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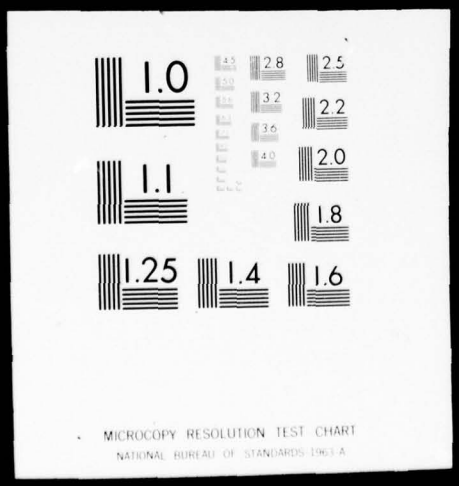
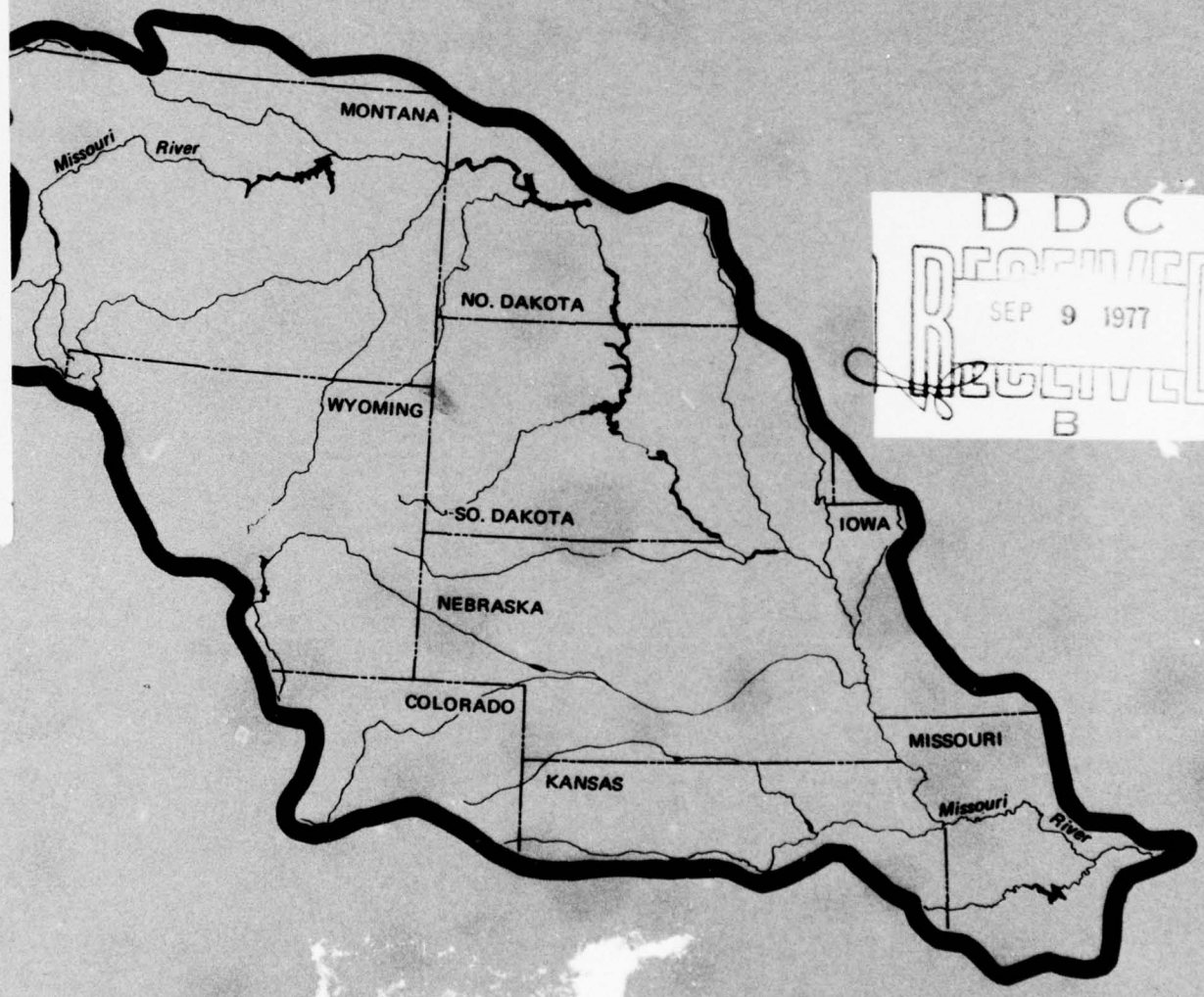


The Missouri River Basin Comprehensive Framework Study

• Economic Analysis and Projections

Volume 4

Appendix



Missouri Basin Inter-Agency Committee
Standing Committee
June 1969

Published December 1971

(6)

COMPREHENSIVE FRAMEWORK STUDY
MISSOURI RIVER BASIN.

VOLUME 4. ✓

APPENDIX.

ECONOMIC ANALYSIS AND PROJECTIONS.

ORIGINAL CONTAINS COLOR PLATES: ALL DDC
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MISSOURI BASIN INTER-AGENCY COMMITTEE

(11) June 1969 (12) 200p.

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REPORTS

Volume 1 – Comprehensive Framework Study

APPENDICES

Volume 2 – Historical Perspective of the Missouri River Basin

History of the Framework Study

Existing Water and Land Resource Development

Volume 3 – Laws, Policies, and Administration Related to Water Resources Development

*Volume 4 – Economic Analysis and Projections

Volume 5 – Present and Future Needs

Volume 6 – Land Resources Availability

Hydrologic Analyses and Projections

Volume 7 – Plan of Development and Management of Water and Related Land Resources

*Covered in this Volume

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CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

TABLES

CONTENTS (Continued)

FIGURES

CONTENTS (Continued)

PLATES

PHOTOGRAPHS

The photographs included in this appendix were furnished by:

Source
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CONTENTS (Continued)

Source

Montana Fish & Game Department: Page 48 (Upper right, upper left and middle left)
Montana Highway Commission: Page 53
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South Dakota Department of Game, Fish & Parks: Page 48 (Middle right and lower left)
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U. S. Army Corps of Engineers: Pages 9, 39, 56, 59, 64, 70
U. S. Department of Agriculture, Forest Service: Pages 28, 55
U. S. Department of Agriculture, Soil Conservation Service: Pages 14, 21, 22, 25, 102 (Upper)
U. S. Department of the Interior, Bureau of Mines: Page 107

CHAPTER 1

INTRODUCTION

BACKGROUND

The history of our Nation's development has been one of a relative abundance of natural resources. However, this has tended to obscure the fact that there are limits to the supply of these resources. As a consequence of continued economic growth and increasing demand for natural resources, these limits have been approached in many areas, and the need to better manage the use of resources is now recognized.

With regard to water resources specifically, there has been growing concern, not only with the quantity of water to meet increasing demands, but with the quality as well. This concern precipitated a Congressional inquiry into the Nation's water problems. A Senate Select Committee on National Water Resources was established in 1959 to investigate the present and future needs for water and the adequacy of supplies to meet these needs.

The Committee's report raised serious questions about the Nation's ability to meet future water resource needs and recommended that a broad-scale study be undertaken to assess the adequacy of water and related land resources. As a result of that report, the Water Resources Planning Act was passed in 1965. The Act created the Water Resources Council within the Executive branch. The Council was charged with the responsibility for making comprehensive studies of water and land resources of the Nation's major river basins, 20 studies in all and 17 in the conterminous United States.

In the Missouri River Basin, the Missouri Basin Inter-Agency Committee (MBIAC) responded affirmatively to the challenge to undertake a study. The MBIAC thus established the Standing Committee on Comprehensive Basin Planning to carry out the assignment. Five work groups were defined to do the work: Economic Analysis and Projections, Present and Future Needs, Hydrologic Analyses and Projections, Land Resources Availability, and Plan of Development and Management of Water and Related Land Resources (figure 1). With representatives from all 10 basin States and seven Federal agencies, it was the Standing Committee's function to assess needs and supplies of water and related land resources and to develop a comprehensive plan for the short- and long-range development and management of these resources.

Each of the work groups appointed several task forces to carry out specific work components. The first four work groups mentioned were responsible for providing data inputs to the fifth. Based on this information and data from additional outside sources, the latter work group prepared the overall Comprehensive Development Plan.

STUDY OBJECTIVES

It is difficult to specify any single objective or set of major objectives in rationalizing water resource planning. Because of the nature of the resource, the political and legal systems regulating its use, a set of clear-cut, noncontradictory objectives almost defies delineation. Objectives of a national character may contradict regional or other institutional-type objectives. Yet, the economic "market" for water may be more regional or local than national, and the politics which more directly govern water use and consumption may lie within state or local jurisdiction.

But, decisions regarding the planning for the efficient use of water, currently and in the future, should be determined from an overall viewpoint, and the planning for adequate water supplies at the state and regional level must be integrated into the overall planning system. When regional development plans have been formulated, they should be coordinated at all levels.

Because water is a scarce resource in many areas of the Nation, economic efficiency must be one of the major criteria governing its use or exploitation. This implies that priorities, determined within a system of national and regional objectives, be established to fulfill future water uses. Such objectives would be specified in terms of national needs and comparable objectives would prevail for the region, state, and local areas.

At a more pragmatic level, the overall objective of the Comprehensive Framework Study is to provide a framework for determining the combination of water and related land resource uses in the basin to meet anticipated short- and long-term needs. In conjunction with this overall objective, such resource development and

FIGURE 1

ORGANIZATION CHART-ECONOMIC

PARTICIPANTS

COLORADO	Colo.
AGRICULTURE, DEPARTMENT OF	
Agricultural Research Service	ARS
Agricultural Stabilization and Conservation Service	ASCS
Economic Research Service	ERS
Farmers Home Administration	FHA
Forest Service	FS
Rural Electrification Administration	REA
Soil Conservation Service	SCS
IOWA	Iowa
ARMY, CORPS OF ENGINEERS	C of E
KANSAS	Kans.
COMMERCE, DEPARTMENT OF ESSA	
U.S. Weather Bureau	USWB
MINNESOTA	Minn.
FEDERAL POWER COMMISSION	FPC
MISSOURI	Mo.
MONTANA	Mont.

PARTICIPANTS

HEALTH, EDUCATION, AND WELFARE, DEPARTMENT OF	
Public Health Service	PHS
NEBRASKA	Nebr.
INTERIOR, DEPARTMENT OF THE	
Bureau of Commercial Fisheries	BCF
Bureau of Indian Affairs	BIA
Bureau of Land Management	BLM
Bureau of Mines	BM
Bureau of Outdoor Recreation	BOR
Bureau of Reclamation	BR
Bureau of Sport Fisheries and Wildlife	BSF & WL
Federal Water Quality Administration	FWQA
Geological Survey	GS
Interior Missouri Basin Field Committee	IMBFC
National Park Service	NPS
NORTH DAKOTA	N.Dak.
SOUTH DAKOTA	S.Dak.
LABOR, DEPARTMENT OF	
Man Power Administration	MPA
WYOMING	Wyo.

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NEEDS | HYDROLOGIC | ECONOMIC | LAND AVAILABILITY | RESOURCE DEVELOPMENT

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Everett M. Jennewein	BR
Charles E. Mooney	MPA
John Putman	ERS
William Drake, Jr.	C of E
Wilbur R. Maki	Iowa
James A. Power, Jr.	Kans.
Clifford L. Summers	Mo.
Thomas Armour	Mont.
Gayle Starr	Nebr.
Dale O. Anderson	N.Dak.
Arthur J. Matson	S.Dak.
Theodore Ferris	PHS
George Christopulos	Wyo.

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Harold Davis	BR

management would (a) be considered within the broader economic development pattern of the basin, and (b) consider the preservation of natural or environmental features.

PROJECTIONS

To assess present and future water and related land resource needs, estimates of current and future resource supplies and demands are necessary. For planning, projections were made of the basin's economy to 1980, 2000, and 2020. Through an agreement between the Water Resources Council and the Office of Business Economics (OBE) and the Economic Research Service (ERS), OBE-ERS in 1965 furnished to the Standing Committee of MBIAC economic and population projections for the three target years. Based on information developed by the work groups, the Comprehensive Framework Plan for the Missouri River Basin, or Region, was formulated. This appendix presents economic and population projections for the region, the eight subregions, and 38 subarea and metropolitan components as shown on plate 1.

An explanation of the national model is contained in the chapter on projection methodology. Briefly, the assumptions used as a basis for these projections were: (1) a population growth rate of 1.6 percent, (2) unemployment at 4 percent in target years, (3) a labor force participation rate at 1955-1957 levels, (4) a Gross National Product based on employment and productivity trends experienced from 1947 to 1963, (5) National Personal Income based on the past relationship to Gross National Product, and (6) regional population allocated by industrial employment.

The Economic Work Group received from OBE-ERS projections of population, employment, income, and earnings for 1980, 2000, and 2020 for the Missouri River Region and its eight major subregions. It was the task of the work group to disaggregate these projections and allocate them among the smaller geographic subareas. At the outset, therefore, the work group was constrained within the aggregates for the Missouri River Region. This is a necessary constraint and a sensible one in terms of national planning, since all of the river basin studies must eventually be merged into a single national plan for water resource development. Thus, in order that maximum reliability be retained in the national projections, each river basin must necessarily be constrained within its regional allocation.

It should be clear that these projections are not prophesies of the future, but rather are projections of past experience modified to reflect what might be expected to occur if certain basic assumptions regarding the structure and behavior of the economy should, in fact, materialize. The estimates for 1980 are considered reasonably sound, but as the projections are extended farther into the future the probability of accuracy becomes more remote. This does not imply that the projections should be viewed as unreliable or discounted in planning studies. Rather, it should be recognized that, due to unforeseeable events, the attainment of a given economic level might well be advanced or retarded from the presently forecast date. As the future unfolds, the basic assumptions and the projections must be revised as necessary to conform with newly available data, and the programming of planned improvements must be modified to meet future demands as they develop.

USE OF PROJECTIONS

Population, employment, and income are the three basic projected indicators for water resource planning. They can also be utilized effectively in assessing the potential damages or benefits. Future demands for water supply or water quality control are directly related to the level and distribution of population. Personal income level is an important factor in determining the amount of water that might be consumed. Employment in various industries, especially heavy water-using industries, and the productivity levels in these industries has a bearing on both the quality and quantity of water needed, since the population, income, and employment have an influence on the demand for food and fiber. For flood control, the damages or benefits a project may provide are related to the use of the flood plain. Level of income may indicate intensity and value of improvements as related to residential construction. Heavy water-using industries are often located in the flood plain. Damages or benefits are related to the level of income or productivity throughout the projection period. Navigation development is related to transporting certain types of commodities in certain geographic areas. Need for electric power production is related not only to the level of personal income, but to the type of industrial employment and the cost of power derived from other sources. Demands for recreation development are related to density of population as well as to the level of income. Fish and wildlife development is related to outdoor recreation. The cost of project lands for all project purposes is related to land use and productivity.

GEOGRAPHIC ORIENTATION

For planning purposes, a division of the Missouri River Basin was made into eight major tributary systems. These tributary systems, designated "subbasins", were defined along hydrologic lines and "companion" subregions were defined along political lines which most nearly approximated subbasin boundaries. Common names were used: Upper Missouri, Yellowstone, Western

Dakota, Eastern Dakota, Platte-Niobrara, Middle Missouri, Kansas, and Lower Missouri. There was no corresponding subbasin or subregion designated. The hydrologic and corresponding political delineations of the basin are shown on plate 1.

The eight subregions were further subdivided into 27 smaller subareas. Again, these followed political boundaries, but approximated minor hydrologic drainage systems. In addition, 11 Standard Metropolitan Statistical Areas (SMSA) in the region were broken out separately and projections developed for them. Because of their strategic economic importance in explaining spatial economic growth and rationalizing projected economic and population changes, separate treatment of these larger urban areas was warranted.

ORGANIZATION OF THE APPENDIX

This appendix has been organized to give the reader a chronological picture of the Missouri River Basin, beginning with the relevant history and proceeding to projections through the year 2020. As such, the first chapter covers the background of the Comprehensive Framework Plan and the events which precipitated the study. The chapter also contains a discussion of the objectives of comprehensive planning within the overall national water resource planning framework.

Chapter 2 is devoted to a physical description of the basin, the major historical events which helped to shape the development of the basin's economy, and the resource endowments of the basin.

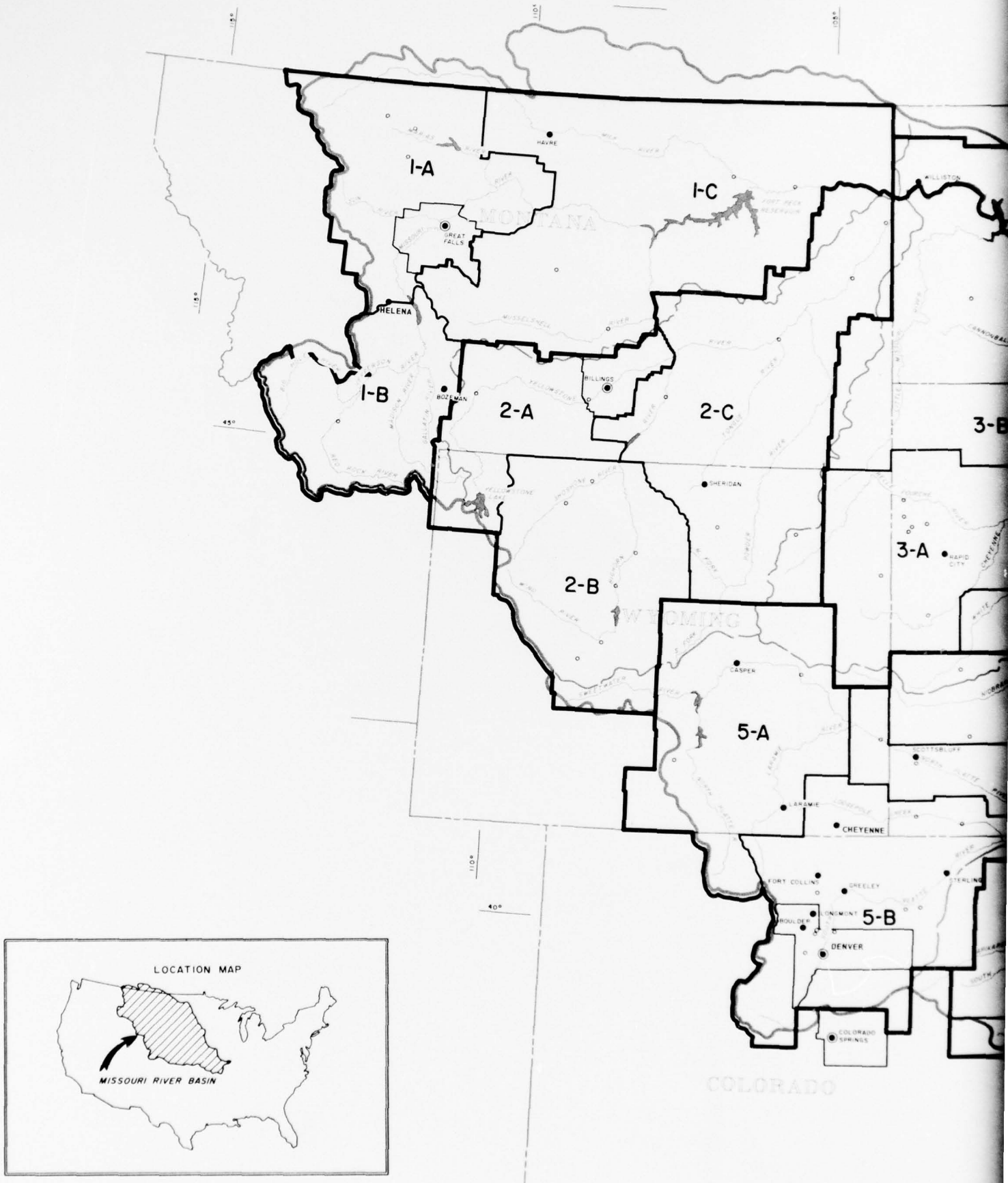
In chapter 3, information on the region's economy for the 1940-1960 period is presented. Detailed employment, income, earnings, and population data are given for the region and its components, and analyses of the region's historical development to the current period are presented. While many elements of an economic base study are contained in this chapter and the one following, the appendix lacks sufficient production data and information on structural interdependencies of the economy to qualify it as a complete economic base study. However, the historic base and the projections are sufficient to provide a projected framework for water and related land resource planning in the basin. The final section of this chapter contains brief summaries of the physical, demographic and economic characteristics of the eight subregions.

Chapter 4 discusses the projected economy of the region for the three target years, 1980, 2000, and 2020. The format and content of the chapter are similar to those of the previous chapter. Detailed economic and population projections for the target years are presented for the Nation and for all geographic units identified in the region.

Chapter 5 was written following the development of the Comprehensive Framework Plan by the Resource Development Work Group. A generalized plan indicating the level of new water investments was made relating to projected needs. These investments were identified by subbasin. The Economic Work Group then assessed the changes in earlier projected parameters that would be expected to occur as a result of such investments. This chapter is intended to reflect the relative impact that certain water resource developments will have upon the region's projected economy.

Chapter 6 describes the methodology used in the development of the various projections. The national projection model is first presented, followed by statements on procedures followed in disaggregating employment and population to smaller geographic and industrial levels. The last two sections are concerned with procedures for projecting national demands for agricultural and minerals production, employment, and population related to these levels, and the disaggregation of these to regional and subregion levels.

The appendix concludes with a Statistical Supplement on population, employment, and income; agriculture; timber resources; mineral resources; and supplemental projections. After the plan for water and related land resources was for the most part completed, in January 1969 the Water Resources Council sent revised demographic and economic projections requesting the new projections be evaluated. The revised projections were deemed necessary primarily due to lower estimates of population growth, revised rates of productivity, and other criteria described in the Supplement. Because of the advanced status of the framework study at the time the new projections were received, the Missouri Basin Inter-Agency Committee deemed it inadvisable to interrupt the study. Therefore the supplement notes the differences between the original and revised projections and the general implications this might have on the plan as it was devised.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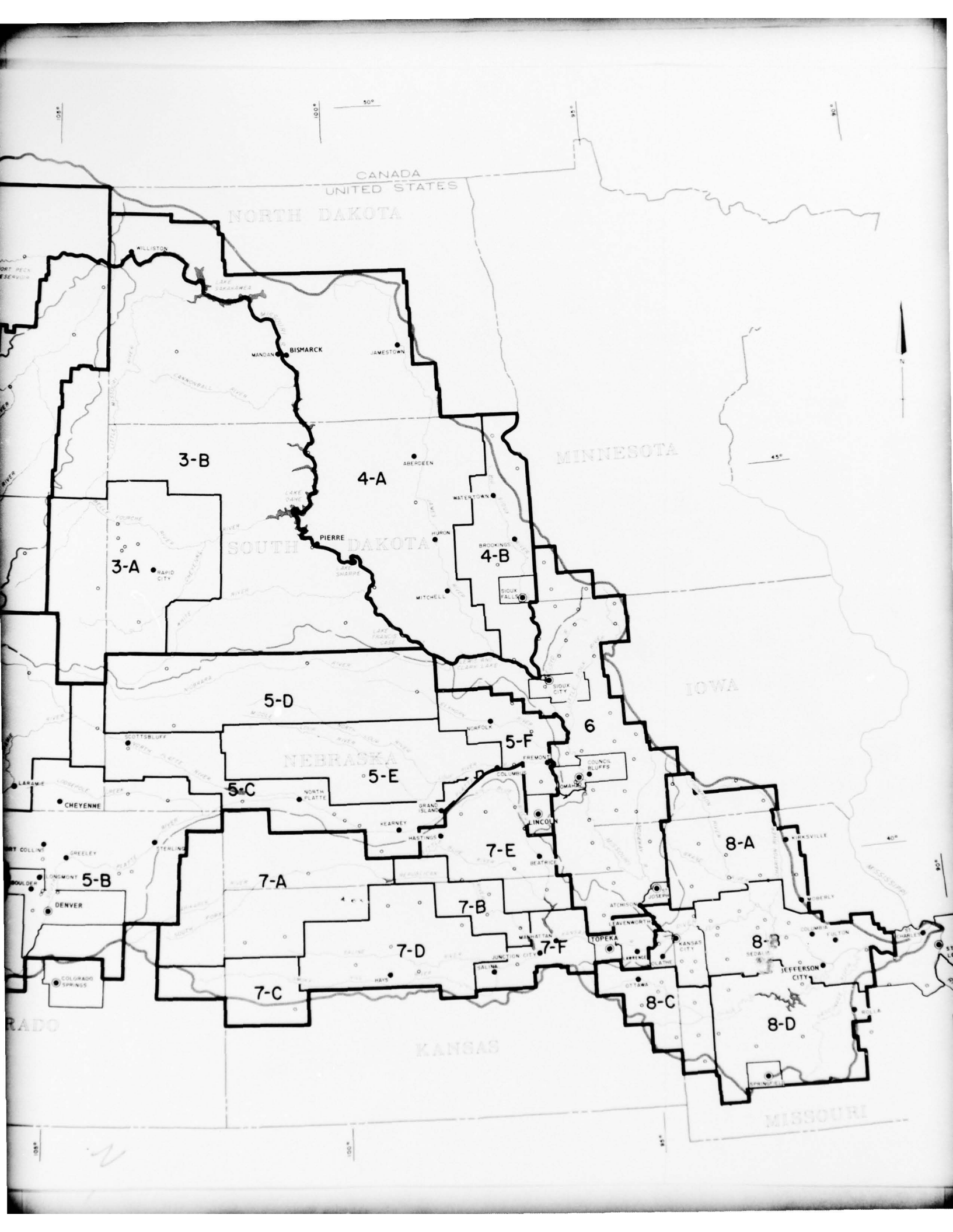
5-A
5-B
HAVRE
GREAT FALLS
HELENA
BOZEMAN
BILLINGS
SHERIDAN
RAPID CITY
CASPER
LARAMIE
CHEYENNE
FORT COLLINS
GREELEY
STERLING
LONGMONT
BOULDER
DENVER
COLORADO SPRINGS
MONTANA
WYOMING
COLORADO
LOCATION MAP
MISSOURI RIVER BASIN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WILLISTON
BISMARCK
MANDAN
JAMESTOWN
ABERDEEN
WATERTOWN
PIERRE
HURON
BROOKINGS
RAPID CITY
MITCHELL
SIOUX FALLS
SIOUX CITY
NORFOLK
FREMONT
COUNCIL BLUFFS
OMAHA
LINCOLN
GRAND ISLAND
HASTINGS
KEARNEY
NORTH PLATTE
SCOTTSBLUFF
CHEYENNE
LARAMIE
FORT COLLINS
GREELEY
STERLING
LONGMONT
BOULDER
DENVER
COLORADO SPRINGS
BEATRICE
ATCHISON
ST. JOSEPH
LEAVENWORTH
TOPEKA
KANSAS CITY
MANHATTAN
JUNCTION CITY
SALINA
HAYS
OTTAWA
LAWRENCE
JEFFERSON CITY
KIRKSVILLE
MEMBERLY
COLUMBIA
FULTON
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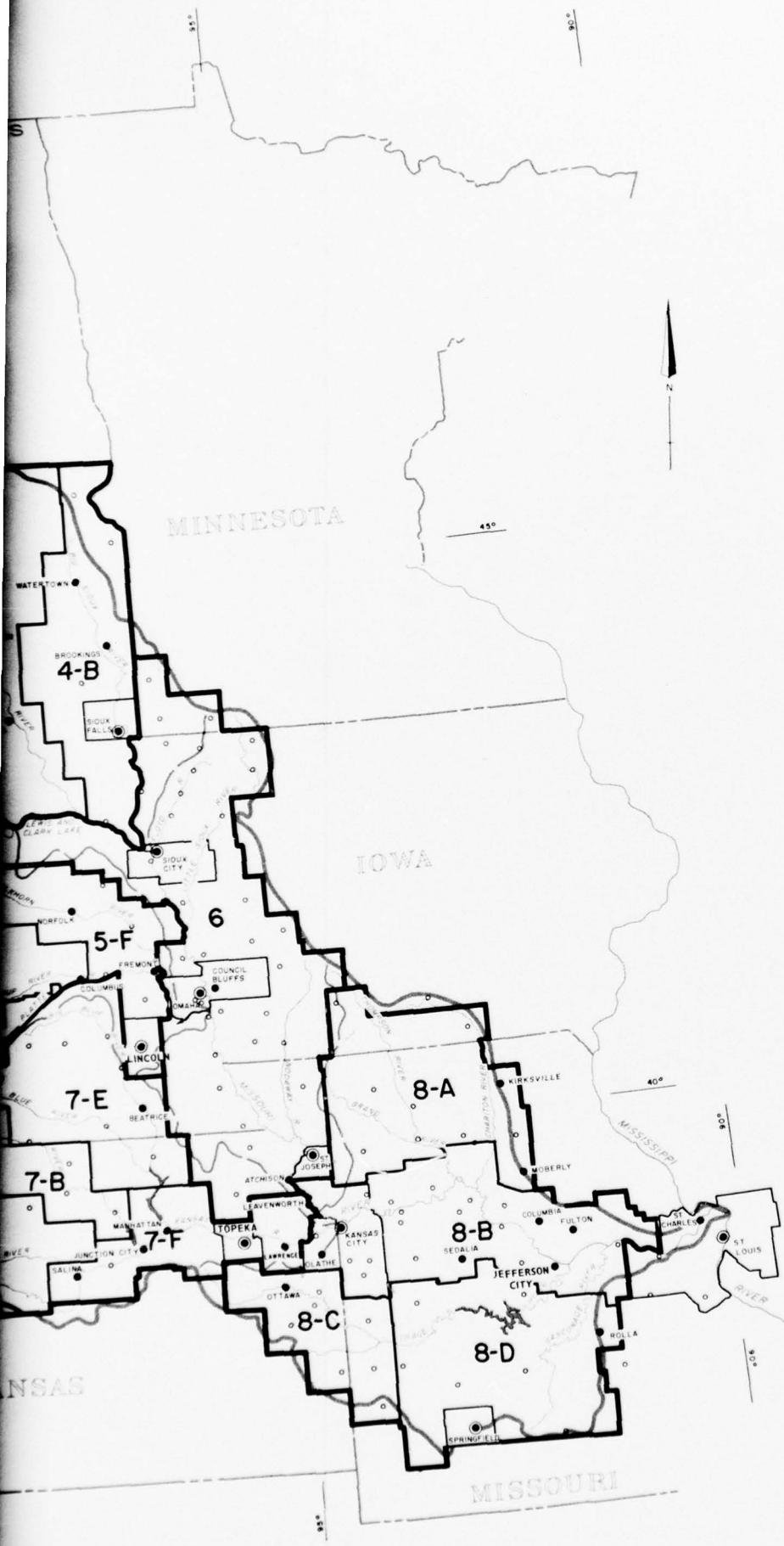


LEGEND

- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- ECONOMIC DATA
  - SUBREGION BOUNDARY
  - *SUBAREA BOUNDARY*
- POPULATED PLACES
  - STANDARD METROPOLITAN STATISTICAL AREA
  - 10,000 TO 49,999 POP. (1960)
  - 2,500 TO 10,000 POP. (1960)
- PERENNIAL STREAMS
- LAKE OR RESERVOIR

SCALE 1/5,700,000

50 0 50 100 150 200

APPROXIMATE SCALE IN MILES

JUNE 1969

SUBREGIONS AND SUBBASINS

TRADE CENTERS AND SUBAREAS

COMPREHENSIVE FRAMEWORK STUDY

MISSOURI RIVER BASIN

MISSOURI BASIN INTER-AGENCY COMMITTEE

PLATE 1

3

CHAPTER 2

GENERAL DESCRIPTION OF THE BASIN

PHYSICAL CHARACTERISTICS

About one-seventh of the total area of the Nation, 519,300 square miles, plus an additional 9,700 square miles in Canada, is drained by the Missouri River. The drainage area has a northwest to southeast axis and covers part or all of the seven West North Central States (North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri) and three Mountain States (Montana, Wyoming, and Colorado), as shown in figure 2. The Missouri River, the longest in the United States, flows southeasterly 2,315 miles from Three Forks, Mont., to join the Mississippi River a few miles north of St. Louis, Mo. The tributaries begin at elevations of about 14,000 feet above sea level, with the main stem flowing to an elevation of 400 feet above sea level at its mouth. There are 30 major tributaries ranging in length from 100 to 1,000 miles and having drainage areas ranging from 2,400 to 90,000 square miles.

The physiography of the Missouri Basin offers considerable variety. Portions of three major physical divisions occur in the basin – Rocky Mountain System, Interior Plains, and the Interior Highlands.[1] Along the western perimeter of the basin in western Montana, Wyoming, and Colorado, the northern, middle, and southern Rocky Mountains offer a rugged appearance in contrast to the Wyoming Basin. Local glaciation has provided interruptions in the form of broad valleys. In western Montana and Wyoming, mountain ranges reach out into the adjacent plains and plateaus. Occasionally an isolated mountain range appears, such as the Black Hills in western South Dakota and eastern Wyoming. The Interior Plains Division includes the Great Plains and Central Lowlands provinces. Much of the central portion of the basin is occupied by the Great Plains. The northern portion in central and eastern Montana and western North and South Dakota is rugged country of eroded river valleys with "badlands" type of topography and occasional isolated buttes on extensive plateaus. To the east of the Missouri River are morainal hills. To the south of the Pine Ridge Escarpment in northwest Nebraska, in eastern Colorado, and in western Nebraska and Kansas, the land is less rugged, but has several lesser north-south escarpments.

Along much of the eastern portion of the basin and extending to the east beyond the basin is the Central Lowlands province. This area extends from eastern North Dakota south through eastern Kansas as well as to adjacent areas in western Iowa and northern Missouri. In the eastern Dakotas, there are many small lakes, lacustrine plains, and much glacial debris. Much of the area to the south has similar rolling topography, but lacks natural lakes and old lake plains. In Missouri, south of the Missouri River, is the Ozark Plateaus province of the Interior Highlands Division, a rugged ridge and valley area.

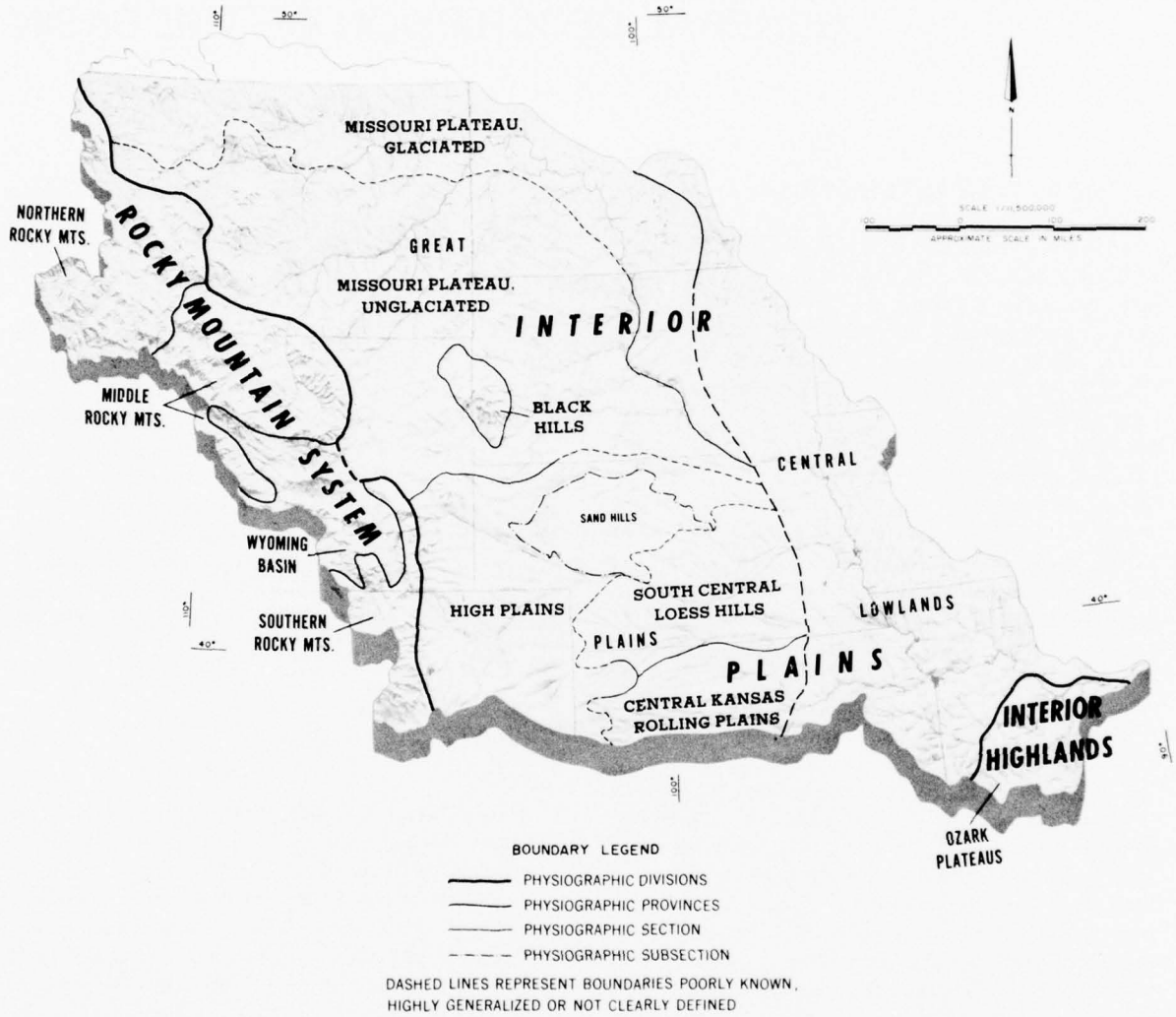
CLIMATE

Widely divergent climatic conditions characterize the basin. Average annual precipitation ranges from as low as 8 inches in limited areas of the northwestern plains to 42 inches in the lower basin. While mean annual runoff is negligible in the Sand Hills of Nebraska, it attains 20 inches in the western mountainous areas. Extensive areas in the central part of the basin have runoff of only 0.25 inch. In the southeast, mean annual runoff attains 20 inches. Seasonal precipitation is highly variable. Annually, it can range from less than half to more than double the average annual amount. Seasonal temperatures also vary considerably, with extremes from -60° F. to 120° F. By climatic types, the basin ranges from the Highland type in the western mountain area to the Humid Continental Long-Summer type in southeastern South Dakota, eastern Nebraska, and Kansas, as well as in adjacent parts of Iowa and Missouri. Humid Continental Short-Summer Climate is found in eastern North Dakota and South Dakota. Eastern Montana, central and eastern Wyoming, eastern Colorado, western North and South Dakota, and western Nebraska experience Middle Latitude Steppe Climate.

[1] Physical Divisions of the United States, Nevin M. Fenneman *in cooperation with the* Physiographic Committee of the U. S. Geological Survey, Department of Interior, Washington, D. C. (1946)

FIGURE 2

PHYSIOGRAPHIC DIVISIONS, PROVINCES, SECTIONS, AND SUBSECTIONS



SOILS AND VEGETATION

Natural soils in the Missouri Basin are closely related to zones of climate and vegetation. Most have developed under grass cover, with the exception of those in the Rocky Mountains and the Ozark Plateaus. Mountain complex soils are in the coniferous forests of the western perimeter of the basin, the Black Hills, and the Ozark Plateaus. Brown soils are in the semiarid short-grass plains of eastern Montana and Wyoming and northeastern Colorado. Desert and sierozem (light-gray) soils occupy intermountain basins and high dry plateaus almost exclusively in Wyoming. Chestnut (light-brown) soils occur in the mixed tall and short-grass areas of eastern Montana and Wyoming; western North Dakota, South Dakota, and Nebraska; and northwestern Kansas. Chernozem (dark-brown) soils, developed under tall and mixed grasses, extend across most of eastern North Dakota and South Dakota and through central Nebraska. The brunizem (black) and some gray-brown podzolic soils occur in southwestern Minnesota, southeastern South Dakota, eastern Kansas and Nebraska, as well as

adjacent parts of Iowa and Missouri. Red-yellow podzolic and some brunizem soils occur in the Ozark Plateaus portion of Missouri where native vegetation includes mixed coniferous and deciduous forests. Within each of the above zonal groups of soils are alluvial soils of the bottomlands and terraces.

MINERALS

Generally the basin is well endowed with a variety of mineral resources. Nearly 50 mineral commodities are produced commercially. The western mountain perimeter contains the metallic mineral deposits. Northwestern and southeastern areas have substantial deposits of coals, ranging from lignite to bituminous. Petroleum and natural gas deposits are found in many areas. Nonmetallic minerals are found in scattered locations throughout the basin.

HISTORY OF SETTLEMENT

Archeological explorations in the Missouri Basin indicate that man was present before 9000 B.C. and has been in the area continuously, or nearly so, since that time. Early ancestors of some of the Indian tribes, such as the Mandan, Hidatsa, Arikara, and Pawnee, may have been in the basin area as early as the 9th century.

It cannot be stated with certainty when the first white men entered the basin. It is possible that the Spaniard Coronado reached its southern edge in central Kansas as early as 1542. French explorers moved toward the basin from the Great Lakes and Mississippi River areas at an early date. The Marquette-Joliet Expedition floated down the "Great River" past the mouth of the Missouri River to the Arkansas River in 1673. It was followed by La Salle, who reached the Gulf of Mexico in the 1680's, and by other explorers.

Fur traders followed in the footsteps of the early explorers. They came up the Missouri River from its mouth and also entered the upper part of the basin from their Canadian trading posts to the north-northeast. At the close of the French era of exploration, the Missouri Basin was sparsely settled only at its extreme southeastern portion. Knowledge of the area farther west and north was very limited.

Systematic exploration and settlement of this vast area began with the United States purchase of the Louisiana Territory in 1803 and the Lewis and Clark Expedition of 1804-06. Government-sponsored explorations and military expeditions throughout the basin continued for the first three-quarters of the 19th century. Fur traders and hunters both preceded and followed the military expeditions.

Settlement followed somewhat slowly and unevenly behind the fur traders. Settlement began in what is now the state of Missouri; from there it spread westward along the Kansas River and northward along the Missouri River. Before settlement had progressed very far, there were several migrations across the lower end of the basin. The Santa Fe Trail, which began at Old Franklin, Mo., was opened in 1820.

In 1858, gold was discovered on Cherry Creek near the present site of Denver, Colo. One of the last and also the richest gold strikes in the basin was the discovery of gold in the Black Hills by General Custer's expedition in the fall of 1874, followed by the Black Hills Gold Rush of 1875-77.

Settlers began to occupy what is now eastern Kansas and Nebraska during the 1850's. They followed the miners to the Rocky Mountain foothills and gradually moved northward along them and eastward along river valleys into the plains. As railroads came from the east, settlement along railroad routes followed quite rapidly and then spread out more gradually between railroad routes. In the late 1860's, large cattle outfits began trailing herds northward from Texas into the Great Plains for shipment east.

Two events that were significant in the development of the basin were the advent of the railroads and passage of the Homestead Act of 1862. The Homestead Act of 1862 gave title, for a nominal fee, for up to 160 acres of land to any citizen of good character who would agree to live on the land and develop it for a 5-year period. Later acts and amendments to the original act made land somewhat easier to obtain and, under certain conditions and in limited areas, permitted one person to obtain up to 640 acres of land. Most of the land was settled as 160-acre tracts. Principal purposes of the ready conveyance of land coupled with the 160-acre limitation were to encourage settlement, encourage ownership of land by the farm operator, provide a more stable settlement, and place a limitation on Government land transfers to any one person.

In many respects, the Homestead Act was very successful in achieving its goals. The most obvious fault was the inadequacy of the acreage given the homesteader in this area. Farms of 160 acres, or even less, were of adequate size to provide a reasonable level of living in areas to the east of the basin, where normal annual precipitation was adequate for good crop production and there were very few crop failures. However, large portions of the Missouri Basin had a much lower average annual precipitation, more frequent drought periods, and a shorter growing period. In these areas, the 160-acre farm was much too small to provide a reasonable level of living for the farmer and many were quickly forced out of business.

The Kansas-Pacific Railroad reached Abilene, Kans., in the fall of 1867, and nearly 1,000 carloads of cattle were shipped out of there that year. In 1867, the Union Pacific Railroad was completed from what is now

Council Bluffs, Ia., to Cheyenne, Wyo., and was connected with the Central Pacific Railroad in Utah in 1869. The first railroad into Denver was completed in June 1870 from Cheyenne. Later in that year, a railroad line was completed from Denver eastward. Railroad construction proceeded fairly rapidly in Kansas, Nebraska, and eastern Colorado from the early 1870's into the late 1880's, by which time most of the major railroad lines were in operation in these States.

Railroads entered the eastern portion of both Dakotas in the early 1870's, and most of the major railroad lines east of the Missouri River in these States were in operation by the late 1880's. The first transcontinental railroad line across the northern portion of the basin was the Northern Pacific, which reached Bismarck, N. Dak., in 1873, with the transcontinental connection through Montana completed in 1883. The Great Northern Railway entered North Dakota in 1880 and was completed across the Missouri Basin during that decade. The first railroad coming into the basin portion of Montana was the Union Pacific, which entered that State from Idaho in the early 1870's. Railroads entered the Black Hills of South Dakota from Nebraska in 1885. Construction of railroads across the Missouri River to western South Dakota was not completed until 1907. Of major significance in financing construction of railroads were large grants of land by the Federal Government which were subsequently sold to private individuals for development.

Large cattle outfits entered the southern plains portion of the basin in the late 1860's. As settlers moved in, following the railroads, range cattlemen were forced out and they moved on northward. In the 1870's, cattlemen were operating in western Nebraska, Colorado, and parts of Wyoming and Montana. In the 1880's, they reached farther northward and spread through most of the remaining plains area that was not within Indian reservations. The last of the large cattle drives from Texas to the northern Great Plains was in the middle 1890's. The era of large open-range cattle outfits drew to a close in the northern Great Plains in the first decade of the 20th century.

The era of the homesteader concluded in the upper Great Plains at the end of the second decade of the 20th century. This ended the basic settlement era, although the legal framework for homestead entry was not changed until February 4, 1935, when the President, by Executive Order, temporarily withdrew all such public lands subject to classification for private entry.

The farmers' frontier had met and expropriated much of the ranchers' cow country and now reached the mining country in the Rockies. Economically, the basin was almost wholly agricultural, the new territories separating roughly into the wheat country of Montana, the Dakotas and Kansas; the corn belt of Iowa and adjacent South Dakota, Nebraska, Kansas, and Missouri; and livestock range in arid sections of Wyoming and Colorado. In the mountains gold booms were over and agriculture had become firmly established. Irrigation had been introduced in valleys and along mountain fronts with water laws based upon the doctrine of prior appropriation operating as the guiding principle.

The predominant nationality groups that came to the basin were the Germans, Russians, Norwegians, Swedes, Czechs, Italians, and the English, in about that numerical order. Germans accounted for about 20 percent of the foreign-born population. However, if all the people with a background from the British Isles (English, Irish, Scotch, and Welsh) were grouped together, they would probably rival the Germans as the most numerous. In addition, there were several other nationalities but their numbers were relatively small. Many came as colonizing groups sponsored by churches, railroads, or other settler agencies. Descendents of these original settlers continue to occupy the basin today because later immigration has been relatively small.

There are 10 states partially or entirely within the Missouri Basin. These states, the order in which they were admitted to the Union, and the date of admission are shown in table 1.

