Young, sent scouts into every part of the "State" to seek lands suitable for farming. He personally selected the colonists, who were of sufficient number to build forts against Amerind attacks and construct dams and canals for irrigation. He located all farm-villages near streams, for upon water the colonists depended for their very existence.

Before long all the arable land had been acquired; scouts were then sent outside Utah to seek new irrigable lands. Thus Mormons made the first permanent settlement in Idaho, and were the first Anglo-Saxons to arrive in the Grand Canyon country.

The California gold rush

Following the explorers, trappers, and farmers came the gold-seekers of 1849. So large was the movement that it led to the establishment of trading posts and stations, where the migrants rested and refreshed themselves. The Salt Lake Oasis especially became a "Mecca" for the weary and exhausted. Farther west the wagon trains rested in Carson, Walker, and Mono basins.

The graziers

Most of this region was a "natural" for the grazier. For some years after the Spaniards came, the rearing of cattle was almost the only range industry, though Navajo Indians and Mexican colonists herded some sheep. Northward in Utah and Idaho cattle-rearing also held sway in nonfarming areas.

In the 1870's and early 1880's bands of Spanish and French

Merino sheep were driven into the Southwest from California, furnishing a fine, short-staple wool in sharp contrast to the long, coarse wool of the Navajo sheep. *Transhumance* was practiced: in Arizona the cool northern mountains were used from May until August; then the flocks were moved to the lower desert ranges. Late spring found them once more among the mountain pastures.

In Utah the self-sufficing Mormons reared sheep for homespun and as early as the 1850's nearly every farmer possessed a few head.

Most parts of the range in this enormous region were overgrazed. The situation in Utah was typical: after only 35 years of use, the best pasture grounds showed scarcely a trace of the originally abundant grass and browse. By 1880 every locality west of the Wasatch Mountains showed the effects of overgrazing.

Errors Made in Settling Arid America

The Spaniards who settled in this region—one not fundamentally different from their Meseta—knew how to cope with its problems; according to the historian, H. E. Bolton, and, contrary to prevailing opinion, Spanish colonization was notably successful.¹⁵ The Anglo-Saxons, on the other hand, encountered a distinctly new type of habitat, for they came from lands of ample rainfall. Even the federal government blundered, its laws having been framed for humid and not for arid and semi-arid land; accordingly the Homestead Act's gift of 160 acres, adequate for the humid East, was inadequate for the arid region. Says Paul Sears:

... a family might starve to death in the grazing country on a farm of one square mile, while a quarter or even an eighth of that would mean comparative comfort in the beautiful valley of Virginia.¹⁶

Only after the pioneer, through trial and error, had learned certain lessons, did the government act wisely and—diange the size of the Homestead unit from 160 to 320 acres. But this amount was inadequate for stock farming in the arid West. Investigators estimated that a family could support itself on 640 acres. Accordingly, after considerable agitation on the part of congressmen from the western states, the Stock-Raising Homestead Act was passed in 1916 allowing a family 640 acres.

Since nearly one quarter of the area of continental United States is arid or semi-arid, it is obvious that greater knowledge of the

¹⁵ *The Geographical Review*, October 1929, Vol. XIX, No. IV, p. 673.

¹⁶ Paul B. Sears, *Deserts on the March*, p. 208. Norman, Oklahoma: University of Oklahoma Press, 1935.

region under consideration is needed. As a means of helping prospective settlers choose land more wisely, the Geological Survey and the Department of Agriculture are today classifying lands on the basis of their suitability for grazing, mineral production, crop production (with or without irrigation), or uselessness.¹⁷ That close settlement was pushed well beyond safe limits is proved by the hundreds of abandoned homesteaders' shacks (Fig. 229). The history behind nearly every one is the same; land was offered for sale at low cost to people who never had lived in a dry region and hence knew nothing of its problems. Time and again people settled where they could not possibly make a living. In many instances they tried to grow crops totally unsuited to the climate. These people were not to blame so much as their government, which should have determined the true character of the land preceding settlement. It is significant that in 1878 Major John W. Powell, in reporting to Congress, pointed out the need of a special land policy for parts of the West that would allot 2,560 acres to each family.¹⁸

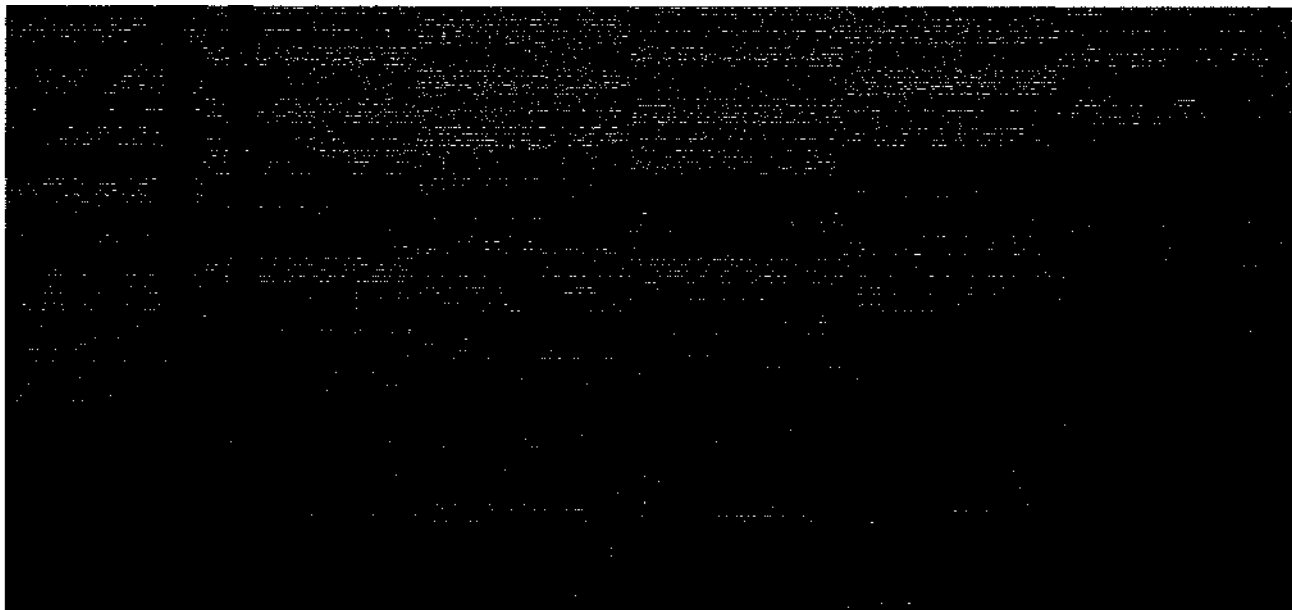
Nowhere in the world was land in such enormous tracts acquired so rapidly. Within a century after the formation of the United States government the Director of the Census announced that there was no longer a frontier. Accordingly, in 1935 the Homestead Policy, which really had long been obsolete, was brought to an end.

Distribution of Population

Over most of the earth, population is located where climate, if given a chance, produces forest or tall grass. From such areas the density of population shades out to virtual invisibility in areas truly arid. Thus in the United States one passes from Maryland with 184.2 persons to the square mile to Oklahoma with 33.7, Arizona with 4.4, and Nevada with 1.0. *These figures are significant in their implications: arid America is a sort of human vacuum.* What population there is congregates in "islands" where (1) water is available for irrigation farming, (2) ore-deposits permit commercial mining, or (3) transportation routes converge. In the entire region only 3 urban centers have 100,000 or more inhabitants: Salt Lake City, Spokane, and Phoenix.

¹⁷ *Journal of Geography*, February 1930, Vol. XXIX, No. I I, p. 79

¹⁸ 1938 *Yearbook of the Department of Agriculture*, p. 114. Washington, D. C.: Government Printing Office, 1938.



Farm Security Administration.

Fig. 229. An abandoned homesteader's shack. Many factors contribute to land abandonment: alkaline soils, water-logged soils, inadequate or badly distributed rainfall, insufficient size of homestead grants, remoteness from railroads, sudden drops in prices, diseases, insect infestations, ruinous taxes, and lack of knowledge about the region. The Intermontane Basins and Plateaus Region is so different from the humid parts of the continent that farmers are heading for trouble when they attempt to farm as they did "back East" or "down South." In fact much of the land here never should have felt the plow but should have remained in grass. It is an example of a costly national error in human geography.

Economic Activities

Agriculture

Though agriculture is the dominant economic adjustment throughout the greater part of this region, only a fraction of the total land area is in farms and of this, little is actually in crops. Moreover, this picture will not change greatly in the future on account of (1) aridity, (2) alkaline, rocky or poorly drained soils, and (3) rugged terrain. Furthermore, the commercial production of crops in many places is definitely limited by transport facilities. Submarginal areas where the rainfall is most unreliable, the soil poorest, the surface roughest, and land most remote from railroads are better suited for grazing than for growing grain, since animals can be walked to market or to a railway.

Dry-farming

Dry-farming is the growing of crops with water-conserving methods; usually only a single crop is grown in two years, the crop being alternated with summer fallow. In the Palouse many farmers fallow only one year in three. Fallowing is one of man's devices for conserving moisture by eliminating weeds and checking evaporation. Dry-farming should be called "water-conservation farming."

This method of farming was carried on by aborigines before 1000 A.D. in the Mesa Verde, San Juan country, and west of the Little Colorado River.

The first Anglo-Saxons in North America to practice dry-farming were the Mormons. In 1863 a company of Danish Mormons left Salt Lake City and founded Bear River City, some miles to the north, where they utilized the water of the Malade River to irrigate their fields. After repeated experiments, they became convinced that something was wrong with the water they were using (it contained too much salt), since their seed did not germinate. As the season was well advanced, they were desperate, and accordingly plowed up some sagebrush land on the bench above the ditch, planted grain, and awaited results. They obtained fair yields which indicated that dry-farming with an alternate fallow year could succeed.

That part of the region actually being dry-farmed is very small indeed. That the area is so small is significant. Dry-farming is **highly** uncertain, except in the Palouse, because the Intermontane Basins and Plateaus frequently have years of drought followed by

periods when the precipitation is well above average. With more rainfall, dry-land crop production flourishes and is accordingly pushed farther into the more arid sections; conversely, periods of lower precipitation reduce soil moisture causing the farmers to blame their troubles on lack of current rainfall.

The Columbia Plateau,¹⁹ known as the White Wheat Belt, the most noted dry-farming area on the continent, is a major world wheat region. Most of the crop is dry-farmed though along the eastern margin some is grown by customary methods. At any one time about half the cultivated land is in fallow and wheat constitutes about four fifths of the total harvested crops. This might be increased to seven eighths if the hay acreage, which really is grain hay, were included. Thus the Plateau is essentially a one-crop region, and the yield per acre and the price per bushel for a given year are vital regional indexes to prosperity.

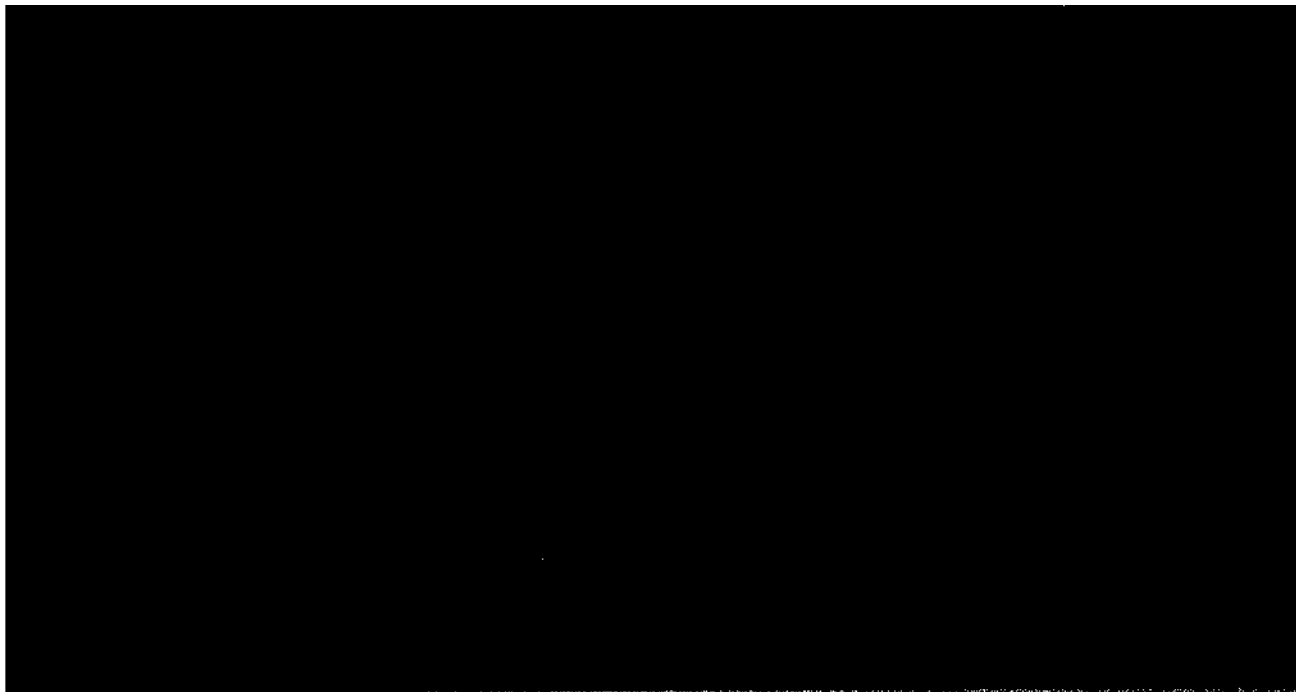
Because of the extremely erodable topsoil (Fig. 230) and the hazards of the one-crop system of farming, wheat acreage is declining. Crop rotations as practiced in the Agricultural Interior are unimportant. Moreover, burning of the stubble, which was formerly customary, removed the soil-binding humus and its protection against blowing and washing. Wheat stubble, burned less extensively than in former years, is disked in to a depth of about 7 inches, forming a low bristling hedge, which extends over the newly broken fields, retarding soil blowing. Trees too are being planted and alfalfa and sweet clover are more important than in the past.

The large landholdings—320 to 2,000 acres—are operated for the most part by their owners. In the Big Bend country, however, tenancy runs high—up to 33 per cent.

Large ranches and small population encourage the employment of machinery—tractors, gang plows, disks, weeders, and combines. By utilizing large power units, one man does the work of three (Fig. 231).

Though both spring and winter wheat are grown, the latter is better suited to a climate characterized by a winter maximum of rainfall, which enables the crop to benefit during its formative period from cool, moist weather. Farmers also prefer the winter variety because it better equalizes their seasonal distribution of labor and yields about 50 per cent more than spring-sown grain. Spring wheat usually sells at a higher price. Spring wheat is grown in this area when a dry autumn season has prevented the

¹⁹ This discussion of wheat deals with but a small part of the Columbia Plateau—the Palouse and Big Bend of Washington and north-central Oregon.



Aerial photo by J. G. James for Soil Conservation Service.

Fig. 230. Aerial view of a farm in the Palouse country showing a field immediately after the operator has "disked in" the gullies so that farm machinery can work 'across' rather than "up and down" the slope. (The loop at the head of each gully is the mark left by the disk as it is turned around without being raised from the ground). Note the large land holdings and widely separated ranch houses

germination of winter wheat or when snowfall is light and winter temperatures low.

The most popular wheats are the white wheats (both common and club), which have strong stiff straw, resistant to lodging, and firm tough heads, which do not shell easily even in dry windy weather—qualities enabling harvesting to extend over a long period, a necessity where labor is scarce.



International Harvester Co

Fig. 231. Harvesting wheat with tractor-drawn combine in the Palouse. The prevailing farm practice here is to cultivate the land one year and follow with a crop of wheat the succeeding year.

In the Palouse, land values and yields per acre are relatively low while the wages of hired labor are relatively high. Farmers have found, therefore, that it is to their advantage to spread their work over a maximum acreage, which may return little per *acre*, but much for the labor and capital expended. Farms are large and adapted to the use of large farm implements which require much power. Whereas horses formerly provided this power, tractors do so now and are especially valuable in rush periods. The outfit shown here can cut and thresh in *one* day the wheat on about 35 acres.

Most wheat produced in the Columbia Plateau is soft and starchy and under modern baking practices is not well-suited for bread-making. When used in the United States, it is converted into biscuit and pastry flours or is blended with the hard bread-wheats grown elsewhere. When possible, it is exported to Asia and Europe.

After nearly 75 years of growing wheat in the Columbia Plateau, the land seems to be going the way of wheat farming in other parts of the country. After 30 to 60 years of cultivation, yields fall so low as to make the crop unprofitable. This situation, however, is more the result of erosion than of soil exhaustion. Over a part of the area it was found that most of the hilltops, ridges, and upper south slopes have lost from 75 per cent to all of their original topsoil, and that the yield varied from 50 bushels per acre on the lower slopes to 14 bushels on those hilltops which had lost their topsoil. Dairying appears to afford a solution in the moister portions. Elsewhere, crops, other than wheat, can be grown only here and there where conditions are especially suitable for them.

Irrigation farming

The importance of irrigation farming to the Amerinds and Spaniards has been pointed out. The Mormons in Utah were the first Anglo-Saxons to practice it on a large scale and by this means transformed an inhospitable desert into a productive oasis. Since 1847, irrigation has been followed wherever water was available. In the dry lands it is the water of the stream rather than the land itself that has value; hence he who controls the water controls the land.

Since irrigation is restricted to the smoother, less sloping terraces and to alluvial belts along rivers, and since the total amount of water is definitely limited, it is obvious that most of this region—probably more than 95 per cent—cannot be irrigated.

Conflicts over water rights. As pioneers poured into Arid America, they quickly perceived that settlement was impossible except where there was water. This was a new experience to people of Anglo-Saxon origin, for English Common Law, evolved in a rainy region, made no provision for the allocation of water for irrigation. According to Common Law's riparian doctrine each river-bank owner may use water which passes over or along his land but he must return it to the stream undiminished in quantity and unaltered in quality. This doctrine, which prevails in eastern United States, had to be abandoned in the arid region because farmers could not use water on their fields and return it undiminished in

quantity or even unchanged in quality. Hence, throughout most of arid Anglo-America the prior-appropriation doctrine prevails—a doctrine much like that operating in Mediterranean countries, where Latin Law appreciated that the common need of the people is not to keep water in streams but to divert it for use on fields. According to this doctrine, which now prevails in most parts of the arid West, the first user of water has prior rights over later users; it is first come, first served. In California both doctrines are recognized.

Unable to inherit irrigation lore, the westward-advancing American people, who were essentially Anglo-Americans, were bound to have trouble. Fights were frequent and deaths from violence were not uncommon.

It is interesting to note, however, that there was never serious trouble over appropriation of water in Utah so long as the population was Mormon, for the Church settled all controversies without friction.

The silting of reservoirs. Farming and grazing on slopes have resulted in soil erosion, which has skimmed off the topsoil from an extensive area. Much of this silt has been transported into reservoirs which were built to store water for irrigation. Without these reservoirs only a pastoral civilization could be supported. Yet most irrigation projects are being endangered by the deposition of silt in the lakes. Since mechanical removal of silt costs 5 to 50 times as much as the original reservoir, the cost is too great to justify taking the mud out and letting the reservoir fill up again. This is a significant argument for fighting soil erosion throughout the West.

Oases

In a book of this scope, treatment can be given only to representative irrigated areas and to those of probable greatest interest. These are (1) the Salt Lake Oasis, (2) the Reno Oasis, (3) the Snake River Plain, (4) the Salt River Valley, (5) the Colorado Delta and the Imperial Valley, (6) Columbia Plateau apple valleys (Yakima and Wenatchee), and (7) Grand Coulee (Fig. 232).

*Salt Lake Oasis.*²⁰ Utah is of especial interest to the geographer for nowhere on the continent is there a closer adaptation of agriculture and its institutions to nature.

²⁰ Charles Langdon White, "The Agricultural Geography of the Salt Lake Oasis," *Journal of the Scientific Laboratories of Denison University*, September 1925, Vol. X X I, pp. 117-283.

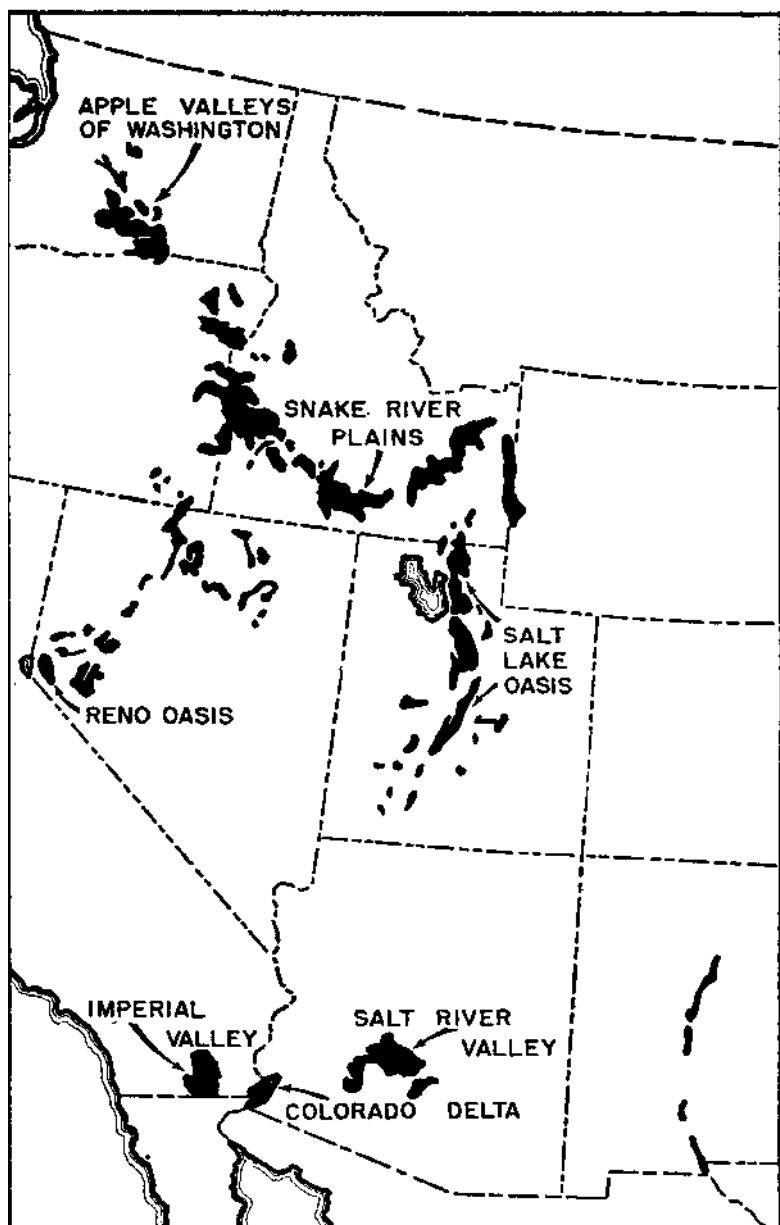


Fig. 232. Principal oases in the Intermontane Basins and Plateaus Region. The patchiness depends upon the water supply, which in turn depends mostly upon location and topography.

The Valley of the Great Salt Lake, one of the most favored spots in the entire West, was settled by the Mormon Church which claimed a vast territory extending from the Sierra Nevada to the Rockies and from Oregon to Southern California. Settlement of much of it began immediately after hundreds of land-hungry immigrants from the East and even from Europe arrived. Brigham Young, carefully picking leaders and families, sent them to definite locations and by means of these outpost colonies, based on irrigation farming, systematically colonized Utah.

The area occupied by the Oasis in 1940 coincides with that in 1857—10 years after the arrival of the Mormon pioneers—which indicates that land suitable for habitation was rapidly acquired. Relatively few irrigated areas have been added as a result of water sources brought from outside the watershed.

The lofty Wasatch Mountains tower above the Oasis on the east; from their snow-clad slopes comes the life-giving water for the valleys below. The greater part of Utah is rugged. Hence the levelness of the area at the foot of the Wasatch and the depth of its fertile soils are additional reasons for the virtual restriction of settlement in Utah to the Salt Lake Oasis. As Egypt is primarily the Nile Valley and Delta rather than the large political block portrayed on the map, so Utah is really but an insular strip of human habitation at the foot of the Wasatch. This, the heart of Utah, contains approximately two thirds of the state's inhabitants.

At the mouth of almost every canyon stream, because of the ease of controlling water, is located a city or village girdled by green fields and adorned by orchards and shade trees. Each town is separated from its neighbors by 5 to 10 miles of field or desert. Both north and south of the Oasis the towns and irrigated farms lie at greater intervals.

Small holdings, cultivated thoroughly, prevail—a result of scarcity of arable land, a limited supply of water for irrigation, the early Mormon land system, and dense population. Here the birth-rate is high—a consequence of high fertility, and approval by the Mormon Church of early marriage and large families.

Possibly 90 per cent of the farmers dwell in towns—the Church, the desert, and the canyon stream conspiring to produce this village concentration. Farms lie one to 5 miles from towns, each of which has its church and school buildings, its public hall and stores; each is compact and practically self-sufficient.

Crops are so diversified that farms resemble gardens, yet three fourths of the cropped land is devoted to sugar beets, wheat, and hay (primarily alfalfa), the remaining one fourth being devoted to

fruits and vegetables. Most farmers concentrate on those products which give a high return per acre and can be sold locally. If distant markets are sought, products that can travel in concentrated form are grown, for these can better stand high transport costs.

The water-logged land near Utah Lake is pastured by dairy cattle and the alkaline soils near Great Salt Lake are grazed occasionally by sheep if water for drinking is available. On the higher portions of the old lake plain and on the coarse soils of the benches are grown the irrigated crops (Fig. 223). Most orchards occupy benchlands, since trees thrive on coarse soils, and benefit from air drainage. On lands above the ditch, winter wheat is dry-farmed. Such areas, however, are merely adjuncts of irrigated farms, and are largely devoid of dwellings and trees.

The Reno Oasis. On the west side of the Great Basin at the foot of the Sierra Nevada lies a beautiful and productive oasis fed by streams from melting snow. It is separated from the Salt Lake Oasis at the eastern end of the basin by hundreds of miles of practically unproductive desert. The most fruitful part of the Reno Oasis—the Truckee Meadows—is sustained by waters of the Truckee River. Here is a checkerboard composed of hundreds of small farms, mostly 40 acres in size, on which are grown alfalfa, wheat, and vegetables. Dairying too is important. The largest project, the Newlands, was created by the United States Bureau of Reclamation.

The greater part of the irrigable land, and, therefore, of the agriculture of Nevada, is confined to the valleys of the Humboldt, Truckee, Carson, and Walker rivers. Yet all this in the aggregate comprises less than 1 per cent of the area of the state. Elsewhere agricultural enterprises consist almost exclusively of grazing.

The Snake River Plain. Another important oasis in this region is the Snake River Plain. In many ways it is more productive agriculturally than the entire state of Utah. Nevertheless it is tributary to Salt Lake City. As compared with the Salt Lake Oasis, it lacks the productive mines and possesses little focal quality with respect to transportation. It supports more than one-half the population of Idaho. Into this area at the foot of the Grand Tetons come two forks of the Snake River pouring their waters through head gates into canals. The irrigable land totals about 1,700,000 acres or almost one tenth of the irrigated land of the United States. The chief crops are alfalfa, potatoes, sugar beets, beans, and wheat. Fruit is important in the west end of the Snake River Valley.

Some sheep and dairy cattle also are reared, the sheep being grazed in the national forests in summer and on the plain in spring

and autumn. They are fed in oases in winter. Large numbers of lambs are fattened for market.

Most of the products when converted into a concentrated form have high value, a necessity in an area located far from large consuming markets. A notable exception is the potato, a product that is both perishable and inexpensive. Because of its excellence for baking, the Idaho potato (from the Pocatello area) stands transport charges to almost every part of the United States.

The Salt River Valley. First of the major irrigation projects undertaken by the Bureau of Reclamation and one of the most economically successful in North America is that in the Salt River Valley. Twentieth-century engineers have built near the inner margin of the desert of south-central Arizona the great Roosevelt Dam, which has converted the upper valley into Roosevelt Lake and has turned the lower valley into a great citrus, truck, alfalfa, and cotton-growing area. The site chosen was the narrow canyon of the Salt River just below the junction with Ton to Creek about 75 miles north of Phoenix. Behind the dam is impounded enough water to irrigate the fields for 2 years if not a drop of rain should fall. The dam supplies water for canals and laterals aggregating some 1,321 miles. Additional dams have been constructed for providing storage, chiefly for the development of power, thereby forming a continuous chain of lakes 60 miles long.

The valley, physiographically considered, is not a valley but a detrital plain—very flat and with soils 50 to 200 feet deep. This alluvium has been washed down onto the valley floor from the surrounding hills.

Centuries before white men arrived, Amerinds had farmed this area. According to archeologists they settled in the valley about 700 A.D., reached their peak in 1200, and disappeared about 1400. It is believed they abandoned this area because the soil became water-logged and, lacking pumps, they could no longer grow crops. So admirably planned and executed were some of their works that they would do credit to modern engineering. Since then the problem of wet land has been solved, the ground water level being controlled by pumps.

Probably the main reason for the success of the Salt River Project is the long frostless season, 60 per cent of the land growing winter crops. Though agriculture is both intensive and diversified, a permanent system of farming has not yet evolved. At first alfalfa and dairying predominated; then Egyptian cotton became the leading crop as a result of high prices for long staple cotton during the first World War. At present alfalfa occupies about half the cul-

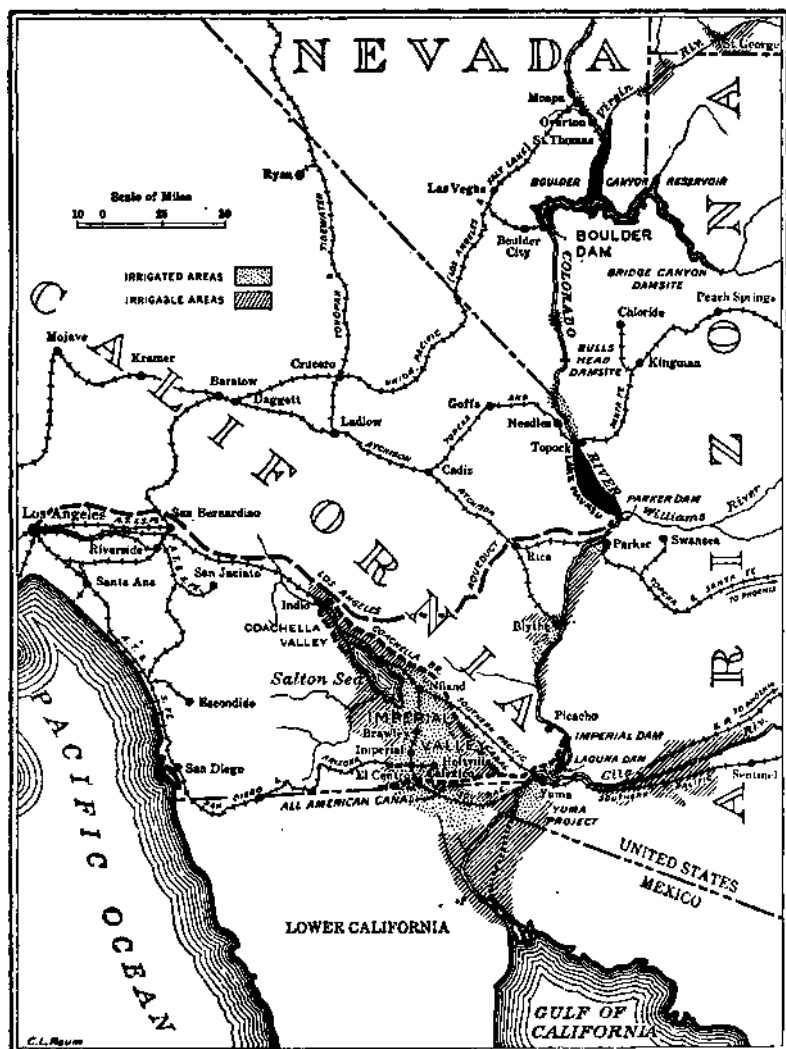
tivated area, though cotton remains important. Cantaloupes, watermelons, dates, and figs are produced in large quantities near Phoenix.

The future of this project and of the people who live in it will depend largely upon the care given to the watersheds. Unless trees and grass are planted and maintained as a check against soil wash, Roosevelt Lake will be filled with sediment in approximately 200 years.

The Imperial Valley. From an economic standpoint the Imperial Valley, whose frost-free season is one of the longest in the United States, varying from 303 to 323 days, has a bright future. The Imperial Valley, occupying the cultivable part of the Salton Basin, first attracted settlement some 30 years ago.

The Inter-California Canal was built down the slope of the delta through a part of northern Mexico toward the Salton Sea (Fig. 233), but the river during a flood cut around a head gate of the canal, enlarged the channel, and doubled the area of the Salton Sea. From then to 1935, Imperial Valley farmers lived in terror. The Boulder Dam Project, however, has changed all this, for the river is now kept under control. This dam, one of the highest in the world, has formed behind it an enormous artificial reservoir (Fig. 234). The stored water is carried down the Colorado River and diverted at Imperial Dam, passing through desilting works (Fig. 235A), and carried to the valley through the Ail-American Canal (Fig. 235B). The All-American Canal was built some 80 miles across the most forbidding part of the Great American Desert so as to lie entirely within United States territory, and to increase the irrigable area of the Imperial Valley. It carries Colorado River water from 20 miles north of Yuma through sand dunes and across a desertic high tableland to the Valley.

Most of the crops, with the exception of alfalfa, have a high value per acre and compensate for the high cost of water. They include lettuce, cantaloupes, dates, citrus fruits, peas, flax, grapes and cotton (Figs. 236 A and B). The leading money crop is the crisp "iceberg lettuce," which dominates the American market from December to March. So successful has this area become in the growing of this crop that it has practically ruined the production of lettuce in greenhouses along the southern shore of Lake Erie. Moreover, it constitutes the greatest single item of business of the Southern Pacific Railroad—50,000 carloads a year. Cantaloupes rank next to lettuce in importance, the area supplying the nation's tables from May to late July. Vegetable-growing is more highly mechanized here than in any other area in the world. With a



U. S. Bureau of Reclamation.

Fig. 233. Colorado River Basin below Boulder Dam.

natural environment much like that of the Nile Delta, the Imperial Valley produces high-grade long staple cotton. Alfalfa which yields 10 tons per acre and 5 to 7 cuttings in a single year, is fed to livestock, and is shipped out in the concentrated form of dairy

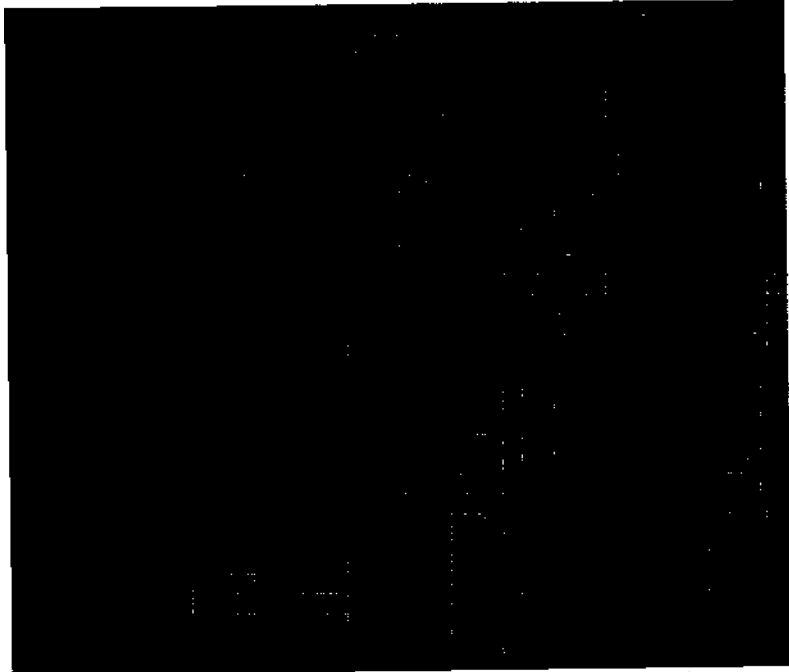


U. S. Bureau of Reclamation.

Fig. 234. Boulder Dam, with Lake Mead behind it, is one of the greatest of America's man-made wonders. Lake Mead is 115 miles long and up to 8 miles wide. Some of its waters pour through giant turbines at the base of the dam to produce electricity for Arizona, Southern California, and Nevada. Some is carried via the All-American Canal to irrigate productive farm lands in the Imperial Valley. The project also aids in the control of floods and of silt, supplies drinking water, and furnishes recreation.

products and fat sheep. The latter are range animals brought here specifically to be fattened.

Columbia Plateau apple valleys. In the rain shadow of the Cascade Mountains lies a series of disconnected oases—North America's and the world's most famous apple-growing area—the Yakima, Hood River, Wenatchee, and Okanogan valleys. Sixty



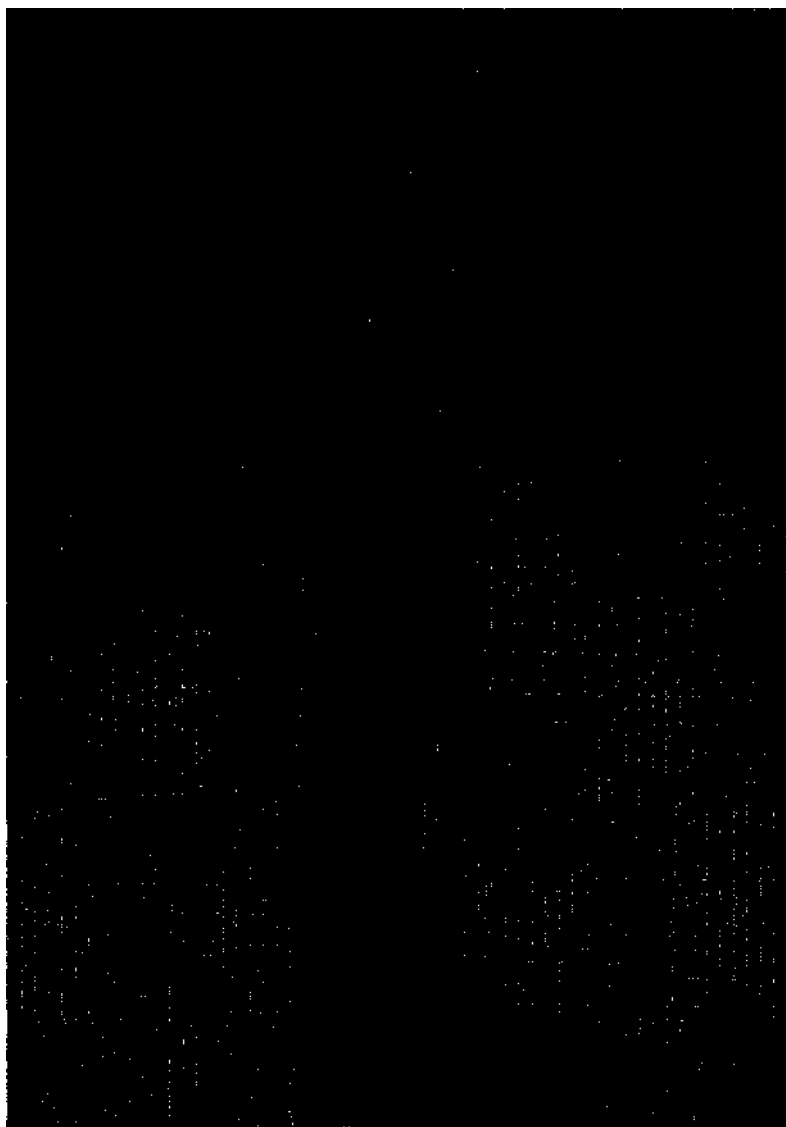
U. S. Bureau of Reclamation,

Fig. 235A. Desilting works at Imperial Dam on the Colorado River, 250 miles below Boulder. Dotted with constellations of clarifiers, these still pools lose by gravity their heavy load of silt and then spill into the All-American Canal, starting an 80-mile journey to the Imperial Valley.

per cent of the irrigated land is in fruit, chiefly apples. Large quantities of soft fruits are grown also in the Yakima Valley.

The Wenatchee Valley which is typical of all apple-growing districts in this region, extends from the Columbia River to Leavenworth, a distance of about 22 miles. The part used for fruit varies from one to 2 miles in width but increases to 6 miles along the Columbia River at the city of Wenatchee.

The climate is highly favorable for apples: zero temperatures are



U. S. Bureau of Reclamation,

Fig, 235B. The All-American Canal. This huge ditch was built through borren country to carry 8 billion gallons of Colorado River water daily to the thirsty Imperial Valley, thereby doubling its productive size. Note the aridity; the annual precipitation seldom exceeds 3 inches and the temperature rises as high as 125° F.



U. S. Bureau of Reclamation.

Fig. 236A. Picking iceberg lettuce, leading crop of the Imperial Volley, near the All-American Canal. From 50,000 to 75,000 acres of this crop are grown un[^]er irrigation each winter. Lettuce starts moving to Eastern markets in December; the harvest is in full swing by February, and the rush is over by March.



U. S. Bureau of Reclamation,

Fig 236B, Picking peas in the Imperial Valley. Early green peas, though important, are less so than lettuce and cantaloupes. The large number of workers shown here is conclusive proof of the intensity of Imperial Valley farming.

rare; the growing season approximates 200 days (apples *need* close to 150 frost-free days); and the high percentage of sunshine gives the fruit an attractive color. Most of the trees are grown on slopes to benefit from air drainage. Surveys made by the United States Weather Bureau show that on a frosty morning a rise of 50 feet on a slope will sometimes cause the temperature to be 30 degrees higher than at the base of the hill. The precipitation is both inadequate and badly distributed for tree growth without irrigation. The soils, while extremely varied, generally contain adequate nutriment, except nitrogen, for which deficiency alfalfa is grown. Most of the farms are small—10 to 15 acres—and are operated by owners.

On the average, a train of forty-five to fifty refrigerator cars, loaded with an average of 750 boxes of apples per car, leaves the Wenatchee Gateway every day of the year.²¹

Grand Coulee Dam and the Columbia Basin Reclamation Project. The Columbia River Basin, a flat land of some 2½ million acres, with rich volcanic soil in an arid and semi-arid area, became important for wheat and livestock around the turn of the century. But continuous cropping consumed the stored-up soil moisture and caused farming to decline.

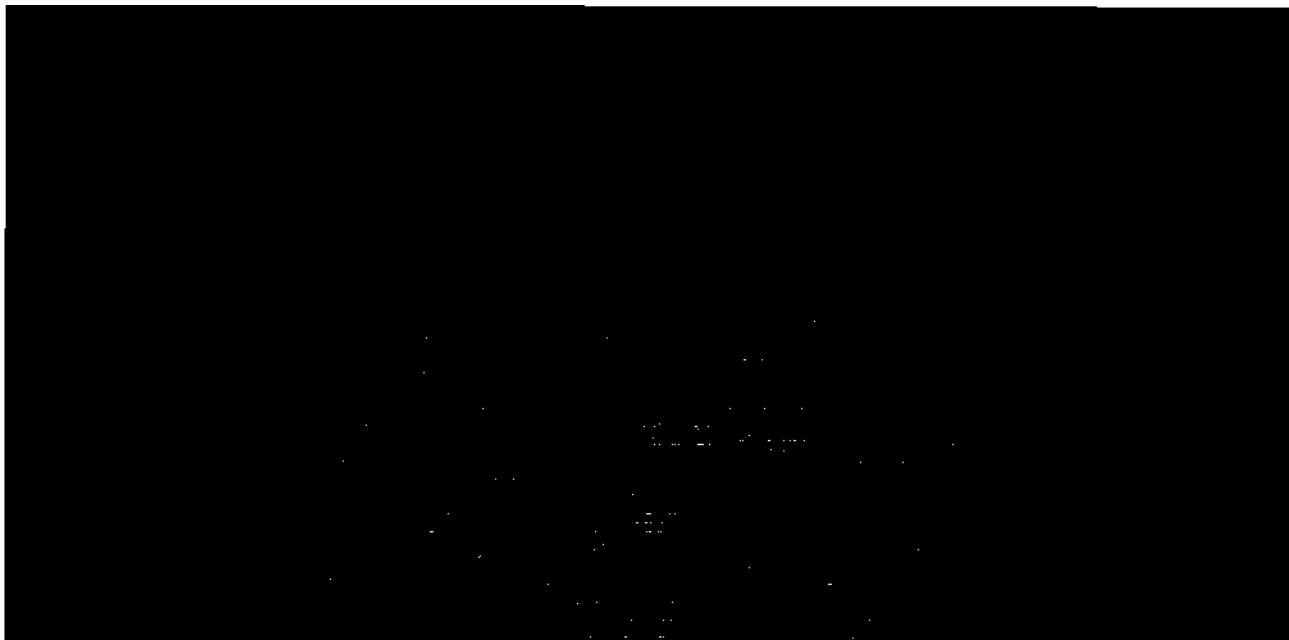
In the winter of 1933-1934, the federal government began construction on the Grand Coulee Dam, aiming to create a new agricultural frontier and make irrigable some 1,200,000 acres of land for the several hundred thousand "Okies," "Arkies," and others forced into migration by soil erosion. The Grand Coulee Dam was built on the Columbia River just below the head of the Grand Coulee²² where granite is exposed on both banks (Fig. 237). It has formed a lake 151 miles long, impounding 10,000,000 acre-feet of water—enough water to supply New York City for 10 years. 4 wide variety of crops is possible—alfalfa, vegetables, sugar beets, hops, potatoes, berries, and grapes. The dam supplies water for irrigation agriculture and power for manufacturing, transportation, and domestic use.

Flood-water farming

The third and least important type of agriculture from the standpoint of acreage is flood-water farming. This method differs from dry-farming in that soil moisture is not conserved by plowing after

²¹ Otis W. Freeman, "The Apple Industry of the Wenatchee Area," *Economic Geography*, April 1934, Vol. X, No. 2, p. 169.

²² The Grand Coulee, a prehistoric river bed 52 miles long, was cut in the lava plateau of central Washington during the Ice Age.



U. S. Bureau of Reclamation,

Fig. 237. General air-view of Grand Coulee Dam in Washington. Grand Coulee is the largest engineering work ever attempted by man. It is as high as the Washington Monument and will form a lake behind it 151 miles long, which will extend to the Canadian border. It is expected that 30,000 farm families will be able to live in the irrigated Columbia Basin. The dam is so high that the salmon, which annually journey upstream to spawn, cannot pass. Accordingly, a program had to be worked out to care for the Chinook, steelhead, and blueback salmon—the commercial species which arrive in numbers totaling between 20,000 and 25,000.

each rain; in fact, no method whatever is used to divert or convey water. The field is flooded but the sheet of water must not assume great velocity or cover the growing plants with too much detritus. It is practiced either on gentle slopes below rock or shale escarpments or in valley floors often inundated by sheet floods. Two crops only, corn and beans, are grown. In planting, the Amerinds dig a deep hole with a planting stick and drop the seed into the hole. They hardly disturb the ground.

Although a precarious type of farming, it has been followed by sedentary Indians since prehistoric times in the more isolated parts of Arizona and New Mexico. When the Spaniards arrived, flood-water farming was changed, as a result of the introduction of livestock, from strictly subsistence farming to a phase of commercial farming. With modifications, flood-water farming may reclaim successfully a considerable acreage in the Southwest.

Grazing

In this region of rough topography, light rainfall, sparse vegetation, and poor transportation, most of the land (if it is to be used at all), must serve as range for livestock (Fig. 238). Probably not more than 3.5 per cent of the land between the Rockies and the Sierra Nevada-Cascades is in crops. Some cannot even serve as range; the 10-inch isohyet is said to separate grazing country from true desert. Disaster awaits him who settles in the latter (Fig. 239).

Ranches of 2,000 to 4,000 acres and more are usually necessary. The greater part of the land does not make even good range, much being so poor that 25, 50, and even 75 acres are needed to support one steer.

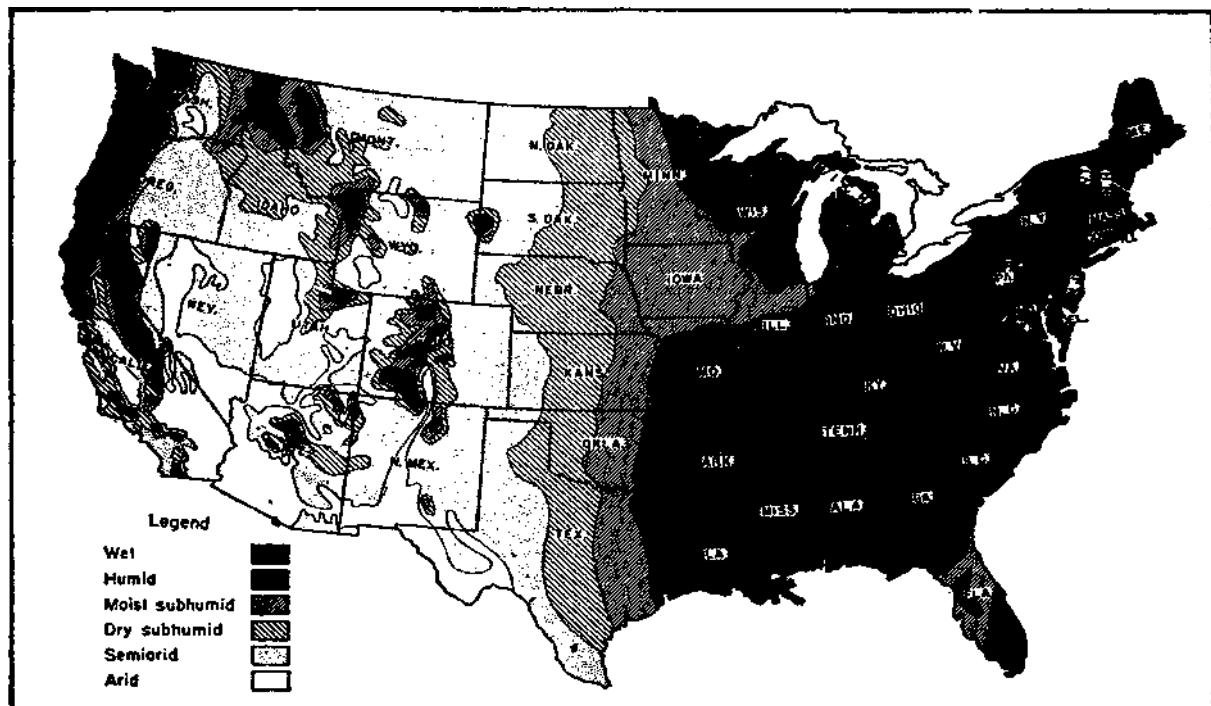
Obviously the pronounced differences in elevation cause differences in precipitation and in vegetation which, in turn, are reflected in the seasonal utilization of the range. Mountain pastures are strictly summer pastures; deserts are utilized mostly in winter when snowfall provides water for sheep and occasionally for cattle. Oasis pastures and feedlots, especially in the northern part of the region, are caring for more and more animals in winter.

Sheep. This region has been one of Anglo-America's leading sheep centers since 1893. The arid interior plateaus, for example, have a ratio of 5 sheep per person as against one for the entire country. Since sheep thrive on rugged land and over a wide range of climatic conditions, their production has been especially successful in the sparsely populated arid West (Fig. 199). Furthermore



U. S. Forest Service.

Fig. 238. A round-up in Arizona. The barren landscape is the result of **overgrazing**. The grass is cropped so short **one year** that it **has no** chance to make seed for the next. In pioneer **days grasses** grew luxuriantly here.



U. S. Dept. of Agriculture.

Fig. 239. Precipitation effectiveness in the United States. This map shows better than any number of words why the intermontane region is devoted largely to grazing.

they relish the shrubby and wheaty types of forage, which horses and cattle do not like.

After 1870 the sheep industry expanded rapidly in the West. In early days the only expense was for labor and supplies, the only investment in the animals themselves and in a camp outfit. Expansion continued until the range became overcrowded and overgrazed. Acquisition of land for dry-farming also reduced numbers, for whenever dry-farming enters an area, sheep give way to cattle.

Ranches handling sheep are nearly always located near streams or perennial waterholes. A man with a couple of dogs can manage and keep in good condition about 3,000 sheep. The herder is with his flocks constantly, directing grazing, preventing his sheep from straying, and protecting them against the depredations of wild animals. He is aided by a camp tender who brings supplies and moves camp. Herding is a lonesome occupation, and before trucks became common, western states passed laws compelling herders to work in pairs. The sheep are reared for both wool and mutton; lambs account for about 55 per cent of the income and wool for about 45 per cent.

Cattle. Beef cattle graze on rough land and sparse vegetation (Fig. 238) though as a rule they are reared in areas of better forage. In summer they are driven into large areas of abundant grassland and abundant browse in the mountains. In winter they are either driven to valley ranches and fed on alfalfa or are shipped into the Corn Belt to be fattened (Fig. 122). In the West more livestock are reared than can be fattened on the feed produced, whereas in the East the reverse is true; hence the importance of stocker and feeder shipments from the West to the East.

Horses. Outside the irrigated districts, this entire region is a land of the horse (Figs. 226 and 238). In the Navajo country, a family's wealth, prestige, and standing have depended on the number of horses owned. Actually there have been too many horses; they have kept many Amerinds from having enough to eat. Accordingly the federal government for a long time tried to convince the Indians-that in order to save their fast-disappearing grass, they would have to sell some of their horses. Finally in 1939, thousands were sold. The aim is for better breeds and smaller numbers.

Goats. Angora and milk goats thrive in the high, dry lands of Arizona and New Mexico where Amerinds run them with their sheep (Fig. 200). Goats do well where cattle would starve.

Mining

From the Wasatch to the Sierra Nevada and from the Columbia Plateau to the Mexican border, the region is dotted with communities located solely to tap the mineral resources—communities that enjoy a mushroom growth so long as the mines produce, but decline precipitously and become ghost towns once the ores are worked out.

With the exception of Utah, prospecting for minerals was the major factor in the settlement and development of the region. Moreover, the total value of minerals mined during the history of this region still is said to be greater than that from any other single source.

The first prospectors, mostly gold miners from California, sought only placers. Later, however, they worked vein outcrops. The West is no longer the land of the lone prospector with his lowly burro, pick and blankets, beans and bacon, searching for gold and silver. Rather is it the land of the large corporation taking great risks, investing fabulous sums of money, and employing eminent engineers and a large labor force. It is now concerned more with low-grade than with high-grade ores.

The Bingham and Tintic Districts. Figure 240 shows the concentration of mines near the vigorous agricultural settlements of the Salt Lake Oasis, the leading nonferrous mining area of the United States. Location here is highly significant, for every mine, regardless of size, is near good transport facilities. A deposit of equal richness located in Nevada, however, might be held back permanently by high transport costs. Bingham, Tintic and Park City—the last just beyond the border in the Rocky Mountain Region—yield 99 per cent of Utah's metals.

Bingham, lying in a canyon of the same name, in a low Basin Range about 30 miles southwest of Salt Lake City, is one of the world's best known and most profitable mining ventures. Historically, it is important because the first mining claim in the state of Utah was staked out there in 1863. Though several mines working copper, lead, silver, and zinc are located in Bingham, the most famous and most profitable is that of the Utah Copper Company. There actually the great electric shovels are tearing down (Fig. 241) an enormous mountain (1,400 feet high) of low-grade ore—1.07 per cent metallic copper. The mountain is girdled with levels or terraces, tracked, and completely electrified (Fig. 241). Laden ore-cars are delivered to the mountain base, made into trains, transported to concentration mills, and later to the Garfield smelter.

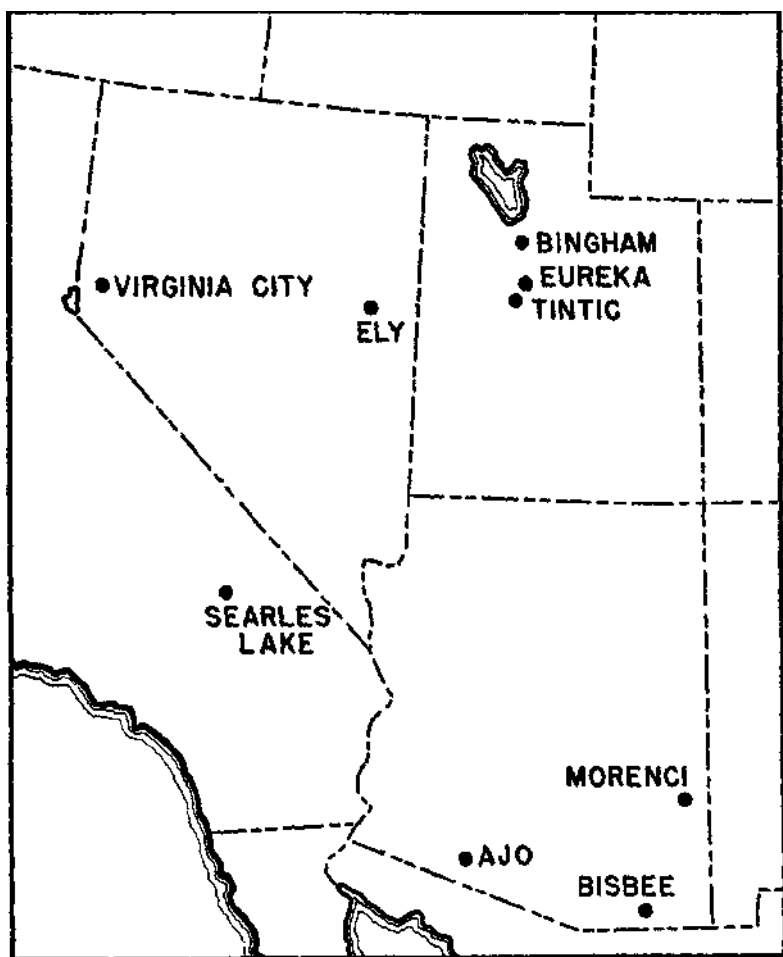
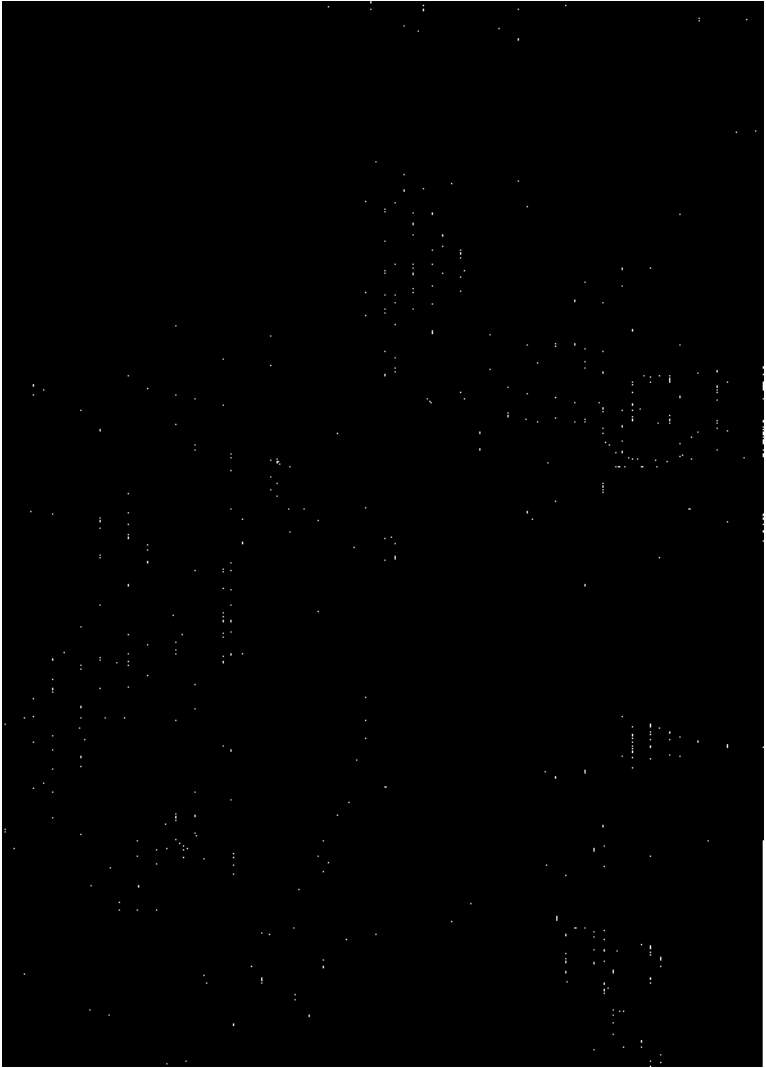


Fig. 240. Major mining districts in the Intermontane Region.

So large is the reserve that mine and town reflect a permanency seldom associated with mining.

Copper is also mined in Bingham by the leaching and precipitation process.

Tintic, wedged in the low East Tintic Hills, a southern extension of the metal-rich Oquirrh Range, 60 miles south of Salt Lake City, is an important silver-lead producer (Fig. 240).



Cillham Advertising Agency.

Fig. 241. North America's largest open-cut copper mine, at Bingham, Utah. Here a great mountain of low-grade ore is being systematically torn down by electric shovels with dippers of 9-ton capacity. Note that the town of Bingham (population 2,834) lies in a narrow canyon where there is room for only one street. Accordingly, residences and business houses are strung along it for a distance of more than 7 miles.

The first mining claim was made here in 1869, but because of poor transportation facilities, early development was retarded until railroads were projected into the area in the 1870's. In 1940 the district was depressed as were most silver-producing areas in North America.

Virginia City and Ely. In 1859 silver was discovered in Nevada, a state differing from others in the West in that its economic life and very existence have been derived from mining. From 1875 to 1877 Nevada produced more gold and silver than all the rest of the United States combined. Near the western border of the desert lies *Virginia City*, the greatest silver mining camp of all time and "a rip-roaring prodigy of the wildest days of the West." The ore was discovered by ignorant prospectors who, seeking only gold, had cast aside and cursed the blue-black rock which later assayed as high as \$4,791 per ton.

As soon as the news spread, a rush set in. Tent houses and saloons sprang up like mushrooms. There was no economic basis for livelihood except mining: fuel and food had to be brought over the Sierra Nevada by wagon trains from California; even water was scarce.

Thousands of people—gamblers, prostitutes, millionaires, promoters, lawyers, doctors, bonafide miners, and even preachers—flocked there. For awhile the mine? were valued on the stock exchange at 400 million dollars.

In 1877 the Comstock Mine produced ore valued at 36 million dollars. As time went on, mining had to be carried to greater depths, entailing serious heat and water problems.²³ The ground water pouring into the shafts sent overhead costs to such a point that even the better ore-bodies could scarcely be mined at a profit. The water problem was finally solved in 1878 by building at a cost of 4½ million dollars the 9-mile Sutro Tunnel. Temperatures rose to 120° F. and ice had to be taken below for miners and mules. Even so, 4 picked men in some stopes could not produce so much as a single miner in a cool drift. After two decades of large-scale mining the industry declined and Virginia City, which had attained a maximum population of 10,917 in 1880, had so wilted as not to be included among the state's first 12 cities and towns in 1940. Even Virginia City Township had only 1,009 inhabitants.

The Ely District, lying in eastern Nevada (Fig. 240) in the heart of the parched Great Basin, is the principal copper-mining area of

²³ When President U. S. Grant visited Virginia City and went down into the mine, he fainted dead away. When reviving he said: "That's as near Hell as I want to go."

Nevada. Its porphyry ores are very much like those at Bingham, the copper being disseminated in veins so small that crushing fails to separate the metal from the gangue. The mineralized zone is about 9 miles long and one half to 1½ miles wide, the ore being found in the igneous rocks which break through the sedimentaries. Mining began with the discovery of gold and silver-lead ores in 1868-1869.

The town of Ely supports a population of 4,140 and the district about 10,000. The mines lie 140 miles south of Cober on the Southern Pacific to which they are connected by the Nevada Northern Railway. The unproductive desert in the intervening land exerts a tremendous charge against the mines. This is in marked contrast to the situation at Bingham and Eureka, which are close to the productive agricultural lands of the Salt Lake Oasis and hence benefit from transportation built and supported largely by farming.

Arizona Highland Mining Districts. The mines of the Arizona Highlands support approximately one half of the stated population, furnish the bulk of its railway tonnage, and provide the chief markets for its farm products. Moreover, Arizona is the first state in copper production. All the mines, of course, are not in the Highland subregion, as for example, the Ajo District.

Since 1858 these mines have produced in excess of 3 billion dollars in metals, approximately 87 per cent of which was copper. Some of this copper is rich ore though there is also much of the lower-grade type. As elsewhere in the region, copper mining requires heavy capital investments. Arizona prospers and suffers according to the price of copper. The discovery of gigantic supplies in Chile, Peru, the Belgian Congo, and Canada have resulted in the closing down of numerous high-cost producing mines in Arizona.

Morenci, in the eastern part of the state, is the home of Arizona's largest copper mine. A low-grade ore body, it had been known for a long time but could not be worked profitably until the advent of modern technology. The Phelps Dodge interests have invested in excess of 30 million dollars to get at the 230 million tons of ore carrying only 1.06 per cent copper or about 20 pounds to the ton. Open-pit mining is followed—gigantic electric shovels removing the ore and dumping it into trucks and trains.

Bisbee, located in the steepest part of the Mule Pass Gulch, is the center of one of the continent's richest copper-producing districts. It is located on the Southern Pacific Railroad, which dominates rail transportation in the southern part of the region. Its ore is richer than that at Morenci. Mining is the sole support of

Bisbee, whose history is the history of its mines. The city boomed about 1900 and, though output rose and fell with the demand for copper, the district has been one of the nation's leading metal producers for almost 60 years.

The town itself is unique, houses clinging to the slopes tier above tier. It is the largest town in the United States without house-to-house mail delivery. Despite its location in an area with an annual rainfall of only 18 inches, Bisbee has a small per capita water consumption (30 gallons per day). Consumption is restricted by the exceptionally high water rates which result from the fact that water must be pumped 9 miles against an elevation of more than 1,000 feet.

Non-metallic mineral production

Potash, so indispensable to agriculture and industry, was not produced in the Western Hemisphere prior to the first World War. When the British blockade, however, shut off shipments to the United States, the government sought alternative supplies, procuring small quantities at Salduro on the Utah-Nevada border, from Great Salt Lake, from alkaline lakes in the Sand Hills of Nebraska, and from Searles Lake in the Mojave Desert of Southern California (Fig. 240). The end of the war found the United States with 128 potash plants in operation but with production costs so high that most of them could not survive. Searles Lake, remnant of an inland sea, is a salt deposit 12 square miles in size, containing a crystal mass whose surface is firm and compact. Brine is pumped from wells sunk into the lake and treated for potash. Until the more recent exploitation of the Carlsbad deposits, Searles Lake supplied 95 per cent of America's output.

Salt. Great Salt Lake is the major salt-producing area in the region. In 1889 it was discovered that the undesirable gypsum, potash, and glauber salts were deposited when the lake water reached certain varying saturation points—a discovery that completely revolutionized the Utah salt industry.

Each spring the lake water is pumped into ponds on diked flats covering hundreds of acres. The density is so maintained that almost pure salt is precipitated in "garden ponds" and solids heavier than common salt in "settling ponds." In the autumn after the desert sun has evaporated the water, the salt is harvested by loosening it with tractor-drawn plows, piled near the railroad tracks with salt harvesters, and removed to a near-by refinery. Some 80,000 tons are produced annually and sold mostly throughout the

intermontane region, for a commodity such as salt, which is low priced and widely distributed, has its sales territory limited by freight rates.

Harnessing water-power

Water-power resources are not particularly great since most of the region consists of basin and plateau country and the Basin Ranges are too low to cause heavy precipitation on their slopes and summits. What water-power there is, therefore, is of two types: (1) that created on the borders by the precipitation falling in the Sierra Nevada, and the Cascade and Rocky Mountains, and (2) that created by man-made dams of the federal government—Boulder, Grand Coulee, Salt River, Strawberry and others.

Grand Coulee, on the Columbia River (Fig. 237), is the greatest potential source of power in North America and accounts for 27 per cent of the total head on the Columbia from the Canadian border to the river's mouth. When completely developed it will be the largest power plant in the world (2,700,000 H.P.), as against Boulder Dam (1,835,000 H.P.), Dnieprostroi, Russia (746,000) destroyed during the German invasion of Russia in 1941, Wilson Dam at Muscle Shoals (610,000), the Niagara (United States, 557,000; Canada, 1,048,000).

Boulder Dam, located 30 miles east of Las Vegas on the Colorado River where it forms the boundary between Arizona and Nevada, shares with Grand Coulee the distinction of being man's most outstanding power achievement. Completed on March 1, 1936, it rises 727 feet above bed rock (Fig. 234) and forms behind it one of the world's largest artificial lakes—Lake Mead with a capacity of 10 billion gallons. Some of this power is sent as far as Los Angeles over one of the world's longest transmission lines—266 miles over deserts and mountains.

Logging and lumbering

In this region, only northern Arizona has forests containing saw timber; elsewhere trees are found only in the mountains which border the region—the Rockies, the Cascades, and the Sierra Nevada.

In northern Arizona the high plateaus support vast forests of virgin timber most of which (about 12 million acres) is within national forests. From time to time the Forest Service offers for sale blocks of ripe timber—considerable stands of western yellow pine and Douglas fir along with spruce and white fir. Approxi-

mately 10 million board feet are cut annually though the forest could sustain double this amount for a century. The most important logging operations are concentrated in and around Flagstaff, McNary, and Williams.

Manufacturing

One of the major problems in this region is the industrial instability resulting from the lack of heavy industries. Heavy machinery must be shipped in from the major steel districts of the East. The industries which are here result from the region's isolation and have developed almost entirely (1) to meet the requirements of the local community, and (2) to convert bulky products of the field, range and mine into concentrated forms for transportation to distant markets. Not a single city in the region can be considered a manufacturing city to the same extent as those of the American Manufacturing Belt.

The highest-ranking industries are smelting—ferrous and non-ferrous, sugar-refining, flour-milling, canning, slaughtering, and meat-packing.

Smelting: non-ferrous metals. Smelting is the most important single industry. So many of the minerals are of such low grade that they cannot move to the Pacific Northwest or Atlantic Seaboard refineries without first being smelted.

The Salt Lake area, premier smelting center of the West, owes its importance to nearness to numerous productive mines, excellent transportation facilities, and ample labor. Though Salt Lake City is recognized as one of the world's major smelting centers, no smelting is actually done within the city primarily because of space requirements and dangerous and offensive fumes. The leading smelters are at Garfield, Murray, Midvale, and Tooele. These handle not only Utah ore but some from Nevada, California, Idaho, Arizona, Montana, and Colorado.

Smelting is also a major industry in Arizona, especially at Clarkdale, Douglas, Miami, Morenci, Hayden, and Superior. Smelting for the Ely District is done at McGill, Nevada.

Smelting: ferrous metals. Near Provo some 50 miles south of Salt Lake City is one of the West's few blast furnaces. Here iron ore from the southwestern part of Utah is smelted with coal from Price, just over the border in the Rocky Mountain Region. The pig iron is sent to Pittsburgh, California, at a cost said to be below that of metal shipped through the Panama Canal from the East and South. By-product coke ovens have been installed and a creosoting plant has been erected to use coal tar from them.

Sugar-refining. Since the sugar beet is the major cash crop in the northern irrigated districts of this region, sugar-refining is an important enterprise. It began in 1852 when Brigham Young sought to make his followers independent of distant sources of sugar. The first successful enterprise in this region got under way in 1891 at Lehi, south of Salt Lake City. Today considerable sugar is refined in large factories conveniently located, and the product is shipped as far east as Chicago.

Flour-milling. Ogden is probably the leading center though Spokane also ranks high. Both are strategically located with respect to wheat-producing centers and both excel in transportation. Ogden flour is used within the region and shipped also to California and the South.

Canning. Where irrigation agriculture is important, farms small, and population dense, the growing of vegetables and fruits is a major activity. Since the markets in the intermontane region can absorb only a part of the total production, a great deal must be canned for shipment outside the area. To prevent deterioration, most packing is done within 5 or 6 miles of the farms. Accordingly these rural workshops comprise a conspicuous part of the cultural landscape. Their products, high in quality and concentrated in form, are shipped to many parts of the United States, though due to widespread distribution of canning and to high freight rates the market is shrinking. About one sixth of all canned peas come from near the Blue Mountains—the area from Dayton, Washington, to Athens, Oregon.

Slaughtering and meat-packing. Although the bulk of the region's livestock is shipped east to the Colorado Piedmont and to the Corn Belt to feeders, increasing numbers of fat cattle are sent to the fast-growing cities on the Pacific Coast for slaughtering and packing.²⁴

Transportation

The frontier could not advance unbroken over the barrier of the Rockies, but it cut channels through it on the lines of least resistance, notably the Oregon Trail (early 1840's) and the Santa Fe Trail (1821). These trails were destined to become major rail lines of industrial flow to the Pacific Coast.

²⁴ California's population increased 21.7 per cent or by 1,230,136 persons between 1930 and 1940.

Pioneer trails

The *Oregon Trail*, paralleling the Mormon Trail, was the best known and the most used route to the Pacific (Fig. 10). Each year, at the approach of spring on the Great Plains, hundreds of covered wagons prepared for the long trek to Oregon. This trail divided the American bison into northern and southern herds leaving the route bare save during seasonal north-south migrations.

The *Santa Fe Trail*²⁵ (1821), began at Independence, Missouri, a short distance east of Kansas City, and extended some 850 miles to Santa Fe (Fig. 10). The Santa Fe was a trader's and not a settler's trail but it contributed notably to the shrinkage of the Great American Desert and broke the policy permitting Indian occupation in the Southwest. In the early 1800's Santa Fe was one of old Mexico's leading commercial distributing centers as well as a point from which trails and highways moved down the Rio Grande Valley.

At first traders made only one trip a year, setting out in early summer as soon as the pasturage was promising. Later on, trade became so important that caravans set out every few days. A day's journey was usually about 15 miles. In 1866 approximately 3,000 wagons were working the Santa Fe Trail.

The *Spanish Trail* (Fig. 10) was blazed in 1830 by a trapper and trader from Kentucky. The original trail, a hard one, later settled down to a more direct route and ultimately became so well defined that numerous covered wagon trains used it between Santa Fe and California. Certain stretches across the Mojave Desert could not be missed because they were lined with bones of animals which had died of thirst. The trail led to Los Angeles by Cajon Pass in the San Bernardino Mountains.

The *Mormon Trail* (Fig. 10) began at Council Bluffs and swept over the grassy plains, following the northern side of the North Platte River. Paralleling it on the southern bank was the Oregon Trail. From Fort Laramie, these routes converged. This trail was the more difficult and dangerous but was chosen for two reasons: (1) the pioneers wished to avoid their enemies, some of whom they might have met on the older trail, and (2) they wished to stop on Sundays to carry on their religious worship without molestation.

The *California Trail* (Fig. 10) resulted from the discovery of gold

²⁵ The Santa Fe Trail lies entirely east of this region but it is discussed here with other trails because of its historic significance and because the Spanish Trail (Fig. 10) was a continuation of it.

in California in 1849. This trail was a part of the Oregon Trail as far as Soda Springs where it branched to follow the Bear River to Great Salt Lake and thence the Humboldt River across Nevada.

Pre-railroad transportation

The *Pony Express* carried the first fast mail to California. It began in 1860, lasted only 16 months, and ruined its promoters.

The *Stage Coach* delivered mail and passengers. Some coaches drove day and night, but some halted at night to enable their passengers to rest.

The *Camel Caravan* was used to open up the Southwest along a route extending from Texas through southern New Mexico and Arizona to California. Camels were tried out during 1857-1858 by Edward F. Beale who reported them to be eminently satisfactory.

I look forward to the day when every mail route across the continent will be conducted and worked altogether with this economical and noble brute.

However, camels were not generally popular and in 1864 were sold by the government.

Railroads

This region, more than any other, is dependent upon railroads, though only 7 transcontinental routes cross it (Fig. 208).²⁶ This paucity is striking, but if they get too close together, tapping the same trade territory, as do the Northern Pacific, the Great Northern, the Burlington, and the Chicago, Milwaukee-St. Paul and Pacific, they cannot prosper. "These roads declare there are entirely too many competitive lines in the territory in view of the freight and passenger volume. . . ."²⁷

Several of these transcontinental lines, htfwever, prosper because they connect rich productive areas, which permit service to the "revenue vacuums" in between. All western railroads face two major problems: (1) much of the country is mountainous which results in high capital and operating costs, and (2) most of the flat country is so dry and sparsely settled as to yield a low traffic density.

Thus while the people who dwell in the region dispose of many of their products and bring in much of what they use by rail, the **bulk** of the traffic is supplied by the terminal areas, and the arid

²⁶ Actually only the Southern Pacific may be considered transcontinental because it reaches from the Pacific Ocean to the Gulf of Mexico.

²⁷ *Cincinnati Times Star*, January 12, 1928.



Courtesy Santa Fe Railway.

Fig. 242, A Santa Fe train of refrigerator cars loaded with fruits and vegetables enroute from Los Angeles to Chicago. The refrigerator car made it possible for California growers to ship their agricultural products to any part of the nation. These ice-packed cars rumble ceaselessly through the scorching summer heat of the desert. The locomotive is a 5400 H.P. Diesel-electric.

region functions primarily as a transit land (Fig. 242). Most of the west-bound freight trains are made up of empty cars.

It was in this region on May 10, 1869, that the first "trans-continental" railroad in the United States was completed—the Union Pacific. At Promontory, Utah, just north of Great Salt Lake, a golden spike was driven into a cross-tie to commemorate joining the rails of the Central Pacific (now the Southern Pacific) built eastward from Sacramento and of the Union Pacific built westward from Council Bluffs. Princely land grants, used as bait to stimulate rivalry between the two roads, hastened construction.

Roads

Good roads reflect rich lands and dense population for they are expensive to build and maintain and unproductive areas characterized by sparse population cannot support them (Fig. 208). This region, therefore, has relatively few superior roads, except those built by the federal government in cooperation with the several states. They are, therefore, the result of a remarkable national program, existing primarily to serve the "automobile nomad" and trucking interests.

While railroads carry almost all of the inter-regional freight and most of the bulky products in intra-regional trade, trucks haul the valuable and diversified commodities within the region.

Air routes

Transcontinental air travel, especially that catering to passengers, grows daily and forms an important link connecting all of North America's regions. So far as this intermontane region is concerned, Salt Lake City is the focal point since it is the largest urban center. Lines from Butte, Portland, San Francisco*⁴ and Los Angeles converge here for the assembly and interchange of passengers with the trunk route east to Chicago and New York (Fig. 208).

Tourist Trade

The region under discussion is one of the most scenic in America with Bryce, Zion, and the Grand canyons, Cedar Breaks, the Kaibab National Forest, the Petrified Forest, the Painted Desert, Death Valley, and the Columbia River Gorge. Fortunately the United States government has preserved these scenic beauties and has made them a part of its national parks, monuments, and forests.

Several generations ago only the rich and the indigent could see their country, "the one in a Pullman, the other in a box car." The automobile, however, has brought a large tourist income to these states which suffer from the "ups-and-downs" of mining. While most visitors spend only a few days in a given place, some settle down permanently.

The *Grand Canyon of the Colorado*, a colossal chasm 250 miles long, 10 to 12 miles wide and more than one mile deep, is too gigantic for the human mind to encompass. The visitor is "numbed by the spectacle. . . . There is no measure, nothing which the eye can grasp, the mind fathom. . . . Comprehension lies always just beyond his reach."²⁸ The Grand Canyon is the world's choicest exhibit of erosion—the result of the cutting and grinding of fast-flowing water, abetted by frost, wind, and rain. It presents the world's greatest geological timetable. The mile of sediment from bottom to rim represents a period estimated at 700 million years. The whole panorama is a riot of colors from the mineral stains and mineral salts originally in the sediments. To be appreciated the canyon should be seen in the sunlight, moonlight, during a rain, and when the weather is cloudy. No color film, no brush, no pencil—no matter how inspired—can reproduce what one sees—and word pictures fall flat.

Bryce Canyon National Park, in south-central Utah, is a significant amphitheatre. The coloring is beyond description and the trails are comparatively easy to follow. No other national park appears so fantastic—its bizarre forms being slender, dainty, bulky, or grotesque. Moreover, these forms are of many colors, but essentially pink, red, white, orange, and purple. Bryce Canyon also tells a story of erosion. One stands on the rim of a precipice and looks down on a forest of tall and erratically carved stone spires.

Zion National Park, lying a short distance from Bryce, consists of a narrow meandering canyon with vertical walls 1,000, 2,000 and 2,500 feet high and with a maze of side canyons. It is banded with white and many shades of red. Some consider it the most inspiring sight in the world. Entering it through a long tunnel, one suddenly comes out into the narrow towering canyon with its unbelievable colors. The Virgin River occupies the bottom of the valley.

²⁸ Department of the Interior, *National Parks Portfolio, The Grand Canyon of the Colorado River in Arizona*, p. 195. Washington, D. C.: Government Printing Office, 1931.

Urban Centers

Only 3 cities in the Intermontane Basins and Plateaus Region exceed the 100,000 class—Salt Lake City, Spokane and Phoenix.²⁹ Aridity, high altitude, and limited natural resources over much of the region are the chief deterrents to urban growth.

Salt Lake City (204,488), the largest metropolitan district between Denver and the Pacific Coast, is located on lacustrine terraces at the foot of the Wasatch Mountains some 18 miles east of Great Salt Lake. It is the capital of Utah and one of the most isolated cities in the country, being more than 500 miles from any other urban center in the 100,000 class. It is the economic capital for Utah, southern Idaho, southwestern Wyoming, and eastern Nevada and is the hub of railways, airways, and highways for the entire intermontane region. Salt Lake City is unusually well planned, with broad 132-foot streets and 10-acre blocks in its center (Fig. 243). It is the only city in the 100,000 class having a high enough birth rate to maintain itself.

From the first, Salt Lake City was the religious center of all Mormon activities and probably this, more than any other single factor, enabled it to become the largest city of the region. The important tributary mining districts have focused upon it a significant commercialization. It has few important industries. Utah's state university is situated in Salt Lake City.

Ogden (43,688), about 40 miles north of Salt Lake City, shares with the latter the advantage of centrality within the Salt Lake Oasis and the intermontane region. Each commanded a pass: Salt Lake City, that most favorable for the pioneer wagon; Ogden, that for a rail route. It has been said that "Ogden is a geographical rebuke to the settlement of Salt Lake-City."³⁰ This concept does not consider the inherent possibilities for twin city development.

Ogden, since 1869 when the Union Pacific reached it, has been a transfer point between major railroad systems. Therefore, it has important railroad shops, flour mills, and packing houses.

Provo (18,071), Utah's third largest city, occupies an important site in the state's principal farming area—the Salt Lake Oasis. It lies about 50 miles south of Salt Lake City at the foot of the Wasatch Mountains and on Utah Lake and the Provo River.

²⁹ Figures for all three are for metropolitan districts¹.

³⁰Nela Anderson and Eduard Lindeman, *Urban Sociology*, p. 17. New York* A. A. Knopf, 1928.

Provo supports several industries, most important of which is that engaged in making pig iron for Pacific Coast steel mills.

Spokane (141,370), located at the end of a pass on which transportation routes converge, shares with Salt Lake City and Phoenix the distinction of being one of the three large cities in the region. It was first settled by white men in 1873



Odham Advertising Agency.

Fig. 243. Looking northeast over Salt Lake City toward the Wasatch Mountains. When the city was laid out in 1847 it was not by the chance camping of the individual settler or of the single family; it was a planned settlement by a large group of Mormons whose mass migration to the Valley of the Great Salt Lake had been conceived clearly and executed skillfully. The streets were laid out with great care and building proceeded on the basis of a definite city plan. Note the regularity with which the city is laid out—the 10-acre blocks, the wide streets, and the rectangular pattern of the city blocks. Salt Lake City is the commercial, cultural, political, and religious capitat of the Intermontane Region and it has served as the pattern for all other Mormon settlements in Utah.

Strategic location with respect to railroads and the Columbia Plateau wheat region gives it a large distributing trade. An abundant supply of water-power makes flour-milling and saw-milling leading industries. The city is also a supply center for mines in British Columbia and Idaho. Spokane should benefit both in population growth and increased business from Grand Coulee Dam.

Yakima (27,221), situated on the Yakima River in south-central Washington, is the metropolis of a leading irrigation district. The federal government transformed the area, formerly covered by sage brush, into a productive oasis. The city shares with Wenatchee the distinction of being one of the nation's leading apple-shipping centers. Fully one fourth of the American commercial apple crop comes from Washington and most of the boxes are stamped either "Yakima" or "Wenatchee." The Yakima Valley also grows soft fruits, especially pears and plums. Other crops are green vegetables, potatoes, grain, and hay. It also rears livestock. The city has cold-storage plants, lumber mills, and canneries, and it is an important trade center. Its population fails to give a true picture of Yakima's importance to the northern part of this region.

Boise (26,130), Idaho's capital and largest urban center, stands at the upper end of Boise Valley in the southwestern part of the state. It was an important point on the Oregon Trail and became a city in 1863. Protected by high mountains on the north, it never suffers from the winter blizzards that paralyze western Canada, eastern Idaho, and some of the Great Plains states. Boise lies in an area containing natural hot-water wells (170° F.) flowing at the rate of 1,200,000 gallons per day. The water is piped to many homes for heating.

Boise's size results from its being the political center of the state and the economic center of the productive irrigated farming area near the Snake River in southwest Idaho.

Pocatello (18,133), second largest city in Idaho, began as a collection of tents with the arrival of the Union Pacific in 1882. Pocatello is a gateway city and has superior rail, highway and airway connections with the Pacific Northwest. It also has the largest railway shops between Omaha and the Pacific Coast. The city's tributary area is important agriculturally and is seamed by a network of irrigation canals. It shares with Idaho Falls and Twin Falls the business of the Snake River Plain.

Reno (21,317), the only city in Nevada with more than 10,000 inhabitants, lies in the Truckee Meadows on the east side of the Sierra Nevada in the midst of the desert. It has no visible industries, making its living "as far as one can tell, off the marital unhappiness that prevails in forty-seven [other] states of the Union."³¹ Nevertheless much of its prosperity rests upon the

³¹ Katharine F. Gerould, *The Aristocratic West*, pp. 150-151. New York: Harper & Bros., 1925.

agriculture of the Reno Oasis. The city showed an increase of about 15 per cent in its population between 1930 and 1940.

Phoenix (121,828), capital and largest city in Arizona, lies in the most extensive area of flat land in the state and in the center of the rich productive Salt River Valley. It is not an old city, having been incorporated in 1881. Its major growth dates from the completion of the main line of the Southern Pacific which reached it in 1926. Phoenix is an outstanding tourist center in winter but loses its thousands of visitors when the heat of summer approaches. It is attractive architecturally, its buildings being a modified Spanish-Colonial and Indian Pueblo type. It is one of the most important distributing centers in the entire Southwest.

Tucson (36,818), lying on the Santa Cruz River, formerly a source of water for irrigation but now only a dry wash, became a walled city in 1776. In 1822 it served as a Mexican outpost and with the Gadsden Purchase in 1853 became an American town. It is basically a health and winter resort, having few industries of importance. Tucson has grown rapidly since 1900. It is a beautiful city despite its lack of rain for some 8 consecutive months. The University of Arizona is located in Tucson.

Albuquerque (35,449), located on the east bank of the Rio Grande in the center of New Mexico, is the largest city of that state. It is on the National Old Trail road and at the junction of two main lines of the Santa Fe, this railroad being the only one overland across the southern dissected Colorado Plateau. Because of its bracing climate and high percentage of possible sunshine, it has become an important health resort. Albuquerque is the commercial capital of a large irrigated farming area along the Rio Grande and of the widespread non-irrigated livestock country. Though it played an important role during Spanish and Mexican occupation, the modern city came into being in 1879. Albuquerque is the home of the University of New Mexico.

The Outlook

Man has accomplished much in this restrictive environment. No one can stand on the steps of the State Capitol Building at Salt Lake City and gaze at the green island that is the oasis without being impressed. Nevertheless there is a limit to what human beings can accomplish against a stubborn and relentless nature. Since water, which means life, is scarce, and much of the terrain is rugged, the greater part of the region is destined to remain one of the emptiest and least used on the continent.

Agriculture should become more important, though dependence on outside markets is a retarding factor. For this reason the region must convert its products into concentrated form. Sugar beets in the northern part of the region will continue to be a dominant crop wherever irrigation is possible for they guarantee the farmers their "tax money."

The United States Reclamation Service will probably continue to add to the irrigable area with great projects such as the Grand Coulee and Boulder dams. Throughout the entire region, however, more attention must be given to conserving water—storing for future use the spring floods of rivers. The government must not allow people to settle here unless it makes the land safe for settlement. One of the anomalies of the past was the Department of the Interior giving away Public Domain at the very time the Department of Agriculture was warning homesteaders of the dangers of dry-farming. Any agricultural areas added in the future will be done so only at heavy cost.³²

Grazing will improve, for nothing has been done since pioneer days to help the enterprise so much as the Taylor Grazing Act of 1933. Until its passage, the Public Domain was a "common" of some 165 million acres—a "free-for-all" grazing region mostly unfenced. The Taylor Act authorized temporary withdrawal of the Public Domain from homestead entry and provided for the formation of districts within which land can be leased to stockmen under fair regulations. Ultimately the carrying capacity of the range will increase.

Mining will be important. Continued exploration and new techniques in mining and treating ores will add discoveries (strikes), camps, and populations. This was the case in the early 1940's. Mining, however, is a robber industry and only one "crop" of minerals can be "harvested." Ultimately—all ores will be mined, towns will be abandoned, and the already appreciable list of ghost towns will grow. It is interesting to note that in 1870, Nevada, which is essentially a mining state, had half as many people as Utah, a predominantly agricultural state. But after the bonanza mines had run their course, the population over much of Nevada disappeared. In 1940 Nevada had 110,247 inhabitants and Utah 550,310.

³² The Great Basin had almost ideal topography for pioneer irrigation, for its streams flowed toward interior drainage base levels and had lower courses in shallow valleys rather than deep canyons. This enabled water to be diverted by simple pioneer tools. The Colorado, the Green, and the Snake, all larger than Great Basin streams, flow out through great canyons from which pioneers could not divert water,

The tourist trade should thrive as more good roads are built with federal funds.

Some believe this region will, with the decentralization of industry, perform certain types of manufacturing, at least for local markets. As yet no indication of this is apparent beyond the simple conversion of raw materials. The original idea of the Mormons was to isolate themselves from trading with the outside world, and leaders in the United States and England were instructed to send workers skilled in metals, pottery, textiles, and other crafts.³³ The Union Pacific dealt this idea a death blow.

Where the Amerindian population is sizeable it should increase and if the present trend of aiding the Indian to live his own type of life continues, his lot should improve.

³³ Chauncy D. Harris, "Salt Lake City—A Regional Capital," p. 55. Chicago: University of Chicago Libraries, 1940.

CHAPTER XIX

The Subtropical Pacific Coast

A REGION OF CITRUS FRUITS, TRUCK FARMING, RANCHING, FISHING, PETROLEUM, MOTION PICTURES, RESORTS, AIRCRAFT MANUFACTURING, AND COMMERCE

THE SUBTROPICAL Pacific Coast Region is probably the smallest of the geographic regions of Anglo-America, but it is one of the most intensively developed. Its true Mediterranean Subtropical climate (Fig. 4), is different from any found elsewhere on the continent. In recent years with the rapid growth of Los Angeles and San Diego,, the region has become highly urbanized.

The boundaries are natural—both physiographic and climatic. The east-west range of the San Gabriel and San Bernardino mountains excludes winds from the continental interior and confines the Mediterranean Climate to a small strip of coast. The mountains continuing to the southeast separate this region from the Salton Trough and Imperial Valley—parts of the Intermontane Basins and Plateaus Region. Several small offshore islands belong to the region. These boundaries set off a region distinctly different economically from other parts of the Pacific Southwest (Fig. 244).

The terrain¹

The most distinct feature is the east-west mountain range along the northern margin—the San Gabriel and San Bernardino mountains. These mountains are primarily the result of block faulting; their present form is largely the result of erosion. South of this rim of mountains lies the extensive lowland sometimes called the "Valley of Southern California," an area made up largely of the combined deltas of the Los Angeles, San Gabriel, and Santa Ana rivers. It is subdivided into several smaller units by a number of intervening ranges of hills. N. M. Fenneman describes the South-

¹ N. M. Fenneman, *Physiography of Western United States*, pp. 493-510. New York: McGraw-Hill Book Co., 1931.

em California Lowland as "all the lowlands between the San Gabriel and San Bernardino mountains on the north, the San Jacinto and Santa Ana on the south, and the Pacific Ocean on the west."

Much of this lowland is covered with huge coalescing alluvial fans formed of material washed down from the mountains. These fans slope from altitudes of 1,000 to 2,000 feet at the base of the mountains to 300 to 500 feet a few miles away. The streams forming these fans are broad, stony washes, becoming surface streams only

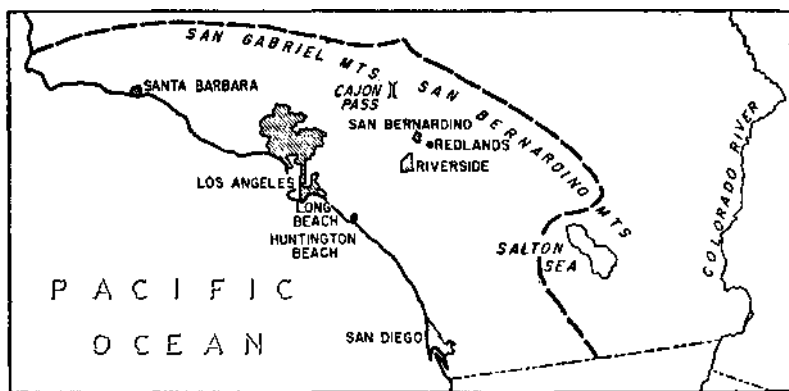


Fig. 244. Subtropical Pacific Coast: a region of citrus fruits, truck farming, ranching, fishing, petroleum, motion pictures, resorts, aircraft manufacturing, and commerce.

during times of flood. They provide, however, an excellent supply of ground water for the region's large-scale irrigation development.

Much of this basin is now occupied by the extensive urban area of Los Angeles and by intensively cultivated citrus groves. South of this area lies a narrow coastal plain that extends to the Mexican border, forming a part of the Lower California Physiographic Province. This narrow plain forms a continuation of the Southern California agricultural area.

The coastline of Southern California is marked by alternating low shelving beaches at points where the deltaic plains reach the ocean, and elevated beaches and bold promontories where the mountain spurs approach the coast. From 25 to 90 miles offshore lie six small rocky islands that are a definite part of the region, Santa Catalina, the best-known, has become a popular resort because of its beautiful scenery and recreational facilities.

Climate

The climate is a true Mediterranean type, having a definite seasonal rhythm of rainfall. The precipitation (15 to 20 inches) comes almost entirely during the winter season (Fig. 245). Desert conditions with a maximum of sunshine prevail during the dry and hot summers. Agriculture would be largely impossible were it not for the supply of ground water and for the supplemental supply

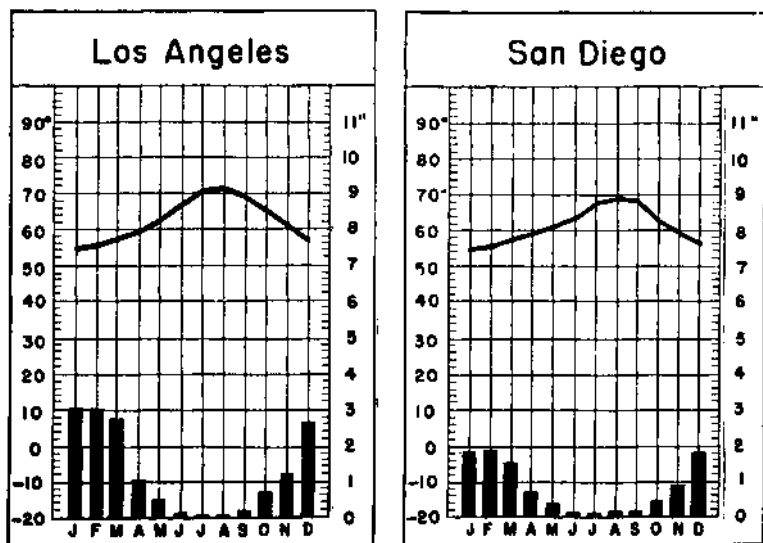


Fig. 245. Average monthly temperature and precipitation for Los Angeles and San Diego.

that has been piped in from beyond the mountains. Winters are mild and summers are hot, although near the Pacific Ocean the summer temperatures are modified by cool sea breezes. The high percentage of sunshine, even during the winter rainy season, has attracted tourists as well as many important industries. Southern California vies with Florida in selling climate to the people of the rest of the continent.

Natural vegetation and soils

Because of low rainfall, the native vegetation consists mainly of chaparral on the moister mountains and bunch grass on the low-

lands. The latter merges into creosote bush in the drier interior valleys. Today most of the lowland has been irrigated and the original vegetation destroyed, the area being covered with orchards, fields, factories, and homes.

Strictly speaking there are no true mature soils within the region. The alluvial materials composing the coalescing fans and deltas, however, provide rich materials for the support of crops.

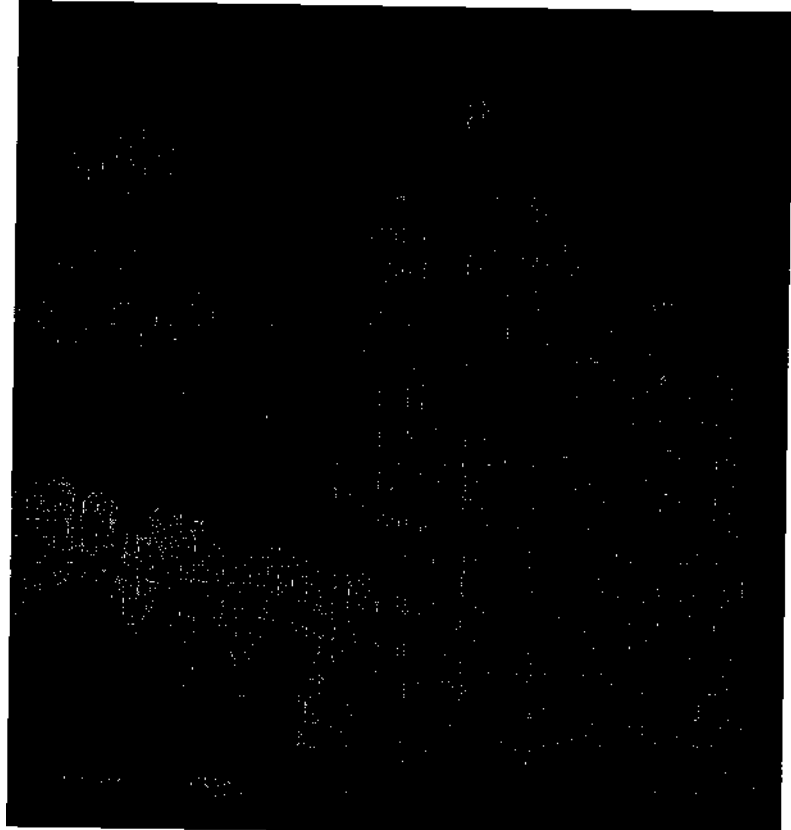
Sequent Occupance of the Region

Little is known about the Amerinds who inhabited Southern California. Records indicate that the region was sparsely occupied by scattered small tribes in a low cultural stage. The high cultures of the desert country to the east had little influence on the Amerinds of this southwest coastal area. When the Spaniards entered the region they subjugated the natives without difficulty.

The Spanish-Mexican period (1542-1848)

In September 1542, Rodriguez Cabrillo, the first European to visit the region, sailed up the west coast from Mexico and discovered San Diego Bay. After exploring the coast and offshore islands he claimed every harbor for Spain. Some years later (1602) a second expedition under Sebastian Vizcaino explored the coast northward as far as Monterey. Following this, however, no further explorations were made, and no settlements attempted in California for more than 160 years. This region seemed to offer little attraction to the adventurous gold-seeking conquistadores. Renewed interest was stimulated not by the possibilities of the region itself but by the rapid advance of Russian domination of the Pacific Coast south from Alaska. Although Spain considered the whole California area economically worthless, she felt that a buffer state should be established to prevent possible Russian encroachment upon her more valuable colony of Mexico. As a result, Spain renewed her interest in this region in 1769, through the establishment of a string of presidios and missions, followed later by the founding of pueblos or towns. The first mission was established at San Diego in 1769 and soon was followed by others. Later, towns were located near the missions at San Jose (1777) and Los Angeles (1781). These mark the beginnings of the present great urban developments of Southern California (Fig. 246).

Although some mineral wealth was found within the region, including quicksilver at Santa Barbara, little mining was practiced. **The** Spanish cattle brought in by **the** early settlers multiplied so



*Santa Barbara County News Bureau**

Fig. 246. Old Spanish mission at Santa Barbara, built in 1786.

rapidly that ranching became the chief occupation. Since there was no way to market cattle, they were slaughtered and the hides and tallow sold to New England traders, whose vessels put in at the port of San Diego. Though Spain prohibited this trade, she offered no substitute; hence the isolated colonists of Southern California continued to ship out animal products in exchange for manufactured goods brought in by Yankee clipper ships. Whaling vessels also visited San Diego and other California ports to outfit for their long trips into the Arctic. During the last two decades of this Spanish-Mexican period (1828-1848), it is estimated that more than a million hides and more than 60 million pounds of tallow were exported from California.

The early American period (1848-1876)

Anglo-Saxon explorers in the Southwest and the trappers who accompanied them during the early part of the nineteenth century rarely entered Southern California. Only toward the end of the period was the Santa Fe Trail extended to Los Angeles. Furthermore, Spanish-Mexican settlers in Santa Fe and Southern California had few contacts with each other. When this territory became a part of the United States in 1848, California's non-Spanish population was estimated at 380 out of a total of 6,000.² The westward drift of settlement was moving toward California, but no great progress was made until gold was discovered near Sacramento in 1848. News of the strike spread rapidly, and soon the most spectacular mass migration in the history of the New World began. The destination was northern California, and Southern California profited little from this early increase in population. It remained a cattle country dominated by a comparatively few Spanish land owners with vast holdings. This region, moreover, without gold, with poor harbors, and off the main route of travel, had little chance to profit from this new migration. Eventually, some people who failed to find gold drifted southward over the mountains and began to see the potentialities of Southern California. Through devious means many large ranchos were broken up and title to considerable land was obtained by these new American settlers. Cattle ranching continued dominant throughout the rest of this period, and during that time the first citrus groves were planted. Because irrigation practices were unknown to the new settlers, the region offered little prospect for intensive agricultural development.

In 1876 the Southern Pacific Railroad built a line from Oakland southward to Los Angeles, and five years later extended it eastward to New Orleans. In 1885 the Santa Fe Railroad completed its "transcontinental" line, making Los Angeles its Pacific terminus. These new connections with the outside world broke down the extreme isolation of Southern California—an isolation that had retarded its growth since the beginning of Spanish settlement.

Railroads provided an immediate outlet to the large consuming markets of the East, and the citrus-fruit industry began its phenomenal rise.

²C. R. Niklason, *Commercial Survey of the Pacific Southwest*, p. 10. Domestic Commerce Series No. 37, Bureau of Foreign and Domestic Commerce. Washington, D. C: Government Printing Office, 1930.

The commercial and industrial period (1876 to the present)

Following the completion of the railroads, people moved into Southern California in great numbers. The development of the citrus industry and of other irrigated crops offered great opportunities, and for the next two decades most of the newcomers went into agriculture. Other important industries, however, began about the same time. Oil was discovered in 1880, and the petroleum industry began its phenomenal growth. This was followed in turn by the motion-picture industry, tourism, the commercial growth of the Port of Los Angeles, and quite recently by the aircraft industry. This modern period, which will be described in more detail, evolved so rapidly that Southern California grew from a few thousand in 1876 to nearly 3 million in 1940. No region on the continent has shown such remarkable growth within the past half-century, and while it seems to be reaching capacity for human occupancy, the population curve continues upward. This trend is exemplified in the remarkable growth of Los Angeles, the dominant city of the region (Table V).

TABLE V
THE GROWTH OF LOS ANOKLES, 1850-1941

<i>Year</i>	<i>Political City</i>	<i>Metropolitan District</i>
1850	1,610	
1860	4,385	
1870	5,728	
1880	11,183	(not given
1890	50,395	before 1930)
1900	102,479	
1910	319,198	
1920	576,673	
1930	1,233,048	2,318,526
1940	1,504,277	2,904,596

Agriculture

Prior to the gold rush of 1849, California agriculture, with the exception of small irrigated areas near the missions, was almost entirely pastoral. The great army of gold seekers, concentrated in northern California, created a demand for food at high prices and initiated a period of bonanza wheat growing. While most of this was confined to the Great Valley (Chapter XX), some wheat was grown on Southern California lands.

Ranching, however, remained dominant until the severe drought

of 1862-1863 brought death by starvation to thousands of cattle and other range animals. Until that time, most of the land in Southern California was in large land holdings—ranchos which had been granted to early settlers by the Spanish crown or the Mexican government. This disastrous drought practically wrecked the livestock industry, and forced many large landholders to sell at least a part of their acreage.