Table 1 – ORDER OF STATEHOOD

State	Order of Admission	Date of Admission
Missouri	24th	August 10, 1821
Iowa	29th	December 28, 1846
Minnesota	32nd	May 11, 1858
Kansas	34th	January 29, 1861
Nebraska	37th	March 1, 1867
Colorado	38th	August 1, 1876
North Dakota	39th or 40th	November 2, 1889
South Dakota	39th or 40th	November 2, 1889
Montana	41st	November 8, 1889
Wyoming	44th	July 10, 1890

A phase of the occupation of the plains section of the basin was the dispossession of the Indians. Until 1861, the Indians were generally on friendly terms with the United States, even though their lands were continually traversed by surveyors and miners. Later, driven to desperation by the obvious fact that the end was near, the Indians made their last stand against the encroaching settlement by the whites. The Sioux uprising of 1862 was followed by that of the Cheyenne and other tribes in the sixties, and the struggle culminated in the Sioux war of 1876. After this, the Indians were largely contained upon their reservations. Today, about 58,000 Indians inhabit 23 reservations in the Missouri Basin. Indians own about 18,000 square miles or about 4 percent of the basin's area.

CHAPTER 3

HISTORIC AND CURRENT ECONOMY OF THE BASIN

For water resource planning purposes it is necessary to identify the Missouri Basin by its hydrologic boundaries. In order to assess the adequacy of current and future water supplies, it is likewise necessary to define current demands for water in terms of people and industry. Population and employment thus serve as proxies for estimating future demands for water. The weakness in this approach is that "the Economy," or market for water, does not neatly coincide with functional geographic units which underlie economic growth and serve to explain regional changes in population and employment. This should be recognized in evaluating the reliability of the projections contained herein.

Projections to the year 2020 or even 2000 serve only as guidelines for framework planning. As such, they provide the water resource planner with generalized trends of the future probable course of the economy, assuming that historical trends and structural relationships continue in the future. And while the planner has taken into account the entire projection period in the planning scheme, the year 1980 was most immediately significant in planning for water resources development for two reasons: (1) projections for 1980 contain a greater degree of reliability, and (2) investments made in water resources development to meet the 1980 needs will tend to modify the projections for later years.

The projected basin economy is covered briefly in the next chapter. Its purpose is to introduce material concerning the present economy and the reasons for such a detailed presentation of the current economic and demographic situation. Contents of the first part of this chapter can be grouped under three broad headings: (1) population, (2) employment and income, and (3) resources and production. Subregional summaries constitute the balance of the chapter.

Small Trade Centers, Such as David City, Nebraska Serve Agricultural Areas of the Missouri River Region

POPULATION

Although population in the Missouri Region has increased each census year from 1940 to 1960, the increase has not been as rapid as the national average. Nationally, population increased by 14.6 percent from 1940 to 1950 and by 16.6 percent from 1950 to 1960. In the Missouri Region, population increased by only 4.3 percent from 1940 to 1950 and by 12.3 percent from 1950 to 1960. Relative rates of growth between the region and the nation can also be seen by looking at the region's share of the total population of the United States. In 1940, the region contained 5.1 percent of the population of the conterminous United States. In 1950, it contained 4.7 percent and in 1960, its share had declined to 4.5 percent. Thus, while the population in the region increased between 1940 and 1960 in absolute terms, nevertheless, the region was a net exporter of population.

One obvious explanation for its relative loss of population lies in the composition of population in the Missouri Region. With agriculture being the dominant economic activity historically, population likewise has been predominantly farm and rural nonfarm in character. The rural-to-urban movement of people which characterized the Nation during the 1940-60 period was even more significant in the region in terms of total population growth. This can be seen in comparative figures for the Nation and the region during the 1940-60 period. Rural farm population as a percent of total population for the Nation was 23.0 percent in 1940, 15.3 percent in 1950, and 7.5 percent in 1960. In the region for the comparable three years, the percentages were 36.5, 27.6, and 18.6 percent. In terms of absolute

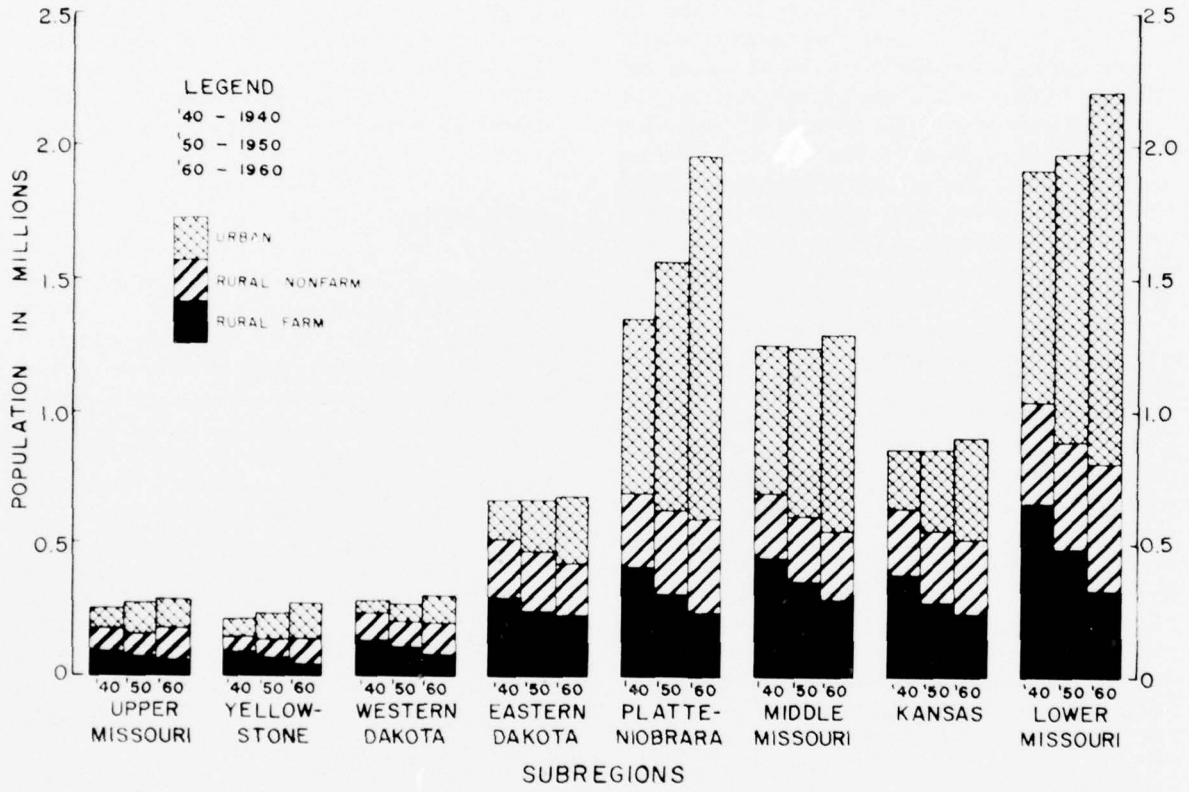
declines, rural farm population fell by slightly more than one million people between 1940 and 1960. This was a loss of 40 percent in the region compared to 56 percent for the Nation during the same period.

The rural nonfarm category increased by only 20 percent in the region from 1940 to 1960. Nationally, rural nonfarm population increased by 49 percent. Urban population in both the region and the Nation increased 68 percent between 1940 and 1960.

Historic growth rates by individual subregion in the region and the changing composition of population in each subregion are shown in figure 3.

FIGURE 3

RURAL FARM, RURAL NONFARM AND URBAN POPULATION
MISSOURI RIVER SUBREGIONS
1940, 1950 AND 1960



EMPLOYMENT

For purposes of this appendix, employment in the region has been grouped into four broad categories: agriculture, manufacturing, other commodity, and noncommodity-producing industries. This grouping was initially formulated by the Office of Business Economics in developing employment data and projections and was continued by the Economic Work Group. While information on historic and projected employment at the two-digit Standard Industrial Classification (SIC) level [1] was available during the disaggregation process, the degree of reliability was not felt sufficient in projections to justify separate treatment at this level of detail.

Throughout this discussion of employment and in later discussions as well, employment is treated in terms of these four broad categories, with individual analyses of two-digit industries whenever warranted. The four industrial employment categories are: Agriculture, manufacturing, other commodity-producing which includes mining and contract construction, and noncommodity-producing which is roughly comparable

[1] The two-digit Standard Industrial Classification Code divides all industrial employment into 32 categories.

to the services sector. However, in certain areas acknowledgment is given that portions of noncommodity-producing employment may be considered basic in nature. While not precisely equated with the basic/service concept of regional economic development theory, the commodity/noncommodity measure was used as roughly approximating this basic/service concept. Thus, the proportion of commodity-producing employment would indicate the degree of basic or residentiary employment in any particular local area (figure 4).

Analyses of historic trends and changes in the industrial composition of employment were necessary in evaluating the reasonableness and consistency of employment projections. Disaggregation of projections was based on trends of historic shares. Hence, because the past bears so directly on the direction and magnitude of the "system" of projections, an appreciation of projections must be based on, or begin with, an understanding of past geographical and compositional shifts in employment within the region.

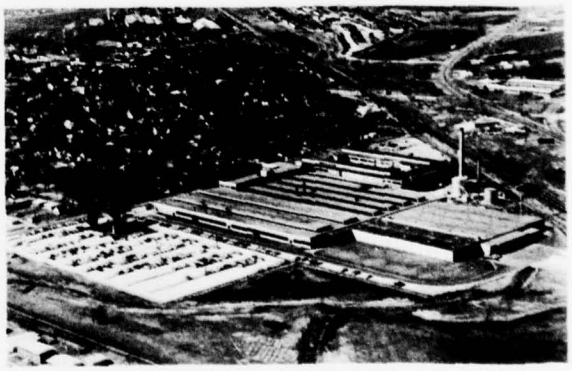
Between 1940 and 1960, total employment in the region increased from 2,236,000 to 2,985,000, or by about 33 percent for the 20-year period. During the same period, total employment for the Nation increased from over 45 million to over 66 million, an increase of about 45 percent. Consequently, the region's share of total employment declined over this period from 4.9 percent to 4.5 percent. Relatively slow growth in total employment in the region as compared to the Nation is accounted for by the relative importance of agriculture and the minor importance of manufacturing and noncommodity-producing industries in the region's economy. Because of an increasing ability of the agricultural industry to feed and clothe more people with fewer employees, agricultural employment, both nationally and in the region, experienced absolute declines throughout the historical period as shown in table 2.

Table 2 – HISTORICAL EMPLOYMENT AND POPULATION, UNITED STATES AND MISSOURI REGION

	1940		1950		1960	
	U. S.	Region	U. S.	Region	U. S.	Region
	(Thousands)					
Population	131,954	6,772	151,234	7,063	176,291	7,931
Employment, total	45,375	2,236	57,475	2,716	66,373	2,985
Agriculture	8,670	792	7,148	740	4,528	512
Manufacturing	10,755	190	14,818	288	18,229	411
Other Commodity	3,033	120	4,453	203	4,653	216
Noncommodity	22,917	1,134	31,056	1,484	38,963	1,846
Employment/Population Ratio (%)	34.39	33.02	38.00	38.45	37.65	37.64

The above information is also shown in figure 4. As can be seen, agricultural employment has been declining nationally and in the region. Agricultural employment as a proportion of total employment nationally decreased from 19.1 percent in 1940 to 6.8 percent in 1960, while agricultural employment in the region decreased during the same period as the proportion of total employment, from 35.4 percent to 17.2 percent. In order for agricultural employment to decline during the period while output was expanding, agriculture became more of a capital-intensive industry supporting an increasing employment base in the noncommodity-producing sector of the economy.

It can be seen from table 2 that employment in manufacturing has been constantly increasing throughout the period, both in the region and in the Nation. The proportion of total national employment accounted for by manufacturing changed from 23.7 percent in 1940 to 27.5 percent in 1960, while in the basin manufacturing employment increased from 8.5 percent to 13.8 percent. While it may be concluded that manufacturing in the region during that period absorbed workers displaced from the agricultural sector, the rate of absorption was not sufficient to allow total employment in the region to keep pace with the total increase experienced in the Nation.



Industrial Tracts and Parks Are Common in the Metropolitan Areas of the Missouri River Basin

Similarly, the rate of growth in employment in the other commodity-producing sector was greater in the region than in the Nation between 1940 and 1960. In

1940, other commodity-producing employment accounted for 5.4 percent of total employment in the region and 6.7 percent in the Nation. By 1950, the proportions for the region and Nation were 7.5 percent and 8.2 percent, respectively. In 1960, employment in this sector declined to 7.2 percent of the total in the region and to 7.0 percent in the Nation. Employment in this sector is made up of two quite distinctly different industries (mining and contract construction) and historic trends are only an aggregate and not an altogether meaningful measure. In terms of total economic activity, contract construction is the more important of the two because it is more closely correlated with growth in population and per capita income. It follows that increases in employment in the construction industry will be in some proportion to increases in population growth. Overall, employment in contract construction in the region doubled during the 1940-1960 period. Nationally, employment in construction increased 84.5 percent during the same period. Employment in contract construction by the eight subregions within the Missouri Region is shown in table 3. The dominance of the Platte-Niobrara and the Lower Missouri subregions is notable.

Table 3 – HISTORICAL CONSTRUCTION EMPLOYMENT BY SUBREGION

Subregion	1940		1950		1960	
	Employment	Percent of Total	Employment	Percent of Total	Employment	Percent of Total
Upper Missouri	4,222	5.0	6,502	6.6	7,586	7.0
Yellowstone	3,679	5.4	7,947	9.2	7,178	7.5
Western Dakota	2,641	3.1	5,726	5.7	7,360	7.1
Eastern Dakota	5,438	2.6	15,709	6.3	13,978	5.9
Platte-Niobrara	21,711	4.8	45,089	7.4	53,716	7.1
Middle Missouri	17,826	4.3	28,697	6.0	28,292	5.9
Kansas	10,427	3.8	22,984	7.0	21,420	6.2
Lower Missouri	27,535	4.3	47,338	6.2	50,139	5.9
Missouri Region	93,479	4.2	179,992	6.6	186,659	6.3

Employment in the mining industry is primarily a function of total demand for various minerals. Location of employment in the industry is governed by source of supply. As parts of the basin are well endowed with various minerals, the basin as a whole is an important segment of the total minerals industry nationally.

Between 1950 and 1961, mineral production value and mineral extraction employment increased substantially. However, due to rapid technological change in minerals extraction, production increases far outstripped employment increases. Production of minerals increased 200 percent while employment increased by only 28 percent (table 4).

Table 4 – HISTORICAL MINERAL INDUSTRY EMPLOYMENT BY SUBREGION

Subregion	1940[1]	1950[1]	1961
Upper Missouri	4,262	2,175	2,250
Yellowstone	1,568	2,577	4,158
Western Dakota	3,673	3,432	3,871
Eastern Dakota	379	565	1,263
Platte-Niobrara	6,440	5,396	6,997
Middle Missouri	950	870	800
Kansas	2,040	3,143	5,803
Lower Missouri	7,667	4,679	4,104
Missouri Region	26,979	22,837	29,246

[1]Office of Business Economics figures – not adjusted for recent changes in subregion territories.

Within the mining industry, the fuels industries experienced the slowest employment growth while enjoying substantial production increases. In 1961, 57 percent of the region's employment in the mineral industry was engaged in fuels extraction, 30 percent in nonmetals industries, and 13 percent in the metals industries. In 1940 and 1950, the percentages were 68 percent in fuels, 25 percent in nonmetals, and 7 percent in metals.

Detailed historic employment data by subarea within the mining industry and its component parts were available during the study from an annual survey made by the Bureau of Mines, Branch of Accident Analyses, Division of Accident Prevention and Health. The survey covered all production, development, maintenance, repair, technical, supervisory, and force-account construction personnel at mines, pits, quarries, wells, and brine operations. Data on personnel and offices, sales store, or other affiliated activities not directly related to the extractive or processing operations are excluded for all mineral industries except the petroleum, natural gas, and slag industries.

Employment trends in the other commodity-producing sector in the region are, therefore, a combination of two trends, mining and contract construction. Given that population growth in the region has lagged somewhat behind that of the Nation, the impetus for the relatively favorable rate of growth in the other

commodity-producing industries has come from the mining industry. Growth in employment in contract construction has been concentrated mainly in the larger urban areas and in defense-related construction within the region.

The most rapidly expanding sector of the economy and the one which accounts for the largest proportion of employment, both nationally and in the region, is the noncommodity-producing group. In 1940, over 1,134,000 were employed in noncommodity-producing industries in the region, which amounted to just over half of total employment in all industries. By 1960, noncommodity-producing employment had increased to 1,846,000, accounting for 61.8 percent of total employment in the region. Whereas the share of noncommodity-producing employment was approximately equal both in the region and the Nation in 1940, by 1960 the relative share in the region was about 3 percent greater. The national share of noncommodity-producing employment stood at 58.7 percent of total employment in 1960. Distribution of employment by four major industrial categories for the 1940, 1950, and 1960 periods for the region and the Nation is shown in figure 4.

Of the 32 individual industries from which data were available, 17 were classified as noncommodity-producing. They can be regrouped into four broad categories comparable to the SIC level. Employment changes for the 1940 to 1960 period are shown in table 5.

Distribution of noncommodity-producing industries by subregion within the region is shown in table 6. The table also shows the percentage share of the noncommodity-producing employment in each subregion. Employment increased in noncommodity-producing industries in all subregions during the 20-year period and also accounted for an increasing share of total employment in each subregion.

FIGURE 4
MAJOR EMPLOYMENT DISTRIBUTION,
NATION AND MISSOURI RIVER REGION
1940, 1950 AND 1960

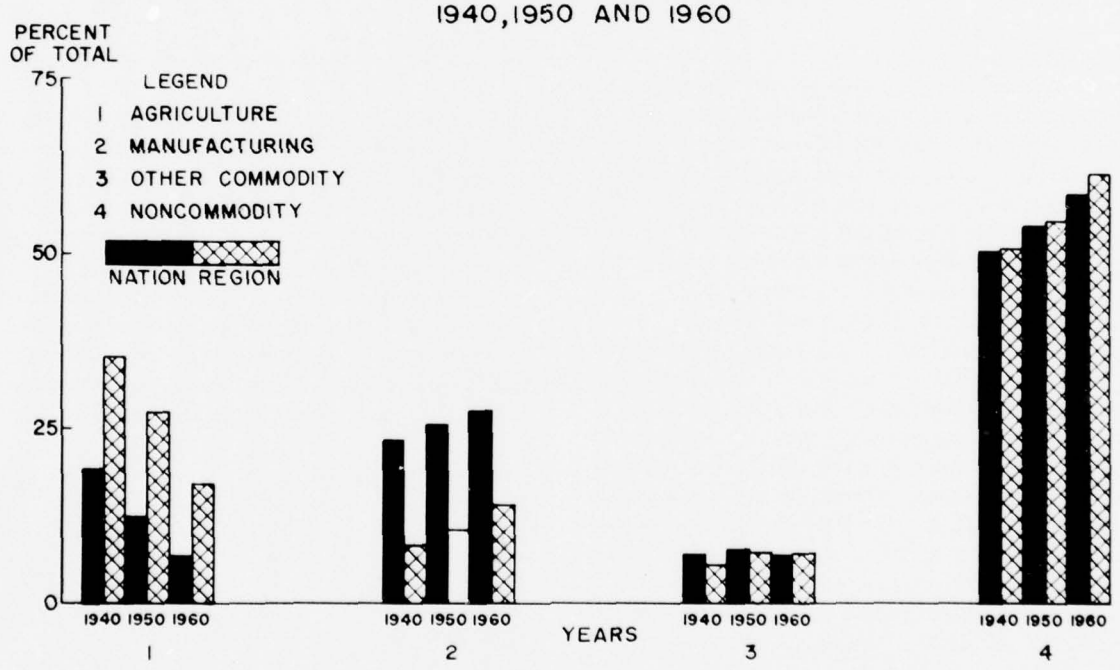


Table 5 – HISTORICAL NONCOMMODITY-PRODUCING EMPLOYMENT BY BROAD CATEGORIES

Category	1940	1950	1960	Percent Change 1940-1960
Government and Armed Forces	94,892	157,343	258,376	172.3
Trade, Finance, and Real Estate	452,690	610,236	710,340	56.9
Professional and Personal Service	414,631	470,248	633,816	52.9
Transportation and Communications	171,945	246,522	243,316	41.5
Missouri Region	1,134,158	1,484,349	1,845,848	62.8

Table 6 – HISTORICAL NONCOMMODITY-PRODUCING EMPLOYMENT BY SUBREGION

Subregion	Employment 1940	Percent of Total	Employment 1950	Percent of Total	Employment 1960	Percent of Total
	(Thousand)		(Thousand)		(Thousand)	
Upper Missouri	39.0	46.2	53.3	54.3	69.1	63.7
Yellowstone	31.7	46.5	47.2	54.4	60.1	62.4
Western Dakota	31.3	37.0	44.8	44.5	56.4	54.1
Eastern Dakota	87.3	41.6	113.1	45.4	128.1	53.8
Platte-Niobrara	259.1	57.3	372.2	61.3	494.6	65.3
Middle Missouri	214.8	51.5	257.6	53.9	285.1	59.0
Kansas	133.7	48.3	175.0	53.1	221.3	64.4
Lower Missouri	337.1	52.4	421.1	55.0	531.1	62.2
Missouri Region	1,134.0	50.7	1,484.3	54.7	1,845.8	61.8

Employment projections are contained in the following chapter. It may be mentioned here that historic trends of the changing distribution of employment by sector continue into the future. Noncommodity-producing employment as a proportion of total employment, both for the region and the Nation, is projected to increase to 71.5 and 69.2 percent, respectively. While this industrial sector contains some industries which are basic to particular local economies and are generative in that they support local employment, the majority of employment in this sector is of the trade and service variety. As such, they are typically the labor-intensive industries. They depend upon commodity-producing or export-based industries in the local area or may be said to be linked to these basic-type industries. Growth of employment in these industries is thus explained by and depends upon growth in the local export base. And because of their labor-intensive character, employment increases in these industries over time tend to be more than proportional to employment increases in the basic-type industries, which are generally highly capital-intensive. Therefore, projections of noncommodity-producing employment which show increasing shares of total employment are reasonable and to be expected.

For water resource planning purposes, a separate breakout of employment in heavy water-using industries was made. Specifically, these are six industries within the manufacturing sector of the region which utilize relatively large volumes of water in the production process. These industries and their respective employment levels during the historic period are shown in table 7.

Ideally, for determining industrial water demands in the future, production, either in constant dollars or units of output, rather than employment, would have been more appropriate proxy variables to use. However, employment data were used as an alternative because of their availability, historical continuity, and generally good reliability. The disadvantage in using employment data is that increases in labor productivity are not accounted for. Within each of the six major heavy water-using industries, employment, productivity, and water use may vary considerably for each plant, depending on materials, products, plant equipment, process, etc. In order to project future industrial water demands, assumptions were made regarding projected productivity increases. Generally, assumed productivity rates were merely extrapolations of historical rates.

Table 7 – HISTORICAL EMPLOYMENT IN HEAVY WATER-USING INDUSTRIES

Industry	1940	1950	1960
Petroleum Refining	6,651	9,921	10,902
Paper and Allied Products	3,584	5,378	9,150
Primary Metals	5,452	13,251	12,367
Chemical Products	6,475	10,168	16,102
Food Products	66,995	88,177	106,768
Textile Mill Products	1,000	1,828	1,545
Missouri Region	90,157	128,723	156,834

As can be seen in table 7, the food products industry accounted for the largest proportion of employment in the region's heavy water-using industries. Although the food products industry experienced employment gains over the 20-year period, it nevertheless represented a

Small Dairy Plants Are Typical of the Food Processing Plants in the Missouri River Region Utilizing Local Agricultural Products

declining proportion of total employment. In 1940, its share of total employment amounted to about 74 percent, whereas the share declined to about 68 percent of the total in 1960. This followed the national pattern of a relative decline of employment in food processing.

Within the region, this decline can be attributed to two factors. A relatively inelastic demand for food products, combined with an above-average rate of labor productivity increase operated to depress employment in the food products industry. A second factor was the geographic shifts in food-processing activity within the region and the Nation which were disadvantageous to the region in terms of its share of total food processing employment. The first factor, inelastic demand combined with relatively high productivity increases, was also operative nationally and explains the below average rate of growth in employment in food products industries. The second, of course, was neutral nationally. However, shifts in food processing activity resulted in the region accounting for a declining share of total employment in the industry (table 8).

Table 8 – HISTORICAL EMPLOYMENT IN FOOD PRODUCT INDUSTRIES, NATION AND MISSOURI REGION

Item	1940	1950	1960
Nation	1,122,965	1,435,045	1,897,020
Missouri Region	66,995	88,177	106,768
Region as Percent of Nation	5.97%	6.14%	5.63%

More detailed discussions on agriculture are contained later in this chapter. However, there have been significant developments in agriculture and agriculturally related activities which should be noted here. These are concerned mainly with the impact of technological change on agricultural production and the location of industries economically linked to agriculture. Technological change and the consequent effect on cost structures underlie the shifts in the location of food production and processing industries. Within the region, the shifts in food processing activity have been toward decentralization.

The remaining five industries classified as heavy water users all showed fairly substantial employment gains over the 20-year historic period as well as increasing shares in total employment nationally in these industries. Table 9 shows comparative growth rates between the region and the Nation, followed by table 10 showing percentage shares of each industry as compared to total employment in the Nation. Except for the primary metals industry, employment growth rates in all industries during the 1950 to 1960 period exceeded the national growth rates.

Table 9 – HISTORICAL HEAVY WATER-USING INDUSTRIES EMPLOYMENT[1], PERCENTAGE GROWTH RATES, NATION AND MISSOURI REGION

Industry	1940-50		1950-60	
	Nation	Region	Nation	Region
	(Percent)			
Petroleum Refining	43.0	49.2	6.4	11.0
Paper and Allied Products	42.7	50.0	26.8	70.1
Primary Metals	39.8	143.0	6.0	-6.7
Chemical Products	49.7	57.0	34.5	58.4
Textile Mill Products	7.6	82.8	-21.1	-15.5

[1]Excludes food products industries.

Table 10 – HISTORICAL HEAVY WATER-USING INDUSTRIES EMPLOYMENT[1] MISSOURI REGION AS A PERCENT OF NATION

Industry	1940	1950	1960
	(Percent)		
Petroleum Refining	3.3	3.4	3.7
Paper and Allied Products	1.1	1.1	1.5
Primary Metals	0.6	1.1	1.0
Chemical Products	1.4	1.5	1.8
Textile Mill Products	0.1	0.1	0.2

[1]Excludes food products industries.

Another industrial sector which is important in water resource planning is the forest-related manufacturing industry. Commercial harvest of mature and merchantable growing timber is dependent on requirements of forest-based industries. Timely harvest of the timber crop and proper management of growing timber stands are related to water yield and are part of the overall water management program. Employment in timber-based manufacturing industries in the Missouri Region was 22,151 in 1962, or an increase of 2,000 over 1952. This employment is shown in table 11 distributed by type of industrial activity.

Information on projected employment in the timber-based manufacturing industries is given in the following chapter on Projected Economy. In terms of the geographic distribution of total employment within the region, just over one-half was employed in the Lower Missouri Subregion. This is shown in table 12. Broken down by industries, 37 percent of the total employment was in the production of pulp, paper, and allied products, 40 percent in lumber and wood products, and the remaining 23 percent in timber harvesting.

Table 11 – HISTORICAL ESTIMATED EMPLOYMENT IN TIMBER-BASED MANUFACTURING INDUSTRIES, MISSOURI REGION

Year	Grand Total	Lumber and Wood Products				Pulp, Paper & Allied Products	Timber Harvesting
		Total	Sawmills and Planing Mills	Veneer and Plywood Plants	Other		
1952	20,123	7,807	4,209	40	3,558	6,322	5,994
1962	22,151	8,846	4,357	40	4,449	8,153	5,152

Table 12 – HISTORICAL ESTIMATED EMPLOYMENT IN TIMBER-BASED MANUFACTURING INDUSTRIES, BY SUBREGION

Subregion	1952	1962
Upper Missouri	465	890
Yellowstone	591	829
Western Dakota	1,275	1,388
Eastern Dakota	330	250
Platte-Niobrara	2,812	3,514
Middle Missouri	2,560	2,820
Kansas	910	940
Lower Missouri	11,180	11,520
Missouri Region	20,123	22,151

Table 13 – HISTORICAL INCOME AND EARNINGS, MISSOURI REGION

Item	1940	1950	1960[1]
Total Personal Income (Millions)	$ 6,270	$11,144	$14,381
Percent of Nation	3.97%	4.44%	4.09%
Per Capita Personal Income	$ 926	$ 1,578	$ 1,813
Percent of Nation	77.29%	95.17%	90.92%
Total Earnings (Millions)	$ 5,209	$ 9,108	$11,196
Percent of Nation	4.12%	4.53%	3.99%
Earnings per Employee	$ 2,329	$ 3,354	$ 3,751
Percent of Nation	83.48%	95.80%	88.72%

[1]1960 employment and 1959 earnings.

INCOME AND EARNINGS

Between 1940 and 1960, total personal income in the United States increased from about $157 billion to over $351 billion. This is stated in terms of constant 1954 dollars in order to remove the effects of inflation. Per capita personal income increased from about $1,200 to $2,000 during the 20-year period. The total increase in personal income in the region over the 20-year period amounted to approximately $8.1 billion in real terms. With the growth in population during this period, increases in per capita personal income from 1940 to 1950 amounted to 70.4 percent but only a 14.9 percent increase during the following decade. Total earnings in the region increased by $3.9 billion and $2.1 billion during these respective decades. This increase in earnings was comparable to the national rate. Table 13 compares the Nation and the region in terms of personal income and total earnings in the 3 historic years. Income and earnings levels approached the national average between 1940 and 1960 and compared favorably with the Nation during the latter year. The region, however, still remains below national income and earnings levels.

Per capita personal income by individual subregions, with few exceptions, remained below the national average. In 1940, per capita personal income was 77.3 percent of the national average. None of the eight subregions exceeded the national average in 1940. By 1960, per capita personal income had increased to 90.9 percent of the national average. Also during 1960, the Platte-Niobrara Subregion equaled the national average, while only two subregions, the Eastern Dakota and Western Dakota subregions, remained substantially below national per capita income levels. Table 14 gives, in index number form, comparative figures on per capita personal income for the region, the eight subregions, and the eleven SMSA's.

Earnings per employee in the region, subregions, and SMSA's as a percent of the national average are shown in table 15. While there appears to be a greater dispersion of rates around the national average in earnings per employee as contrasted to per capita personal income, it appears that there is a general tendency for convergence upon the national average. In terms of geographical differences within the region, earnings per employee in the Platte-Niobrara Subregion came closest to the national average, 97.0 percent in 1960. The Eastern Dakota Subregion was farthest from the national average in 1960 with 70.0 percent.

The 11 standard metropolitan statistical areas in the basin compared favorably with the Nation in terms of earnings per employee. Sioux Falls, Springfield, Lincoln, and Topeka all failed to equal the national average in each of the 3 census years.

A comparison between the region and Nation in terms of earnings per employee by the four major employment categories shows the region comparing favorably (table 16).

In agriculture, earnings per employee in the region exceeded those in the Nation for 1940 and 1950, but to a lesser extent in 1960. In manufacturing, earnings per employee were less in the region than the Nation

Table 14 – HISTORICAL PER CAPITA PERSONAL INCOME, BY SUBREGION AND SMSA'S AS A PERCENT OF NATION

Area	1940	1950	1960[1]
	(Nation = 100)		
Subregions and SMSA's			
Upper Missouri	95.8	120.5	92.5
Great Falls SMSA	117.3	124.0	105.2
Yellowstone	92.7	99.0	90.9
Billings SMSA	105.3	106.8	102.2
Western Dakota	59.2	81.1	72.7
Eastern Dakota	59.8	78.6	66.8
Sioux Falls SMSA	86.8	96.1	85.2
Platte-Niobrara	[2]	105.0	100.8
Denver SMSA	117.5	115.6	113.7
Lincoln SMSA	92.9	100.7	98.8
Middle Missouri	[2]	100.4	91.8
Omaha SMSA	102.7	115.4	111.4
Sioux City SMSA	100.1	111.8	99.8
St. Joseph SMSA	100.3	105.9	104.7
Kansas	61.2	89.8	89.0
Topeka SMSA	86.9	102.4	114.3
Lower Missouri	76.6	90.2	92.0
Kansas City SMSA	109.4	120.3	114.3
Springfield SMSA	77.5	86.3	89.3
Missouri Region	77.3	95.2	90.9

[1]1960 population and 1959 income.
[2]Not available.

Table 15 – HISTORICAL EARNINGS PER EMPLOYEE BY SUBREGION AND SMSA'S AS PERCENT OF NATION

Area	1940	1950	1960[1]
	(Nation = 100)		
Subregions and SMSA's			
Upper Missouri	104.3	125.3	91.7
Great Falls SMSA	119.1	110.6	90.8
Yellowstone	105.1	108.0	96.3
Billings SMSA	116.1	109.3	103.4
Western Dakota	72.4	87.2	75.3
Eastern Dakota	69.4	83.9	70.0
Sioux Falls SMSA	84.1	86.6	83.9
Platte-Niobrara	[2]	102.2	97.0
Denver SMSA	111.6	104.6	107.6
Lincoln SMSA	89.7	91.5	81.4
Middle Missouri	[2]	102.9	91.7
Omaha SMSA	102.8	108.4	107.6
Sioux City SMSA	105.6	110.4	97.8
St. Joseph SMSA	103.1	105.3	103.7
Kansas	66.0	88.3	79.5
Topeka SMSA	85.5	95.4	97.7
Lower Missouri	81.0	89.3	89.0
Kansas City SMSA	100.9	110.1	110.4
Springfield SMSA	86.1	87.3	89.8
Missouri Region	83.5	95.8	88.7

[1]1960 population and 1959 income.
[2]Not available.

throughout the 20-year period, with the difference increasing between 1940 and 1960. In other commodity-producing industries, earnings per employee were below the national level in 1940 and 1950 and exceeded the national level in 1960. In noncommodity-producing industries, the difference between the Nation and region was reduced between 1940 and 1950, and the region was approximately $400 below the Nation in 1960.

A comparison of total earnings is illustrated graphically in figure 5, which shows the distribution of earnings by the four major employment categories during the historic period.

FIGURE 5

EARNINGS DISTRIBUTION BY MAJOR EMPLOYMENT GROUP, NATION AND MISSOURI RIVER REGION 1940, 1950 AND 1960 [1]

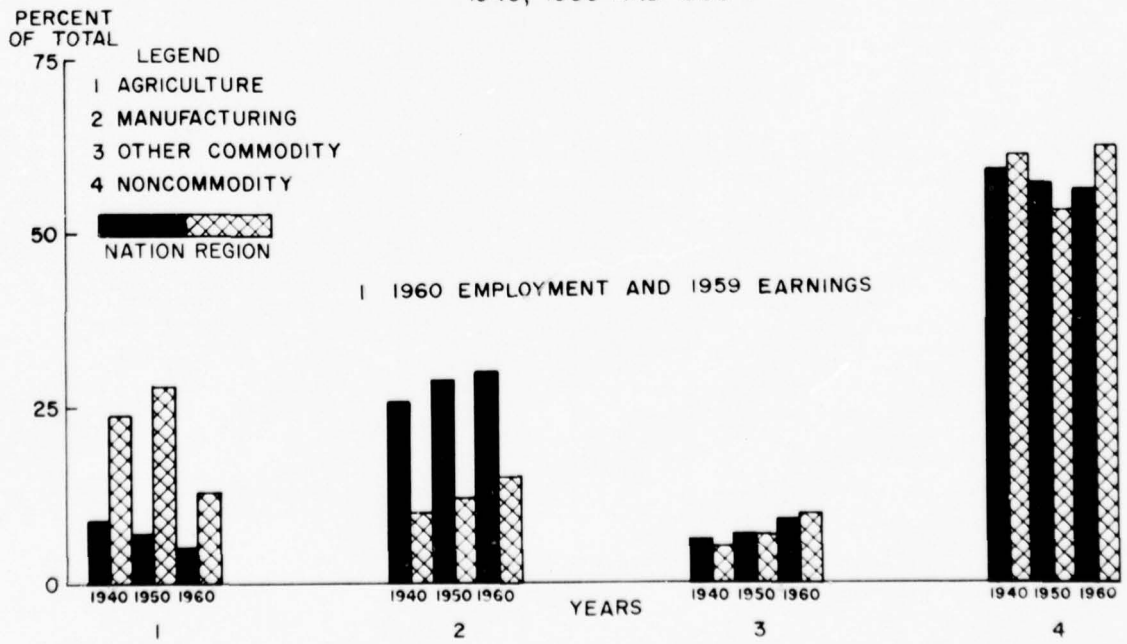


Table 16 – HISTORICAL EARNINGS PER EMPLOYEE BY MAJOR EMPLOYMENT GROUP, NATION, AND MISSOURI REGION

Employment Group	1940		1950		1960[1]	
	Nation	Region	Nation	Region	Nation	Region
	(Current Dollars)					
Agriculture	$ 646	$ 794	$2,241	$3,111	$3,158	$3,181
Manufacturing	1,517	1,405	3,527	3,342	5,038	4,445
Other Commodity	1,256	1,019	3,212	2,894	5,309	5,515
Noncommodity	1,620	1,381	3,167	2,924	4,456	4,054

[1]1960 employment and 1959 earnings.

AGRICULTURE

Agriculture is the dominant industry in the region. A significant portion of the Nation's food and fiber requirements is supplied from this area. Many of the same forces that have affected other agricultural areas are reflected in the same basic trends of the Missouri Region. Rapidly improving efficiency and application of technology have aided in increasing farm output from fewer, but larger, farms. Increased productivity per worker has eliminated many agricultural employment opportunities. A farm worker provided farm products for 11 persons in 1940; by 1960, he supplied 26 persons. Presently, each worker can provide for 38 people – 32 at home and 6 abroad.

The large proportion of total employment supported by agriculture in the region is the principal reason for a relative decline in total employment growth compared to the Nation. Other sectors of the region's economy have not absorbed the excess manpower to the extent it became available.

Table 17 presents 1959 and 1964 production levels for major agricultural products for the region and the Nation and illustrates the importance of the Missouri Region in the total agricultural industry. For example, in 1964 approximately $5.1 billion worth of farm products were marketed in the region. This accounted for more than 15 percent of the national total of farm products sold. For many of the more important crops, the region's share of total output was substantially greater than 15 percent.

Table 17 – HISTORICAL MAJOR FARM PRODUCTS, MISSOURI REGION AND NATION

Product	Unit (Thousand)	1959			1964		
		Missouri Region		Nation	Missouri Region		Nation
		Production[1]	% of Nation	Production[1]	Production[2]	% of Nation	Production[2]
Wheat	Bu.	339,982	32.2	1,055,925	383,241	31.5	1,217,757
Rye	Bu.	6,612	30.3	21,809	11,725	35.0	33,472[3]
Oats	Bu.	168,057	16.8	1,001,092	176,474	21.8	808,120
Sorghum Grain	Bu.	138,827	27.3	508,149	153,739	36.0	426,663
Corn, Grain	Bu.	800,080	21.6	3,697,191	623,763	18.6	3,361,152
Barley	Bu.	98,575	24.8	398,312	84,029	23.2	362,147
Potatoes	Cwt.	7,840	3.5	224,140	5,125	2.3	221,763
Dry Beans	Cwt.	3,675	19.2	19,087	2,807	16.8	16,692[3]
Flaxseed	Bu.	7,282	37.2	19,597	10,087	41.3	24,408[3]
Sugar Beets	Tons	4,605	27.4	16,822	5,845	25.0	23,368[3]
Soybeans	Bu.	42,559	8.2	515,628	76,396	11.4	669,714
Corn Silage	Tons	10,674	18.7	57,076	16,323	20.6	79,336
Sorghum Silage	Tons	3,349	29.9	11,190	4,455	41.9	10,625
Alfalfa Hay	Tons	13,522	22.6	59,871	15,745	23.0	68,380
Wild (Native) Hay	Tons	4,968	57.5	8,636	5,306	57.8	9,165
		Sold[4]	% of Nation	Sold[4]	Sold[4]	% of Nation	Sold[4]
Cattle & Calves	Head	12,426	24.0	51,252	15,184	24.0	62,952
Hogs & Pigs	Head	17,115	21.0	80,900	18,651	22.0	83,537
Sheep & Lambs	Head	7,349	29.0	25,394	6,377	29.0	22,080
Chickens	Head	36,801	4.0	968,688	2		1,620,241
Broilers	Head	14,805	1.0	1,419,260	2		1,915,374
Turkeys	Head	6,806	8.0	80,396	2		104,750
Eggs	Doz.	348,469	10.0	3,618,203	312,107	7.0	4,282,304
Milk	Lbs.	4,848,210	5.0	97,606,342	6,623,069	6.0	107,421,936

[1]Source: 1959 Census of Agriculture
[2]Source: 1964 Census of Agriculture
[3]Source: Agricultural Statistics, 1965
[4]Not comparable to production

Within the region's economy agriculture is most significant. The farm sector still accounts for a greater proportion of employment than any single industry, although declining in relative importance. Total agricultural employment has declined during the past 20 to 30 years. Since 1940, approximately 280,000 fewer farm workers were employed in the region annually.

The long-term change in structure of the agricultural industry which is most directly reflected in employment reductions, is due to a combination of complex factors. However, two overriding factors underlie the decline. First, technological change and rapidly increasing efficiencies have had the effect of eliminating jobs through the substitution of capital for labor. Second, while agriculture has become more efficient in production as a result of the first factor, the increase in efficiency has not been offset by similar increases in the total farm output. Aggregate demand for agricultural output tends to be relatively inelastic. With this relative inelasticity, the rate of increase in labor productivity in agriculture due to the application of new technology in production has been more rapid than the rate of increase in demand. The result has been commodity surpluses and the releasing of labor for other pursuits. This is shown in table 2. During the historic period, employment in agriculture in the region declined from about 792,000 in 1940 to 512,000 in 1960.

In addition to the more technical considerations, there have been institutional and market forces which serve to explain further the problems of agriculture. In an economy dependent so heavily upon agriculture as its major export base, the region has been and to a lesser degree remains exposed to the variety of uncontrollable and unpredictable influences which plague agriculture generally. By way of illustration, agriculture is very similar to the "open economy" on the international trading scene in that outside forces govern to a large degree the pricing, output, and employment decisions within the export industry.

Aside from the uncertainties which climatic conditions pose on prices and output in agriculture, the fact that prices of farm products are determined in highly competitive markets subjects price determination of various crops to the "natural" laws of supply and demand. Because of the inelasticity of demand for most crops, as discussed previously, market prices become, for all practical purposes, a function of supply. Because agriculture is characterized by many small sellers, there is no control over quantities supplied. Thus, each farm operator, in attempting to maximize his own profits, operates or attempts to operate, at full capacity, with the result that the market is over supplied and prices are depressed. This tendency toward over supply is reinforced by current output decisions based on prices of crops during the preceding year. The farmer determines his pattern of crop outputs at the beginning of the year based upon relative prices existing in the preceding year. This cyclical nature of agricultural pricing and output tends to create persistent disequilibrium in the market place annually.

Added to this is the lack of growth in nonfarm job opportunities which has persisted in the region and which has tended to discourage the "under-employed" farm operator from moving out of agriculture. He has remained in farming as a marginal producer, thus adding to the over supply of various crops and the subsequent depressing influence on prices and average farm incomes. Under these conditions, the market for farm products typically favors the buyer, with prices at or below the cost of production and income barely exceeding costs. Farm incomes, as a result, tend to remain close to subsistence levels (at least for the marginal or subsistent farmer) and generate only minimal employment and income opportunities in residentiary industries.

During the 1930's, Federal price supports and acreage controls were initiated which improved farm incomes. During the 1950's, production controls were relaxed and the result was a rapid buildup of stocks of wheat, feed grains, and other commodities. The growth in these stocks would have been substantially greater but for the export of grains under the Food-for-Peace Plan. Approximately one-third of the grain produced in the region during this period was exported. Currently, Federal agricultural support programs contain both price supports and production controls which recognize the problems of agriculture and partially succeed in alleviating many of them.

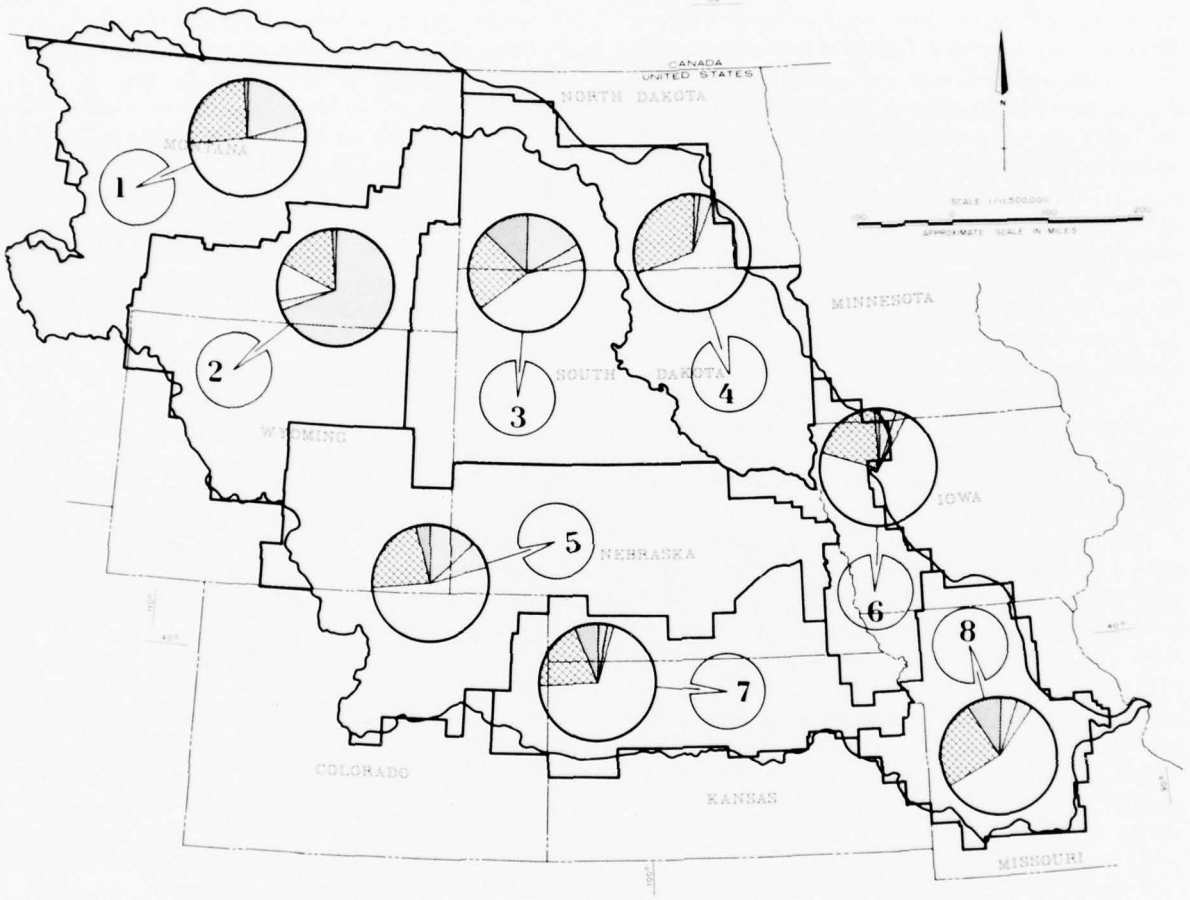
Thus, agriculture in the Missouri Region currently is heavily dependent upon Federal programs to support farm prices and maintain incomes with substantial acreages of crop land in retirement to hold food and fiber production close to demand. There continues to be a decline in agricultural employment, excess capacity and overproduction in agriculture, and insufficient growth in nonfarm job opportunities which inhibits mobility of the marginal farm operator out of agriculture.

Land Use

Agriculture is the primary user of land in the region and basin, as shown in figure 6 and table 18. Nearly 95 percent of the approximately 328 million acres of land and water available annually is used for some agricultural purpose. Within the four westernmost subbasins, more than one-half of the land is used for grazing. The Middle Missouri Subbasin is most intensively cultivated, with 75 percent of the area in cropland. The Kansas Subbasin has the most cropland, approximately 22 million acres, followed by the Platte-Niobrara Subbasin with nearly 16 million acres.

FIGURE 6

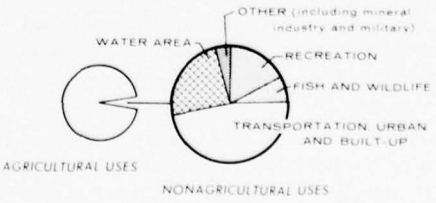
MAJOR LAND USE MAP
MISSOURI RIVER SUBREGIONS



LEGEND

SUBREGIONS

1. UPPER MISSOURI RIVER TRIBUTARIES
2. YELLOWSTONE RIVER
3. WESTERN DAKOTA TRIBUTARIES
4. EASTERN DAKOTA TRIBUTARIES
5. PLATTE-NIOBRARA RIVERS
6. MIDDLE MISSOURI RIVER TRIBUTARIES
7. KANSAS RIVER
8. LOWER MISSOURI RIVER TRIBUTARIES



TOTAL REGION

Table 18 – WATER AREA AND PRIMARY USES OF LAND BY SUBBASIN

Primary Use	Subbasin								
	Upper Missouri	Yellow-stone	Western Dakota	Eastern Dakota	Platte-Niobrara	Middle Missouri	Kansas	Lower Missouri	Missouri Basin[1]
	(Thousand Acres)								
Agriculture	50,382	43,152	47,289	34,399	60,787	14,901	37,182	24,300	312,392
Recreation	519	1,408	334	38	377	37	36	65	2,814
Fish and Wildlife	142	31	92	162	220	25	15	51	738
Transportation, Urban & Built-up	1,240	246	897	1,801	1,508	600	1,195	603	8,090
Water Area[1]	670	345	472	902	654	174	336	266	3,819
Mineral Industry	3	9	3	[2]	6	2	6	3	33
Military	7	9	269	[2]	123	6	106	102	622
Total	52,963	45,200	49,356	37,303	63,675	15,745	38,876	25,390	328,508

[1] Includes primary water area of recreation, fish, and wildlife.
[2] Less than 500 acres

Seven percent of the cropland in the Missouri Basin is irrigated. This 7 percent of the cropland accounted for 17 percent of the agricultural production. The Platte-Niobrara Subbasin has the largest area of irrigated land, 2.8 million acres. Other important areas of irrigation are in the Kansas Subbasin, with 1.7 million acres, and the Upper Missouri and Yellowstone subbasins, each with approximately 1 million acres. Smaller amounts of irrigation are found in the Western Dakota and Middle Missouri subbasins. The current inventory of private agricultural land use and cropping patterns by subbasins includes appropriate acreage and production adjustments for projects assumed in place.

Grazing is the Predominant Land Use in the Western Portion of the Missouri River Basin

Farm Numbers and Size

The number of farms in the Missouri Region has been declining steadily since 1940 (table 19). This reflects the national pattern of farm consolidation and population movement off the farms. This change has occurred uniformly in all subregions, although somewhat accelerated in the Lower Missouri Subregion. In total, the region lost nearly 150,000 farms between 1949 and 1964 or nearly 30 percent of the 1949 total. This reduction in the number of farms has been accompanied by a corresponding increase in average farm size (table 20). In 1964, average farm size ranged from a high of 3,038 acres in the Yellowstone Subregion to a low of 232 acres in the Lower Missouri Subregion.

A tabulation of farms by size shows that 54 percent in the region are 260 acres and greater, and approximately 24 percent are between 260 and 499 acres (table 21). All types of farms are represented within the region. However, in 1964 approximately 62 percent were either cash grain or livestock farms (table 22).

Table 19 – HISTORICAL NUMBER AND PERCENTAGE DISTRIBUTION OF FARMS BY SUBREGION

Subregion	Number of Farms				Percentage Districution			
	1949	1954	1959[1]	1964	1949	1954	1959	1964
Upper Missouri	18,287	17,140	15,355	14,484	3.4	3.5	3.6	3.8
Yellowstone	14,485	13,510	11,491	10,575	2.8	2.8	2.7	2.8
Western Dakota	27,072	24,966	22,002	20,099	5.1	5.1	5.1	5.3
Eastern Dakota	71,725	68,021	61,066	54,182	13.6	13.9	14.3	14.2
Platte-Niobrara	80,332	74,132	64,795	57,654	15.2	15.2	15.2	15.2
Middle Missouri	90,570	85,469	76,772	67,387	17.1	17.5	18.1	17.7
Kansas	80,836	75,187	66,354	58,624	15.4	15.5	15.6	15.5
Lower Missouri	145,194	129,288	109,577	97,061	27.4	26.5	25.6	25.5
Missouri Region	528,501	487,713	427,412	380,066	100.0	100.0	100.0	100.0

[1] Unadjusted for farm definition change.
Source: Agricultural Census, 1949, 1954, 1959, and preliminary 1964

Farm Consolidation Has Brought Larger Farms and an Increasing Number of Vacant Farmsteads

Table 20 – HISTORICAL AVERAGE FARM SIZE BY SUBREGION

Subregion	1949	1954	1959	1964
	(Acres)			
Upper Missouri	1,863	2,118	2,494	2,762
Yellowstone	1,896	2,328	2,646	3,038
Western Dakota	1,515	1,658	1,861	2,141
Eastern Dakota	474	504	563	632
Platte-Niobrara	920	990	1,146	1,293
Middle Missouri	191	202	219	256
Kansas	419	459	518	590
Lower Missouri	157	177	208	232
Missouri Region	512	578	650	690

Source: U. S. Dept. of Commerce, Bureau of Census, Agriculture Census, 1949, 1954, 1959, and preliminary 1964.

Table 21 – NUMBER OF FARMS BY SIZE AND SUBREGION, 1964

Size of Farm (Acres)	Subregion								Missouri Region	
	Upper Missouri	Yellow-stone	Western Dakota	Eastern Dakota	Platte-Niobrara	Middle Missouri	Kansas	Lower Missouri	Total Farms	Percent of Total
Less than 10	232	323	199	977	2,007	1,949	1,426	1,849	8,962	2.4
10 – 49	383	645	304	1,582	3,044	4,504	2,681	12,454	25,597	6.7
50 – 99	293	547	280	1,512	3,373	5,902	3,394	16,027	31,328	8.2
100 – 139	182	416	193	929	2,128	4,656	1,856	11,372	21,732	5.7
140 – 179	434	681	652	4,211	6,806	11,588	5,434	11,002	40,808	10.7
180 – 219	206	335	166	1,518	2,734	5,499	2,158	7,837	20,453	5.4
200 – 259	218	351	253	2,756	4,069	7,816	3,802	7,006	26,271	6.9
260 – 499	1,555	1,536	2,428	16,765	14,173	19,818	16,388	20,170	92,833	24.4
500 – 999	2,417	1,412	4,959	15,074	8,669	4,989	8,448	7,815	58,372	15.4
Greater than 1000	8,564	4,329	10,665	8,858	10,651	666	13,037	1,529	53,710	14.2
Total	14,484	10,575	20,099	54,182	57,654	67,387	58,624	97,061	380,066	100.0

Source: U. S. Department of Commerce, Bureau of the Census, Agriculture Census: 1964.

Table 22 – NUMBER OF FARMS BY TYPE OF FARM, BY SUBREGION, 1964

Type of Farm[1]	Subregion								Missouri Region	
	Upper Missouri	Yellow-stone	Western Dakota	Eastern Dakota	Platte-Niobrara	Middle Missouri	Kansas	Lower Missouri	Total Farms	Percent of Total
Cash Grain	6,907	1,514	4,749	14,343	11,715	14,857	22,200	12,255	88,540	23.3
Other Field Crops	68	769	75	50	1,071	24	78	25	2,160	0.6
Vegetable	5	11	5	10	171	31	16	61	310	0.1
Fruit and Nuts	0	1	0	6	12	54	9	125	207	0.1
Poultry	54	47	38	512	342	435	295	1,011	2,734	0.7
Dairy	242	260	823	4,355	2,784	3,744	2,156	10,363	24,727	6.5
Livestock[2]	2,733	2,784	7,484	23,911	24,425	34,980	19,140	32,594	148,415	39.0
Livestock Ranches	2,226	2,543	2,917	405	3,541	141	1,110	101	12,984	3.4
General	645	885	1,783	5,985	6,177	5,072	4,921	5,616	31,084	8.2
Miscellaneous[3]	1,604	1,761	1,861	4,605	7,416	8,049	8,699	34,910	68,905	18.1
Total	14,484	10,575	20,099	54,182	57,654	67,387	58,624	97,061	380,066	100.0

Source: U. S. Department of Commerce, Bureau of the Census, Agriculture Census, 1964.

1 The type of farm classification represents a description of the major source of income from farm sales. To be classified as a particular type, a farm had to have sales of a particular product or group of products amounting in value to 50 percent or more of the total value of all farm products sold during the war year. The types of farms, together with the products on which type classification is based, are as follows:

Type of Farm	Source of Cash Income
	(Products with sales value representing 50 percent or more of total value of all farm products sold)
Cash-grain	Corn, sorghums, small grains, soybeans for beans, cowpeas for peas, dry field and seed beans and peas.
Other field crops	Peanuts, potatoes, sugar cane for sugar or syrup, sweet sorghums for syrup, broomcorn, popcorn, mint and hops, sugar beet seed, and pineapples.
Vegetable farms	Vegetables.
Fruit and nut farms	Berries, other small fruits, tree fruits, grapes, nuts, and coffee.
Poultry	Chickens, chicken eggs, turkeys, and other poultry products.
Dairy	Milk and cream. The criterion of 50 percent of total sales was modified in the case of dairy farms. A farm having value of sales of dairy products amounting to less than 50 percent of the total value of farm products sold was classified as a dairy farm, if – (a) milk and cream sold accounted for more than 30 percent of the total value of products sold, and (b) milk cows represented 50 percent or more of total cows, and (c) the value of milk and cream sold plus the value of cattle and calves sold amounted to 50 percent or more of the total value of all farm products sold.
Livestock & Other than Dairy & Poultry	Cattle, calves, hogs, sheep, goats, wool, and mohair except for farms in the 17 western states that qualified as livestock ranches.
Livestock ranches	Farms in the 17 western states were classified as livestock ranches if the sales of livestock, wool, and mohair represented 50 percent or more of the total value of farm products sold and if pastureland or grazing land amounted to 100 or more times the acreage of cropland harvested.
General	Field seed crops, hay, silage. A farm was classified as general also if it had cash income from three or more sources and did not meet the criteria for any other type.
Miscellaneous	Nursery and greenhouse products, forest products, mules, horses, colts, ponies, fur-bearing animals, bees, honey, goat milk, and farms with no value of farm products sold. Also all institutional farms and Indian reservations.

2 Other than poultry and dairy.

3 Includes tobacco farms: 50 in Middle Missouri Subregion, 2 in Kansas Subregion, and 207 in Lower Missouri Subregion.

Value of Agricultural Products Sold

Total value of farm products sold in the Missouri Region was approximately $4.6 billion in 1959 and $5.1 billion in 1964. The average value per farm was $10,775 for 1959 and $13,444 for 1964, which is significantly higher than national averages. In 1964, livestock and livestock product sales accounted for 70.6 percent of total sales, as compared to 53.6 percent for the Nation. Within the region, the sale of livestock and livestock products was greater than crop sales in all subregions, except the Upper Missouri Subregion (table 23). Table 24 shows the distribution of farm numbers by value of farm products sold. Approximately 39 percent of the farm units sell more than $10,000 worth of farm products, while at least 21 percent sell less than $5,000 worth of farm products.

Table 23 – VALUE OF CROPS AND LIVESTOCK AND LIVESTOCK PRODUCTS SOLD, BY SUBREGION, 1959 and 1964

Subregion	1959				1964			
	Crop Sales	Livestock and Livestock Products	Total Sales	Percent of Total	Crop Sales	Livestock and Livestock Products	Total Sales	Percent of Total
	($ Thousand)				($ Thousand)			
Upper Missouri	121,684	113,177	234,861	5.10	124,228	112,954	237,182	4.64
Yellowstone	43,512	121,011	164,523	3.57	50,753	118,072	168,825	3.30
Western Dakota	46,149	176,170	222,320	4.83	75,337	162,876	238,213	4.66
Eastern Dakota	114,346	388,972	503,018	10.92	202,497	449,380	651,877	12.76
Platte-Niobrara	262,792	587,374	850,166	18.46	248,595	688,671	937,266	18.34
Middle Missouri	275,967	985,912	1,261,879	27.40	330,596	1,095,807	1,426,403	27.92
Kansas	355,134	374,050	729,184	15.83	309,615	470,477	780,092	15.27
Lower Missouri	162,644	477,003	639,648	13.89	197,425	472,205	669,630	13.11
Missouri Region	1,382,228	3,223,669	4,605,599	100.00	1,539,046	3,570,441	5,109,487	100.00

Table 24 – NUMBER OF FARMS BY ECONOMIC CLASS, BY SUBREGION, 1964

Class of Farm[1]	Subregion								Missouri Region	
	Upper Missouri	Yellow-stone	Western Dakota	Eastern Dakota	Platte-Niobrara	Middle Missouri	Kansas	Lower Missouri	Total	Percent of All Farms
Commercial Farms	(13,007)	(8,960)	(18,378)	(49,801)	(50,854)	(59,694)	(50,227)	(63,581)	(314,502)	(82.7)
Class I	1,008	755	719	1,577	5,058	4,968	2,716	1,732	18,533	4.9
Class II	2,530	1,501	2,164	5,148	8,658	11,086	6,440	4,789	42,316	11.1
Class III	4,007	2,476	5,275	15,199	14,080	18,886	13,876	12,493	86,292	22.7
Class IV	3,104	2,161	5,835	16,964	12,899	14,731	14,832	17,333	87,859	23.1
Class V	1,725	1,442	3,215	8,407	7,566	7,833	9,513	17,061	56,762	14.9
Class VI	633	625	1,170	2,506	2,593	2,190	2,850	10,173	22,740	6.0
Other Farms	(1,477)	(1,615)	(1,721)	(4,381)	(6,800)	(7,693)	(8,397)	(33,480)	(65,564)	(17.3)
Part Time	908	1,043	968	1,952	3,662	3,910	4,421	19,523	36,387	9.6
Part Retirement	508	547	721	2,394	3,110	3,770	3,965	13,936	28,951	7.6
Abnormal	61	25	32	35	28	13	11	21	226	0.1
Total, All Farms	(14,484)	(10,575)	(20,099)	(54,582)	(57,654)	(67,387)	(58,624)	(97,061)	(380,066)	(100.0)

Source: U. S. Department of Commerce, Bureau of the Census, Agriculture Census, 1964.

1 The 1964 Census of Agriculture grouped farms into two major categories—commercial and other farms. The basis for this classification and the determination of economic class is as follows:

Class of Farm	Value of Farm Products Sold
I	$40,000 and over
II	$20,000 to $39,999
III	$10,000 to $19,999
IV	$ 5,000 to $ 9,999
V	$ 2,500 to $ 4,999
VI*	$ 50 to $ 2,499

*Provided the operator was under 65 years of age, and (1) did not work off the farm 100 or more days, and (2) nonfarm income of operator and his family was less than value of farm products sold.

"Other farms" were divided into three economic classes as follows:

a. Part-time—Economic class VI farms failing to meet criteria (1) or (2) above.
b. Part-retirement—Value of products sold of $50 to $2,499 with operator 65 years old or over.
c. Abnormal—Farms that do not fit other census definitions.

Agricultural Production

Few other major regions in the Nation equal the Missouri Region in the proportion of land producing food and other commodities. Only about 18 percent of the Nation's land is in the region, though the region contains almost 25 percent of the farmland and the same percentage of the cropland. Because of the high degree of specialization, the region produces larger than proportional shares of grain and meat. It regularly produces

Large Combines Are Examples of Modern Production Efficiency

a third or more of the Nation's wheat and is commonly known as the "bread basket" of America. The region's share of total production of feed grains is somewhat smaller. It produces about 30 percent of the Nation's sorghum, barley, and sugar beet crops, and 20 percent of its corn and oats. In addition, the region produces 40 percent of the Nation's rye and 50 percent of the flaxseed. The region also produces one-fourth of the Nation's red meat animals—cattle, hogs, and sheep.

The region's share of grain and meat production is large in comparison to its share of the Nation's land. This share of the Nation's output has been accomplished with only 11 percent of the Nation's agricultural employees. Historical production of crops and livestock is shown in tables 25 and 26, respectively.

The preceding discussion of agricultural characteristics has been concerned with average values by subregions. Subregions, however, are delineated by drainage areas on political boundaries which transcend a wide range of climatic, topographic, and soil conditions. Such factors are closely correlated to specific types of farming and ranching operations which have developed to best utilize the natural environment.

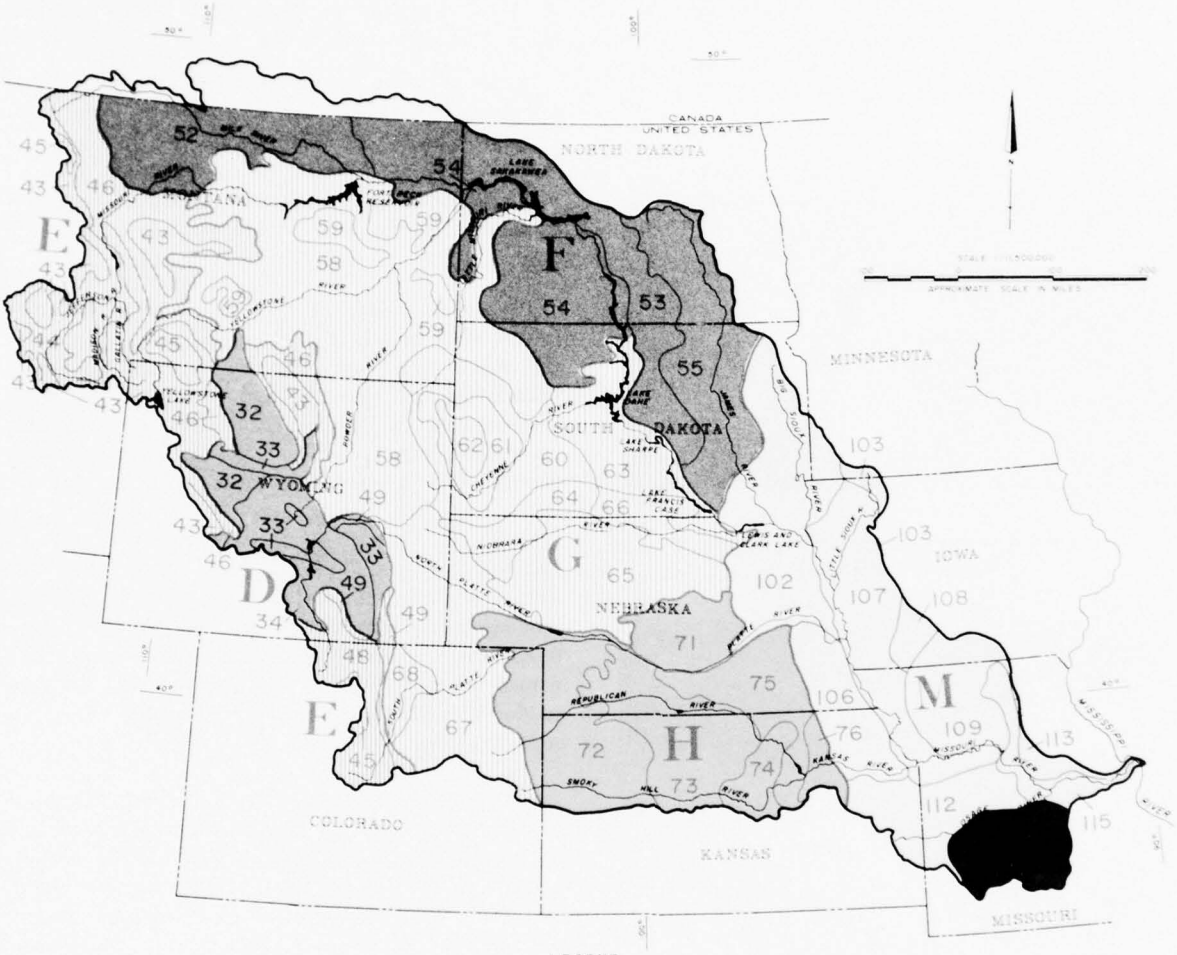
Types of farming and ranching operations can generally be grouped according to land classification (see description in the Land Resources Availability Appendix) more satisfactorily than by subregions. Figure 7 illustrates this system and identifies seven general types of farming regions and 40 land resource areas in the basin.

In general, rainfall belts range from a favorable subhumid environment in the lower part of the basin and eastern plains to a semi-arid to arid environment in the western area. With this transition from east to west, cropland gives way to grassland, farm size increases, operations change from farms to ranches, and the density of farm population declines. This general climatic transition is interrupted at points by physiographic features such as the Ozark Plateaus and Black Hills and by soil conditions such as the Sand Hills, Flint Hills, and Badlands which create uniquely different farming types from the general area. Water resource development, particularly irrigation, has also modified natural limitations and allowed areas of diversified crop production and higher intensity production than surrounding areas.

Livestock production and types of enterprises generally associate with the use of the land. Cow-calf operations and sheep grazing, typically found throughout the region, are the principal livestock enterprise in the mountains and plains of the northern and western parts. A large portion of the cattle and sheep production in the Upper Missouri, Yellowstone, Western Dakota, and the western two-thirds of the Platte-Niobrara and Kansas subregions is sold as feeders for finishing elsewhere. Finished cattle and sheep from feedlots are concentrated in the Middle Missouri, parts of the Lower Missouri, the southern part of the Eastern Dakota, and eastern Kansas and Platte-Niobrara subregions, generally associated with feed-grain producing areas of the region. There seems to be a trend, however, toward the movement of feedlots into the southern and western plains. The South Platte valley in Colorado, and the Platte and Elkhorn valleys in Nebraska, and certain areas of western Kansas are becoming important feeding areas. Such movement may be partly attributed to the western advancement of nonirrigated feed grains, such as sorghums, irrigated feed grains, climate, and market and processing trends.

FIGURE 7

LAND RESOURCE REGIONS AND MAJOR LAND RESOURCE AREAS



LEGEND

D WESTERN RANGE AND IRRIGATED REGION

37 Northern Intermountain Desertic Basins
33 Semiarid Rocky Mountains
34 Central Desertic Basins, Mountains, and Plateaus
43 Southern Rocky Mountain Foothills

E ROCKY MOUNTAIN RANGE AND FOREST REGION

42 Northern Rocky Mountains
44 Northern Rocky Mountain Valleys
47 Alpine Meadows and Rockland
45 Northern Rocky Mountain Foothills
36 Southern Rocky Mountains
41 Southern Rocky Mountain Foothills

F NORTHERN GREAT PLAINS SPRING WHEAT REGION

52 Brown Glaciated Plain
53 Dark Brown Glaciated Plain
54 Rolling Soft Shale Plain
55 Black Glaciated Plains

G WESTERN GREAT PLAINS RANGE AND IRRIGATED REGION

58 Northern Rolling High Plains
59 Northern Smooth High Plains
60 Pierre Shale Plains and Badlands
61 Black Hills Foot Slopes
62 Black Hills
63 Rolling Pierre Shale Plains
64 Mixed Sandy and Silty Tableland
66 Nebraska Sand Hills
65 Dakota - Nebraska Eroded Tableland
70 Central High Plains
69 Irrigated Upper Platte River Valley

H CENTRAL GREAT PLAINS WINTER WHEAT AND RANGE REGION

71 Central Nebraska Loess Hills
72 Central High Tableland
73 Rolling Plains and Breaks
74 Central Kansas Sandstone Hills
75 Central Loess Plains
76 Bluestem Hills

M CENTRAL FEED GRAINS AND LIVESTOCK REGION

102 Loess, Till, and Sandy Prairies
103 Central Iowa and Minnesota Till Prairies
107 Nebraska and Kansas Loess - Drift Hills
108 Iowa and Missouri Deep Loess Hills
109 Illinois and Iowa Deep Loess and Drift
113 Iowa and Missouri Heavy Till Plain
112 Cherokee Prairies
115 Central Claypan Areas
Central Mississippi Valley Wooded Slopes

EAST AND CENTRAL GENERAL FARMING AND FOREST REGION

Ozark Highland

Table 25 – HISTORICAL PRODUCTION OF MAJOR CROPS, MISSOURI REGION, WITH INDEXES OF PRODUCTION

Item	Unit (Thousand)	Production				Index of Production (1949=100)			
		1949	1954	1959	1964	1949	1954	1959	1964
Wheat	Bu.	284,407	297,316	339,928	383,241	100	104	120	135
Rye	Bu.	6,169	7,434	6,612	11,725	100	120	107	190
Oats	Bu.	225,253	320,112	168,057	176,474	100	142	75	78
Sorghum Grain	Bu.	15,481	40,941	138,827	153,739	100	264	897	993
Corn, Grain	Bu.	609,678	518,667	800,080	623,763	100	85	131	102
Barley	Bu.	53,569	68,333	98,575	84,029	100	128	184	157
Commercial Potatoes	Cwt.	11,921	9,044	7,840	5,125	100	76	66	43
Dry Beans	Cwt.	3,875	3,859	3,675	2,807	100	87	95	72
Flaxseed	Bu.	10,030	13,653	7,282	10,087	100	136	73	101
Sugar Beets	Ton	3,161	3,437	4,605	5,845	100	109	146	185
Soybeans	Bu.	8,040	32,462	42,559	76,396	100	404	529	950
Noncitrus Fruits	Acres	52,071	36,520	30,560	26,969	100	70	59	52
Vegetables for Sale	Acres	45,680	29,360	30,030	24,747	100	64	66	54

Source: Agricultural Census, 1949, 1954, 1959, and preliminary 1964.

Table 26 – HISTORICAL PRODUCTION OF LIVESTOCK AND LIVESTOCK PRODUCTS, MISSOURI REGION, WITH INDEXES OF PRODUCTION

Item Sold	Unit (Thousand)	Production				Index of Production			
		1949	1954	1959	1964	1949	1954	1959	1964
Cattle and Calves	Head	8,470	10,501	12,426	15,184	100	124	147	179
Hogs and Pigs	Head	14,237	12,177	17,115	18,651	100	86	120	131
Sheep and Lambs	Head	5,403	5,966	7,349	6,377	100	110	136	118
Chickens	Head	35,050	33,862	36,801	31,674	100	97	105	90
Broilers	Head	1	13,196	14,805	6,133	1	100	112	46
Turkeys	Head	3,326	4,987	6,806	9,417	100	150	205	283
Chicken Eggs	Doz.	345,382	320,381	348,469	312,107	100	93	101	90
Milk	Lbs.	2,703,167	3,449,887	4,848,210	6,623,069	100	128	179	245

[1] Not reported in 1949.
Source: Agricultural Census, 1949, 1954, 1959, and preliminary 1964.

FOREST RESOURCES

Forests of the Missouri Basin are largely concentrated in the Lower Missouri Subbasin and adjacent tributaries in the southeast, and the mountains in the northwest (table 27). In the Lower Missouri Subbasin, woodlands cover one-fourth of the land area and are almost all privately owned. A long period of heavy grazing and/or poor markets for forest products has resulted in an accumulation of sawtimber stands. Half of the growing stock volume is in sawtimber trees, but the stands contain many cull trees and too few growing-stock trees. The volumes average only 860 board-feet per acre. The sawtimber is almost entirely hardwood, 60 percent being oak. One-half the volume is in trees 15 inches in diameter at breast height or larger.

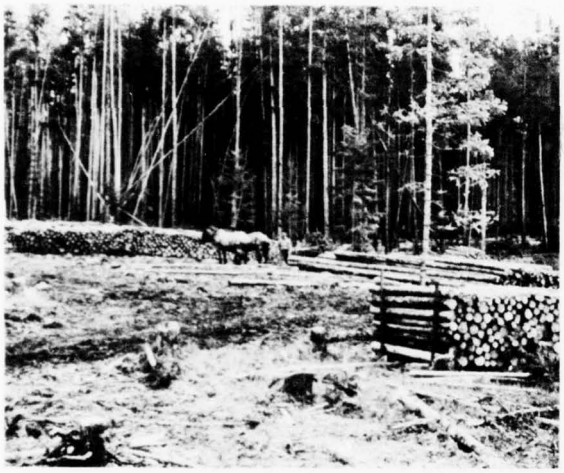
The 22 million acres of forest land in the western portion of the basin, comprising 73 percent of all forest land in the basin, produce 65 percent of the commercial forest products. A large proportion of these forest lands is federally owned. Elevation has an important bearing on the distribution of forests and their species composition. In the western portion of the basin, trees seldom grow at less than 4,000 feet above sea level, except along river bottoms. A big proportion of the forest at low elevations consists of scrubby, low quality stands of juniper and ponderosa pine. Most of these low areas are classed as noncommercial. The commercial forests, which consist mostly of stands of lodgepole pine,

Table 27 – ACRES OF FOREST LAND BY CLASSES, CURRENT INVENTORY BY SUBBASIN

Subbasin	Commercial Forest Land[1]	Noncommercial Forest Land[2]	Total Forest Land
	(Thousand Acres)		
Upper Missouri	5,500	1,711	7,211
Yellowstone	3,166	3,871	7,037
Western Dakota	2,218	206	2,424
Eastern Dakota	129	31	160
Platte-Niobrara	4,150	978	5,128
Middle Missouri	1,019	17	1,036
Kansas	500	20	520
Lower Missouri	6,651	206	6,858
Missouri Basin	23,333	7,040	30,374

[1] Forest land which is producing, or is capable of producing, crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation.
[2] Unproductive forest land incapable of producing crops of commercial industrial wood. This also includes productive forest land withdrawn from commercial timber use through statute or administrative regulations.

Douglas fir, spruce, and ponderosa pine, are located at somewhat higher elevations. For the most part, these are along the eastern slopes of the Continental Divide and on a number of mountain ranges to the east. At still higher elevations extending to the upper timberline, there are additional noncommercial areas of rugged sites with scrubby trees, largely subalpine fir, whitebark pine, and spruce.



Pulpwood is One of the Products Harvested in the Lewis and Clark National Forest, Montana

Timber Inventory

The sound wood in the bole or trunk of live growing trees, cull trees, and salvable dead trees on commercial forest land makes up the basic timber inventory in the basin.

The total volume of sound wood in forest growing stock over 5 inches in diameter is 19.1 billion cubic feet[1]. Sixty-five percent of it is in sawtimber-size trees (softwood trees over 9 inches and hardwood trees over 11 inches in diameter at breast height and sufficiently straight and sound to contain one or more 12-foot saw logs). This wood, 85 percent of which is softwood, is both the base for future timber growth and a stockpile of standing logs from which industries may draw their requirements.

Timber Growth and Cut

Comparison of timber growth and cut provides a rough indication of the degree of undercutting or overcutting. Net annual growth of all growing stock in the Missouri Basin is estimated to be 306 million cubic feet, while growth per acre amounts to about 13 cubic feet. Growth of sawtimber totals 961 million board-feet. The forest land area as a whole is currently producing only about one-third of the timber volume of which it is capable. Most of the timber stands, particularly in the western portion of the basin, are old-growth forests. In this section, most of the sawtimber stands are overmature and subject to heavy mortality loss.

Timber cutting is low, amounting to 104 million cubic feet in 1962, or about 34 percent of the net annual growth. The sawtimber cut of about 554 million board-feet was 57 percent of the growth. Timber products in the basin totaled 138.9 million cubic feet in 1962, ninety-two percent of this from roundwood and the balance from plant by-products. About 461 million board-feet were produced from saw logs comprising 55 percent of the total output from roundwood. Seventy-five percent of the saw logs was cut in the western subbasins. Another 471,000 cords, or 26 percent of the total output from roundwood, were used for fuelwood, chiefly in the Lower Missouri Subbasin. The cut of veneer logs and pulpwood together totaled 6 percent. An additional 15 million cubic feet were used for industrial wood and minor products.

MINERALS

Mineral resources in the Missouri Region can be discussed conveniently if grouped into three broad categories—metallics, nonmetallics, and fuels. The following discussions on each of the minerals groups proceed in terms of available resources, historic and current production, and markets for each group of resources.

Metallics

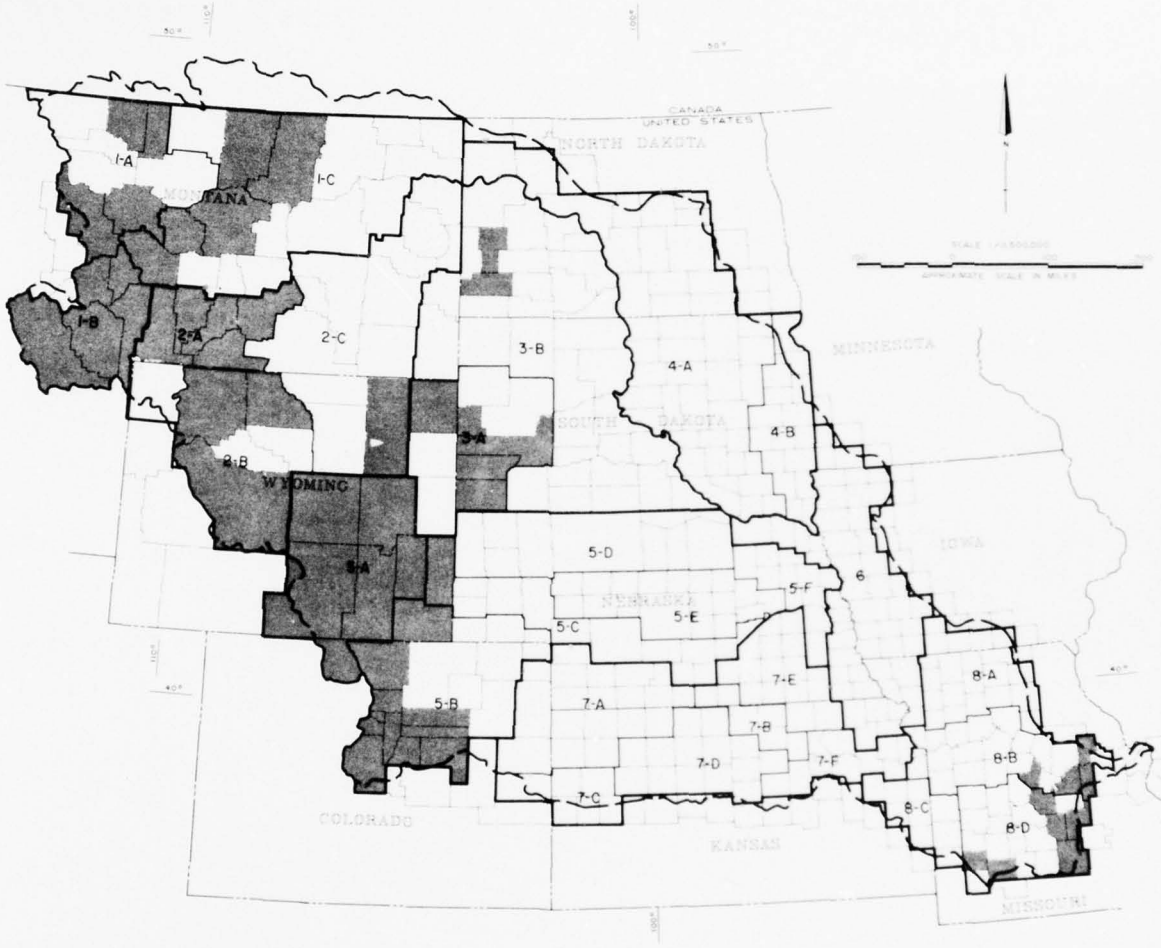
Metallic mineral resources are generally associated with mountainous areas and their peripheral outwash plains. This generalization is clearly applicable to the region. Metallic ores are produced in significant quantities in the western part of the region from the mountainous areas of central Montana, central Wyoming, north-central Colorado, and the somewhat isolated Black Hills of South Dakota (figure 8).

Metallic mining in the region has followed a rather typical sequence of development. The initial attraction was the discovery and production of precious metals (gold and silver) in the Black Hills of South Dakota and in the Rocky Mountains of central Colorado and west-central Montana during the last half of the 19th century. Subsequently, the geologically associated and deeper-seated veins of base metals (copper, lead, and zinc) were exploited. More recently, ferroalloys and minor metals, such as tungsten, vanadium, chromium,

1 Growing timber is measured in terms of cubic feet and includes all trees over 5 inches in diameter at breast height. Sawtimber is measured in terms of board-feet and includes only trees over 9 inches in diameter at breast height.

FIGURE 8

COUNTIES PRODUCING METALLIC ORES, 1910-1963

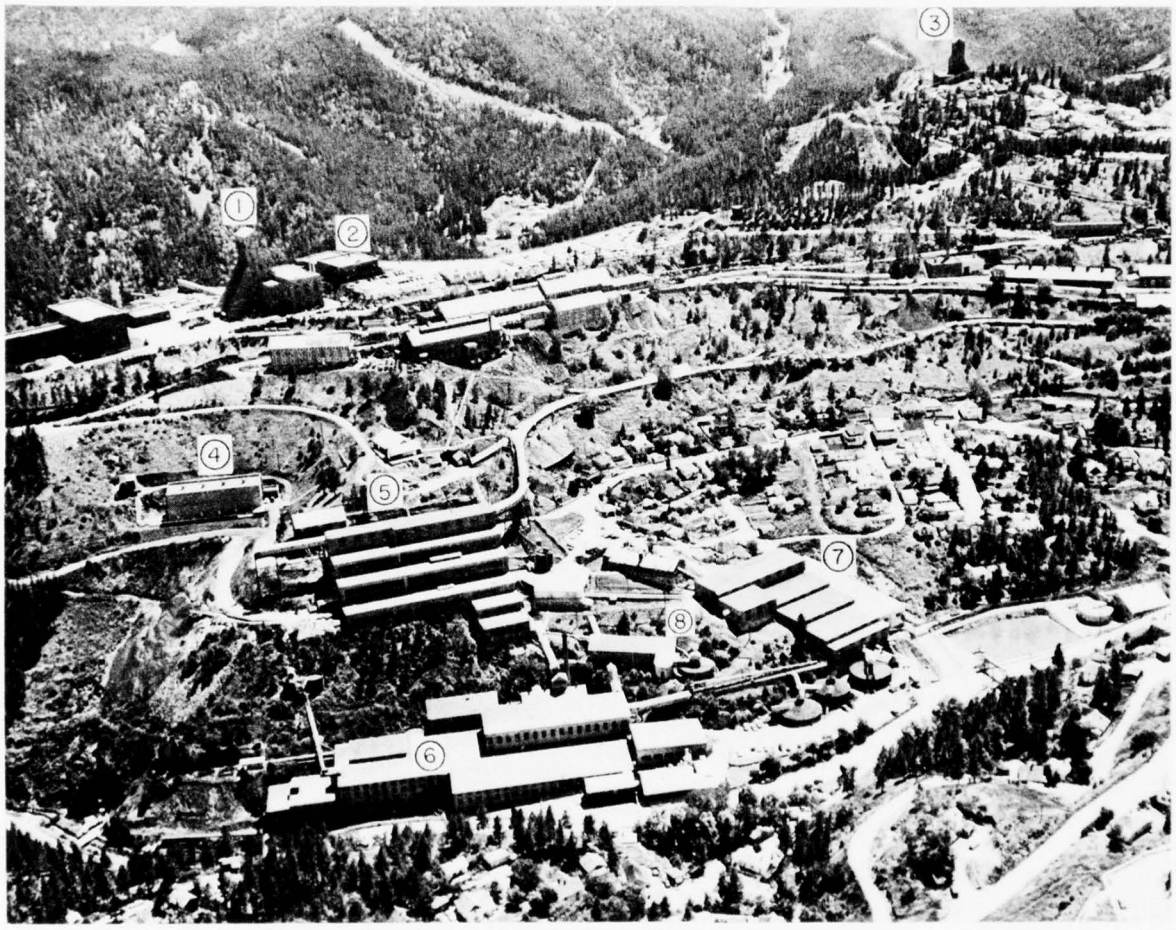


LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC SUBREGION BOUNDARY
- ECONOMIC SUBAREA BOUNDARY
- COUNTIES PRODUCING METALLIC ORES

beryllium, and lithium, have been produced in small quantities from localized ore deposits. Currently, the sprawling taconite (low-grade iron ore) open-pit operation developed near Atlantic City, Wyo., and the large but not yet completely defined molybdenum ore body being developed near Empire, Colo., have a potential for volume production.

The largest gold-mining operation in the United States is in the Black Hills at Lead, S. Dak. (Subarea 3A). Among the States, Wyoming is the second largest producer of uranium (Subareas 5A and 2B). The world's largest molybdenum mine is just west of the Continental Divide and outside the region in Colorado, but other deposits are being developed within the region in Colorado. Both economic and marginal deposits of iron, uranium, vanadium, beryllium, tungsten, copper, lead, zinc, and silver occur at several locations along the Rocky Mountain flank of the Missouri Region. Economic reserves of silver have been enlarged by recent price increases.



Homestake Gold Mine, Lead, South Dakota, is the Nation's Largest Operating Gold Mine Shafts and Hoists (1 & 3), Offices (2), Compressor (4), Mill (5), Cyanide Plants (6 & 7), Gold Refinery (8).

Uranium and thorium resources of Subareas 1B, 3B, 5A, and 5B, which include Jefferson County, Mont., the western Dakotas, eastern Wyoming, and the "eastern slope" of Colorado, respectively, are large enough to produce significant quantities. Southeastern Montana and southwestern South Dakota, Subareas 2C and 3A respectively, are expected to yield additional ore. With the increasing use of nuclear fuel in powerplants and the continuing development of other peaceful uses of radioactive materials, these resources are expected to be in great demand.

In common with established open-pit uranium mines in Wyoming and the remaining underground gold operations in South Dakota, the large taconite mine and the developing molybdenum operation accent the recent trend towards development of large, low-grade, metal-bearing resources in the region. Bureau of Mines studies in the early 1960's revealed the existence of a number of

low-grade iron deposits in South Dakota and Wyoming. Extensive deposits of alumina-bearing igneous rocks and clays occur in the region and have been investigated in the recent past. Areas of low-grade chromium mineralization are known, and recent copper and molybdenum exploration activities along the Continental Divide reportedly have proved encouraging. Advancing technology and the insatiable demand for metal seem certain to favor further orderly development of metallic mineral resources in the region.

Nonmetallic Minerals

Nonmetallic minerals include a broad array of construction materials (sand, gravel, stone, clay, etc.), several fertilizer minerals (phosphate, potash, and gypsum), and numerous minerals for chemical and other miscellaneous uses (fluorspar, feldspar, lime, mica, and salt). Some nonmetallics satisfy a wide spectrum of demands. For example, gypsum, a calcium sulfate mineral, is used in the manufacture of wall board, in soil conditioning, and as a source of elemental sulfur.

Almost every county in the Missouri Region has recorded annual production of nonmetallics (figure 9). The bulk of this output is consumed locally to meet needs of the construction industry at a minimum transportation cost. While many of the nonmetallic minerals are found in most parts of the basin, they are mined only where it is economically feasible in terms of local demand. The more valuable chemical and fertilizer minerals, as well as some construction minerals, are processed locally and marketed regionally, nationally, and, in a few instances, world wide.

The Upper Missouri Subregion contains a high concentration of nonmetallic mineral resources. Virtually every county has some deposits and three-fourths of the counties are producers. Another area of concentration of nonmetallics is in the extreme lower region where all but seven counties contain economic nonmetallic mineral deposits.

The production of nonmetals is highly dependent upon the construction industry, which, in turn, is correlated with and a function of population growth. Thus, the demand for nonmetallic minerals is expected to be directly proportional to the increase in population in the region. Sand, gravel, and stone are the principal nonmetals and are available in sufficient quantity throughout most subregions to meet foreseeable demands. Cement minerals also are plentiful, and studies have shown substantial reserves in parts of Colorado, Kansas, Missouri, Montana, Nebraska, and Wyoming. Clay is abundant in all but nine dispersed subareas throughout the region, Colorado, Montana, and Wyoming having especially large deposits. Major deposits of gypsum are found in Montana, Colorado, and Wyoming. Limestone is available in the western and southeastern portions of the region and in the Black Hills area. Overall, the Missouri Region is well-endowed with nonmetals.

Aside from the market for construction materials, other outlets for nonmetals can readily be identified. The primary markets for bentonite clays are the petroleum industry which uses such clays in drilling mud, and the taconite-processing plants where it serves as a binder for iron-ore pellets. Bentonite is used also as a binder for foundry molds and as a seal in lining ponds and ditches. Bentonite producers seem assured of a stable market in output because of newly developed uses.

Lime is required in both construction and nonconstruction activities. In Nebraska and Colorado, it is used primarily in sugar-beet refining; whereas, in other region states it is used predominately in the construction industry. Phosphate resources along the western edge of the region in Wyoming and Montana hold some promise for future production.

The anticipated pressures of increased population and greater per capita demand, normal features in orderly growth of the regional economy, should lead to further development of the region's nonmetallic mineral resources.

Fuels

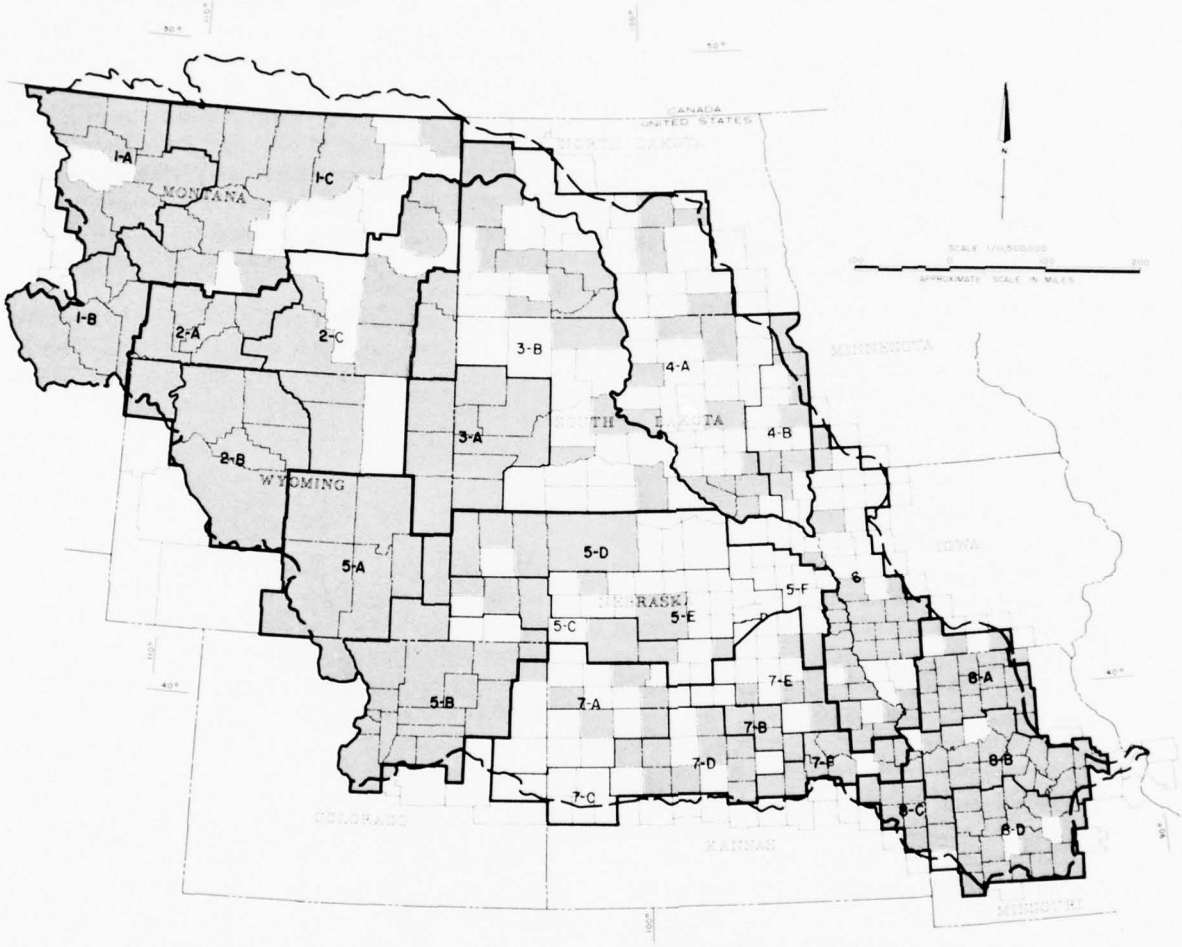
Mineral fuels, as a group, constitute the greatest mineral resource now in production in the region. Reserve statistics that have been widely published point up the vast potential of coal deposits. Oil and gas production in the region has been valued at approximately $1.4 billion annually in recent years, representing about two-thirds of the total mineral production. Region-wide, production of the petroleum industry has increased since World War II, paralleling a national trend. Nationwide, proven reserves of petroleum topped out in the mid-1950's, and have not changed significantly since. Proven reserves in the region also topped out in the mid-1950's, followed by a marked decline. In contrast to the limited reserve picture, the demand for petroleum products continues in an uninterrupted but moderate growth trend. Reserves of petroleum and natural gas now approximate a 10- to 12-year supply at the current rate of production.