Many prospectors, unsuccessful in their search for gold, migrated southward in search of land. In the late 1860's, boatloads of prospective land-buyers went from San Francisco to Los Angeles. Land sales soon became so important that companies were organized to subdivide and sell ranches that had been acquired by foreclosure of mortgages. With the completion of railroads to Southern California, the land boom increased, and during the 1880's reached large proportions. Since the region was deficient in rainfall and most of the rain came during winter, many agricultural experiments were made. Among crops attempted were cotton, tobacco, and castor beans; even sericulture was tried. Unfavorable physical factors, coupled with high transportation costs to distant markets, caused these early experiments to fail.

Ranching, however, continued important, especially on the rougher hill lands, and today is surpassed only by irrigation farming.

On the drier bench lands along the coast, barley and beans are grown without irrigation. Though occupying considerable acreage, their value is of minor significance in comparison with that of the irrigated crops.

Irrigation was practiced on a small scale by the early Spanish settlers, each mission having its irrigated plots. The limited amount of surface water, however, precluded any extensive development until additional supplies could be developed from wells or could be brought in from the outside. Until the coming of the railroads in the early 1880's, few surplus crops could be sold outside the region and production was limited largely to the local market. Between 1850 and 1880, however, small shipments of fruits and vegetables were sent regularly by boat from Los Angeles to San Francisco. The boom in irrigation agriculture started in 1880, and its importance has increased each decade since then. Irrigated lands have so encroached upon dry farming and ranching areas that today only the least desirable lands remain in lower-grade uses. It should be noted, however, that much land formerly irrigated has since been abandoned to non-agricultural uses because of the rapid growth of Los Angeles.

Most surface and underground sources in the region have been

tapped. In addition, some of the surplus water brought in through large aqueducts for urban usage is diverted for irrigation, particularly in the San Fernando Valley. Despite these additional supplies, however, Southern California is approaching the limit of agricultural development because of the ever-increasing domestic demand for water by the large urban centers. Possibly no other region on earth has so large a population in an area so deficient in rainfall. The development of the trans-mountain aqueducts will be considered further in connection with the City of Los Angeles.

The irrigated crops

Truck crops. This region, along with the Subtropical Gulf Coast and the Imperial Valley, supplies most of the early truck crops for the United States. Although grown here under irrigation, the methods used in cultivation and production are similar to those described in the other areas. The Subtropical Pacific Coast ranks high in the production of lettuce, tomatoes, cauliflower, celery, and carrots. Because of the great expansion of the citrus-fruit industry in this region, however, the Imperial Valley of southeastern California (Chapter XVIII) has been able to surpass it in the production of truck crops.

Alfalfa is grown to a considerable extent on the valley flats in the eastern part of the Los Angeles Basin and in the San Fernando Valley, most of the crop being cut and fed green to dairy cattle. The production of fresh milk and cream is a major industry of the region, the dairies lying largely southeast of the city within a radius of 10 to 20 miles.

Citrus fruits

While citrus fruits are grown over wide areas in California, by far the major production is confined to the Subtropical Pacific Coast Region, making it one of the leading producers of the continent. Oranges and lemons predominate although some grapefruit also are grown.

The citrus industry became important after the introduction of the Washington navel orange into California in 1873. Together with the Valencia variety, it now furnishes fruit the year round. California today produces two thirds of the oranges grown in the United States and 84 per cent of these come from the Los Angeles Basin.

Commercial lemon production, which began about the same time, has expanded until today California produces practically all of the

lemons of the country, 95 per cent coming from the Subtropical Pacific Coast.

Extensive acreages of citrus groves dominate much of the landscape of Southern California (Fig. 247), and no fruit district of the nation is more intensively cultivated or more productive. Since citrus fruits are produced by irrigation, this has created a tremendous demand for water. Aside from the fact that the fruits are irrigated, in contrast to those of Florida, production in the two states differs little.



California Fruit Growers Exchange.

Fig. 247. Picking oranges in Southern California. Contrast this subtropical scene with the snow-capped mountains in the background.

Because of the great distance of this region from the large consuming centers of the East, marketing methods must be very efficient.

The California Fruit Growers Exchange. The first carload of oranges was shipped from California in 1877. A decade later shipments had increased to 2,200 cars. The railroads did not give the attention to the rapidly developing fruit industry of Southern California that it deserved. As a result of slow transportation and poor refrigeration facilities, much of the fruit spoiled enroute to the East. During the early years of the commercial industry, oranges were bought outright by dealers who then shipped them to wholesalers in the East. These dealers developed into large shipping and marketing concerns, and by the 1890's five or six such organiza-

tions practically controlled the business. These firms packed and marketed the oranges on a commission basis, consigning the fruit directly to commission merchants in the East. Market gluts, coupled with large losses of fruit, frequently threatened widespread disaster to the entire industry.

Some of the early attempts at cooperative marketing included the Orange Growers' Protective Union, but since this organization did not own or operate packing houses or have any way of controlling the marketing of fruit of its members, failure was inevitable. Other strictly cooperative concerns operated for short intervals, but complete cooperation could not be secured and most of them ceased to exist after a short time. Conditions became so bad that in 1893, some 60 orange growers banded together in a type of exchange system which operated successfully for a while but was ultimately rendered impotent through loss of membership. Then came the Southern California Fruit Exchange, which, as an incorporated institution, established cooperative marketing of citrus fruit on a reasonably secure basis. By 1903 this organization, which was gradually growing in strength, controlled approximately 43 per cent of the California citrus shipments. The large crop of the 1902-1903 season glutted the market, causing great losses among shippers and threatening disruption of the Exchange. Having weathered this crisis, the organization adopted in 1905 the present name—the California Fruit Growers Exchange. Since that date it has grown steadily in importance. California citrus shipments increased from 5,188,511 boxes in 1905 to 32,799,936 in 1939.³ Today, with this large Exchange functioning for practically all citrus growers, marketing difficulties have been eliminated. Picking, packing, and shipping are now done by the Exchange, or under its supervision.

The care of orchards. A good citrus grove represents an investment of \$800 to \$4,000 per acre, including land, trees, irrigation pipeline, and other equipment. Groves belonging to members of the Exchange average from 10 to 15 acres in size and represent an investment of \$20,000 to \$30,000 each. The Exchange provides supplies at cost for spraying and treating trees and keeps the grove owners informed of new methods of treatment. Protection from frost is largely the responsibility of the individual owner, although the U. S. Weather Bureau cooperates by broadcasting daily the expected temperatures. Owners must be on guard at all times dur-

³ Nephthune Fogelberg and A. W. McKay, "The Citrus Industry and the California Fruit Growers Exchange System," p. 20. Circular C-121, Farm Credit Administration, Washington, D. C., 1940.

ing the frost season. Many of them have installed automatic signal systems that sound an alarm at the approach of a critical temperature. Growers have learned to plant trees on slightly sloping hillsides to benefit from air drainage, but at times temperatures fall so low as to necessitate the use of orchard heaters. Successful orchard heating is accomplished by warming large quantities of air a few degrees rather than by heating small amounts to a higher temperature. Thus groves require numerous small heaters (75 to 100 per acre). High stack heaters are preferred, since they are practically smokeless. The trunks of young trees are usually wrapped with some insulating material to prevent frost damage.

Occasional hot dry winds, known as "Santa Anas," which blow into this region from the desert country to the northeast, inflict great damage on orchards. Although windbreaks have been used with some success, areas opposite canyon mouths, particularly Cajon Pass, are avoided by citrus growers because of these destructive desert winds.

No citrus fruits are grown without irrigation. Intensively cultivated land in Southern California is directly proportional to the amount of water available. Water costs are high, amounting in some districts to \$30 an acre, and most water is controlled by mutual organizations of users. Nearly three fourths of that used by citrus growers comes from wells. Orchards receive 5 to 8 applications of water each year in addition to the scanty rainfall. Excessive irrigation in areas of poor drainage results in the accumulation of salts in the soil, which is detrimental to the citrus trees.

Picking and packing the fruit. When the fruit reaches maturity, the job of picking usually is turned over to a local packing unit, which harvests the fruit economically by using crews of expert pickers. The packing plant lays down strict rules: all pickers must wear gloves to keep their fingernails from injuring the fruit, and all must use special clippers for removing the fruit from the tree. Special picking bags and carefully designed field boxes are used, to assure a minimum of damage to the fruit. When the field boxes are filled they are taken by motor trucks to local packing houses and the fruit is prepared for shipment.

At the packing house the fruit is first washed and dried. In some cases a treatment of ethylene gas is used on the fruit to bring out its natural color and to get rid of green spots. The fruit moves along an endless canvas belt where it is graded for quality and size, and then is carried on separate belt conveyors to other bins to be wrapped individually and packed in boxes for shipment. Fruit is graded according to the number capable of being packed

into a standard shipping box. Thus oranges are graded as 80's, 100's, or 200's. An average operator can pack from 50 to 75 boxes of oranges a day. From the packer the box moves by conveyors to the box-lidding machine and on to the refrigerator car for shipment.

The Exchange provides the local packing houses with all supplies, such as tissue wraps, labels, and packing boxes. The volume of this business has caused the Exchange to own and operate a large lumber mill that manufactures boxes for the local packing houses.

Selling the fruit. The California Fruit Growers Exchange employs all recognized methods of selling fruit, from private sales in more than 600 carlot-markets to regularly used fruit auctions in 11 of the largest metropolitan centers. It also carries on an extensive advertising program (\$1,596,284 being spent during the 1939 season) to increase the consumption of citrus fruit.

By-products. Since a considerable part of the fruit grown cannot be marketed as fruit, an enormous waste would ensue if by-products had not been developed. The canning of both fruits and juices has saved much waste, but the pulp is further processed to make pectin, distilled oils, and dried meal—a feed for livestock. Pectin is used for making jellies and candies, and in the form of citrus pectate to "cream" rubber latex.

Other irrigated fruit and nut crops ⁴

Peaches and *apricots* are grown in a number of the valleys bordering the mountain zone, particularly in the San Fernando Valley and on the alluvial fans of the Cucamonga-Ontario district. *Olives* also are grown in portions of Los Angeles, Riverside, and San Diego counties, but production is of minor significance compared with that in valleys to the north. *Japanese persimmons* are produced in many irrigated areas of Southern California, but the total area involved is small. *Avocados* have recently become quite important, and large farms or "ranches" have been established to produce them for the ever-increasing national market. In true California fashion, the choicest quality of this tropical fruit is being marketed under the trade name of "Calavos" instead of avocados.

Almonds are produced to some extent in the northern part of this region, though the bulk of the output comes from the coastal valleys of central California. Southern California, however, is the country's leading producer of *English* (Persian) *walnuts*, output being confined largely to the counties of Los Angeles, Orange, and Ven-

⁴ O. E. Baker, "Agricultural Regions of North America, Part VIII—The Pacific Subtropical Crops Region," *Economic Geography*, Vol. 6 (1930), pp. 281-285.

tura. California and Oregon lead the country in this crop—California accounting for 53,000 of the 57,000 tons in 1939.⁵

The Subtropical Pacific Coast also produces large quantities of *tomatoes*, some of which are canned, and a sizeable early *potato* crop. The increasing urban population is creating a large local market for all kinds of foodstuffs.

The Fishing Industry

Southern California in recent years has become one of the important commercial fishing regions of the continent (Fig. 41). The major fishing grounds extend from Southern California waters southward along the coast of Mexico and Central America. Most commercial fish are brought to Los Angeles or San Diego harbors.

The establishment of a sardine cannery at San Pedro in 1893 marks the beginning of commercial fishing. The year 1905 found a temporary scarcity of sardines, and the fishermen experimented with the canning of albacore (tuna). By 1909 the canning of tuna became so profitable that the packing of sardines was temporarily abandoned. When other types of tuna were caught and canned after 1918, the commercial fishing grounds were extended into the waters off Lower California. San Diego, the nearest port, profited greatly from this new expansion of the fishing grounds. By 1923 Latin American waters were supplying nearly half of the tuna landed at Southern California ports. High license fees for fishing in Mexican territorial waters caused the construction of larger sea-going tuna vessels that could fish in offshore waters, thereby avoiding the payment of the Mexican fees. The development of these larger ships has so expanded the tuna fishing grounds that they now extend southward as far as the equator and westward as far as Hawaii. All of the catch is handled by San Diego and Los Angeles canneries, as no tuna canneries are located north of the latter. Of the 111 million pounds taken in the peak year of 1930, San Diego handled about 60 per cent and Los Angeles the remainder.

The temporary stoppage of the European supply of sardines during the first World War led to the reestablishment of the sardine industry. Los Angeles soon became a major center and has main-

⁵ *Agricultural Statistics*, 1940, p. 287. United States Department of Agriculture, Washington, D. C.

⁶ Clifford M. Zierer, "The Los Angeles Harbor Fishing Center," *Economic Geography*, Vol. 10 (1934), pp. 402-418, and "The Fishing Industry of California," *Scottish Geographical Magazine*, Vol. 51 (March 1935), pp. 65-83.

tained its importance even in competition with European supplies. More recently mackerel, a fish abundant along the Southern California coast throughout most of the year, is being canned especially during months when neither tuna nor sardines are available.

About 1930 a tuna-canning industry patterned after that of Southern California was developed in Japan, and in 1933 more than 600,000 cases of Japanese tuna appeared on the United States market, despite a 30 per cent *ad valorem* tax. The duty was soon increased to 45 per cent, but even that, as a result of the differential between American and Japanese labor, was not sufficient to bar Japanese competition. Furthermore, Japan, through a subsidy, was making it possible for her canned tuna to be delivered to markets on the Atlantic Coast at only 5 cents a case more than that of California fish. Despite apparent advantages Southern California seemed to enjoy in the tuna industry, Japanese competition was a serious threat to future expansion.

"Fish Harbor" is an artificial basin developed on Terminal Island at the time Los Angeles Harbor was being constructed. Here are located all of the fishing docks, canneries, and residences of most of the fishermen, who are largely Japanese, Yugoslavs, and Italians. Eight large fish canneries and associated oil and meal plants line the north side of the docks at Fish Harbor (Fig. 248), providing outlets for the fish brought to the harbor. The west side of the harbor is lined with marine oil and gasoline stations and with ice and other supply plants for outfitting the fleet.

Because the fishing industry in this region is so new, vessels and equipment are quite modern. With the construction of sea-going fishing ships to work the offshore tuna grounds, modern Diesel-powered tuna clippers have been developed. These boats, built exclusively for catching tuna at sea by means of hand lines, are equipped to refrigerate the fish for several weeks while the boat is away from port.

Tuna are caught largely from June to September, sardines between November and March, and mackerel largely in winter though to some extent throughout the year. This seasonal distribution provides all-year employment for the canneries and has made Los Angeles one of the best-organized fishing ports in Anglo-America.

Petroleum and Natural Gas

The Subtropical Pacific Coast Region contains some of the most productive oil fields on the North American continent, and, despite its small areal extent, in 1939 the region accounted for approxi-

mately 11 per cent of United States production. Two of the three California oil districts are located in this area, the Coastal district with six major producing fields and the Los Angeles Basin with 15 major fields. The latter produced a total of 113,997,000 barrels in 1939, or more than half of the California total.⁷

Oil was discovered in the Los Angeles Basin as early as 1880 with



Los Angeles County Chamber of Commerce.

Fig. 248. Fishing fleet in Los Angeles Harbor. The great variety of fish available in waters off Southern California makes fishing an important industry in the Los Angeles district. Many canneries are located in the harbor area.

the completion of the Puente Hills field, but, despite miscellaneous drilling, no further important development occurred until 1902, when the Brea-Olinda field was brought in about 7 miles west of the center of Los Angeles. Extensive drilling began throughout the basin, but, after reaching a peak in 1909, drilling declined until the close of the first World War. By that time rotary drilling was replacing that by cable-tools, and deeper horizons could be explored. The big oil boom for Southern California came in 1921 and 1922 with the completion of three large fields at Huntington

⁷ A. G. White, G. R. Hopkins, and H. A. Brpakley, "Crude Petroleum and Petroleum Products," *Minerals Yearbook*, 1940, pp. 956-958.

Beach, Long Beach (Signal Hill), and Santa Fe Springs. In 1936 these fields, the three largest in the Los Angeles Basin, contained one-half the producing wells of the area. In 1939, seventeen years after they were brought in, they were producing more than 37 million barrels, or nearly one-third the total for the basin. Only the new Wilmington field (1937) of the Los Angeles Basin, and the Ventura Avenue field in the Coastal district, surpassed these in production. In spite of the several large fields in Southern California, none approaches the size or total production of East Texas (pp. 271-274).

Probably the most interesting aspects of the Southern California fields are those concerned with land utilization. In general, oil fields have been brought in on lands having little surface value. In the Los Angeles basin, however, much of the land was under intensive utilization before oil was brought in. With rapid increases in land values due to the phenomenal growth of the City of Los Angeles, some of the less productive fields are being abandoned. Although some of the fields are in brush-covered hill lands, many are either in irrigated agricultural lowlands or in crowded urban territory. Those along the Pacific Coast compete with bathing beaches and in some cases have been forced out into the water. Nowhere else have oil wells had such keen competition for surface rights. Clifford M. Zierer⁸ classes the fields of the Los Angeles Basin into three types according to location: (1) hill districts, where fields have been developed on brush-covered hill lands devoted largely to grazing activities, (2) urban districts, where oil wells, drilled on building lots (50 by 120 feet or less in size), have resulted in the greatest crowding of derricks to be found anywhere, and (3) rural districts, largely irrigated and planted in citrus orchards or intensively cultivated truck crops. In the latter the oil fields have had to compete with high-value surface rights, and serious conflicts in surface development frequently take place. Where leases are large, wells may be spaced 600 feet apart, each draining about 8 acres. In citrus holdings wells are drilled so as not to destroy more than the few trees that must make way for the derricks. Possibly no other oil region presents such a systematic and orderly drilling arrangement.

Nearly all fields in the region are accompanied by considerable gas pressure, but the large urban market of metropolitan Los Angeles consumes practically the total production.

⁸ Clifford M. Zieror, "An Ephemeral Type of Industrial Land Occupance," *Annals of the Association of American Geographers*, Vol. XXVI (1936), pp. 125-156.

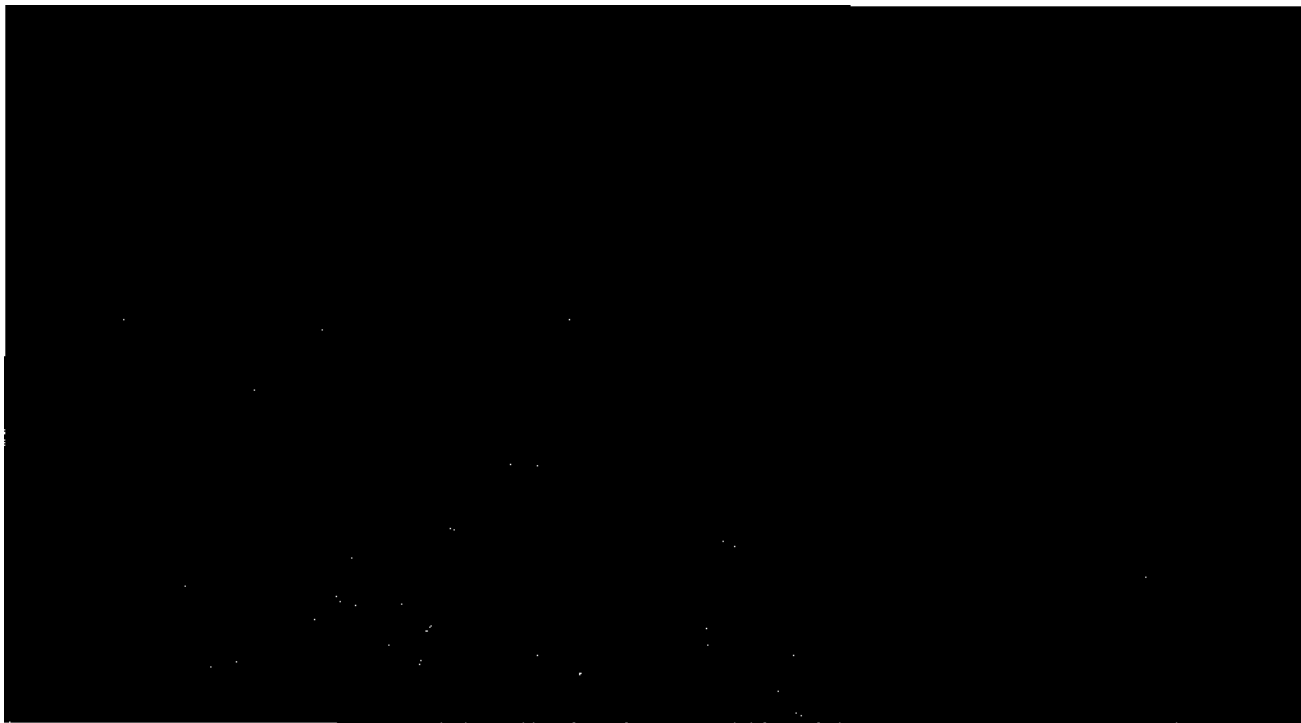
Refining and shipping petroleum are important industries in Southern California. Because of the chance distribution of the oil fields within a 25-mile radius of Los Angeles Harbor, most refining is done on the coast. Oil and refined gasoline, above the requirements of Southern California, move out of the port by tank steamer to the East Coast (via the Panama Canal), to the Pacific Coast of South America, and to the Orient. In normal times Japan received a large share of its aviation gasoline from Southern California refineries. The embargo on shipments to Japan and the shortage of tankers seriously crippled the exportation of oil from this region, and since no pipelines connect it with other parts of the United States, production may be curtailed temporarily. The large local market and the great expansion of the aviation industry in this region may eventually consume most of the surplus.

The Motion-picture Industry

The Subtropical Pacific Coast Region, especially Los Angeles and its world-famous suburb Hollywood, produces two thirds of the motion-picture films of the world in some 75 studios. The size of the industry is well shown by the fact that "cost of production" figures in 1940 amounted to \$171,000,000.

The original studios were attracted to Southern California by the sunny Mediterranean climate and the great variety of scenery to be found within the immediate area—mountains, deserts, tropical vegetation, and seacoast. This early start enabled the region to retain the industry even after natural advantages were no longer so significant. Early photography required good sunlight, and before the advent of "sound-on" films, most pictures were taken in the open, which required periods of protracted sunlight with a minimum of rain that might damage the equipment. Today most movies are staged in studios, and since a large part of the lighting effect is produced artificially, Southern California sunshine is no longer a controlling factor. Nevertheless, the industry is firmly entrenched here. Many producers have moved into the suburbs of Los Angeles in order to have more room for their large studios and sets, and in recent years some have gone to Culver City on the south and to Burbank in the San Fernando Valley (Fig. 249).

The motion-picture industry has attracted tourists and job-seekers. Many of the latter have been "misfits" and frequently have been a severe drain on Los Angeles charities. Furthermore this industry has established Hollywood as one of the chief style centers of the world, especially after the fall of Paris. A large



Spence Air Photos,

Fig. 24V: Warner Brothers Studio, one of the numerous motion picture industries in Southern California. Note how completely the buildings occupy the small mountain valley.

clothing and costume-designing industry has developed recently within the region.

Resorts and the Tourist Trade

The Subtropical Pacific Coast Region, with its mild, sunny climate, is truly an American "Riviera." Southern California offers the tourist mountains, beaches, citrus groves, offshore subtropical islands, a large city, and Hollywood. These draw visitors from all parts of the continent and the world, and the Los Angeles Chamber of Commerce, with its various allied organizations, does a good job in advertising the attractions of the region.

At first Southern California attracted people largely during the mild winter season. Although summers are relatively cool near the beaches, the inner parts of the Los Angeles Basin often record high temperatures, which, according to the natives are "unusual." The winter season is a festive occasion, with many pageants and entertainments, climaxed by the "Tournament of Roses" and the famous "Rose-Bowl" football game at Pasadena on New Year's Day.

Overcrowding by destitute "tourists," job-seekers, and movie-aspirants has caused the state of California to try to keep out additional immigrants of that class. Today all advertising literature includes a statement such as the following: °

This invitation to visit Los Angeles County is sincere in every respect. Persons seeking employment, however, should be cautioned that this is no place for the job-hunter, since the County's natural advantages have already attracted a more than adequate supply of workers. Also, the California law denies relief to persons until they have resided in the State three years without public assistance.

To provide for the legitimate tourist trade, Southern California has established many large resort hotels in the mountains, along the coast, and on the offshore islands, and has so improved its highway system that all parts of the region are easily accessible by the finest motor roads. Railways and airways have contributed greatly to the development of the resort business by providing swift transportation from distant centers of the Northeast. The new diesel-powered trains on the Santa Fe and the Union Pacific make the trip from Chicago in less than 40 hours, and the transcontinental airlines place Los Angeles less than 16 hours away from New York.

⁹ Los Angeles County Chamber of Commerce.

Manufacturing

Southern California has recently developed into an outstanding industrial area. The establishment of the motion-picture business created many important subsidiary industries, such as the manufacture of women's clothing. The most recent industrial development of this region has been along the line of heavy manufacturing. The aircraft industry, together with the manufacture of parts and accessories for airplanes and automobiles, accounts for the recent rapid growth of Southern California.

The aircraft industry

Part of the rapid development of this industry is due to the second World War and the gigantic demand for military aircraft, but the industry was entrenched in Southern California before the outbreak of the war.

The establishment of this industry, which uses large quantities of metals and heavy machinery, none of which can be supplied from local sources, is not a response to raw materials, but rather to capital that would gamble on a new industry. Southern California's climate, however, did favor the development of aviation, since new designs and planes coming from the factories can be tested at all seasons of the year.

The aircraft industry, which might seem to belong in the American Manufacturing Belt, has instead sprung up in the richest agricultural community of the continent, in an area extremely vulnerable to attack and almost entirely dependent upon private automobiles for transportation. Furthermore, it is attracting thousands of laborers with their unions to a region that has been conspicuous for its "open-shop" policy. Also, despite the fact that Southern California builds almost a tenth of the nation's nonfarm dwellings, the housing problem for aircraft workers is extremely acute. The whole thing seems to be something that might have been planned by the movies. "They are making dive bombers in the Land of Oz."¹⁰

However unreal this gigantic development may seem, Southern California has within the last decade developed an industry that is turning out at least half of the nation's aircraft. The dozen plants in September 1941 were employing more than 100,000 men and disbursing a monthly payroll of over \$15,000,000. Southern Cali-

¹⁰ *Fortune*, Vol. 23, No. 3 (March 1941), p. 174.

ifornia seems to have a monopoly on the new and growing aircraft industry and will in the future be the aircraft center in the same sense that Detroit is the automobile center.

Because of their extensive land requirements for testing fields as well as for floor space, the factories are located in the outlying parts of the cities. The seven operating plants in Los Angeles County lie in a line extending 40 miles from the *Vega* plant north of Burbank to the *Vultee* plant at Downey.¹¹ Many of these factories are located amid suburban homes, vegetable fields, or citrus groves, and all tend toward ultra-modern design. Douglas Aircraft's new "blackout" (windowless) plant near Long Beach cost more than 11 million dollars and employs about 20 thousand men.

Other industries

In addition to many establishments manufacturing accessories and supplies for the aviation industry, Southern California has one of the largest automobile assembly centers on the continent. In the manufacture of *tires* and *tubes* Los Angeles ranks second only to Akron, the "rubber capital."

A recent development is the new plant of the Aluminum Company of America at Vernon. The great demand of the aircraft industry for aluminum has caused this plant to expand production until it now makes approximately 600,000 pounds per month.

The region ranks high in meat-packing, petroleum-refining, and in the manufacture of women's clothing.

Transportation

The Subtropical Pacific Coast, with its major seaports of Los Angeles and San Diego, is today one of the continent's most important regions for maritime trade. This development is a product largely of the twentieth century.

The early trails reaching Southern California were discussed in Chapter XVIII (p. 701). Because of its relative isolation and because the region did not produce gold and other valuable metals, Southern California did not secure its first railroad until 1876, and direct connections with the East were not established until the 1880's. The region eventually became connected with the rest of the nation by a complete and thoroughly modern series of railways,

¹¹ After the United States entered the second World War, the aircraft industry of Southern California expanded greatly. Because of the military nature of the information, few details can be given.

highways, and airways, and today Southern California is more accessible by land than are most other parts of the continent.

Railroads

The region is today served by the Southern Pacific, Union Pacific, Santa Fe, and locally by the Pacific Electric (Fig. 208A). With the development of streamlined Diesel-powered trains, such as the Santa Fe's "Super Chief" or the Union Pacific's "City of Los Angeles," extremely fast service has been established between Los Angeles and Chicago. Through the organization of the Pacific Fruit Express, which operates a large number of refrigerator cars, perishable fruits and vegetables are handled swiftly by rail. The stock of this company is owned jointly by the Southern Pacific and the Union Pacific. The Santa Fe Railroad operates its own refrigerator service (Fig. 242).

Highways

With the rapid development of good roads in the United States in the 1920's, Southern California became the terminus of several transcontinental highways (Fig. 208B). Most highway travel to the Pacific Coast in winter follows these southern routes to Los Angeles, because they cross no high mountain passes that might be blocked by snow. California has constructed many excellent highways along the coast, through the valleys and across the mountains. Certainly no region of the continent is better served by paved highways, and probably none depends so much upon them for local transportation.

Airways

The development of transcontinental airlines in the late 1920's and early 1930's established Los Angeles as the major Pacific terminus for most lines (Fig. 208C). Today that city has better connections with other parts of the nation than any other place on the Pacific Coast. By the new "Stratosphere Liners" of Transcontinental & Western Air Lines, New York is less than 16 hours away.

Water transportation

Despite the small ocean trade that had moved in and out of **San Diego for more than a century**, Southern California did not **develop water transportation until** some time after the beginning

of the twentieth century. Trade with the Orient was handled out of the more northern Pacific ports of San Francisco, Portland, Seattle, and Vancouver, and there seemed little reason for another ocean port to the south. The regular Southern California coastline was a further deterrent to ocean shipping, since, except for San Diego Harbor, no good shelter existed. The opening of the Panama Canal in August 1914 was the outstanding development in the transportation structure of this region because it promptly lowered freight rates to the East Coast. Immediately Los Angeles became interested in building a great ocean port. Unfortunately the city was then located some miles inland. This handicap was overcome by the annexation of two small coastal towns, San Pedro and Wilmington, with the main city by an urban extension commonly known as the "shoestring." The metropolis then dredged a harbor out of a shallow lagoon and built large protecting breakwaters. In time, through great expenditures of money, Los Angeles, the inland city, built one of the most complete and modern ports on the continent (Fig. 250) and established itself as one of the nation's great seaports for coastwise trade via the Panama Canal and for trade with the Orient and the West Coast of the Americas. The land connections with the East, as good as those of any other Pacific Port, aided materially in its rapid growth.

San Diego, although possessing a good natural harbor, was never able to capture much of the West Coast ocean trade. Its location and its poorer land connections with the East have prevented it from getting much of the Southern California trade. In contrast, however, San Diego has become the chief naval base on the Pacific Coast, and its harbor is filled at practically all times with naval craft.

Several other small ports are found along this coast, but they are not important.

Cities

No region of Anglo-America is so dominated by one city as is the Subtropical Pacific Coast. Here the cities may be discussed as Los Angeles and all others, despite the relative importance of San Diego and Santa Barbara. Los Angeles, with its great areal extent (450 square miles), includes numerous small Southern California towns; some, such as Beverly Hills and Hollywood, are as well known as the metropolis itself.

Los Angeles (2,904,596), the nation's fourth-largest city, has **had** the most rapid growth of any of the large cities **of the world**. **From**



Fig. 250. Los Angeles Harbor.

a small town in 1880 (Table V) it has boomed until today it outranks anything west of the Mississippi and is easily the outstanding city of that vast territory. Located in a semi-arid basin midway between the San Gabriel-San Bernardino mountains and the Pacific Ocean, its location on the insignificant Los Angeles River was not imposing. As a great metropolitan center Los Angeles developed in spite of its site rather than because of it. Los Angeles is truly a city that achieved greatness against heavy odds.

The things contributing most to growth were, in sequence, railroads, citrus fruit, the movie industry, oil, the ocean port, and the aircraft industry. Each has sent a new wave of people to the city, and despite numerous depressions most people have remained and have found some means of making a living.

By 1908 Los Angeles and the adjacent irrigated areas had outgrown their local water supply. Accordingly, upon the advice of its city engineer, William Mulholland, a 238-mile aqueduct was constructed to tap the waters of the Owens River in the high Sierra Nevada. This pipeline, costing \$24,500,000, one of the engineering wonders of the world at that time, carried water over mountains and desert. It seemed that the city had solved its water problem for all time; but, with the increasing demands by the urban population, and the irrigated areas, this source soon appeared inadequate. During several dry years in the early 1920's, the water supply became critical and an open feud developed between the irrigationists of Owens Valley and the citizens of Los Angeles over water rights. By 1923 the city recognized that additional water would soon be needed, and again Mulholland was sent out in search of water. The only other logical source seemed to be the Colorado River, on the eastern border of the state. That river contained a large supply of water but, without a great dam to impound and conserve it, the volume was not dependable. In addition, the lower Colorado was the source of all irrigation water for the Yuma district and the Imperial Valley. These interests looked with considerable anxiety upon the continued urban growth of Los Angeles and its increasing demands for water in a region notoriously deficient in rainfall. After considerable litigation, the problem was solved when the United States Bureau of Reclamation built Boulder Dam (Fig. 234), impounding behind it Lake Mead, the largest artificial body of water in the world. In 1931 Los Angeles and twelve small neighboring cities voted bonds authorizing the construction of a 335-mile pipeline from the Colorado River at a cost of \$200,000,000—the greatest engineering job ever tackled by a municipality in the United States. It is estimated that this aue-

duct will provide enough water to care for at least 7 million people.¹² The project at Boulder Dam also provided water-power for the Los Angeles area through a 266-mile high-voltage network of transmission lines. Thus what the City of Los Angeles did not have in its local environment (water and hydro-power), it went outside to get at great expense.

The rapid growth of the metropolis has caused it to have "growing pains" along many other lines, such as housing, transportation, parks, and recreational facilities. The citizens of the community have been farsighted and extremely liberal in meeting the ever-increasing demands and the city, in spite of its extremely rapid growth, has developed along well-planned and artistic lines. For its size, Los Angeles has probably fewer unattractive tenement districts than any other metropolitan area on the continent. This may be explained by the lack of large industrial mills and the comparatively high per-capita wealth of its population.

All in all Los Angeles, with its many diversified industries, citrus groves (in the immediate hinterland), oil, motion pictures, the tourist trade, and most recently the aircraft industry, is an outstanding example of what can be done in a region which could not naturally support so large a center without careful planning. Today it is in every respect one of the world's great cities.

San Diego (256,368), the second-largest city of Southern California and one of the most rapidly growing centers in the United States, is located on San Diego Bay, the only natural harbor along the coast south of Point Conception. As the first settlement established by the Spaniards in 1777, San Diego remained a small sleepy village, deriving its livelihood from products grown locally and from horses and cattle produced in the hinterland. With the coming of New England whalers and traders, San Diego attained some importance as an outfitting point and as a shipper of hides and skins. Although important during the latter days of the Spanish and Mexican rule, this trade languished after the territory became a part of the United States. San Diego was too remote from the gold "diggings" to profit from that boom, and for the rest of the nineteenth century it remained in the backwash of settlement. Its only attractions were ideal climate (Fig. 245B) and an excellent harbor. Its limited hinterland, however, and its poor contact with the rest of the nation retarded San Diego at the time Los Angeles started to grow. Moreover, it had no petroleum and it had no

¹² *Fortune*, Vol. 23, No. 3 (March 1941), p. 178.

motion-picture industry. It did have a sizeable tourist business but nothing like that of the larger city to the north.

Because of its good harbor and its proximity to the Mexican border, San Diego became an important naval base and during the first World War grew rapidly under government sponsorship. With the return of peace, however, much of the government activity was removed and it again lapsed into an easy-going small city that attracted tourists to its Coronado Beach and historic shrines.

The aircraft industry that developed in Southern California was confined largely but not entirely to the Los Angeles Basin. The excellent year-round climate, with its maximum of sunshine, that caused the Navy to use San Diego as an air base, also attracted Consolidated Aircraft and one or two other aircraft corporations.

Then came the second World War, with its greatly increased demands for war planes for the United Nations, and San Diego again became violently alive. The Navy increased its personnel of officers and enlisted men, the Army established camps near by, and the aircraft industry brought in large numbers of industrial workers. The city faced one of the most acute housing problems ever known. Perhaps 100,000 people arrived after the federal Census was taken in 1940, so that the figures above hardly represent the true situation. The government helped by constructing a 9 million dollar housing project on Kearny Mesa, 6 miles north of the city.¹³ Most of this boom, however, is attributable directly to wartime emergency.

Santa Barbara (34,958), the only other center of importance on the coast of Southern California, lies nearly 100 miles northwest of Los Angeles Harbor. The city was founded by the Spaniards in 1782 and became important through the discovery of quick-silver in 1796. The Spanish padres, however, fearing that this might attract unwanted outsiders, retarded further development. The country around Santa Barbara remained largely in cattle ranches and, like the other settlements, developed little until after the boom came to all of Southern California. Santa Barbara has grown in recent years but it has not been influenced by large industries. The tributary area, the source of 60 per cent of the nation's flower-seed supply, has a small but diversified agriculture. Perhaps its chief asset is the resort business and its fame as a beautiful residential city. Being somewhat off the path of the great industrial development to the south, Santa Barbara has re-

¹³Life, July 28, 1941, pp. 64-68.

tained the beauty and charm that make this region so attractive.

Riverside-San Bernardino (78,615),¹⁴ two medium-sized urban centers, lie toward the eastern side of the Los Angeles Basin and derive their major activities from the rich agricultural areas surrounding them. Riverside owes its origin to the fact that a bridge was built across the Santa Ana River in 1774 which placed it on the main trail between Arizona and Monterey. For a long time the site was a part of the large Jurupa Ranch, but, following the discovery of gold in California and a severe flood and drought which decimated the herds in the area, intensive use of the lands through irrigation became important. In 1870 the ranches of the area were purchased by the Southern California Colony Association, and the Riverside townsite was surveyed. Today Riverside is a thriving metropolis and the trade center of many large citrus ranches. It is unique in being the place where the first navel orange was planted in California—the orange that revolutionized the Southern California fruit industry. The city, with its wide tree-bordered boulevards, is one of the show places of Southern California, and contains one of the most famous hotels of the region, the Glenwood Mission Inn.

San Bernardino lies about 10 miles north of Riverside near the foot of the San Bernardino Mountains and serves as a "pass city" for the Cajon Pass to the desert region to the northeast. Like Riverside, its early development was associated with the cattle industry of the Spanish settlers, but in 1851 a Mormon colony of some 500 members was established in the vicinity. The colony was short lived, however, since the colonists were withdrawn to Utah in 1857. The completion of the Santa Fe Railroad to Southern California through Cajon Pass made San Bernardino a railroad center, and today it serves as an important fruit-packing center for the surrounding area. Like Riverside, the city has many attractive homes.

The Outlook

The future of the Subtropical Pacific Coast Region is perhaps most difficult of all to forecast. Mild climate and remoteness kept its first settlers aloof from the rest of the world for more than a century. When it was ultimately rediscovered and connected by rail and later by seaway, highway, and airway, it grew rapidly in

¹⁴ Riverside (34,969) and San Bernardino (43,646) together have a total population of more than the 50,000 considered by the Census Bureau for the metropolitan centers, but these figures are for the political cities only.

population. Irrigation agriculture, particularly the production of citrus fruits, gave the region its first real boom, but this was soon followed by the discovery of oil, the development of the motion-picture industry and tourist trade, the rise of fishing and overseas trade, and more recently by the unbelievable expansion of the aircraft industry. All of these contributed to the region's rapid growth but more particularly to the growth of Los Angeles.

Southern California in a short time became so populous that it was taxing its resources to the limit and had to rely upon outside resources for water and hydro-power. But the region continued to increase in population. A few years ago writers were saying that it had about reached its saturation point, but since then probably a million new inhabitants have moved into the region. The new aqueduct from the Colorado River will provide water for 7 million people, but one wonders if other facilities can be increased to that extent.

The recent boom, due largely to wartime demands on the aircraft industry, can be but temporary. When the emergency is over, Southern California may continue to lead the country in the production of airplanes, but the industry must of necessity reduce in size. Retrenchment and population losses are inevitable, but Southern California has weathered several depressions and should be able to do so again.

The Subtropical Pacific Coast has great wealth in its climate, its scenery, and its progressive people and should always be one of Anglo-America's most important and best-known geographic regions.

CHAPTER XX

Central California

A REGION OF FRUITS AND MIXED FARMING, LUMBERING, MINING, RESORTS, AND COMMERCE

THE CENTRAL California Region, which extends from the eastern crest of the Sierra Nevada to the Pacific Ocean, includes a major part of the state. Only those portions of southern and eastern California that lie within the Intermontane Basins and Plateaus or the Subtropical Pacific Coast regions, along with the coastal ranges north of San Francisco Bay, lie outside this region (Fig. 251).

The region is subdivided into (1) the Sierra Nevada (2) the Great Valley of California, and (3) the Coast Ranges and Valleys, including the important San Francisco Bay area. While these subdivisions show marked contrasts in relief, climate, soils, vegetation, and cultural development, they are so inter-related and so mutually dependent that they constitute one major geographic region. The Great Valley of California, the heart of the region, could not have become the important area it is without the resources of the Sierra Nevada (particularly the water resources), and likewise its development would have been greatly retarded had it not possessed excellent contacts with the coast through the San Francisco Bay area. In similar manner the Sierra Nevada and the coastal areas are vitally dependent upon the Great Valley of California.

The terrain

The *Sierra Nevada* constitutes a huge block of mountains 50 to 80 miles wide and 400 miles long. It was formed by a gigantic uplift which tilted the block westward. The eastern front is marked by a bold escarpment which rises 5,000 to 10,000 feet above the alluvial-filled basins of the Intermontane Region to the east,

and this bold escarpment marks one of the most definite geographic boundaries on the continent. The western slope, although more gentle, is deeply incised with river canyons and has been greatly

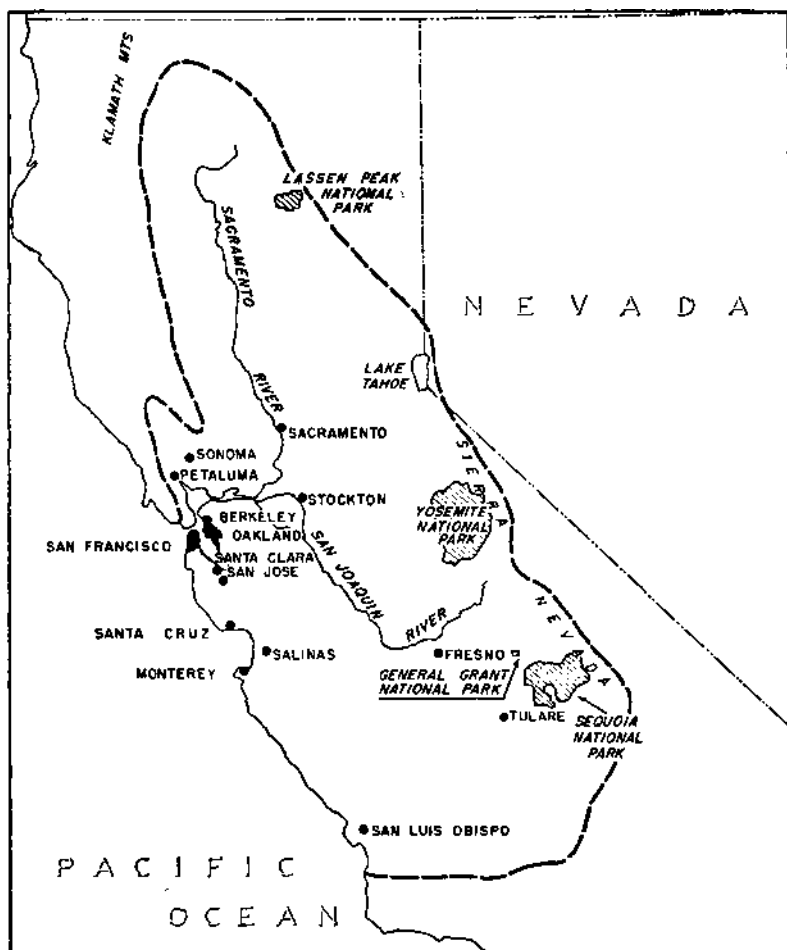


Fig. 251. Central California, a region of fruits, mixed farming, lumbering, mining, resorts, and commerce.

eroded by glaciers, forming such magnificent canyons as the Yosemite and Toulumne valleys.¹ The summits of the Sierra Nevada have

¹ Wallace W. Atwood, *The Physiographic Provinces of North America*, p. 441. Boston: Ginn & Co., 1940.

suffered severe glacial erosion and consist of a series of interlocking glacial cirques. Complex faulting, mountain glaciation, and stream erosion account for most of the details of the mountain mass. Some of the block-faulted valleys contain lakes, the most noted of which is Lake Tahoe. Since the crest of the Sierra Nevada is toward the eastern margin of the region, and since the rain-bearing winds come from the west, practically all of the precipitation falling upon the mountains flows down the gentle western slope into the Great Valley of California, providing it with water for irrigation.

The Sierra Nevada was greatly affected by volcanic activity, large lava flows filling many of the mountain valleys. Gold-bearing gravels in the stream beds were covered by these lava flows. In a later stage of erosion when a new stream system developed in the mountains, these buried lava flows and stream gravels appeared on the sides of the canyons. Gold-bearing materials were later washed down the slopes into the present stream channels. The presence of these auriferous gravels was responsible for the great Gold Rush to California in 1849.

The *Great Valley of California*, A broad trough lying between the Sierra Nevada and the Coast Ranges, averages 50 miles in width and has a length of approximately 400 miles. Structurally the valley is synclinal, having been warped downward when the Sierra Nevada and the Coast Ranges were uplifted. The long period of erosion that followed this uplift caused the trough to be filled by great quantities of sand, silt, and gravel washed down from the mountains. In places the alluvium has a known thickness of more than 2,000 feet. The Valley is divided into three drainage basins: the Sacramento Valley in the north, the San Joaquin in the middle section, and the Tulare Lake Basin, an area of interior drainage, in the extreme south. This last area is due to that portion of the Valley being separated from the rest of the trough by the unusually large alluvial fan of the Kings River, and to the arid climate in the south.

The *California Coast Ranges* lie west of the Great Valley and tend to run parallel to the coast. Their nearly even crests average 2,000 to 4,000 feet above sea level. Severe faulting throughout the ranges has resulted in numerous intervening valleys that have been eroded by many small streams. The entire mountain mass is divided into fault-blocks that are tilted in different directions. Along the coast, ancient shore terraces (in places as high as 1,500 feet above sea level) show that much of the coastal area has been uplifted, but more recently a moderate amount of localized sinking along the coast has allowed the sea to break through some of the

fault valleys of the outer coastal range and submerge the lower valleys of the streams. Golden Gate and San Francisco Bay were formed by this type of subsidence.

Climate

Although the Central California Region lies largely within the Mediterranean Subtropical Climatic Zone (Fig. 4), probably no other region of like size has so many diversified climatic types. These are due largely to the influence of the mountains and to great variations in altitude. On the whole the region is characterized by

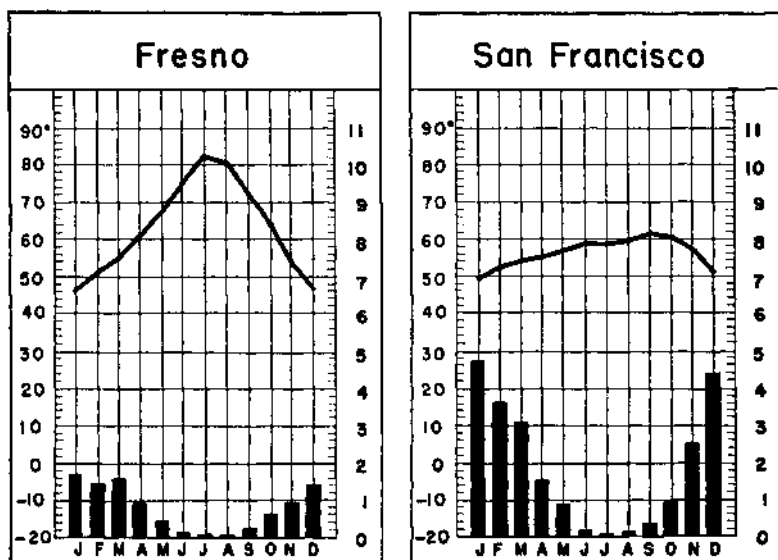


Fig. 252. Average monthly temperature and precipitation for Fresno and San Francisco.

mild winters and warm to hot summers, with the maximum precipitation coming in winter. Local variations, however, must be noted, where elevation produces a modification of the general climatic type (Fig. 252).

The Sierra Nevada along the eastern border of this region, because of its great elevation and because it presents a formidable barrier to the rain-bearing winds from the Pacific Ocean, has a heavy precipitation on the western slope, while the eastern, rain-shadow side is dry. Although some rain falls throughout the summer, the maximum precipitation comes as snow during the winter season. The western slope receives the heaviest snowfall.

of any part of the United States, the average being more than 400 inches a year. During the 1906-1907 season, Tamarack (elevation 8,000 feet above sea level) recorded a snowfall of 884 inches.² These heavy snows tend to emphasize the barrier nature of the Sierra Nevada and have caused great expenditures in money to transportation lines operating across them. The accumulation of moisture in these snows, however, is of inestimable value to agriculture in the Great Valley of California, since the snow, which does not melt until late spring, provides an abundance of irrigation water during the hot, dry summer. Without the heavy snows of the Sierra Nevada, the great agricultural development of the Valley would be impossible. Along the summits of the higher ranges, true tundra climatic conditions prevail, but they are confined to a very narrow strip. The steep eastern face lies in the rain-shadow and belongs with the climate of the Intermontane Basins.

The Great Valley of California possesses a "Hot Summer" Mediterranean type of climate (Fig. 252A). Lying as it does between the Coast Ranges and the Sierra Nevada, most parts suffer from a lack of rainfall. The rainfall decreases rapidly from more than 30 inches in the northern section to less than 10 in the extreme south. Most of the precipitation comes during winter when the high Sierra Nevada is receiving its heaviest snowfall. Because of the moisture deficiency, most agriculture would be impossible were it not for the abundance of irrigation water derived from the heavy snowfall in the mountains. So far as temperature is concerned, the Valley is characterized by mild winters with a long growing season, and hot summers. Summer day-time temperatures ordinarily exceed 100 degrees.

The Coast Ranges receive more moisture than the Valley and are somewhat cooler in summer, but, since few of their summits exceed 2,000 feet in elevation, they do not get the heavy precipitation of the Sierra Nevada to the east. They serve as a barrier to the rain-bearing winds for the Valley but do not receive any heavy precipitation themselves.

Along the coast a distinctive variation of the central California climate exists in what is known as the "Fog Belt,"³ an area (Fig. 252B) characterized by mild winters and cool summers with a maximum of fog during the summer season. Because of the prevalence of fog, the summer maximum temperature occurs in August

² Robert DeCourcy Ward, *The Climates of the United States*, p. 254. Boston: Ginn & Co., 1925.

³ R. J. Russell, "Climates of California," *University of California Publications in Geography*, Vol. 2, No. 4 (1926), p. 82.

and September, but throughout the entire area cool summers are characteristic. Rainfall comes largely during the winter season, but fogs tend to offset the lack of rainfall during summer.

Natural vegetation

On the western slopes of the Sierra Nevada, dense forests of conifers dominate the landscape. These include yellow pine, lodgepole pine, sugar pine, and sequoia, and constitute some of the most magnificent forests of the continent. Higher up on the slopes the large trees give way to smaller dwarfed varieties and ultimately on the highest summits to tundra vegetation.

Because of its low rainfall, the Great Valley was originally a grass land, with tall grasses and scattered oaks in the northern better-watered section and bunch grass and desert vegetation on the drier southern section. Today much of the land is under cultivation and the original vegetation has been largely destroyed.

The Coast Ranges, also deficient in moisture, are usually grass-covered, with chaparral occupying a considerable part of the upper shady slopes. Throughout much of the year the vegetation of the Coast Ranges presents a brown appearance. Only on the few higher areas is moisture sufficient for coniferous forests.

The western slopes of the Coast Ranges and the "Fog Belt" along the coast support some forest vegetation; but only in the more favored parts, such as in the vicinity of Santa Cruz, do the large redwood trees appear. North of San Francisco Bay, along the northwest coast of California, lies the world's greatest Redwood forest, but this area falls within the North Pacific Coast Region (Chapter XXI).