Within the region, petroleum reserves are of the heavier concentrations primarily in Subareas 2B, 5A, and 3B (figure 10). Reserve statistics indicate a short supply of natural gas and petroleum, but this condition reflects normal policy of the petroleum industry to cite only proven available reserves rather than potential reserves. Possible declines in ultimate production usually are determined more realistically when based on geologists' estimates of total available petroleum.

Petroleum and natural gas production is expected to continue at least to the year 2000 in the western

FIGURE 9

COUNTIES PRODUCING NONMETALLICS (OTHER THAN SAND AND GRAVEL) 1910-1963

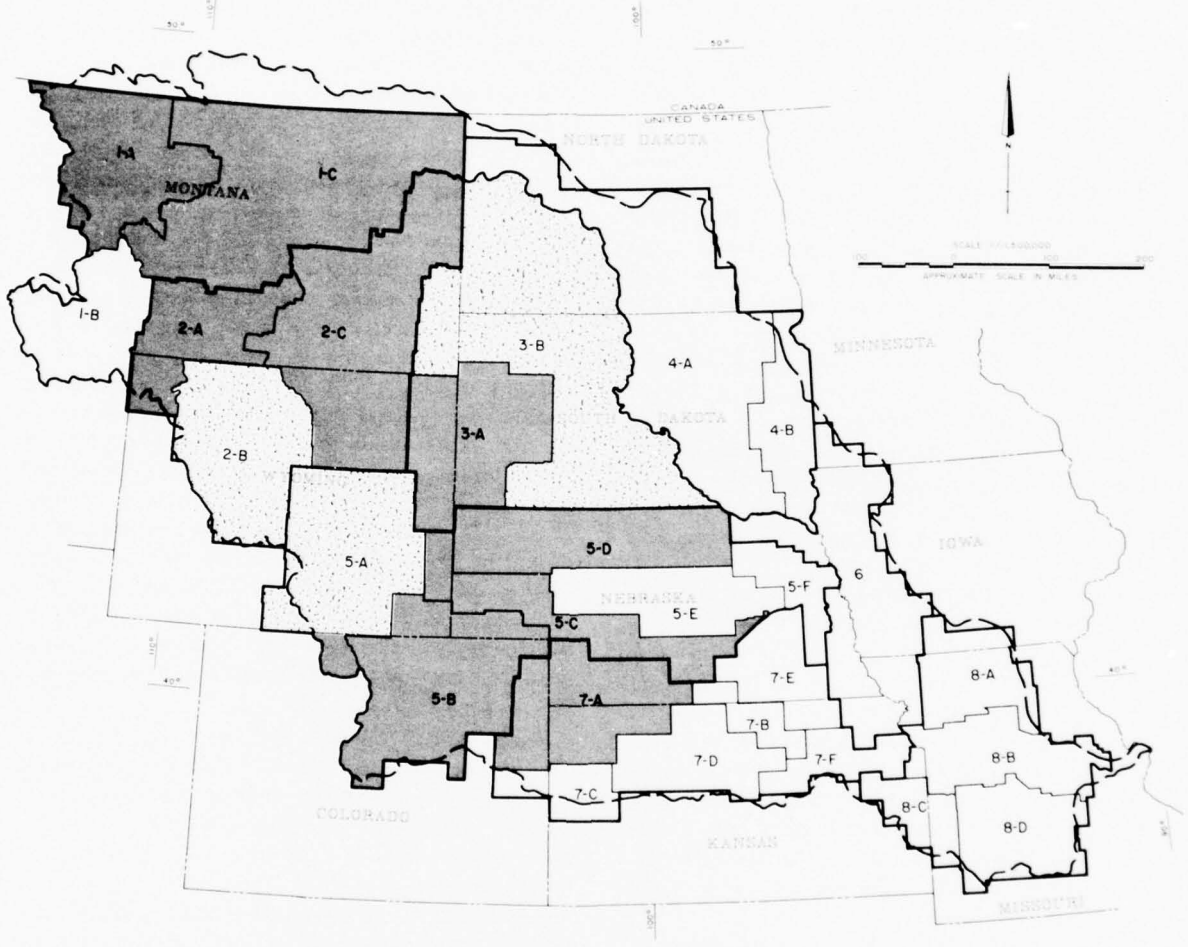


LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC SUBREGION BOUNDARY
- ECONOMIC SUBAREA BOUNDARY
- COUNTIES PRODUCING NONMETALLICS (OTHER THAN SAND AND GRAVEL)

FIGURE 10

ESTIMATED CRUDE-OIL RESERVES BY SUBAREAS, 1965



LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- ECONOMIC SUBREGION BOUNDARY
- ECONOMIC SUBAREA BOUNDARY
- 10 TO 150 MILLION BARRELS
- OVER 150 MILLION BARRELS

Missouri Region. Subareas 4A, 7A, 7D, 7F, 8C, and 8D in the eastern portion have significant though relatively smaller resources. Oil and gas fields are shown on plate 2.

Leveling off of the national petroleum reserves and the decline in the Missouri Region reserves stem from several economic and technical factors. Probably the most direct cause of the decline in the region reserves is the continuing attraction of offshore exploration in the Gulf of Mexico and on the Pacific Shelf where impressive discoveries have been made. Low-cost foreign crude oil is another important reason for reduced exploration in the region.

Although proven domestic reserves represent only a 10- to 12-year supply, it is unlikely that either the Nation or the region will exhaust their resources during the remainder of this century. Furthermore, the advent of synthetic liquid fuels from coal and/or oil shale seems certain, adding to the complexities of projecting petroleum output. The resource base in the region is assumed to be capable of providing some further growth of petroleum output at least to 1980. Beyond 1980, a marked increase in petroleum production in the region is not likely and a downturn in output is a distinct possibility. The reserve picture is not expected to improve. Thus, petroleum production is expected to increase moderately through 1980, to top off by 2000, and to decline thereafter. Meanwhile, proven reserves will diminish yearly at a moderate rate constantly narrowing the production-reserve ratio.

In contrast to the petroleum reserve picture, the coal reserves in the region are very substantial (figure 11). Missouri Region States have more than 450 billion tons of recoverable coal reserves, or about 55 percent of the Nation's total known recoverable reserves (recoverable reserves are estimated conservatively by the Bureau of Mines as one-half of the resource). With the exception of Nebraska and the small southwestern section of Minnesota, the other eight states have substantial coal reserves. North Dakota, Montana, and Wyoming possess the bulk of the reserves, or at least 350 billion tons of recoverable coal.

The largest consumers of coal in the region are the steam-electric power generation plants. The market for coal, as well as for all fuels, is characterized by vigorous interregional competition in which comparative costs are all-important-cost of fuels per million BTU, cost of energy conversion, and cost of electric power transmission. A primary market for coal is assumed to be the Federal Power Commission's study Areas "L" and "O", comprising the FPC West Central Region. These areas include eastern Montana and most of Colorado, Wyoming, North Dakota, South Dakota, and Nebraska. Although the Pacific Northwest and other adjacent areas ultimately may become significant markets for Missouri region power, competition by Canadian and other suppliers and the cost of high-voltage transmission make study Areas "L" and "O" a more realistic market area.

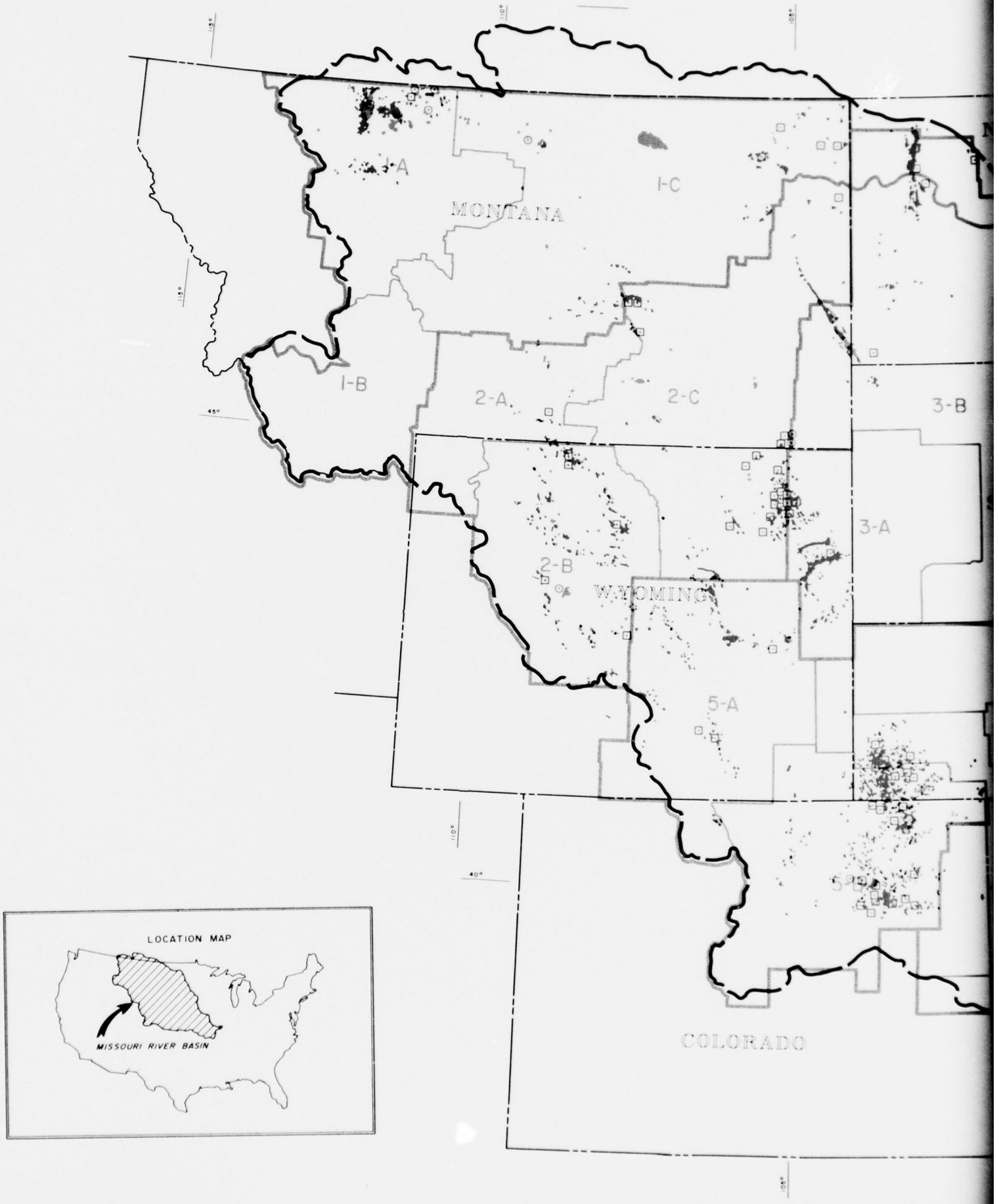
Fuel requirements supplied by coal have been declining, except for the last several years. The recent uptrend reflects improvements in coal mining and transportation techniques, increases in the efficiency of converting coal energy into electric power, and a rising number of coal-fired thermal-electric powerplants, especially in North Dakota near the extensive lignite beds. According to the FPC, by 1980 the steam-electric power-generating capacity is expected to be 58.9 percent of total installed capacity in the Upper Missouri Subregion and 67.1 percent of total installed capacity in Colorado and Wyoming (Area "O"). In the same year, nuclear plants are expected to comprise 5.5 percent of the total installed capacity in Area "L" and 8.6 percent in Area "O". Nuclear capacity is expected to expand more rapidly beginning about 1980.

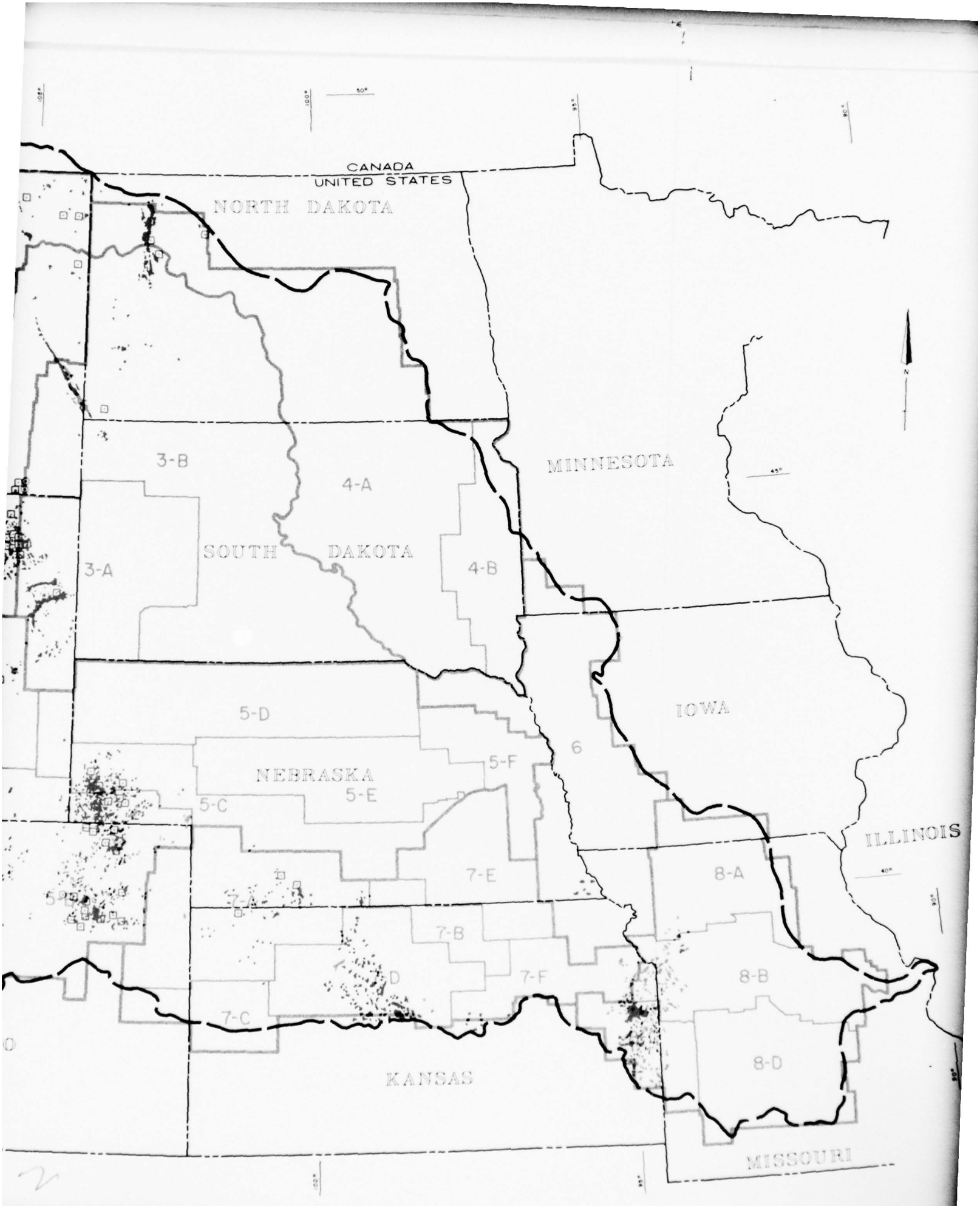
The Nation's output of coal was about one-half billion tons annually during the mid-1960's. Because of limited regional market demand and other economic factors, the Missouri Region has supplied only 12 to 15 million tons of coal annually, or about 3 percent of the Nation's total output. About half of the Nation's output is consumed by electric utilities while in the region more than 60 percent of the coal production is so consumed.

Nationally, there are indications that the electric utility market utilizing coal may have reached a peak. However, in areas of the region where coal is accessible at very low cost, some further development of coal-fired electric utilities is probable. The established utility base and additional need for coal to feed new, enlarged, and planned thermal plants may well presage further modest growth in coal mining activity and orderly development of the region's coal reserves.

Because of vast reserves and low cost availability of Missouri Region coals, it appears that a synthetic fuels industry not only should develop, but possibly the region may overcome its handicap of low quality coal and market isolation to acquire a disproportionately large share of the national fuels market. Factors that will determine the timing, location, and size of a possible nationwide synthetic fuels industry are numerous and complex. Technology now exists for producing synthetic liquid fuels, but it is not yet competitive with conventional sources of petroleum products. Moreover, the cost of conventional petroleum products has been declining in terms of real dollars since World War II, almost without interruption. Thus, improvements in synthetic-fuels techniques must be measured in dramatic proportions in order to overcome petroleum's favorable competitive position.

Projections of coal output based upon a multitude of unknowns are not prudent in narrowly defined terms. However, some broadly based assumptions seem fairly valid in the mid 1960's and may point the direction of


1-A
MONTANA
1-C
1-B
2-A
2-C
3-B
3-A
2-B
WYOMING
5-A
COLORADO
LOCATION MAP
MISSOURI RIVER BASIN


CANADA
UNITED STATES
NORTH DAKOTA
MINNESOTA
3-B
4-A
SOUTH DAKOTA
3-A
4-B
5-D
IOWA
6
5-F
NEBRASKA
5-E
5-C
ILLINOIS
7-E
8-A
7-A
7-B
D
7-F
8-B
7-C
8-D
KANSAS
MISSOURI

LEGEND

OIL FIELD

GAS FIELD

OIL AND GAS FIELD

1967 OIL DISCOVERIES

1967 GAS DISCOVERIES

SCALE 1:5,700,000

50 0 50 100 150 200

APPROXIMATE SCALE IN MILES

JUNE 1969

OIL AND GAS FIELDS

COMPREHENSIVE FRAMEWORK STUDY

MISSOURI RIVER BASIN

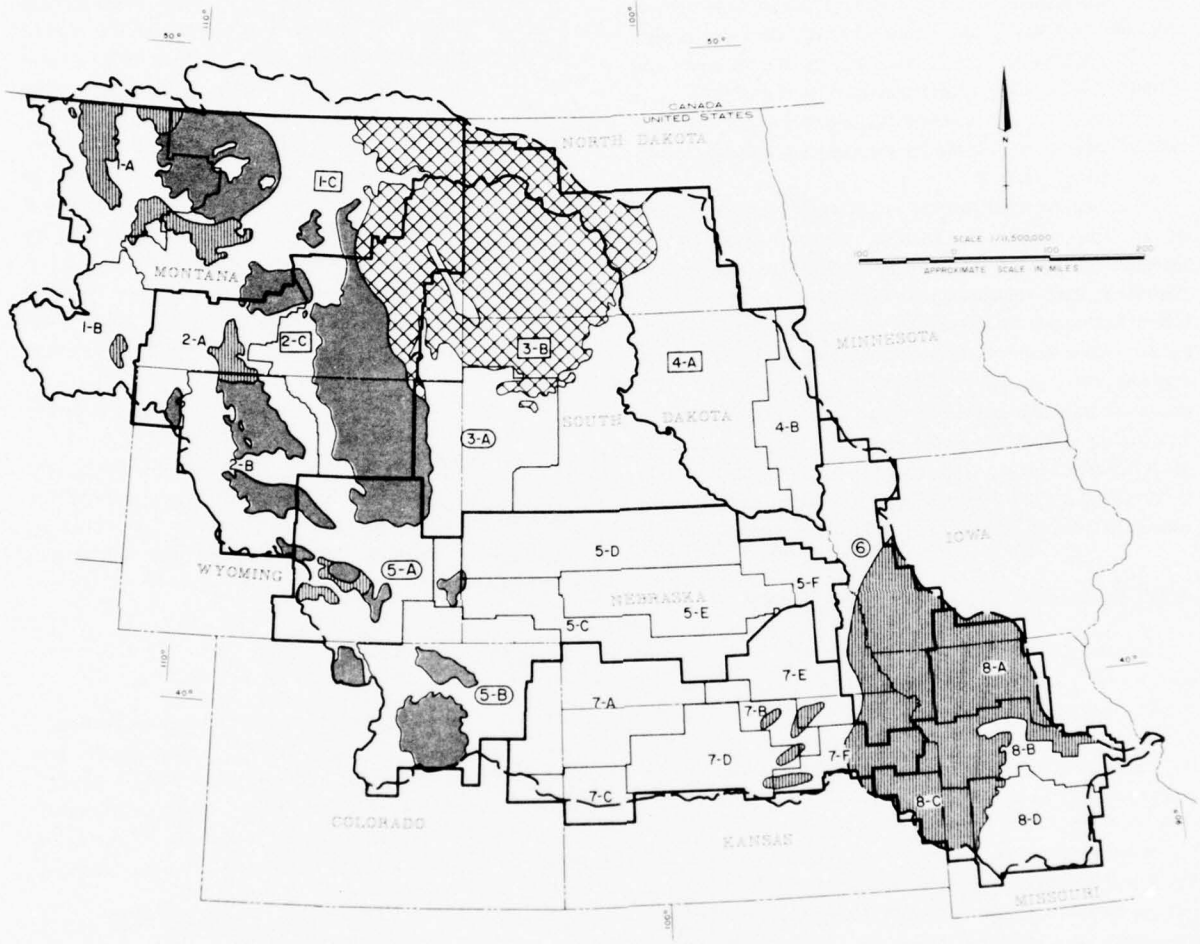
MISSOURI BASIN INTER-AGENCY COMMITTEE

PLATE 2

3

FIGURE 11

COAL FIELDS AND RESERVES, JUNE 1965



LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- ECONOMIC SUBREGION BOUNDARY
- ECONOMIC SUBAREA BOUNDARY
- BITUMINOUS COAL AREA
- SUBBITUMINOUS COAL AREA
- LIGNITE COAL AREA
- 4-A — SUBAREAS WITH RESERVE ESTIMATES OVER 20 BILLION TONS
- 5-B — SUBAREAS WITH RESERVE ESTIMATES 1 TO 20 BILLION TONS

coal resource development, if not the magnitude. First, it does not seem reasonable to anticipate any large synthetic fuels output in the Nation before 1980. Second, if a synthetic fuels industry of substantial capacity does develop after 1980, the northern regions of the Nation and the Missouri Region in particular would be in a favored position because of the vast coal reserves, in contrast to limited petroleum reserves and the remoteness of Atlantic and Gulf Coast low-cost oil imports. And third, the future of synthetic fuels, as well as conventional carbonaceous fuels, more and more will depend upon their environmental acceptability in a society wherein the pressure of population growth now seems destined to require an even greater rate of growth in total energy output.

In summary, coal output in the region seems assured of a firm market in meeting electric utility needs through the end of the century, including some further growth in such requirements continuing into the 1970's. Other important increases in coal output for currently conventional markets are not foreseen after 1980. New markets for coal, in synthetic fuels production and in chemical industry uses, offer the greatest potential for developing the region's coal resources. Such markets, if they do materialize, could be expected to exert strong demands upon the region's land and water resources, as well as its coal, probably by 1980 or soon thereafter.

PUBLIC FACILITIES AND SERVICES

The purpose of this section is to present a current picture of transportation, communication, and electric power facilities and services in the Missouri Region. These elements serve industry, as well as social and economic demands of the people residing in the region. Although the transportation facilities and services are a portion of the greater national network, they facilitate the shipment of raw materials and finished goods and the transportation of people within the region. Modern communication systems enable rapid to instantaneous exchanges of information vital to the conduct of business and in response to the cultural and social needs of the general populace. The generation, transmission, and distribution of electric power within the region and interconnections with other areas have rapidly improved within recent years to the point where industrial and household needs are being served as adequately as any area in the Nation. These three industries are basic in a sense that they provide services vital to the growth of the region's economy. Employment within these industries is included within the broad classification of noncommodity-producing or service industries. Segments within each of these three industries are unique from the standpoint that their pricing is subject to governmental regulation. There will be no attempt in the following discussion to isolate future growth of these industries since it will follow to a degree the expansion of the economy in general.

Air Service

Air transportation in the region, although less extensive than in other more densely populated areas of the United States, is growing rapidly with the development of air service to the smaller urban areas of the region. This expansion and development is taking place within the so-called feeder airlines, which link minor urban markets to each other and to major markets. The region's major cities within the air transportation network are Kansas City, Denver, Lincoln, and Omaha in the South; and Billings, Great Falls, Sioux Falls, and Bismarck in the North. These cities are all served by major airlines and by regional feeder lines, and intraregional service and nonstop services to the Nation's metropolitan areas are provided. Figure 12 shows the scheduled airline routes within the region in the late 1960's.

Two major problems facing air transportation in the region are: (a) inclement weather during the winter months, which is cause for bypasses of some stops, and (b) limited airport facilities, especially in many of the smaller communities. Generally speaking, air service in the region is growing, and indications are that it will continue to grow.

Railroads

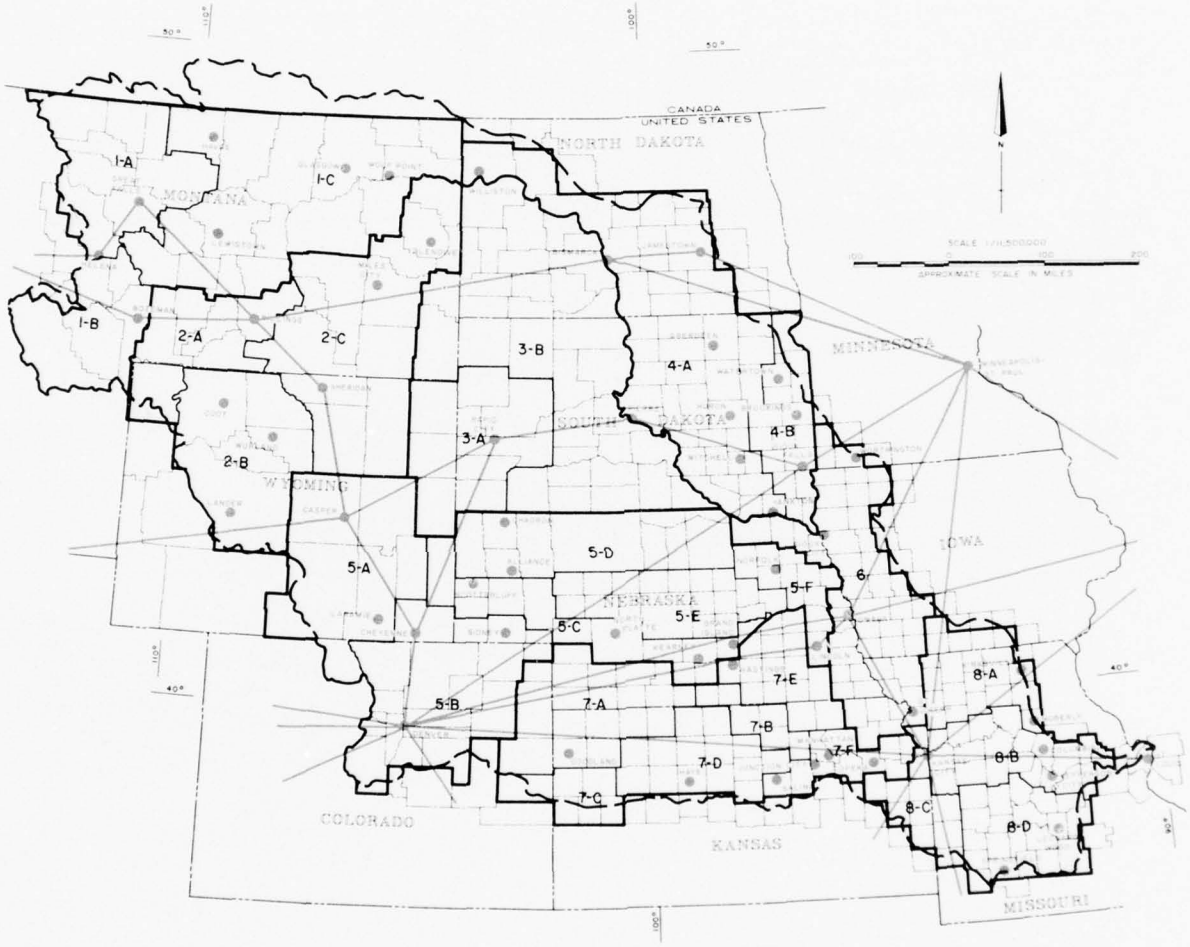
The system of railroad routes in the region developed during the railroad building period of the mid and late 19th century. As such, there is an east-west general orientation of the railroad system. While north-south routes exist and are adequate, the flow of traffic is primarily east-west. Figure 13 shows the major railroad systems within the basin.

The railroad industry within the region is of particular interest. This industry is in the process of undergoing a transition from its historic role as the major, and in some cases, sole carrier of goods and services. Today, railroads are faced with intense competition from all types of carriers within the transportation industry. From the airlines and commercial motor carriers, the railroads are facing competition for the carriage of people. Based upon trends in the volume of passenger traffic, it appears that railroads may be eliminated from the passenger traffic business. This may be both an economic inevitability and a choice on the part of the railroads.

Railroads are also facing increasing competition from bargelines and pipelines. This competition is for the transportation of commodities, primarily low-valued bulk commodities. However, competition between

FIGURE 12

AIRLINE SERVICE

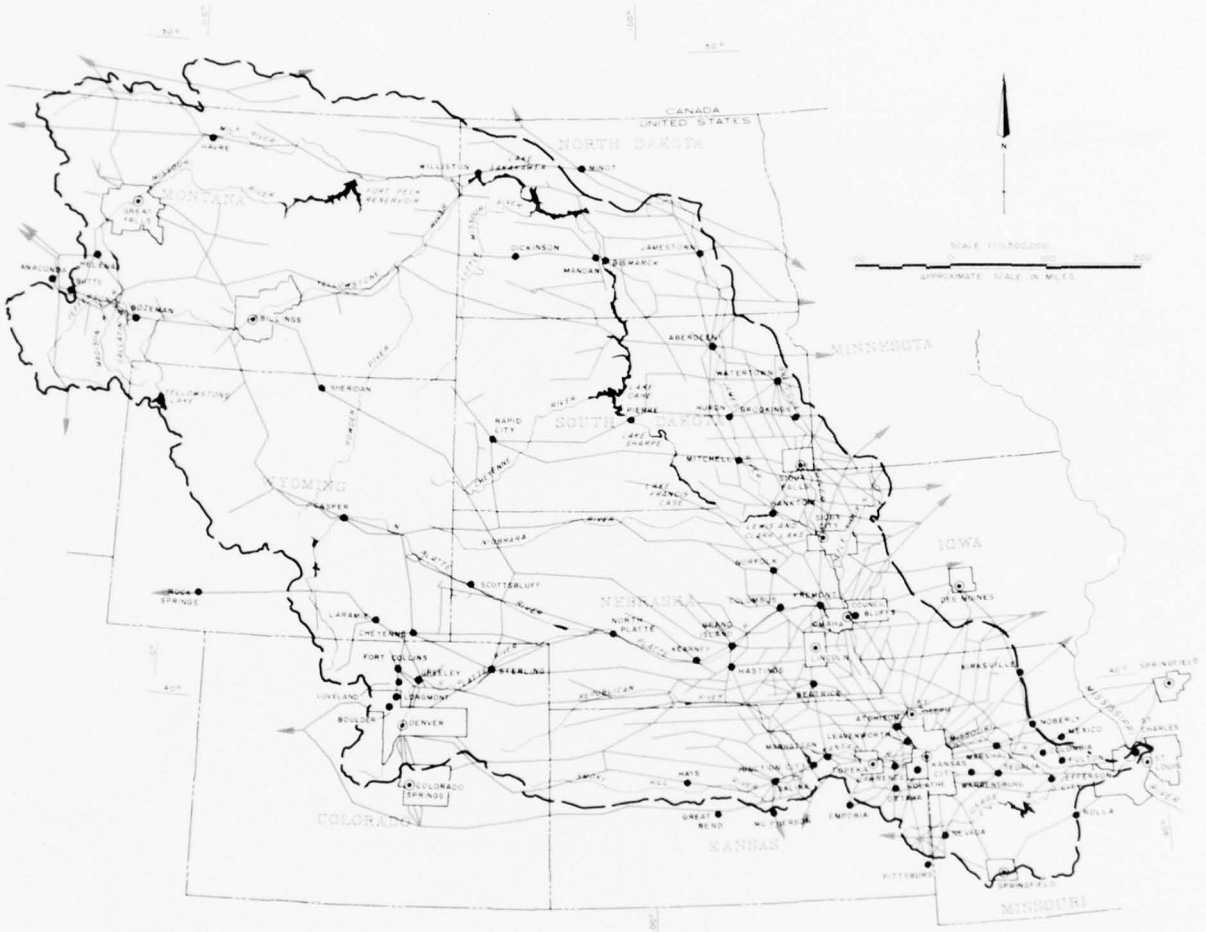


LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC SUBREGION BOUNDARY
- ECONOMIC SUBAREA BOUNDARY
- CITIES SERVED BY SCHEDULED AIRLINES
- TRUNK AIRLINE ROUTES

FIGURE 13

RAILROAD SYSTEM



LEGEND

BASIN BOUNDARY

STATE OR NATIONAL BOUNDARY

10,000 TO 49,999 POPULATION

STANDARD METROPOLITAN STATISTICAL AREA

PERENNIAL STREAMS

LAKES OR RESERVOIRS

RAILROADS

barges and rails for these bulk-type commodities is not nearly so intense in the Missouri Region as it is in other regions of the Nation. Railroads will remain competitive within the Missouri Region in the carriage of commodity traffic.

Pipelines

One of the most economic and dependable forms of transportation in the Missouri Region is the pipeline (figure 14). The source of heat and energy, as well as lubricants, chemicals, and other by-products, for industrial and domestic use would be somewhat lacking without the pipelines of the region. Principal commodities transported by pipelines, are crude petroleum, petroleum products, and natural gas. The crude lines extend from production areas to refineries, sometimes located in or near the production fields and sometimes in principal market areas. The product lines are connecting links between natural gas processing plants, oil refineries, and the markets. Unless natural gas has certain impurities, little treatment is required, and the pipelines extend from the production fields to the market areas.

The petroleum and natural gas fields in the region (plate 2) are in the western and extreme southern portions. The larger portion of their market area is, on the other hand, in the more populous eastern portion of the region. A share of this market area is served by production areas lying south of the region in Oklahoma and Texas. Distribution and density of pipelines, as shown in figure 14, illustrates relationship between production and market areas.

Pipelines, like electric transmission lines, are specialty carriers or modes of transportation. Unlike other forms of transportation, they can facilitate only a one-way movement of commodities. Although burdened with a relatively high initial capital investment in facilities, pipelines do operate at relatively low cost, depending on the load factor or level of use.

Natural gas pipelines are confronted with additional operating problems, especially in the Missouri River Region where seasonality of demand for space heating uses is subject to wide fluctuations in temperatures. An efficient and economic load factor is gained when markets can be obtained in particular industries that are able to contract for purchase on an interruptible service basis and in industries whose peak demand occurs during the summer months, the slack season for household heating demands. Lower rates may be offered for off-season demand to interruptible service customers in order to maintain a satisfactory load factor. Several natural gas transmission companies in the Missouri Region utilize underground storage of gas to improve operating load factors.

Future development and use of pipelines will be subject to many variables and conditions. Not the least of these is the continued availability of crude petroleum and natural gas (discussed in the section on the availability of minerals). Among various technological advances that might be forthcoming and which could change the resource picture in the Missouri Region and have an impact on the pipeline industry, are the liquefication of natural gas, gasification of lignite, and the use of coal or lignite slurry (suspension in a watery solution). Other products may also be found to be feasible for pipeline transport. Expansion of the potential market will be directly related to projected growth of population, income, and certain types of employment.

Waterborne Transportation

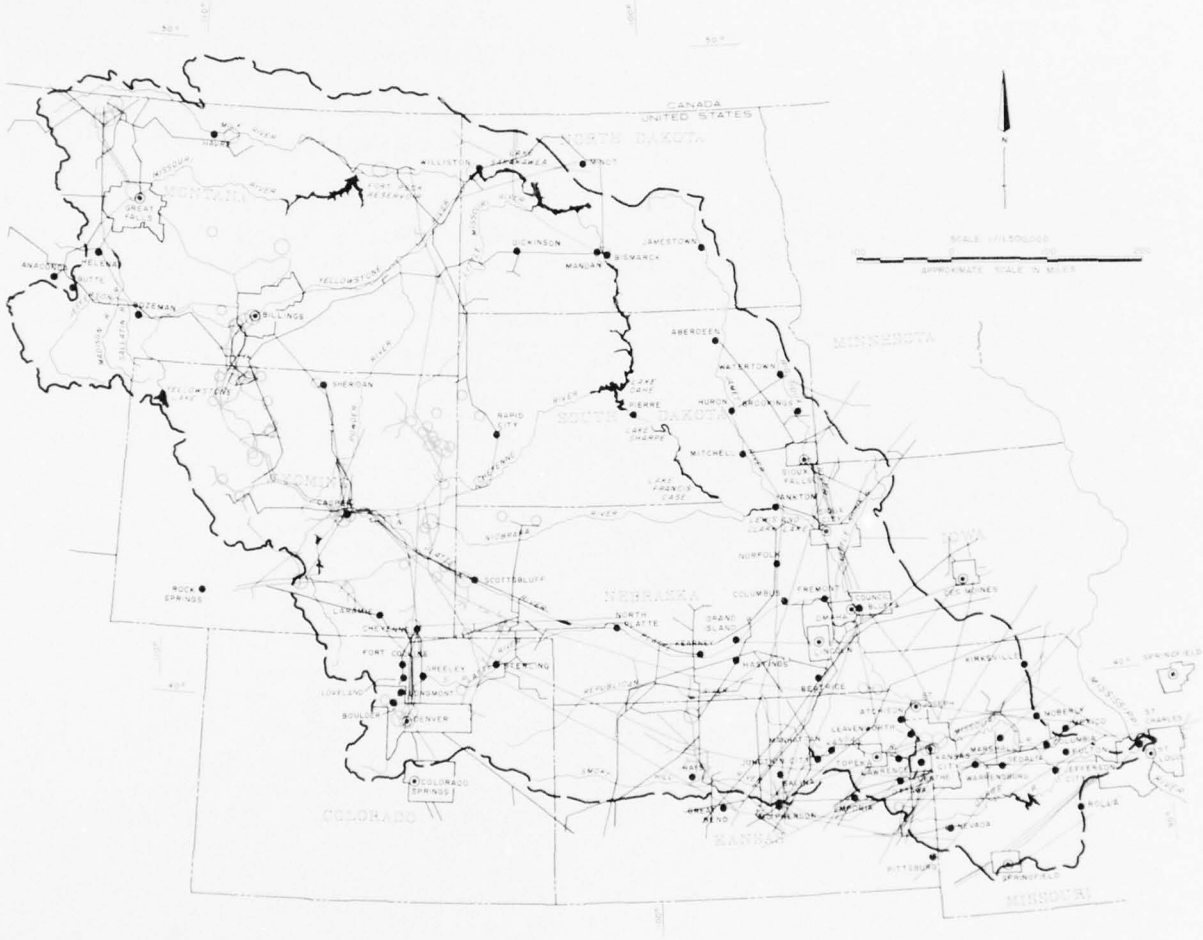
As an aid to navigation on the Missouri River, Federal expenditures were made for snag removal in 1824. Later in the 19th century, additional expenditures were made for the initiation of bank stabilization and erosion control. Further improvements were authorized from Sioux City to the mouth of 1912. At present, commercial navigation on the Missouri River occurs between Sioux City and the mouth. Completion of improvements on the 9-foot minimum depth channel is scheduled in the near future. The navigation system includes not only channel improvements but also upstream reservoirs, which are integrated to supplement flows along the lower stretches of the river as needed (figure 15).

Aside from the natural and manmade barriers to water transportation on the Missouri River, which limit the season and the geographic service area, there are other characteristics of the market which determine the shipment of goods by barge. Commodities shipped by water move slowly and at infrequent intervals; consequently, they cannot be subject to spoilage or deterioration. Typically, the commodities are limited to low-value and high-bulk items which require long hauls. Both the shipper and buyer usually must hold large inventories, so commodities cannot be those subject to frequent price fluctuations, depreciation, or obsolescence. The need for large terminal storage facilities is somewhat alleviated since the barge offers a convenient storage facility to the benefit of both the shipper and buyer.

Barge Traffic on the Missouri River Below Sioux City, Iowa, is Becoming Increasingly Important in the Shipment of Bulk Commodities

FIGURE 14

PIPELINE TRANSMISSION NETWORK

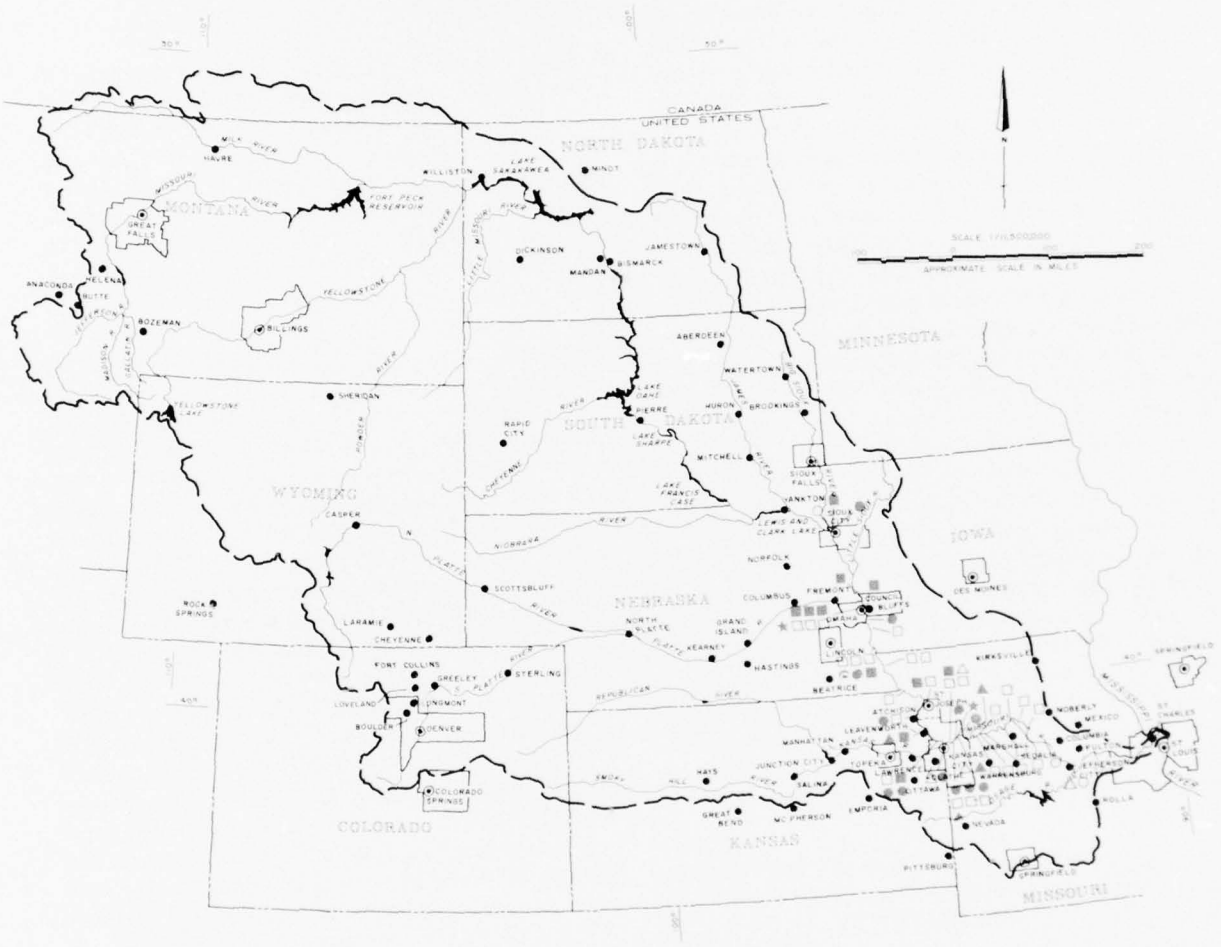


LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- 10,000 TO 49,999 POPULATION
- STANDARD METROPOLITAN STATISTICAL AREA
- PERENNIAL STREAMS
- LAKES OR RESERVOIRS
- CRUDE PETROLEUM PIPELINES
- MAJOR REFINERIES
- MINOR REFINERIES
- PETROLEUM PRODUCTS PIPELINES
- NATURAL GAS PIPELINES

FIGURE 15

NAVIGATION SYSTEM



LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- 10,000 TO 49,999 POPULATION
- STANDARD METROPOLITAN STATISTICAL AREA
- PERENNIAL STREAMS
- LAKES AND RESERVOIRS

MISSOURI RIVER SERVICE AND CARGO FACILITIES

- GRAIN
- SAND, GRAVEL AND STONE
- PETROLEUM PRODUCTS
- TERMINAL, INCLUDING STEEL HANDLING
- BULK, GENERAL
- CEMENT
- YARD, REPAIR FACILITY, FUELING
- COAL AND LIGNITE

Because of the relatively large operating module (a 2,000-ton barge), this mode of transportation becomes economically feasible to the barge owner only when a designated minimum-size shipment is reached. The out-of-pocket expense for moving an empty barge is nearly the same as for a fully loaded barge. Except for terminal cost per ton, costs for barge lots would almost be the same as for less-than-barge lots. Hence, the larger the volume of traffic being shipped, the lower the per unit costs may be. Either the individual buyer at the terminal is large or the terminal market is large enough to absorb large volumes of individual commodities. The relatively low line-haul cost associated with barge traffic becomes more significant as the distance traveled is increased and works to equalize the relatively high terminal costs. These factors establish a minimum shipping distance within which barge traffic is not competitive with other modes of transportation commonly associated with short hauls. Usually, both shipper and the buyer are located on or near the river, because when other forms of transportation are needed for trans-shipment the relatively low costs of barge transport are offset.

Of the 11 Standard Metropolitan Statistical Areas in the region, only four are located on the navigation channel of the Missouri River. The nature of commodities and markets available to these metropolitan areas may act as limiting factors to the growth and development of barge traffic. Almost two-thirds of the present tonnage movement is downstream. A more equitable balance of movement upstream is essential to a more economic and efficient traffic pattern. Gross tonnage of commercial barge movement on the Missouri River was 2.6 million tons in 1967, an increase of 85.7 percent over 1960. Historic and projected traffic on the Missouri River, measured in ton-miles, is presented in table 28.

Table 28 – COMMERCIAL BARGE TRAFFIC, MISSOURI RIVER, HISTORICAL AND PROJECTED

Year	Tonnage	Traffic
	(Thousand Tons)	(Thousand Ton-miles)
1955	435	186,291
1960	1,441	658,818
1965	2,272	1,003,035
1967	2,590	1,200,000
1980	---	2,605,000
2000	---	3,200,000
2020	---	3,300,000

In terms of commodity shipments by barge, farm products presently account for approximately 60 percent of the total tonnage. In 1967, 91 percent of the downstream traffic consisted of farm products and 8 percent was food and kindred products. Among principal commodities shipped upstream were chemicals, 32 percent; nonmetallic minerals, 18 percent; food and kindred products, 17 percent; stone and clay products, 14 percent; petroleum products, 10 percent; and metal products 9 percent. Waterway construction materials of an intraport variety are not included in commercial water tonnage statistics.

Highway Systems

Highway and air transportation are the two modes of transportation which are experiencing continued expansion in both commercial and noncommercial use. These two modes of transportation also share a common problem in that their concentration of markets is in the urban areas and it is in these areas where the greatest demand for expanded services and facilities exist. The Missouri Region has four east-west and three north-south interstate highway routes. In addition, there are numerous Federal and State highways providing intra- and inter-basin routes. Only the main arterial network of highways is shown in figure 16.

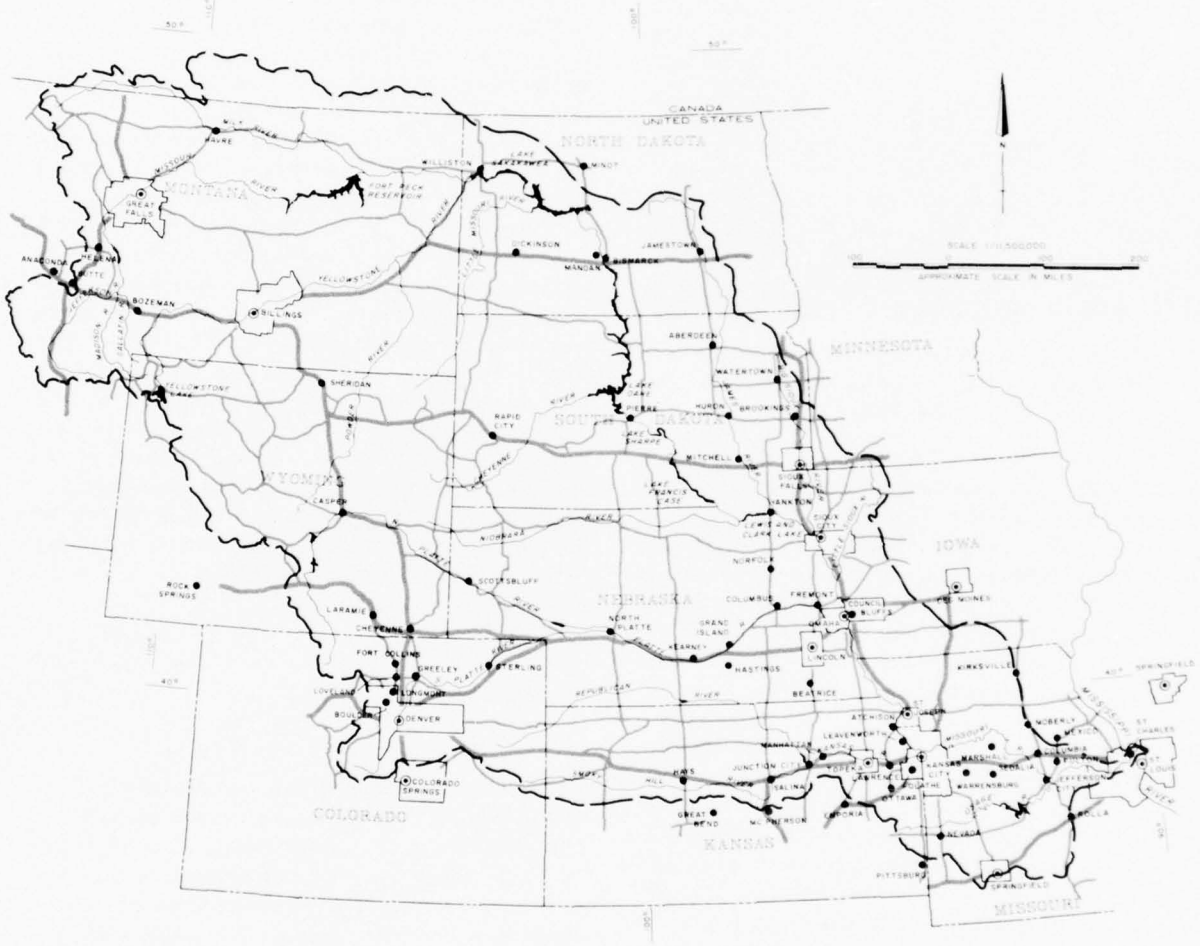
In 1960, the nine-state area[1] had about 864,500 miles of highway, or 24.4 percent of the Nation's total highway mileage. Of the area's total, 53,700 miles were municipal roads and 483,100 miles were rural surfaced highways, or 12.5 and 22.3 percent of the Nation's total mileage in these respective categories. The balance of the roads in the area was classified rural nonsurfaced. By 1965, total highway mileage had increased in the area to about 883,500 miles, but its share had dropped to 23.9 percent of the Nation's total highway system. While municipal highway mileage in the area had increased about 3,400 miles, its share of the total had decreased to 11.3 percent. Rural surfaced mileage had increased 47,000 miles, or to about 23.0 percent of the national total. The area currently has 7,377 miles of designated interstate highway, or about 18.0 percent of the national system. By 1965, 3,974 miles of this system had been open to traffic in this area, representing 18.8 percent of the total interstate system open.

Somewhat indicative of the amount of overall traffic in the area is the number of motor vehicle registrations. Automobile registration, including taxicabs, in the nine-state area in 1960 was approximately equal to the area's share of the Nation's population, 8.7 percent in 1960 and 8.5 percent in 1965. Total motor vehicle registration

[1] The nine-state area, for the purpose of this discussion, consists of Colorado, Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Wyoming, having a total of 21.7 percent of the Nation's total area and, in 1960, 8.3 percent of the population and, in 1965, 8.0 percent. In contrast, the Missouri Region had 14.4 percent of the Nation's area and, in 1960, had 4.4 percent of the population. The nine-state area was chosen for comparison due to the availability of statistical information. Minnesota was excluded because of its relatively small share of the region's area and population.

FIGURE 16

HIGHWAY SYSTEM



LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- 10,000 TO 49,999 POPULATION
- STANDARD METROPOLITAN STATISTICAL AREA
- PERENNIAL STREAMS
- LAKES OR RESERVOIRS
- FEDERAL INTERSTATE AND DEFENSE HIGHWAYS
- OTHER MAJOR HIGHWAYS

was slightly above the area's share, with 9.6 and 9.4 percent in 1960 and 1965, respectively.

Modern Highways and Railroads Remain the Backbone of the Transportation Network in the Missouri River Basin

The area possesses 22.6 percent of the Nation's motortrucks used for agriculture, while the other major uses almost parallel the percentage of population in the area: personal, 10.1 percent; wholesale and retail trade, 8.9 percent; contract construction, 9.2 percent; and services, 9.9 percent. The role of the motortruck in commercial transportation, with some exceptions, is, for the most part, confined to short or intermediate-length hauls, playing a dominant role in the initial gathering and final distribution of goods. They complement, rather than compete with, rail and barge traffic for bulk commodity, long-distance shipments. Completion of the interstate highway system will significantly influence efficiency of long distance truck movement because it will permit faster service and larger truck load lots. Certain commodities probably will continue to move by other modes of transportation; however, trucking in the region is continuing to assume a more dominant role in the movement of most commodities.

Communications

The subject of communications is very difficult to equate with an area's ability to sustain economic development, especially in the United States where there are few areas that suffer from a lack of communications services. Modern commercial communications networks serve the cultural and business communities alike. In very recent times, these earlier forms of communications have been eclipsed by modern telecommunication networks, including telegraph, telephone, radio, and television, which have been facilitated in transmission by coaxial cables, microwave equipment, and satellites. These latest developments in communications have literally brought the world instantaneously to the doorstep of almost every citizen in the Nation.

The region contained 8.3 percent of the population in 1960 and about 8.5 percent of the occupied dwelling units. About 82 percent of these dwelling units had telephones, representing about 7.5 percent of the total number of telephones in the Nation. There were about 48 telephones per 100 persons in the region. Only about 7.3 percent of the occupied dwelling units had no radio, and 14 percent no television. About 62 percent of the units had one radio and 30.4 percent two or more radios. Eighty percent of the units had one television set and two or more sets were installed in about 5.7 percent of the occupied dwelling units. The region differed most substantially from the Nation in only one of these categories, it had only 4.9 percent of the Nation's occupied dwelling units with two or more television sets.

As might be expected from the region's relatively large share of the Nation's area and relatively low population density, it had a slightly higher share of the total number of commercial broadcasting stations, 10.8 percent, compared to its share of the population, 8.3 percent. In 1960, there were about 11 percent of the Nation's AM stations, 5 percent of the FM stations, and 17 percent of the TV stations in the region. The region had 246 daily newspapers, or 14 percent of the Nation's total. Of the total net paid circulation of daily newspapers, the region had 8.6 percent.

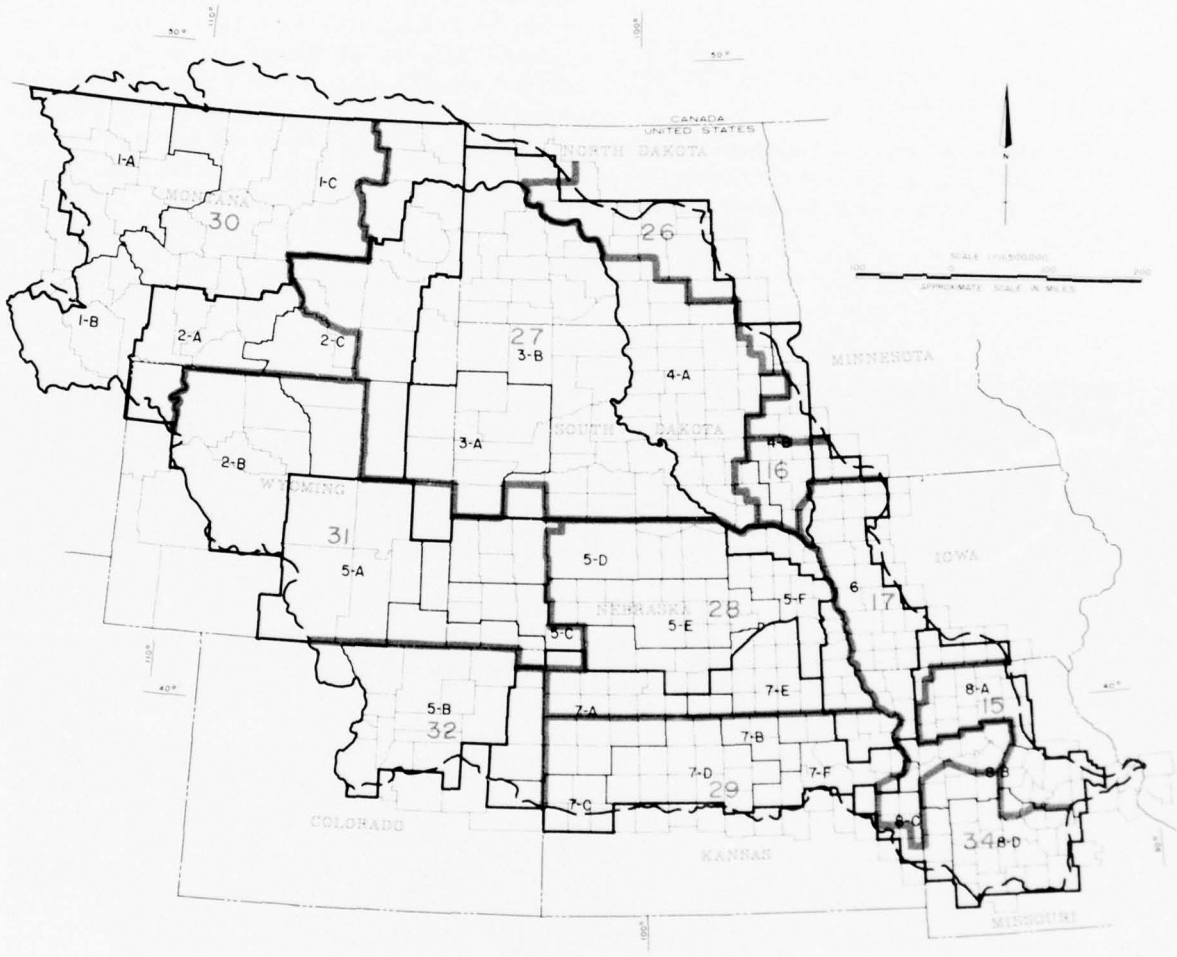
Electric Power

The Missouri Power Region includes parts of the Federal Power Commission's power supply areas 15, 16, 17, 26, 29, 30, 31, 32, and 34, and the whole of 27 and 28. Power supply areas (PSA's) represent geographical areas which are essentially the service areas of groups of major electric utilities and are the logical units for determination of present and projected power requirements (figure 17).

In 1965, the combined electric energy requirements of the PSA's comprising the Missouri Power Region amounted to about 39,000 million kilowatt-hours with a peak load of some 8.1 million kilowatts. There were nearly 580 electric systems supplying these power requirements. They represent every segment of the power industry: Investor-owned, cooperatives, municipals, public power districts, and the Federal Government. The generation capacity and loads of the investor-owned utilities comprise, by far, the largest segment of the total, while the hydroelectric power plants of the Federal Government constitute about 80 percent of the hydro capacity.

FIGURE 17

FEDERAL POWER COMMISSION
POWER SUPPLY AREAS



LEGEND

- BASIN BOUNDARY
- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC SUBREGION BOUNDARY
- ECONOMIC SUBAREA BOUNDARY
- 30 — POWER SUPPLY AREA

The Federal generation capacity is obtained from hydroelectric developments situated, for the most part, on the main stem of the Missouri River. The total capacity of the Federal supply in 1965 was 2.3 million kilowatt[1], with an average annual generation of about 11 billion kilowatt-hours. In order to integrate the major hydroelectric plants and to connect them with their loads, an extensive transmission network has been constructed between them and major power systems.

Steamplants, using coal and gas as fuels, generate the major portion of electric energy in the region. There are numerous small diesel plants, but these account for a negligible portion of the current capacity.

The gas turbine is increasing in importance in some areas as a source of peaking and emergency supply, but in this application it is expected to be only a small part of the total capacity.

There are several small plants utilizing lignite as a boiler fuel for steam-electric generation. By the mid-1960's two large lignite plants in the order of 200 megawatts each were located in the lignite fields in North Dakota. It has been estimated that a large development of lignite-burning thermal-electric plants will be constructed in the lignite fields from which transmission lines of extra high voltage (EHV), in the order of 345 kilovolts, will be constructed to transmit their outputs to distant load centers. The region is now served by transmission lines of 115, 138, 161, and 230 kilovolts. The first 345-kilovolt line in the Missouri Region was built from Kansas City to Wichita and energized at 138 kilovolts in 1967 and at 345 kilovolts in early 1968. Also a 345-kilovolt line is being constructed between Ft. Thompson, S. Dak. and Grand Island, Nebr. which will interconnect with 230 and 345 kilovolt lines to be constructed by non-Federal entities.

[1] Total capacity in 1966 was 2.7 million kilowatts.

Bagnell Dam on the Osage River Impounds the Popular Lake of the Ozarks and Provides Hydroelectric Power

Essentially all of the electric power which is produced by thermal energy requires cooling water. The technology of electric generation and supply is changing rapidly with the advent of larger and larger units made possible by rapid load growth, increasing reliance on EHV transmission, the construction of minemouth generation, utilization of unit-type coal trains, and the large increase in number of scheduled nuclear-fueled plants. Consequently, it is uncertain as to what portion of the future supply will be fossil-fuel or nuclear-powered and as to the location of future plants and their water requirements and source of supply. However, projections have been made which are presented in the Appendix, "Present and Future Needs".

The amount of water for cooling required to pass through condensing units of steam-electric plants located within the region is approximately 3 million acre-feet per year, with a consumptive use of about 37,000 acre-feet per year in 1965.

Consumptive use of water for cooling in electric power generation can be varied at the discretion of designers by changing the controlling conditions, the two most important being the type of cooling and permissible temperature rise of the cooling water. The type of system used for cooling water has an important effect on water consumption as consumption is greatest for wet-type cooling towers and negligible for dry-type cooling towers. Consumption by the flow-through and cooling-pond method is intermediate between that of wet- and dry-cooling towers.

Presently, the major portion of the generating capacity within the region employs once-through cooling rather than supplemental types (towers or ponds). However, as other demands for water become more acute, it is expected that certain areas will be required to employ supplemental cooling and may even utilize dry-type cooling towers.

RECREATION AND FISH AND WILDLIFE

A discussion of recreation and fish and wildlife industries in the Missouri Region must necessarily proceed on an individual subregion basis for several reasons. The major reason for such a geographic distinction is that recreation in one area may be considered a basic or export industry, whereas in another area it is largely a service-type activity.

The major problem in discussing recreation is in defining the industry. While it is no problem to include economic activities which are of a strictly recreationally based nature, a problem arises when including economic activities which are defined as nonrecreational in terms of the Standard Industrial Code (SIC), but are in fact a part of the local recreation industry. For example, employment in restaurants, service stations, drug stores, etc. in a recreational or tourist area such as Yellowstone National Park, is associated with and can legitimately be defined as employment engaged in the recreation industry. For the same type of industry in a town in the Black Hills, such as Rapid City, S. Dak., the portion of employment serving the recreational industry cannot be separated from the nonrecreational-generated employment. This type of employment, whether it is in a nonrecreational urban setting, a recreational setting, or a partial recreational-nonrecreational setting, is grouped according to its legitimate SIC classification in all cases. Therefore, the identification and analyses of the recreational industry in a particular location in terms of employment, personal income, and total earnings is less manageable and less meaningful than in analyzing a recreational industry in terms of demand.

The relative importance of the recreation industry is discussed for each subregion later in this chapter. The impact of increases in recreation and fish and wildlife industries was likewise measured in terms of additional incomes generated, and is included with the other SIC classifications for each subregion and the region, but it is not separated out by these specific industries.

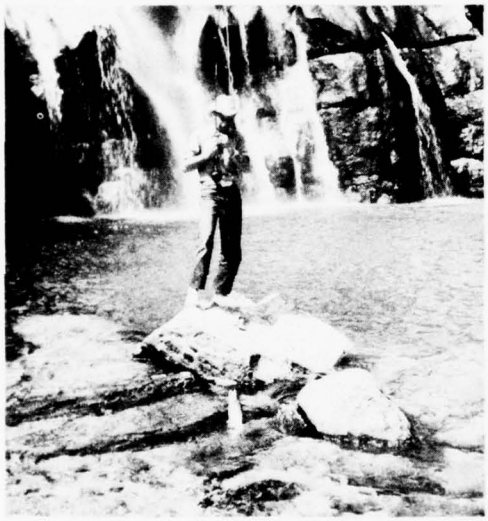
The importance of recreation and fish and wildlife industries varies widely. Within the upper portions of the region, these industries are very significant to the economy. In some localities, recreation is the basic or primary industry for the area. In other portions, recreation is relatively less important in the overall economic activity but nevertheless significant in absolute terms. In the Lower Missouri Subregion, for example, recreation is important to local economies, but compared with total economic activity it accounts for a small portion.

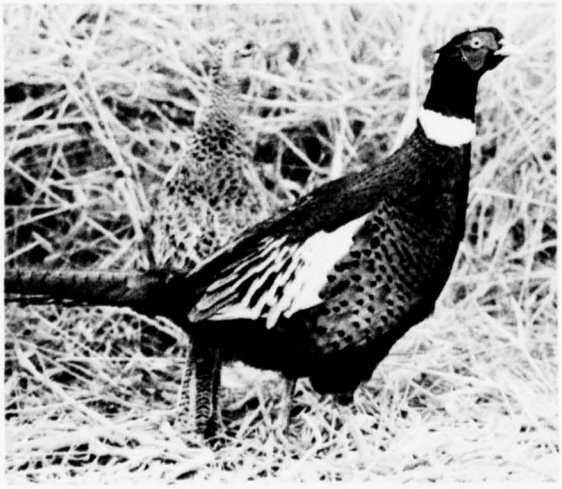
INDIAN ECONOMY

The Indian segment comprises less than one percent of the total region population, but Indian-owned land comprises 3.6 percent of the total land area. A lag in development of the Indian human resource makes it necessary that resources and needs of this important minority group be given special consideration.

In 1965, there were nearly 58,000 Indians residing on or near 23 reservations in six states of the Missouri Region (figure 18). The Indian population is projected to be 93,000 by 2020.

In 1965, Indians owned approximately 12 million acres of land within the region, as shown in table 29. Title to this land is held in trust by the United States Government. Six reservations are located in Montana, namely, Fort Belknap, Fort Peck, Blackfeet, Rocky Boy's, Crow, and Northern Cheyenne. One reservation, the Wind River, is located in Wyoming. Another reservation, Fort Berthold, and a portion of two others, Standing Rock and Sisseton, are located in North Dakota. Six reservations, namely, Pine Ridge, Rosebud,





Camping, Fishing, and Hunting Are Among the Many Outdoor Recreation Activities in the Missouri River Region

FIGURE 18

INDIAN RESERVATIONS AND SETTLEMENTS

Yankton, Lower Brule, Crow Creek, and Cheyenne River, and a portion of two others, Standing Rock and Sisseton, are in South Dakota. The Santee, Winnebago, and Omaha, and a portion of two others, the Sac and Fox and the Iowa, are in Nebraska. The Potawatomi and Kickapoo reservations and a portion of two others, the Sac and Fox and the Iowa, are in Kansas.

Table 29 – INDIAN-OWNED LAND AND POPULATION BY RESERVATION, 1965

Reservation	Subregion	Indian-owned Land[1]	Estimated Population
		(Acres)	(No.)
Blackfeet	Upper	945,008	6,600
Fort Belknap	Missouri	595,768	1,635
Fort Peck		890,975	4,000
Rocky Boy's		107,612	880
Crow	Yellowstone	1,574,230	3,190
Northern Cheyenne		433,227	2,495
Wind River		1,887,372	3,580
Standing Rock	Western	851,866	4,640
Cheyenne River	Dakota	1,456,634	3,840
Fort Berthold[2]		275,927	1,080
Lower Brule		100,117	570
Pine Ridge		1,501,394	9,600
Rosebud		938,457	5,200
Yankton	Eastern	35,506	1,320
Crow Creek	Dakota	107,370	1,140
Fort Berthold[2]		148,576	1,620
Sisseton[3]		108,621	2,275
Santee	Middle	5,802	320
Omaha	Missouri	27,703	1,090
Winnebago		29,368	750
Iowa		1,463	235
Sac and Fox		119	30
Kickapoo[4]		4,949	565
Potawatomi[4]		21,485	980
Missouri Region		12,049,549	57,635

[1]Acres of land owned by Indians, the title of which is held in trust by the United States Government.

[2]Fort Berthold Reservation is in both the Eastern and Western Dakota subregions.

[3]Except for small portions in North Dakota and Minnesota most of the Sisseton Reservation is within the Eastern Dakota Subregion; however, only 38,000 acres of the reservation land and about 770 of the 1965 population are within the hydrologic boundary of the Eastern Dakota Subregion (see figure 18).

[4]Kickapoo and Potawatomi reservations are within the hydrologic boundaries of the Kansas Subbasin but within the Middle Missouri Subregion.

Eighty-five percent of the Indian land is grazing land and most of the remainder is cultivated. While most of the cultivated land is dry-cropped, a relatively small percentage is irrigated. Additional land, both grazing and cultivated, is irrigable.

Most of the reservations have natural resources that, to a considerable extent, remain undeveloped or have not reached their full potential. For example, there has been significant oil and gas production during the last 20 years on some reservations, but development of extensive coal deposits found on some reservations has just started. Timber resources on the reservations, which are found almost exclusively in Montana and Wyoming, are being harvested under sustained yield cut. Recreation resources on several reservations are beginning to be developed, but tourism is, by and large, an undeveloped resource. Accelerated development of Indian resources for agriculture, industry, recreation, and other uses is essential to the development of the economy of the entire region.

The major undeveloped Indian resource is the human resource. This is reflected in 1966 unemployment which ranged from a low of 24 percent to a high of 69 percent of the employable work force. Much of the employment in the reservation areas comes from seasonal agricultural work. The present average family income of the Indian segment of the population is generally less than $2,000 per year, though it varies widely from one reservation to another. There is a serious shortage of job opportunities on or near the reservations, and because of social and cultural factors, the labor force is highly immobile; the Indian people are reluctant to leave the reservation largely because they are neither adequately trained nor culturally equipped to enter the off-reservation labor force. For several decades, the Indian population has remained at an almost static 88-percent rural, while the rural population for the region as a whole declined from 60 percent in 1940 to 43 percent in 1960.

Until recent years, there had been very little development of industry on or near most of the reservation areas. However, as a result of programs of the Bureau of Indian Affairs, the tribes, and other government agencies designed to assist depressed areas, industry has been developed on some reservations to the mutual benefit of the employers and the Indian people. While industrial development is providing much needed jobs on some of the more favorably situated reservations, such as the Crow, it is being held back on other reservations by many of the same factors that are holding back development in many of the non-Indian areas of the region. Some of the factors holding back development are distance from markets, distance from raw materials, lack of adequate transportation facilities, undesirable living conditions, lack of ancillary services, shortage of trained and skilled workers, and insufficient funds to construct the buildings and facilities frequently required by a company considering a rural or semi-rural location.

In retrospect, problems inherent in the development of the Indian segment of the economy are in many respects similar to, but more complex than, the problems inherent in the overall development of the region. While the Indian-owned resources must be developed as an integral part of the resources of the region, it is essential that the problems peculiar to Indian-owned resources be recognized. These problems are a cultural difference between Indians and non-Indians, a relatively immobile labor force, relatively undeveloped human and natural resources, and a critical imbalance between population and developed resources.

SUBREGION SUMMARIES

The Missouri Region is an area of diversity and extremes. While the dominant industry is agriculture, many highly industrialized centers are located in the region. There are many arid and semiarid areas in the region, some of which have extensive irrigation development. The region may be characterized generally as one of out-migration. However, there are also areas which offer attractive opportunities for development and are centers of in-migration. A discussion of population and employment prospects and the resource base and potential for the region as a whole would be less confusing if it could be broken down into separate subregional discussions; and, while there is still a lack of common economic and demographic unity, even on a subregional basis, there is less diversity subregionally than regionwide. Therefore, the following individual discussions summarize the salient economic characteristics of each of the eight subregions.

Upper Missouri Subregion

The Upper Missouri Subregion is located in Montana. This subregion is bordered by Canada on the north, the Yellowstone Subregion on the south, the Continental Divide on the west, and North Dakota on the east (figure 19). The subregion is characterized by high mountains, with elevations of about 11,000 feet above sea level, in the western portion, and by rolling plains, with elevations of about 2,000 feet above sea level, in the eastern and southern portion. Climatic conditions vary throughout the subregion. Much of the area is semiarid. Annual precipitation averages from 10 to 20 inches per year over most of the subregion. A few mountainous areas have up to 50 inches of precipitation. At the higher elevations much of the precipitation comes as snow. Precipitation during the growing season varies widely from year to year in the plains area and contributes to wide variations in crop income.

Air, rail, and road transportation is centered at Great Falls, Mont. Most transportation lines that traverse the subregion lead to and from that city.

Population in the subregion increased from 249,907 in 1940 to 254,734 in 1950 and 298,191 in 1960. Farm population decreased from 85,779 in 1940 to 56,390 in 1960, a decline of 26 percent. However, the Great Falls Standard Metropolitan Statistical Area (SMSA) grew from 41,999 in 1940 to 73,418 in 1960. This is a 75-percent increase, or a compounded annual growth rate of about 2.8 percent for the 20-year period. In addition to Great Falls, there were 11 other urban places in 1960, and they had a combined population of 79,472 in that year. See figure 19 for the location of these urban places. More detailed population data are presented in Statistical Supplement A, tables A-1 through A-5.

Per capita personal income in the subregion increased from $1,148 in 1940 to $1,844 in 1960.[1] Per capita personal income in the Great Falls SMSA increased form $1,405 in 1940 to $2,098 in 1960.

Total employment in the subregion increased from 84,527 in 1940 to 108,540 by 1960. Agricultural employment declined from 31,944 in 1940 to 23,332 in 1960, while manufacturing and other commodity employment increased from 13,564 in 1940 to 16,059 in 1960. Employment in noncommodity-producing industries increased from 38,019 in 1940 to 69,149 by 1960. Continuing urbanization, rising personal income, and expansion of service industries account for gains in the noncommodity-producing industries. About 95 percent of the subregion is used for agricultural purposes. Nearly 66 percent of the agricultural land in the subregion was in pasture and range in 1959. There are about 11 million acres of cropland, of which about 1.1 million acres are irrigated. Feed grains and hay are the most common crops raised. Spring wheat is the most common cash crop on dry land. Sugar beets are an important cash crop on irrigated land. Of the $234.9 million in cash receipts for farm marketings that year, $121.7 million, or 52 percent, was from crop sales and $113.2 million, or 48 percent, was from the sale of livestock and livestock products. Most of the livestock is sold as feeders to be fattened where grains are more plentiful. Gross farm income in 1964 amounted to $296.6 million

Production of timber products output in 1962 amounted to about 21 million cubic feet with an estimated value of about $10.7 million. This value is for air-dry, mill-run lumber in random lengths, widths, and thickness at the sawmill and for pulpwood and industrial timber products at the railroad or landing.

Total value of mineral production in the subregion was about $64 million in 1960 as measured in 1957-59 constant dollars. About 75 percent of the value is for mineral fuels, primarily petroleum and natural gas, while about 20 percent is from non-metallic minerals. Total mining employment amounted to 1,441 in 1960.

Manufacturing employment increased from 5,080 in 1940 to 7,063 in 1960. The compound annual growth rate of manufacturing employment was 1.7 percent from 1940 to 1960. About half is in the manufacture of primary metals and food products. In 1960, 47 percent of the manufacturing employment in the subregion was concentrated in the Great Falls SMSA.

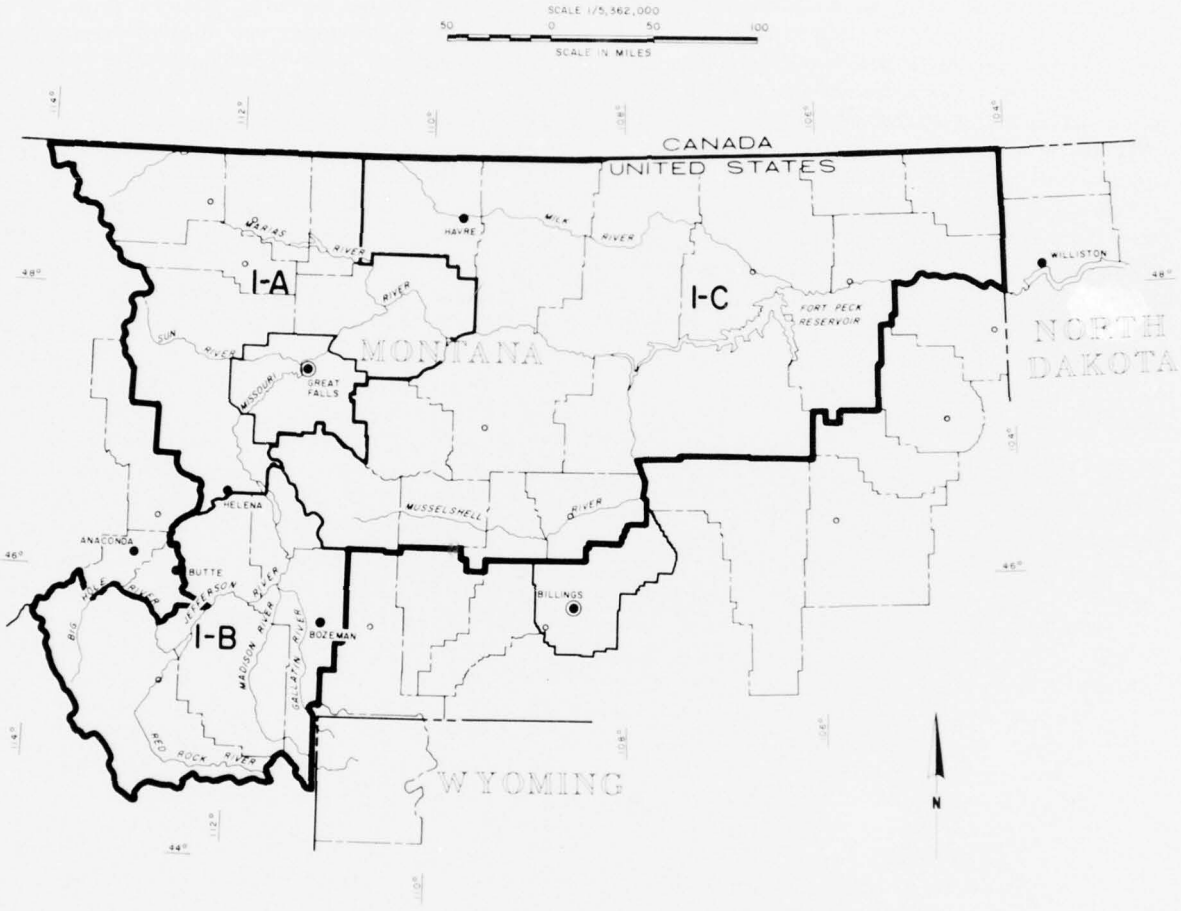
Recreation, hunting, and fishing are significant industries in this subregion. Glacier National Park, the eastern half of which is in this area, and the Rocky Mountains attract thousands of tourists and fishermen during the

[1] All per capita income values in this appendix are in 1954 dollars.

FIGURE 19

UPPER MISSOURI RIVER TRIBUTARIES SUBREGION

TRADE CENTERS AND SUBAREAS



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- COUNTY BOUNDARY
- ECONOMIC DATA
- SUBREGION BOUNDARY
- SUBAREA BOUNDARY
- POPULATED PLACES
- STANDARD METROPOLITAN STATISTICAL AREA
- 10,000 TO 49,999 POP. (1960)
- 2,500 TO 10,000 POP. (1960)
- PERENNIAL STREAMS
- LAKE OR RESERVOIR

Mountain Slopes of the Upper Missouri Subregion Offer Excellent Skiing

summer vacation season and hunters and skiers during their respective seasons.

Four Indian reservations are located in the subregion. The reservation Indian population was about 13,100 in 1965 and the Indians owned about 2.5 million acres of land. The reservations' principal natural resources are agricultural land, timber, oil and gas, coal, scenery, and water. Unemployment among the Indian population ranged from 37 to 52 percent of the labor force during 1966. Average family income ranged from $1,450 to $1,750 annually during 1960-62.

Yellowstone Subregion

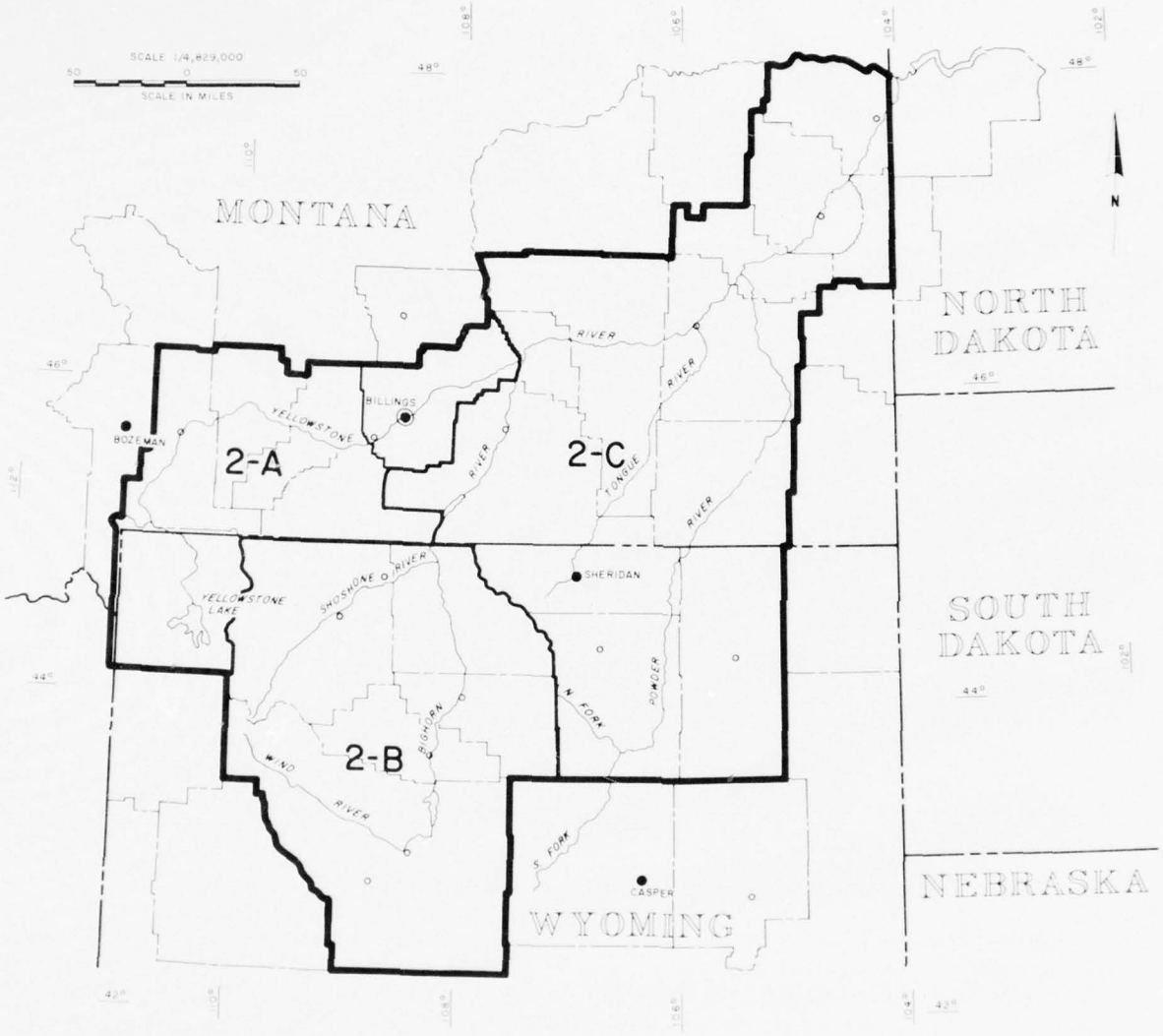
The Yellowstone Subregion, situated in southeastern Montana and northern Wyoming, encompasses parts of two geographic regions: The Rocky Mountain province and the northwestern ranching area of the Great Plains province. While the Rocky Mountains border the subregion on the west, the Big Horn Mountains lie in the south-central part about 150 miles east of Yellowstone National Park in the Rocky Mountains, in Wyoming (figure 20). These scenic resources attract tourists from all parts of the Nation. As a result, tourist trade and service activities in several communities are basic industries in these areas, especially during the summer months. In their respective seasons, skiing and hunting activities also attract many nonresidents. Recreation, hunting, and fishing industries constitute a significant portion of the business activity in this subregion.

Population increased from 210,589 in 1940 to 234,626 in 1950 and to 270,382 in 1960. During the 20-year period of 1940 to 1960, urban areas increased from 71,331 to 146,122, over a 100-percent increase,

FIGURE 20

YELLOWSTONE RIVER SUBREGION

TRADE CENTERS AND SUBAREAS



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- LAKE OR RESERVOIR

while the rural farm population decreased from 81,631 to 48,160, or a 41-percent decrease. (See Statistical Supplement A, tables A-6 through A-10 for additional details.)

In the plains areas, surface conditions and climate combine to permit an agricultural economy of mixed dryland and irrigated farming and cattle ranching. Of the nearly 3.4 million acres of cropland, about 35 percent or 1.2 million acres are irrigated. Most of the irrigated lands are along streams. Over large sections of the subregion, the plains are rough and many of the tributary streams have cut deeply into the surface of terraced valleys. Precipitation is too limited to permit widely diversified agriculture, except where lands are irrigated. Growing season precipitation varies widely from year to year. The principal dryland products are livestock, hay, and wheat. Dry edible beans, sugar beets, hay, and some vegetables are grown in the irrigated areas. Most livestock is sold as feeders to be fattened in areas where grains are more plentiful.

The value of farm sales increased from $164.5 million in 1959 to $168.8 million in 1964. About three-fourths of these receipts are from livestock and livestock product sales.

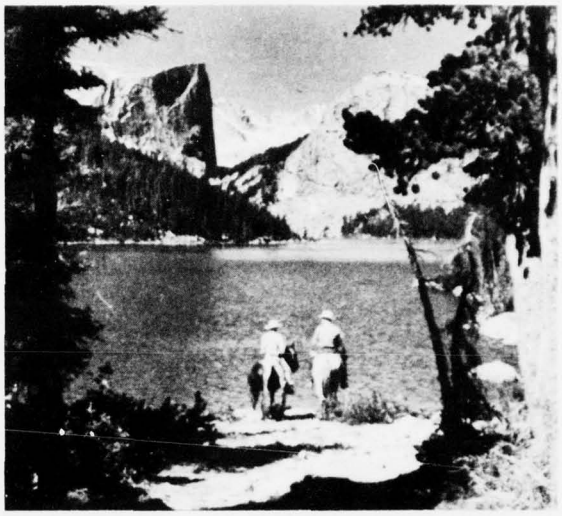
The output of timber products in 1962 amounted to about 11 million cubic feet with an estimated value of over $7 million. This value is for mill-run, air-dry lumber in random lengths, widths, and thickness at the sawmill and for pulpwood and industrial timber products at the railroad or landing.

Total value of mineral production in the subregion was about $303 million in 1960 using 1957-59 constant dollars. About 90 percent of the value was for mineral fuels, almost entirely petroleum and natural gas. Most of the remaining output was from metallic minerals including uranium, chromite, iron, gold, silver, vanadium, beryllium and copper. Over 4,100 people were employed in mining during 1961. About 123 billion tons of economically-recoverable coal and lignite are found in the subregion.

More than half of the 6,800 employed in manufacturing in the Yellowstone Subregion are engaged in petroleum products and food products. Manufacturing employment more than doubled by 1960 from the 3,100 employed in 1940. Except for the Billings SMSA, urban development is sparse. In 1960, there were 14 urban communities, but only Sheridan, Wyoming exceeded 10,000 population.

Employment trends in the subregion follow generally those in the Missouri Region with declining employment levels in agriculture and rapidly increasing employment levels in the noncommodity-producing sector.

The importance of tourism, which may be considered as a basic industry in the subregion accounts for some of the increasing urbanization.



Forested Mountain Lakes in the Yellowstone River Subregion Provide an Attractive Background for Recreational Activities

Three Indian reservations, the Crow and Northern Cheyenne in Montana, and the Wind River in Wyoming, are in the subregion. In 1965, these reservations had a population of nearly 9,300 residing on 3.9 million acres of Indian-owned land. In addition to agricultural land, principal reservation resources are oil and gas, coal, scenery, and water. Unemployment in 1966 ranged from 24 to 53 percent of the labor force of 2,662 individuals.

Western Dakota Subregion

The Western Dakota Subregion includes the tributaries and drainage areas on the western side of the Missouri River from the Yellowstone Subregion on the west downstream to the Platte-Niobrara Subregion. It encompasses that portion of North Dakota south and west of the Missouri River, South Dakota west of the Missouri river, and adjacent counties in Montana and Wyoming (figure 21). Average annual precipitation in the subregion ranges from 28 inches near Lead, South Dakota, in the northern Black Hills to about 13.5 inches in Carter County, Montana, and Weston County, Wyoming.

Topography in the Western Dakotas is varied, ranging from the mountainous terrain of the Black Hills to the unglaciated plains, with deeply eroded valleys to the east. Elevations in the Black Hills range from 3,500 feet above sea level in the east to 7,242 feet at Harney Peak. Lake Francis Case (Fort Randall Dam) at the southeastern boundary of the subregion has an elevation of 1,365 feet. Outstanding features of the plains area are the many buttes rising several hundred feet above the surrounding area, and the extensive Badlands of North Dakota and South Dakota which have experienced

Oahe Dam and Lake Oahe, One of Six Large Main Stem Reservoirs on the Missouri River, is on the Eastern Boundary of the Western Dakota Subregion

severe wind and water erosion. In addition to Lake Francis Case, there are three other main-stem reservoirs on the Missouri River, Lake Sharpe (Big Bend Dam), Lake Oahe (Oahe Dam), and Lake Sakakawea (Garrison Dam), that form the eastern boundary of the subregion.

Transportation routes are primarily oriented in an east-west direction. Two interstate highways traverse the area; Interstate 90 follows an east-west route to Rapid City, So. Dak., and skirts the northern portion of the Black Hills, while Interstate 94 traverses an east-west route from Bismarck west across North Dakota. Two transcontinental railroads cross the subregion, one west from Bismarck, the other west from Aberdeen, South Dakota, crossing into North Dakota midway between the Missouri River and the western State line. Other trunk and branch lines serve principal communities in the area. Commercial airlines serve the Black Hills area. Pipelines serve the Black Hills and southern North Dakota areas. There is no commercial navigation in the subregion.

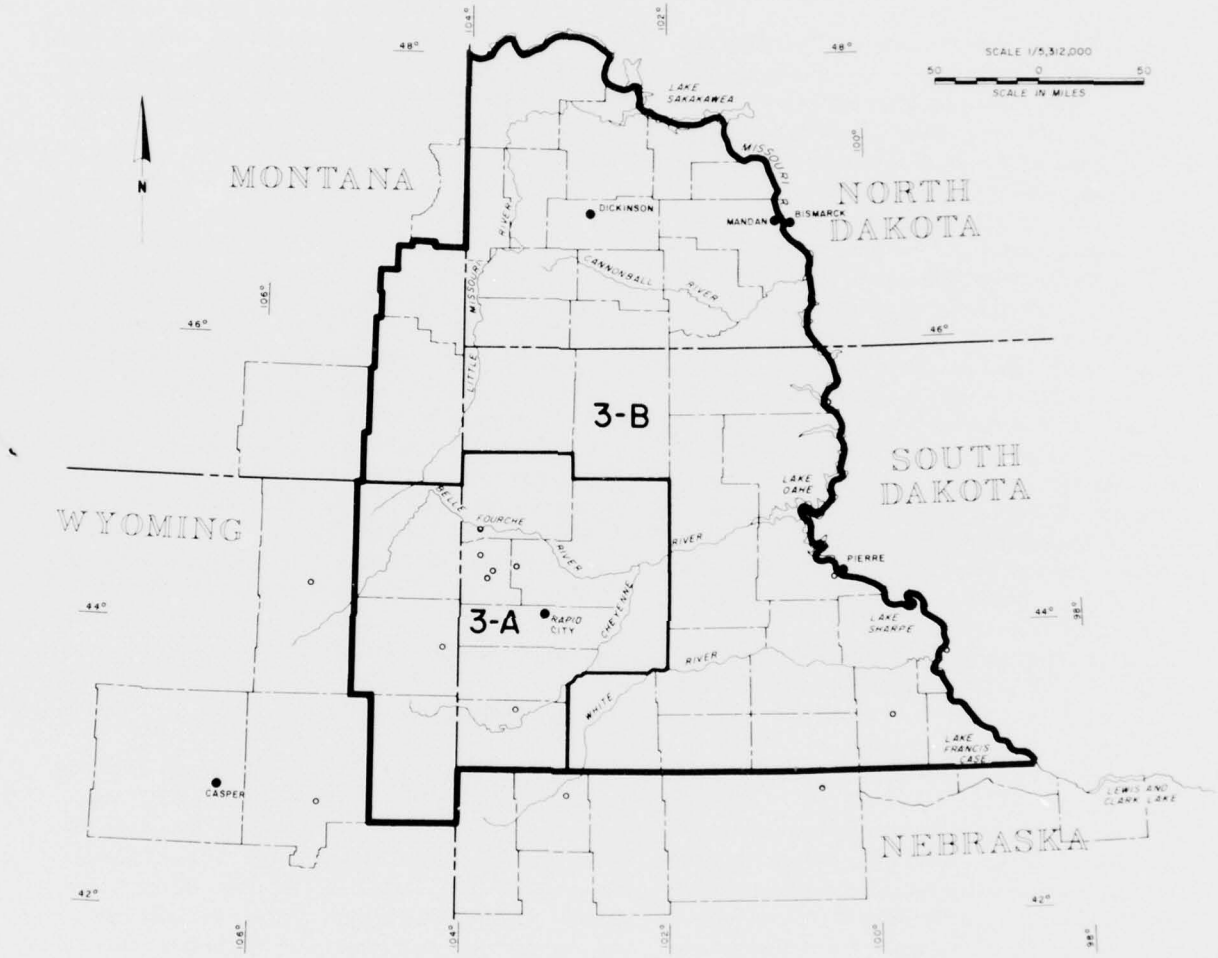
Population declined from 282,246 in 1940 to 277,411 in 1950, and then increased to 299,545 in 1960. The subregion's share of the total Missouri Region's population declined from 4.2 percent in 1940 to 3.8 percent in 1960. Rural farm population decreased from 142,496 in 1940 to 86,866 in 1960. Rural nonfarm population in the subregion was nearly 6 percent of the region's rural nonfarm population in 1960. Except for Rapid City, urban population in the subregion increased by 16,800, or 40 percent, from 1940 to 1960. In contrast, Rapid City grew from 13,844 in 1940 to 42,399 in 1960, or about 206 percent. In addition to Rapid City, there were 11 other areas in the subregion that were classified as urban places by 1960. These 11 cities had a combined population of 57,800. (For additional details, see Statistical Supplement A, tables A-11 through A-13.) Per capita personal income increased from $709 in 1940 to $1,449 by 1960 for the subregion.