Soils

It is extremely difficult to give an accurate picture of the soils in this region of diversified relief. The mountains, both the Sierra Nevada and the Coast Ranges, have been subjected to such severe erosion that no mature soil types have been able to develop. Only thin forest soils of little economic value characterize the timbered areas.

The Great Valley and the several coastal valleys have soils composed of materials derived from the large alluvial fans that have washed out from the mountains. Continuous deposition of alluvium prevents most of these areas from attaining soils with mature profiles, but the great fertility of the alluvium makes these areas highly productive for agricultural crops. In the southern

part of the Valley near Tulare Lake, alkaline conditions make large areas unsuited to irrigation agriculture. Along the lower course of the Sacramento-San Joaquin River, much land is waterlogged and hence unsuited to cultivation. On the whole, however, most of the Great Valley and the coastal valleys are covered with rich alluvium that provides excellent plant food for agriculture, and this, together with the abundance of irrigation water, makes these areas among the most important farming sections of the entire continent.

Sequent Occupance

The early history of settlement in Central California is so closely associated with that of Southern California (Chapter XIX) that little more need be said of it here. The early Spanish and English explorations along the coast failed to discover the great natural harbor of San Francisco Bay, and it was not until 1769 that a land party found it, despite the fact that Spanish galleons from the Philippines had passed within a few miles of the Golden Gate for more than two centuries. This seems hard to believe, but may be explained by (1) the heavy fogs along the coast which forced the sailing vessels to keep a safe distance out to sea and (2) the disdain in which all California was held by Spain.

When settlement was finally made in the latter part of the eighteenth century to offset the Russian advance from the north, only the most favored coastal points were selected by the Spaniards for their missions and presidios. Monterey and San Francisco (then known as Yerba Buena) were the two chief settlements, although others were made in the coastal valleys. Much of the valley land was granted to Spanish settlers in great estates and in that form the land holdings of California remained until "after the area was annexed to the United States. Most ranching development took place in Southern California and the lucrative trade in hides and tallow that followed was largely confined to the southern port of San Diego. Considerable ranching, however, developed in the area back of San Francisco, and this stimulated some trade out of that port. With the rapid growth of the whaling industry in the early 1800's, San Francisco, supplying the ships with meats and some fresh fruits and vegetables, became the leading outfitting port on the Pacific Coast for these Arctic expeditions. It also provided a market for a considerable amount of whale oil. Spain tried to discourage this trade but was unsuccessful. After the land became a part of Mexico, trade with the Yankees from New England increased. Some English-speaking people settled in the area, and

as early as 1822 an English firm established a mercantile house at Monterey. A prosperous trade also sprang up between this part of California and Peru. California shipped hides, tallow, grain, wines, and other products of the missions to Peru in exchange for textiles and other manufactured goods. Although a slow infiltration of English-speaking settlers into this region occurred during the first half of the nineteenth century, the total non-Spanish population was small. Remoteness from populous centers and the vast undeveloped landholdings of the Spaniards served to retard any rapid westward drift to California. The discovery of gold in 1848, however, touched off the spark that sent hordes of people from everywhere in a mad dash for California.

The Gold Rush

In the late 1840's, the United States and Mexico went to war over Texas. Since Mexico never held much control over either New Mexico or California, it was easy for the comparatively few English-speaking people living there to wrest the lands from the Mexican authorities and with the close of the war to make California an American territory. In January 1848, shortly before the signing of the treaty closing the Mexican War, James W. Marshall discovered flakes of gold in the river gravels of one of the canyons of the Sierra Nevada. During the following summer, news of the discovery spread to the coast of California and to Oregon, and from both places hundreds of men rushed to the Sacramento area. The stampede caused San Francisco to be almost deserted, and for a time the local newspaper was suspended. Before winter the news of the great gold find had spread to the East and to northwest Europe, and before the end of 1848 the real rush began.

As the "gold-fever" gained headway, people began pouring into California from all directions. The majority came overland via the Oregon and Mormon trails to Salt Lake City, and thence across the Great Basin and the Sierra Nevada to the "gold diggings/" but many came by boat, either (1) around Cape Horn, (2) across Panama (at first by pack train and later by rail), or (3) across Nicaragua (by boat through Lake Nicaragua and by stage coach across the narrow isthmus to the west of the lake).

During one month in the spring of 1850, 18,000 people were estimated to have gone overland to California. By the end of that year the state's population was 92,000, but ten years later it had risen to 380,000. The "Forty-niners" suffered untold hardships on

their way to the "gold diggings/* but nothing daunted them. Despite almost insurmountable hazards and considerable loss of life, most of them reached their destination.

The population of California (admitted as a state in 1850), which had become quite cosmopolitan, consisted of three distinct groups: (1) the rough and hardy mining population located largely in the Great Valley, (2) the boisterous population of San Francisco, which had grown suddenly from a village of a few hundred inhabitants to a city of several thousand, and (3) those who occupied the sparsely settled coastal areas and valleys from Monterey to San Diego, Spanish-Mexican *rancheros*, engaged chiefly in cattle-raising.

Northern California (near the gold diggings) and San Francisco received practically all the new influx of population, while the coastal areas remained largely in the hands of the original Spanish owners. That the mining settlements were wild, "wide-open" places occupied by "gold-crazy" reckless men is revealed in the names of some of the settlements, such as *Poker Flat*, *Hang town*, and *Hell-out-for-Noon City*.⁴ San Francisco, the ocean gateway to the gold fields and the chief metropolis of the area, became one of the most prominent as well as one of the most wicked cities of all time, its "Barbary Coast" being known far and wide.

The period following the Gold Rush

Gold-mining continued important for some years after 1848, but the more easily worked stream gravels were soon exhausted and the majority of individuals either had to find other occupations or move to new mining areas elsewhere in the West. The discovery of gold in the Rockies of Colorado and of silver in Nevada took a large number of miners eastward. Many of the people, however, who had moved to California realized "its potential worth as an agricultural area and began to secure land from the old Spanish *ranchos* that were being broken up and sold. Remoteness from large centers of population made it impossible for these regions to produce farm products for the outside market, but they had a decided advantage for supplying the rapidly growing California market. Subdivision of the great ranches into small tracts brought many new homeseekers to California, particularly after the close of the Civil War, and soon the Great Valley became an outstanding wheat-producing area. With the completion of the first "trans-continental railroad" in 1869, providing a greater outlet for agri-

⁴ C. R. Niklason, *Commercial Survey of the Pacific Southwest*, p. 458. Domestic Commerce Series No. 37, U. S. Dept. of Commerce, 1930.

cultural surpluses, the Valley blossomed forth as one of the great "bonanza" wheat-growing areas of the nation.

The development of irrigation and reclamation

In the early 1880's the Great Valley and the more favored coastal valleys entered into a new phase of agricultural development through the use of irrigation waters from the mountains. With the change from dry-land farming to irrigation, emphasis shifted from extensive crops, such as wheat, to the intensive crops of fruits and vegetables. Today the Great Valley and the several coastal valleys are among the most important fruit and vegetable producing areas of the continent. Central California is fundamentally an agricultural region, and the value of its farm products is many times as great as that of its minerals, despite the fact that gold still is mined and that the southern part of the Valley contains one of California's most important oil fields.

Agriculture

Today wheat production occupies a relatively minor place in the farm economy of the region, despite the fact that considerable acreage still is planted in that crop. O. E. Baker⁵ says that "in no other region in North America is agriculture so highly specialized. . . ." He groups the systems of farming into the following:

1. Fruit and nut farming.
2. Vegetable growing.
3. Sugar-beet and bean production.
4. Grain farming.
5. Hay production and dairying.
6. Beef-cattle ranching.
7. Sheep grazing and fattening.
8. Poultry and egg production.

The Sierra Nevada and Coast Ranges are in general too rough to support any agricultural development except for ranching and some hay and grain production on the low foothills. Farming is accordingly confined to the level to gently rolling lands of the Great Valley and to several smaller coastal valleys. Subdivisions of the Great Valley include the Sacramento, the San Joaquin (the Tulare Basin of interior drainage occupies the southern end of this subregion), and the Sacramento-San Joaquin Delta. The

⁵"Agricultural Regions of North America: Part VIII, The Pacific Subtropical Crops Region," *Economic Geography*, Vol. VI (1930), p. 294.

most important coastal valleys are the Sonoma north of San Francisco Bay and the Santa Clara and Salinas to the south of the bay area. They constitute practically all of the agricultural land of the region; together with the Imperial Valley in southeastern California and the several basins in Southern California, they account for the state's preeminence in agriculture. Within these areas considerable grain and wild hays are grown without irrigation as winter crops, but most crops depend upon irrigation for their existence. The hot, dry summers make irrigation a necessity for the production of almost all fruits and vegetables.

Irrigation in the Great Valley

In the 1880's when irrigation began to be practiced in this sub-region, much land that previously had been used for ranching or for growing wheat or other small grains was placed "under the ditch." Prior to that time the courts of California had upheld the "doctrine of riparian rights," for the waters of the Valley, which allowed the owners of land bordering streams to maintain the flow of water in those streams in undiminished volume. This doctrine, designed for a humid country, was unsuited to a land where the chief purpose of water was to be for irrigation, and it had the effect of granting a large supply of water to certain overflow lands that did not need it and prohibiting the use of water on good irrigable lands not adjacent to streams. Within recent years, however, the courts have ruled that even riparian landowners are entitled to only a "reasonable use" of stream waters and that the surpluses may be diverted. Following the peak year of grain production in the Great Valley (1885), irrigation has increased steadily. In 1934 the irrigated lands of the Valley represented 64 per cent of the total for California.

The Central Valley Project⁶

Almost from the beginning of irrigation in the Great Valley, need was felt for some central control of irrigation waters, so that the heavy winter precipitation on the Sierra Nevada could be better conserved for summer use. Some fifty active districts have distributed waters to the more than 2 million acres of irrigated lands. On some of the major streams, such as the Toulumne, the Stanislaus, and the Merced, large storage reservoirs have been constructed, but still no unified project has been completed. In 1920, Robert B.

⁶Peveril Meigs, "Water Planning in the Great Central Valley, California," *Geographical Review*, Vol. 29 (1939), pp. 252-273.

Marshall worked out an elaborate plan for the coordinated exploitation of the water resources of the Great Valley. Although the plan was rejected, it created interest in a Central Valley Project. The California legislature began an investigation; plans were issued in 1923 and revised in 1925, 1927, and 1930. The plans were replaced by a final one presented by the state engineer, Edward Hyatt, and ultimately adopted, with minor changes, by the state legislature.

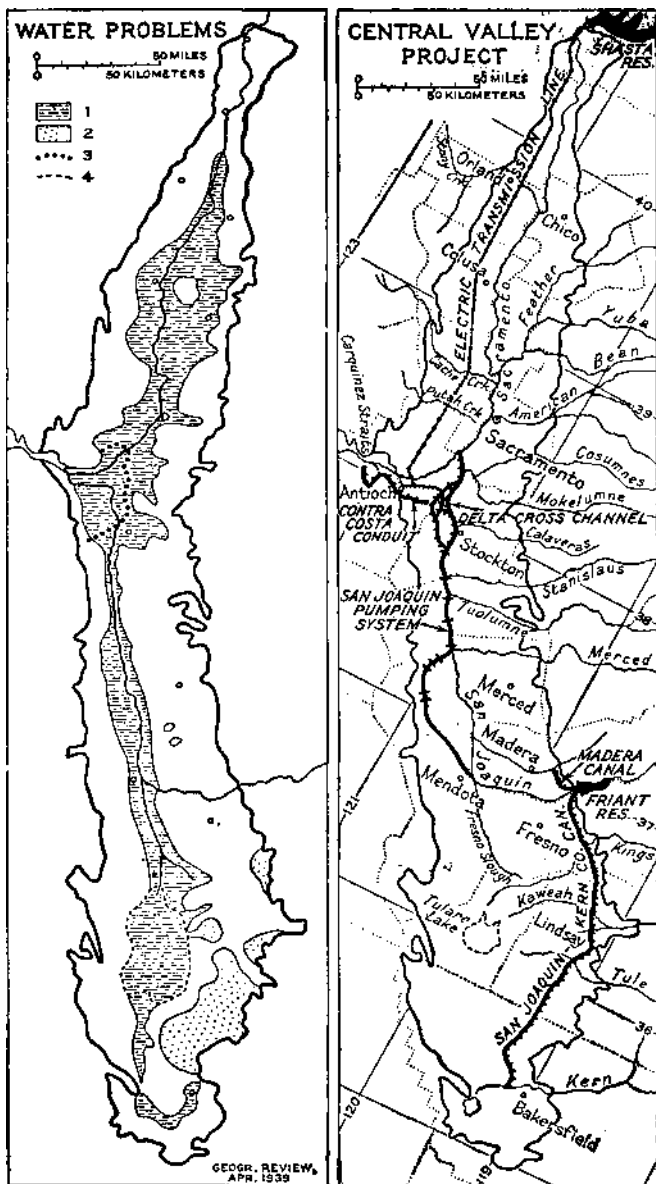
The present Central Valley Project (Fig. 253) has two main purposes: (1) the supplying of water to the dry southeastern San Joaquin Valley and (2) the prevention of salt-water encroachment in the delta area. Two large reservoirs are to be built: the Friant Reservoir (storage capacity of 520,000 acre-feet) on the San Joaquin, and the Shasta Reservoir (storage capacity of 4,500,000 acre-feet) at the upper end of the Sacramento Valley. Water will be distributed by several major canals and conduits, and 375,000 kilowatts of hydro-electric power will be generated at the Shasta Dam. The Pacific Gas & Electric Company, serving the San Francisco Bay and Great Valley areas, has offered to purchase all of the power generated at the Shasta Dam.

Work was started in 1937 on this project. The dam is scheduled for completion in 1943. The United States Bureau of Reclamation and the Water Project Authority of the State of California are jointly supervising the project. It will cost \$170,000,000 but a plan has been devised for complete utilization of waters of all streams draining into the Great Valley that will ultimately involve an expenditure of \$683,900,000. These figures seem colossal, but probably no other region of like size (total area of the Great Valley is 18,810 square miles) on the earth could so nearly justify this investment in agricultural lands. When the present project is completed, the water problems of the currently irrigated lands will have been solved.

Irrigation in the coastal valleys

The coastal valleys are not so well favored as the Great Valley with supplies of irrigation water from mountain streams. They have to depend largely upon an ever-diminishing supply of ground water, but they do not have the severely hot dry summers of the Great Valley and their evaporation rates are not so great. Fogs also help to reduce evaporation and provide a small amount of moisture..

The *Santa Clara Valley*, which lies southeast of San Francisco Bay, is the most productive and most highly developed of the



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Fig. 253. The Central Valley Irrigation Project. Under "Water Problems" are included (1) land subject to flooding under natural conditions, (2) areas where water table has fallen more than 25 feet, (3) upper limit of salt water or harmful concentration, and (4) limit of Tulare Lake in 1862.

coastal valleys, and it well illustrates the type of development within this subregion. It is one of the most intensively cultivated areas on the continent, consisting largely of prune and apricot orchards. In Santa Clara County, which lies in the heart of the Santa Clara Valley, 60 per cent of the cultivated land is in orchards and nearly three fourths of the farmers derive their chief income from the sale of fruit. Prunes and apricots constitute about 84 per cent of all the orchard trees, and pears, most of the remainder.⁷

Because of frost hazards, most of the orchards are planted on the slopes of the valley, the flat bottom lands being left in grains or in hay and pasture. This explains the fact that the Santa Clara Valley is also important for dairying, despite its heavy concentration upon deciduous fruits. The crop zonation within this subregion is well shown by the land utilization block-diagram (Fig. 254) of a strip of land across the valley northeast of the city of San Jose.

Although none of the other coastal valleys specializes to the extent of the Santa Clara, they nevertheless produce large quantities of fruits, nuts, and vegetables. The distribution of crops in these coastal valleys as well as in the Great Valley is considered under the individual crops.

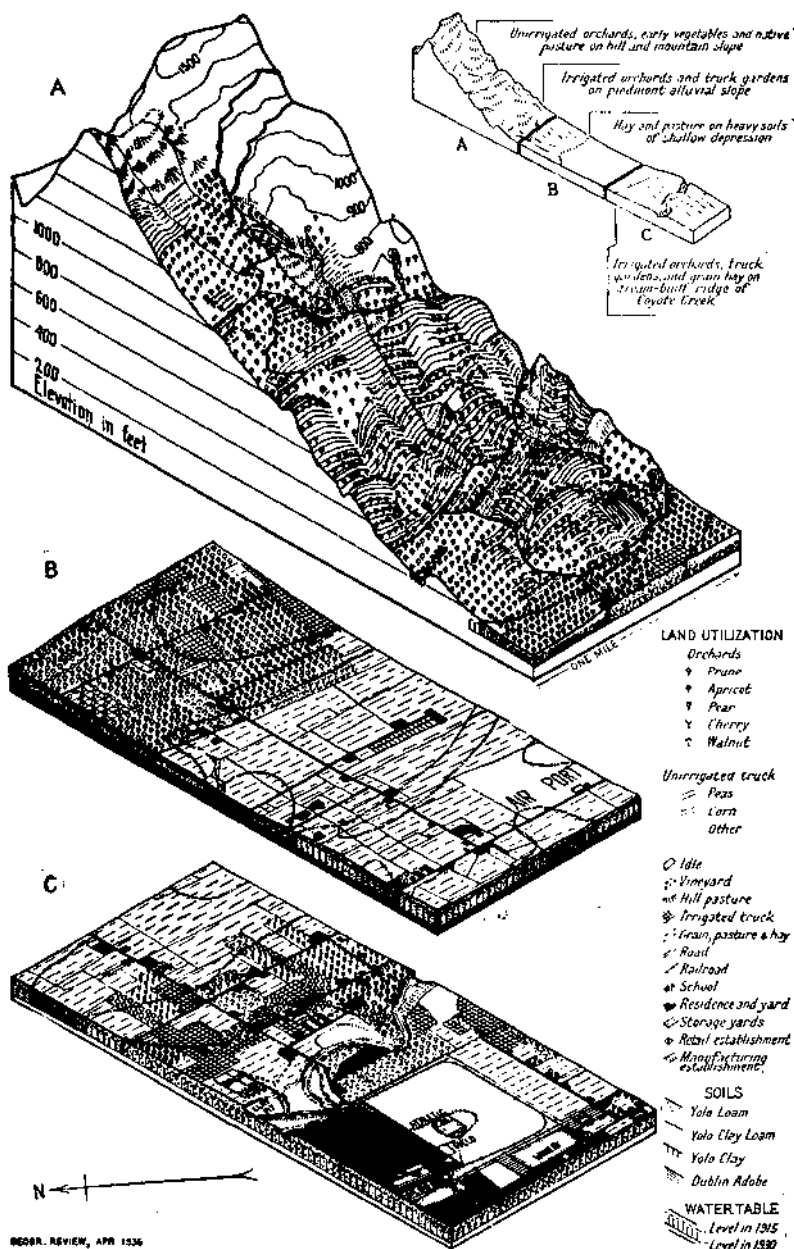
The non-irrigated areas

Although the several valleys dominate the agriculture of Central California, they represent less than half of the total area. Much of the region, composed of high, rocky, and forested mountains or hills covered with grass and chaparral, is unsuited for cultivation (Fig. 251). The lower slopes, together with some of the raised beaches along the coast, support some farming without irrigation. While these crops occupy a subordinate place to the irrigated fruits and vegetables of the valleys, they nevertheless contribute considerably to the total agricultural wealth of California.

The Crops

The major crops and other agricultural products of Central California may be grouped under the following heads: (1) grains and other field crops grown largely without irrigation, (2) fruits and nuts, (3) vegetables, and (4) livestock.

⁷ Edward N. Torbert, "The Specialized Commercial Agriculture of the Northern Santa Clara Valley," *Geographical Review*, Vol. 26 (1936) pp. 247-263.



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Fig. 254. Land utilization in the Santa Clara Valley.

Grains and other field crops⁸

Although grains, hay, and other field crops have ceased to occupy a dominant place in the farm economy of Central California, they still are important in the non-irrigated sections. Even in the irrigated areas, rice and alfalfa occupy considerable land. These crops dominate more than one half of the cultivated acreage of the region, but their value is less than one-fifth that of all crops. The major grains are wheat, barley, and rice, while the other field crops include alfalfa and tame hays.

Wheat, once the most important crop of the region, declined rapidly in importance between 1899 and 1909, partly because of the use of the better lands for more intensive crops, and partly because of the depletion of soil fertility from continuous cropping. High prices for wheat during the first World War caused a revival in production, but today wheat occupies only three-fourths the area of barley, the other important non-irrigated grain crop. California wheat, which is soft, is either used locally or shipped to Europe and the Orient. Most of the wheat is grown in the Great Valley.

Barley grows on the same lands as wheat, but is better adapted to the dry climate of the Great Valley. Areas of heaviest production are found in the northern part of the San Joaquin Valley and in the Sacramento Valley. Although most of the crop is used locally for feed, a considerable part is shipped in normal times through San Francisco to Europe, where it is used for malting.

Rice, which ranks third among the grain crops of California, is produced entirely within the Sacramento Valley, where water for irrigation is plentiful and where the heavy clay soils of the natural-leveed basins are well suited to its cultivation. A large part of this crop was sent to Japan and China during normal times, where it could compete with Oriental-grown rice, despite the fact that Oriental laborers get 40 cents or less a day in contrast to \$4.00 in California. This competition is made possible through the use of the latest type of harvesting machinery. The area produces, however, only about one fifth of the nation's total and is surpassed by the Gulf Coastal Region of Louisiana and Texas and the bottom lands of Arkansas.

Alfalfa, the chief hay crop of the region, accounts for more than 80 per cent of the production of all hay crops. Because of the long growing season, alfalfa is cut from three to six times annually.

⁸ O. E. Baker, "Agricultural Regions of North America: Part VIII, The Pacific Subtropical Crops Region," *Economic Geography*, Vol. 6 (1930), pp. 186-190.

Wild and tame hays constitute a sizable part of the forage, but the tame hays are far more important. Before the beginning of the dry summer season, a large acreage of small grains also is cut for hay.

Other field crops. Small amounts of oats and Egyptian corn are grown in the central part of the Great Valley, while in some localities *dry beans*, *sugar beets*, and *cotton* are produced. Beans are most important in the Salinas Valley, and cotton in the southern part of the San Joaquin Valley. Sugar beets are confined chiefly to the Sacramento and Salinas valleys.

Citrus fruits

Citrus fruits are grown in the Porterville and Lindsay districts of the San Joaquin Valley, but the total production in this region represents less than one fourth of that of the state. Southern California (Chapter XIX) produces the major part of the stated citrus fruits.

Deciduous fruits and nuts

Although Central California takes second place in the production of citrus fruits, it ranks first among Anglo-America's regions in the production of grapes, prunes, plums, peaches, apricots, pears, cherries, figs, olives, and almonds. Central California accounts for almost the entire continental production of several of these. Since practically all of the deciduous fruits are grown in the Great Valley or in the coastal valleys of Central California, state statistics may be taken as representative of this region.

TABLE VI °
FRUIT AND NUT PRODUCTION IN CALIFORNIA, 1938

Crop	Production (short tons)	Per Cent of Total U. S. Production	Rank of California in U. S.
Grapes.	2,331,000	93	
Prunes and plums.	285,000	77	
Peaches.	500,040	40	
Apricots.	176,000	85	
Pears.	293,775	36	
Apples.	178,440	6	
Cherries.	28,800	21	
Olives.	40,000	99	
Figs.	43,500	97	
Almonds.	12,100	99	

⁹ Peveril Meigs III, "Current Trends in California Orchards and Vineyards/" *Economic Geography*, Vol. 17, No. 3 (July 1941), p. 275.

Grapes, based on acreage, are the principal fruit of Central California. Moreover, this region accounts for nearly nine tenths of the nation's production. The San Joaquin Valley, with nearly a half-million acres of vineyards, is the chief producing center, but the Sacramento and coastal valleys north and south of San Francisco Bay also have large acreages in vines. Some of the California grapes are shipped East for table use but more are made into wine. By far the largest part of the crop, however, is dried into raisins, principally on the farms where grown. The coastal valleys in the San Francisco Bay district produce the major part of the wine. The industry is largely in the hands of native Italians and their descendants. In contrast to what might be expected, national prohibition proved a great stimulus to the grape and wine industry of California, the number of vines increasing 60 per cent between 1919 and 1924. During recent years grape-production in this region has remained at about the same figure. The climate of the Great Valley is especially favorable for drying raisins, since summer and early autumn are hot and dry and sunshine is abundant. A large portion of the raisins produced is consumed within the United States. Most of those exported go to northwest Europe or to Canada. Fresno is the center of the chief raisin-producing district.

Prunes and plums are grown largely in the coastal valleys near San Francisco Bay, the chief production being found in the Santa Clara Valley, with a large acreage also in the Sonoma and Napa valleys. Considerable acreage also characterizes the Great Central Valley. Most of the fruit is dried and marketed as prunes. This region produces more than one half of the prunes of the world. Fresh plums, though far less important than prunes, are also produced in large quantities; California accounts for more than one third of the fresh plum crop of the United States.

Peaches, grown primarily in the Great Valley, are concentrated along the east side of the San Joaquin Valley in the vicinity of Fresno and Merced, where they are grown almost entirely under irrigation. In the Sacramento district, however, large peach Orchards thrive without irrigation. Although California ranks first in the production of peaches in the United States, little of the crop is marketed fresh, most of it being dried or canned. In recent years there has been a steady increase in the number of peaches canned and a decrease in the number dried, the result of changing household demands for the fruit. When dried fruit occupied the more important place, the Fresno district with its hot dry climate led in importance, but with the change toward canning, the major

processing has migrated farther north where the clingstone variety grows better.

Apricots, the earliest-blooming of the deciduous fruits, are restricted to districts that are comparatively free from spring frosts, and hence are confined largely to the coastal valleys of the San Francisco Bay district and the southern San Joaquin Valley. The major producing district is in the Santa Clara Valley, where apricots rank next to plums and prunes in importance. A large part of the crop is sold as fresh fruit throughout California, but most of it is either dried or canned.

Pears require somewhat cooler temperatures than either apricots or peaches, and hence are grown largely in the coastal valleys north of San Francisco Bay or in the foothills 2,000 feet or more above the Sacramento Valley. California (mainly this region) produces about one third of the country's pear crop, supplying 60 per cent of the canned, 40 per cent of the fresh carlot shipments, and practically all of the commercial output of dried pears. More than one half of this crop is shipped fresh to the large Eastern markets. Although California has suffered less than the East from pear-blight, losses in recent years from overproduction have offset its natural advantage. There is a tendency toward a decline in pear production.

Apples, which also require cooler climates, are grown largely in the coastal districts around Monterey Bay and in the Sonoma Valley north of San Francisco Bay. The cool fogs that drift in from the Pacific favor apple production here, but California is unimportant when compared with Oregon and Washington.

Cherries, grown chiefly in the San Francisco Bay area and in the southern portion of the Great Valley, are not so important as other fruits. They are largely of the sweet variety and are consumed as fresh fruit.

Olives, along with grapes and figs, were introduced into California by the first Spanish settlers. They are most important in the central San Joaquin and in the Sacramento valleys. While the California crop is free from the insect infestations common to Mediterranean lands, the cheapness of production in the latter area makes competition difficult. Freedom from insect infestation permits the California crop to be picked ripe, and most of the crop is thus marketed. Almost the entire production of North America comes from California.

Figs. In Central California their production is confined almost entirely to the middle San Joaquin Valley. Production has been curtailed in recent years by tree disease in this section, but progress is being made toward a solution of this problem. Normally, the

United States imports twice the amount of dried figs as California produces. A sizable part of the crop is now being sold fresh or is canned, but in these forms California must compete with large-scale production on the Texas Gulf Coast.

Almonds. Central California produces only one commercial nut crop, the almond, and accounts for practically the entire crop of the continent. In recent years the area of intensive almond production has shifted from the San Luis Obispo district in the southern part of the Salinas Valley to the Sacramento Valley. While this more northern region requires a greater rate of planting than the San Luis area because of flood losses, it nevertheless seems destined to replace the older almond-producing districts. The annual value of the crop is about 10 million dollars, but following the first World War, with the heavy importations from Spain, France, and Italy, the California industry suffered severely. The recent demand for shelled and salted almonds combined with a high tariff against imported nuts has greatly stimulated California's production, particularly in the Sacramento Valley.

Vegetables

Central California produces large quantities of vegetables for the market, but because of the competition offered by the various fruit crops for the best lands, only a few types have attained commercial importance: potatoes, tomatoes, asparagus, celery, artichokes, beans, and peas. In most of these crops this region is a national leader. Much of the crop reaches the market in cans, although considerable quantities of the fresh vegetables are consumed locally. California's distance from the large Eastern markets places it at a distinct disadvantage in marketing. Most vegetable production is confined to the Delta District near San Francisco Bay, the cooler parts of the San Joaquin Valley, or to parts of the Santa Clara Valley.

Another important industry of this region is the production of vegetable and flower seeds. The Santa Clara Valley and several smaller areas account for a large part of the nation's production of seed.

Livestock

During the period of Spanish settlement huge tracts of land were granted to the colonists for ranches. Although most of these large ranches were in Southern California, some lay in the coastal valleys and even in the Great Valley. By the time American pioneers

came to the Valley, most of the land was in ranches. About the only outlet, however, for cattle products came from the sale of hides and tallow to New England clipper ships which stopped at San Francisco, Monterey, and San Diego. Cattle ranching, although the leading activity during the entire Spanish-Mexican period, was never especially profitable. With the increase in the demand for foodstuffs following the discovery of gold, the better lands in the Great Valley as well as in most of the coastal valleys were plowed up and planted in wheat and other cereals. Cattle ranching and, in the Great Valley, sheep ranching, was then crowded off onto the poorer hill-lands of the coastal region or into the drier parts of the San Joaquin Valley.

In recent years dairying has become important on the more favored bottom lands in the San Francisco Bay area, and poultry raising has become a leading activity in the Sonoma Valley. The keeping of bees is important throughout the Great Valley, although not so significant as in Southern California.

Dairying. Although most of the dairy cows are in the San Joaquin Valley, the areas of greatest specialization in dairy products are those adjacent to the large urban centers near San Francisco Bay. In the favorably located Santa Clara Valley, the land in general is not well suited to orchard crops because of its susceptibility to frosts, and because of its compact soils which contain large quantities of alkali. Milk production for the San Francisco Bay cities is therefore the dominant activity. Some dairymen produce all the hay they require and purchase only grain feeds, while others grow no feed crops and depend entirely upon pastures. Some farmers in this valley keep no dairy stock, but specialize in the production of alfalfa to sell to dairies.¹⁰

In terms of the large-scale milk production of the North and East, California cannot be considered outstanding in dairying. Butter and cheese are produced in all of the dairy areas, but the total is insufficient to supply even the needs of California, and large quantities are shipped in from the Puget Sound area and from the Northeast.

The poultry industry, which ranks second to dairying in the value of products, is more important in the coastal valleys than in the Great Valley. The Petaluma District in the Sonoma Valley north of San Francisco Bay is the most important egg-producing center in the United States and probably in the world. Sonoma

¹⁰ Edward N. Torbert, "The Specialized Commercial Agriculture of the Northern Santa Clara Valley," *Geographical Review*, Vol. 26 (1936), pp. 252-253.

County has in excess of 3 million white leghorn chickens. Despite the size of the San Francisco market, egg production exceeds the domestic demand and large quantities are shipped as far east as the Atlantic coast. Large-scale production near the shipping point and modern marketing methods enable Petaluma eggs to reach the New York City market in such fresh condition that they command the highest prices.

The Canning and Preserving Industry

Because much of Central California's heavy production of fruits and vegetables can be successfully marketed in the East only when converted into a nonperishable product, this region leads the nation in canning and preserving, producing about one third of the total for the United States, and nearly 3 times that of New Jersey, the state ranking second. Practically all prunes and figs are dried, more than 60 per cent of the grapes are converted into raisins, most of the peaches are canned or dried, and although a large part of the pear crop is marketed fresh, more than one third is canned.

The canning industry began in California in 1862 when fruits and vegetables were packed in tins and shipped across the continent to help meet the food requirements of the Union Army. Since the completion of the first transcontinental railway in 1869, the canning industry has been expanding rapidly. This industry has certain advantages here that offset the high transportation costs. The long growing season and the great diversity of crops enable the canneries to utilize more completely costly plant equipment and to operate throughout the year. A large part of California's pack of canned foods is fruit. Apricots, peaches, and pears account for about 97 per cent of the total canned.

Since only about 5 per cent of the canned foods is consumed locally in California, most of the crop is shipped either to other parts of the United States (half moving by water), or to foreign countries.

This region is also the world's outstanding producer of many dried fruits. The hot, almost rainless summers provide excellent climatic conditions for natural drying, and although mechanical means have been perfected, there seems little reason for this new process seriously to affect California's dominant position. About 40 per cent of California's dried fruit is exported.

Mineral Industries

Gold was instrumental in developing Central California and bringing to it the first great influx of population, and although mining has since been surpassed by agriculture, mining activities continue to be important. In addition to gold, considerable silver, and some copper, lead, and zinc are recovered. Mercury is also produced commercially in Central California. The southern part of the San Joaquin Valley contains one of the 3 great oil fields of the state.

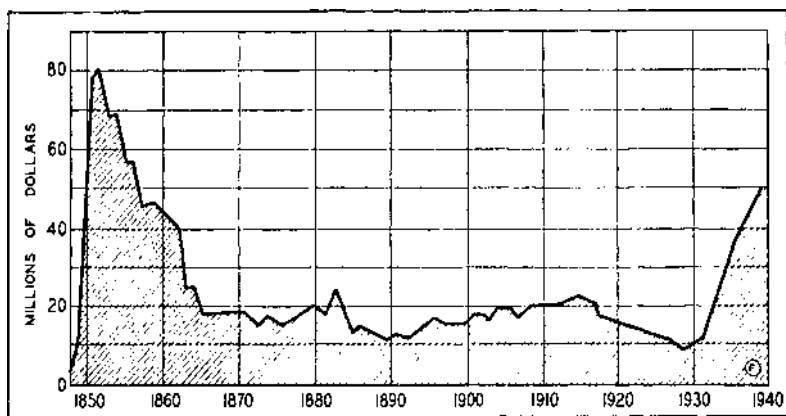


Fig. 255. Gold production in California from 1849 to 1940. (From a chart in "Minerals Yearbook, 1940.")

Gold, discovered in river gravels at the edge of the Sacramento Valley in 1848, caused what is generally considered the greatest "rush" that the world has ever known. By 1852, the gold production of the state had risen from practically nothing in 1849 to a peak of more than 80 million dollars (Fig. 255). After the easily worked placers were exhausted, more expensive types of mining became necessary and gold production declined to an annual average of about 20 million dollars, until recent years when increased prices made California again an important producer. From 1930 to 1939, the value of the gold mined increased from 10 to 50 million dollars, the latter figure being the highest since the peak years of the 1850's.

Following the depletion of the rich gold-bearing sands of the rivers in the early 1850's, large companies were organized to carry

on lode mining. In the 1880's, hydraulic mining became important, but it caused so much silt to wash down into the lower stream courses and onto the irrigated areas that a court injunction, issued in 1884, prohibited further discharge of debris from hydraulic mining operations and practically terminated that method of gold extraction. In modern times the dredge, in its several forms, has replaced this former method of working auriferous sands and gravels. By far the largest number of important mines (16 of the leading 25), are lode mines securing their gold from ore.

Copper, lead, and zinc are mined in some quantities in Central California but their total production today is negligible as compared with gold.

Mercury is produced in considerable quantities (over 3 million dollars' worth in 1940¹¹) in both Central and Southern California, and the two regions enable the state to account for more than one half of the nation's total.

Oil. While the bulk of the petroleum of California comes from the Los Angeles Basin and adjacent coastal areas (Chapter XIX), the southern part of the San Joaquin Valley accounted for nearly 38 per cent of the state's total in 1939. The two most important fields in this district are Kettleman Hills and Midway-Sunset, which reached their maximum production of 29 million and 26 million barrels, respectively, and have since declined to about 19 million barrels each. None of the other fields of the San Joaquin Valley produces any large amounts of oil.

Explorations have been made recently throughout the entire Central Valley with considerable success, and four new fields have been brought in farther north. Further exploratory work may show additional discoveries throughout the Valley, but as yet most of the production is confined to the southern end. The huge natural gas resources of the San Joaquin Valley are now piped to Los Angeles and San Francisco and constitute a major industrial and domestic fuel.

California's mineral wealth, although great, is dwarfed by the more important agricultural wealth of the state and particularly of this region. The fact that mineral activities are not considered in greater detail here does not mean that they are unimportant, but since these have been discussed in other regions and since they are subordinate to agriculture, the authors feel that additional consideration is unwarranted.

¹¹ *Minerals Yearbook*, 1941, p. 657. Washington, D. C.: Government Printing Office, 1941.

Logging, Lumbering, and the Forest-products Industries

The mountainous sections of Central California, particularly the Sierra Nevada, are covered with dense stands of conifers, including western yellow pine and sugar pine. These areas together with the redwood district of the northwestern part, which belongs in the North Pacific Coast Region (Chapter X XI), make California an important lumber-producing state.

Logging and lumbering began with the development of mining. For a long time the chief uses for wood products were for mine props, cross-ties for railroads, and construction timber for dwellings and other buildings in the mining camps. Logging operations in those days were extremely wasteful and doubtless much more timber was destroyed through fire and careless logging methods than was actually utilized.

With the development of the national forests (Fig. 216), a large part of the formerly cut-over and burned-over lands was withdrawn from logging activities, though a large part still remains in the hands of major lumber companies. The establishment of the national forests in the Sierra, Nevada was partly to reestablish forest stands for future lumbering industries, but chiefly to protect the watersheds of the numerous streams that provide irrigation waters for the Great Valley. These national forests also serve as important recreational centers for the region, and they provide summer pastures for a large livestock industry.

Since the snows in the mountains are extremely heavy, most logging activities are confined to the summer months. Logging camps, temporary settlements that are moved from season to season, are now usually located in remote areas. When logs can be moved out of the forests, they are brought to such lumber towns as Westwood, McCloud, and Weed, where they are converted into lumber for consumption within the state or for export. Despite the export of considerable lumber, California is deficient in lumber supply and must import most hardwoods for furniture and cabinet purposes, since its forests are primarily coniferous. Altogether California produces less than 60 per cent of its lumber requirements.

Several important industries are dependent partly or entirely upon lumber and timber products. These include building and construction, planing mills, the manufacture of wood and fiber boxes, cooperage, and paper and pulp mills. One of the most important of these is the manufacture of wooden boxes and crates for the citrus industry of Southern California and the deciduous fruit

industry of the Great Valley. Many of the sugar-pine and yellow-pine mills of Central California depend to a great extent upon the box-shook requirements of the agricultural industry.¹²

The California Fruit Growers Exchange owns and operates a large lumber mill at Susanville (Fig. 256) which is designed primarily to produce shook for Sunkist orange, lemon, and grapefruit packing boxes. Although this mill provides the greater part of the boxes, additional supplies must be purchased on the open market. During 1939 the box factories of the Exchange handled 43 million feet of lumber; to transport the manufactured product, 4,300 railroad cars were needed.¹³

The forest-products industries of Central California are of great importance to the region, but they occupy a place of minor significance as compared to the great lumber-producing regions in the Pacific Northwest or the South.¹⁴

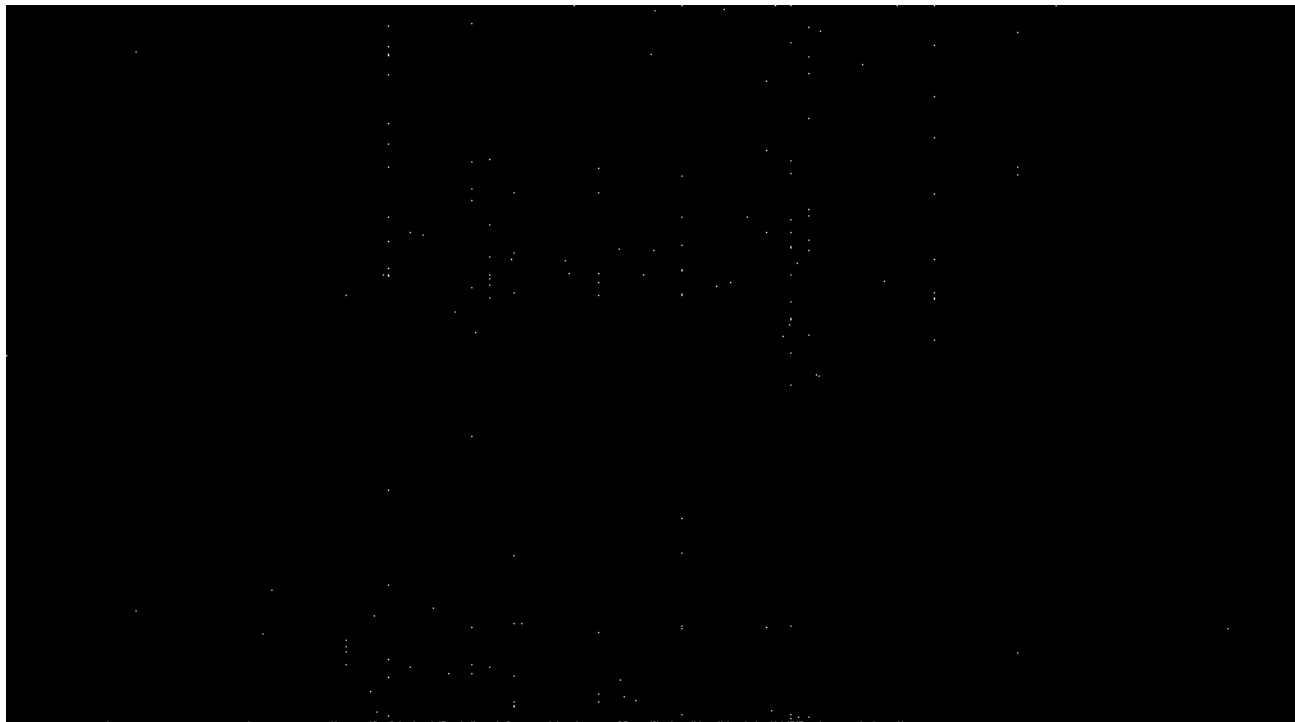
Power and Manufacturing

Manufacturing began in Central California soon after the discovery of gold. However, until well into the twentieth century, it consisted largely of smelting (in the mineralized zones) and of processing crops (in the agricultural districts). The lack of power resources was a great handicap. With the development of hydro-electric power in the Sierra Nevada in the early 1900's and the discovery of oil in the southern San Joaquin Valley about 1910, this region became well supplied with power. However, the population, although growing rapidly, did not constitute a large market for manufactured products. Furthermore, the opening of the Panama Canal and the reduction of freight rates to Pacific Coast ports practically prohibited any large-scale competition with manufactured products from the Atlantic Coast. When the first World War caused a withdrawal of most intercoastal shipping and so overtaxed the capacity of the railroads that the Pacific Coast was unable to secure the products it normally received from Eastern manufacturing regions, all California was thrown upon its own resources, and manufacturing developed rapidly. Since then, Central Cali-

¹² C. R. Niklason, *Commercial Survey of the Pacific Southwest*, p. 306. Domestic Commerce Series No. 37, U. S. Department of Commerce. Washington, D. C: Government Printing Office, 1930.

¹³ Neptune Fogelberg and A. W. McKay, *The Citrus Industry and the California Fruit Growers Exchange System*, pp. 56-57. Circular C-121, Farm Credit Administration, U. S. Department of Agriculture. Washington, D. C: Government Printing Office, 1940.

¹⁴ For a discussion of lumbering industries, see pp. 261-267 and pp. 791-798.



California Fruit Growers Exchange.

Fig. 256. Lumber mill at Susanville, California, owned and operated by the Fruit Growers Supply Co. In this plant is manufactured much of the box-shook for Sunkist orange, lemon, and grapefruit packing boxes.

ifornia has continued to develop its industries, but chiefly along a few highly specialized lines: (1) those engaged in the primary conversion of raw materials, such as smelters, refineries, canneries, and sawmills, and (2) those producing commodities for local consumption, such as bakeries, printing and publishing establishments, and machine shops.

Despite the abundance of water-power and the supply of oil, this region has not become highly industrialized like Southern California. Except for the types of manufacturing mentioned, it seems unlikely that it will become very important. Helen M. Strong, however, in discussing the possibility of future manufacturing development in this region, says:¹⁵

The large areas of agricultural land in the Great Valley, its mineral and power resources, the deep waters of the Bay with space for ocean shipping to dock, and for terminals for railroads which run through the valley, all afford the setting for an enlarging industrial development, an increasing population, and a growing commerce.

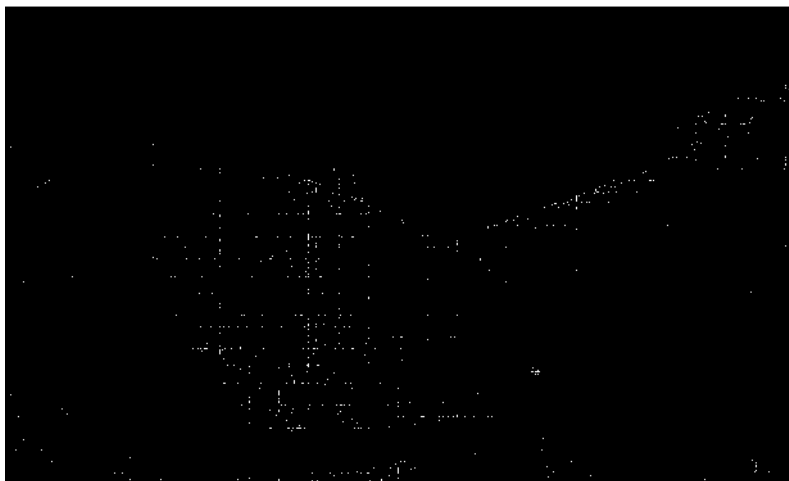
Transportation

San Francisco Bay is one of the best harbors on the North American Continent and is easily the best on the Pacific Coast. Through the gap in the Coast Ranges made by the combined Sacramento-San Joaquin rivers, the Great Valley has excellent connections with the ocean. On the land side, however, the high wall of the Sierra Nevada presents a great barrier to connections with the rest of the continent. For a long time the heavy snows of the Sierra Nevada closed for several months all but the railroad lines crossing the mountains. These were able to operate through the mountains only by utilizing snow-sheds and rotary snow-plows. In recent years the main highways have been kept open throughout the winter by the use of large snow-plowing equipment (Fig. 257), but this climatic handicap coupled with the steep ascent of the eastern face has deflected a large amount of trade around this region toward Southern California, or northwestward to Puget Sound. The maps showing railway, highway, and airway patterns in Central California (Fig. 208) reveal the great contrast between the highly developed systems in the Great Valley and coastal valleys and the almost complete lack of transportation lines in the mountains.

¹⁵ Helen M. Strong, "Regions of Manufacturing Intensity in the United States," *Annals of the Association of American Geographers*, Vol. 27 (1937), p. 41.

Railways

The first transcontinental railway, the Union Pacific-Central Pacific (the latter now a part of the Southern Pacific System) crossed through the center of the Sierra Nevada giving Central California its first rail contacts with the rest of the continent. Later the Western Pacific, utilizing the Feather River Canyon farther north, effected a second crossing. These two lines are the only ones to be built across the mountain barrier. Except through the gap



California Division of Highways.

Fig. 257. Removing snow from a transcontinental highway over the Sierra Nevada at Donner Pass, elevation 7,018 feet. This road is kept open all winter in spite of the extremely heavy snowfall in the mountain area.

focusing upon San Francisco Bay, no railroads cross the Coast Ranges. The Southern Pacific crosses into the Great Valley from Southern California and operates a line throughout the length of the Valley. Crossing through the Klamath Mountains into Oregon, it affords rail connection between this region and Puget Sound. The Southern Pacific also operates another line through the coastal valleys between San Francisco and Los Angeles. The Great Northern Railroad has recently been linked with the Western Pacific through the extension of its line southward from Bend, Oregon. This gives the northern part of the Great Valley an additional outlet to the northeast. The main line of the Santa Fe Railroad runs from the southern end of the Great Valley to the

gap opposite San Francisco Bay, reaching tidewater at Oakland. Aside from these 4 major railroads and their numerous branch lines, no others penetrate this region (Fig. 208A).

Roads

Highways (Fig. 208B) present a similar pattern to railroads. The Great Valley and the coastal valleys have well developed networks, while the mountain areas are crossed by only a few trunk roads. The highways of Central California, like those of Southern California, are among the finest on the continent.

Airways

The major airways (Fig. 208C) cross the Sierra Nevada between San Francisco and Salt Lake City, or operate between San Francisco and Los Angeles on the south and Portland and Seattle on the north. The San Francisco Bay district also has the only air connection with Hawaii, the Philippines, the Orient, and Australia through the clippers of Pan-American Airways.¹⁶ The air terminal at Alameda on San Francisco Bay is one of the largest in the world. This trans-Pacific air service gives Central California an important advantage in air travel; nevertheless the Los Angeles airport still outranks all others on the West Coast in volume of travel.

Ocean shipping

The San Francisco Bay ports during normal times carry on considerable trade with the Orient, the Hawaiian Islands, the West Coast of South America, and Europe. The total volume of trade from this district enables it to rank first among Pacific Coast port areas. While a large part of this trade originates in Central California, considerable traffic crosses the Sierra Nevada from the Intermontane Basin Region or even from the Rocky Mountain Region. Likewise although most of the imports are destined for Central California, the port district serves the interior portions of the West to a considerable extent.

The Resort Industry

Central California has much to offer the tourist. Rock-bound coasts, magnificent mountain scenery, dense forests of gigantic trees, and an agreeable climate make it a summer playground (Fig. 33).

¹⁶ This service has been disrupted temporarily by the second World War.

In the Sierra Nevada are located 4 of the nation's most famous national parks (Fig. 217): *Sequoia* and *General Grant*, famous for their magnificent groves of giant sequoia trees, *Yosemite*, famous for its spectacular glacial scenery and waterfalls, and *Lassen Peak*, which contains the only active volcano in continental United States. These parks, together with the Lake Tahoe district and other famous resort centers, attract thousands of tourists during the summer season. In recent years a sizable winter-sports trade has been developed. The Sierra Nevada may be classed as one of the continent's most outstanding recreational areas, and the continued growth of its resort industry seems assured. Because of location, however, it will tend to serve mainly a West Coast clientele and can never rival the highlands of the Northeast in the volume of business.

Cities

Like the Subtropical Pacific Coast Region, Central California is dominated largely by one great urban agglomeration which clusters around the shores of San Francisco Bay. This metropolitan area is referred to by the Census Bureau as the San Francisco-Oakland Metropolitan District. In addition, only 4 other cities are considered. Three of them, Sacramento, Stockton, and Fresno, are in the Great Valley of California while the fourth, San Jose, lies in a coastal valley south of San Francisco Bay (Fig. 251).

The *San Francisco-Oakland Metropolitan District* (1,428,525) includes, besides San Francisco and Oakland, the cities of Berkeley and Alameda and numerous smaller centers.

San Francisco is situated on a hilly peninsula which lies between San Francisco Bay and the Pacific Ocean. It has both a strategic and commercial location of prime importance on the Golden Gate guarding the entrance to the bay. The city was established first as a presidio and mission by the Spaniards in 1776, the Bay having been discovered only a few years prior to that date. The first settlement, then known as Yerba Buena, was the northernmost outpost of Spanish America and served somewhat as a barrier to further southward advance of the Russians from Alaska. Although some trade entered the port during the first half of the nineteenth century, little development took place, even though Anglo-Americans began to filter into the region in the early 1840's.

With the discovery of gold in the Sacramento Valley in 1848 and the transfer of the California territory to the United States during the same year, San Francisco began its spectacular rise. As the major port of entry for all gold-seekers coming by boat to Cali-

foria and as the chief center and market for the "gold-diggings," San Francisco grew so rapidly that by 1850 it had an estimated population of 25,000 of every "race, creed, and color"; by 1900 the population was nearly 350,000. Because of its rapid growth, no master plan for the city was developed, and the customary rectangular street pattern was superimposed upon the hilly terrain of the peninsula without regard to slope. Accordingly, many streets are too steep for most types of vehicular traffic and hence the cable-car has been retained within parts of the city.

Modern San Francisco dates from the rebuilding immediately after the great earthquake and fire of 1906, when 4 square miles of the city, including practically all of the business buildings, were destroyed. The earthquake resulted from crustal movements along the San Andreas fault. The disaster killed more than 500 people and caused a property damage of nearly 500 million dollars.

Although railroads made Oakland their terminal, ferries carry most goods destined for overseas trade to the great wharves and docks near the foot of Market Street in San Francisco. The opening of the Panama Canal in 1915 further stimulated the trade of the city. Although San Francisco's early growth resulted from its position as the gateway to the Sierra Nevada gold fields, the recent commercial expansion is due to the fact that the city is the natural outlet to the Sacramento-San Joaquin Valley—California's great agricultural empire.