Total employment increased from 84,612 in 1940 to 104,293 in 1960. Agricultural employment declined from 44,018 in 1940 to 32,091 in 1960, while manufacturing and other commodity-producing employment increased from 9,256 to 15,775. Both absolute and relative increases are reflected in the numbers employed in the noncommodity-producing industries; from 31,338, or 37 percent, in 1940 to 56,427, or 54 percent, in 1960. Continuing urbanization, rising personal income, and expansion of service industries, including recreation and tourism, account for gains in the noncommodity-producing industries.

FIGURE 21

WESTERN DAKOTA TRIBUTARIES SUBREGION

TRADE CENTERS AND SUBAREAS



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Forest production is concentrated in the Black Hills area. Timber products output in 1962 amounted to nearly 18 million cubic feet with an estimated value of about $6.7 million. This value is for mill-run, air-dry lumber in random lengths, widths, and thickness at the sawmill and for pulpwood and industrial timber products at the railroad or landing. It is anticipated that timber products output will increase to about 66 million cubic feet in 2020.

The Black Hills of South Dakota and Wyoming, the Badlands in South Dakota and in North Dakota, and the four large reservoirs formed by dams on the main stem of the Missouri River attract many thousands of tourists to this subregion each year. Recreation, fishing, and hunting are basic export-type industries for the area. At the present time, the Black Hills, which is very well known and popular vacation area, attracts the bulk of the tourist trade. However, the main-stem reservoirs on the Missouri River are rapidly growing in popularity.

Production of livestock and livestock products is predominant in the agricultural economy of the subregion. Most of the livestock is sold as feeders to be fattened out in other areas, with a limited, but increasing, number being fattened in the area. Nearly 75 percent of the agricultural land is in pasture and range. Of the nearly 10 million acres classified as cropland, about 200,000 acres are currently being irrigated. Cash receipts for farm marketings totaled $222.3 million in 1959, of which 79 percent, or $176.2 million, was from livestock or livestock products.

Wheat is the principal dryland cash crop accounting for nearly 1.5 million acres of the cropland. Alfalfa, feed grains, and some corn are the other principal dryland crops. Alfalfa is the principal irrigated crop along with the minor crops of other feed grains, corn, and some specialty crops of dry beans, sugar beets, etc. Wide variations in growing season precipitation cause wide variations in crop production on the non-irrigated lands.

Total value of all mineral production in the subregion was about $108 million in 1966. Mineral fuels accounted for almost two thirds of the total value of production, predominantly petroleum and natural gas. The value of the remainder was almost equally divided between metallic and non-metallic minerals. Total employment in this industry was nearly 3,900. About one half of the total employment was engaged in metallic mineral production. The Homestake Mine, the Country's largest operating gold mine, produced about ten times the value of all other minerals produced in the subregion during 1963. Cement minerals constituted about two thirds of the value of non-metallic minerals and bentonite clay almost all of the remainder. About 132 billion tons of economically-recoverable coal and lignite reserves are found in the subregion.

Manufacturing employment increased in the subregion at a rate substantially lower than that of the Nation and of the Missouri Region from 1940 to 1950 and substantially higher from 1950 to 1960. However, in that 20-year period, the rate of increase in the subregion was identical to that of the Nation. The Western Dakotas Subregion manufacturing employment was 2,942 in 1940, and increased to 4,987 in 1960. About 72 percent of the subregion's manufacturing employment in 1960 was in Subarea 3A. Food production accounted for almost 30 percent of the manufacturing employment. Although the subregion has no identifiable Standard Metropolitan Statistical Area, a substantial amount of the manufacturing employment is concentrated in Rapid City and surrounding Pennington County, South Dakota. In 1960 this employment was 1,858.

Five Indian reservations and part of a sixth are located in Subarea 3B. The 1965 Indian population of nearly 25,000 in the six reservations represents nearly 15 percent of the total population of the subareas. The Indians own about the same percentage of the land area aggregating 5,124,000 acres. With only 35 percent of the Indian labor force having full-time employment and 75 percent of the Indian families on the reservations with incomes of less than $2,000 per year, the reservations' economies have a negative effect on overall averages of employment and income for Subarea 3B. Average family income in 1960 was $1,790, and it had increased to $2,025 by 1965. The fact that five of the reservations are located on or adjacent to the four main-stem reservoirs may have some favorable impact on the future economy of the Indians in the area which is now oriented almost entirely toward livestock grazing.

Eastern Dakota Subregion

The Eastern Dakota Subregion is located in North Dakota and South Dakota. The subregion is bordered on the north by the Souris and Red River Basins, on the west by the Upper Missouri and Western Dakota Subregions, on the south by the Platte-Niobrara and Middle Missouri Subregions, and on the east by the Middle Missouri Subregion and the Missouri Region boundary (figure 22). The western or upper portion of the subregion is characterized by rolling plains which become well-defined valleys and alluvial bottomland toward the southeastern or lower portion of the subregion. In addition to the four main-stem dams and reservoirs common to the boundary between the Western and Eastern Dakota Subregions, Lewis and Clark Lake (Gavins Point Dam) bounds the area to the south.

Climatic conditions vary throughout the subregion. Much of the area is semiarid. Precipitation usually ranges from 18 to 25 inches per year. Characteristic of the inland plains, great extremes of temperature occur, ranging from -40° F. to 115° F. There is also a wide variation in annual precipitation during the growing

Yankton Boat Basin, Lewis and Clark Lake, Eastern Dakota Subregion

season causing wide variation in crop production and farm income.

Roads are generally good throughout the area. Interstate highways 90 and 94 follow east-west routes through the subregion. Interstate 29 follows a north-south route in eastern South Dakota. Air and rail transportation is available with service to the larger cities in the area. Pipelines serve the larger communities and some of the smaller communities in the subregion. Commercial navigation on the Missouri River reaches to Sioux City, Iowa, adjacent to the southeastern tip of South Dakota.

Population in the subregion increased from 659,248 in 1940 to 662,431 in 1950, to 669,635 in 1960. Rural farm population decreased from 326,318 in 1940 to 222,086 by 1960. The Sioux Falls SMSA increased from 57,697 in 1940 to 86,575 in 1960. This is an average annual rate of 2.1 percent for the 20-year period. In addition to the Sioux Falls SMSA, there were 18 other urban places in 1960 with a combined population of 179,937. Per capita personal income increased from $716 in 1940 to $1,332 in 1960 in the subregion. (For additional details, see Statistical Supplement A, tables A-14 through A-17.)

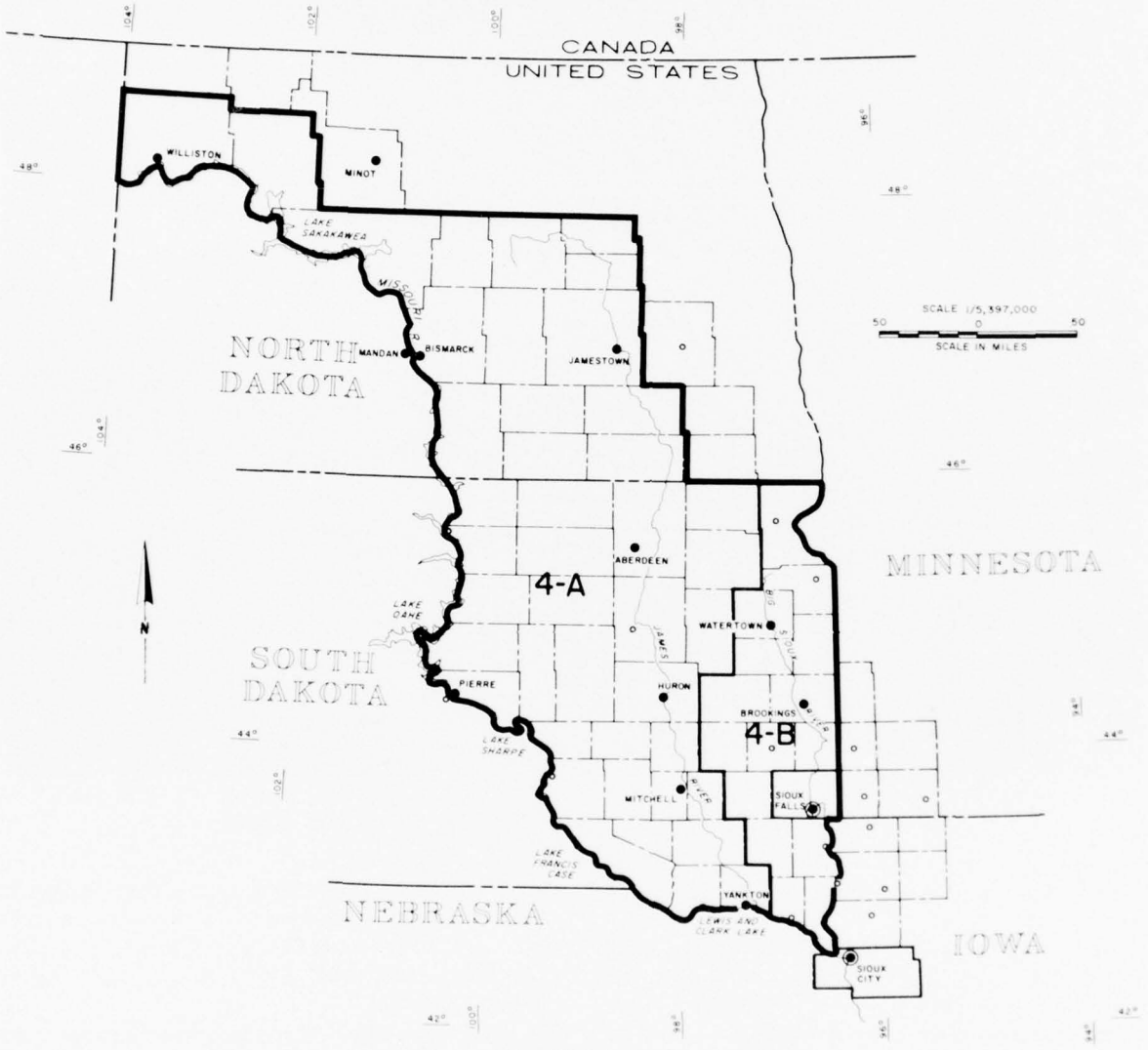
Total employment in the subregion increased from 209,639 in 1940 to 238,266 by 1960. Agricultural employment decreased from 108,106 in 1940 to 80,434 in 1960, while manufacturing and other commodity-producing employment increased from 14,248 to 29,725. Employment in noncommodity-producing industries increased from 87,285 in 1940 to about 128,107 by 1960. This is an increase of from 42 percent to 54 percent of total employment. Continuing urbanization, rising personal income, and expansion of service industries accounts for gains in the noncommodity-producing industries.

Of the slightly over 35 million acres of private agricultural lands in the area, about 60 percent is

FIGURE 22

EASTERN DAKOTA TRIBUTARIES SUBREGION

TRADE CENTERS AND SUBAREAS



LEGEND

- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC DATA
- SUBREGION BOUNDARY
- SUBAREA BOUNDARY
- POPULATED PLACES
- STANDARD METROPOLITAN STATISTICAL AREA
- 10,000 TO 49,999 POP. (1960)
- 2,500 TO 10,000 POP. (1960)
- PERENNIAL STREAMS
- LAKE OR RESERVOIR

cropland of which over 60,000 acres were irrigated in 1959. Wheat is the principal crop in the northern portion of this subregion while corn predominates in the southern portion. Other feed grains and alfalfa are raised throughout the area. Corn and alfalfa are principal crops on the irrigated land.

Fattening of livestock has become increasingly important in recent years in the South Dakota portion of the area and is spreading northward. Additional meat-packing plants have been developed in recent years. Some cattle are still being shipped out of the area to be fattened, but likewise, some pigs are shipped in to be fattened. Of the $503 million in cash receipts from farm marketings in 1959, $389 million, or 77 percent, was from the sale of livestock and livestock products and $114 million, or 23 percent, was from crop sales.

Total value of mineral production in the subregion amounted to $35.5 million (1957-59 constant dollars) in 1960. Total mining employment was about 1,300, almost equally divided between fuels and non-metallic minerals. Three-fifths of the value of production was from mineral fuels and of this 95 percent was from petroleum and natural gas. Construction minerals played an equally dominant part of the non-metallic mineral production.

Manufacturing employment increased from 8,431 in 1940 to 14,624 by 1960 in the subregion. The average annual growth rate of manufacturing employment was 2.8 percent from 1940 to 1960. Almost 60 percent of the manufacturing employment is in food products. In 1960, 38.5 percent of manufacturing employment was concentrated in the Sioux Falls SMSA.

The five large reservoirs formed by the dams on the Missouri River and smaller lakes in the eastern Dakotas are significant recreation and fishing resources. Wetlands and small lakes in the eastern Dakotas provide production and hunting areas for migratory waterfowl.

All or part of four Indian reservations are found in this subregion: Yankton, Crow Creek, and Sisseton in South Dakota, and part of Fort Berthold north and east of the Missouri River in North Dakota. The resident Indian population in 1965 was 6,355. Indians own about 400,000 acres of land, of which 72 percent is used for livestock grazing and most of the balance is dry farmed. The economy is oriented primarily to agriculture, principally livestock and dry farming. Undeveloped economic resources are tourism and irrigation. Only 16 percent of the labor force has permanent employment, 15 percent has temporary employment, and 69 percent is unemployed.

Platte-Niobrara Subregion

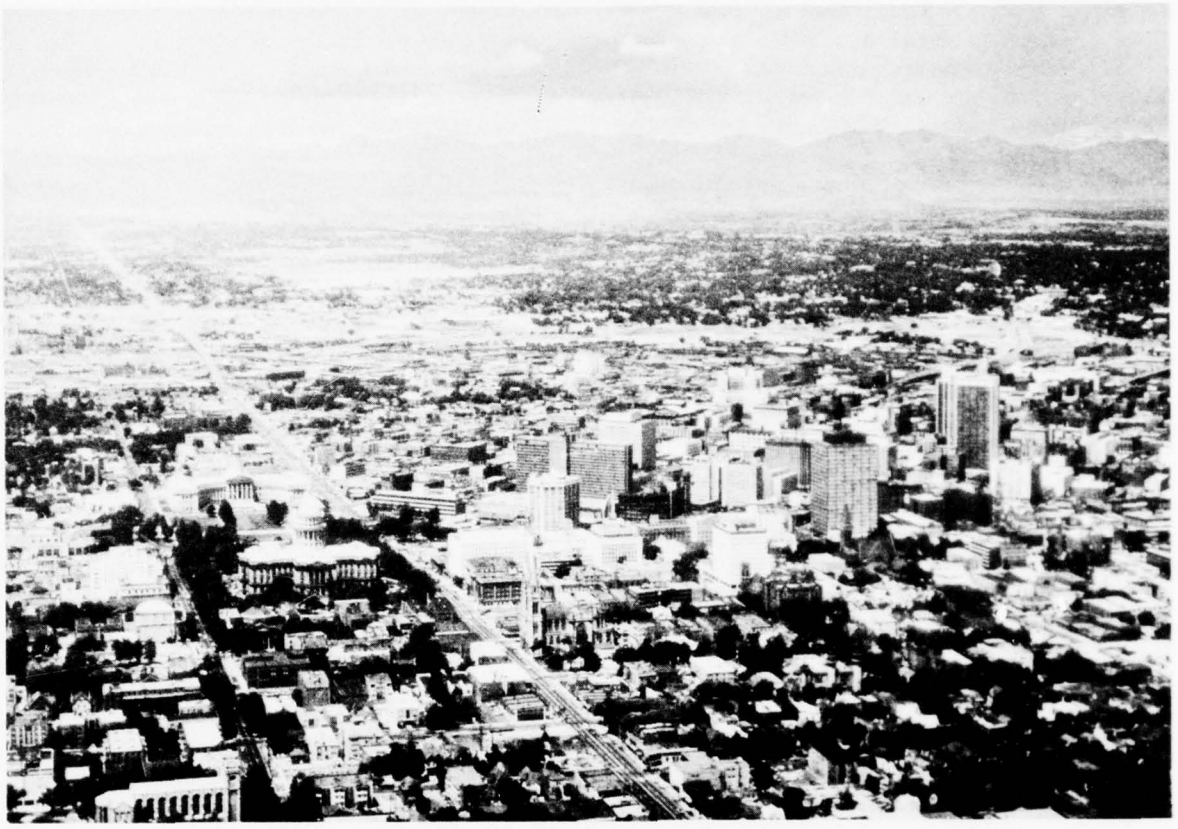
The Platte-Niobrara Subregion stretches from the Continental Divide (figure 23) in north-central Colorado and southeastern Wyoming to eastern Nebraska. Consequently, it extends from the semi-arid to the sub-humid zones, with average annual precipitation ranging from about 12 inches and wide annual variations in the high western plains to more than 25 inches in the lower plains area, and over 50 inches in isolated mountain areas. Several distinct physiographic provinces can be identified within the Platte-Niobrara Subregion, the Southern Rocky Mountains, Wyoming Basin, Great Plains, and Central Lowlands.

The principal transportation routes lie in an east-west direction along the Platte River and branch to the North and South Platte River Valleys in Wyoming and Colorado, respectively. They include Interstate Highway 80 and its connecting link to Denver. Interstate 25 is a north-south route in Wyoming and Colorado. Several railroads also serve the subregion in similar directions and principal air routes generally follow the same directional patterns. Pipelines serve principal cities in the area, but there is no commercial navigation.

Population in the subregion increased from 1,352,495 in 1940 to 1,559,170 in 1950, to 1,963,857 in 1960. The Denver SMSA, one of the fastest growing metropolitan areas in the Nation, is the dominant economic center. The population of Denver increased from 445,206 in 1940 to 929,383 in 1960. Other smaller urban centers — Casper and Cheyenne, Wyo., Fort Collins and Greeley, Colo., and Grand Island, Nebr. — also have shown significant growth rates. The Lincoln SMSA increased from 100,585 in 1940 to 155,272 in 1960.

For the subregion, employment increased from a 1940 level of 452,043 to a 1960 level of 757,229. Agricultural employment decreased from 129,703 in 1940 to 93,427 in 1960, while manufacturing and other commodity employment increased from 63,192 to 169,173. Employment in noncommodity-producing industries increased from 259,148 in 1940 to 494,629 in 1960. The gains in noncommodity-producing employment are indicative of the intensifying urbanization, rising personal income, and proliferation of service activities. (For additional details, see Statistical Supplement A, tables A-18 through A-27.)

The Platte-Niobrara Subregion has a diverse agricultural economy which includes livestock, cash grains, and specialty crops. New crops and advanced livestock breeding practices have been introduced, allowing for extensive increases in productivity. Wheat, corn, sugar beets, milk, beef, veal, and pork are the major agricultural products. About 18 percent of the subregion's cropland is irrigated. The value of farm products sold increased from $850.2 million in 1959 to $937.3 million in 1964. Sales of livestock and livestock products accounted for 74 percent of total receipts. Although livestock sales account for most of the farm income throughout the subregion, the dryland western portion is



Denver, Colorado, in the Platte-Niobrara Subregion, is Expected to Maintain a Rapid Growth

primarily range production with the cattle to be fattened elsewhere; whereas the irrigated and eastern portions of the region fatten the livestock for slaughter. The eastern portion of this subregion is in what is commonly referred to as the "corn belt area."

Commercial forest areas are mostly in the mountains in the western portion of the subregion. In 1962, the timber products output amounted to over 19 million cubic feet with an estimated value of $8.1 million. This is the value for mill-run, air-dry lumber in random lengths, widths, and thickness at the sawmill, and for pulpwood and industrial timber products at the railroad or landing.

The western portion of the subregion contains most of the mining activity. Total value of mineral production was $241 million in 1957-59 dollars. Mineral fuels account for 82 percent of total value of mineral production while non-metallic and metallic minerals account for 14 and 4 percent, respectively. About 6,900 people were employed in mineral production in 1961, 64 percent were in fuel production and two-thirds of the balance were associated with non-metallic minerals. Petroleum and natural gas accounted for almost 97 percent of the value of fuels produced. Construction minerals constituted almost all of the non-metallic mineral production. Recently iron ore and uranium contributed most of the metallic production.

Manufacturing employment has experienced more rapid growth in the subregion than nationally. This is due partly to the rapid growth and increasing dominance of the Denver SMSA. In 1960, about 66 percent of the subregion's manufacturing employment was centered on Denver while 34 percent was scattered throughout the remainder of the subregion. Of the 106,548 in manufacturing employment for 1960, over 20 percent was food products and 3 percent each in petroleum refining and chemical products manufacture.

Recreation and fish and wildlife industries are especially significant in the western portion of this subregion. Although most of the recreational activities take place in the summer vacation months, the winter sports, especially skiing, attract thousands of out-of-state winter sports enthusiasts.

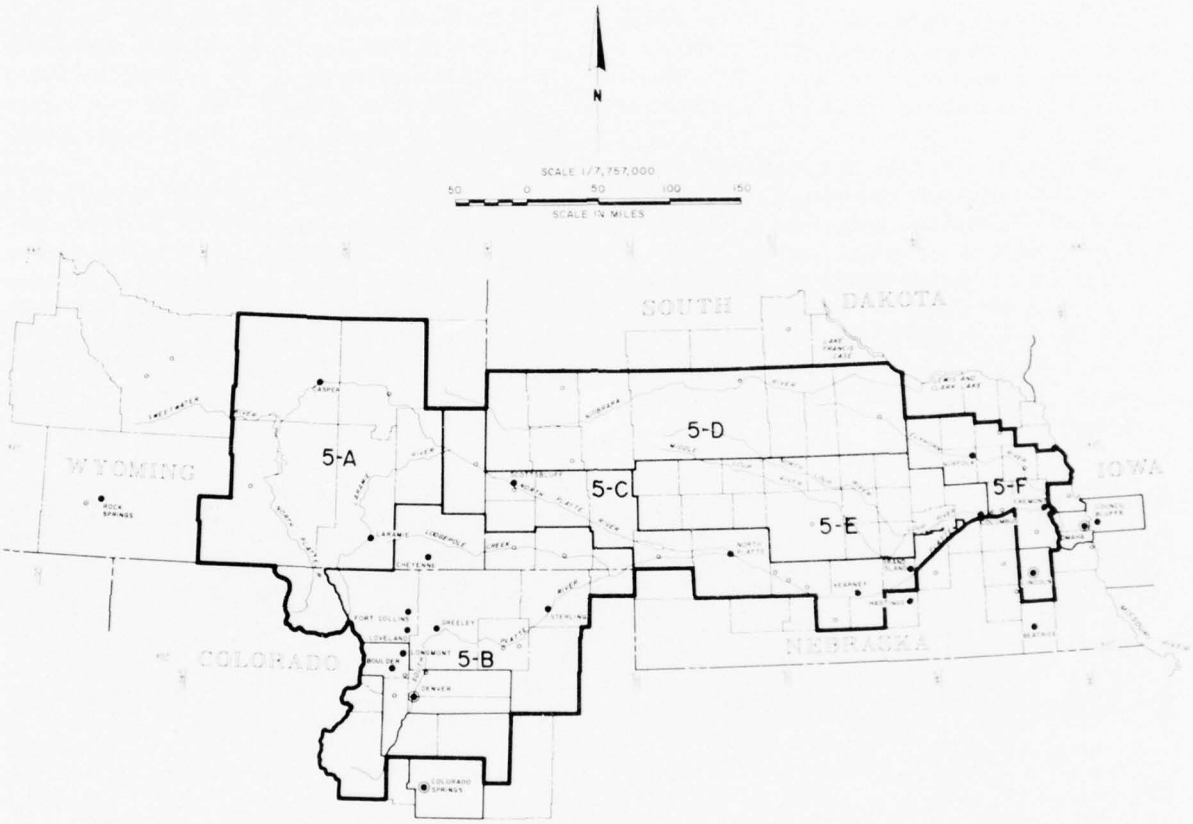
Middle Missouri Subregion

The Middle Missouri Subregion includes the tributaries and drainage areas to the Missouri River from Sioux City, Iowa, downstream to the Kansas City SMSA.

FIGURE 23

PLATTE-NIOBRARA RIVERS SUBREGION

TRADE CENTERS AND SUBAREAS



LEGEND

- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC DATA
- SUBREGION BOUNDARY
- SUBAREA BOUNDARY
- POPULATED PLACES
- STANDARD METROPOLITAN STATISTICAL AREA
- 10,000 TO 49,999 POP. (1960)
- 2,500 TO 10,000 POP. (1960)
- PERENNIAL STREAMS
- LAKE OR RESERVOIR

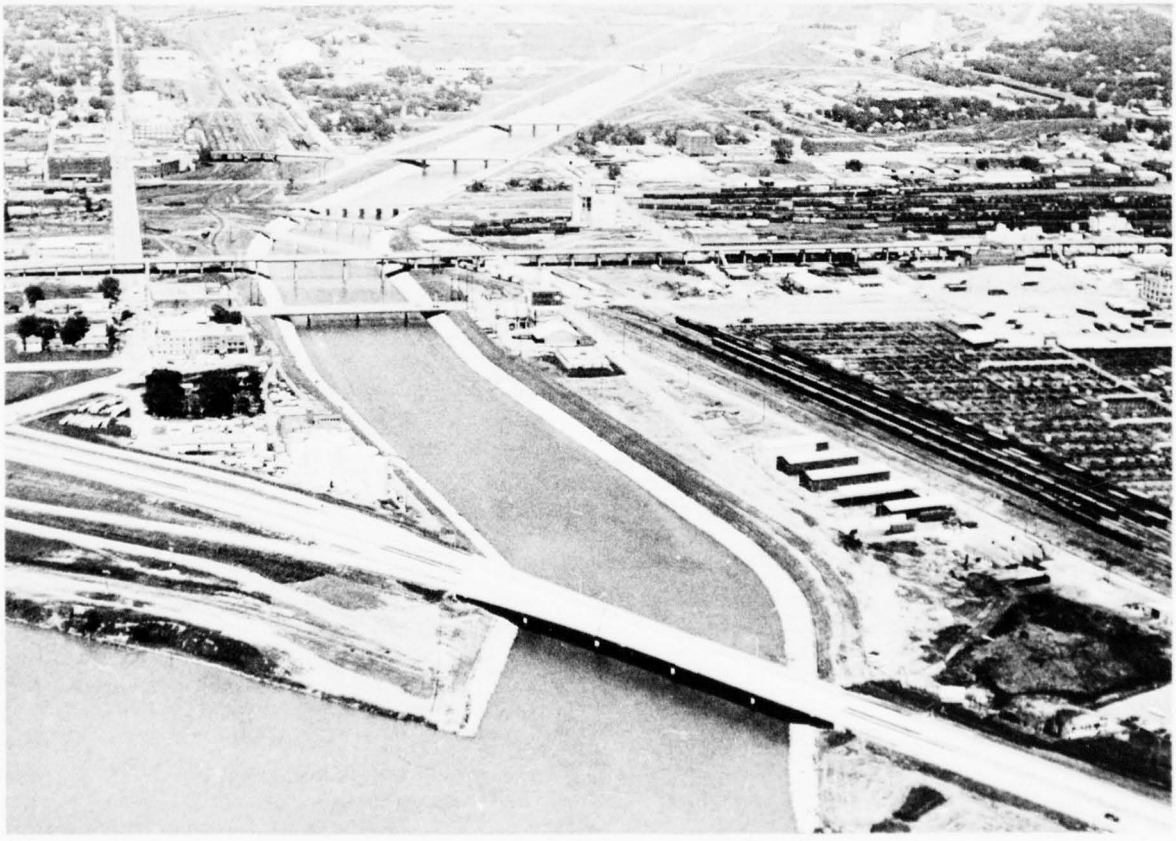
It is the central portion of the eastern border of the Missouri Region (figure 24).

Topography and climate of the Middle Missouri Subregion are relatively uniform throughout and show the least variation of any subregion within the Missouri Region. The variation in topography ranges from the broad, fertile flood plain of the Missouri River and the lower reaches of its principal tributaries to the bluffs bordering the flood plain to the steep to gently rolling uplands. Elevation ranges from 750 to 1,875 feet. Average annual precipitation varies from 25 inches in southwestern Minnesota to 34 inches at St. Joseph, Missouri. The average freeze-free period ranges from 150 to 200 days.

Transportation routes serve the subregion extensively. Three interstate highways traverse the area: Interstate 29 which extends from Kansas City to Sioux City, Ia., on the east side of the Missouri River; Interstate 80 follows an east-west route through Omaha and Lincoln, Nebr.; and Interstate 90 which runs east-west across southwestern Minnesota. Airlines, railroads, and pipelines also serve the subregion in both east-west and north-south directions. Navigation on the Missouri River extends from Sioux City to its mouth.

Population in the subregion decreased from 1,247,064 in 1940 to 1,242,428 in 1950, and then increased to 1,293,481 in 1960. Rural farm population declined from 424,837 in 1940 to 280,050 in 1960. Of the three Standard Metropolitan Statistical Areas, Omaha-Council Bluffs is the largest. Its population increased from 325,153 in 1940 to 457,873 in 1960. The Sioux City SMSA increased from 113,463 in 1940 to 120,017 in 1960. The St. Joseph SMSA decreased from 94,067 in 1940 to 90,581 in 1960. Per capita personal income in 1960 for the subregion was $1,830. Per capita income in 1960 for the three SMSA's ranged from about $100 to $400 above the subregion average. (See Statistical Supplement A, tables A-28 through A-32, for additional details.)

Total employment in the subregion increased from 416,760 in 1940 to about 483,000 by 1960. Agricultural employment decreased from 143,630 in 1940 to 92,929 in 1960, while manufacturing and other commodity-producing employment increased from 58,327 in 1940 to 104,988 in 1960. Employment in noncommodity-producing industries increased from 214,803 in 1940 to 285,082 in 1960. As stated previously for other subregions, continuing urbanization,

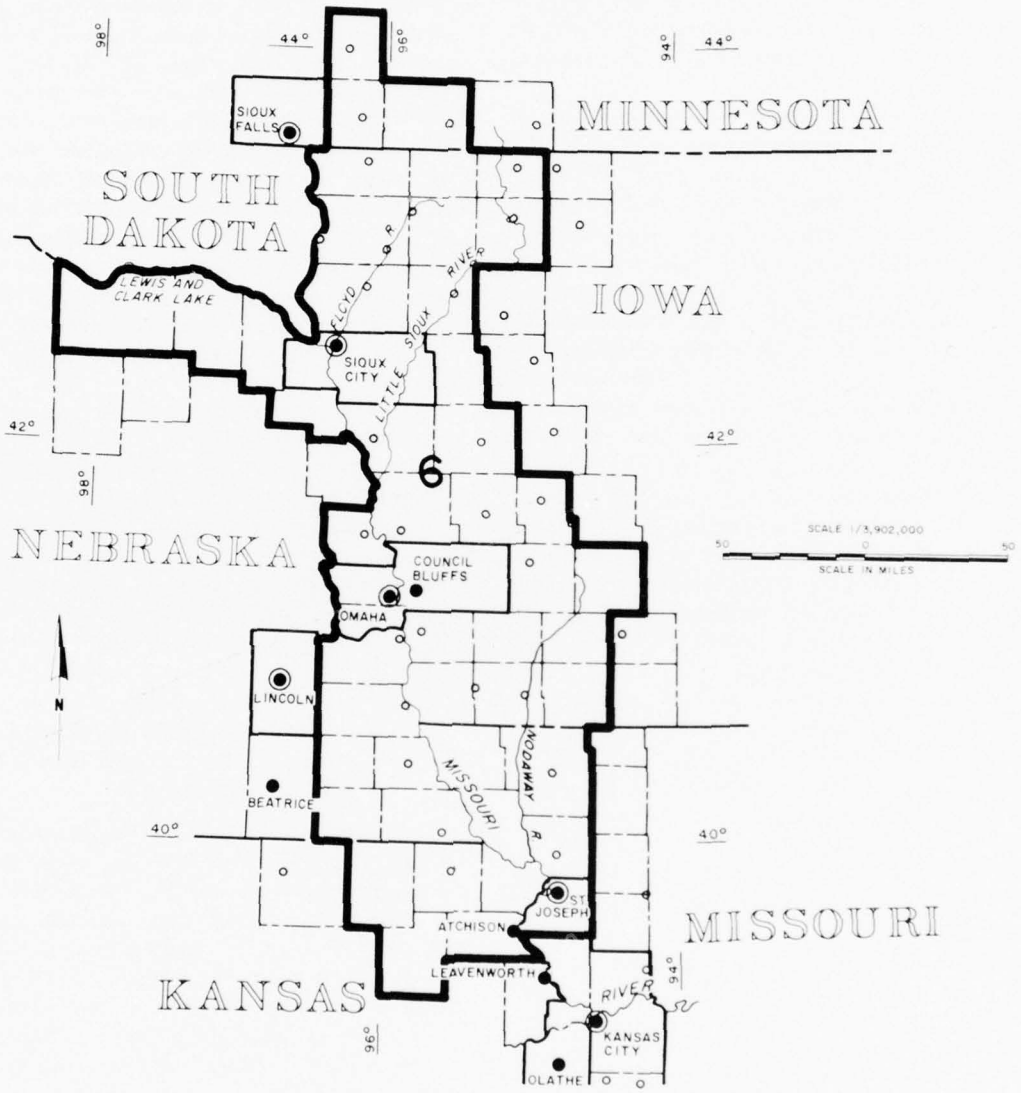


Flood Control Projects Protect Developed Areas. Floyd River at Sioux City, Iowa, Middle Missouri Subregion

FIGURE 24

MIDDLE MISSOURI RIVER TRIBUTARIES SUBREGION

TRADE CENTERS AND SUBAREAS



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- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC DATA SUBREGION BOUNDARY
- PERENNIAL STREAMS
- LAKE OR RESERVOIR
- POPULATED PLACES
- STANDARD METROPOLITAN STATISTICAL AREA
- 10,000 TO 49,999 POP. (1960)
- 2,500 TO 10,000 POP. (1960)

rising personal income, and expansion of service activities account for gains in noncommodity-producing industries.

Production of feed grains and the raising and fattening of livestock are predominant in the agricultural economy of the Middle Missouri Subregion. Much of the area is in what is commonly referred to as the "corn belt area". In 1959, about 78 percent of the $1,262 million value of farm products sold was derived from the sale of livestock and livestock products.

Productive commercial forests and woodlands, mostly of hardwood timber, extend along the flood plains and the streams and rivers of the subregion. The forested lands are in private ownership from which about 7 million cubic feet of timber, with an estimated products output value of $3.0 million was harvested in 1962. This is the value for the air-dry, mill-run lumber in random lengths, widths, and thickness at the sawmill and for pulpwood and industrial timber products at the railroad or yard.

Mineral production and its employment are generally limited to non-metallics and fairly well dispersed throughout the subregion. Construction minerals dominate both the employment and the value of production, the latter accounting for $28 million in 1960. The balance of mineral production is a small amount of petroleum production in the southern part of the subregion where active coal deposits also are found. About $468,000 in fuels were produced in 1960. Total employment in this sector was 800.

Manufacturing employment has grown relatively faster in the Missouri Region and in this subregion than it has in the Nation. The subregion's manufacturing employment amounted to 75,600 in 1960. Of these, a total of 56,400 employees, or about 75 percent, was centered in the three SMSA's with Omaha accounting for 49 percent. About 46 percent was engaged in food products manufacture and one-half of these associated with meat products.

Recreation and fish and wildlife industries in this subregion are not as significant in relation to total employment, personal income, and earnings as these industries are in the northern four subregions of the region. This area is deficient in basic recreation opportunities. However, there is a significant amount of latent demand which will be felt when additional opportunities are available.

Seven Indian reservations are located in this subregion: The Santee, Winnebago, Omaha, Iowa, Sac and Fox, Kickapoo, and Potowatomi. The resident population was 3,970 in 1965. Indians own about 91,000 acres of land of which 74 percent is dry farmed. Other than agricultural land the reservations offer little in the way of natural resources. Of the present labor force, 20 percent is permanently employed, 26 percent is temporarily employed, and 54 percent is unemployed.

Kansas Subregion

About 60 percent of the Kansas Subregion is in northern Kansas, 24 percent is in southern Nebraska, and 16 percent is in northeastern Colorado. The subregion is bordered by the Platte-Niobrara Subregion on the north and west, the Lower Missouri and Middle Missouri Subregions on the east, and the Missouri Region boundary on the south (figure 25). The western portion of the subregion is characterized by flat plains which become gently rolling hills in the eastern portion.

Climatic conditions vary throughout the subregion and much of the area is semiarid. Average annual precipitation usually ranges from 15 inches on the western edge to 36 inches on the eastern edge. Characteristic of the inland plains, great extremes of temperature occur, ranging from -38° F. to 120° F. The average freeze-free period ranges from about 140 days in the northwest corner to 185 days in the southeast corner.

Major transportation lines tend to run east and west in the subregion. Interstate 70 follows an east-west route through the subregion and airline, railroad, and pipeline service is also oriented in that direction.

Population in the subregion increased from 859,603 in 1940 to 861,768 in 1950, to 902,519 in 1960. The rural farm population decreased from 368,001 in 1940 to 204,427 in 1960. The Topeka SMSA grew from 91,247 in 1940 to 141,286 in 1960. This is an average annual rate of about 2.2 percent for the 20-year period. In addition to the Topeka SMSA, there were 30 urban places in 1960 with a combined population of 282,437. Per capita personal income increased from $733 in 1940 to $1,775 in 1960 in the subregion.

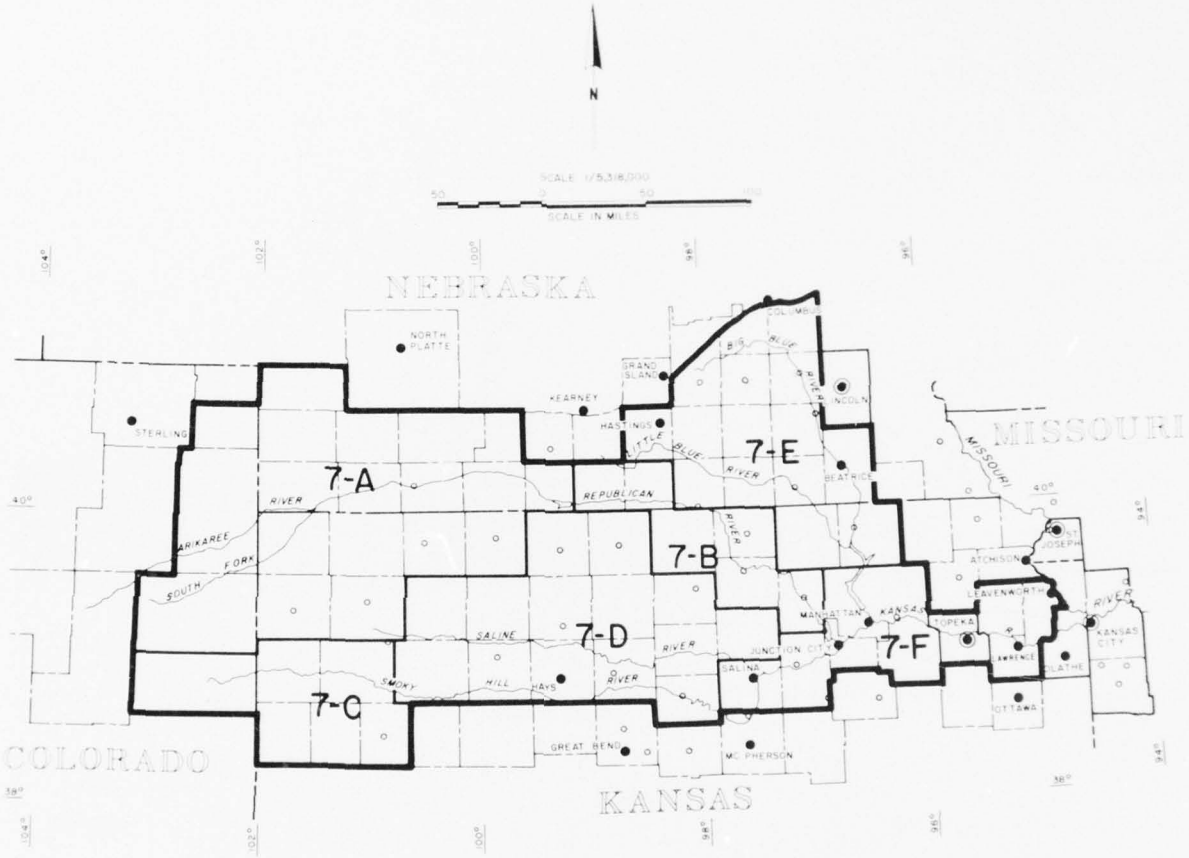
Total employment for the subregion increased from 276,983 in 1940 to 343,786 by 1960. Agricultural employment declined from 116,794 in 1940 to 74,047 in 1960, while manufacturing and other commodity-producing employment increased from 26,748 in 1940 to 48,446 in 1960. About 6,500 or 27 percent of manufacturing employment is in food products and 6 percent is in chemical products. Employment in noncommodity-producing industries increased from 133,711 in 1940 to 221,293 by 1960. Continuing urbanization, rising personal income, and expansion of service industries account for gains in the noncommodity-producing industries. (For additional details, see Statistical Supplement A, tables A-33 through A-40.)

Over 95 percent of the subregion area is used for agricultural purposes. About 22.3 million acres are cropland of which 1.6 million acres are irrigated. Pasture and range account for 13.6 million acres while the forest and woodland acreage is 620,000. The difference in topography and climate influence the general type of farming areas occurring in the subregion.

FIGURE 25

KANSAS RIVER SUBREGION

TRADE CENTERS AND SUBAREAS



LEGEND

- STATE OR NATIONAL BOUNDARY
- COUNTY BOUNDARY
- ECONOMIC DATA
- SUBREGION BOUNDARY
- SUBAREA BOUNDARY
- POPULATED PLACES
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- 10,000 TO 49,999 POP. (1960)
- 2,500 TO 10,000 POP. (1960)
- PERENNIAL STREAMS
- LAKE OR RESERVOIR

This subregion is part of the plains winter wheat and range region. About 60 percent of the area is cropland, of which about 1.7 million acres are irrigated. The principal dryland crop is winter wheat and the next largest acreage is summer fallow. The most important dryland feed grain is grain sorghum followed by corn for grain and barley. Alfalfa, sorghum forage, sorghum silage, and pasture are other important dryland crops. Corn for grain is the principal irrigated crop, followed by grain sorghum, alfalfa, and corn for silage. Two important cash crops on irrigated land are sugar beets and dry edible beans. Beef cattle and hogs are the principal livestock. Of the $729.2 million in cash receipts for farm marketings in 1959, $355.1 million, or 49 percent, was from crop sales and $374.1 million, or 51 percent, was from the sale of livestock and livestock products.

Large Grain Storage Facilities are Found in the Kansas Subregion

The eastern portion of the subregion has areas of commercial hardwood forests. Harvest of timber products in 1962 amounted to over 2 million cubic feet with a value of $1,640,000. Timber products output is expected to reach 7 million cubic feet in 2020.

In 1960 the total value of all mineral production in the subregion was $135 million (1957-59 constant dollars). Almost 90 percent of the total value of production was for mineral fuels, consisting of petroleum and natural gas. Total employment in this industry was about 5,800 in 1960, about 85 percent was in fuel production.

The recreation and fish and wildlife industries in this subregion are primarily to service local residents.

Lower Missouri Subregion

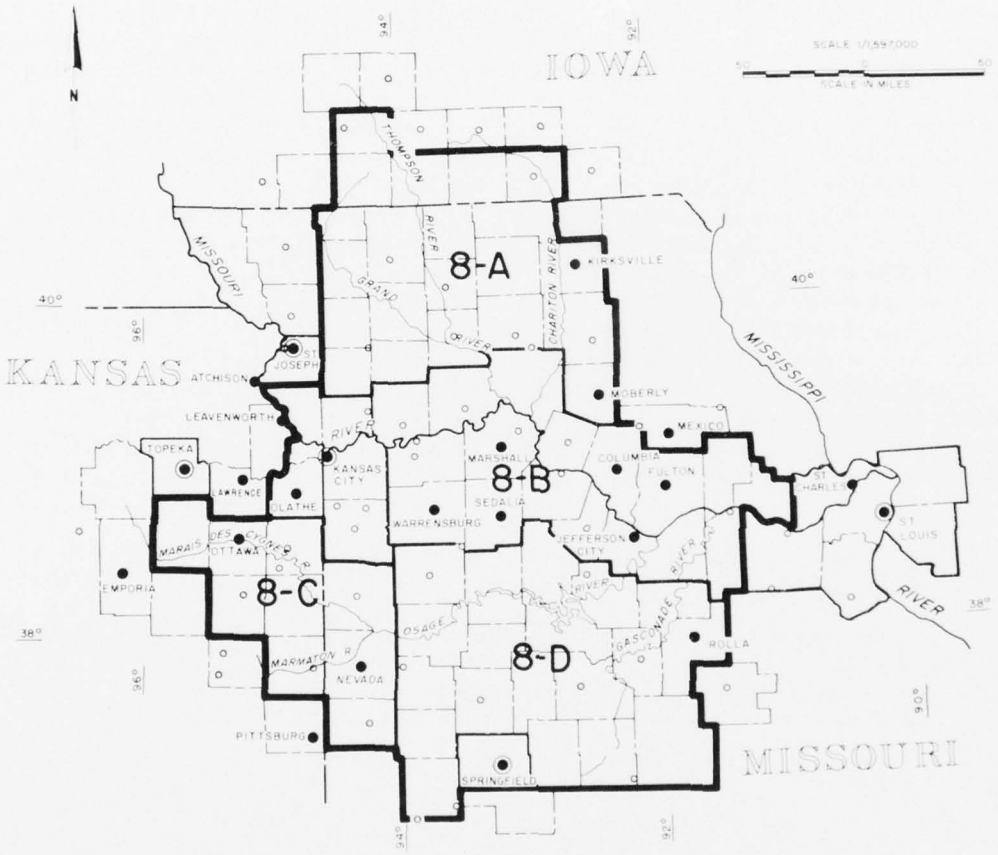
The Lower Missouri Subregion is situated in the southeasternmost part of the Missouri Region (see figure 26). Its annual average precipitation of about 35 inches at Kansas City and St. Louis is somewhat higher than other subregions. The average freeze-free period varies from 160 to 205 days in various portions of the subregion. The subregion contains the largest SMSA in the Missouri Region, Kansas City, situated at the western edge. The St. Louis SMSA is adjacent to the subregion to the east.