The several miles of water separating San Francisco from the other cities of the Bay District have been a handicap to its urban growth. After the great earthquake, many families moved across the bay to Oakland or Berkeley and commuted daily to their work. Faster service than was provided by the ferries between the several parts of the great metropolitan district became necessary. In 1936 and 1937 two great bridges connecting San Francisco with Oakland on the east and with the north shore of the Golden Gate were opened to traffic, giving the city direct connections to all parts of its urban area (Fig. 258). In 1936, also, San Francisco was made the eastern terminus of the Pan-American Airways Trans-Pacific Service, because it is the North American port nearest to the Hawaiian Islands. The airport, located on the east shore of the Bay at Alameda serves the entire district.

Oakland, Berkeley, and Alameda on the eastern shore of the Bay form a complementary part of the San Francisco center to the west. Their development is closely linked with that of the larger city. As the railroad terminus of the district, Oakland grew rapidly. After the 1906 disaster it threatened to become the chief



Sfence Air Photos.

Fig. 258. San Francisco and the Golden Gate. The San Francisco-Oakland Bridge is shown in the foreground, the Golden Gate Bridge in the distance

center on the Bay, but the advantage offered by better harbor facilities on the San Francisco side (Fig. 258) kept Oakland a secondary center. Most of the industrial development of the Bay District is located in Oakland because of its better rail connections. Despite the fact that it is included within the Bay District, Oakland is a complete city in itself and its business district is large and modern.

Alameda, to the south, is largely an industrial center and the terminus of the "Pacific Clippers," while Berkeley to the north is primarily an educational center, being the home of the University of California with an annual enrollment in excess of 15,000 students.

The cities of the Bay District form one of the nation's most important urban agglomerations, and despite the fact that industrial development is less important than that of Southern California the commerce that passes through the Golden Gate is equaled by only a few major ports of the world. The entry of the United States in the second World War threw additional traffic through the port of San Francisco.

Sacramento (158,999), the state capital of California and the chief center of the northern part of the Great Valley owes its origin to the discovery of gold in the near-by area. Its growth has been steady so that today Sacramento stands as the dominant urban center of northern central California. At the head of navigable water on the Sacramento River, the city has profited from a sizable steamboat trade. In recent years, through channel improvement, it has become an ocean port. It is also a major center for two trans-continental railroads. Aside from its government functions, Sacramento serves primarily as a market town for the rich surrounding agricultural districts and as a supply center for the mining districts of northern California. Because a large part of the fruits and vegetables grown in California comes from the Sacramento district, the city has become an important canning center. Its can-manufacturing plants have a daily output of more than one million cans. Sacramento is a substantial city of trees, green lawns, fine residences, and government buildings.

Stockton (79,337), located at the head of tidewater on the San Joaquin River, is an ocean port of importance with well developed docks on the dredged 32-foot Stockton Channel. The city boomed with the gold rush since it was the nearest seaport to the central and southern Sierra "diggings." In 1849 Stockton was described as "a canvas town of a thousand inhabitants, and a port with 25 vessels at anchor." With the decline of gold mining and the introduction of irrigation in the San Joaquin Valley in the 1860's, Stock-

ton became a center for the marketing of agricultural product?, and later an industrial city for the manufacture of farm machinery. The caterpillar tractor was originally developed in Stockton. The city also manufactures paper, road-building machinery, and canned goods. With excellent rail and highway connections and with a deep-water port Stockton has all the necessary requisites for a thriving metropolis.

Fresno (97,504), the "raisin center" and chief marketing and shipping point for the fertile San Joaquin Valley, lies almost in the center of the state of California. The business district rises abruptly from the flat-floor of the Valley; the edges of the urban area are clearly marked by a rapid transition to vineyards which extend in seemingly endless rows in all directions. Unlike most California cities Fresno is not Spanish but is an American creation typical of the agricultural interior of the continent. It is well served by railways and highways and has developed some manufacturing; however it is chiefly famous for the production of raisins, having capitalized on its hot and dry summer weather. Today more than 60 per cent of the raisins produced in the United States comes from the Fresno district.

San Jose (129,367), lies on the flat alluvial lands of the Santa Clara Valley at the southern end of San Francisco Bay some 50 miles south of Oakland. After California became a state San Jose served for a while as the first capital. Following the decline in gold mining and the stabilization of agriculture in the 1860's, the Santa Clara Valley began to specialize in the raising of apricots, prunes, and grapes. The city has good rail connections with both San Francisco and Los Angeles. San Jose today is one of the continent's largest canning and dried-fruit packing, centers. It specializes also in the manufacture of farm equipment for the fruit and truck farms of California.

The Outlook

Probably no region of the continent is so outstanding in such a variety of agricultural products. Central California leads the nation in the production of many fruits and vegetables. Its isolation, even after the completion of modern transportation, has caused the region to develop the canning and drying industry to a higher degree of efficiency than anywhere else in the world. Transportation costs are a major factor limiting agricultural expansion.

While agriculture is the chief activity of the region and will remain dominant, other industries are likely to increase in impor-

tance. The Sierra Nevada supports dense stands of timber that have stimulated the development of a sizable lumber industry. In these mountains, also, is found one of the continent's major playgrounds and resort centers. In the southern part of the San Joaquin Valley lies one of California's three important oil districts, and recent geophysical prospecting shows that other parts of the Great Valley may be productive in oil. Recently, through the increase in value of gold, mining has been revived and is now more important than at any time since the 1860's.

The San Francisco Bay ports, including San Francisco, Oakland, Berkeley, and Alameda, have grown rapidly since the beginning of the gold boom days, and their growth seems assured for the future. Although industrially it seems unlikely that they can rival the Los Angeles district, the great volume of overseas trade that passes through the ports tends to offset their smaller industrial development.

Considering all elements of the natural environment, Central California comes as near being a self-sufficient region as can be found on the continent, and it should continue to exert an important role in the leadership of Anglo-America.

CHAPTER XXI

The North Pacific Coast

A REGION OF LUMBERING, FISHING, FARMING, MINING, MANUFACTURING, RESORTS, AND COMMERCE

THE NORTH PACIFIC Coast Region occupies the northwest coastal fringe of the North American continent between the crest of the Cascade Mountains in Oregon and Washington, the Coast Ranges of British Columbia and Alaska on the east, and the Pacific Ocean on the west. It is nowhere more than 150 miles wide, and has a length of more than 2,500 miles (Fig. 259). Despite its great latitudinal extent, conditions throughout the region are somewhat similar as a result of the dominance of the Temperate Marine Climate (Fig. 4). Similarity is also evident in the rocky coast, and the moist, forest-covered slopes.

The terrain ¹

The entire region is dominated by mountains. These vary in height from the comparatively low coastal ranges of northern California, Oregon, and Washington, to the higher ranges of the Cascade Mountains with their superb volcanic peaks of Mount Hood, Mount Adams, Mount St. Helens, Mount Rainier, and Mount Baker, and to the great alpine ranges of British Columbia and Alaska, surmounted by Mount McKinley (elevation 20,300 feet) the highest peak on the North American Continent.

The coastal ranges within the United States portion of this region comprise a series of somewhat distinct mountain areas. They include the Coast Ranges of northern California, the Klamath Mountains which tie these ranges to the southern Cascades, the Coast Ranges of Oregon, and the Olympic Mountains of Washington.

¹ Wallace W. Atwood, *The Physiographic Provinces of North America*, pp. 452-472, 481-486. Boston: Ginn & Co., 1940.

The California Coast Ranges are composed of a series of folded and faulted structures that have an even, though discontinuous crest line. The entire mountain mass is divided into a series of blocks that are tilted in all directions. The streams that break through these ranges follow structural valleys. The mountains frequently project out into the ocean forming bold rocky headlands.

The Klamath Mountains, which are much older geologically than

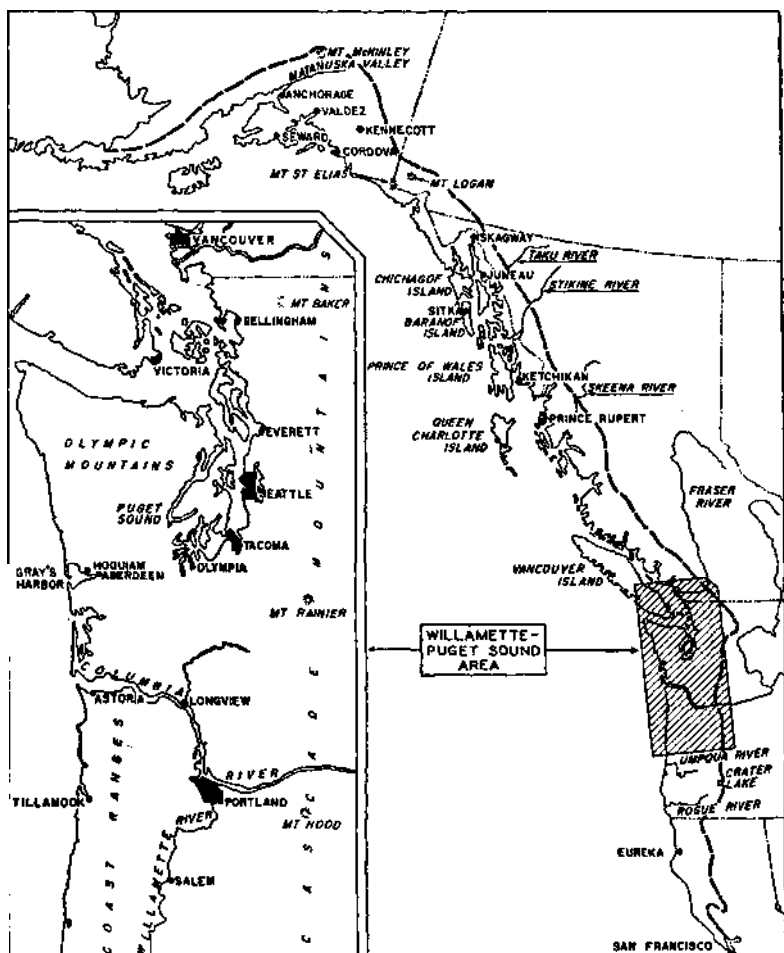


Fig. 259. The North Pacific Coast: a region of lumbering, fishing, farming, dairying, mining, manufacturing, resorts, and commerce. Insert is an enlargement of the shaded area on the main map.

the other coastal ranges, appear as a dissected plateau with an average summit level of 2,000 to 4,000 feet. The stream canyons that radiate from the Klamath show the influence of glaciation in their upper reaches.

The Oregon Coast Range which extends northward from the Klamath almost to the mouth of the Columbia River, is dissected by the deeply entrenched Rogue and Umpqua rivers and by several smaller streams that flow across this mountain mass to the Pacific Ocean. The gaps through the mountains facilitate travel between the coast and the interior valleys but do not seriously affect the barrier nature of the coast ranges so far as climatic effects are concerned.

In Washington the Olympic Mountains, with their somewhat uniform summit level, appear to be the remnant of an old erosion surface that has been greatly carved by glaciation. Mount Olympus (elevation 8,200 feet), the highest peak in the range, rises as a monadnock above the other peaks. Because of the extremely heavy snowfall in these mountains, some small glaciers still exist near their summits. The Olympics do not present an effective barrier to the rain-bearing winds from the Pacific in the same manner as do the Oregon Coast Ranges, and hence the Puget Sound area receives considerably more rainfall than the Willamette Valley.

The Cascade Range, extending from Lassen Peak in northern California to southern British Columbia, is divided into a southern and a northern section by the deep gorge of the Columbia River. The relief features of the southern part are due largely to upbuilding, while those of the northern part have been carved out of the uplifted mass by streams and glaciers. One of the most interesting features of the southern Cascades is Crater Lake, which occupies the crater of an extinct volcano. Toward the northern end of this section, a few miles south of the Columbia River gorge, is Mount Hood (elevation 11,225 feet), a nearly perfect volcanic cone which rises sharply above the general level of the Cascades. The Columbia River crosses the entire Cascade Range through a deep gorge, indicating that the stream is antecedent, although its course was undoubtedly determined to some extent by faulting. The northern Cascades are composed largely of a huge granitic mass that was thrust upward toward the surface, surmounted by a number of volcanic cones. All of the mountain mass of the northern Cascades has been severely eroded by glaciers, and within this area are numerous small active mountain glaciers today.

Between the Cascades to the east and the Olympics and Oregon Coast Ranges to the west lies the structural trough of the Wil-

lamette Valley and Puget Sound. The trough was formed by the sinking of this land mass at the time the Cascades were elevated. In glacial times a large lobe of ice advanced down Puget Sound and was instrumental in forming that body of water. The Willamette Valley today is a broad alluvial plain 15 to 30 miles wide and 125 miles long, while the Puget Sound lowland is somewhat smaller in area, since a large part of it was submerged. North of Puget Sound glacial erosion and submergence formed the "Inside Passage." Practically all valley lands there lie below sea level.

North of the international boundary, the mountains that correspond to the Cascades are known as the Coast Ranges. They average 100 miles in width, have a length of nearly 900 miles, and have been greatly eroded by mountain glaciers. Deep canyons of the Fraser, Skeena, Stikine, and Taku rivers have cut across the range, forming features similar to the Columbia Gorge. The outer belt of mountains, which corresponds to the Oregon Coast Ranges and the Olympics, is sometimes referred to as the Vancouver system. These mountains constitute a series of discontinuous islands such as Vancouver, Queen Charlotte, Prince of Wales, Baranof, and Chichagof, and unite again with the mainland in the great Mount Fairweather Range. Between these islands and the mainland lies the Inside Passage, the submerged counterpart of the Willamette-Puget Sound trough.

Northwest of the Mount Fairweather-Chilkoot Pass district, the Alaska Range and the Coast Range extend westward and ultimately blend into one, constituting the Alaskan Peninsula. Between the Alaska Range and the Coast Range lies the Susitna-Matanuska Valley, the only lowland area of any extent in this northern part of the region. The Alaska Range contains Mount St. Elias, Mount Logan, and Mount McKinley and presents some of the most superb mountain scenery on the continent.

Climate

The climate of this region is relatively uniform throughout its entire extent, being influenced by nearness to the ocean and by the mountains, which are at right angles to the westerly winds that come off the Pacific.² As a result, the longitudinal valleys have a much lighter rainfall than the littoral or the exposed mountain slopes. The land is also warmer than the ocean in summer and cooler in winter; hence winter rainfall is heavy while that of

² O.E. Baker, "Agricultural Regions of North America: Part IX, The North Pacific Hay and Pasture Region," *Economic Geography*, Vol. 7 (1931), pp. 114-117.

summer is light. The West Wind Drift, a continuation of the Japan Current, which flows southward along the coast of British Columbia, Washington, and Oregon, and northward along the coast of southeastern Alaska, tends to counterbalance the influence of latitude and produces a somewhat uniform temperature and rainfall distribution throughout. Cloudiness is common, particularly in winter, throughout the region, the average number of clear days being less than 100. Temperatures range from 38° to 67° in central Oregon and from 33° to 55° along the coast of Alaska (Fig. 260). In some interior valleys, however, such as the Matanuska,

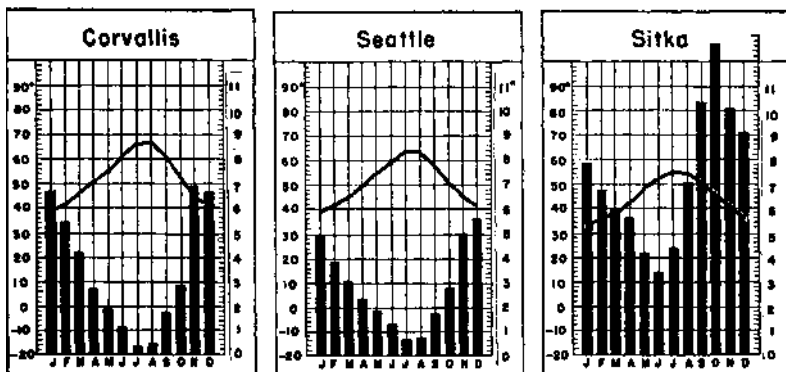


Fig. 260. Average monthly temperature and precipitation for Corvallis, Seattle, and Sitka.

the average winter temperature drops to 16° . Practically all valleys of this region except the Matanuska have a growing season in excess of 180 days, and even the latter has about 130 days free from frost. On the mountain slopes, temperatures are considerably lower in winter, and are accompanied by exceedingly heavy snowfall, particularly in the Olympic Mountains of Washington and along the Coast Range of British Columbia and Alaska.

Natural vegetation

Except in some of the grassy interior valleys, the heavy precipitation throughout this region makes it a land of forests. In the northern California Coast Ranges and in parts of the Klamath, the dominant tree is the redwood, and within this area may be found some of the most magnificent forests of the world. Along the coasts of Oregon and Washington and in the Cascade Mountains, the Douglas fir is dominant, constituting the major lumber tree of

the continent. Other trees within this area are the western hemlock, western red cedar, and Sitka spruce. In the Canadian and Alaskan sections, Sitka spruce is the leading tree. The forests of this region are almost exclusively coniferous.⁸

A marked contrast in natural vegetation exists between the Willamette Valley of Oregon and the Puget Sound area of Washington. In the former the barrier nature of the Coast Range tends to produce a low summer rainfall, while in the latter the rainfall is slightly heavier in summer because the gaps in the Coast Range allow more rain-bearing winds from the Pacific to enter the Valley. The slightly cooler temperature of the Puget Sound Valley also causes it to be somewhat more humid. As a result, the native vegetation of the Willamette Valley was prairie grass, while that of the Puget Sound area was a dense stand of giant Douglas fir trees. This contrast in vegetation types profoundly influenced the settlement of the two areas.

Soils

Because of heavy rainfall, nearly all soils of the region have the characteristics of those of the humid eastern part of the continent. Since much of the region consists of rough mountainous terrain, good soils are confined largely to the valleys. As practically all valley soils within the region have the characteristics of those of humid climates, they have been severely leached of lime and other soluble salts and are not especially fertile. The infertility of much of the soil, together with the great percentage of hilly and mountainous land, have greatly retarded the development of agriculture. The Willamette Valley, with its prairie soils, is the chief exception and is by far the most important agricultural section of the region.

Sequent Occupance

In the United States portion of the North Pacific Coast, the white settlers found numerous small Amerind tribes inhabiting the river valleys and coastal areas who derived most of their livelihood from fifehing and hunting. In the Canadian and Alaskan portions dwelled the Haida and Tlinglit tribes, which represented a more advanced stage of culture. They lived along the shore of the Inside Passage and depended largely upon that body of water for their food and as a means of transportation. They built large dugout canoes

³ H. J. Andrews and R. W. Cowlin, *Forest Resources of the Douglas-fir Region*, p. 3. Miscellaneous Publication No. 389, U. S. Department of Agriculture, 1940.

from native cedar trees and with these navigated the Inside Passage and the open ocean. They became skilled as wood-carvers, as is shown by their totem poles, designed usually to show the genealogy of each family. In California, Oregon, and Washington, Amerinds have been rapidly replaced by white men, although they are still carrying on fishing activities along the streams. In Canada and Alaska, however, Amerinds have remained about as important as they were before white men arrived. Today they constitute a sizable portion of the population of southeastern Alaska and are an important element in the salmon fishing of that section.

Early exploration

While the Spanish galleons sailed along the coast of Oregon and northern California on their return from the Philippines, no attempts were made by them to explore or colonize the coast until after the Russian advance began in the north.

The voyages of Vitus Bering between 1728 and 1742 caused the Russian trappers and fur-traders to advance down the Alaskan coast and even establish remote outposts on the Farralone Islands off San Francisco Bay. They roused the Spaniards from their inactivity, and in 1774 Juan Perez sailed as far north as latitude 55° and laid claim to Nootka Sound (latitude 49°). Another important voyage of exploration was that of the English Captain Cook in 1778, who explored the coast between latitudes 43° and 60° N, and further complicated the claims to this strip of coast. In 1792 a New England trading vessel discovered the mouth of the Columbia River and established a fourth claim to the region. Thus by the end of the eighteenth century four nations—Spain, Russia, Great Britain, and the United States—had explored and claimed in whole or in part the Pacific Coast of North America from San Francisco Bay to western Alaska. Permanent Spanish settlements were located no farther north than San Francisco, but by 1800 Russia was well established on Baranof Island in southeastern Alaska, had its seat of colonial government at Sitka, and was spreading rapidly down the coast. Further settlements were made south of Sitka, but ultimately Russia agreed to limit her territory to the region north of 54°40' and signed agreements with the United States and Great Britain in 1824 and 1825. Spain ultimately agreed to abandon her claim to Nootka Sound and all land north of the Columbia River (actually she made no further claim to lands north of the 42nd parallel). This left the land, then known as the Oregon country, between the Spanish settlements in California and

the Russian settlements in Alaska, to be disputed between the United States and Great Britain. British claims were based partly on the voyages of Captain Cook but more on the explorations of the Hudson's Bay Company, which had sent expeditions into the area via the Saskatchewan River, the Selkirk Rockies, and the Columbia River. The claims of the United States were based primarily upon the discovery of the mouth of the Columbia River by an American ship and later upon the explorations of Lewis and Clark.

Later settlements

The Spanish made no further attempts toward colonization in the North Pacific Coast Region, and the Russians contented themselves with establishing further settlements in southeastern Alaska north of the 54°40' parallel; but both Great Britain and the United States became quite active in the settlement of the disputed territory between Spanish and Russian America. Following the Lewis and Clark expedition, the American Fur Company in 1810 established a trading post at Astoria at the mouth of the Columbia, but this settlement was seized by agents of the Hudson's Bay Company during the war of 1812. The British Fort George and Fort Vancouver, near the mouth of the Columbia, dominated the area until 1818, when an agreement of joint occupancy by English and American traders was reached.

At first the only Americans who came to this far-off land were a few trappers and traders, but in the early 1830's New England colonists began to arrive via the Oregon Trail, and soon a mass migration began. The great migration along the Oregon Trail took place in the early 1840's. These pioneers, mostly from the Middle West, were determined to establish a Pacific outlet for the United States, and they carried as their "battle-cry" the slogan "Fifty-four forty or fight." Most of them located along the lower Columbia and particularly in the grassy Willamette Valley of Oregon. By 1845 there were 8,000 Americans in the Oregon country. In the final settlement of the "Oregon Question" in 1846, the United States got the lands south of the 49th parallel, except for Vancouver Island, and Great Britain got the land between there and Russian America.

Influence of the California Gold Rush

Since nine tenths of the early settlers were in the Willamette Valley, some of the young men of that area were among the first

to move southward to the California "gold diggings" when the news of the discovery became known. The Willamette Valley, however, was in an excellent position to provide grain and other foodstuffs for the mining communities at very favorable prices, and soon it became the chief source of foodstuffs for the mining districts. The Oregon Donation Land Law of 1850 further attracted settlers by giving 640 acres to a married man and 320 acres to a single man who would settle in the area by December of that year. Neither the Puget Sound area nor the coasts of Canada and Alaska profited from the Gold Rush, because at that time their agricultural lands which could produce the greatly needed foods had not been developed. Practically all of the limited level lands north of the Columbia River were densely forested and offered little attraction to settlers until lumbering became important.

The transfer of Alaska

The Russians in Alaska were primarily interested in furs, and after these were largely depleted in the 1840's, they lost interest in their far-off American possession. Although they had leased or sold some of their posts to the Hudson's Bay Company (Wrangell in 1840), they were loath to sell Alaska to Great Britain because of the Crimean War, and therefore offered it to the United States. The purchase was made in 1867 for the sum of \$7,200,000, or less than 2 cents per acre. Except for a few fur trappers, however, no citizens of the United States showed any interest in this vast northern territory until the end of the century, when gold was discovered in the Klondike district of Canada and at Nome.

The coming of the railroads to the Pacific Northwest

The Puget Sound country was still remote from populous centers of the continent and, until the completion of the Northern Pacific Railroad in 1883, its only outlet for bulky commodities of grain and lumber was by ship around Cape Horn. Nevertheless a number of small sawmills were erected in the area between 1840 and 1850 to supply the mining camps of California and for export to the Hawaiian Islands. In 1893 the Great Northern completed its line across the mountains to Puget Sound, and some time later the Chicago, Milwaukee, St. Paul & Pacific Railroad built into the region. Later the Union Pacific established direct connection with Portland, and the Southern Pacific connected Portland with San Francisco. These rail connections made possible the exploitation of the great forest resources, which became important about the

beginning of the present century, and contributed also to the industrial development and urban growth of that part of the region.

Influence of the Klondike Gold Rush

When gold was discovered in the Klondike in 1897 and at Nome in 1898, a second stampede began that closely rivaled the California rush of 1849. The most direct route to the Klondike field was by boat through the Inside Passage from Seattle to Dyea or Skagway, thence over Chilkoot or White Pass to the headwaters of the Yukon River, and finally by river boat or raft about 500 miles downstream to Dawson—a long, hard, dangerous trip. When gold was found on the beach sands at Nome, the trip was made entirely by boat, but in each case Seattle profited by being the nearest port having railroad connections with the rest of the United States.

The Pacific Coast of Canada

Although settlements were established on Vancouver Island in 1843, little development took place in the British part of this territory until the completion of the Canadian Pacific Railway to Vancouver in 1885, and later the building of the Grand Trunk Pacific (Canadian National) Railway to Prince Rupert in 1914. These two ports serve western Canada, but the former is by far the more important.

Agriculture

The North Pacific Coast is still more than 90 per cent in timber. Little of the land is suited to agriculture. A recent estimate places only about 1 per cent of the region in crops and an additional 2 per cent in pastures. Dairying, the dominant farming activity of the region, accounts for the large percentage of agricultural land in pasture. Hay and oats occupy two thirds of the land in crops.

Since most of the region consists of high mountains, steep slopes, and heavily forested terrain, only a few favored areas stand out as important agricultural districts, and they contain practically all of the crop land. These include: (1) the Willamette Valley, (2) the Umpqua and Rogue river valleys of southwestern Oregon, (3) the Cowlitz and Chehalis valleys and the lowlands around Puget Sound in Washington, (4) the lower Fraser Valley of British Columbia, and (5) the Matanuska Valley of Alaska. Of these, the Willamette Valley, having more than 2 million acres in crop lands, is by far the largest and best developed. The least developed of all is the recently colonized Matanuska Valley of Alaska.

Early settlement and general farming

Settlement of the Willamette Valley followed rapidly after the acquisition of the Oregon country in 1846, though a large number of agricultural colonists had occupied the area prior to that date. The valley, protected from the rain-bearing winds from the Pacific Ocean, was a natural grassland which appealed to the early settlers in the West. They recognized in the area a type of farming land similar to that which they had left in the Middle West, and soon, practically all of the prairie lands were preempted and planted in grains. The California Gold Rush, with its great demand for food-stuffs, made this valley an important source of grains. When railroads were built into this region in the 1880's and 1890's, a new wave of settlers arrived, encouraged by the generous offers of the railroads. Since most of the prairie lands of the Willamette Valley had been occupied some years prior to the advent of the railroads, the new settlers had to make agricultural lands by clearing the forests. Many of them had cleared forest lands in the East, but the gigantic size of the trees and the difficulty of stump removal in the North Pacific Coast Region discouraged them. However, nearly 4 million acres of land in the Oregon-Washington part of this region has been transformed into agricultural land, either by land-clearing alone or by logging and subsequent clearing.⁴

Types of farms

Although considerable grain is still grown in the Willamette Valley, and to a lesser extent elsewhere, the agriculture of this region has assumed two dominant types,:: dairying and fruit production. Dairying is by far the most important activity although poultry production and the raising of beef cattle and sheep assume some importance. In the dairy industry this region, especially the Puget Sound section, resembles New England in that most of the fluid milk is designed for the large urban markets near by.

Fruit crops occupy a smaller acreage than either pasture or grain but have a greater value than either. The Willamette Valley specializes in apples, prunes, small fruits (berries), and cherries. Apples, the most widely distributed, are also grown in large quantities in the Fraser Valley of British Columbia and on the southeastern part of Vancouver Island. Prunes and cherries are largely confined to the Umpqua and Willamette valleys. Salem, in the

⁴ *Ibid.*, p. 70.

Willamette Valley, is one of the largest cherry-canning centers in the United States. Strawberries, raspberries, blackberries, and loganberries are grown rather extensively throughout the region, but again the major production is confined to the Willamette Valley.

The region is well suited to certain kinds of vegetables, particularly cabbage, kale, and mustard, but most of these are grown for local consumption. It is also an important producer of potatoes and is the continent's chief source of hops. Some flax is also grown.

Despite the importance of certain special crops, agriculture can never assume a dominant role in the economy of the North Pacific Coast Region, since comparatively little land is suited to crops. One of the most interesting experiments in agricultural colonization in recent years has been that of the Matanuska Valley in southern Alaska.

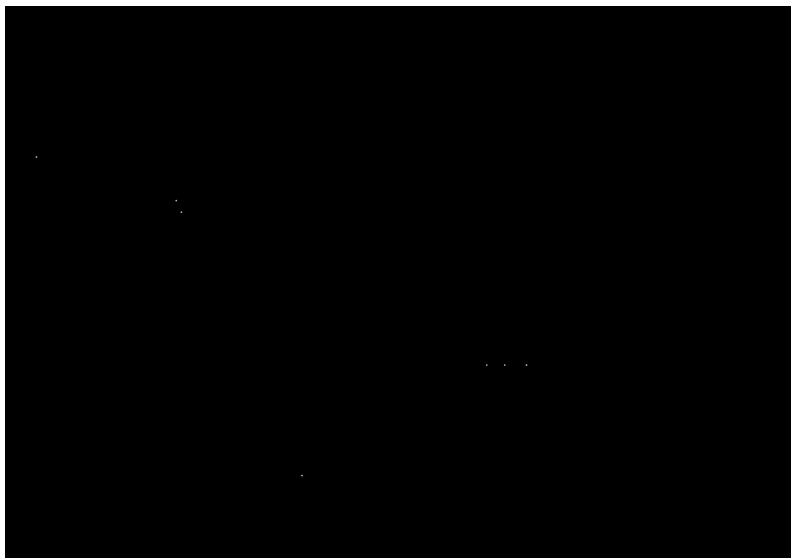
The *Matanuska Valley*, a fairly extensive, well-drained area of reasonably fertile silt-loam soils, lies at the head of Cook Inlet about 125 miles inland from Seward, Alaska. The area under cultivation is about 15 miles long and nearly that wide. Some settlement occurred in the valley about 1910, and some of the pioneer farmers of that period raised hay, grain, and root crops with reasonable success. The United States Department of Agriculture established an experiment station at Matanuska as early as 1915, but no further government aid was given until 1935, when the Federal Emergency Relief Administration sent there some 200 families who had been on relief in the Middle West. While a number of these farm families were definitely misfitted to the life of pioneer agriculture and in time were returned to the States, in 1938 there still remained about 180 families.⁵

The farms of the Valley average about 40 acres. Each has a house, a barn, and other buildings (Fig. 261), and most of the farms are stocked with cows, poultry, and pigs. The land was cleared by tractors and other machinery. Two years after being cleared some of the lands produced from 4 to 6 tons of hay per acre. Other crops included spring wheat and barley (raised for feed), peas, root crops, strawberries, and garden vegetables. These were sold primarily to the small urban market at Anchorage. A canning plant and a cooperative creamery located at Palmer in the Valley should provide an outlet for the surplus.

The Matanuska Valley project has not been especially successful, owing partly to the type of settlers but far more to the limited

⁵ Otis W. Freeman, "Alaska," in *The American Empire*, p. 208. University of Chicago Press, 1940.

market for agricultural products. If the Matanuska Valley project ultimately proves successful, then the settlement of a few similar areas might be justified as a means of developing this sparsely populated land; but with limited level land and a very short growing season, the agricultural possibilities of coastal Alaska can never be great.



Alaska Steamship Co. and the Pacific Aerial Survey.

Fig. 261. The Matanuska Valley of Alaska. A distinctly American farming community with well-built homes and productive farms carved out of a former forested wilderness.

Agriculture in Oregon and Washington

The older settled parts of the Willamette Valley in Oregon and the Puget Sound margins in Washington present an agricultural picture of a mature cultural landscape such as can be found in few places in the West. In the Willamette Valley one can drive **for** scores of miles on excellent highways, past fruit farms (prunes, cherries, and berries), small fields of wheat and oats, and excellent pastures. Livestock is less prominent here than on farms in the Middle West, but fruit orchards are far more important. The Willamette Valley, occupied by farmers of the third or fourth gen-

eration on the same farm, is the old, long-settled, prosperous heart of Oregon and grows nearly all of the fruit, berry, vegetable, and grain crops of the Northwest.⁶

In the Puget Sound margins, many of them diked or drained lands, are located the finest dairy and pasture lands of the entire region. Market gardening has also become an important agricultural activity in these areas, and with the continued growth of the large urban centers it should increase in importance. The vegetable acreage has grown steadily, with beans, cabbage, cauliflower, spinach, sweet corn, rhubarb, and tomatoes as the chief crops. Vegetables are grown in this area for use in the local urban markets, but the surplus is shipped to other parts of the United States.⁷ The quick freezing of field peas is important.

The North Pacific Coast cannot be expected to rank as an important producer of agricultural products—it will always be dominantly a region of exploitive industries such as fishing, lumbering, and mining, and in that respect resembles the Northern Continental Forest Region (Chapter XIV). However, agriculture is constantly achieving a better-balanced position in the ratio of economic activities.

Lumbering and the Wood-products Industries

The North Pacific Coast Region with its Temperate Marine Climate contains possibly the most magnificent stand of timber in the world. The trees decrease in size from the giant redwoods of northwestern California and the large Douglas firs of Oregon, Washington, and British Columbia, to the smaller varieties of spruce, hemlock, and fir along the coast of Alaska. Originally probably 95 per cent of the region was covered by these great forests.

Except for the lumbering operations in the California redwood forests and smaller logging and pulpwood cutting in the forests in the Canadian and Alaskan sections, the major lumbering and wood-products activities coincide with the Douglas fir forest subregion in Oregon and Washington. Because of the importance of this Subregion, and because more complete data are available for it than for the other forested parts of the North Pacific Coast, it will be used to illustrate the development of the lumbering and wood-working industries of the region.

⁶ Howard H. Martin, personal communication.

⁷ Frances M. Earle, "Agricultural Trends in Western Washington," *Yearbook of the Association of Pacific Coast Geographers*, Vol. 2 (1936), p. 25.

The Douglas fir subregion

This subregion is exceeded in size by nearly every other commercial forest area on the continent, but it surpasses any of them in saw-timber volume because of the large size of the trees and the density of their stand. Ease of logging and transportation in the Puget Sound area and along the lower course of the Columbia River attracted the lumberman as early as the middle of the nineteenth century. Today the old-growth Douglas fir forests of those areas are largely barren of conifer growth. In the less accessible parts of the subregion, however, excellent stands of timber are still to be found, and even at the present rate of logging they should last for many years. Forest fires, such as the great fire at Tillamook, Oregon, in 1933, which denuded 380 square miles, have taken a heavy toll of timber, but every effort is being exerted to combat the fire hazards. Because of better controlled methods, forest fires in the future should be less destructive than in the past.

*Chief commercial species.*⁸ While this forest subregion contains a number of commercial trees, the Douglas fir outranks all others in importance. Furthermore, practically all trees are conifers, the hardwoods occupying a place of minor importance.

The *Douglas fir* has a greater saw-timber volume than any other tree-species on the continent, the size of the individual trees and the density of the stand being exceeded only by the sequoias. Douglas fir attains its best development in western Oregon, Washington, and British Columbia, and constitutes approximately 61 per cent of the saw-timber volume of this subregion. Sawlog-size trees range in diameter from 16 to more than 100 inches, and the volume stand per acre is from 10,000 to more than 175,000 board feet. The average per-acre volume for Douglas fir is about 60,000 board feet. Douglas fir is marketed throughout the world, the wood being widely used for structural timbers, flooring, doors, factory lumber, piling, and ties.

Western hemlock ranks next to Douglas fir in importance and constitutes nearly a fifth of the total saw-timber volume of the subregion. The wood is light, fairly soft, straight-grained, and nonresinous. Because of the ease with which it can be worked, western hemlock is used extensively for common lumber, box-shook, flooring, and paper pulp. The bark of the tree also has high tannin content and may be used more extensively in the future.

⁸ Andrews and Cowlin, *op. cit.*, pp. 28-34.

Sitka spruce. Although comparatively limited in extent within this subregion, Sitka spruce is highly prized because of its special qualities, being light in weight, tough, nonresinous, and easy to work. Formerly it was extensively used in airplane construction, but today metals have largely replaced wood. The chief uses today for Sitka spruce include box-shook, ladder stock, basket and crate veneers, and paper pulp.

Western red cedar. Western red cedar is a light, easily split wood which is extremely resistant to decay. Its chief use is for shingles, but it is also used for sills, siding, posts, and piling.

Port Orford white cedar. A higher price by volume is paid for Port Orford white cedar than for any other tree of the region, owing to its intrinsic excellence and its scarcity. The wood is highly prized for veneer stock, interior trim, pattern stock, boat-building, and is widely used for Venetian blinds because of its light weight, straight grain, and great durability.

Balsam fir, including a number of other varieties of fir grown in this subregion, is not utilized to any great extent but is in some demand for interior finish and for box-shook. All balsam firs are well adapted to the manufacture of wood pulp and probably will be used to a greater extent for that purpose in the future.

Ponderosa and sugar pines are of less importance here than in other western regions. Only in the Rogue River Valley of southern Oregon do they assume a place of importance. The wood is used chiefly for sashes and doors, but is also used for box-shook and common lumber.

Hardwoods, as has been noted, occupy a place of minor importance among the commercial species of this subregion. *Red alder* and *bigleaf maple* are the two most important trees. They are used for furniture manufacturing and for fuel wood. This subregion is economically dependent upon outside forest areas for hardwood supplies.

Logging and sawmill operations

The first sawmill in the Douglas fir subregion was erected in 1827 near Fort Vancouver on the Columbia River by the Hudson's Bay Company. Soon after that, lumber was exported to Hawaii, and later large quantities were shipped to the California gold fields. Between 1840 and 1850 a number of sawmills were established to supply the rapidly growing urban centers of Oregon and California.

The lumber industry of the continent has been migratory. As each timbered district was depleted, the industry was forced to

move to a locality more remote from the consuming centers. When the lumber industry came from the South (Chapter X) to the Pacific Northwest, it moved into the last timbered frontier. Today this region and the South together produce most of the lumber of the continent (Fig. 262). Not only does distance from market affect the industry in this region; the gigantic size of the trees, particularly the Douglas fir, has forced the development of many new logging devices and new practices.

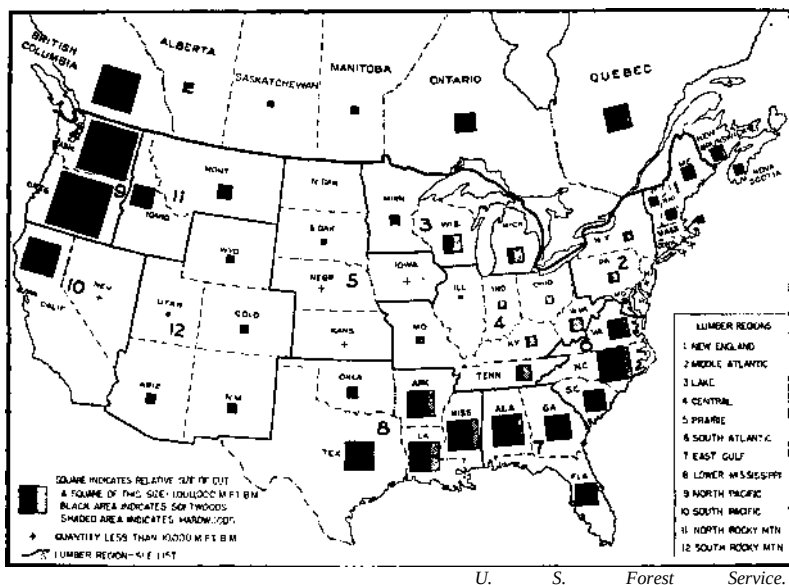


Fig. 262. Lumber cut by states and provinces. Softwoods constitute almost the entire cut of California, Oregon, Washington, and British Columbia.

Today the logging industry is highly mechanized. Giant Diesel-powered tractors with specially designed hoists snake the logs out of the forests (Fig. 263). These are then hauled by large trucks or by rail to the sawmills, or to streams where they can be floated to the mills. While some of the sawmills are located in the more remote forested areas, the major ones are located at tidewater where logs can be floated to the mill and the finished lumber can be exported.

One of the most important sawmilling towns in the whole region is Longview, Washington, on the Columbia River. This small city was built by a major lumber company and has been cited as



Caterpillar Tractor Co,

Fig. 263. Caterpillar Diesel tractor getting out large fir and hemlock logs near Aberdeen, Washington. The logs scale 5,000 to 6,000 board feet and are solid timber. Compare this photo with Fig. 75.

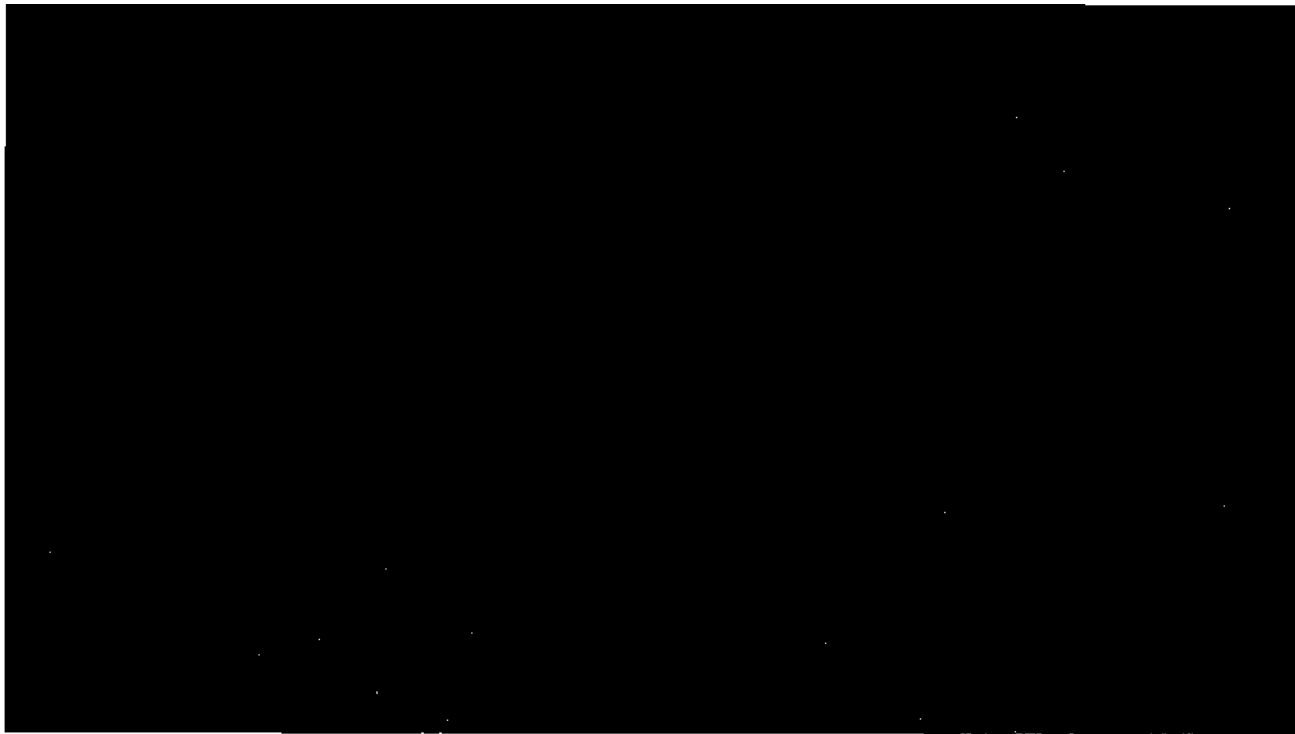
one of the most progressive and beautiful towns on the continent.

Since the opening of the Panama Canal in 1915, the North Pacific Coast Region has been favored by cheap water rates to the great consuming markets of the Atlantic Coast and to northwestern Europe. The eastbound intercoastal rate between this region and the Atlantic Seaboard was only \$14 per thousand board feet in 1938, which enables this region to compete with areas nearer the eastern market. The peak was reached in 1928, when nearly 2,000 million feet of lumber were sent through the Canal to the Atlantic Coast, 376 million feet of which came from British Columbia.⁹ The decline that has taken place since then has been due to a decrease in the Canadian supply.

The Douglas fir subregion produces approximately 30 per cent of the total lumber cut, more than 90 per cent of the shingles, and more than 20 per cent of the wood pulp of the nation. While this production is scattered throughout the subregion, it is most heavily concentrated along the lower Columbia in Portland and Longview, and around Puget Sound. Seattle, the largest urban center in the entire region, is one of the leading lumber-producing and exporting centers of the world. Large lumber mills occupy extensive tracts along the waterfront, and huge log-rafts may be seen at all times in many of the smaller inlets of the great harbor at Seattle (Fig. 264).

The manufacture of pulp and paper, although comparatively new in this region, is rapidly becoming a leading industry, with Tacoma as its center. In 1937 some 25 wood-pulp manufacturing plants were operating at full capacity. Although a considerable quantity of the pulp is exported as such, the 17 active paper mills of the subregion were consuming an ever-increasing quantity in the manufacture of newsprint. This region is well supplied with hydro-power for the development of a sizable paper industry, but the limited demand for paper within the region handicaps the paper mills. The British Columbia section has a number of paper and pulp mills in the vicinity of Vancouver, and one has been projected at Prince Rupert but as yet has not been built. The Canadian and Alaskan sections of this region are potentially important in lumber production, although the trees to the north are not so large as those in the Douglas fir subregion. In the production of pulp and paper, however, many areas along the Inside Passage could become important, since they have the chief prerequisites for the

⁹ R. V. Reynolds and A. H. Pierson, *Lumber Distribution and Consumption for 1938*, pp. 13-14. Forest Service Miscellaneous Publication No. 413, U. S. Department of Agriculture, 1941.



Spence Air Photos.

Fig. 264. A large lumber mill et Seattle, Note the numerous log rafts in the harbor*

industry—an abundance of timber suited to pulp and paper manufacture, a wealth of potential water-power, ample water-supply for washing the pulp, and a tidewater location for the shipment of the finished product. The location of this part of the region is unfavorable for the marketing of large supplies of newsprint and other papers as yet, but if production costs can be held at a low figure, this district should be able to compete with imported Scandinavian and Finnish pulp and paper that in normal times reach the shores of Anglo-America in large quantities.

If careful logging practices are followed, if forest fires are reduced, and if reforestation is practiced in the cut-over lands, this forest region should continue to produce an important part of the continent's wood products, and the industries here should not suffer the decline that has characterized other forested regions. This is the last timbered frontier on the continent. It must be used wisely if the lumber industry is to continue to be important.

The Fishing Industry

The North Pacific Coast is one of the major fishing regions of the continent (Fig. 41) and ranks in total catch with the great banks fisheries of the North Atlantic. Unlike those of the latter, however, most fish along the North Pacific Coast are taken in coastal waters or in the lower courses of streams, and most of the flesh is canned. Salmon is the major species caught, although in recent years halibut and herring have increased in importance.

Salmon fishing

Salmon was probably the chief food of the Amerinds living along the North Pacific Coast from the time of their arrival. Salmon fishing undoubtedly dates far back into the early antiquity of man. The first attempt by white man to preserve salmon was made in 1834, and the first canned salmon was packed in 1866 along the Columbia River. From these meager beginnings the salmon fishing and canning industry has grown so that today the annual sales value of salmon represents a yearly income of about \$65,000,000. In 1937 the North Pacific salmon fisheries of the United States, Canada, and Alaska employed approximately 64,000 persons.¹⁰

Five species of salmon live in the coastal waters of this region

¹⁰ **Homer E. Gregory**, "Salmon Industry of the Pacific Coast," *Economic Geography*, Vol. 16 (1940), p. 409.

and migrate into fresh-water streams to spawn. These are: (1) the chinook or king salmon, the largest of all, averaging 22 pounds in weight, (2) the sockeye or red salmon, the finest canning fish, averaging 12 pounds in weight, (3) the humpback or pink salmon, which averages 4 or 5 pounds per fish, (4) the silver or coho salmon, which averages about 6 pounds per fish, and (5) the dog or chum salmon, which averages about 8 pounds.¹¹

Some king salmon attain weights of 80 to 100 pounds. The meat of this fish commands the best prices on the market either canned or fresh (frozen). The king salmon range the entire length of the North Pacific Coast but are most abundant in the streams of Oregon and Washington. Second in importance is the sockeye salmon. Although smaller, sockeye make up most of the canned salmon. They are found in great abundance all along the coast from northern Washington to the Bering Sea. They are the chief fish caught in the Inside Passage of British Columbia and Alaska. The other varieties, although important, do not rank with these first two.

Life history of the Pacific salmon. Practically all Pacific salmon spawn only once and then die. The life span varies from 2 years for the small humpback salmon to 4 or more for the sockeye and king salmon. The young fry are hatched in the headwaters of fresh-water streams, where they feed on insects and aquatic life until they attain a length of several inches. At that time they migrate downstream to the sea. On their trip downstream they are preyed upon by trout and other fish, but because of their large numbers many of them get through to the open sea. For the next 2 to 7 years these fish live in the open ocean. Although they have certain enemies in the ocean, particularly seal, it seems that most of the fish that reach the open sea attain maturity. Ultimately they begin their migration upstream to the fresh-water spawning grounds, there to deposit and fertilize their eggs, and then die almost immediately. The young salmon hatch out of the eggs considerably later.

In most cases that have been studied, the fish return to the same spawning grounds from which they were hatched 2 to 7 years previously, although some cases have been found where they entered another stream. Once the salmon start upstream, they do not eat but gradually use up their energy ascending rapids and jumping waterfalls to reach the spawning beds. Despite the many obstacles along their way, enough of the mature fish reach the spawning beds

¹¹ Otis W. Freeman, "Salmon Industry of the Pacific Coast," *Economic Geography*, Vol. 11 (1935), pp. 109-110.

to deposit the eggs for the next generation of fish. When the salmon enter fresh-water streams, their color changes and their flesh becomes flabby and unfit for food. For that reason all fishing is done either at the mouths of streams or along their lower courses.

Depletion and conservation of salmon. The chief cause of the depletion of salmon-runs in the western streams is man himself. The chief destruction of the salmon has come through (1) over-fishing in rivers and ocean, (2) damming up streams, (3) pollution of spawning grounds, (4) destruction of salmon in irrigation ditches. The Columbia River is still the most important stream in the United States for salmon, but it has shown a decline from its peak year in 1895. The construction of the Bonneville and Grand Coulee dams across the Columbia River may ultimately diminish the \$10,000,000-a-year Columbia River industry. Fish ladders and other devices have been built at these dams, but it remains to be seen whether they will be successful. The Fraser River in British Columbia had a very destructive landslide that partly blocked the river in 1913, the very year that the large run was ascending. Most of the fish never reached the spawning grounds, and as a result salmon-runs on that stream have never been so large since.

Artificial propagation is helping to keep the streams stocked with young salmon, and today California operates 4 hatcheries, Oregon 15, Washington 30, and British Columbia 12.

Methods of fishing. The chief methods of catching salmon are by gill nets, purse seines, haul seines, and floating and stationary traps. Formerly the fish wheel was used to some extent along the Columbia River, but the state of Washington has made the use of this device unlawful. Indians still spear salmon along some of the streams, but the total number they take in that manner is insignificant. Gill nets and seines account for most of the catch. The gill nets are stretched across a part of the stream that the salmon are ascending. The fish become entangled in the nets, and the fishermen extract the fish at night and take them to the canneries as rapidly as possible to prevent their deterioration.

In the deeper waters of the Inside Passage, most salmon are caught in floating or stationary traps. The stationary trap, which is the more common, consists of a number of piles driven into the deep water in such a way as to form a trap. Around the piles, below water level, is stretched wire netting, which directs the migrating fish toward the center or heart of the trap. In the center is a movable netting, called a "brailer," that allows the fishermen to lift the trapped fish out of the water and dump them into a boat or scow (Fig. 265). From the trap they are transported immedi-

ately to the cannery. Other methods are used to catch salmon, but the ones considered above account for most of the catch.

Salmon canning. Canneries are located on tidewater, so as to be convenient to boats unloading the fish, and also to be convenient to ocean shipping for marketing the canned product. Most Alaskan canneries are isolated communities that are populated only during the summer season; yet these many small canneries, whose only



U. S. Bureau of Fisheries.

Fig. 265. Broiling salmon from a fish trap in southeastern Alaska.

access to the outside world is by steamer, account for more than 50 per cent of the annual pack of salmon. A cannery location requires plenty of fish, a safe ship landing, and an abundance of pure fresh water. The heavy rainfall throughout this region, particularly in Alaska, provides an abundance of fresh water from the many mountain streams. The cannery is usually built out on piles over the beach so as to assure deep water for the ships and so that the fish refuse can be dumped into the water and be carried away with the tide. Some canneries employ as many as 300 workers in the summer and in winter maintain only a caretaker or two.

As soon as fishing boats or scows bring their catch of salmon to the cannery, the fish are unloaded mechanically into bins. Streams

of fresh water are then played on the fish to remove all dirt and slime. Next they go to the dressing machine, known as the "Iron Chink," which cuts off the head, tail, and fins, scoops out the entrails, and removes the scales. Formerly this was all done by hand. After being again washed and inspected, the salmon then passes through a series of revolving gang knives, which slice the fish into proper sizes for canning. Other machines fill the cans, then seal and cook the fish in the can. In the most modern canneries, practically every operation is done by machine. Most Alaskan canneries bring in their tins from Seattle in a collapsed form, so that they will not occupy so much space in the hold of the ship, and have machines to ream out and assemble the cans at the cannery.

The bulk of the canned salmon is marketed through Seattle to the large consuming markets of Anglo-America and Europe. Seattle ships more canned salmon to foreign countries than do all other American ports combined.

Although most of the salmon are canned, large quantities are now being marketed fresh, salted, smoked, or "mild cured." Fresh salmon sold on the Seattle market are worth a million dollars a year.

Other fishing

While salmon are commercially the most important fish in the North Pacific waters, large quantities of halibut, herring, pilchard, and tuna are also caught. In addition, a sizable shellfish industry (particularly oysters) has developed in recent years. Table VII shows the relative rank of fisheries in the Pacific Northwest for the year 1938.

TABLE VII -
FISHERIES OF THE PACIFIC NORTHWEST¹²

<i>Varieties</i>	<i>Total Value</i>	<i>Varieties</i>	<i>Total Value</i>
Salmon	\$20,224,000	Cod	\$405,000
Halibut	3,724,000	Clam	395,000
Herring	1,219,000	Whale	363,000
Pilchard	932,000	Flounder (soles)	200,000
Oysters	754,000	Sablefish	156,000
Crab	519,000	Trout	146,000
Albacore (tuna)	454,000	Smelts	128,000

Halibut is by far the most important of the other commercial fish although the catch of herring, pilchard, and tuna is increasing rap-

¹²Otis W. Freeman and Howard H. Martin (editors), *The Pacific Northwest*, p. 222. New York: John Wiley & Sons, 1942.

idly. The halibut, one of the standard food fishes of America, is a large deep-sea flounder which weighs anywhere from 4 to 200 pounds when caught. Unlike salmon, halibut live and spawn in deep waters. The eggs then rise to near the surface and drift with the currents. The small fish, when hatched, work toward the shallow waters near the shore. They spawn more than once in their life cycle and do not enter fresh water streams. Halibut are caught with gear similar to that used in the tuna-fishing industry. Problems of conserving the supply of halibut are similar to those for salmon, and unless care is taken there is a great danger that the total supply will be exhausted.

Halibut are marketed as fresh (frozen) fish, and the chief receiving port is Prince Rupert. From there they are sent by fast *Tuil* service to all parts of the North American continent. Today the fish-freezing plants on the West Coast ship only the choicest parts of the fish eastward, thereby saving freight costs on the bones and other non-edible parts. A recent demand for halibut liver oil, which is high in vitamins A and D, has caused the growth of a subsidiary industry that brings halibut fishermen an additional \$150,000 a year.¹³

Tuna (albacore), the newest of the commercial fish along the northwest coast, are caught with short rods from fishing boats using lures or bait. In 1941 purse seiners were successful in making a few hauls of tuna, but it is doubtful whether this will continue. Tuna are canned chiefly at Astoria, near the mouth of the Columbia River. The canning method differs from that for salmon; tuna must be cooked first, then hand-packed in cans, and finally steamed in order to sterilize the pack.¹⁴

Other edible fish caught in the offshore waters of this region include the herring, pilchard, Bering Sea codfish, and sole. Astoria, Grays Harbor, Seattle, and Aberdeen are the home ports for most of the fishing boats.

Oysters are the most important of the shellfish caught in Northwest waters. A million-dollar industry using modern cultivation methods has developed mainly in and around Willapa Bay. That bay, with its 100 square miles of shallow tidal flats, offers excellent conditions for growing the Pacific oyster. Eighty per cent of the oyster canning in the Northwest comes from the Willapa district, and production in 1940 amounted to 166,000 cases. The other

¹³ John Q. Adams, "The Pacific Coast Halibut Fishery," *Economic Geography*, Vol. 11 (1935), p. 256.

¹⁴ Howard H. Martin, personal communication.

important shellfish caught in Pacific Northwest waters are clams, crabs, and shrimp.¹⁵

Mining

Until the discovery of gold in the Klondike and later on the beach sands at Nome, both of which lie outside of this region, little interest was shown in minerals, as the mountains of the North Pacific Coast seemed poor in metallic wealth, and the dense vegetation prohibited systematic exploration in the early days. The Russian trappers doubtless knew of certain gold placers along the coast of Alaska, but they were never worked systematically. Even as late as 1880, some years after the United States purchased Alaska, the gold production of that territory amounted to only \$20,000.

With the great finds in the interior toward the close of the nineteenth century and with later discoveries along the coast, the total Alaskan output has surpassed \$510,000,000, placers accounting for nearly two thirds of the total. Practically all placers are in the Yukon Valley Region, but along the coast are several lode-mining districts.

The most important gold-mining district in this region lies in southeastern Alaska. The chief mine is located at Juneau. This district produced 70 per cent of the total output of lode gold for the entire territory, along with small quantities of silver, copper, and lead.¹⁶ The largest single producer is the Alaska-Juneau Gold Mining Company at Juneau, which, through complete mechanization of the mining process and the use of cheap hydro-power, is able to extract very low-grade ore at a profit. This mine is in a sense the successor to the old Treadwell Mine at Douglas, across the Gastineau Channel from Juneau. The Treadwell Mine was opened in 1880 and operated at a great profit to its Owners until 1917, when some of the deeper workings that extended below sea-level caved in and ocean water flooded the mine to such an extent that it had to be abandoned.¹⁷

After the Alaska-Juneau Mine, the next most important one in southeast Alaska is the Hirst-Chichagof Mine on Chichagof Island. Other smaller mines are found in the vicinity of Ketchikan. Some metallic mining is carried on in the British Columbia section of this region, but production there is not large.

¹⁵ Freeman and Martin, *op. cit.*, p. 200.

¹⁶ Charles W. Henderson, "Gold, Silver, Copper, and Lead in Alaska," *Minerals Yearbook*, 1940, p. 171. Washington, D. C: Government Printing Office, 1940.

¹⁷ Otis W. Freeman, "Alaska," in *The American Empire*, pp. 185-186. University of Chicago Press, 1940.

A second important mining district in coastal Alaska lies in the vicinity of Cook Inlet. The several mines of the district produced 19 per cent of the total Alaskan lode gold in 1939. This district also operates some dredges and portable washing plants which produce a fairly large quantity of gold. In this same general district is one of Alaska's two important coal fields, but as yet there is little demand for coal in this remote land.

To the northeast lies the Copper River mining area, which was for a long time an important producer of copper, silver, gold, and lead. The Kennecott Copper Corporation at Kennecott produced large quantities of copper ore for a long time, which were shipped to the smelter at Tacoma. The known copper-ore reserves, however, seem to be exhausted, and in 1939 production was abandoned.¹⁸

The southern section of this region produces only minor quantities of minerals, although small coal deposits are found in the Puget Sound district and on Vancouver Island.

Several small deposits of ferro-alloys, particularly manganese, molybdenum, and chromite, were being explored in 1941. Hydro-power from the new Bonneville and Grand Coulee plants offers many opportunities for the development of electro-metallurgical and electrochemical industries, and the North Pacific Coast seems destined to become the leading region of the continent for those industries.¹⁹

Manufacturing

Aside from the food and wood-products industries, manufacturing on the North Pacific Coast must of necessity be limited because of the lack of variety in raw materials for processing, the limited local market, and great distances from other large markets. Three industries, not listed in the above group which deserve further consideration are (1) the great smelter at Tacoma, (2) the aluminum plant at Vancouver, Washington, and (3) the airplane industry at Seattle.

The Tacoma smelter

This smelter, largest combined smelter and refinery in the United States, represents the electro-metallurgical development of the region. Although gold, silver, and copper are smelted at this plant, copper is by far the most important, since one tenth of the nation's

¹⁸ *ibid.*, p. 183.

¹⁹ Freeman and Martin, *op. cit.*, p. 462.

refined copper is produced here. Some ore moves to this smelter and refinery from the Rocky Mountain Region, but most of it come? by boat from the west coast of South Ameiica.²⁰ Tidewater location and an abundance of cheap hydro-electric power are the chief reasons for the smelter being in this region. In 1939 there were ten copper refineries in the United States, eight of which used the electrolytic method. Of these eight, five were on the Atlantic Seaboard, two in the Great Plains near the Rocky Mountains at Great Falls, Montana, and El Paso, Texas, and this one on the Pacific Coast at Tacoma, which uses coal as well as hydro-electric power. In addition, two refineries on the Great Lakes were using the furnace process of refining copper, although one of these has been idle since 1933.²¹

The aluminum industry

During 1939 and 1940, a large plant was constructed on the Columbia River near Vancouver, Washington, for the electrolytic conversion of alumina into metallic aluminum. Alumina is being produced from South American bauxite which is shipped to the Northwest via the Panama Canal. This new industry to a great extent is due to the heavy demands being made by airplane factories for metallic aluminum. If these continue, other electrolytic conversion plants similar to the one at Vancouver will be built in the Puget Sound subregion.²²

The aircraft industry

A representative plant is the giant one of the Boeing Aircraft Corporation at Seattle. Although climatically this region with its heavier rainfall, rougher terrain, and greater number of foggy days is not so favorable for the development of aviation as is Southern California, it nevertheless ranks high in total production. The Boeing plant has specialized in the production of the large four-motored passenger craft and recently has been one of the chieif factories making heavy bombers for the United States, Great Britain, and Russia. While this industry will undoubtedly suffer a severe retrenchment in production at the close of the second World War, it should be able to survive the period of reduced pro-

²⁰ Gertrude L. McKean, "Tacoma, Lumber Metropolis," *Economic Geography*, Vol. 17 (1941), p. 316.

²¹ H. M. Meyer, "Copper," *Minerals Yearbook*, 1940, p. 85. Washington, D. C.: Government Printing Office, 1940.

²² Freeman and Martin, *op. cit.*, p. 462.

duction and continue to build the large flying boats for which it has become famous.

Woolen textile manufacturing

This is an old stabilized industry, which is centered largely in the Willamette Valley. The wool for the mills of the valley cities comes from the surrounding territory. About one fourth of that produced in the Northwest goes to the mills in Portland, causing that city to rank second to Boston as a wool center for the continent.

Shipbuilding

The shipbuilding industry is located largely on Puget Sound and along the Columbia River. It became important during the first World War, and was revived greatly during the second World War. Both wooden and steel ships are built in the 66 yards of the district, the raw materials for the steel ships coming from outside the region. At Bremerton the United States Navy has one of the largest shipyards on the continent.²³

Transportation

Despite the mountainous terrain, most parts of the North Pacific Coast are well served by railways, highways, airways, and seaways (Fig. 208). Water transportation is still of major importance, as shown by the large ocean ports of Portland, Tacoma, Seattle, and Vancouver, which export a great quantity of fabricated goods such as lumber and wood products and which imported Oriental goods, particularly Japanese silk, during normal times. The British Columbian and Alaskan sections are even more dependent upon water transportation, since only the military highway completed in November 1942 extends between the United States and Alaska.²⁴

Railroads

Today the region is served by the following trunk lines (Fig. 208A).

²³ *Ibid.*, p. 450.

²⁴ For a description of the new highway, see Richard Finnie, "A Route to Alaska Through the Northwest Territories," *The Geographical Review*, Vol. 32, No. 3, July 1942, pp. 403-416, and Lawrence J. Burpee, "A Road to Alaska," *Canadian Geographical Journal*, Vol. 21, No. 5, November 1940, pp. 257-267.

1. The Southern Pacific—through the Willamette Valley to Portland, connecting it with San Francisco.

2. The Union Pacific—from Salt Lake City via the Columbia Gorge to Portland.

3. The Chicago, Milwaukee, St. Paul, & Pacific, across the Cascade Mountains to Tacoma and Seattle.

4. The Northern Pacific (the first railroad), through the Cascades to Tacoma and Seattle.

5. The Great Northern, across the Cascades (via the Cascade Tunnel) to Everett and Seattle. This road also has a second line via the Columbia Gorge to Portland.

6. The Canadian Pacific, over the coastal ranges of British Columbia to Vancouver.

7. The Canadian National, across the Canadian Rockies and coast ranges with one line to Vancouver, and another to Prince Rupert.

In addition, connecting lines of most of these railroads link Vancouver on the north with Portland on the south and provide excellent facilities along that major traffic way of the Puget Sound trough.

In Alaska, only three railroads are found, and each consists of a feeder line connecting the interior with the coast:

1. The White Pass & Yukon, from Skagway, over White Pass to the headwaters of the Yukon River. This, the first railroad in Alaska, was built to serve the gold fields of the Klondike in the late 1890's.

2. The Copper River & Northwestern, privately owned and built to handle the formerly rich copper ores of the Kennecott district. These ores were shipped from the port of Cordova to the smelter at Tacoma.

3. The Alaska Railroad, government-owned and built to connect Fairbanks in the Yukon Valley with tidewater at Seward and Anchorage. This is today the most important railroad of Alaska.

Highways

Highways serve practically all parts of the United States section and southern Canada, but north of Vancouver highways are as yet few and in most cases poorly developed. Most of the highways in Oregon and Washington are excellent, and some of them have been built at tremendous costs. These roads have been of great value in reaching remote areas not touched by railroads, and have served not only to get out large quantities of timber, but have also

stimulated the tourist trade by providing easy access to numerous wilderness areas of superb scenery. In Alaska, the Richardson Highway runs from the coast at Valdez to Fairbanks in the Yukon Valley, providing a good gravel road to the interior.

Airways

Airways serve most centers in the Pacific Northwest and also provide direct connection across Canadian territory between the United States and Alaska. With numerous flying fields being built in the Alaskan coastal districts, that isolated section should be well provided in the future with rapid transportation to the United States for passenger and high-value freight service.

Resorts

The North Pacific Coast is one of the continent's most scenic regions, and is rapidly becoming one of its major playgrounds (Fig. 33). The remoteness of much of this area from large population centers of the East, and the inaccessibility of many of the most scenic spots, have retarded the development of resorts. Construction of new highways, and to a lesser extent the extension of air and steamship service, have greatly stimulated travel throughout this region. The United States section is as yet the best-developed, having three national parks, *Crater Lake*, *Mt. Rainier*, and *Mt. Olympus*, and several national monuments, state parks, and other recreational areas. The Canadian section and the Inside Passage of southeastern Alaska rank among the world's most scenic areas with their spectacular glaciated mountains, glaciers, and fjords that are easily accessible by ocean and coastwise steamers. Along the coast of southern Alaska, however, is found the continent's most magnificent scenery, culminating in the majestic peak of *Mt. McKinley* (elevation 20,300 feet), and set aside for the public in the *Mt. McKinley National Park*. Although most of the tourist trade comes during the summer season, the recent development of winter sports in the Cascade Mountains of Oregon and Washington has greatly increased the volume of business.

Cities²⁵

Because of the great latitudinal extent and the wide diversity of habitats in the North Pacific Coast Region, its urban centers will be considered under three heads: (1) the large cities of the Wil-

²⁵ Freeman and Martin, *op. cit.*, pp. 499-519.

lamette-Puget Sound subregion, (2) the smaller centers in the same subregion and along the Oregon and Washington coast, and (3) the ports of the fjorded coast of British Columbia and Alaska (Fig. 259).

Portland (406,406), at the confluence of the Willamette and Columbia rivers, occupies a crossroads location between north-south traffic through the Willamette-Puget Sound valley and east-west traffic along the Columbia River. Its location 110 miles from the mouth of the Columbia gives it excellent contact with the oceans, and the deep watergap of the Columbia River provides it with the only low-level (97 feet altitude) route through the Cascade Mountains. Despite this apparent advantage, however, most of the trade of Portland comes from the Willamette Valley to the south instead of from the hinterland to the east. Portland draws some trade from the Puget Sound area to the north, but most of that goes either to Tacoma or Seattle. The city's importance, aside from its commerce and trade, lies in the fact that it is the dominant agricultural center of the Pacific Northwest and is the continent's second-largest wool center, ranking next to Boston. Approximately one fourth of the wool produced in the surrounding area goes to the mills of Portland to be converted into textiles. The city's commercial supremacy in the lower Columbia Valley was won over the cities of Astoria and Vancouver (Washington). Both of these had certain advantages of site, but Portland had the best opportunity of controlling the north-south traffic through the Willamette Valley.

In many respects Portland has retained the quiet, dignified attitude that was bestowed upon it by its New England founders, who plotted the first streets and "flipped a coin" to determine whether the city should be named Portland or Boston. When railroads were being built into the Northwest, Portland was indifferent and allowed some of the first ones to establish their tidewater termini elsewhere. Despite this mistake, the city continued to be the largest urban center in the Northwest until 1910, when it was pushed into second place by Seattle. It remains, however, the leading cultural center of the region and has become a very beautiful city. It well deserves its reputation as the "City of Roses."

Tacoma (156,018) is located on tidewater at the point where the Puyallup River empties into Puget Sound. Although more than 140 miles from the Pacific Ocean, the deep, commodious harbor has caused Tacoma to become a leading port of the Northwest. The first settlement began with the building of a sawmill on the shores of Commencement Bay in 1852. Little further development took place for the next two decades, and in the early 1870's the town

had only 200 people. Upon being selected as the Pacific terminus of the Northern Pacific, the first transcontinental railroad to build into the Northwest, its commercial future was assured. Before 1900 its population remained about the same as that of Seattle, but with the Klondike gold rush, Seattle forged ahead because it had a better location for trade with Alaska. The same held true with trade with the Orient, since Seattle is closer to the Far East than any other port of the United States. While Tacoma had to surrender its commercial supremacy to Seattle, it maintained its industrial leadership. Today it is preeminently an industrial "payroll" town. Its leading industry, employing nearly one half of the wage earners of the city, is sawmilling and wood-processing. As such it ranks as one of the leading furniture centers of the West. In addition to the manufacture of wood products and paper and pulp, Tacoma has become the leading electro-metallurgical and electro-chemical center of the Northwest. The dominant heavy industry is the copper smelter and refinery, one of three in the West (pp. 805-806). The city also ranks fifth among the nation's flour-milling centers.

Tacoma's location between Seattle and Portland, and its restricted trade territory to the east because of the Cascade Mountain barrier, will tend to retard its commercial growth in the future, since either of the other places has a decided advantage in both land and sea connections. As an industrial center with an abundance of cheap hydro-power, it should continue to be important and increase in population, although possibly at a slower rate in the future than in the past.

Seattle (452,639) is one of America's most highly water-conditioned and water-conscious cities, being surrounded by the navigable waters of Elliott Bay, Lake Union, and Lake Washington. Lake Washington has been connected to the others by means of the great Ballard locks, which have a lift of 26 feet at low tide. This system of inland waterways gives Seattle a great advantage in water-borne traffic and has been a major factor in making it one of the leading ocean ports of the continent.

The first settlement was made in connection with a sawmill in 1851, and for a time the town, which grew very slowly, was confined to a narrow plain along the bay. This small strip of level land provided the best transportation facilities for the railroads which ultimately were built into Seattle and largely determined the location of the industrial sites. The residential section, however, sought higher, better-drained grounds and moved back upon the hilly lands overlooking the Bay. Eventually this was followed by

a movement of the retail business district to the higher lands. As the city grew it reached across the hilly land between Elliott Bay and Lake Washington to the shores of the lake. In recent years this rough terrain has caused the city to have to spend large sums of money to level off steep slopes in order to have more room for growth. The earth removed from the hills has been used to fill in the low places, or else is dumped into the Sound.

For nearly a half-century after the first settlement was made, Seattle remained one of several small lumber-shipping ports on Puget Sound. It came to life suddenly with the discovery of gold in Alaska and the Klondike at the end of the nineteenth century. When the Klondike gold rush began in 1898, Seattle had the most advantageous position of any Pacific Coast city of the United States to profit from that trade, since it was the nearest port to Alaska that had rail connections with the rest of the nation. From 1898 to 1910, the city experienced its greatest growth, with an increase of more than 150,000 people. In that time it changed from "a muddy sawmill and lumber-shipping town to a recognized urban center." Since 1910 the growth of the city has been steady but not rapid.

Seattle is not primarily an industrial city, but three types of manufacturing have been of importance in its industrial development: (1) woodworking industries (Fig. 264), including lumber mills and furniture factories, (2) mechanical industries such as ship-building plants and airplane factories, and (3) food-processing plants, especially for the canning and quick-freezing of fish, fruits, and vegetables. Seattle can never rank high among the industrial cities of the nation, but its advantages of cheap water-power and excellent water transportation will make it grow in importance.

As a commercial center, Seattle ranks high. Three transcontinental railroads make it their major Pacific terminus, and at least three others have good connections with it. The city has the best land connections on the Pacific Coast. Its excellent harbor on the protected waters of Puget Sound give it an advantageous location with regard to normal trans-Pacific trade.

The cultural life of the city is dominated by the campus of the University of Washington, which lies along the wooded shores of Lake Washington.

Vancouver (351,491),²⁶ the largest city in British Columbia and chief Pacific port for the Dominion of Canada, occupies a strategic commercial position on Puget Sound near the mouth of the Fraser

²⁶ *Eighth Census of Canada, 1941.*

River and only a few miles north of the international border. The town began as a lumber mill in the same manner as the cities to the south, and remained a small lumber port until 1887, when transcontinental rail service was established. Shortly after that steamship connections were established with the Orient, and the city's commercial future was assured. For a time its commercial supremacy seemed to be challenged by the newly established port of Prince Rupert several hundred miles to the north, but the completion of the Canadian National Railway into the city soon made it the chief Pacific terminus for all westbound Canadian products. Vancouver now enjoys a monopoly of Canada's Pacific trade, surpassed only by the port of Montreal on the Atlantic side of the country. Vancouver's economic life is chiefly commercial and only slightly developed industrially. Because of its great commerce it has built excellent dockage facilities and ranks as one of the best-equipped ports on the continent.

Vancouver, with its scenic setting and many beautiful parks, is becoming an important tourist center. It competes with Seattle in the tourist trade with Alaska.

The smaller centers of the Puget Sound subregion are mainly small ports along the California, Oregon, and Washington coast, on the Columbia River, and on the Sound (Fig. 259). *Eureka* (17,055) is an important lumber port and resort center on the northern coast of California. *Astoria* (10,389) is a leading fishing and canning center at the mouth of the Columbia River. *Aberdeen-Hoquiam* (29,671), sometimes called Grays Harbor, is an important lumber and fishing port. *Longview* (12,385) and *Vancouver* (18,788) are lumber ports on the Columbia River. *Olympia* (13,254), *Bremerton* (15,134), *Everett* (30,224), *Bellingham* (29,314), and *Victoria* (75,218)²⁷ are ports of importance and are also resort centers. Bremerton is important for its shipbuilding activities while Olympia, the capital of the state of Washington, and Victoria, the capital of the province of British Columbia, rank as important government centers. In addition, three interior Oregon cities—*Medford* (11,281), *Eugene* (20,838), and *Salem* (30,908)—are significant as agricultural centers. Salem also is the capital of the state of Oregon.

Along the fjorded coast of British Columbia and Alaska lie several urban centers and ports that are significant in spite of their small

²⁷ *Eighth Census of Canada, 1941.*

populations. These include *Prince Rupert* (6,656),²⁸ *Ketchikan* (4,695), *Juneau* (5,729), *Sitka* (1,987), *Seward* (949), *Petersburg* (1,323), *Wrangell* (1,162), and *Anchorage* (3,495). All are important in the fishing trade and all have considerable commercial activity. During the brief summer season, all enjoy a prosperous tourist trade.

Sitka, the former Russian capital, and Juneau, the present capital of Alaska, are also governmental centers. To this group might be added the "all but abandoned" port of *Skagway* (634), the terminus of the White Pass & Yukon Railway and the entry port to the Klondike during the gold rush. Skagway's importance is largely historic.²⁹

The Outlook

Today the leading occupations of the region are lumbering and allied wood-products industries, general agriculture (especially in the broad Willamette Valley), specialized agriculture (dairying, fruit growing, poultry farming, market gardening), fishing, and a limited amount of mining. Much of the terrain is still in virgin forests, but the Puget Sound area supports several large urban centers whose combined population totals more than a million people. Abundance of hydro-electric power tends to offset the lack of mineral fuel. The cities of this region, then, are primarily trade centers, and their future depends largely upon the commerce of the Pacific.

This is primarily a region of extractive industries. The natural resources seem almost limitless, and all activities dependent upon them should remain dominant for a long time. Agriculture may expand to some extent through specialization.

If the natural resources are not wasted, and if the trade with the Pacific countries continues to expand, the Puget Sound section should continue to grow, but much of the growth will be urban. The rest of this section, and practically all of the Canadian and Alaskan parts, will remain primarily a wilderness dominated by a few extractive industries and by the people who operate them.

²⁸ *Ibid.*

²⁹ Edwin J. Foscue, "The Development and Decline of Skagway, Alaska," *Economic Geography*, Vol. 10, No. 4 (October 1934), pp. 419-428.

CHAPTER XXII

The Yukon-Kuskokwim Basins

A REGION OF MINING, HUNTING AND FISHING, TRAPPING, AND SUBSISTENCE FARMING

THIS REGION (Figs. 12 and 266), one of the most sparsely populated in the world, is of almost continental magnitude. It lies between the Alaska Range on the south and the Brooks Range on the north, and extends from the source of the Yukon in Canada to the Bering Sea. Because the Seward Peninsula lacks the Yukon Basin's extremes of temperature and supports no agriculture, it is considered a part of the *tundra* rather than of this region.¹

The Yukon-Kuskokwim Basins form one of Anglo-America's most colorful regions. There are few who do not thrill to the names of Dawson, Klondike, Whitehorse, and Fort Yukon. The writings of Jack London, Rex Beach, Joaquin Miller, and Robert W. Service, which deal with man's battles against a hostile nature, have become a part of America's folklore.

The Physical Setting

Climate

For the most part the climate is decidedly continental, being characterized by extremes of temperature from summer to winter and by light precipitation (Fig. 267). Summers are short and hot, winters long and cold. The average January temperature is about 2,0° below zero and the average for July 60° above, an annual range of more than 80°. Periods of extreme cold, however, seldom last long. The lowest temperature on record is -76° F. at Tanana south of the Arctic Circle, and the highest 100° F. at Fort Yukon north of the Arctic Circle. The range of temperature is smaller near the Bering Sea, where winters are less cold and summers less hot. The growing season varies from 80 to 90 days, though the 18 to 19 hours

¹ Albert L. Soeman, "Regions and Resources of Alaska," *Economic Geography*, October 1937, Vol. XIII, No. 4, p. 343.

of daylight in summer partly compensate for this short period and for the rather low heating power of the sun's rays.

The average annual precipitation varies from 10 to 12 inches, but since it falls during the growing season and since evaporation

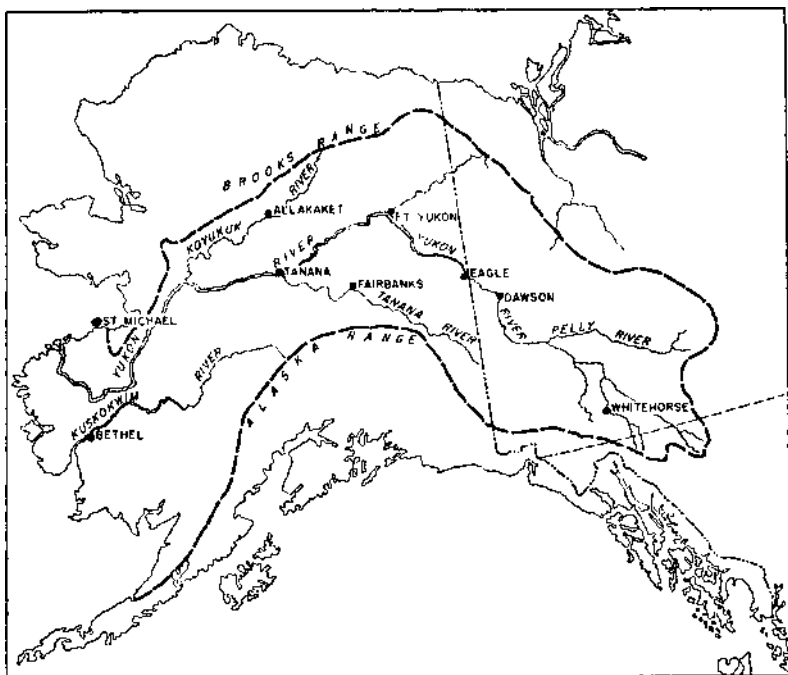


Fig. 266. The Yukon-Kuskokwim Basins: A region of mining, hunting and fishing, trapping, and subsistence farming.

is low, crops rarely suffer. About 25 per cent falls as snow. Ordinarily only June and July are snowless.

Land forms

The terrain of the region, mostly one of rolling, flat-topped hills (Fig. 268), is drained by the Yukon and Kuskokwim rivers and their tributaries. At places the watershed may change from year to year; at others it is indefinite. In the Yukon Valley from Whitehorse to Circle, mountains lie along the river banks or at no great distance from them so that only the narrow river terraces give any promise of possible cultivation. Near Circle on the great bend in

the Yukon are the marshy flats, which continue downstream to Fort Hamlin. East of the junction of the Yukon and Tanana lies a considerable area of comparatively flat land. For many miles along the lower course, the Yukon is virtually at sea level and hence

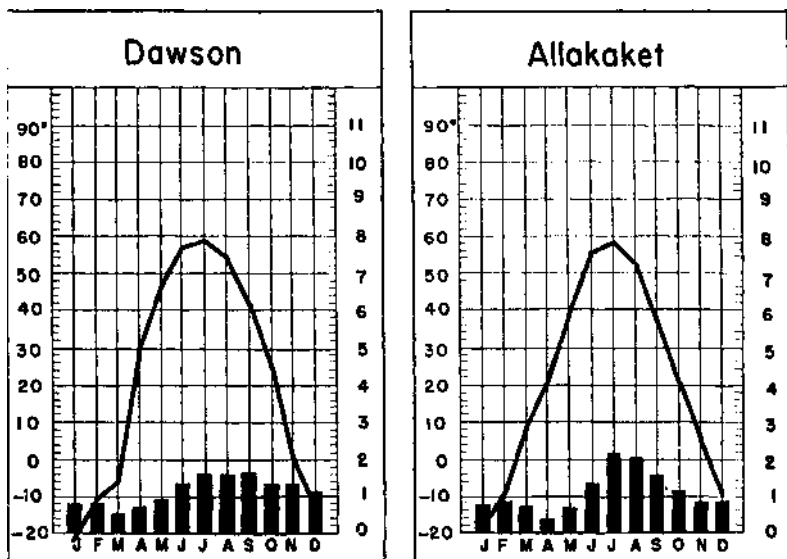


Fig. 267. Average monthly temperature and precipitation for Dawson and Allakaket.

the land is marshy. An additional cause of poor drainage and hence of ponds, marshes and lakes is the fact that the permanently frozen subsoil over much of the region prevents normal soak-in. In the 60-mile wide Yukon delta, the water is so shallow and the distributaries so numerous that sea-going vessels cannot enter.

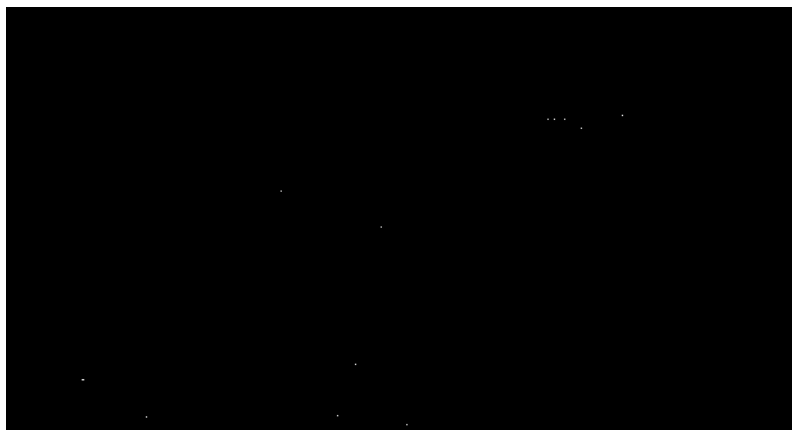
Soil^{2,3}

Since detailed soil studies have been made in but a few places, only broad generalizations regarding soils are possible. It is believed, however, that the Yukon and Tanana valleys possess the most productive soils in all Alaska. These soils, mainly loams and

² *Soils and Men, Yearbook of the Department of Agriculture*, pp. 1150-1151. Washington, D. C: Government Printing Office, 1938.

³ H. H. Bennett and T. D. Rice, "Soil Reconnaissance in Alaska with an Estimate of the Agricultural Possibilities," *United States Bureau of Soils Report 16*, 1914, pp. 43-236.

silt loams, fall into three principal groups: (1) the Tanana soils of the river bottoms, (2) the Fairbanks soils on the well-drained slopes, and (3) the Gilmore soils on the rolling upland. The Tanana soils, 6 to 10 inches deep are grayish brown, mellow, and sandy. The surface is generally covered with muck, peat, or vegetable mold. The Fairbanks soils, deep, mellow, and brown-silt loams, are derived from wind-laid material. The Gilmore soils, brown loams or silt loams, derived from schists and other metamorphic rocks, cover



Courtesy Meredith F. Burrill.

Fig. 268. Terrain typical of the region. Note especially the rounded hills. It is in this kind of country that placer mining is carried on.

most of the uplands. Large areas of brown alluvial soils are to be found in the Yukon Valley.

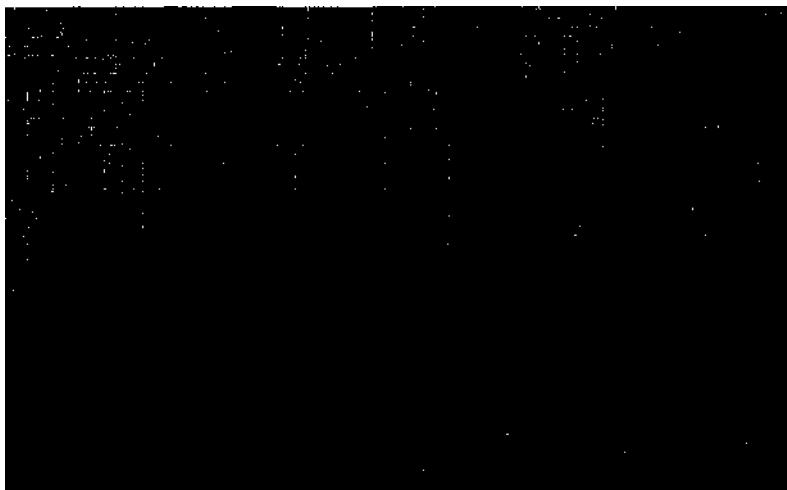
In this region where grass and moss cover the surface, the subsoil is perpetually frozen. When the thick mat is removed, however, the permanent ground-ice disappears or sinks to a level that permits agriculture.

Natural vegetation

The natural vegetation consists largely of light forest growth on the better drained valley floors and on the lower slopes of ridges, and of grass and scrubby vegetation on the higher areas (Fig. 269). Nowhere is tree growth continuous over large stretches. The Great Northern Forest enters the region via the Yukon-Tanana gateway

but the trees are small and shriveled as a result of the large seasonal temperature extremes and the low rainfall. Towards the northwest the trees thin out and finally disappear in the *tundra*. Grass and *tundra* dominate the lower valleys near the Bering Sea.

The trees, mostly white spruce, Alaska white birch, cottonwood, and balsam poplar seldom exceed 6 inches in diameter. Growth everywhere is slow. Shrubs, grasses, and mosses persist in the forest and are luxuriant in the open marshes.



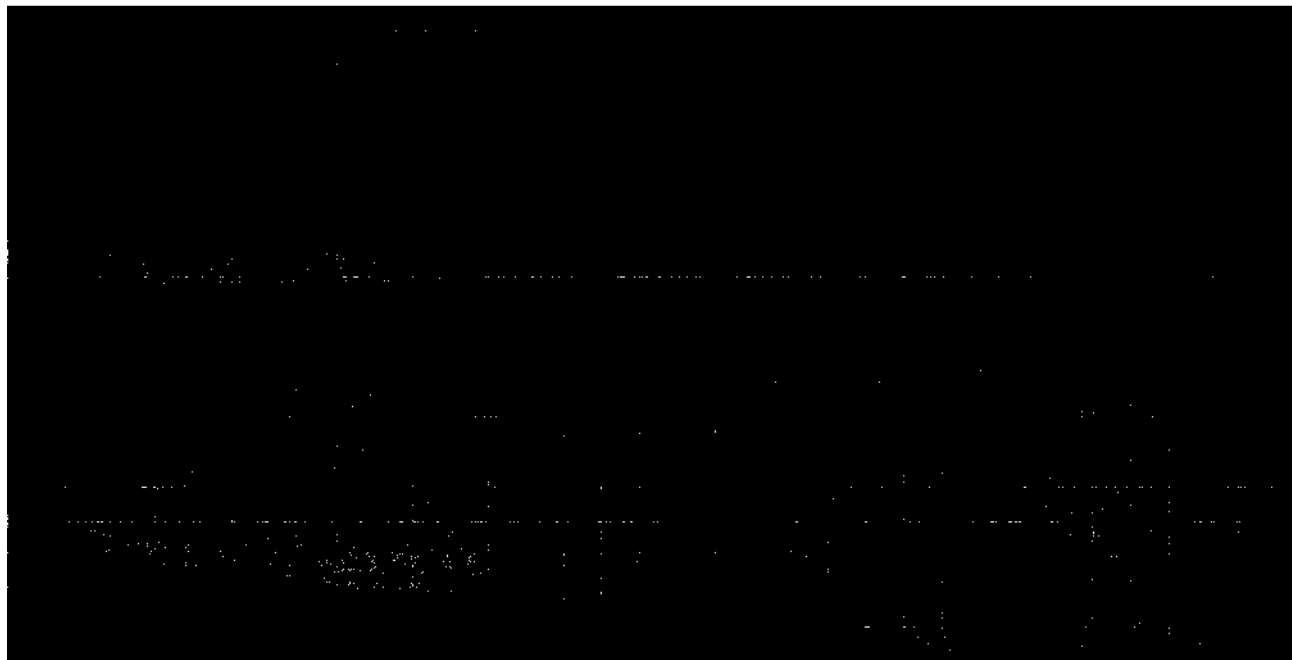
V. S. Fotest Service.

Fig. 269. Natural vegetation: spruce forest at the upper limits of its growth with willow underbrush, Yukon Basin.

Native animals

The animal most closely associated with this region (excepting the Bering Sea littoral) and the one most highly valued is the caribou. Migrations of caribou, which travel in large herds (Fig. 270), are much like those of the bison on the American Great Plains before they were exterminated in the 1880's. Each summer the caribou start north, crossing the Yukon between Selkirk and Circle, and return later to their winter quarters near the Alaska Mountains or between the St. Elias and Coast ranges. Caribou meat furnishes the principal item in the diet of the natives and the skin makes ideal clothing for the far north. Unfortunately caribou are being depleted rapidly, though large numbers still persist.

Moose and black bear are plentiful. The marauding wolf, travel-



Courtesy White Pass & Yukon Route.

Fig. 270. Migrating caribou. Caribou are excellent swimmers; they can go long distances at a speed of 2 miles per hour increasing it to 5 when necessary. Large herds make the migrations; formerly these contained hundreds of thousands of animals, but they are smaller now as a result of widespread destruction by white men with guns. It is estimated that as many as 50,000 head still pass over the divide between the Yukon and Tanana rivers. Caribou are of inestimable value to both Eskimos and Amerinds; the meat forms the chief item of diet and the skin is superior to any cloth in resisting wind and sub-freezing temperatures.

ing alone or in pairs in summer but in packs in winter, kills annually thousands of reindeer and caribou. Among the smaller animals are the marten, mink, marmot, ground squirrel, Arctic hare, and snowshoe rabbit—the last-named changing color from brown in summer to white in winter. In summer millions of ducks and geese make their nesting grounds on the Yukon Flats. Finally there are the billions of gnats, black flies, and mosquitoes which thrive in this region of poor drainage and high summer temperatures. Travelers insist that the mosquito is the curse of the Yukon; that they can overcome with a fair degree of satisfaction all the other obstacles—the vast stretches of swamps, the isolation, and the bitter winter cold. The mosquito retards immigration and lowers the quality of work. Farmers and miners must wear head nets and canvas gloves during May, June, and July. So greatly do mosquitoes torment cattle that some farmers prepare smudges in their pastures to enable the animals to get relief.

Settlement

The Yukon and Kuskokwim basins have never been really colonized—but only exploited—by white men. The economic background of every white settlement is the demand from distant lands for the gold and furs which this area can supply. Obstacles to sedentary living are (1) the long cold winters, (2) the isolation, (3) the pestiferous mosquitoes and gnats, (4) the high-cost transportation making for prohibitive prices, and (5) the limited market for farm products.

Most of the settlers are remnants of the thousands who stampeded into the Yukon in Gold Rush days hoping to strike it rich and then return to "God's country." They are no doubt above average mentally and physically for only men with imagination and ability venture into lands so little known. They are widely scattered over the region, since most of them are miners and "minerals are apt to be found in the very places least suited to living or to the integrated development of other resources."⁴ The white population of the region—10,233⁵—is lower per square mile than that in the state of Nevada, which has one inhabitant per square mile. Most of the population is distributed along the rivers—the chief high-

⁴ National Resources Committee, *Regional Planning, Part VII, Alaska: Its Resources and Development*, p. 27. Washington, D. C.: Government Printing Office, 1938.

⁵ Data for -Canada supplied by A. J. Pelletier, Chief of the Census Branch, and for Alaska by Leon E. Truesdell, Chief Statistician for Population and Meredith F. Burrill, Economic Geographer, General Land Office.

ways. Since the number of white women is considerably smaller than the number of white men,⁶ interbreeding of whites and natives is going on at a rapid rate. Every fourth Alaska native is of mixed blood.

The number of natives is also small—probably 8,000 Eskimos and 5,300 Indians⁷—for there has never been enough game and fish here to sustain primitive man in appreciable numbers.



Fig. 271. Eskimos are essentially coastal people, though some have penetrated inland along the rivers, where they live in small scattered villages.

Eskimos in the lower Yukon and Kuskokwim valleys (Fig. 271) formerly lived wholly off this region," illustrating superbly man's capacity to adjust himself to nature. They now barter furs for flour, tea, sugar and other products and are quite dependent upon the white man. While they are remarkable in transition, there is little chance they can endure in the white man's civilization, which, in one generation, has swept them into a new world.

Indians are widely but thinly distributed over the region. They all belong to the Tinnah family and make their living by hunting on land and fishing in streams. They grow no crops, are quite primi-

⁶ In 1939 there were in this region 3,808 native white males and 1,943 females, and 1,592 foreign-born white males and 330 females.

⁷ Meredith F. Burrill, General Land Office, United States Department of the Interior.

tive, and live in scattered, isolated villages along the upper courses of the rivers. Most of the older villages have now disappeared.

Economic Pursuits

Mining

The rich gold placers discovered in the Klondike brought a feverish stampede of about 80,000 persons to the region in 1898. Most of these knew nothing about this north country but they were willing to exchange a few weeks, a few months, or perhaps even a few years of hardship and adventure for a fortune. The trail, nearly 600 miles long, was a bitter and dangerous one, leading over notorious and dangerous Chilkoot Pass and later the less difficult White Pass, Dead Horse Gulch, the rock desert, and the Miles Canyon Rapids. Unlike the American West the Yukon had no "oases"—places where the weary might rest and refresh themselves. *But gold was there!* Production reached 10 million dollars in 1898 and 16 millions in 1899. Relatively few individuals, however, found prospecting profitable and by 1910 many of those still alive had returned to the United States.

About a billion dollars worth of minerals—three fourths gold—has been removed from this region. Gold is taken both from placers and veins, though the Yukon is essentially one of gravel mining.⁸ The first miners separated gold from sand and gravel with a pan (Fig. 272), rocker, or cradle. So slow were these methods, however, that a prospector could work only about 2 cubic yards a day. Then came the sluice box with its string of boxes into which gravel was shoveled and through which a stream of water was sent. Wire cleats in the bottom caught and held the heavier gold. This method enabled a miner to wash from 8 to 12 cubic yards per day. Today bulldozers are being used so generally as to have practically revolutionized small-scale placer mining (Fig. 273). Unfortunately much of the gold lay in frozen ground which could not be worked until thawed. At first the ground was thawed with wood fires, then with steam engines. Today cold water is used. In this method pierced pipes, spaced 16 to 32 feet apart, are driven deep into the ground and cold water forced through them. The water seeps to the surface and is used again. Sixty to 120 days are thus required to thaw the gravels.

After the more accessible and richer gravels were worked and

⁸ Seventy-five per cent of Alaska's total lode emanates from the southeastern portion.

prospecting became less profitable, large-scale corporate enterprises purchased the better holdings. Much of the placer-mining today is done by huge dredges—excavating and concentrating plants combined—which with their hundred or more buckets, each weighing many tons, dig up the gravel, deliver it to a revolving screen, remove the coarse tailings, and pass the gold-laden gravels to tables where



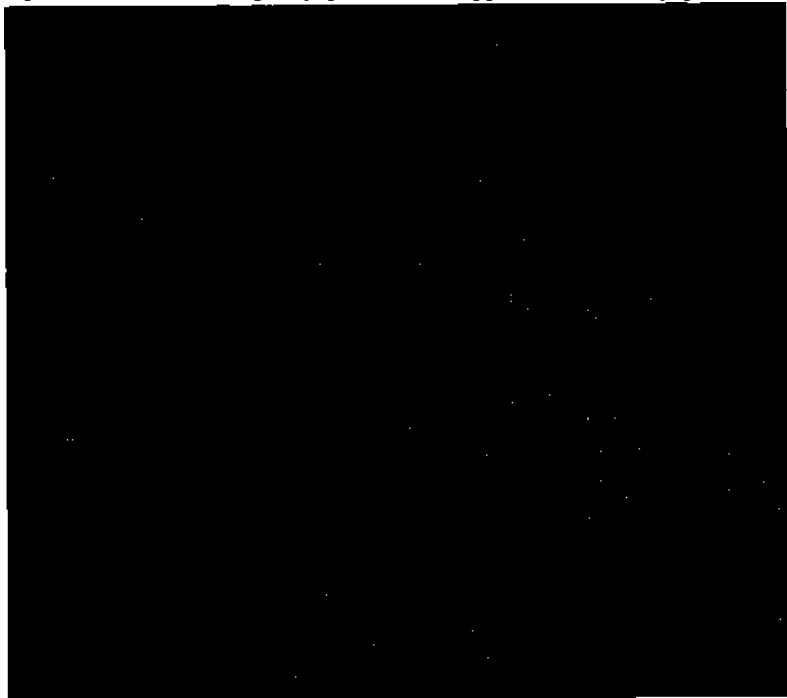
Courtesy White Pass & Yukon Route.

Fig. 272. Panning for gold in Alaska's Yukon. This is the simplest method of recovering gold. The pan, about two thirds full of the material to be tested, is placed under water and any hard lumps are broken by hand. The pan is then raised to just below the surface of the water and is vigorously shaken with a circular motion. This keeps the lighter material in suspension, enabling it to work out of the pan. The heavier material settles to the bottom. Occasionally the pan is lifted from the water. This procedure is followed until only the gold and the heaviest material remain. The gold in the pan shown here has a value of \$1,000.

the metal is caught by quicksilver in the riffles. The resulting amalgam is cleaned up every two weeks, melted and assayed, and finally is shipped to the United States Mint. These dredges, which cost about a million dollars, remove approximately 10,000 cubic yards of gravel per day (Fig. 274). Engineers determine in advance the quantity of gold, computing the profit so that there is hardly more risk involved than in any other business. Thus most gold mining in Alaska today is carried on by a few companies owned largely by nonresidents who employ little labor in propor-

tion to the value of their product. Prospecting is done chiefly with airplanes, which can cover the same territory in a fraction of the time required on foot or by canoe and can do so without battling swamp and muskeg, black flies, gnats, and mosquitoes.

In addition to gold, some silver, copper, lead, and platinum are procured, silver being a by-product of copper and lead a by-product



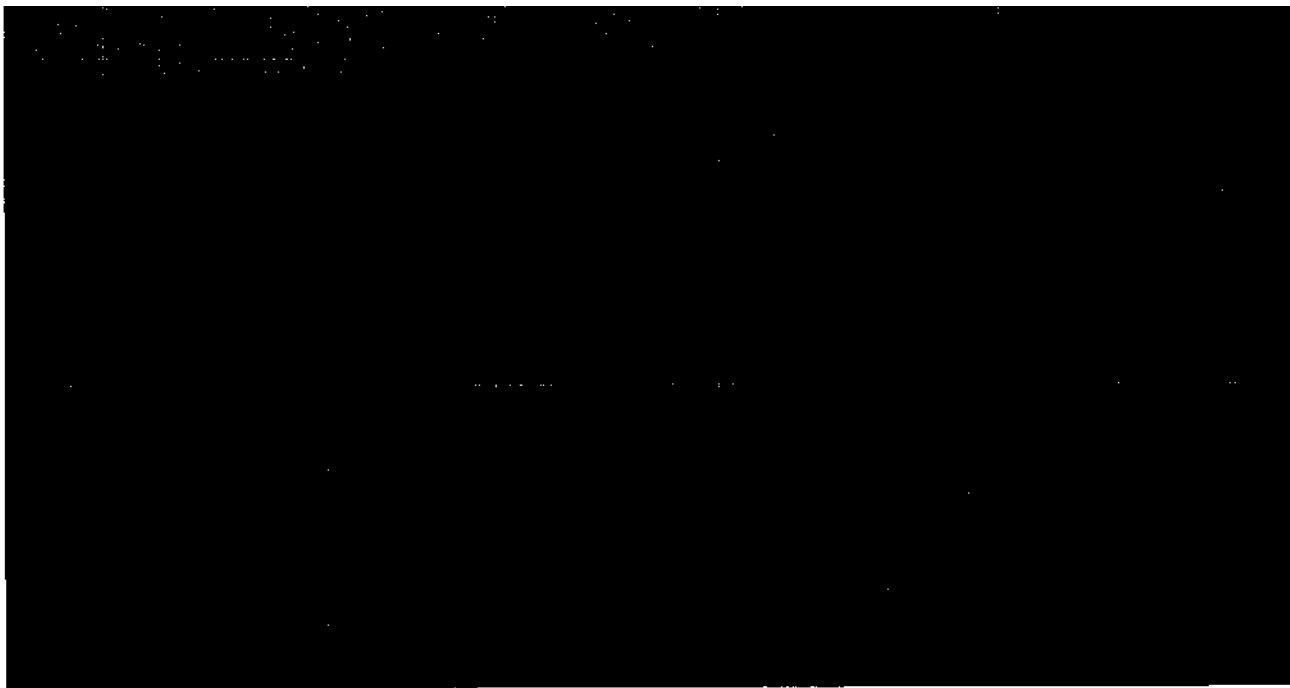
Courtesy Meredith F. Burrill.

Fig. 273. Bulldozer pushing tailings away from the end of the sluice. This powerful and efficient machine now dominates the small-scale placer mining in the Yukon.

of gold. Coal is widespread but the small population, lack of manufacturing, and paucity of railroad mileage keeps production at a low figure. Most of the coal mined is used by the Alaska Railroad and a gold-dredging concern near Fairbanks. Building-stone, gravel, clay, limestone, and marble all are present and are quarried in negligible quantities for local consumption.

Hunting and fishing

Before white men reached the Yukon country the Indians lived chiefly on salmon which they caught in the streams as these were



Courtesy White Pass & Yukon Route.

Fig. 274. Characteristic tailings in the Klondike. **These** great hummocks of gravel, which look like gigantic caterpillars, **are left** by the dredges which glean gold from the workings of early **placer** miners. Only large power-driven equipment can operate profitably on poorer gravels.

en route to spawn. The catch was smoked and much of it cached above ground beyond the reach of dogs and wolves. The Eskimos killed walruses, seals, and whales, and carried on some fishing.