Topography in the subregion consists of three divisions. North of the Missouri River, the glacial till plains have been dissected to form a steep to gently rolling landscape. In the southwestern section (eastern Kansas and western Missouri) is an old eroded plain with

FIGURE 26

LOWER MISSOURI RIVER TRIBUTARIES SUBREGION

TRADE CENTERS AND SUBAREAS



LEGEND

STATE OR NATIONAL BOUNDARY

COUNTY BOUNDARY

ECONOMIC DATA

SUBREGION BOUNDARY

SUBAREA BOUNDARY

POPULATED PLACES

STANDARD METROPOLITAN STATISTICAL AREA

10,000 TO 49,999 POP. (1960)

2,500 TO 10,000 POP. (1960)

PERENNIAL STREAMS

LAKE OR RESERVOIR

entrenched main streams. To the east and south of the Missouri River are the Ozark Plateaus, which remain largely forested.

This portion of the region is better served by all modes of transportation than any of the other subregions. The most extensive utilization of navigation on the main stem is downstream from Kansas City to the mouth at St. Louis. Kansas City is the regional hub of many transcontinental and area air traffic routes. St. Louis provides air traffic access to the eastern portion of the subregion and Springfield, Mo., to the southern points. Highway routes, Federal, State, and local, form an integrated network to serve all portions of the subregion. When completed, Interstate 29 will serve the area north from Kansas City through Omaha, Nebr.; Interstate 35, north through Des Moines, Ia., and southwest through Wichita, Kan.; Interstate 70, east through Columbia and St. Louis, Mo., and west through Topeka, Kan.; and Interstate 44 will serve Springfield east through St. Louis and west through Tulsa and Oklahoma City, Okla. Kansas City remains the major railroad center of the southern portion of the Missouri Region. Main and branch lines serve the subregion and the surrounding area in a directional network similar to the highway routes. Crude petroleum products and natural gas pipelines serve the major cities of the subregion and traverse it to surrounding areas.

The census of 1940, 1950, and 1960 show the Lower Missouri Subregion contained about 28 percent of the total Missouri Region population. Total population in 1940 was 1,910,828, in 1950 it was 1,970,873, and in 1960 it was 2,233,493. Rural farm population in the Lower Missouri decreased from 648,758 in 1940 to 332,563 in 1960. Urban population increased from 875,934 in 1940 to 1,391,330 in 1960. Within the six-county Kansas City SMSA, the population in 1960 was 1,092,545, which represented about 49 percent of total population in the Lower Missouri Subregion. The population of St. Louis was nearly twice that of Kansas City in 1960 and ranked ninth among the Nation's metropolitan areas. Situated in middle Missouri, roughly halfway between Kansas City and St. Louis, are two smaller but rapidly growing cities — Columbia, the locale of the University of Missouri, and Jefferson City, the State capitol. Lying to the southeast of central Missouri on the southern edge of the Ozark Plateaus is the Springfield SMSA, the second most populated center in the Lower Missouri Subregion. Springfield experienced a growth of nearly 40 percent from 1940 to 1960, with a 1960 population of 126,276. Excluding the Kansas City and Springfield SMSA's, the Lower Missouri Subregion contained 44 urban communities in 1960. Of the total, 37 cities are in Missouri, five in eastern Kansas, and two in southern Iowa. The population of these 44 urban

Kansas City, Lower Missouri Subregion, Remains the Center of Economic Diversity in the Lower Basin

places totaled 330,491 in 1960 and accounted for 14.8 percent of the subregion's total population (or 23.8 percent of the urban population). They show an overall increase of over 26 percent from 1940 to 1960; however, that growth rate is substantially less than changes for the same period for Kansas City and Springfield.

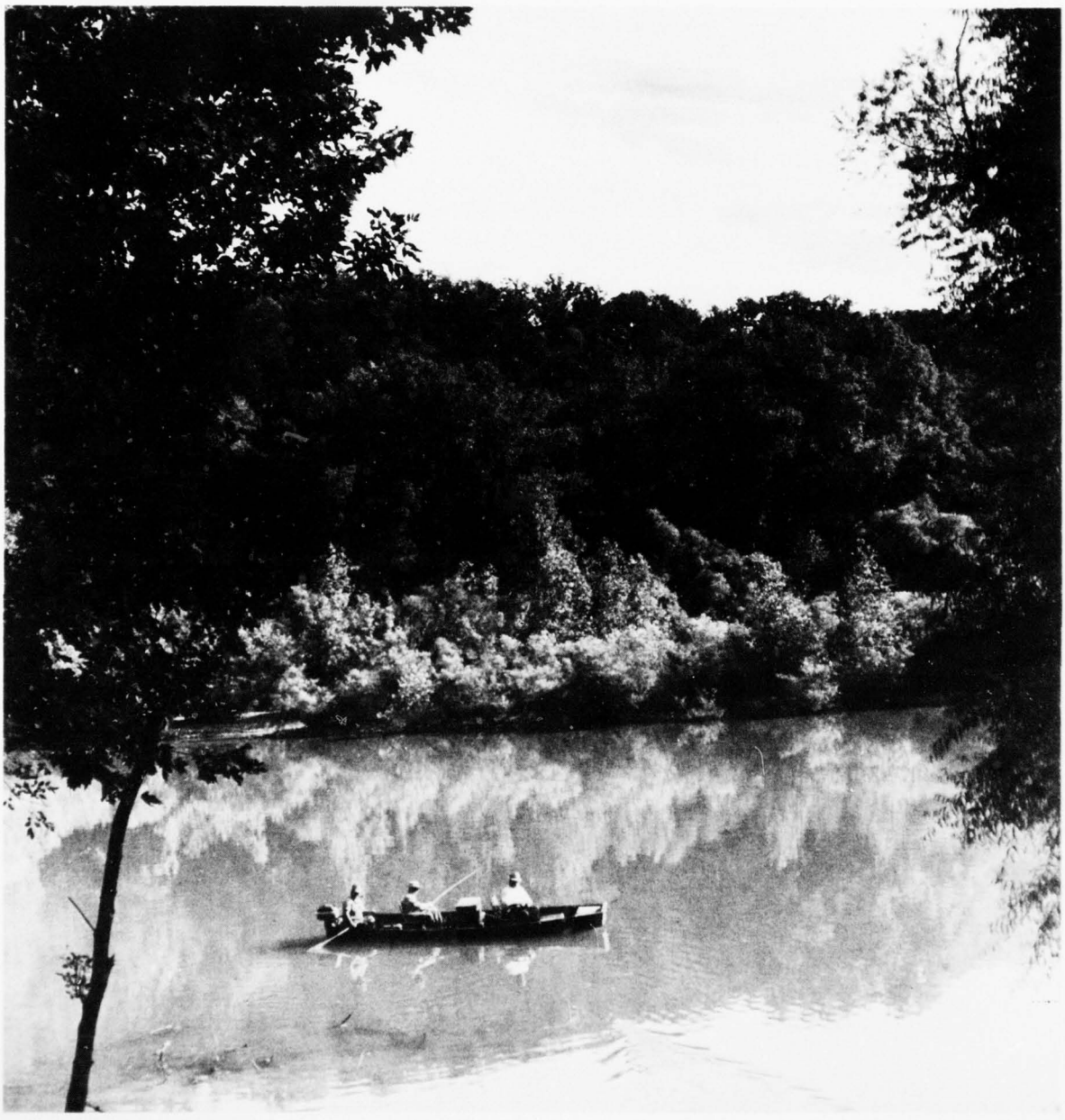
This phenomenon of higher growth rates in the larger urban centers and lower rates in the smaller ones, especially in the more densely settled regions of the country, is well known and arises largely from two forces. They are the more plentiful and attractive employment opportunities in the larger centers and the improved highways and greater use of automobiles which permit increasing numbers of people to reside in rural areas and to commute to the urban places of their employment. About 20 percent or 170,808 of the subregion's employed were in the manufacturing industries during 1960. One-sixth of the manufacturing employees were in the food products industry. Contract construction and mining represented about 3 percent of those employed, 11 percent in agriculture and 62 percent in noncommodity-producing industries. (For additional details, see Statistical Supplement A, tables A-41 through A-47.)

Most of the subregion is a part of the central feed grains, general farming, and livestock producing region, with the western tip being in the winter wheat and range areas. Nearly one-half of the area is cropland. Corn for grain is the principal crop followed by other tame hay, including alfalfa, winter wheat, and tame pasture. Other feed crops account for the balance of the dryland crop acreage except for small but significant acreages of fruits and nuts, commercial vegetables and commercial Irish potatoes. About 70 percent of the 5,000 acres of irrigated cropland is used to produce commercial vegetables. Dryland pasture, forest, and woodlands constitute most of the remaining dryland area. About one-half of the forest and woodlands is used for grazing purposes. Beef cattle, dairying, and hogs are the principal livestock enterprises. Livestock and livestock product sales accounted for 75 percent of the value of all farm products sold in 1959. Total sales amounted to $669.6 million in 1964.

Commercial forests occupy over 6 million acres in the Lower Missouri Subregion and over 90 percent is in private ownership. The timber products output in 1962 amounted to over 56 million cubic feet with an estimated value of about $26.3 million. This value is for mill-run, air-dry lumber in random lengths, widths, and thickness at the sawmill and for pulpwood, industrial, and other timber products at the railroad or yard.

Total value of mineral production was about $82.8 million for 1960 in 1957-59 dollars. Approximately 80 percent of the total value and 75 percent of the employees were in the production of non-metallic minerals, and the remainder was associated with the minerals fuels industry. Non-metallic minerals in this subregion are primarily those used by the construction industry — stone, sand, gravel, cement minerals, and clays. Coal demand is expected to rise to meet increasing demands for electric power generation. Petroleum output is very uncertain, depending upon technological developments in the production of "heavy oil" and the possibility of new petroleum discoveries. There is a future possibility of an iron ore industry becoming operable in the subregion.

Most of the recreation and fish and wildlife industries in this subregion are primarily to service the local population, although portions of the Ozark Plateaus do service a considerable number of non-resident recreationists.



Float-Fishing On The Gasconade River Is A Pleasant Experience

CHAPTER 4

PROJECTED ECONOMY OF THE REGION

This chapter contains projections of the Missouri Region economy for the years 1980, 2000, and 2020. Projections of population, employment, income, and earnings have been made for the region and the eight subregions, including the 26 subareas, and the 11 SMSA's for each of the 3 target years. Population projections for each of the 3 target years have been made for total, urban, rural, and farm components down to the subarea and SMSA level. Employment projections have been disaggregated to the four broad industrial groupings and for individual industries within these groupings. Projections have also been made for agricultural resources and requirements, timber resources, and mineral production. Historic and projected income, employment, and population data for the Missouri Region are contained in table 30.

While this chapter is concerned primarily with the projected economy, frequent references are made to historical data to give a point of reference in evaluating the projections. Chapter 5 assesses how the proposed water development plans may influence the projected economy since the projections have been made without constraint of the availability of water resources. For a detailed explanation, see Chapter 6, "Disaggregation and Projections Methodology," which contains an explanation of the national model and the regional disaggregation models.

Projections contained in this chapter are in no way predictions of the future economy of the region. Rather, they are extrapolations of historical trends. To the extent that historical trends and relationships between trends continue unchanged, the estimates contained in these projections represent the best approximation of the future course of events. The assumption implicit in these projections, therefore, is that the future will largely duplicate the past. This is both a naive and a *sensible approach. It is not logical* to accept the position that there will be no change taking place within the

Table 30 – INCOME, POPULATION, AND EMPLOYMENT – HISTORICAL AND PROJECTIONS
MISSOURI REGION

Item	1940	1950	1960	1980	2000	2020
Total Personal Income (Million)	6,270	11,144	14,381	32,400	69,400	151,425
Per Capita Personal Income[1]	926	1,578	1,813	3,106	4,838	7,549
Total Earnings (Million)	5,209	9,108	11,196	25,800	54,250	117,900
Earnings per Employee[1]	2,329	3,354	3,751	6,334	9,703	15,065
Population	6,771,980	7,063,441	7,931,103	10,433,000	14,345,000	20,060,000
Urban	2,711,869	3,473,088	4,555,954	7,035,200	10,475,600	15,452,800
Rural	4,060,111	3,590,353	3,375,149	3,397,800	3,869,400	4,607,200
Non-farm	1,588,044	1,643,215	1,903,246	2,444,900	3,101,300	3,910,600
Farm	2,472,067	1,947,138	1,471,903	952,900	768,100	696,600
Employment	2,236,199	2,715,484	2,984,633	4,073,000	5,591,000	7,826,000
Agriculture	791,905	740,587	512,246	336,000	272,000	249,000
Manufacturing	189,678	287,719	410,634	652,000	879,000	1,202,000
Petroleum Refining	6,651	9,921	10,902	13,000	14,000	16,000
Paper and Allied Products	3,584	5,378	9,150	12,000	19,000	30,000
Primary Metals	5,452	13,251	12,367	14,000	15,000	17,000
Chemical Products	6,475	10,168	16,102	29,000	49,000	80,000
Food Products	66,995	88,177	106,768	117,000	143,000	151,000
Textile Mill Products	1,000	1,828	1,545	[2]	[2]	[2]
Other Commodity-producing Industries	120,458	202,829	215,905	306,000	416,000	578,000
Noncommodity-producing Industries	1,134,158	1,484,349	1,845,848	2,779,000	4,024,000	5,797,000

[1]Per capita income and earnings per employee computed from unrounded data (1954 dollars).
[2]Not available or not projected.

region over the next 50 to 60 years. Yet, it is likewise unreasonable to attempt to build into the projection framework the changes that will almost certainly take place about which there is no advanced knowledge. It is possible to modify or adjust projected trends based upon more recent knowledge of change or upon knowledge of impending changes likely to take place, but this is all. A reasonable assumption regarding the trend of any future economic activity is an average rate of growth based upon past performance.

Whatever subregional or regional analysis is used to scrutinize the Missouri Region there are probably a number of natural or manmade conditions that are difficult to quantify regarding their influence on future conditions in the area. A number of real and psychological restraints have shaped the economic and social development of the Missouri Region. The problems these restraints have placed on development are not unique to this area, however, because of environment and history, but perhaps the mix in the area is somewhat unique. The projections of future population, employment, earnings and income reflect these restraints as they have affected the historic development of the region. The water and related land resources development plan resulting from this study will influence changes in the projections as discussed in the following chapter. Other factors have had considerable influence on past experience and could affect projections, especially if they were changed or eliminated.

The natural environment of the Missouri Region has been an important restraint on the development of the area. The climate, particularly the sparsity and erratic nature of precipitation, has greatly influenced the economy and the geographic distribution of human settlement. Access to transportation and consequently to markets probably had a greater influence on the settlement of most other portions of the Nation. Here, climate has influenced the development of agriculture and economy of the region has remained heavily dependent on this sector of the economy. The products of the agricultural economy – crops, livestock, and forest – can be transported to the market place, as can the mineral resources. Outdoor recreation and fish and wildlife, dependent on the development of water and related land resources, cannot be exported; therefore, they have been slow to develop where they are remote from existing markets. Because of the erratic nature and poor geographic distribution of precipitation, irrigation is being more widely introduced, even in the eastern and more humid areas of the region, so crops can be diversified and yields can be improved as well as assured through the application of water in proper amounts and at the correct time. Reservoirs developed to supply water for irrigation in some places have aided in the development of recreation and fish and wildlife. Land treatment measures, forest management, desalinization, and weather modification are among other considerations that may play important roles in future production capabilities, and distribution of population in the Missouri Region.

Several events in history have had lasting effects on the development of the area, many of them adverse. Uneconomic agricultural units had their beginnings in the Homestead Act and with the land grants to railroads in the region, and the limited irrigation development associated with Federal projects may be perpetuating this situation in certain instances or areas of the region. The dispersion of farm population has had and continues to have a strong influence on rural nonfarm institutions. Small towns originally established to serve the local agricultural economy no longer have such a purpose with large farms and fast transportation; thus many of the towns are stagnant because few job opportunities are available. Perhaps one of the reasons that some of these communities are able to continue is that the costs of services are relatively low only because associated earnings are low, due in part to the lack of competition for jobs. On the other hand the cost of goods remains high because the distance from major markets or sources of supply is great and the volume of sales is low. Certain amenities associated with small cities and towns counter the low earnings. In some occasional instances these communities are attracting small manufacturing firms where the costs of transporting the finished goods to market are more than offset by other savings including lower employee earnings. Often these opportunities fail or fail to materialize due to the lack of financing or the inability to obtain managerial or skilled personnel because of their (or their wives') reluctance to move to "inaccessible" locations. Past and current concentrations of urban population in the Missouri Region are in the SMSA's which are located near the eastern and western peripheries of the region. The availability and low cost of water and outdoor recreation may at some future date become a growth stimulant for the nonmetropolitan areas of the region.

The political structure of the region was established when the farms were more numerous and population was more equally distributed geographically. As the population becomes more urban oriented, changes are lagging in some of the political alinements. Many aspects of governmental organization have been slow to change from the once agrarian dominated economy with more rural population distributed more widely. Only relatively recently has the rural dominance of the legislature begun to change to the one-man-one-vote concept of representation. On the local level the reduction of rural farm population and other factors has led to the restructuring of school districts to more centrally located and optimum size units. The local pride felt for schools, churches and other social institutions, especially in rural areas, has often resulted in retention of these institutions

long after they are functionally obsolete or financially destitute. The current attention given to regional health care, or water development districts and regional planning are examples of changing concepts. Possibly the next time-honored institution which was founded in the days of denser rural population, poor communications, and poor transportation that might become the target for reorganization and consolidation will be the county government. In 1960 almost 52 percent of the 425 counties in the Missouri Region had less than 10,000 population, 23 percent had less than 5,000 population, and only about 13 percent was above 25,000.

Some of the nonmetropolitan areas of the region, if they are growing at all, are not able to grow at their natural rate. This is due partly to the occurrence of deaths over births but primarily to the lack of local job opportunities. Some of the principal fields of employment are agriculture, construction, and to a much lesser extent service employment associated with the vacation and recreation industries. These industries are not only highly dependent on the day-to-day weather, but even under the best weather conditions are subject to extreme seasonal variations. Many of these jobs are in their greatest abundance during the summer when the work force is at its seasonal peak, with high school and college students available. But, there are from three to six months during the winter when these employment opportunities are at their annual low, and these tend to be the months when living expenses are relatively high. Undoubtedly these circumstances lead to a high degree of underemployment and unemployment, inducing migration of the younger members of the work force out of the region. Migration itself increases the proportion of older citizens who have demands for specific social and public services and the burden of the associated costs go to a smaller segment of population. The high investment and operating costs associated with agriculture and many other businesses greatly reduce the number of younger people who are interested or able to become owners and/or operators. Those younger people who remain have a great need for social services such as schools, but like the older people they have a limited ability to pay. The middle aged and established generation can best afford the costs of social services, but seem to have the least need. An increase in absentee ownership may also introduce some people who are affluent and others who were forced off the farms, where neither group is interested in financing local social services and institutions.

Not only has the need for certain social institutions and the methods of financing these same institutions become an increasing concern for the public administrator, but the demands in the Missouri Region are further complicated by some concentrations of ethnic groups which have not been diluted by immigrations. As a result these groups arranged geographically have different social concerns and values for such social institutions as the aged, welfare, morality, etc. and their methods of obtaining and/or providing these services often differ from legislated procedures. Their kinship, religious, language, and other cultural ties are often perpetuated.

Some of the agricultural products of the Missouri Region have definite problems in the marketplace and also for the producers. In general since 1940 the region produced an abundance of agricultural crops and livestock products. Part of this is due to the erratic nature of the precipitation, some is due to the rapid advancements of technology, and to a certain extent to over capacity. Even though there are fewer farms as the years go by, there are still a large number of producers and it is difficult for them to control their collective production in response to the market and prices. The closing of obsolete meat-packing facilities closer to the eastern market and the use of more flexible transportation has led to the establishment of meat-packing plants and slaughter facilities nearer the source of supply. In recent years local livestock auction markets have changed the complexion of marketing range and feeder cattle. At the same time, range management capabilities have increased the productivity of the range and hay country, and the fattening of cattle has expanded north and west into the periphery of the range country.

Forest production is presently going through a period of uncertainty with respect to meeting future demands, and several matters have to come to satisfactory decisions before the objectives may be realized. Public and private forest lands are being managed in different ways to satisfy different purposes. Associated with these management practices are different harvesting procedures which range from clear cutting and strip cutting to selective cutting and thinning operations, both under somewhat difficult operating conditions. Whether it will be possible to meet optimum management objectives will depend not only on how much the products will command in the marketplace, but on how much can be contributed for complementary forest management objectives such as recreation, wildlife, range management, soil conservation, water management, and other uses.

Problems inherent in the development of the Indian economy were discussed in the previous chapter. The Indian people are aware of these problems as demonstrated through the activities of their leaders in housing, community development, etc. They are attempting to resolve their problems so the development of the Indian segment of the region economy will be comparable to the projections for the region.

POPULATION PROJECTIONS

Comparison of Missouri Region and National Projections

The purpose of this section is to compare projected trends in population in the Missouri Region with those of the Nation. Because projections at the national level (table 31) are more broadly based and more reliable and valid than at the regional level, a comparison between the region and the Nation may show weaknesses or inconsistencies in the regional projections.

Total population within the region (table 32) has grown less rapidly than population growth nationally. Between 1940 and 1960, population in the United States increased from 131,954,000 to 176,291,000, or 33.6 percent. As shown by table 32, for the same period population in the Missouri Region increased from 6,771,980 to 7,931,100. The rate of growth for the region was about 17.1 percent, or approximately one-half the national rate of growth. Consequently, the region's share of total population dropped from 5.1 percent in 1940 to 4.7 percent in 1950 and to 4.5 percent in 1960. As discussed in earlier chapters, the primary explanation for the relatively slow growth rate of population historically in the region has been due to the relative dominance of agriculture within the region's economy. Because the agricultural employment has been declining historically and population within the rural economy has likewise been declining, agriculture is relatively more important in the region than in the Nation.

The historical situation within the region is reflected in the population projections made through 2020. While the region does improve its position relative to the Nation during the projection period, it does not exceed national rates of growth until after the year 2000. By 1980, national population is projected to reach

Urban Population in the Missouri River Region is Projected to Expand Almost 3.4 Times by 2020.

Table 31 – POPULATION AND EMPLOYMENT, UNITED STATES HISTORICAL AND PROJECTIONS

Item	1940	1950	1960	1980	2000	2020
			(Thousand)			
Population	131,954	151,234	176,291	243,900	336,800	467,700
Employment	45,376[1]	57,475	66,373	94,800	130,600	181,200
Agriculture	8,670	7,148	4,528	2,500	1,900	1,750
Manufacturing	10,755	14,818	18,229	24,800	31,300	40,400
Other Commodity	3,033	4,453	4,653	6,650	9,100	12,800
Noncommodity	22,917	31,056	38,963	60,850	88,300	126,250
Employment as Percent of Population	34.39	38.00	37.65	38.87	38.78	38.74

[1] Totals may not add due to rounding.

Table 32 – POPULATION AND EMPLOYMENT, MISSOURI REGION – HISTORICAL AND PROJECTIONS

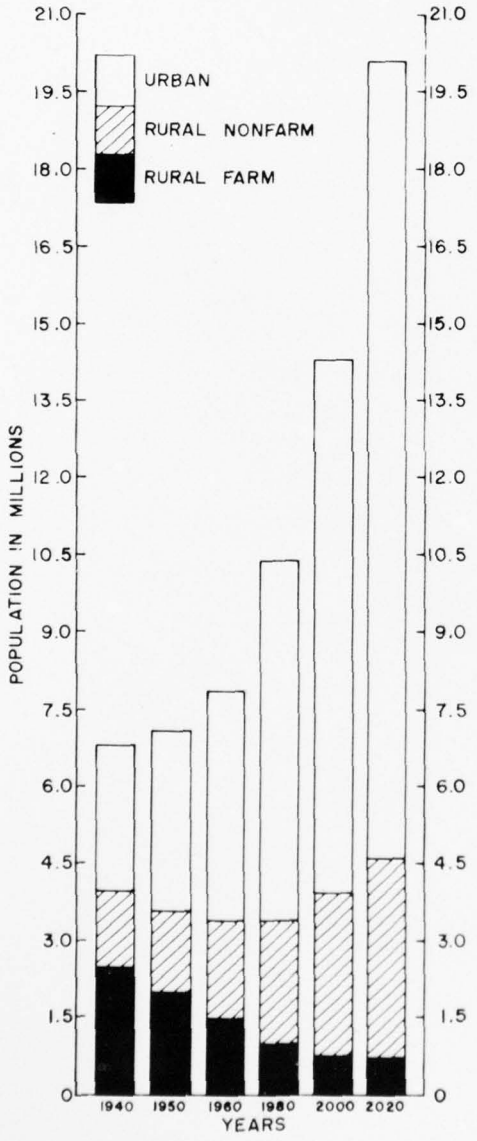
Item	1940	1950	1960	1980	2000	2020
			(Thousand)			
Population	6,772	7,063	7,931	10,433	14,345	20,060
Employment	2,236[1]	2,716	2,985	4,074	5,591	7,826
Agriculture	792	741	512	336	272	249
Manufacturing	190	288	411	652	879	1,202
Other Commodity	120	203	216	306	416	578
Noncommodity	1,134	1,484	1,846	2,779	4,024	5,797
Employment as Percent of Population	33.02	38.43	37.64	39.05	39.00	39.01

[1] Totals may not add due to rounding.

243,900,000, or a 38.3 percent increase over 1960.[1] By the year 2000, national population is projected to reach 336,800,000, or a 38.1 percent increase over 1980. By the year 2020, population is projected to reach 467,700,000, or a 38.9 percent increase for the 20-year period.

FIGURE 27

RURAL FARM, RURAL NONFARM AND URBAN POPULATION, MISSOURI RIVER REGION 1940, 1950, 1960 AND PROJECTIONS FOR 1980, 2000 AND 2020



[1] The population projections in this appendix are based on "Series B" of the Census Bureau.

For the Missouri Region, the population is projected to reach 10,433,000 by 1980, or a 31.5 percent increase over 1960. The rate of increase rises to 37.4 percent between 1980 and 2000, for a projected population level of 14,345,000. Between 2000 and 2020, population is projected to increase at a rate of 39.8 percent, to reach a total of 20,060,000 (figure 27). Based on these rates of change, the region would maintain slightly over 4 percent of the Nation's population during the projection period.

Subregion and Subarea Projections

Historically, population has been concentrated in the southern one-half, primarily in the Platte-Niobrara, Middle Missouri, Kansas, and Lower Missouri subregions (figure 28). These four subregions accounted for about 80 percent of the total regional population in 1960 and their aggregate share is projected to increase to about 84 percent of the total population by 2020. The most rapid growth is projected for the Platte-Niobrara Subregion, largely because of the rapid growth rate historically in the Denver SMSA. From a population of 2.0 million in 1960, this subregion has been projected to reach 6.9 million by 2020. At this level, its share of the total region population would expand from 24.8 to 34.6 percent. Although all of the remaining subregions are projected to gain in population by 2020, only two maintain their historic share. The Lower Missouri Subregion is projected to maintain about 28 percent of the region population in 2020. In absolute terms, it is projected to increase from 2.2 million to 5.7 million, or 156.6 percent above that of 1960. The Middle Missouri Subregion is projected to grow from 1.3 million in 1960 to 2.4 million by 2020. Its share of the region's population decreases from 16.3 to 12.1 percent by 2020. The Kansas Subregion, like the Middle Missouri, is projected to nearly double its population between 1960 and 2020 while its share of the region's total declines from 11.4 percent in 1960 to 8.7 percent by 2020. The other area maintaining its share of the region's population during projection is the Yellowstone Subregion. Population in this subregion in 1960 was 270,382 and is projected to increase to 690,000 by 2020, although its share of the region's population remains at about 3.4 percent. While the three remaining subregions—the Upper Missouri, the Western Dakota, and the Eastern Dakota—are projected to double their population from 1960 to 2020, their respective share of the region's total population declines.

The changing distribution of urban and rural population of the eight subregions for 1960 and the 3 years projected, 1980, 2000, and 2020, is shown in figure 29. Rural farm population is projected to decline in the region from 1,471,903 in 1960 to 696,600 by 2020. In all of the eight subregions, about the same rate of farm

FIGURE 28

MISSOURI RIVER REGION TOTAL AND SUBREGION SHARES OF POPULATION, 1940, 1950, 1960 AND PROJECTIONS FOR 1980, 2000 AND 2020

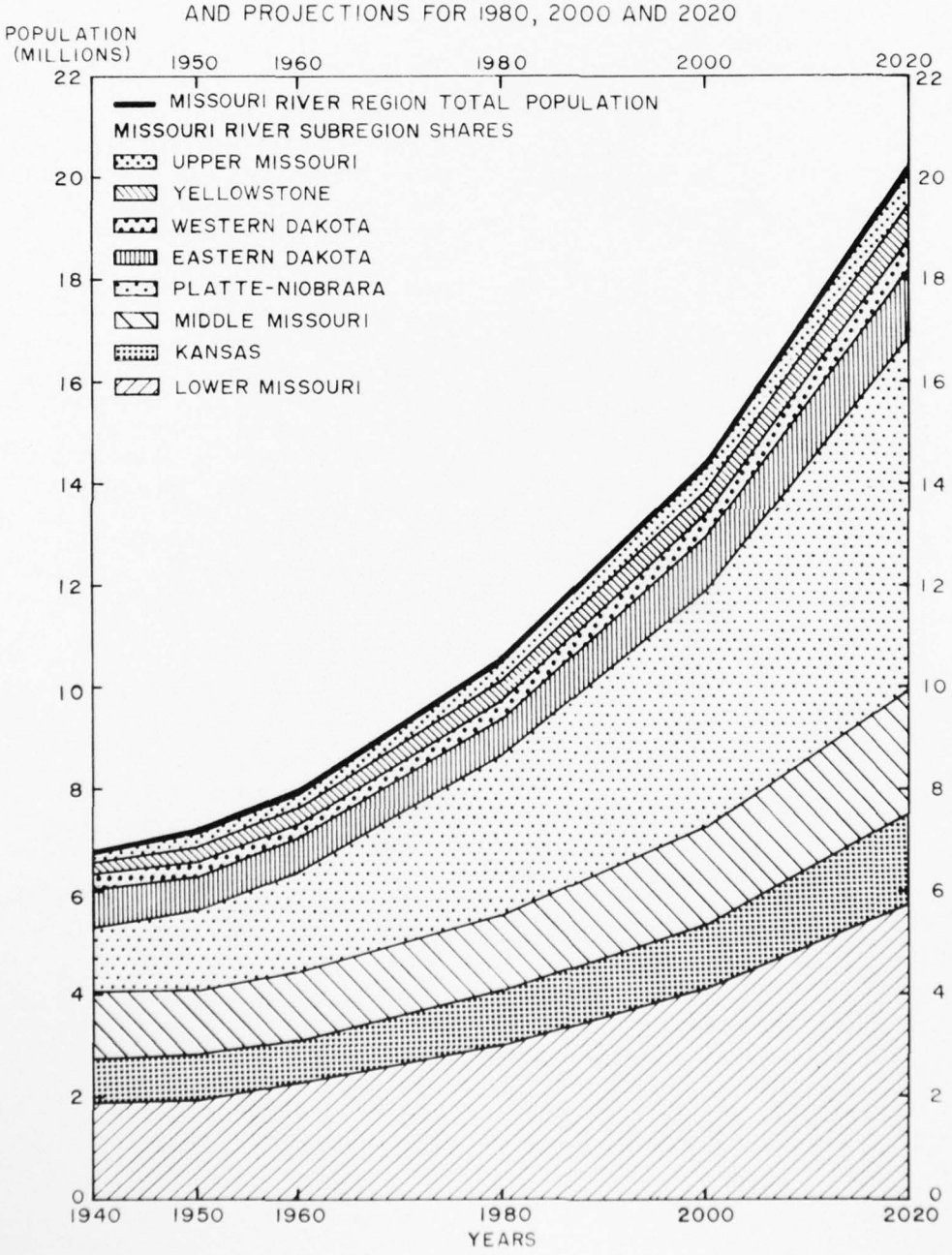
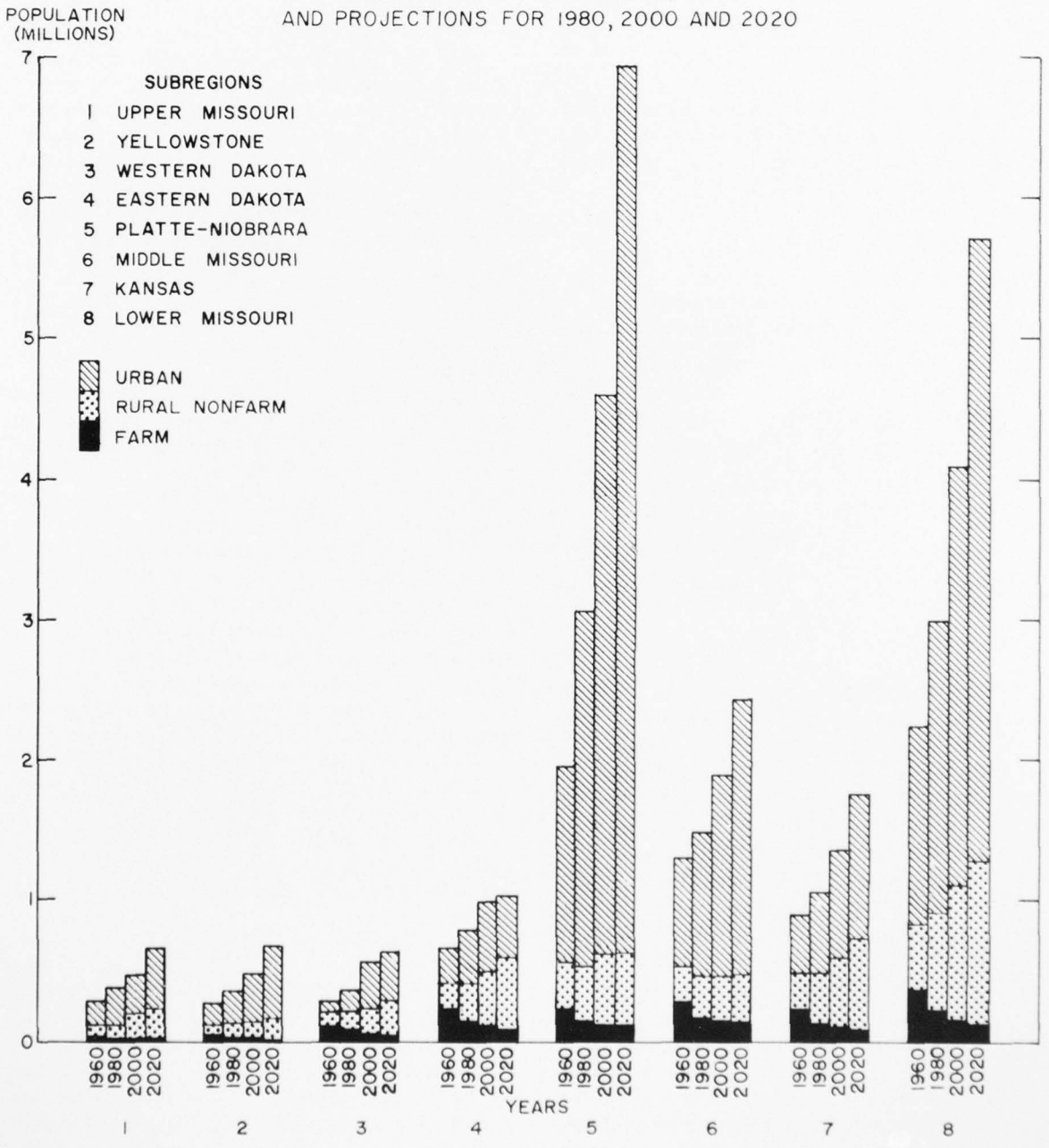


FIGURE 29

URBAN AND RURAL POPULATION
MISSOURI RIVER SUBREGIONS, 1960
AND PROJECTIONS FOR 1980, 2000 AND 2020



population loss during the next 60 years is projected. Where farm population represents a greater proportion of the total subregion population, such as in the Upper Missouri and the Western Dakota subregions, total population is projected to grow at a lesser rate. Or, stated somewhat differently, total population growth depends on the relative proportion of the urban population. For example, the Platte-Niobrara Subregion, dominated by the Denver SMSA, and the Lower Missouri Subregion, dominated by the Kansas City SMSA, had the greatest urban concentrations in 1960 and are projected to increase most rapidly of all subregions in the region.

The number of rural farm people projected for each subregion is shown in table 33. These projections were developed from the projections of farm workers and projected worker-population ratios.

Table 33 – RURAL FARM POPULATION, BY SUBREGION, 1960 AND PROJECTIONS

Subregion	1960	1980	2000	2020
	(Thousand)			
Upper Missouri	56.4	33.0	29.0	26.0
Yellowstone	48.2	31.9	26.5	24.8
Western Dakota	86.9	57.1	45.1	40.2
Eastern Dakota	222.1	150.0	120.0	107.0
Platte-Niobrara	241.4	155.6	134.3	129.4
Middle Missouri	280.1	184.2	156.7	147.3
Kansas	204.4	136.0	107.0	95.0
Lower Missouri	332.6	205.1	149.5	126.9
Missouri Region	1,472.1	952.9	768.1	696.6

These data show rather substantial declines in the rural farm population component. They also represent declines in the rural farm population component as a percentage of total population in each subregion. By 2020, rural farm population in the Platte-Niobrara Subregion is projected to be about 1.9 percent of the total population, whereas in 1960 it was 12.3 percent.

Of all subregions, the Eastern Dakota had the largest proportion of its total population living on farms in 1960, nearly one-third. By 2020, this share is projected to decline to about 8 percent, but the share is still the largest of all subregions.

Expansion of rural nonfarm population during the projection period is continued for the more densely populated subregions. This is because of the assumption of continued location of rural nonfarm population within the metropolitan urban areas. With continued advancements in transportation, commuting distances will be no deterrent to the growth of rural nonfarm homes in close proximity to urban areas.

EMPLOYMENT

Figure 30 shows the historic and projected distribution of employment in the four major divisions for the Nation and the region.

Agricultural Employment

While agricultural employment is projected to decline relatively, both in the region and nationally, the region's share of total national agricultural employment is projected to increase throughout the projection period. Increased productivity per farm worker will be of such magnitude as to release farm labor for other pursuits. By 2020 total agricultural employment in the region is projected to be roughly one-half of its 1960 level. Nationally, employment in agriculture is projected to be slightly over one-third of its 1960 level by 2020. The relative share of agricultural employment in the region is thus projected to increase from 11.3 percent in 1960 to 14.2 percent by 2020.

As a point of reference, agricultural employment as a percent of total employment nationally declined from 19.1 percent in 1940 to 6.8 percent in 1960. For the region, 35.4 percent of the total work force was employed in agriculture in 1940 as compared to 17.2 percent in 1960. In 1940, the region accounted for 9.1 percent of the total agricultural employment and increased this share to 11.3 percent in 1960. By 2020, only 3.2 percent of total employment within the region is projected to be in agriculture. Nationally, 1.4 percent of total employment is projected to be in agriculture.

Previous discussions on agriculture have dealt primarily with aggregate employment in the region and the general nature of the agricultural economy. In discussing projections of agricultural employment and production it is necessary to consider projected agricultural activity in terms of its distribution within the region. First, however, it would be helpful in understanding the projections of agricultural employment to distinguish between the two series of employment which are used in this appendix.

The first series is that used by the Office of Business Economics (OBE) in its projections and reported by the Census of Population. This is a count of the number of agricultural employees in the labor force during the week in March or April the year the Census is taken. A count taken at this time of year would be a seasonal low in the Missouri Region. The series is used, however, because it provides employment data compatible with other data used by OBE in the economic base study. Agricultural employment and gross farm income data are shown in table 34.

FIGURE 30

DISTRIBUTION OF MAJOR EMPLOYMENT DIVISIONS, NATION AND MISSOURI RIVER REGION 1940, 1950, 1960 AND PROJECTIONS FOR 1980, 2000 AND 2020

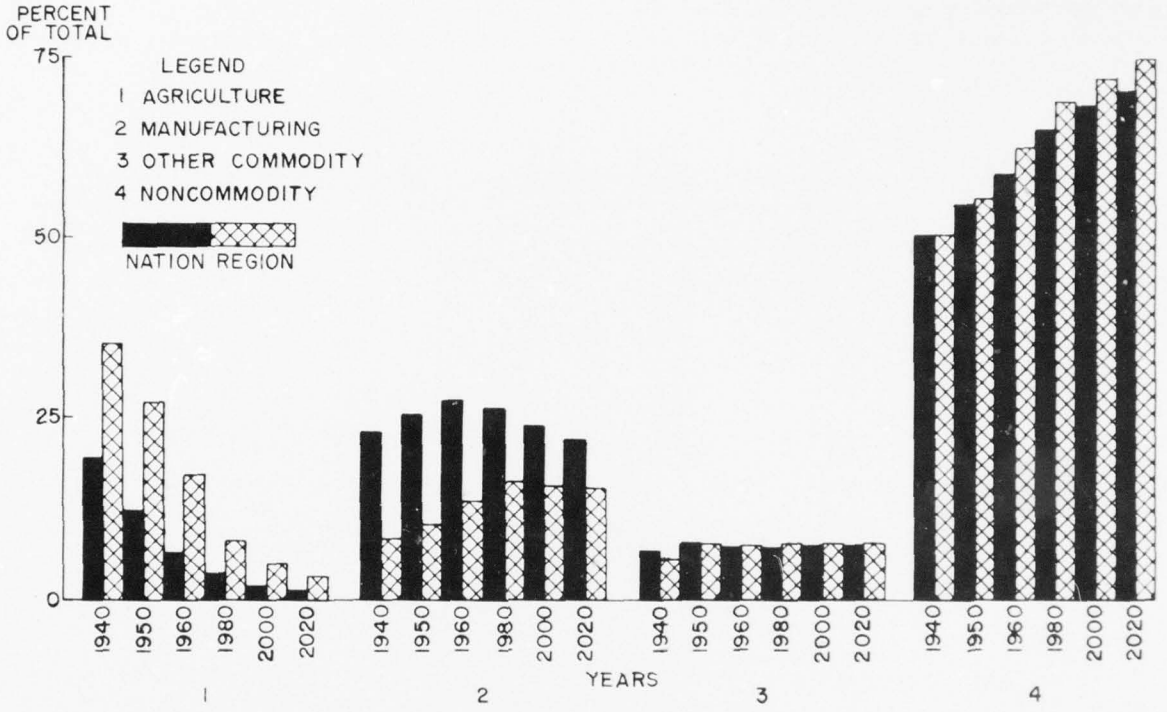


Table 34 – AGRICULTURAL EMPLOYMENT AND GROSS FARM INCOME, UNITED STATES AND MISSOURI REGION, 1959-'61 AVERAGE AND PROJECTIONS

Item	Unit	1959-'61	1980	2000	2020
Employment:					
United States[1]	(Thousand)	4,528	2,500	1,900	1,750
Missouri Region					
Pop. Census[1]	(Thousand)	512	336	272	249
USDA Farm Workers[2]	(Thousand)	716	413	381	306
Gross Farm Income:[3]					
United States	($ Million)	38,333	55,951	74,767	99,076
Missouri Region	($ Million)	5,300	8,054	10,816	14,741

[1] Numbers of agricultural employees as defined by the 1960 Census of Population (see text for discussion).
[2] Annual average number of farm workers concept as reported by SRS, USDA. (see text for discussion).
[3] 1959-61 average prices.

The other series of agricultural employment is based on data published by Statistical Reporting Service (SRS), United States Department of Agriculture. Conceptually, the data differ significantly from the Census series. The SRS estimates are annual averages of unpaid family workers and hired farm workers. No attempt was made to determine if any of the workers held additional jobs, so it is possible for double counting to occur. That is, an individual doing part-time farm work is counted as a farm worker even though he may also work at a full-time nonfarm job. A second difference relates to the age of the worker. The labor force definition excludes people under 14 years of age. In the SRS estimates no age specifications are made nor is the level of cash wages prescribed. Farm family workers are counted regardless of age if they work 15 hours or more at farm work during a week. However, this 15-hour minimum requirement undoubtedly excludes many farm children doing less than 15 hours per week farm work.

The USDA series is more appropriate for analyzing the agricultural economy of the region as it provides a better measure of the number of people engaged

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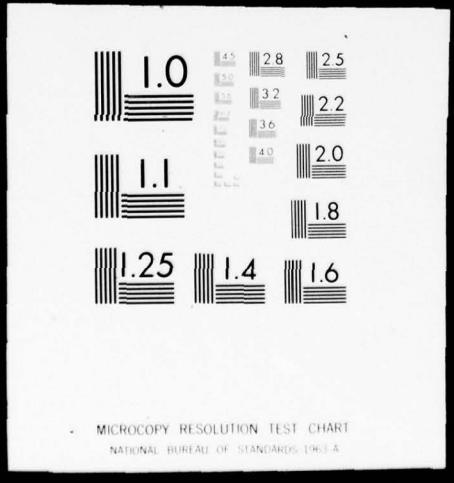


agricultural production. It recognizes the presence of people working at two or more jobs at the same time as well as making an allowance for short-time or seasonally hired farm workers. In addition, the data are available on a subarea and subregion basis, and, the series provides a breakdown between unpaid family and hired farm workers. This distinction between type of farm workers is extremely useful in analyzing employment trends in agriculture.

Direct employment in agriculture in the Missouri Region declined by about 280,000 workers between 1940 and 1960. In 1960, 512,200 farmers and farm workers were enumerated by the population census. Distribution of farm employment historically and for the projection periods is shown in table 35. Similar information based upon the SRS series is shown in table 36.

Table 35 – AGRICULTURAL EMPLOYMENT BY SUBREGION, HISTORICAL AND PROJECTIONS[1]

Subregion	1940	1950	1960	1980	2000	2020
	(Thousand)					
Upper Missouri	31.9	30.2	23.3	14.0	12.0	11.0
Yellowstone	28.2	24.6	17.9	11.0	9.0	9.0
Western Dakota	44.0	43.3	32.1	23.0	18.0	16.0
Eastern Dakota	108.1	108.5	80.4	57.0	46.0	41.0
Platte-Niobrara	129.7	124.0	93.4	60.3	52.4	50.7
Middle Missouri	143.6	132.6	92.9	60.7	51.6	48.3
Kansas	116.8	109.0	74.0	51.0	40.0	36.0
Lower Missouri	189.6	168.5	98.1	59.0	43.0	37.0
Missouri Region	791.9	740.7	512.1	336.0	272.0	249.0

[1] "Projections of Population, Employment, and Income for the Missouri Region," final projections, February 1968, prepared for Standing Committee on Comprehensive Planning, MBIAC.