With the coming of white men, trapping became more important, furs being traded for flour, sugar, tea, and other items. Despite the sparse human population in this region, fur-bearing animals are not numerous and trapping is not profitable, yielding at best only a precarious living. Many believe that the wild fur industry is on the decline. With greater regulation on the part of the governments, and by keeping white men away from areas surrounding native villages, the industry might be revived, for the natural habitat is not unfavorable. The long, cold winters give the animals thick coats.

Fur-farming

Fur-farming is being followed at several points with a fair degree of success and should become increasingly important as the natives are taught how to pen-raise fur-bearing animals.

Forest industries

Forest industries are unimportant now and offer little promise for future development. The cold, long winters, short summers, and light precipitation conspire to keep the trees small. They might be used for pulpwood were there not so many regions better located and with superior growing conditions.

Most of the cut is for river steamers, mining operations, domestic firewood and for saw mills at Fairbanks and a few other points. Everywhere the timber is for local consumption.

Agriculture

Agriculture is unimportant and will probably continue so into the remote future. It is restricted to a few areas mostly near the towns of Dawson and Fairbanks, not so much because a hostile environment does not permit crops to grow but rather that the region is so thinly settled as to offer no appreciable market. The crops are essentially of the hardy type—grains (oats, barley, and rye), root crops (potatoes, beets, radishes, carrots, and parsnips), vegetables (peas and cabbages), and hay. Spring wheat has been grown both at Dawson and Fairbanks, the short growing season of less than 100 days being partially compensated for by the 18 to 19 hours of sunshine each day.

The Yukon-Tanana area is said to have possibilities for general farming, stock raising, and dairying. Feed could be obtained from native grasses and from forage and root crops.⁹ The Alaska Railroad which reaches the Tanana Valley enables the farmers of that area to supply a number of mining centers of the Yukon Basin.

Recreation

This region has many possibilities for recreation: lofty, snow-clad mountains, a variety of wildlife, and beautiful lakes and rivers. It also is one of the few remaining so-called primitive regions accessible to Canadians and Americans. Some authorities believe the tourist trade holds the greatest future for this region.

At present little use is made of these scenic attractions because of (1) small population, (2) isolation, (3) vast distances, (4) pestiferous insects, and (5) the great cost of everything people need. The trip is now definitely beyond the reach of the average American family, even one from the region nearest, the North Pacific Coast.

A potential magnet is Mount McKinley National Park with its almost 2 million acres and the highest peak in North America—20,300 feet. Lying on the north slope of the Alaska Range it is accessible via the Alaska Railroad. A road some 90 miles long traverses a part of the park along the *tundra* slopes, crossing many rivers and terminating near Wonder Lake. The completion of a hotel at McKinley Park Station is contributing notably to the tourist business.

Transportation

So large, isolated, and relatively unproductive is the Yukon-Kuskokwim Region that it has only five outlets: (1) the Yukon and its several navigable tributaries, (2) the White Pass and Yukon Railway, (3) the Alaska Railroad, (4) the Richardson Highway, and (5) airways (Fig. 275). Since white people will not make permanent homes far from transport facilities, the small population of this region is understandable.

Waterways

The *Yukon*, chief highway of this tremendous land, is navigable for river boats to Whitehorse, a distance of about 2,200 miles during

⁹ *Soils and Men, Department of Agriculture Yearbook*, p. 1151. Washington, D. C* Government Printing Office, 1938.

some three months of the year (Fig. 275). The Tanana is navigable to Fairbanks by small boats specially built to go against its swift current. The Kuskokwim is navigable for 650 miles during some four months. Unfortunately the numerous distributaries of the delta and the badly shifting channel practically preclude ocean-going vessels from entering the Yukon. All river transportation comes to a complete standstill during the long cold winters.

Railways

The total mileage in the enormous area of Alaska and Canada's Yukon Territory is small,¹⁰ but railways play a vital role. The *White Pass and Yukon Railway* was started in 1898 during the feverish boom days of the Klondike. It is 111 miles long and extends from Skagway up over White Pass to Whitehorse (Fig. 275). Upon its completion freight rates, which had fluctuated from 30 cents to a dollar per pound, dropped to 4% cents. The *Alaska Railroad*, extending 470 miles from Seward to Fairbanks, was built by the United States government to help develop and settle interior Alaska. It was completed in 1923. This route has greatly stimulated mining in its tributary area and in turn mining supplies the larger part of the traffic. In 1936 half the mineral production of all Alaska came from the area along this railroad, which operates trains throughout the year.

Probably no new railways will be built, certainly not at public expense. Even extensions should be made only after careful planning and after a definite need has been shown. Probably no railroad in this region can pay its own way year in and year out, though in 1937 the Alaska Railroad made expenses.

Roads

The small population, the enormous distances, and the swampy surface mean great expense in building and maintaining good roads. Hence this region is almost empty of roads (Fig. 275). The *Richardson Highway*, extending 371 miles from Valdez on Prince William Sound to Fairbanks in the interior, was the chief means of access, especially in winter, prior to the building of the Alaska Railroad. It was a trail in 1907, became a wagon road in 1910, and was improved for automobile traffic during the 1920's. It reaches from sea level to an elevation of 3,310 feet and then descends into the beautiful Tanana Valley. The *Stccse Highway*, 160

³⁰ Most of this mileage is in the North Pacific Coast Region (Chapter XX1) and not in the Yukon-Kuskokwim Basins (Fig. 275).

miles long, is really a prolongation of the Richardson Highway from Fairbanks on the Tanana to Circle on the Yukon (Fig. 275). Extending farther north than any other road in the region, it penetrates some of the outstanding and most highly mechanized gold-mining districts of Alaska.

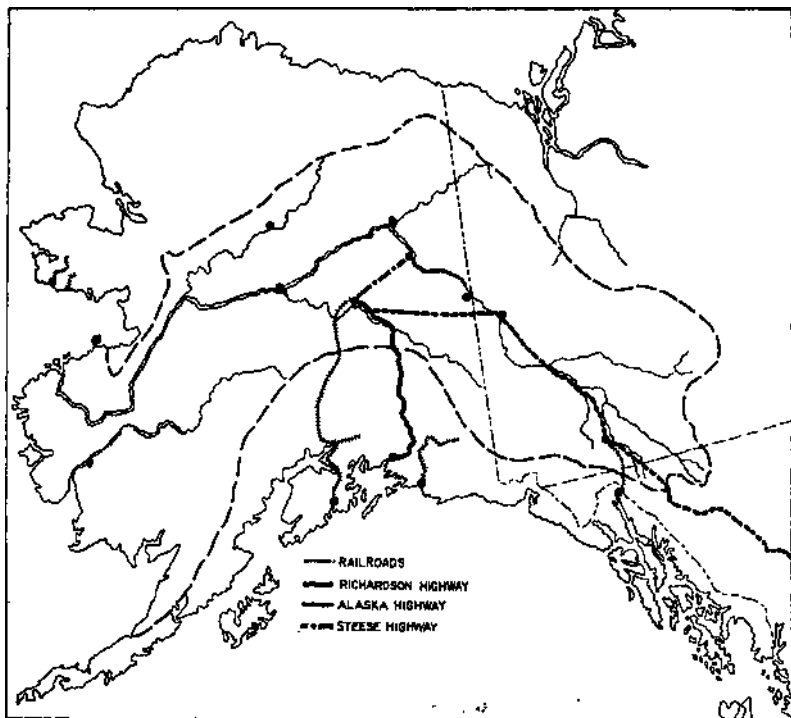


Fig. 275. Railroads and highways in Alaska and northwestern Canada,

A new road extending from Edmonton to Fairbanks has been built by the United States because of the strategic value of Alaska in this nation's defense program. Machinery, food, and all other heavy freight formerly were sent to Alaska by vessel. Strategically this road might be similar to the Burma Road, which prior to its capture by the Japanese in 1942 was the lifeline of China so far as war materials were concerned. In case of possible blockade or partial blockade of southern Alaska by sea, this road would permit supplies to be trucked to Fairbanks in several days.

Airways

Aviation promises to become the chief solution to the transportation problems of the Yukon Basin. The airplane is the cheapest means of long distance travel and seems ideally suited to the small population scattered over this enormous region. Large-scale construction of railroads and roads cannot be undertaken by private enterprise. Only governments can sponsor non-profitable lines. Moreover, the rivers are not navigable in winter. In the Yukon are most of the large-producing placer camps but they are badly isolated, the operating season is short, and many workers leave camp when the freeze-up begins in autumn returning only when work begins in spring. Accordingly a rapid economical method of transportation such as the airplane provides is of inestimable value. Vilhjalmur Stefansson asserts that an Eskimo can go from Fairbanks to Nome more cheaply by airplane than he can by his own dog-sledge. The cost of food for himself and his dogs and of lodging during the trip is far greater than the price of an airplane ticket.¹¹

Towns and Villages

What would be a village or small town in almost any part of the United States is a metropolis in this region, where there is only one center with a population exceeding 1,000—Fairbanks. There are, of course, scores of villages (many really hamlets). Denizens of this region seem to be continually in motion. Camps spring up like mushrooms but quickly return to nature after the prospects for quick returns are dissolved.

Fairbanks (3,455), located in the geographical center of Alaska on a bend in the Chena River, a tributary of the Tanana, is the metropolis of the whole region (Fig. 276). It is the northern terminus of the Alaska Railroad and Richardson Highway, the southwest terminus of the Steese Highway, and the focal point in the North for air routes.

Fairbanks never experienced the mushroom growth of Dawson and Nome, for its gold, lying at great depths, could not be won by the prospector with pick, shovel and pan. From the beginning large-scale operations and expensive equipment were imperative for working the drifts or deep placers. The railroad has been the

¹¹ Vilhjalmur Stefansson, "The American Far North," *Foreign Affairs*, April, 1939, Vol. XVII, No. 3, p. 517.

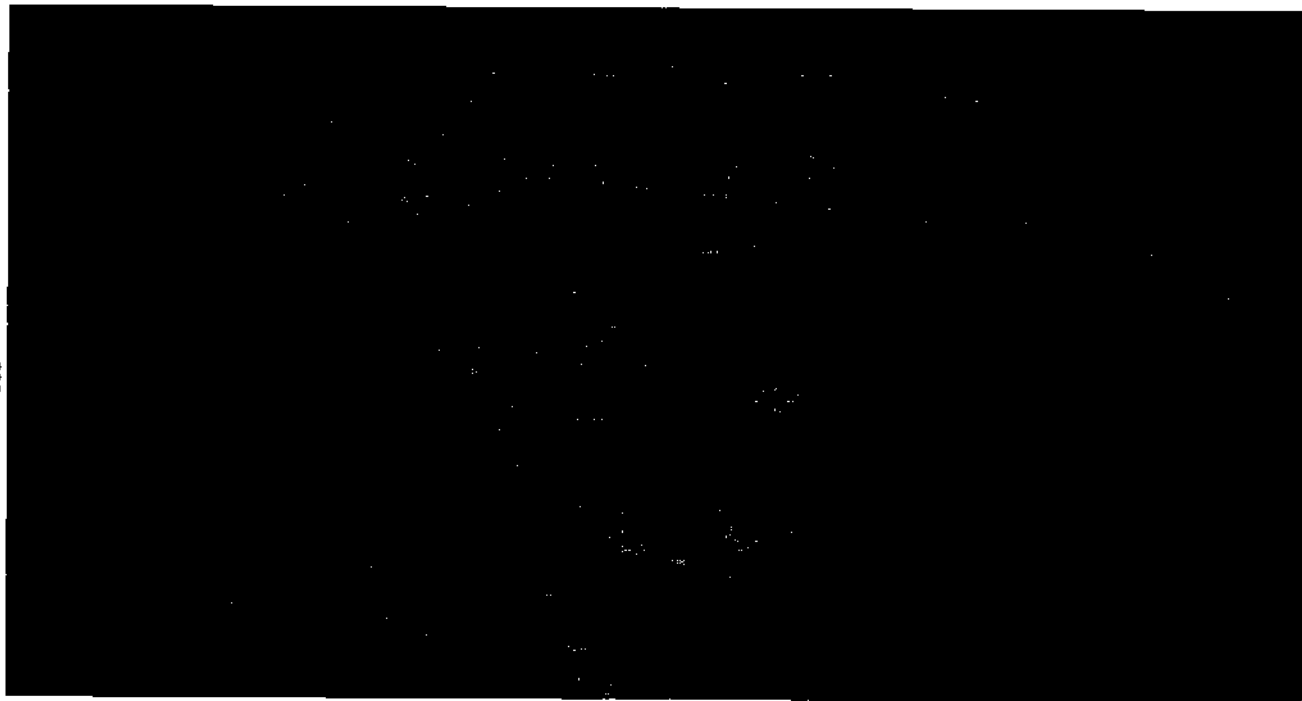


Photo by Pacific Aerial Surveys. Courtesy White Pass & Yukon Route.

Fig. 276. Fairbanks, metropolis of the Yukon-Kuskokwim Basins, as seen from the air. Though giving little promise of ever becoming a large city, Fairbanks increased in population by 64.4 per cent between 1930 and 1940. Note the limited agriculture in the immediate environs. There is very little farming in this whole region.

dominant factor preventing the town from stagnating. In 1938 there were 8 huge dredges operating in the vicinity of Fairbanks.

This town lies in the heart of Alaska's agricultural area and in addition to the hardy crops mentioned on page 827, table vegetables are grown in numerous greenhouses and outdoor gardens. Fairbanks is also the home of the University of Alaska.

Dawson (1,034) occupies river flats at the confluence of the Yukon and Klondike rivers (Fig. 277). It was the focus of the stampede of '98 and despite the air of desertion, it persists as the metropolis of the Klondike gold area. Founded in 1898 its population reached 30,000 within a few months, an amazing fact considering that the majority trudged over the country via Chilkoot and White Passes. Dawson was like most boom towns built on minerals (Fig. 278). Traders arriving after their trip over the bitter trails got as much for their products as "the traffic would bear": eggs sold for \$18.00 a dozen, sugar \$100.00 a sack, and butter \$10.00 for a 2½-pound can.¹²

Whitehorse (753) owes its existence to the gold rush of '98 and to its location below Miles Canyon at the foot of the rapid. Today it is the head of navigation on the Yukon and the northern terminus of the White Pass and Yukon Railway. It is also the center of a copper-mining area.

Fort Yukon (274), largest Indian village on the river, has only a few white inhabitants. It is the northernmost settlement on the river and lies just north of the Arctic Circle on the Yukon Flats (Fig. 266). Founded by the Hudson's Bay Company in 1847, it is the oldest English-speaking community in Alaska and owes its existence even today to furs rather than to minerals.

Wiseman (53), lying 195 miles north of Fairbanks in a huge empty wilderness, is the major settlement in the Upper Koyukuk Valley (Fig. 266). It is the "capital" of an area larger than New Jersey and Massachusetts combined, whose population averages 0.0085 per square mile.¹³ Most of the inhabitants are miners and are white.

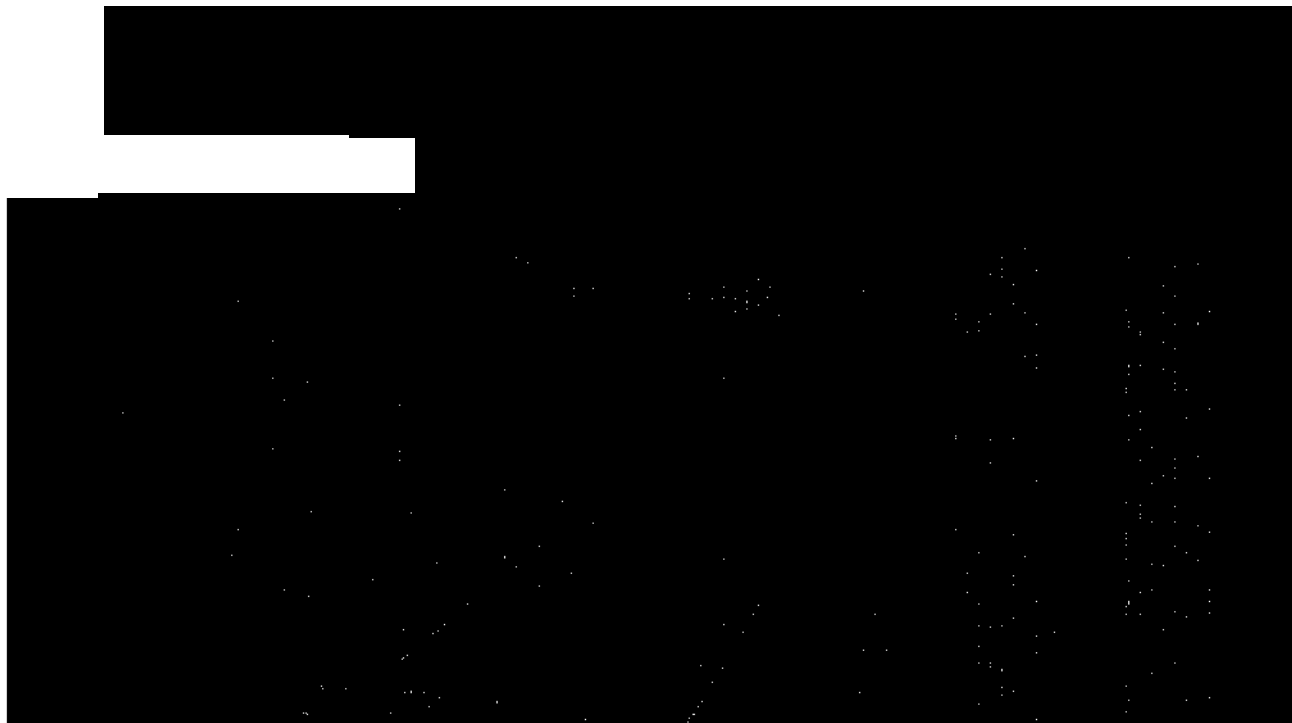
Other villages exceedingly important to the region are Bethel (376), Eagle (73), St. Michael (142), and Tanana (170).

The Outlook

This region, larger than Texas, with 5,000 square miles arable and 50,000 more, suitable for pasture, is today supporting a population

¹² Merle Colby, *A Guide to Alaska: Last American Frontier*, Federal Writers' Project, p. 108. New York: Macmillan Co., 1930.

¹³ Robert Marshall, *Arctic Village*, p. 13. New York: Harrison Smith and Robert Haas, 1933.



Courtesy White; Pass & Yukon Route.

Fig. 277. Dawson—hub of the Klondike area. It is, however, little more than the ghost of the Dawson of Gold Rush days.



Courtesy White Pass & Yukon Route,

Fig. 278. Front Street in Dawson when the town was the focus of one of the world's greatest gold rushes.

of about 23,639. The whites are mostly engaged in mining and transportation. The Amerinds and Eskimos are occupied almost wholly in fishing, trapping, and hunting. The region, then, appears to be primarily a reserve for the future: a region where only whites of the pioneer type—people willing to risk all to find something better—will venture. A subsistence-farming existence without near neighbors and without roads, schools, churches, and movies does not attract the average white Anglo-American. However, should the pressure of population in this continent become great (as has long been the situation in Europe), *but which now seems unlikely* as a result of a diminishing rate of population growth, immigration into the less desirable agricultural lands of the Yukon would take place. Settlers, however, avoid going to distant lands, especially unfriendly ones, unless they can appreciably improve their financial condition. A recent report by experts states that the extractive industries and tourism will play a far more important role in the future development of Alaska than will agriculture.¹⁴

In spite of the fact that crops can be grown over a considerable part of the region, not more than 500 acres are actually in production. This is because of the restricted local market and the fact that the exportation of farm crops is economically impossible. A director of one of the Alaska industrial schools says:

The Government, through the Alaska Railroad, is carrying on a colonization movement to settle the fertile valleys of this territory. To me, who has spent two summers here among the dense clouds of mosquitoes which infest the interior regions from early spring until fall, this attempt at colonization with outsiders (people from the States) seems futile. A large per cent of these colonists will not remain after the first summer. Why overlook the material for colonization right at hand? Why not encourage the natives to take up agriculture as a means of livelihood? We all know that fishing and trapping are decreasing rapidly every year and cannot be depended upon any longer as the means of support. The boys and girls who have lived all their lives in this mosquito-infested region are accustomed to conditions. They will continue to live here.¹⁵

Gold mining, the dominant activity today, appears to be the most promising enterprise for the future though ultimately it must die. It has been greatly aided by improvements in transportation—

¹⁴ National Resources Committee, *Regional Planning, Part VII, Alaska: Its Resources and Development*, p. 15. Washington, D. C: Government Printing Office, 1938.

¹⁵ H. Dewey Anderson and Walter C. Eells, *Alaska Natives, A Survey of Their Sociological and Educational Status*, p. 401. Stanford University, California, Stanford University Press, 1935.

railways, highways, and airways. It will continue to be a large-scale enterprise inviting capital only if large profits are available.

The grazing of reindeer by Eskimos for subsistence is possible over a considerable part of the region. In 1939 as a result of the Third Deficiency Act, the reindeer of white owners were purchased, making the reindeer industry exclusively native. For many years the presence of large herds of reindeer owned by whites using the same ranges as those animals owned by Eskimos had led to serious overgrazing and had created misunderstandings, one result of which was to discourage Eskimos from keeping reindeer. The industry, now exclusively native, should eliminate controversies, reestablish an interest in reindeer among the Eskimos, and build up the herds "so that every native village in Alaska, where the raising of reindeer is at all feasible, will be supplied with a herd. This will insure the natives a supply of food and clothing at all times and remove any danger of [possible] food shortage. . . ." ¹⁶

Since the natives have been declining numerically as a result of white contact and competition, the United States and Canadian governments must adopt policies to protect them from outside influences. Only the aborigines can form the foundation of future development, for only they are constitutionally suited to the country. The Bureau of Indian Affairs is launching a program to capitalize the native virtues and simultaneously orient the aborigines for living successfully in contact with whites. Native culture must not be permitted to decay and perish.

Eskimo villages tend to become larger—a response to the trader, missionary, and school teacher and to the resultant advantages of medical attention and social and economic services. Villages vary in size from 298 inhabitants to 10; the larger ones lie in northern Alaska (outside this region and in the *tundra*), the smaller ones in the isolated coastal country between the Yukon and the Kuskokwim. In the latter area the villages are more isolated and remain much as they were prior to the coming of white men.

As more is learned of Arctic weather and climate and as flying becomes safer, cities such as Fairbanks and Dawson may attain international importance as centers on airways as a result of Great Circle flying (Fig. 279).

The Great Circle Route between Japan and the West Coast of the

¹⁶ "Reindeer of Alaska henceforth in belong only 10 Eskimos," *Indians at Work*, Vol. VII, No. 1, September 1939, pp. 1243).

United States passes just south of the Aleutian Islands. After war broke out between the United States and Japan, Alaska had great strategic value. The Territory was strengthened by naval air and submarine bases at strategic points along the coast and by army air bases on the coast and in the interior. A complete network of emergency landing fields was built. At Fairbanks, a cold-weather

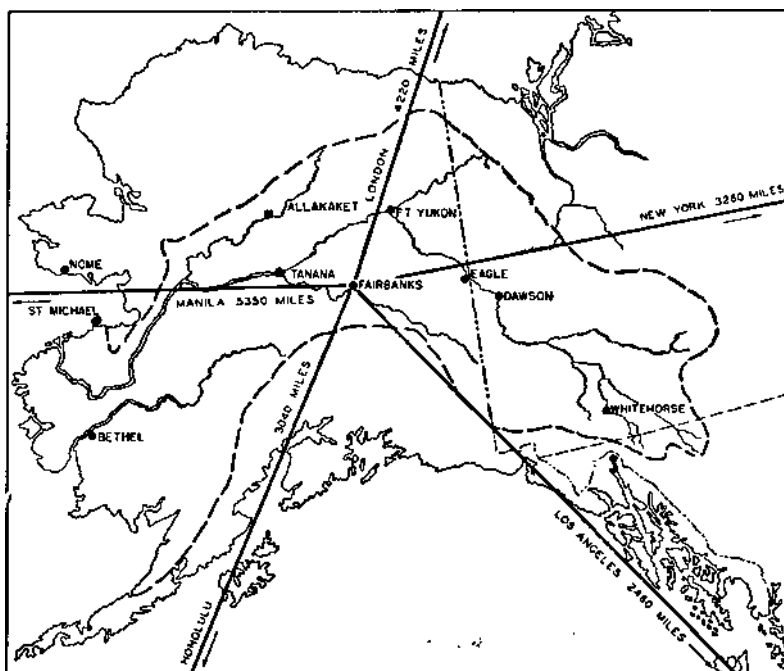


Fig. 279. Yukon Basin towns and Great Circle flying. A look at the globe will show that the centers of political and economic power are connected most directly by air routes across the Arctic. Some day, when more knowledge is had regarding the weather and climate of these lands, the circumpolar nations will perhaps cooperate in establishing trans-Arctic airlines.

flying station, United States aviators were trained for polar warfare under conditions much like those that prevailed in the Finnish-Russian conflict. Entirely new types of equipment and methods of warfare had to be developed because of the rigorous climate. Defense measures in Alaska cost in excess of 50 million dollars, or more than six times the purchase price of the Territory.

In Alaska are found valuable raw materials either scarce or absent in the United States. Eight of these—antimony, chromium,

manganese, nickel, platinum,¹⁷ quicksilver, tin, and tungsten—have been classed by the Army and Navy Munitions Board as "strategic"—those essential to national defense, for the supply of which, in war, dependence must be placed in whole or in substantial part on sources outside the United States.

¹⁷ Platinum is a "critical" material—the procurement problem of which in war is less difficult than that of the "strategic" materials, because of the lesser degree of essentiality or because of the more adequate quantities from domestic sources.

CHAPTER XXIII

The Tundra¹

A REGION OF HUNTING, FISHING, AND MINING

THE TUNDRA Region, one of the larger regions in Anglo-America (Fig. 12), is the most sparsely populated, the least productive economically, and certainly the least promising so far as man's future occupancy is concerned. In few parts of the earth is nature more unyielding or more niggardly, and nowhere else are people's ways of living more closely attuned to the physical environment. Huge areas of land, some as large as western European countries, never have been explored by white men. The *tundra* is primarily the land of the Eskimos; yet they have established themselves permanently only in small numbers.

Parts of this region have long been known to white men. Five centuries before Columbus reached the New World, Norsemen had visited the coast of Labrador. Eric the Red, who first colonized Greenland near the close of the tenth century, appreciated this fact in giving Greenland its name, "for," he said, "that might attract men thither when the land had a fine name."² Thus along with the hot dry deserts, rainy tropics, and lofty mountains, the *tundra* is one of the least desirable places for settlement. The few white inhabitants have gone to the *tundra* to get furs, exploit minerals, convert the natives to Christianity, or to represent their respective governments. Cities, towns, or even villages as we think of them in

¹ Greenland, though Danish, is included as a part of Anglo-America in this book. This seems justifiable as a result of its having become an American protectorate under the Monroe Doctrine. When Germany occupied Denmark on April 9, 1910, the United States and Canada became apprehensive regarding Greenland, which could be of inestimable value to Germany as a base for submarines, surface craft and aircraft, and for weather forecasting. The United States proclaimed its firm determination to prevent transfer of any geographic region in the western hemisphere from one non-American power to another. It proposes to return Greenland to Denmark at the end of the war.

² Isobel W. Hutchison, "Flowers and Farming in Greenland," *Scottish Geographical Magazine*, July 1930, Vol. XLVI, No. 4, p. 216.

the United States are non-existent. A settlement nucleus may not include more than 2 or 3 families.

The Tundra Region includes the part of North America that extends from the Bering Sea on the west to the Atlantic Ocean on the east and from the Great Northern Forest or *taiga* on the south to the icy Arctic Ocean on the north (Fig. 280); it includes also the vast Arctic Archipelagos north of the Canadian mainland and the

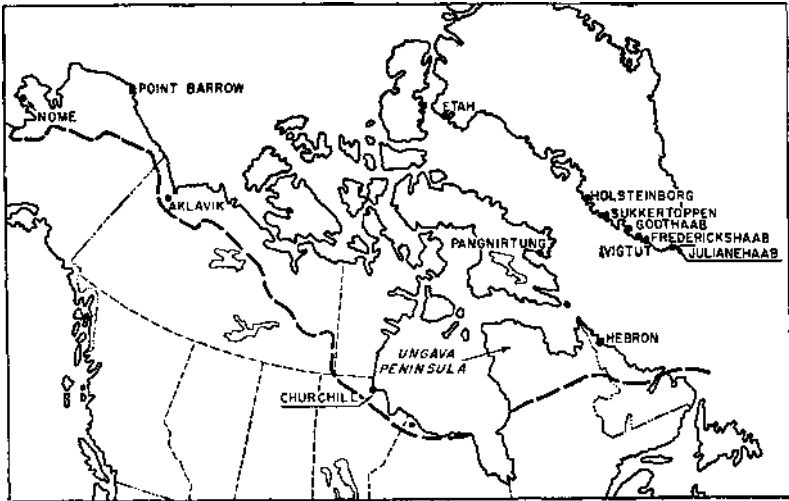


Fig. 280. The Tundra: a region of hunting, fishing, and mining.

island of Greenland.³ The region thus comprises parts of Alaska, Canada, Greenland, and Labrador.

The *tundra* is not the God-forsaken, desolate region so often pictured. Writers who used such adjectives as "barren" and "desolate" possibly intended to emphasize little beyond the mere absence of trees, but they actually conveyed a much gloomier picture. "Barren Grounds" is a misnomer. Most of the Arctic Plain of Alaska and Canada resembles the former prairies of the Dakotas, Montana, and Nebraska. While trees are scarce they are not completely lacking; along the Coppermine River spruce grows within 20 miles of the Arctic Circle and on the delta of the Mackenzie, beyond it. Nor is

³ William H. Hobbs prefers to regard Greenland as a continent though he admits convention has designated it as an island. William H. Hobbs, "Greenland, The Advances of a Decade (1921-1931)," *Michigan Papers in Geography*, Vol. 111, 1933, p. 363.

this region cold at all times; in certain places the summers may become hot. Ignorance of the *tundra* "is not directly through a misunderstanding of the facts of geography and meteorology but is rather a survival, in spite of correctly apprehended scientific principles, of ancient inherited opinions about the terrors of the Frozen North."⁴

Climate

There are few regions on the earth whose true climatic conditions are so little understood. Much of what is considered scientific climatic literature is really pseudo-scientific. But the region is vast, varying greatly from place to place, and weather data are so few, scattered, and fragmentary that it will be many years before the climate of the whole is known. Except in books the *tundra* is not a land of perpetual ice and snow. According to Stefansson, 75 to 90 per cent of the surface of Arctic lands is nearly free from snow at all seasons since the light snowfall is mostly swept into the lees of hills. Winter temperatures are low, though higher than in the *taiga* to the south. Point Barrow (Fig. 281) has yet to record winter temperatures as low as those characterizing certain stations in North Dakota and Montana. Extremes become greater south of Point Barrow since the country increases in altitude and is more remote from the ameliorating effects of the ocean. Thus the temperature range at Allakaket, 350 miles to the south, is much greater; whereas the lowest and highest temperatures at Point Barrow are -56° and 78° respectively, those at Allakaket are -70° and 90°. Winters everywhere in the Tundra Region are long and summers short except on the periphery of the oceans. The growing season at Barrow is only 17 days, whereas at Allakaket it is 54 and at Fairbanks it is 89. The snow hardly has time to melt before another winter begins. The growing season in the area north of the Brooks Range in Alaska is less than 40 days.

The precipitation is light, varying over most of the area from 5 to 12 inches, with the maximum in summer. At Point Barrow snow begins falling by the middle of August and the coastal ice holds until July. Air at low temperatures cannot carry much water vapor and the precipitation falls mostly as a fine dry snow or sleet. The amount is small and the number of days it occurs few.

Winds, especially in winter, are very strong and frequently howl day after day. They greatly affect the sensible temperature; "on

⁴Vilhjalmur Stefansson, "Some Erroneous Ideas of Arctic Geography," *The Geographical Review*, April 1922, Vol. XII, No. 2, p. 264.

a quiet day a temperature of as much as -30° is not at all unpleasant if one is suitably clothed; but on a windy day a temperature of zero, other conditions being the same, is much less bearable."⁵

The periphery is greatly influenced by the ocean; thus the Polar Sea is 30° to 40° warmer in winter than lands to the south and it is correspondingly less warm in summer. The Arctic Sea is very cold in summer because (1) it has lost much heat during the previous

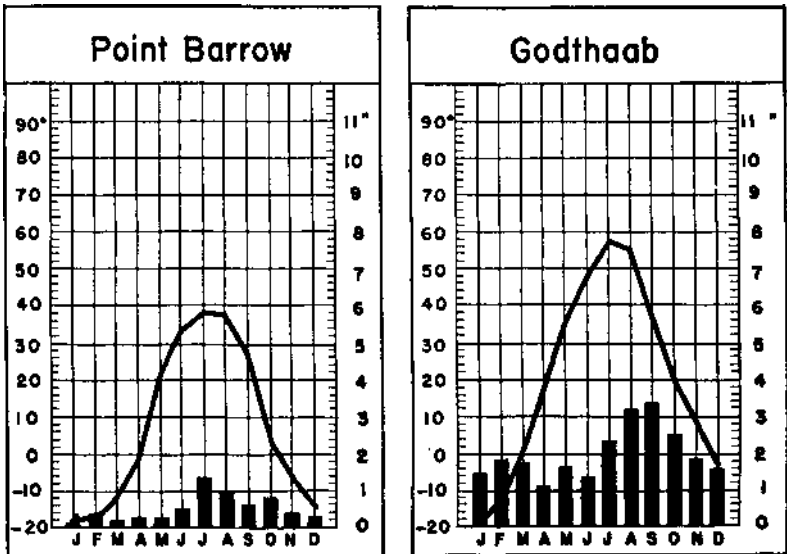


Fig. 281. Average monthly temperature and precipitation for Point Barrow and Godthaab.

winter and (2) its icy surface reflects rather than absorbs most of the light of the summer sun.⁶

North of the Arctic Circle the climatic phenomenon of greatest significance to human beings is the seasonal changes in the length of daylight and darkness. North of the Arctic Circle, the sun may remain continuously above the horizon for more than one day—even as long as five months at the northern extremity of Ellesmere Island, 83° N. latitude.

The strip of Labrador coast is much the same over a distance

⁵ Philip S. Smith, "Explorations in Northwestern Alaska," *The Geographical Review*, April 1925, Vol. XV, No. 2, p. 247.

⁶ Vilhjalmur Stefansson, "The American Far North," *Foreign Affairs*, April 1939, Vol. XVII, No. 3, p. 609.

of 600 miles, latitude playing a minor part. The Labrador Current, carrying floes and bergs, causes the immediate coast to be barren and bleak. If the altitude remains the same, vegetation increases with distance from the ocean. There is no such thing as our summer; frost occurs in every month.

Topography

It is extremely difficult to generalize on the topography of such an extensive region. "The surface features of the polar lands include all varieties of relief, from low, swampy coastal plains to high ice plateaus and glaciated mountains."⁷ Vast lowlands monotonously flat and poorly drained are especially extensive.

Most streams have tortuous courses and estuaries characterize their northern reaches. Near the coast many split into distributaries.

Innumerable lakes dot a large part of the mainland and a part of the Arctic Islands. Some of the lakes are small, some large. Great Bear Lake, for example, with an area greater than either Lake Erie or Lake Ontario, is one of the largest fresh water bodies in the world. The east coast and much of the plateau consists of bald rock—a result of over-riding by glacial ice (Fig. 282). Greenland, Labrador, and the Archipelago have fjorded coasts. Off many of the coasts lies a fringe of rounded islets—*skerries*.

Natural vegetation

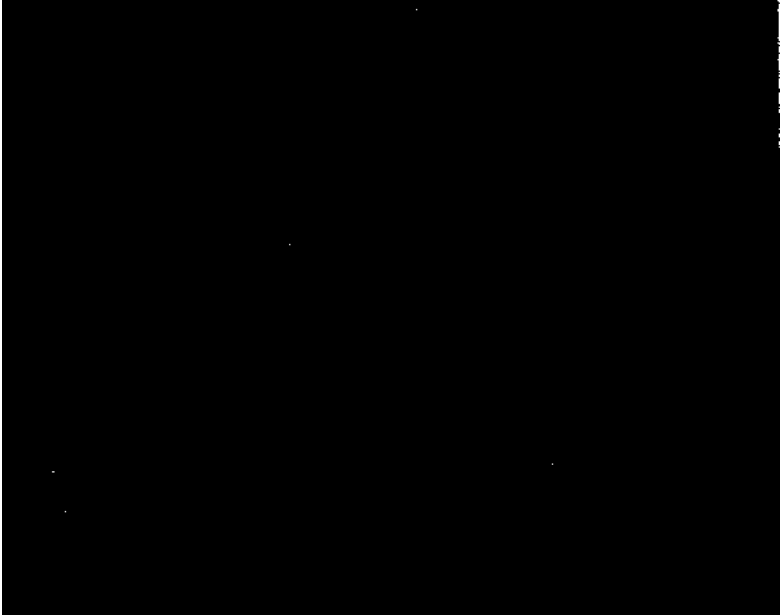
The zone of dwarf vegetation, largely treeless, is known as *tundra* and often is called in North America "Barren Grounds." The *tundra* is of enormous extent east and west but of unequal width from north to south. It penetrates farther south in North America than in Eurasia, reaching the 60th parallel on the east side of Hudson Bay. The southern boundary is exceedingly irregular and is drawn where the last stunted trees disappear. Whether the *taiga* moves farther north or the *tundra* farther south depends upon the velocity of the north winds. In areas sheltered from the fierce winds of the Polar Sea, the forest encroaches upon the *tundra*. Thus in the valley of the Mackenzie the forest straggles to beyond the Arctic Circle—almost to the 70th parallel.⁸ Where flat lands are exposed to the winds, *tundra* conditions advance far to the south invading the forest zone for a considerable distance; they likewise

⁷ Preston E. James, *An Outline of Geography*, p. 295. Boston: Ginn & Co., 1935.

⁸ John Q. Adams, "The Business of Fur Hunting in Canada as an Example of an Extractive Industry," *Journal of Geography*, November 1926, Vol. XXV, No. 8, p. 303.

continue in fingerlike projections into higher altitudes as far south as the Alaska Range.⁸

The *tundra* consists mostly of lichens and mosses; in summer the whole region is virtually a swamp. The less marshy tracts are carpeted with lichens, called reindeer moss, which is the most valuable natural vegetation in the region. Here and there in sheltered



Courtesy Geographical Review, published by
The American Geographical Society of New York.

Fig. 282. Hudson's Bay Company post and Canadian government station at Port Burwell on Ungava Bay. Note how bold, steep, and forbidding the shores are, and how bare of vegetation the terrain is.

spots in a death-struggle grow dwarf willows and birch. The *tundra* is underlain by perpetually frozen deep strata of earthy matter.

Native animal life

Native animal life is far more abundant than one might expect. Among the most characteristic mammals are the Arctic hare, Arctic

⁸ John W. Harshbarger, "Tundra Vegetation of Central Alaska Directly Under the Arctic Circle," *Proceedings of the American Philosophical Society*, Vol. LXVII, 1928, No. 1, pp. 215-234.

fox, caribou, ermine, lemming, muskox, and wolf. The lemming, never found outside the *tundra*, lives solely on grass roots and stalks, mosses, and reindeer lichens. The caribou and muskox, at home on the *tundra*, graze throughout the year—pawing the light snow cover away in winter. With its shaggy long coat of hair the caribou thrives even during the severest gales. The Arctic fox (white and blue) ranges as far south as the lower end of Hudson Bay but never leaves the *tundra*. The polar bear lives along the coast and on the ice-floes where he can fish and kill seals and walruses.

Birds, extremely numerous in summer, arrive by the million to breed in the seclusion and security of the *tundra*. They are also attracted by the prolific insect life. The snow owl, ptarmigan, gerfalcon, raven, and snow bunting are year-round habitants.

Marine life is more abundant than land life, for the sea teems with small forms such as Crustacea which attract mollusks and fish. Most characteristic of the larger sea animals are the seal, walrus, whale, and sea elephant.

Because of the abundance of poorly drained land, insects find this region a paradise. Mosquitoes, probably present in greater numbers here during summer than anywhere else on earth,¹⁰ plague man and beast alike and there is little escape from their constantly pestering presence. In some parts of the region men must wear thick clothes, veils, and gloves in late summer. During the "big trek" from Alaska to Canada, when mosquitoes and warble flies descended on the reindeer, the animals bolted to the ocean to benefit from breezes and the soothing effect of salt water.¹¹

Economic Activities

Fishing

Fishing on a subsistence basis is important both in summer and winter. The Eskimos use leisters, harpoons, hooks, and nets. The leister consists of a pointed middle prong and two elastic side prongs of antler, which are barbed to hold the fish. It is fitted to a long wooden shaft. Inland tribes on the "Barren Grounds" and in the Colville River area in Alaska employ the harpoon. When this method is used the Eskimo from a small snow hut watches for the

¹⁰Preston E. James, *An Outline of Geography*, p. 291. Boston: Ginn & Co., 1935.

¹¹Ovid M. McMillion, "Reindeer Trek," *Journal of Geography*, April 1939, Vol. XXXVIII, No. 4, p. 135.

fish through a hole in the ice. The most important method of fishing through the ice is with a jig—an unbarbed iron hook set in the under edge of an oval bone sinker. Deep-sea fishing is carried on only in the outer regions—Alaska, and Greenland-Labrador, where cod and halibut are present in great numbers. Cod are caught with a jig and halibut with a special kind of composite hook.¹² However, much of this fishing is commercial, modern methods being used. Only the commercial fishing of Labrador and Greenland are considered in this chapter, since commercial fishing in Alaska is discussed in Chapter XXI.

Labrador. Fishing is the only economic enterprise of note in this segment of the region, entire communities depending almost wholly upon it. Actually the people have but one idea, one interest—fish. This is natural where the sea is rich in plankton and fish, and the land exceedingly poor in minerals and agricultural possibilities. Coastal Labrador lacks most of the qualities that make life easier in other parts of the world, and hence opportunities for making a living are indeed limited. If fish were not abundant there would be no people. According to the late Sir Wilfred Grenfell, the Labradorians are on "a cod standard rather than a gold standard."

Fishing is carried on only in summer—the season beginning in late June. Trap nets 320 feet long, 50 feet wide, and 45 feet deep are set in the sea like huge boxes. A heavy catch is procured until winter abruptly terminates the season. Labradorians (*Liveyeres*) and some 15,000 to 20,000 Newfoundlanders fish in these cold waters, the latter coming in boats of all sizes. Although the *Liveyeres*, Newfoundlanders by birth but Labradorians by adoption, work hard, remoteness from markets retards their progress. In the average village each family accumulates nearly 39,000 pounds of fish of which 30,000 should be marketed. Remoteness, however, makes this impossible and the surplus is converted into fertilizer. Sir Wilfred Grenfell went to the heart of the problem when he said man's laws prevent prosperity here:

We noted recently when leaving Labrador . . . hundreds of tons of good fish lying unsold in the stores, wharves and vessels' holds belonging to men who needed wheat above all things; . . . a week later in New York we saw thousands of hungry men line up for a bite to eat, with thousands of tons of wheat rotting in government stores.¹³

New methods of quick freezing should enable Labrador to market its fish in the United States. Experimental shipments were sent to

¹²Kaj Birket-Smith, *The Eskimos*, pp. 94-96. New York: E. P. Dutton & Co., Inc., 1935.

¹³*The New York Times Book Review*, May 13, 1934, p. 4.

England during the latter 1930's and the fish were reported to be in good condition upon delivery.

Greenland. Commercial fishing on the south and west coasts became important in 1906 as a result of the decline in the number of seals in South Greenland. The Danish Government rendered considerable aid to the fisheries. It established and supervised fishing stations; it aided in the selling of the fish; it sent experts to organize and conduct the industry along modern lines; and it procured for the native a more favorable income from his fish.

Formerly the Eskimos fished almost exclusively from *kayaks* (Fig. 283) and by means of hand lines. Now they employ European boats—even motorboats.

The principal fish caught are cod, halibut, Norway haddock, salmon, caplin, and Greenland shark. The catch is taken to stations and canneries in the Holstensborg, Sukkertoppen, Godthaab, Frederickshaab, and Julianehaab districts where they are prepared for export (Fig. 280).

What the fisheries mean to the modern Greenland community is indicated by the fact that exports rose from 17 barrels of halibut in 1904-1905 to about 3,000 barrels in recent years (one barrel being the equivalent of about 500 pounds of live-weight fish). Greenland also exports about 7,000 tons of cod per year.

Hunting

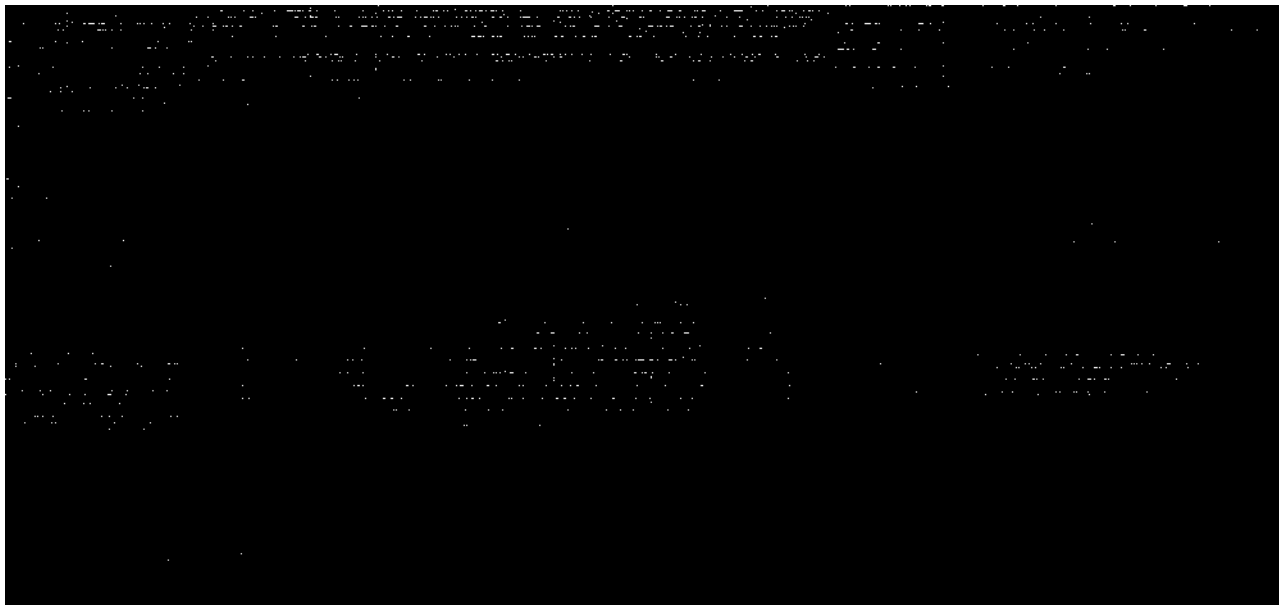
Since edible plants are largely absent, the Eskimos, who constitute nine tenths of the population, are hunters. Upon the success of hunting and some fishing depends their comfort, health, happiness, and life itself. Despite skill and persistence in hunting starvation is not uncommon because game is not plentiful.

Sea hunting. Nowhere on earth are there more skillful sea hunters than the Eskimos. They know the intimate habits of all animals. Even their villages are located with respect to hunting grounds and navigable water.

The most valuable animal of all is the seal. "Eskimo life revolves around the seal, which provides shelter, clothing, food and fuel,"¹⁴ *Kayaks* are used exclusively in sea hunting (Fig. 283).

Ice hunting for seal, walrus, and polar bear, takes place only when the ice is firm. Polar bears are sought on moonlight nights in winter and in the dazzling sunlight of spring, dogs being used, though not for the kill.

¹⁴ *Natural History*, June 1938, Vol. XLII. No. 1, p. 60.



U. S. Indian Service,

Fig. 283-A. "Kayakers" and fish drying on the racks at Unalakleet, Alaska. Both are hung out of reach of hungry dogs. This photo gives an excellent idea of the size and construction of the "kayaker." It is made of a patchwork of raw sealskin stretched on a driftwood frame and kept waterproof with seal oil. Diamond Jenness has called the "kayaker" "The cleverest one-man vessel afloat"; an Eskimo can keep up with *on* ordinary motorboat, making 10 miles *on* hour without great difficulty. Note **the** driftwood on **the** beach; this is **used for** "kayakers," igloos, and caches.

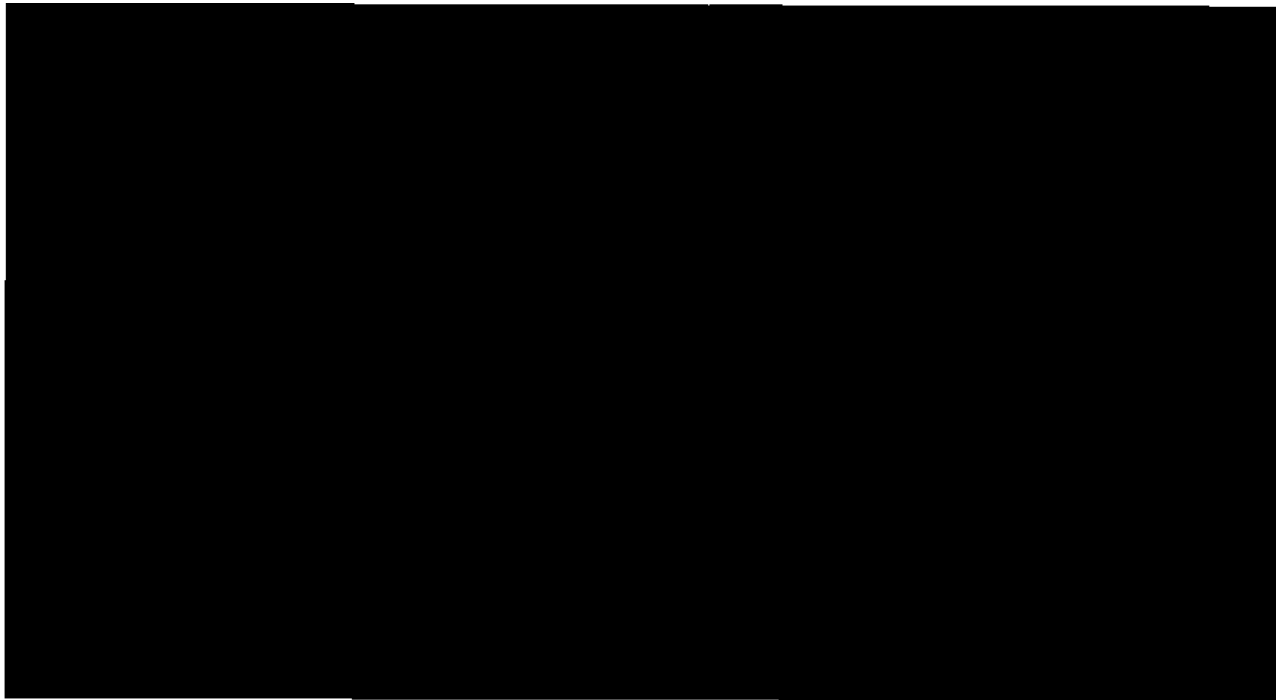


Photo by Highton. Courtesy Federal Works Agency.

Fig 283-B The Eskimo "kayak" does in the water what the swallow does in the air." Among aboriginal craft, only the canoe of the South Sea islander equals the graceful, slender "kayak!" The water proof dress worn by the Eskimo is tied tightly around the boat to exclude all water.

Land hunting. Land hunting, though not so necessary as that on sea and ice, is, nevertheless, important. Caribou, hare, fox, and birds provide sleeping bags, stockings, furs, and birdskin underwear. The meat of these animals also adds variety to the Eskimo's diet.

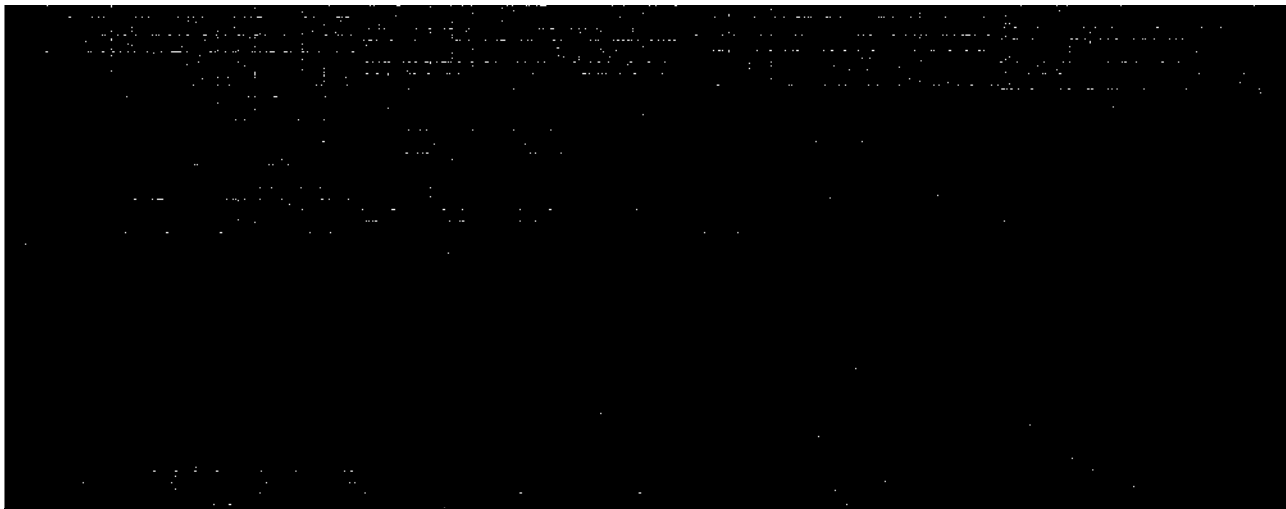
Trapping in the *tundra* is not nearly so important as in the *taiga*. However, fur-traders have induced the Eskimo locally to trap for skins as well as for meat, clothing, and shelter. This has led to overexploitation of certain animal resources, chiefly the white Arctic fox. Moreover, in parts of the region, outsiders are carrying on commercial trapping near native villages. Accordingly some trapping areas have been so badly exploited by white men that the natives must migrate or starve. In Alaska some whites use air-planes to get themselves and their supplies into the choicer areas, whereas Eskimos must rely on dog teams.

Commercial trapping also ties the Eskimo to the white man's world on which he depends both for necessities (traps) and luxuries (phonographs). Whereas formerly the Eskimo hunted caribou and seals for clothing and meat, he now frequently traps, getting his clothing and food from the trader. As a result of this arrangement Eskimo trappers in Arctic Canada, who are unsuccessful or unskilled, go on relief—trading goods being paid for by the government.¹⁵ In Greenland, the natives frequently trade blubber and skins which they really *need for themselves*, for coffee, dried peas, flour, rice, sugar, and tea—European foods for which they have acquired a taste.

Grazing

Throughout Anglo-America as a result of the depletion of the native food supply by the whites, the respective governments are attempting to transform the natives from hunters into graziers. Observing that Siberian Chukchee Eskimos kept reindeer as insurance against famine during the periodical depletion of wild life and sea food, two Americans, Sheldon Jackson and Michael Healy, purchased reindeer in Siberia and employed Lapp herders to instruct the Alaskan Eskimos, who were then apprenticed for 4 years in the care of reindeer. At the end of their apprenticeship each owned a herd of approximately fifty. Actually the animals require little care, for they need no shelter and secure their own food (Fig. 284). They must be herded, however, to prevent straying and to protect them against predatory animals, particularly wolves.

¹⁶ John Q. Adams, personal communication.



U. S. *Indian Service.*

Fig. 284. Reindeer being driven into c corral at Egavik, Alaska. In the "tundra" of Arctic Alaska, where pastures consist mostly of mosses and dwarf willows and where winter nights are long, horses and cattle cannot be reared. Accordingly, the reindeer is *and* must be **the** one stable source of food, of clothing, ond to a lesser extent of income for the native.

North America today has half a million reindeer. So long as white men and Eskimos used the same ranges there was serious overgrazing and there were numerous misunderstandings. Accordingly the United States government purchased all the reindeer owned by non-natives and now prohibits ownership except by Eskimos.

The Big Trek. Recently the Canadian government, noting that the supply of game for its Eskimos was fluctuating and being favorably impressed by the American experiment in Alaska, contracted for the delivery of 3,000 reindeer from Alaska to Kittygazuit, east of the delta of the Mackenzie. It was believed that with these as a nucleus the whole of northern Canada might be stocked in due time. The drive, estimated to take from 18 to 24 months for a distance of about 1,600 miles, actually required 5 years and the distance covered was 2,500 miles. Herders and animals suffered untold hardships—avalanches, exposure to frost, snow slides, storms, fogs, intense cold, attacks by wolves, bears, and insects, and shortage of food. Though 2,370 animals were delivered, it is estimated that only 10 per cent of them actually started in Alaska.¹⁶ The rest were born enroute.

Attempts to introduce reindeer into Labrador and Baffin Island have met with little success. In Greenland reindeer have not yet been tried but it is believed they would succeed since a few cattle have been kept there since 1782 (there were 70 head in 1929) and sheep have been reared successfully since their introduction in 1900. In 1934 there were about 8,000 (mostly Icelandic) sheep in west Greenland.¹⁷ Livestock must be kept in sheds during winter and are fed almost entirely on cured native grasses and willow along with turnips and dried fish.

Minerals and mining

Considerable mineral wealth is known to exist in this region and possibly new strikes of sensational importance may be made in the future. Transportation difficulties, the curse of the *tundra*, have retarded commercial mining. Much of this region has never been prospected and there is very limited information regarding it. Aviation more than anything else is opening up the Canadian and Alaskan mineral fields; airplanes can reach the most remote dis-

¹⁶ Ovid M. McMillion, "Reindeer Trek," *Journal of Geography*, April 1939, Vol. XXXVIII, No. 4, p. 140.

¹⁷ Kaj Birket-Smith, *The Eskimos*, p. 218. New York: E. P. Dutton & Co., 1935.

tracts in a day or two and can transport supplies to sections which prospectors previously considered too remote. A map of commercial mining in Anglo-America shows only a small amount of saxicultural activity in this region. It is known that there is considerable petroleum in northern Alaska and northern Canada. The United States has set aside in northern Alaska the Naval Petroleum Reserve, a tract of about 35,000 square miles. Coal also is widely distributed. In the Alaskan part of the region, more than a dozen beds of sub-bituminous and bituminous coal ranging from 4 to 20 feet in thickness are known and coal-bearing rocks have been found through a belt of country 100 miles wide and 300 miles long. This coal supply should prove of inestimable value locally because of the absence of other fuel. Many coal beds outcrop near the coast and hence could be lightered to seagoing vessels.¹⁸ Soft coal is mined and used in settlements in northeastern Baffin Island. There is also considerable coal on the west coast of Greenland, but the quality is not good. Therefore, it is used only locally by the natives and Europeans. The beds vary from one to 9 feet in thickness and annual production is only about 2,000 tons.

The only deposit of commercial cryolite in the world is being worked in southern Greenland at Ivigtut. The mine, a great quarry mostly below sea level, is one of the most northerly on earth, its royalties providing the colony's chief revenue. The mining season is limited to 7 months—April to November, when water is available for sorting. Danish labor is used for mining all minerals except coal, the government allowing Eskimos to dig coal for their own use.¹⁹ Some marble is quarried at Marmorilik in North Greenland, and prior to the second World War was sent to Denmark.

A deposit of pitchblend yielding radium is being mined from an almost inexhaustible supply of ore at Great Bear Lake. Total production, however, is small when compared with that of the Belgian Congo. However, since 1937 Canada has ceased publishing statistics on production.

The white men who do come into the *tundra* to mine quickly change their mode of living, adopting some of the customs of the Eskimos and relying on their aid in the hostile Arctic climate.²⁰

¹⁸ Philip S. Smith, "Explorations in Northwestern Alaska," *The Geographical Review*, April 1925, Vol. XV, No. 2, p. 252.

¹⁹ *The Geographical Review*, July 1923, Vol. XIII, No. 3, p. 476.

²⁰ Harold A. Innis, "The Hudson Bay Railway," *The Geographical Review*, January 1930, Vol. XX, No. 1, p. 27.

Agriculture

Since the *tundra* has so short a growing season—much of it only 40 days—commercial agriculture is impossible. The late Wilfred Grenfell believed that the Labrador climate would never permit cereal production in sufficient quantity to supply the needs of the people.²¹ In Canada, however, wheat has been grown successfully 100 miles north of the Arctic Circle. In certain highly favored localities hardy vegetables such as turnips and radishes have been grown as far north as latitude 66° degrees. In Labrador cabbage, beets, and lettuce are also grown, providing seeds are started indoors while snow still covers the ground. In Greenland attempts to grow hardy grains (barley) have not been successful; though the crop makes satisfactory forage it never ripens. Root crops such as turnips, radishes, and potatoes, however, are successfully grown. J. W. Tyrrell, thinking in terms of any appreciable development of agriculture, says in his book, *Through the Sub Arctic of Canada*, "Agricultural development is not to be expected anywhere in the northern parts of the district."

Transportation

One of the biggest hurdles to economic development in this region is transportation. The *tundra* is almost impassable in summer except by canoe and in winter save by dog-team. Railroads and roads are almost non-existent for they could not pay in so thinly populated a region. Villages on the sea are accessible to small ocean-going vessels for a few weeks each year (the open season on the coast near Barrow, Alaska, is practically limited to the month of August).²² Only products of high value in proportion to bulk or weight such as furs and gold can stand transport very far by sledge or canoe. Thus a ton of furs valued at \$70,000 and one of gold valued at \$500,000 may be handled this way.²³

The airplane is breaking down the region's isolation by reducing travel time from weeks to hours. Areas formerly too far away for mining are now within easy reach as indicated by the air rush to the mineral strikes near Great Slave Lake, 600 miles north of

²¹ Sir Wilfred Grenfell, "The Problems of Labrador," *Canadian Geographical Journal*, November 1933, Vol. VII, No. 5, pp. 202-203.

²² Philip S. Smith, "Explorations in Northwestern Alaska," *The Geographical Review*, April 1925, Vol. XV, No. 2, p. 246.

²³ Alfred H. Brooks, "The Value of Alaska," *The Geographical Review*, January 1925, Vol. XV, No. 1, p. 41.

Edmonton. The airplane not only carries the miner and his equipment, but mail, medical supplies, and food. It also establishes gasoline caches. Maps accurate to minute detail are now being made from aerial photographs. Moreover, rather than wait for the open-water shipping period of late summer, trappers are employing airplanes to bring out bales of prime furs during winter when the highest prices prevail.

The *Hudson Bay Railway*, 510 miles long, extending from The Pas, Manitoba, to Churchill on Hudson Bay, passes through a flat country, broken by lakes and rivers. The terrain offers few construction difficulties except where spongy soil requires heavy ballast. Churchill rather than the closer Port Nelson was selected because harbor works could be constructed at less expense.

This railway was built by the Dominion government for political rather than strictly economic reasons. To escape the monopoly of the Canadian Pacific Railway and the equally long haul on the Canadian National Railway, Prairie Province wheat farmers demanded the construction of this line, declaring that the depression following the first World War was caused and prolonged by high freight rates. "The possibilities of the line were kept constantly before the government's at tent ion."²⁴

Edmonton and Calgary in the wheat belt are a thousand miles closer to Churchill than to Montreal. The Hudson Bay Route, however, is dangerous and the navigation season short; it is free from ice for only 3½ to 4 months—from the middle of July to the middle of November. Fog, too, is bad but no worse probably than on the coast of Nova Scotia.

The railway offers little hope for commercial success, shipments of wheat being relatively small. Mining now provides most of the local traffic.

Trade

Trade is unimportant in this large and sparsely populated region where the majority of the inhabitants live outside a money economy. So far as the natives and even some of the whites are concerned, trade is mostly by barter. The Eskimos trade furs (chiefly white fox), ivory, and fish for guns, ammunition, knives, needles, thread, cloth, tea, coffee, tobacco, and even lumber, iron, kerosene, and stoves. An exception is the trade in Greenland where a Danish state monopoly exists and where barter has been replaced by an

²⁴ Harold A. Innis, "The Hudson Bay Railway." *The Geographical Review*, January 1930, Vol. XX, No. 1, p. 6.

exchange of products on a cash or credit basis. The Labradorians (whites) who trade with the Hudson's Bay Company get a service not entirely satisfactory to them but necessary since there is no other outlet for their wares.

The People and the Future

The Hudson's Bay Company has located posts at strategic points on James Bay, the west shore of Hudson Bay, Ungava Bay, and in the interior at important river junctions or at strategic portages.

All of the native inhabitants are nomadic, since fishing and hunting grounds are widely scattered and food supplies are soon exhausted in one spot.

In the southern part of the region, small groups of people live along the streams. Farther north there are fewer people and these are confined to the coasts. Most Eskimos, largely dependent on the seal, walrus, and fish, place their villages along the seacoast.

The Eskimo

The Eskimos, fur-clad hunters of the north, girdle Polar North America, little disturbed by other races (Fig. 271). Those who went into northeasternmost Greenland disappeared, being gradually and completely destroyed by an environment they could not overcome.²⁵ The Polar Eskimo of northwestern Greenland, the most northerly people in the world, were completely separated from their nearest neighbors when first discovered by John Ross in 1818. They had lived in isolation so long they had forgotten their origin and believed themselves to be the only people in the world.

The name Eskimo is derived from "Eskimeg" meaning "eaters of raw flesh" and was used by the Amerinds as a term of contempt. The Caribou Eskimos, who occupy an interior area west of Hudson Bay (Fig. 271) are the only group who do not live on the seacoast. Some of these have never visited the coast and some adults have never seen a seal. The main occupation throughout the year is hunting caribou, the autumn hunt being best. In summer and winter when caribou-hunting is less profitable the Eskimos do some fishing in streams and lakes.²⁶

Nowhere else on earth are human beings faced with so severe and grudging an environment, and yet the Eskimos have learned

²⁵ *The Geographical Review*, October 1934, Vol. XXIV, No. 4, p. 695.

²⁶ Knud Rasmussen and others, "The Danish Ethnographic and Geographic Expedition to Arctic America," *The Geographical Review*, October 1925, Vol. XV, No. 4, p. 540.

how to *endure* and *enjoy* the "unspeakable tedium of the long winter." The cultural elements that have enabled them to survive are (1) their methods of hunting seals on ice and in the water, (2) the snow-house, (3) the blubber lamp, (4) the Eskimo dog and sledge, and (5) the clothing made mostly from furs and perfectly adapted to the climate.

Clothing, dwellings, *kayaks*, and weapons all are human triumphs. Furs of a minimum weight will keep the body at an even temperature regardless of winter weather. With proper garments man can be as comfortable in polar regions as anywhere.²⁷

Since heating and lighting must be done solely with oil lamps, Eskimo houses usually have but one room, circular or oval in shape and about 10 by 14 feet. The temperature inside the houses is always high—80 to 90 degrees being not uncommon. Windows of translucent lake ice or of seal or walrus intestine that has been "cleaned, dried, split, and sewn together into a two-foot semi-transparent square" impervious to frost are often set in the dome.

During the winter most Eskimos live in *igloos* made of rocks covered with sod (Fig. 285), though some live in snow-houses built around a skin tent to prevent dripping from the roof. As melting begins in the spring, sod and snow-houses are abandoned and are replaced by sealskin tents or *tupiks*. The Caribou Eskimos live in snow-houses in winter and in conical deer-skin tents in summer. To some extent in Labrador the snow-house is the sole winter dwelling. The *kayak* (Fig. 283B), a perfect vehicle used for hunting on the sea, is built on a framework of driftwood and whalebone held together by tendon and decked over with raw sealskin.

The Eskimos of southern Greenland, who fish both in coastal waters and the open sea, have become experts in the handling of *kayaks*. Those of northern Greenland, where the coast is frozen virtually all the time, have become skilled in the handling of dog sledges and in hunting on the ice.²⁸ The *sledge*, also a remarkable contrivance, is made of driftwood (when this is available) and of whalebone or ivory (Fig. 286). Wooden poles 3 to 4 inches by 8 to 12 feet, used to make these sledges, have recently become regular articles of trade at the posts. Harpoons, spears, and bows and arrows are other ingenious adaptations to the physical environment and the materials at hand.

²⁷ Clarence E. Koeppe, *The Canadian Climate*, p. 225. Bloomington, Illinois: McKnight & McKnight, 1931.

²⁸ *The Geographical Review*, October 1934, Vol. XXIV, No. 4, p. 695.



U. S. Indian Service

Fig. 285. An Eskimo family and its mud igloo on Alaska's Arctic Coast.

The Eskimo's contact with white men: gain or loss? All Eskimos have now had contact with white men—those in southern Greenland for centuries and those of the Copper River region since 1908. Probably the last independent native group in Anglo-America to come in contact with the white man was that at Igloodik at the northern end of Fox Basin. Here in the summer of 1938 came a resident missionary followed the next year by Hudson's Bay Company fur-traders. Nearly all Eskimos have been Christianized and are losing their native culture.

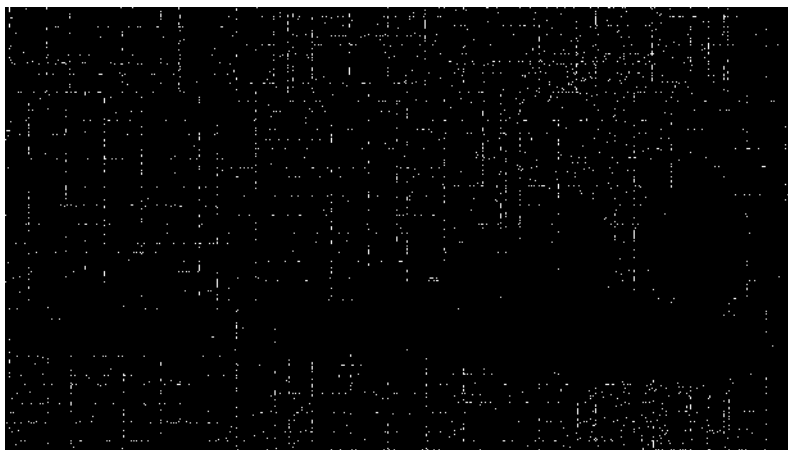


Photo by John G. Cormack.

Fig. 286. Dog team and sledge.

They have rapidly adopted the white man's tools and civilization but at great cost. They are fast losing mastery over their environment and it seems unlikely that they could subsist as did their fathers. They are now utterly dependent for some essential foods, weapons, and tools. The white man's high-powered rifle has upset the balance of the game supply. The white man has also encouraged the Eskimo to kill for furs rather than for food, clothing, and shelter, which has resulted in overexploitation of animal resources.

The Eskimos in many places have given up the skin and stone-sod dwellings of their fathers and are building frame houses or using canvas tents. John Q. Adams reports that canvas tents formed 90 per cent of the summer homes he saw from north Hudson Bay to Ellesmere Island in 1936. Whereas the ancestral home was easy to build and was cheap, the wooden one is just the reverse

Furthermore, Eskimos are not clean. When they move from the winter *igloo*²⁹ to the summer *tupik*, they escape the dirt; but now with a permanent abode, dirt and filth accumulate year after year, making conditions extremely unhealthy. To keep out winter cold the Eskimo must fill every chink and he even closes the keyhole.³⁰ By contact with foreigners he is losing his native honesty, independence, and sterling character.³¹

Then there is the matter of crossing of breeds. The part-breed Eskimo is not uncommon. In Alaska racial diffusion has been increasing "with greatly accelerating speed."³² In Greenland there is a strong admixture of Eskimo and Danish, Dutch, and English. Few mixed bloods are found in Canada, however, because of the missionaries and the backing they have gotten from the mounted police.³³ Whether ultimately this racial blending will be for good or ill is a controversial question on which anthropologists and sociologists do not agree.

The future of the Eskimo. Despite paternalistic considerations shown the Eskimos by the several governments, these folk cannot long endure a civilization that is sweeping them out of a past 10,000 years away. They cannot compete with the white man; they are deteriorating from the use of European food; and they are dying off from introduced diseases such as measles, small-pox, tuberculosis, and syphilis. Dentists who have examined the teeth of meat-eating Eskimos find few dental caries, but in the teeth of those who eat the food of the white man, they find much tooth decay. The Eskimos also find it difficult to resist the white man's temptations, and moral degeneration has set in.³⁴

It should be said to the credit of Denmark that under her intelligent and progressive guidance, every precaution was taken to protect the Eskimos in Greenland. It was a closed country, open only to certain Danish officials and to scientists vouched for by their own governments and approved by the Danes. Accordingly, the natives increased in numbers, improved in health, and gained

²⁹ "Thom does not seem to be unanimity regarding the word *igloo*. In Alaska and Greenland, for example, *igloo* is the common term for the winter dwelling of the Eskimo, but in northern Canada the term seems to apply only to the snow-house.

³⁰ A. E. Parkins, "The Changing Eskimo," *Journal of Geography*, May 1923, Vol. XXII, No. 5, p. 183.

³¹ W. Elmer Ekblaw, "The Ecological relations of the Polar Eskimo," *Ecology*, Vol. II, No. 2, April 1921, p. M1.

³² H. Dewey Anderson and Walter C. Eel Is, *Ata-a Natives*, p. 105. Stanford University Press, 1935.

³³ John Q. Adams, personal communication.

³⁴ Sir Wilfred Grenfell, "The Problems of Labrador," *Canadian Geographical Journal*, November 1933, Vol. VII, No. 5, p. 210.

in wealth. Greenland became the outstanding example of progressive colonial government in Polar lands.

The white man

Norsemen under Erik the Red reached Greenland in 986 with 14 ships and about 400 people. A republic was maintained from 990 to 1261—271 years. These immigrants survived as Europeans as late as 1520 and then disappeared as though the earth had swallowed them up, leaving no authentic records. Recent research indicates that they merged with the Eskimo population, and that they were absorbed, not lost. After all it was better for a Norwegian girl to marry an Eskimo and live than it was for her to stick to her European culture and die.³⁵

Most of the whites who live in this region today are government officials, missionaries, and fur-traders, except for the miners at Ivigtut and near Great Bear Lake and some 4,000 white fishermen resident in Labrador. The last-named, known as *Liveyeres*, live hard lives in a stern environment. Even here there has been some crossing and the part-breed Eskimo is everywhere.³⁶

The *tundra* country belongs to the Eskimo and the white man's only chance to succeed appears to be to live as does the Eskimo.

Villages, Settlements, and Hudson's Bay Company Posts

Settlements (often called "villages") in the *tundra* usually mean a cluster of a few *igloos* or *tupiks* or of several houses;³⁷ they may even mean a store or a Hudson's Bay Company Post. Food-getting activities make impossible large units of concentrated populations.

The characteristic abode of the Eskimos prior to the coming of the white man was the permanent village located at some spot on the coast or on a river bank of a coastal stream suitable for hunting and fishing. The major location factor was proximity to navigable water containing sea mammals. The hostility of interior Indians (Alaska and Canada) also influenced the Eskimos to settle in the *tundra*.

In northwestern Greenland are several semi-permanent settle-

³⁵ *New York Times Book Review*, February 12, 1939, p. 2. Review of Vilhjalmur Stefansson, *Unsolved Mysteries of the Arctic*. New York: The Macmillan Co., 1939.

³⁶ O. W. Junek, *Isolated Communities: A Study of a Labrador Fishing Village*, p. 22. Cincinnati: American Book Company, 1937.

³⁷ A. A. Zagoskin (*Notes on a Walking Tour of Part of Russian-America in 1842, 1843, 1844*, St. Petersburg, 1847, pp. 39-41) counted 80 houses in 21 villages or about 3 houses per village. The largest village had 6 houses with 130 inhabitants and the **smallest** a single house with 5 inhabitants.

ments where families seldom remain more than a year or two since the tributary hunting grounds lack a variety of game. Where wild life is more abundant, however, a village may be occupied year after year. Greenland's largest settlement has less than 1,000 inhabitants, and most settlements have 70 or less. Only a few Greenland settlements have permanent Danish residents. Less than 300 white people live in all Greenland.

Julianehaab (450), one of the largest villages in Greenland, lies at the mouth of a river in a pocket-like basin of a topographically rugged promontory in the extreme south. Facing south it gets protection and considerable solar warmth and is accessible by surface ships during practically the entire year.

It is loosely agglomerated, each building and dwelling reaping the benefit of some special advantage of site, such as flat surface or nearness to docks.³⁸ The Danish buildings, usually of one story, are set on stone foundations, have steep-sloping roofs, are painted red with white trim and front on the fjord. The native Greenlanders' home ranges from the semi-subterranean with its rock walls to the typical European type. Denmark has a government agricultural experiment station here.

Godhavn (327; only 27 are Danes), capital of North Greenland, is perched on a rock bench at the edge of the sea.³⁹ Immediately behind it rise great red mountains cut by ravines. The coast in this part of Greenland is characterized by the "*Skaergaard*" or skerry fence. Godhavn has an excellent harbor though it can be entered from the south only by skilled pilots. During the season when the bay is open, it is not uncommon to see one or more Danish whaling vessels in the harbor. There are many dogs here since the winter is sufficiently cold for solid sea ice to form in the bay, thus making sledging practicable.

Godthaab (700 to 800), capital of South Greenland, has a site almost identical with that of Julianehaab. It differs markedly in appearance from the fishing villages of Labrador. Whereas they frequently seem decadent, Godthaab looks prosperous; most of its buildings (a church, hospital, houses of Government officials, storehouses, schools and radio station) are painted.

Because the fjords in this part of Greenland do not freeze in winter and because the rocky surrounding hills are ill-suited for

³⁸ Herman R. Friis, "Greenland: A Productive Arctic Colony," *Economic Geography*, January 1937, Vol. XIII, No. 1, p. 85.

³⁹ N. G. Ricketts and P. D. Trask, *The Marion Expedition to Davis Strait and Baffin Bay*, Bulletin No. 19, Part I, U. S. Coast Guard, Washington, D. C.: 1932. pp. 18-19.

sledging, dogs are not kept and hence goats and ducks are raised.

Angmagssalik (650), is the only settlement on the east coast of South Greenland and it lies south of the Arctic Circle. High mountains of Alpine character form its hinterland. The coastal belt is broken into numerous high rocky islands which, as a result of currents, are connected by open water even when the ice pack is solid outside. This permits the hunting of seals.

This settlement, though known only since the eighties, has been



Courtesy John Q. Adams,

Fig. 287. Pangnirtung and the Fjord. Though appearing small on the landscape, Pangnirtung is the metropolis of the Canadian Arctic. It was established in 1921 in order to obtain fox furs. The buildings at the left are those of the mounted police and the Hudson's Bay Company; those in the right center are a mission and hospital; those at the extreme right on the shore are a whaling station.

invaded by the white man with his religion and his wares. Once each year a ship appears to obtain the output of polar bear and Arctic fox skins.

Hebron, on Hebron Bay, Labrador, is the northernmost village OF the Atlantic Coast of North America. The population, mostly Eskimo, depends upon products of the sea rather than of the land. A Moravian Mission is located at Hebron.

Pangmrtung (569), located on Cumberland Sound in southeastern Baffin Island, was established as a "post" by the Hudson's Bay Company (Fig. 287) in 1921 to obtain white fox furs. In addition to the fur-trading activities are a Royal Canadian Mounted Police Station, a mission which includes a school and a hospital, and a

small whaling station.⁴⁰ It is one of the most accessible settlements in the region, both to the white man who comes by sea and to the Eskimo who comes overland or along the shore. Hence it has grown much in the past few years. Though larger than other Arctic settlements, it appears small in the landscape. The 16 low wooden buildings and half dozen tents line the low ice-polished ledge which juts out into the fjord. The occupied area is only 700 yards long and 200 yards wide. It possesses a small stream that provides fresh water in summer.

Churchill, (1,813 in 1931; 236 in 1941), one of the more important settlements in the Tundra, is located on Hudson Bay at the mouth of the Churchill River. A squatter town with a transient population, its permanent residents, numbering not more than 20, work for the government, the railroad, Hudson's Bay Company, or are connected with the missions.

The white population, demanding a high standard of living, has enforced elaborate preparations for procuring water and disposing of sewage. Fresh water is brought 8 miles from the Churchill River in 10-inch pipes heavily insulated with muskeg and kept moving by means of a pumping station. Churchill owes its existence primarily, if not entirely, to the Hudson Bay Railway of which it is the northern terminus. Its modern grain elevators can store 2½ million bushels of wheat and load 3 vessels simultaneously at the rate of 8,000 bushels per hour. Yet the port moves only a small part of the wheat it is capable of handling.

Aklavik (town and district 411; 91 whites, 180 Indians, 140 Eskimos). Ninety per cent of these live in Aklavik in summer; in winter it is estimated that there are only 60 whites, 60 Indians and 10 Eskimos.⁴¹ The settlement is located on the combined delta of the Mackenzie and the Arctic Red River and serves as the trade center for white and Indian trappers from the inner delta and for Eskimos - from the outer delta and adjacent coasts. Some few prosperous Eskimos go as far as Banks Island in their gasoline power-boats. This concentration of people has attracted two missions: the Roman Catholic and the Church of England. The latter also maintains a large mission school. A hospital is operated jointly by the Church of England and the Canadian Government.

Aklavik is also the center of government services for its tributary area. These services which include a Royal Canadian Mounted

⁴⁰ John Q. Adams, "Settlements of the Northeastern Canadian Arctic," *The Geographical Review*, January 1941, Vol. XXXI, No. 1, p. 119.

⁴¹ Canadian Department of Mines, *Canada's Western Northland*, 1937.

Police Post, a wireless station, and part of the administration for the Alaskan reindeer herd now kept on Richards Island in the delta. Aklavik has two small independent traders in addition to those with the Hudson's Bay Company. All groups are served by steamers on the Mackenzie and by air lines south to Edmonton and, on charter, southwest to Fairbanks, Alaska. The air lines maintain service throughout the year.⁴²

Barrow (363), northernmost town in Alaska, stretches for 2 miles along the low shore. With its two stores, government hospital, Presbyterian Mission, and native school, Barrow is the trading center for the entire coast stretching hundreds of miles eastward but unoccupied except by a few Eskimos. The "village" consists of about a dozen wooden houses and numerous Eskimo frame huts, tents, and *igloos*. Point Barrow, 12 miles to the north is populated entirely by some 80 natives.

Nome (1,559), on the south coast of the Seward Peninsula on the Bering Sea 150 miles south of the Arctic Circle, is essentially a white man's town and the metropolis of northwestern Alaska. "Its front yard [is] a bleak shore . . . , its back yard [consists] of mile upon mile of moss-covered *tundra* and low rolling hills." On June 21 the sun shines here for twenty-one hours but on December 21 for only four. Nome cannot be reached in winter except by dog-team or airplane. The buildings reflect an air of desolation largely because their underpinnings have been badly twisted by freezing and thawing.

Nome was long synonymous with gold: here the yellow metal was won from the beach sand between low and high tide levels rather than at the end of a bitter trail like that of Dawson in the Klondike. Ships could anchor near by.

The Outlook

This region's future doubtless will continue as a land of great distances and few people, where a scanty livelihood is gained either by extractive industries or pastoral activities and where fixed habitations are exceptional. Cities in the true sense will as now be non-existent.

Mining will become increasingly important as a result of aerial reconnaissance and prospecting. Moreover, as the world struggle for petroleum becomes more acute as a result of depletion of the

⁴² John Q. Adams, unpublished manuscript on "Settlements in the Mackenzie-Basin."

more accessible reserves, parts of this region, especially northwest Alaska, will doubtless be exploited.

Hardy crops, particularly vegetables, will be grown in the more favored locales. Beri-beri, rickets, and scurvy are no longer considered indigenous diseases of Labrador.

Trapping will continue to be important and even fur-farming offers considerable hope of success. The valuable mink, which is being reared in Labrador, multiplies rapidly and is a healthy animal even when fed dried fish. The Hudson's Bay Company has established a large white fox farm at Chesterfield.

Greenland has become of major political and strategic significance since, as a part of North America, it comes under the provisions of the Monroe Doctrine. Its strategic value to Germany would be great because that country could forecast weather there, acquiring information that would be valuable for bombing Britain (weather comes mostly from the west). It could also establish naval and air bases relatively near the United States and Canada since this island lies strategically with respect to both countries.⁴³

The natives have been well treated by the governments of the United States, Canada, and Denmark. Probably no natives ever have received better treatment at the hands of a modern nation than the Eskimos of Greenland. Nevertheless the native appears to be doomed, for he cannot compete with the white man; he is subject to many introduced diseases; his animal resources have been largely depleted; he cannot flourish on the white man's diet; and he is degenerating morally. Thus his mode of life is less dependent upon the home environment than formerly and his dependence on the outside world is becoming more firmly established.

The Ice Cap

Greenland, the world's largest island and definitely a part of North America, is a great plateau 1,500 miles long and 800 miles wide at its greatest breadth. Nine tenths of it, or an area 5 times the size of the United Kingdom is, as a result of Arctic location and elevation, an ice desert. From the ice cap live glaciers move out to the seas. Over much of this interior plateau the surface is flat with few minor irregularities. Greenland experiences bitterly cold temperatures, among the strongest winds in the world, and practically a half year of darkness.

⁴³ The Danish Minister to the United States signed an agreement on April 10, 1941, giving the United States military defense sites in Greenland.

The ice cap has no permanent inhabitants and is utterly lacking in utility, offering no prospects for the future. Its location on the Great Circle Route, the most direct air route between America and Europe, gives it some potential geographical value for airplane landing fields.

CHAPTER XXIV

Anglo-American Unity

IN STUDYING Anglo-America, it has been noted that the continent is an aggregation of complementary regions (Fig. 12) shared primarily by the United States and Canada. It is significant that within 200 miles of the common border are the continent's leading cities, their *ecumenes*,¹ their richest and most productive mines, and their most fruitful fields.

Canada's terrain, however, is so effectively fragmented as to cause the country to be harassed by sectionalism. The Shickshocks of eastern Quebec wall off the Maritime East; the rocky hills, lakes, and streams of the Laurentian Shield separate the St. Lawrence Valley from the Prairie Provinces, and the Rocky Mountains divide the Prairies from the lands of the Pacific. Thus the grain of the continent extends north and south, whereas the international border has been drawn east and west. The geographic regions, which cross this political boundary, vary in minor ways on each side. But these differentiations, with the exception of French-Canada, are limited to differences in architecture and secondary cultural items.

Factors Encouraging United States-Canadian Unity

Natural environment

So identical are the natural environmental factors that there is a close affiliation between the two peoples. The Maritime Provinces form a unit with New England (Chapter IV), as does the Shield of western Ontario with Michigan and Wisconsin (Chapter XIV), the Prairie Provinces with Montana and the Dakotas (Chapter XV), and British Columbia with the American Pacific Northwest (Chapter XXI). It is thus apparent that much of the international boundary is indifferent to nature—to mountains, drainage basins, and rivers.

¹ "The most populous region of a state, particularly that part most closely knit by communication lines."

Proximity of the Canadian population to the United States (50 per cent of the Dominion's inhabitants live within 100 miles of the international boundary) is a major factor leading to unity, for economically and socially Canada is the narrow belt bordering the United States (Fig. 13). Furthermore, the peoples in these two countries were neighbors 150 years before the American Revolution. Outside the *ecumene*, the Dominion is largely a wilderness of forest, muskeg, and *tundra* inhabited by small numbers of Indians and Eskimos and widely scattered white trappers, traders, loggers, and miners. Canada's two transcontinental railways operate close to the international frontier. The physically favored routes in most cases were with or through the United States. Where nationalistic insistence confined rail routes to Canadian terrain, as across the wilderness north of Lake Superior, construction was costly and the lines operate at no profit even today. In such cases the nation has had to pay the bill.

Juxtaposition also facilitates a constant exchange of cultural ideas through the medium of the press, magazines, radio, motion pictures, sports, higher education, lectures, and travel.

Similar economies

Since the natural environment in southern Canada and northern United States is roughly similar, their economies are similar. Both are world leaders in the production of wheat, other small grains, flax, copper, lead, zinc, gold, silver, lumber, fish, fruits (particularly apples), tobacco, and dairy products. Moreover, both are industrialized, although not to the same degree. However, each year Canada is becoming a stronger industrial country. As her manufacturing enterprises expand, the Dominion becomes less and less dependent upon the mother country and more and more dependent upon the United States. As Canada attempts to adjust the tremendous industrial machine to the ways of peace following the second World War, she will find herself strapped to United States economics to an amazing degree.

Common standard of living

Probably nowhere else in the world is the standard of living so high and in such contrast to that characterizing Asia, Latin America, and even continental Europe. The American tourist traveling through Anglo-Canada feels at home as does his Canadian neighbor in the "States." Neither is considered a foreigner in the other's

country. This part of North America, then, is on the same social level. Never would Canadians be willing to accept the lower standard of living characterizing continental Europe, an argument against which neither sentiment nor politics can prevail.

Similar cultural background

Similar cultural background is one of the strongest factors bearing on international unity. Regardless of how far a people may go from the original home, the national roots are difficult to escape. The Canadian and the American, unlike the Mexican and the American, speak the same language. They are derived from identical colonial stock; they have the same habits of thought, religion, and political traditions; they enjoy the same inheritance of the English Common Law; therefore, these people understand each other well. Moreover, when the United States purchased Alaska from Russia in 1867, North America became assured of English-speaking domination.

Type of human migration

Settlement of Anglo-America was not in the form of two parallel streams north and south of the intangible political boundary; it was rather a single tide. The people moved wherever they wished responding only to the economic conditions and political events of their day and disregarding the wholly artificial international boundary.

Thus to the people of these two countries, land and opportunity exerted a stronger pull than allegiance to a flag or questions of political jurisdiction. The history of the continent presents a picture of one body of Anglo-Americans migrating to make the best livings they could.² Canadians tended machines in the factories of New England, cleared forests in the Upper Lakes area, broke sod in the American prairie, helped build towns and cities from New York to California, and aided in organizing and building the web of railroads centering on Chicago. Americans helped to log much of the Canadian forest, locate and develop the mineral wealth, plow the land (especially the prairie since Iowa and Illinois farmers knew how to subdue the tough sod); they also played an important role in the completion of the Canadian Pacific, the Dominion's first-transcontinental railway.

² Marcus J. Hansen and John B. Brebner, *The Mingling of the Canadian and American Peoples*, p. 245. New Haven: Yale University Press, 1940.

Investments

Investments in a foreign country may or may not create a better relationship between two nations. American investments in Canada, however, definitely have promoted good will. Furthermore, lacking them, it is doubtful whether many of Canada's natural resources could have been developed without sacrificing standards of living. American business has about 4 billion dollars invested in Canada—more than in any other single country. Canadians have about a billion dollars invested in the United States. Many American corporations built branch factories in Canada in order to serve the important Canadian market and circumvent the high tariff which Canada has imposed as a means of providing revenue for the government and employment for its people. A large part of the pulp and paper industry has moved to Canada since, generally, each province has passed laws forbidding the exportation of raw pulpwood cut from Crown lands. Several provinces do, however, allow a certain amount of pulpwood to leave the country under special permit, though most of the total emanates from privately-owned lands. In 1940 Canada exported (largely to the United States) 1,539,440 cords valued at \$11,901,480.

Even with American participation in her manufacturing Canada still is unable to fill a significant part of the national requirements.

Travel and transportation

Travel enables Anglo-Americans to erase sectional lines and build up a unity of thought and feeling. Business and recreation induce approximately 40 million crossings of boundary lines per year. Canada's attraction for American tourists has been called a capital example of the law of compensation. Where the physical environment permits only small numbers of people to earn a living, many at least can play. Even the Canadian winter has become a tourist asset. Tourism is now the Dominion's fourth largest industry.

One of the best indications of the closeness of the two countries is the continent's 300,000 miles of railway closely interwoven at the border through 50 gateways. The New York Central enroute from New York City and New England to Chicago offers the choice of going north of Lake Erie through Canada or south of it through American territory. The Canadian Pacific crosses Maine and the Canadian National most of the New England states. The Grand Trunk Railway began as a means of uniting the provinces but built its first main link to Portland, Maine. It pressed on to Chicago in-

1880. This enabled it to participate in the traffic from the Middle West to the Atlantic Seaboard. It could also send wheat during winter to ice-free ports in the United States and take back manufactured products from New England to western Canada. In short the Grand Trunk denied the reality of the United States-Canadian boundary.

The Canadian National Railways, successor to the Grand Trunk, consider their Chicago-Atlantic Seaboard traffic most important to their system. More than 15 per cent of Canada's total freight tonnage is derived from foreign connections destined to foreign points.

Nowhere else in the world is there anything to compare with this intimacy of border contact. Through-traffic for domestic consumption or to and from nations across the seas flows as freely over the international border as from state to state or province to province.⁸ Interesting indeed is the fact that Canadian railways are members of The American Association of Railroads. Moreover, increasing numbers of people from the Middle West have been using Montreal as their seaport enroute to Europe. Thousands of Americans also travel on the Great Lakes aboard Canadian steamships. Many Canadian motorists reach their own West via Chicago and St. Paul-Minneapolis.

In 1941 during the oil shortage along the Atlantic Seaboard, the Portland-Montreal Pipeline, 236 miles long, was built (1) to free for service elsewhere some 4 tankers which had used the 2,000-mile tanker route around the Gaspé Peninsula and up the St. Lawrence to Montreal and (2) to assure Montreal refineries of adequate crude oil even in winter when shipping is halted on the St. Lawrence. The pipeline saved these tankers 12 days' steaming time.

Trade

Trade between contiguous important countries invariably is large. Thus Canada and the United States have become each other's best customers, their trade being larger than that between any other 2 nations. The United States sends iron and steel and their products, coal, petroleum, cotton, citrus fruits, and vegetables to Canada for which the latter exchanges newsprint, wood pulp, minerals (especially asbestos, nickel, and platinum), furs, fish, and chemicals. United States tariff barriers have at times affected adversely an untrammelled exchange of goods but in retaliation the Ottawa

³ William J. Wilgus, *The Railway Interrelations of the United States and Canada*, p. 228. New Haven: Yale University Press, 1937.

Agreement of 1932 gave preferential tariff treatment to all Empire countries. In 1939, however, the United States made a trade agreement with Canada, which greatly accelerated and increased commerce between the two countries.⁴ Canada ranks second only to the United Kingdom as a purchaser of United States exports, taking one seventh of the total—86 per cent of which are non-agricultural, and 14 per cent agricultural products.⁵ Canada has become the chief source of United States imports.

The United States, Great Britain, and Canada must keep each other in mind in working out their mercantile calculations, so inter-dependent are they. Though Canada's trade with the United States is considerably greater than with Great Britain, the latter's market is of outstanding importance, especially for the exports of the Prairie Provinces and British Columbia. Canada's welfare depends upon international free trade or at least freer trade in wheat, a result of the fact that her Prairie Provinces became a gigantic wheat field prior to and during the first World War, when she could sell all the wheat she raised. Since Great Britain is the world's largest market for wheat (Fig. 181) the importance of this trade is obvious.

The international boundary and common problems

When two nations are separated by so artificial a boundary as that between Canada and the United States, there must be common problems, many of them acute. If these are solved for the common good, the two countries are brought closer together. To settle all controversies between these two nations the International Joint Commission has been set up. Its power as fixed by the Treaty of 1909 is so great and the sentiment behind it in both countries so sincere as to make it one of the world's leading international bodies. The Commission has handed down more than 25 important decisions, only three of which can be discussed here.

1. The Trail Smelter, located in the Columbia River Valley of British Columbia some 10 miles north of the international boundary, was producing some 250 million pounds of sulphur, nine tenths of which it discharged into the atmosphere as sulphur dioxide gas. Because of the narrow river gorge and the prevailing winds, lateral

⁴ The 1942 *Fortune* Survey, polling a cross section of the public in both countries, found sentiment overwhelming for the free movement of goods between the United States and Canada.

⁵ John L. Stewart, "Agriculture in the New Canadian Trade Agreement," *Foreign Agriculture*, Vol. II, No. 12, December 1938, p. 583.

distribution of the fumes was prevented. These were accordingly carried southward some 42 miles into United States territory to burn the natural vegetation and crops of Washington farmers. Upon complaint of the farmers, the matter was turned over to the International Joint Commission for investigation and a unanimous decision reached whereby \$350,000 was paid as compensation to cover damage up to January 1, 1932. Since then the fumes have been collected in a special plant and used as the base for a chemical fertilizer.

2. There is also the case of the power dam at Grand Falls, New Brunswick. Since the St. John River forms the international boundary above the dam and since the latter would affect water levels there, permission had to be secured from the International Joint Commission prior to construction.

3. The St. Lawrence Seaway, called by some "the most promising step taken toward Canadian-United States integration," has navigation as its primary and water-power as its secondary purpose. The Commission, with the advantage of expert advice, finally reported in favor of the project but recommended that its conclusions be considered by an independent board of engineers and by American and Canadian economic committees. This was done, a favorable report rendered, and a treaty prepared and signed in July, 1932. The treaty was the subject of extended discussions in the United States Senate and in 1934 the Senate rejected the treaty. In 1941-1942 the Seaway had again become a major issue and the subject of acute differences of opinion on both sides of the border—differences not following international lines. Since the United States stood to benefit more than Canada, the project received less support north of the border than south of it. The seaboard cities in both countries were hostile. In 1942 military strategy became a major factor, it being argued that construction of ocean-going vessels could most safely be carried on in the interior of the continent since the speed and cruising range of bombing planes far exceeded anything deemed probable a few years before. It seemed certain that ultimately the Seaway would be realized.

United States-Canadian Pact for defense

Canadian security is in the hands of the United States and in 1938 President Franklin D. Roosevelt guaranteed Canadian territorial integrity. In 1940 the United States and Canada established a permanent Joint Defense Board to achieve close military and economic cooperation. This was a big step in American foreign policy

and was undertaken primarily because (1) Great Britain was imperiled and the two North American countries felt it was a common peril, and (2) realization on the part of the United States that the shortest distance between the powers is by air "across the top of the world." A. Lawrence Lowell said in 1939 that no hostile army could land in Canada without getting into a war with the United States and that a cession of Canadian territory to a foreign nation is unthinkable.⁶

The United States has thus found it cheaper and safer to place the protective mantle of the Monroe Doctrine over Canada than to fortify and protect almost 4,000 miles of open frontier.

North America—Stronghold of Democracy

If democracy in its broadest sense is to survive, it will be primarily through the efforts of Anglo-America, most of all the United States.

She is the chief exponent for two reasons. The first is her size; . . . more important, she exhibits it in its most intelligible form. . . .

It has two main characteristics. The first is that the ordinary man believes in himself and in his ability, along with his fellows, to govern his country. It is when a people loses its self-confidence that it surrenders its soul to a dictator or an oligarchy. . . . The second is the belief . . . of the worth of every human soul—the worth, not the equality. . . .

The democratic testament is one lesson that America has to teach the world. A second is a new reading of nationalism. Some day and somehow, the peoples must discover a way to brigade themselves for peace. Now, there are on the globe only two proven large-scale organizations of social units, the United States and the British Empire. The latter is not for export, and could not be duplicated; its strength depends upon a thousand-year-old monarchy and a store of unformulated traditions. But the United States was the conscious work of men's hands and a task which has once been performed can be performed again. She is the supreme example of a federation in being, a federation which recognizes the rights and individuality of the parts, but accepts the overriding interests of the whole.

Canada, too, has inherited from the past this faith in democratic self-government and along with the United States her large and diverse regions are successfully working out complex problems with a minimum of friction.

⁶ A. Lawrence Lowell, "Frontiers of the United States," *Foreign Affairs*, July 1939, *Foj.* XVII, No. 4, p. 665.

⁷ John Buchan, "My America," *Pilgrim's Way*, pp. 275-276. Boston: Houghton Mifflin Co. 1940.

What Is an Anglo-American?

Though nationalism is strong on both sides of the international border, loyalty to the United States or to Canada should never crowd out pride in descent from the blended peoples who created the common Anglo-American heritage.⁸

An Anglo-American is the result of a collection of national groups of diverse origins that has become absorbed by the land of their adoption and held together by common interests. Everywhere nature has had a telling effect upon them.

An exception to this mixing are the French-Canadians who are concentrated largely, though not entirely, in the Province of Quebec and are isolationists of the first order. The fastest-growing group in Canada, they constitute more than a third of the Dominion's population. They are the nearest thing in Anglo-America to the European peasant. In many cases they are still pioneering, for which they are excellently suited, since they endure hardship and privation well and have much ingenuity and self-reliance. They love the land and are unwilling to sell it, preferring to live on it and leave it to their sons after death. Largely subsistence farmers, they make a fair living with the aid of their wives and children.

Though having dwelt side by side with the Anglo-Canadians since 1759, when France abandoned them to the British, the two peoples are poles apart. Unfortunately, the French-Canadians have inherited from the past certain attitudes which work against national unity. Their patriotism is limited mostly to Quebec and they are "invincibly opposed to English ways." They also view with suspicion the increasing powers of the national parliament which, they fear, may take from them those things for which they fought for nearly 2 centuries. It is unthinkable at the present time that the French-Canadians will ever abandon their language in an effort to bring about national unity.

At the other extreme, the Anglo-Canadians have long put loyalty to Great Britain before loyalty to Canada.

In order to survive, however, any government in Ottawa must have considerable support from French-Canada and it would appear that *true Dominion unity* can come only when the nation bases its foreign policy entirely on its own needs as a North American State. In his very enlightening book, *Canada* (Charles Scribner's Sons, New York, 1932), Alexander Brady calls Canada a country of

⁸ Marcus L. Hansen and John B. Brebner, *The Mingling of the Canadian and American Peoples*, p. xi New Haven: Yale University Press, 1940.

two nations and says that it cannot hope for more than a super-nationality.

There is some disagreement regarding the susceptibility of the French-Canadians to change. Most authorities consider their cultural integrity as steadfast and "granite-like" as that of the Mexican. Some, however, assert that French-Canada is losing its traditional features, is being swept along on the tide of uncertainty with the rest of Canada and North America and that everything formerly considered permanent is now being questioned.⁹ However that may be, French-Canada will continue to be dominated by the Catholic Church, which has temporal as well as spiritual power.

Although the idea of a voluntary annexation of Canada was apparently terminated by the Anglo-American Conference of 1871, there are still Americans and Canadians who think that some type of absorption is inevitable. These, however, do not represent public sentiment in either country.¹⁰ Certainly Canada shows no desire for political union and the United States none for forcing a merger. Regardless of how intermeshed their economic and strategic relations become, they probably will not come much closer to political union. In solving their various and sundry problems the Canadians will wish to do it themselves and they will wish to remain Canadians. There is no reason why Canada should not move in the orbit of the United States and at the same time retain her identity.

Summary and Conclusion

It has been pointed out that the regions of Canada are vertical—really prolongations of those from the United States—and that they have more in common with their complementary parts south of the border than they have with one another; that the peoples of these international [geographic] regions feel at home on either side of the border; that whereas Canada is in many ways as *North American* as the United States, she still is "ineradicably British."

Canada represents politics at war with geography. She is geographically an integral part of the American continent. . . . But politically she belongs to a system mainly European and her economy has been organized not on a north-south but on an east-west axis. Therein lies in part the explanation of Canada's slow progress, of her lack of unity, of her present discontents.¹¹

⁹ L. J. Burpee and M. Barbeau, "People of Canada," *Canadian Geographical Journal*, May 1939, Vol. XVIII, No. 5, p. 232.

¹⁰ *Fortune's* 1942 poll found sentiment among leaders and the general public on both sides of the border opposed to a Canadian-American union.

¹¹ John MacCormac, *Canada: America's Problem*, p. 215. New York: Viking Press, 1940.

The Dominion has struggled hard to overcome these obstacles imposed by her physical geography (1) by confederation and building a transcontinental railway system, and (2) by sustained faith of nationalists who have considered her place within the British Empire a more important asset than union with the United States. Indeed the persistence of loyalist sentiment in Canada is one of the least understood things in the United States.¹²

Will Canada Be Absorbed by the United States?

Twice hostile American armies invaded Canada to free (really absorb) it. In the controversy over the boundary between south-eastern Alaska and Canada, the American slogan became "54°-40 or fight." Between 1782 and 1925 the United States-Canadian boundary was the object of negotiation at least 17 times, though only details were considered. Most of these misunderstandings resulted from errors made when European monarchs drew ambitious lines upon the inaccurate maps of their day.

The boundary today, however, stands as the most notable "unarmed frontier" and the "safest borderline" on earth (Fig. 11).

That the peoples on either side of the international boundary will continue to drift back and forth seems assured. Both governments will probably disapprove formally while actually acquiescing calmly "as their restless peoples distribute themselves in a pattern roughly corresponding to the best chances of making a living which they can find anywhere on the continent which they have hitherto developed in remarkable unison."¹³

Canada has developed a nationality of her own, though Englishmen call it "American" and Americans call it "British." Actually it is a concoction of both with a dash of something else that has made it neither, but rather "Canadian."

Regardless of what happens in the Old World as a result of the second World War, the United States and Canada must and will act more and more as one. Whatever developments may occur in the future in the realm of political organizations, it seems that the interests of all can best be served if Canada remains Canada and the United States remains as she now is, a strong, sympathetic neighbor. Through cooperation both will prosper economically, politically, and culturally.

¹² Robert Falconer, *The United States as a Neighbour from a Canadian Point of View*. Cambridge University Press, 1925.

¹³ Marcus L. Hansen and John B. Brebner, *The Mingling of the Canadian and American Peoples*, p. 263. New Haven: Yale University Press, 1940.

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