Table 36 – AGRICULTURAL EMPLOYMENT: NUMBER OF FARM WORKERS BY SUBREGION, 1960 AND PROJECTIONS[1]

Subregion	1960	1980	2000	2020
	(Thousand)			
Upper Missouri	24.3	14.9	14.9	11.2
Yellowstone	22.7	31.6	13.1	10.5
Western Dakota	38.1	22.1	19.8	15.5
Eastern Dakota	99.9	70.4	62.7	52.1
Platte-Niobrara	122.4	63.8	62.5	53.7
Middle Missouri	131.9	71.0	69.6	58.7
Kansas	106.3	67.6	61.4	45.7
Lower Missouri	174.3	89.6	77.0	58.6
Missouri Region	719.9	413.0	381.0	306.0

[1] Based on "Farm Employment, Family and Hired Workers, Annual Averages," Statistical Bulletin No. 334, Statistical Reporting Service, U.S. Department of Agriculture. The data are derived from estimates "which are designated 'annual averages' of family, hired and total farm workers for each specified year." They "are the average of estimates for 12 designated survey weeks in each year."

Geographic distribution of agricultural production and employment in the region will generally continue to be concentrated in the same areas in the future as in the past. Agricultural activity is projected to be relatively more important in the Platte-Niobrara, Middle Missouri, and Eastern Dakota subregions and relatively less important in the Lower Missouri Subregion (figure 31).

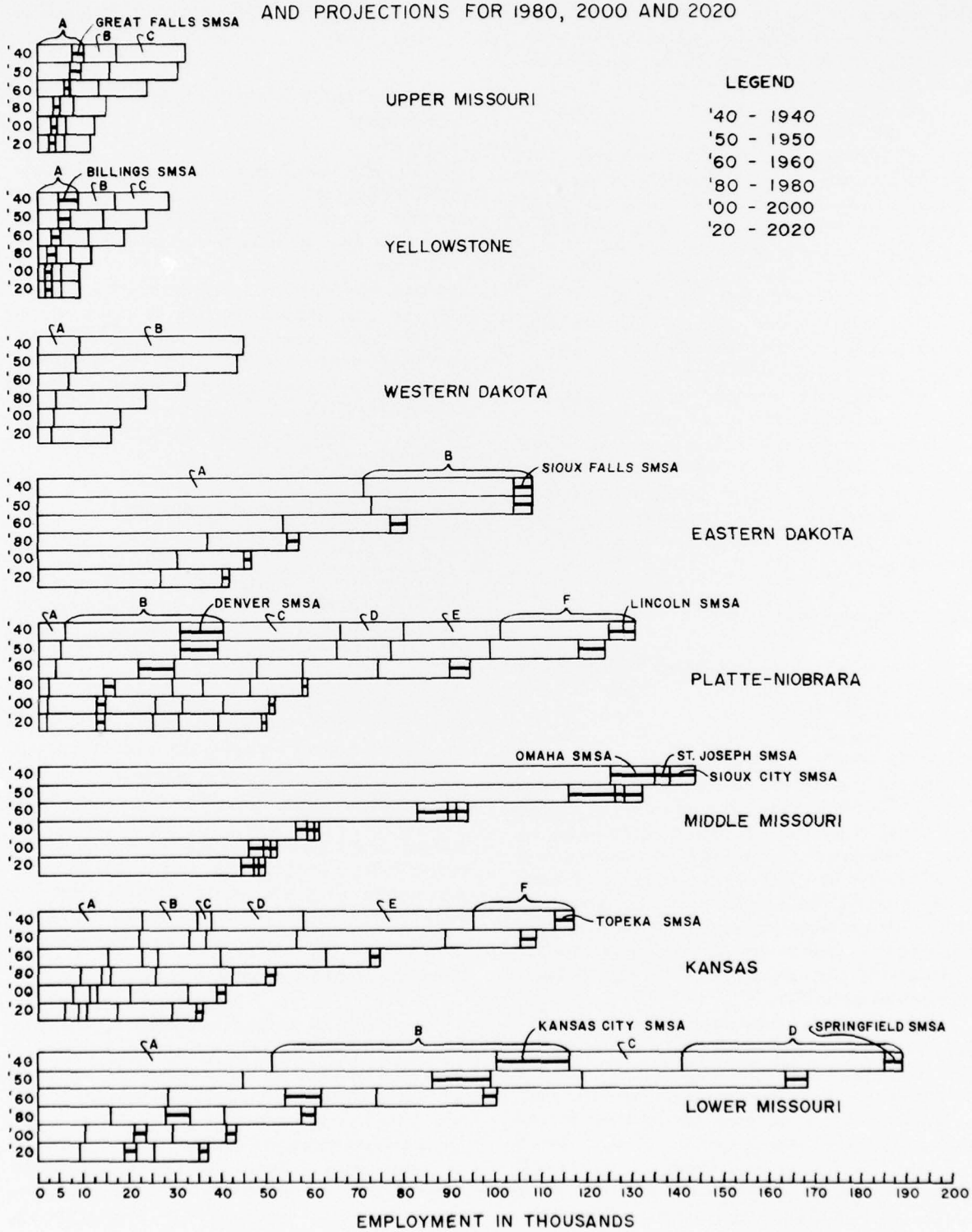
A word of caution may be in order. It has been pointed out that these projections are merely extrapolations of historical trends and, as such, duplicate historic performance. Certain assumptions were made in view of the past trends and existing relationships between these trends. In the case of agriculture, long-term declines in agricultural employment historically have been continued in the future. The rationale for projected declines in farm employment lies in technical conditions of production in agriculture combined with the nature of demand for agricultural output.

Assumptions regarding future rates of productivity increase and demand for farm products have been built into the projection model. Rates of productivity increase which existed during the 1940-1960 period are assumed to continue throughout the projection period. However, in examining the components of productivity change in the past, it is possible to underestimate future levels of employment in agriculture.

Historically, two factors have contributed to changes in labor productivity in agriculture. First, there has been technological change in the increased substitution of capital for labor. Application of new technology makes each remaining labor input more productive and more efficient. The second factor contributing to changes in labor productivity is the changing composition or organization of the agricultural work force. Within the

FIGURE 31

DISTRIBUTION OF AGRICULTURAL EMPLOYMENT
BY SUBREGIONS AND SUBAREAS 1940, 1950, 1960
AND PROJECTIONS FOR 1980, 2000 AND 2020



aggregate trend in agricultural employment there are two distinct trends. First is the relatively stable level in the number of hired farm workers, and second is a decline in the number of unpaid family workers engaged in agriculture. In other words, unpaid family workers are a declining proportion of total employment in agriculture. This suggests that the decline of the unpaid family worker segment is accounting for nontechnologically based changes in aggregate farm employment.

Assuming that the trend toward increasing efficiency in agriculture will continue to exert pressure on the marginal farm operation, the virtual elimination of the "nonprofit" farm operation in the region is possible. The implication this has for the projections is that as the "marginal farm" accounts for less and less of the total employment engaged in agriculture, its influence upon the aggregate trend will be diminished. This means simply that labor productivity rates which partially reflect the increase in efficiency due to elimination of the marginal operator will likewise be lowered. Thus, if we can accept that (a) historic productivity rates show both the effects of technological change and organizational changes in the agricultural work force itself, and (b) influence of the marginal farm operations on total agricultural employment is diminishing over time, then (c) assumed productivity rates for the future may be over optimistic. The result of using such high productivity rates will be to underestimate future levels of employment.

Manufacturing Employment

Historically, manufacturing employment in the region increased at a greater rate than in the Nation. Between 1940 and 1960, manufacturing employment increased by 116.5 percent in the region and only 69.5 percent in the Nation. During the projection period, manufacturing employment is projected to increase by 192.7 percent in the region as compared to 121.6 percent in the Nation. In terms of relative shares, in 1940 the region accounted for 1.8 percent of the total national employment in manufacturing. By 1960, the region's share of manufacturing employment had increased to 2.3 percent. By 2020, manufacturing employment in the region is projected to increase to over 1,200,000 and account for approximately 3.0 percent of total manufacturing employment nationally.

Within the region, employment in manufacturing has been increasing in relative importance throughout the historic period. In 1940, manufacturing represented only 8.4 percent of total employment in the region. By 1960, employment in manufacturing had increased to 13.8 percent. By 2020, workers engaged in manufacturing are projected to increase to 15.4 percent of total employment in the region. At the same time, the relative importance of manufacturing employment nationally is projected to decline. Whereas, in 1960 27.5 percent of total employment was accounted for by employment in manufacturing, by 2020 employment in manufacturing is projected to account for less than 22 percent of total employment. The region's share of national manufacturing employment is thus projected to increase from 2.3 percent in 1960 to 3.0 percent by 2020.

Other Commodity-Producing Industries Employment

Historically, employment in other commodity-producing industries grew faster in the region than nationally. Between 1940 and 1960, employment in contract construction and mining, as a group, increased by 79.4 percent in the region compared to an increase of 53.4 percent in the Nation for the same period. Between 1940 and 1960, the region's share of employment in these two industries increased from 4.1 percent to 4.6 percent of employment nationally. The relationship between rates of growth in other commodity-producing industries employment for the region and the Nation is projected to remain relatively constant through the projection period.

Noncommodity-Producing Industries Employment

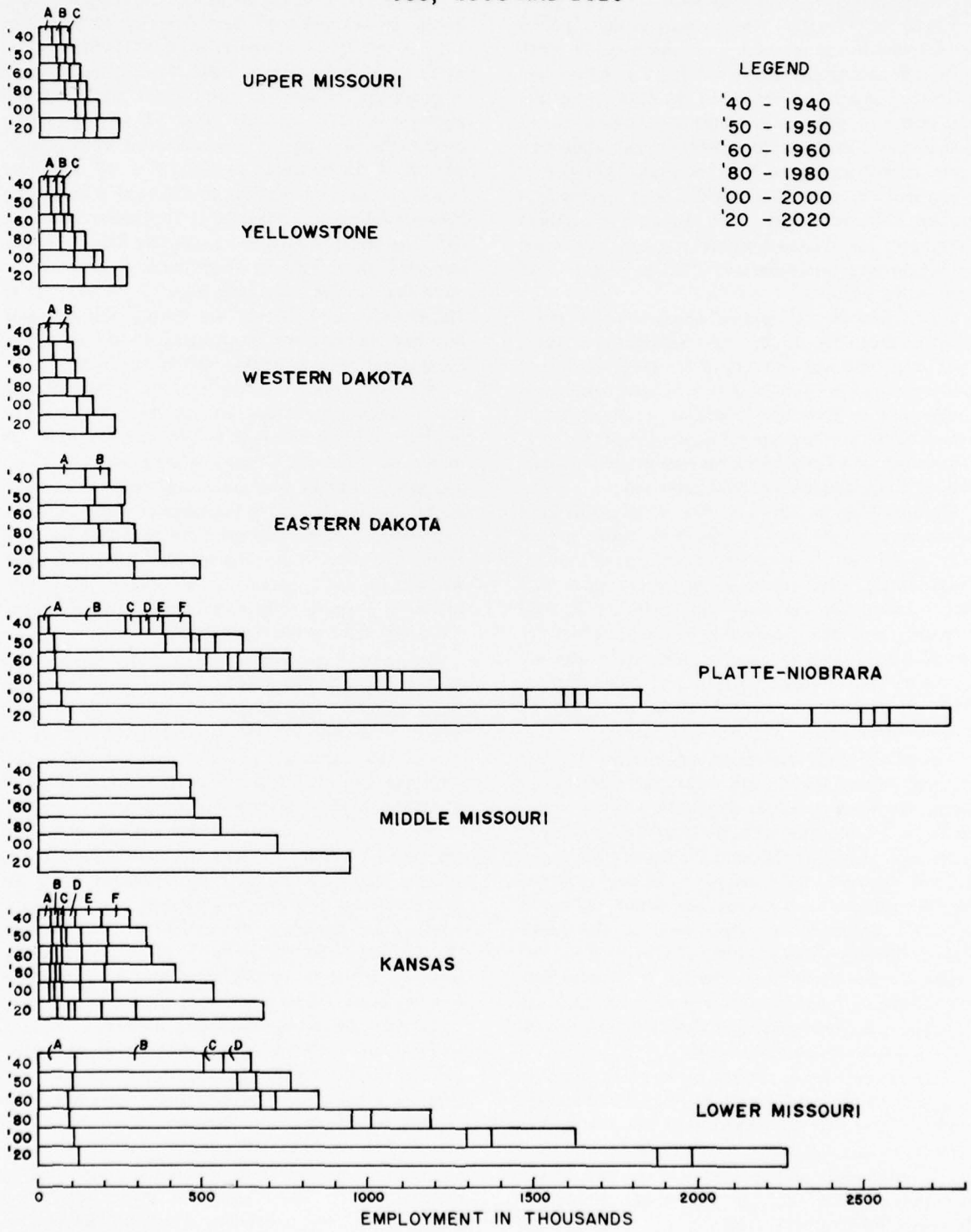
Historically, employment in noncommodity-producing industries was relatively more important in the region than in the Nation. In 1960, approximately 62 percent of total employment in the region was accounted for by noncommodity-producing industries. This compared to 58 percent nationally. The relative importance of noncommodity-producing employment is projected to increase throughout the projection period, accounting for approximately 74 percent of the region's total employment by 2020 as compared to 70 percent of total employment nationally. The region's share of the Nation's noncommodity employment is projected to remain almost constant between 1960 and 2020, accounting for 4.7 percent in 1960 and 4.6 percent by 2020.

Distribution of Employment by Subregions

The distribution of total employment by subregions and subareas for 1940, 1950, and 1960 and projections to 1980, 2000, 2020 are shown in figure 32. Because of the direct relationship between employment and population, there is a close similarity of growth patterns among the various subregions and subareas. The greatest growth has taken place in Subarea 5B, which includes the Denver SMSA, and 8B, which includes the Kansas City SMSA. In 1960, employment in Subarea 5B was

FIGURE 32

DISTRIBUTION OF TOTAL EMPLOYMENT
BY SUBREGIONS AND SUBAREAS 1
1940, 1950, 1960 AND PROJECTIONS FOR
1980, 2000 AND 2020



1 SUBAREAS INCLUDE THEIR RESPECTIVE SMSA'S

468,145 and is projected to almost double in each of the succeeding 20-year periods. By 2020, employment in Subarea 5B is projected to reach 2,207,600. In Subarea 8B, total employment is projected to more than treble during the 60-year period, increasing from 561,420 in 1960 to 1,711,400 by 2020.

Similar to population, employment in the region is concentrated in the southern four subregions. In 1960, these four subregions accounted for 2.4 million employees, or about 81.6 percent of the region total. The same four subregions are projected to account for about 6.6 million workers in 2020, or 84.9 percent of the total region employment. The Platte-Niobrara Subregion is projected to increase most rapidly with employment reaching 2.75 million by 2020. Among the northern subregions, the Yellowstone is projected to reach 260,000 in total employment by 2020, or a 169 percent increase over 1960.

Distribution of employment among the four major industrial groupings for the eight subregions in 1940, 1950, and 1960 and projections for 1980, 2000, and 2020 are shown in figure 33. As can be seen, agricultural employment is projected to decline in all eight subregions. In the northwestern subregions (Upper Missouri, Yellowstone, and Western Dakotas) the smallest absolute and percentage declines have been projected.

Manufacturing employment, as opposed to national trends, is projected to be a relatively strong growth sector in the region particularly in the lower subregions. Manufacturing employment in the upper three subregions historically has been less significant to their economies, and their projected growth rates reflect this historical significance of manufacturing. Subregion and subarea manufacturing employment for 1940, 1950, and 1960 and projections to 1980, 2000, and 2020 are shown in figure 34.

Among the eight subregions, projections of manufacturing employment do not change the 1960 ranking except the Western Dakota Subregion will move from eighth to seventh place by the year 2000, changing places with the Upper Missouri Subregion. The Lower Missouri Subregion will continue to be first in importance in manufacturing employment within the region. In 1960, manufacturing employment in the Lower Missouri Subregion was 170,808 and accounted for 41.8 percent of the region total. The Lower Missouri Subregion's share of the region's total manufacturing employment is projected to decline slightly to 39.4 percent in 1980 and to 38.4 percent by 2020.

Other subregions in the region in which manufacturing was important were the Platte-Niobrara and the Middle Missouri. In 1960, there were 106,548 workers employed in manufacturing in the Platte-Niobrara and 75,611 employed in manufacturing in the Middle Missouri. In terms of relative shares the Middle Missouri's share of the region's total manufacturing employment is projected to decline from 18.4 percent in 1960 to 13.5 percent by 2020. In contrast, the Platte-Niobrara is projected to increase its relative share of total manufacturing employment from 25.9 percent in 1960 to 36.2 percent by 2020.

Subarea 8B, including the Kansas City SMSA, had the largest concentration of manufacturing employment, 132,550 in 1960, as compared to 80,000 in Subarea 5B, which includes the Denver SMSA. The dominance of 8B is projected to continue until 2000 when 5B will approximate it in size. By 2020, 5B is projected to exceed 8B in terms of manufacturing employment, 368,000 in 5B compared to 350,400 in 8B. The third largest area in manufacturing employment is the Middle Missouri Subregion, dominated by the Omaha SMSA but including the St. Joseph and Sioux City SMSA's. In this subregion, manufacturing employment is projected to more than double, increasing from 75,611 in 1960 to 162,400 by 2020. Within the Omaha SMSA, manufacturing employment is projected to almost treble, going from 37,000 in 1960 to 104,000 by 2020.

Within the manufacturing industry, employment in heavy water-using industries has been broken out because of its significance in planning for water resources development. Although water consumption rates and projected levels of output would be more appropriate proxies for projecting the range of water demands, employment in these selected industries which use large amounts of water is the only available measure of water demands for the projection years. Because textile production is relatively insignificant in the Missouri Region, it is not included in this discussion.

Within the heavy water-using industries category, the food products industry is by far the most important single industry. The Middle Missouri Subregion ranks first in employment in the food products industry. In 1960, employment in the food products industry in that subregion was 35,017 and is projected to increase to 41,600 by 2020. In terms of relative shares, 32.8 percent of the employment in this industry was concentrated in the Middle Missouri. Its share for 2020 is projected to decline to 27.5 percent. Other subregions where the food products industry is important are the Platte-Niobrara and the Lower Missouri. In 1960, the Lower Missouri accounted for about 26 percent of total employment in the food products industry and is projected to have the same share by 2020.

Of the other heavy water-using industries, chemical products will probably be the most rapidly expanding industry in the region. Employment in the chemical industry is projected to increase from 16,102 in 1960 to 80,000 by 2020. The Platte-Niobrara and Lower Missouri subregions are projected to account for approximately 63.4 percent of the region's chemical industry employment by 2020 while the Middle Missouri is projected to have approximately 19.1 percent. The

FIGURE 33
DISTRIBUTION OF EMPLOYMENT BY SUBREGIONS
(FOUR MAJOR DIVISIONS)
1940, 1950, 1960, AND PROJECTIONS FOR
1980, 2000 AND 2020

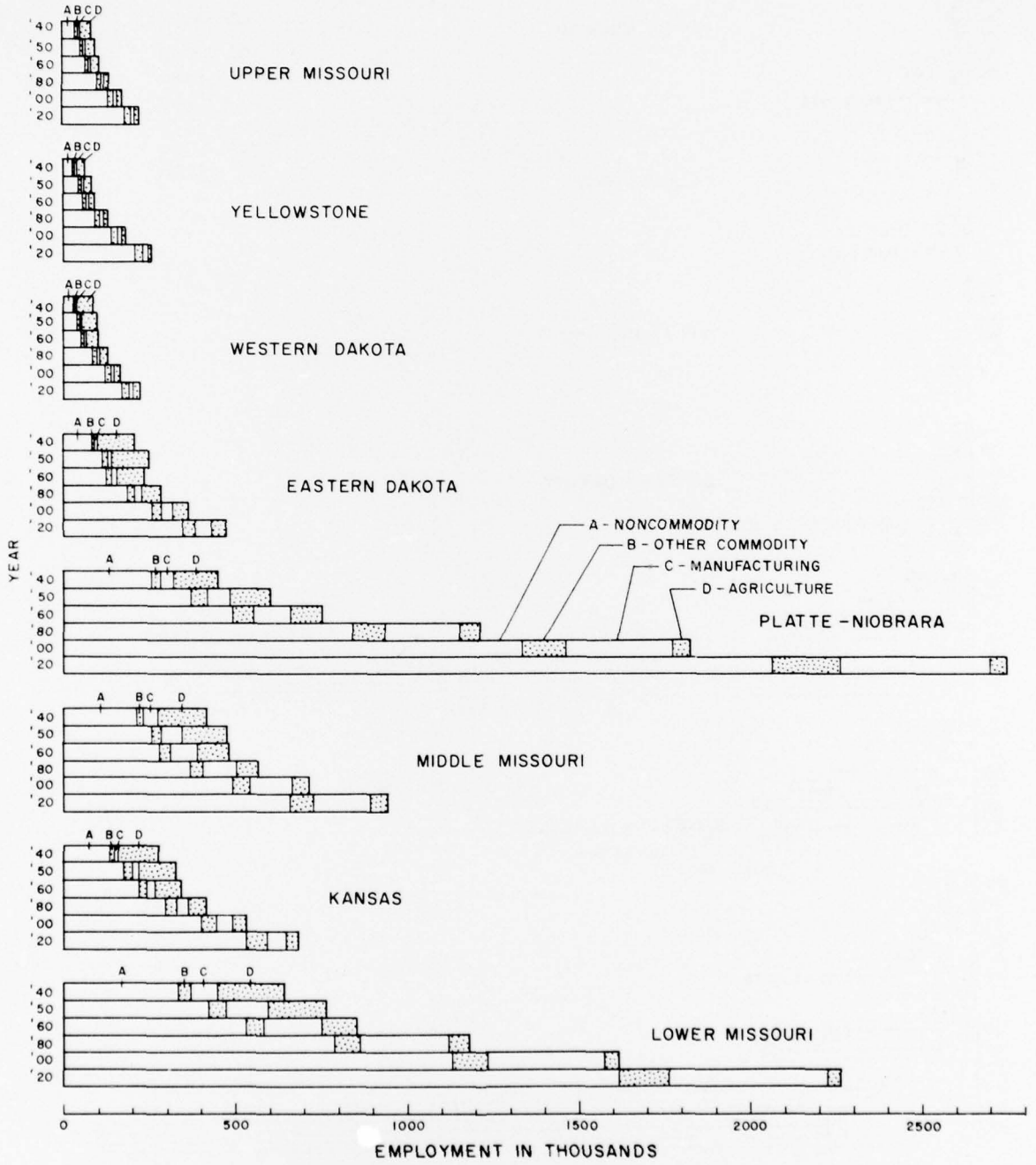
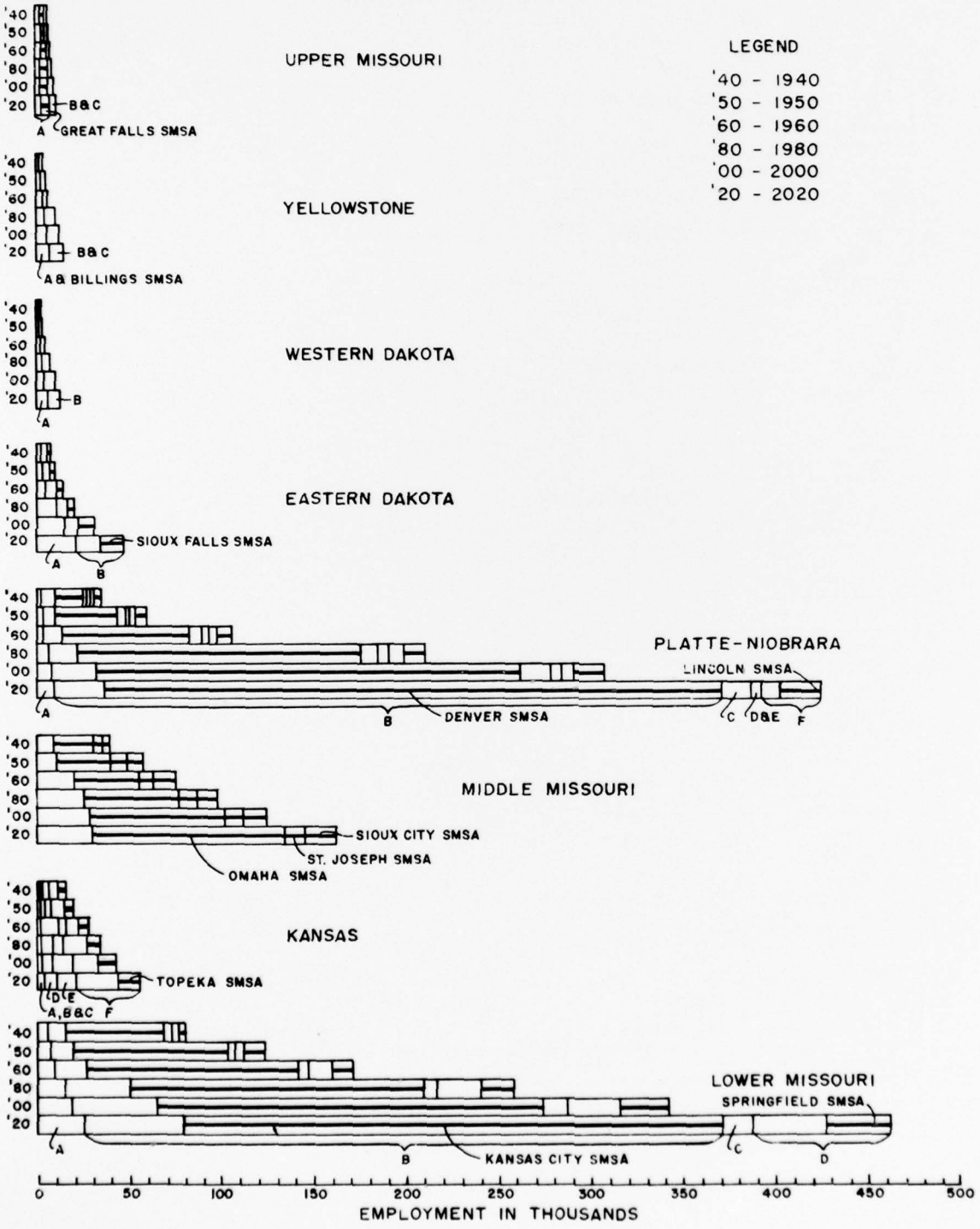
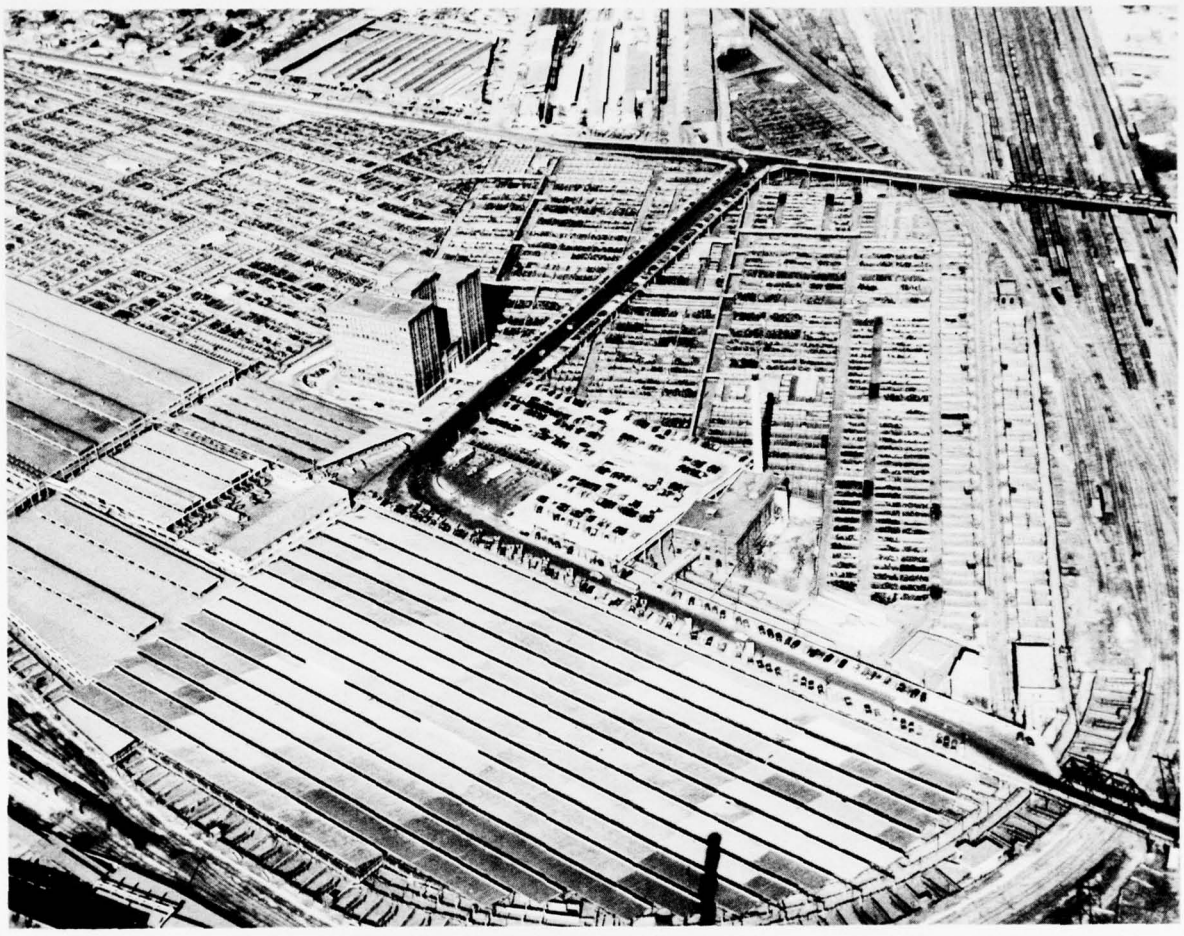


FIGURE 34

DISTRIBUTION OF MANUFACTURING EMPLOYMENT
BY SUBREGIONS AND SUBAREAS
1940, 1950 AND 1960 AND PROJECTIONS FOR
1980, 2000 AND 2020





Large Stockyards, Such as the Union Stockyard in Omaha, Are Also Found in Kansas City, St. Joseph, and Sioux City.

Kansas Subregion will have about 8.8 percent. Total region employment in the three heavy water-using industries, petroleum refining, paper and allied products, and primary metals, ranged from 9,000 to 12,000 in 1960 and is projected to range from 16,000 to 30,000 by 2020. Petroleum refining is particularly important in the Lower Missouri, Platte-Niobrara, and Yellowstone subregions, in that order. By far, the most important in the paper and allied products industry is the Lower Missouri Subregion, with two-thirds of the industry's total employment. Paper and allied products have also been and are projected to be important in the Middle Missouri and Platte-Niobrara Subregions. About one-half of the total region employment in the primary metals industry also is located in the Lower Missouri Subregion. Figure 35 shows the distribution of employment for heavy water-using industries by subregions and figure 36, for the region.

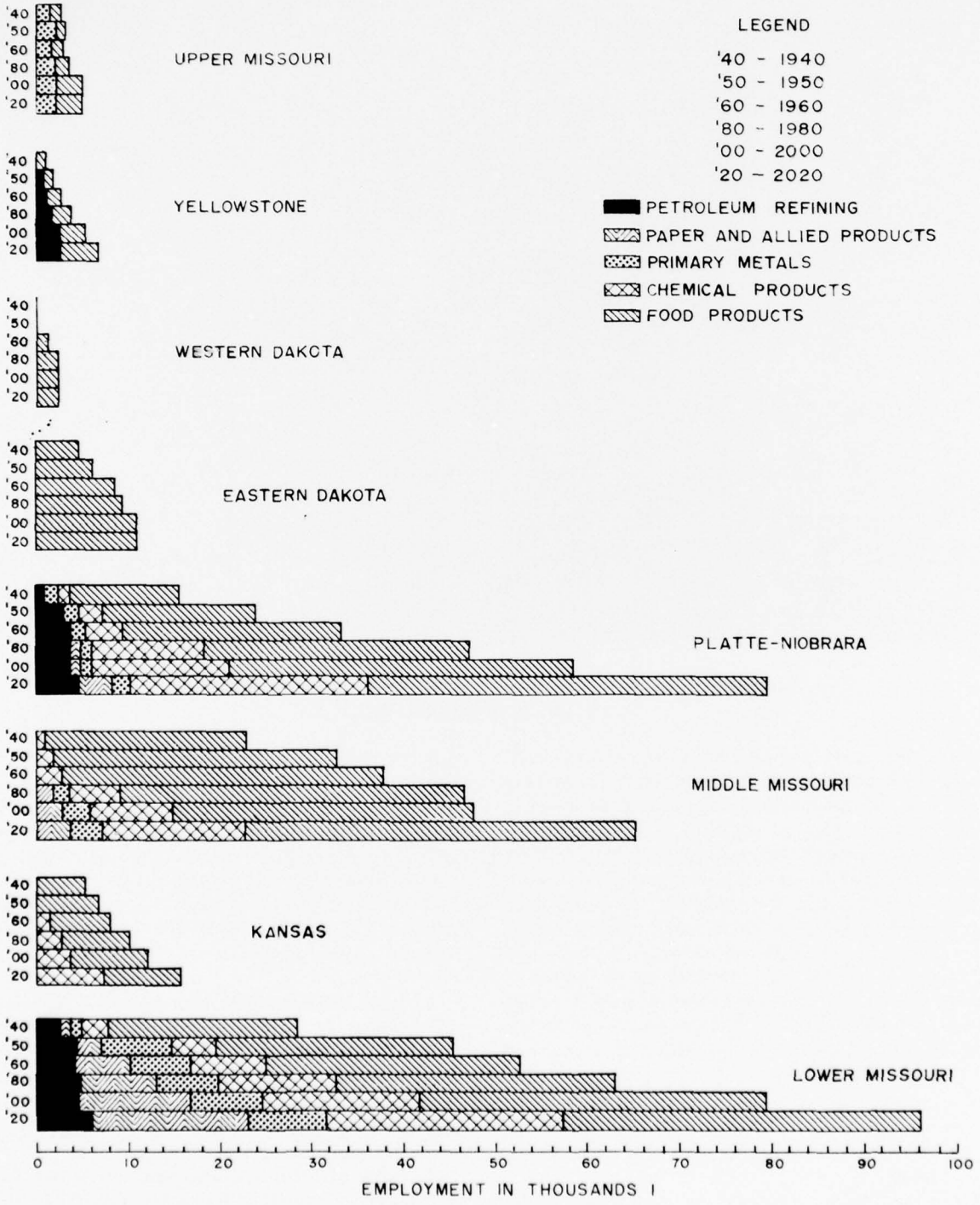
Distribution by subregion of other commodity-producing industry employment for 1960 and projections for 1980, 2000, and 2020 are shown in figure 37. Although employment in this sector is projected to increase from about 216,000 in 1960 to 578,000 by 2020, its share of the total region employment remains relatively stable. Accounting for approximately 7.2 percent of total region employment in 1960, it increases slightly to 7.39 percent by 2020. The ranking of other commodity-producing employment among the subregions remains unchanged from 1960 through the 60-year projection.

Employment in the construction industry is projected to continue to increase throughout the projection period. Projections indicate that construction employment in the region will reach a total of 530,411 persons by the year 2020. Table 37 shows the construction employment projected for the Missouri Region and its proportion of total employment at those levels.

Probably the most significant factor shown by these projections, in comparison to historic construction employment trends, is the relative stability during the

FIGURE 35

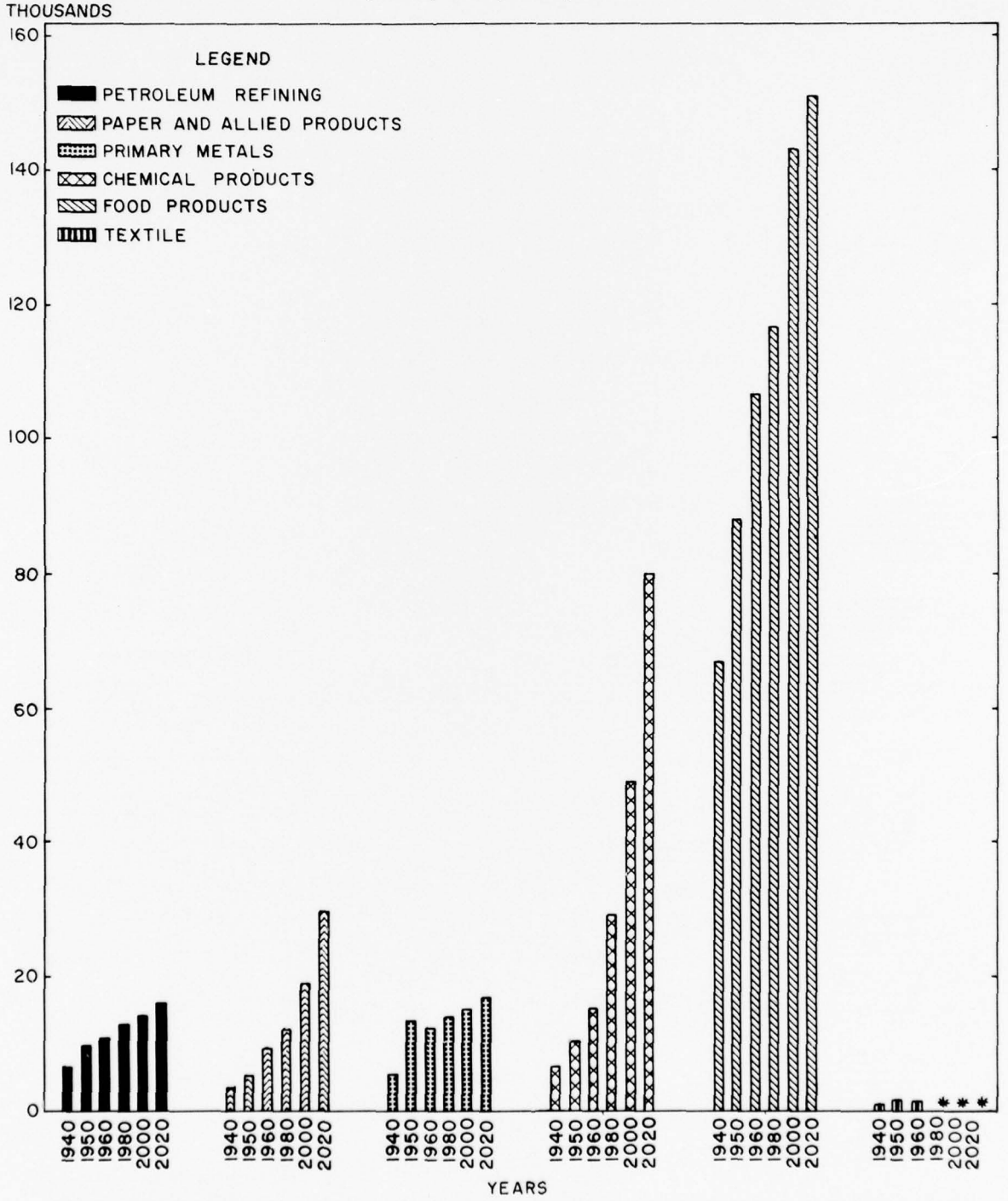
DISTRIBUTION OF EMPLOYMENT IN SELECTED HEAVY WATER-USING INDUSTRIES BY SUBREGIONS, 1940, 1950, 1960 AND PROJECTIONS, FOR 1980, 2000 AND 2020



1 NO DATA RECORDED WHERE LESS THAN 1,000 EMPLOYEES

FIGURE 36

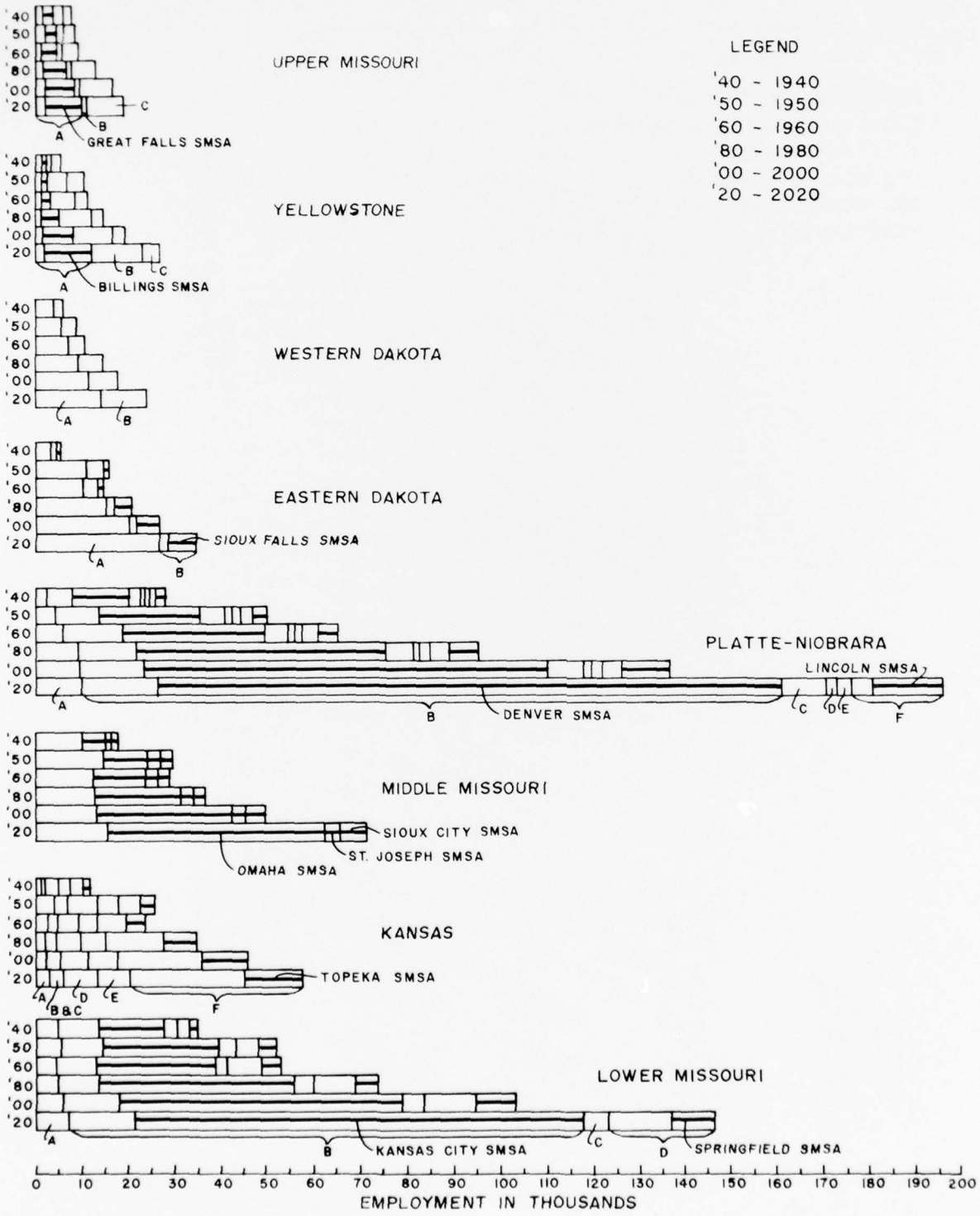
DISTRIBUTION OF EMPLOYMENT IN SELECTED HEAVY WATER-USING INDUSTRIES FOR MISSOURI RIVER REGION 1940, 1950, 1960, 1980, 2000 AND 2020



*EMPLOYMENT IN TEXTILES WAS NOT INCLUDED BECAUSE LESS THAN 1,000 EMPLOYEES WAS PROJECTED.

FIGURE 37

DISTRIBUTION OF OTHER COMMODITY-PRODUCING EMPLOYMENT
BY SUBREGIONS AND SUBAREAS 1940, 1950, 1960
AND PROJECTIONS FOR 1980, 2000 AND 2020



Refineries Process Crude Oil Found in Many Parts of the Missouri River Region. Above is the American Oil Refinery at Mandan, North Dakota, on the Missouri River.

projection period in terms of construction employment's proportion of total employment, however, construction employment in comparison to the total economy will not grow as fast as it did in the 1940-1960 period.

Chapter 3 contains a discussion on mining employment in the region and factors which influence the level of employment. This section is a continuation of that previous discussion with emphasis on the projections of employment in the mining industry. Based upon historical trends in employment, output, and productivity, employment in mining has been projected to increase at relatively slow rates. This is because the mining industry historically has been characterized by large increases in productivity combined with moderate increases in demand for mining output.

Early Construction on the Woodman Tower, Omaha, Nebraska, Belies Its 30 Story, 460-Foot Height, and 370,000 Sq. Ft. of Floor Space.

Table 37 – CONSTRUCTION EMPLOYMENT BY SUBREGION – PROJECTIONS

Subregion	1980		2000		2020	
	Projected	Percent of Total Employment	Projected	Percent of Total Employment	Projected	Percent of Total Employment
Upper Missouri	8,517	6.2	13,508	7.7	17,704	7.8
Yellowstone	9,825	7.0	13,247	7.2	19,079	7.3
Western Dakota	9,411	7.2	11,802	7.0	17,431	7.8
Eastern Dakota	19,440	6.7	25,259	6.9	32,907	7.0
Platte-Niobrara	85,795	7.1	124,199	6.8	182,909	6.7
Middle Missouri	36,376	6.4	47,920	6.7	69,436	7.4
Kansas	27,709	6.6	38,769	7.3	51,271	7.5
Lower Missouri	70,795	6.0	97,848	6.0	139,674	6.2
Missouri Region	267,108	6.6	372,552	6.7	530,411	6.8

Table 38 – MINERAL INDUSTRY EMPLOYMENT BY SUBREGION, HISTORICAL AND PROJECTIONS

Subregion	1940	1950	1961	1980	2000	2020
Upper Missouri	4,262	2,175	2,250	4,480	3,490	1,300
Yellowstone	1,568	2,577	4,158	5,720	6,750	7,920
Western Dakota	3,673	3,432	3,871	5,590	6,198	6,570
Eastern Dakota	379	565	1,263	1,560	1,740	2,090
Platte-Niobrara	6,440	5,396	6,997	9,730	10,900	12,690
Middle Missouri	950	870	800	1,320	1,980	2,960
Kansas	2,040	3,143	5,803	7,290	7,230	6,730
Lower Missouri	7,667	4,679	4,104	4,200	5,150	7,330
Missouri Region	26,979	22,837	29,246	39,890	43,448	47,580

Source: Bureau of Mines projections (rounded).

Regionwide, employment in the minerals industry is projected to increase from over 29,000 in 1961 to more than 47,000 by 2020. Historical and projected levels of employment in mining by subregion are shown in table 38.

Unlike most other industries within the region, the location and level of minerals production, and hence local employment in mining, are largely functions of source of supply. Mining activity obviously occurs where mineral resources exist. Projections of future mining activity and future employment levels likewise are dependent upon the availability of resources. This accounts for the rather sporadic nature of mining employment projections by subregion. It can be seen from table 38 that the trend of employment in mining in the Upper Missouri Subregion declines historically, increases abruptly to 1980, and then declines substantially thereafter. In the Platte-Niobrara, Middle Missouri, and Lower Missouri subregions, declines in mining employment are shown historically, but increases are projected to 2020. In the Kansas Subregion, trends in mining historically have been positive and sharply upward; whereas, the projected trend peaks out at 1980 and declines thereafter. In the Western Dakota and the Platte-Niobrara subregions, historic trends are inconsistent, both positive and negative, but projections show positive trends. Only in the Yellowstone and Eastern Dakota subregions have historical trends been positive throughout and projected trends, likewise, positive.

Employment in noncommodity-producing industries accounts for the largest and an increasing proportion of total region employment. The share of employment in this industrial category is projected to continue to increase, but the rate of increase will slow as its proportion approaches 100 percent. Still, this category will remain the fastest growing employment sector throughout the projection period. Table 39 shows historical and projected levels of noncommodity-producing employment by subregion.

As technological change leads to increases in productivity in all industrial sectors, an indirect stimulus is provided in the noncommodity-producing sector. Normally, this sector is characterized by high labor-capital ratios; it is highly labor intensive. As a result, new technology has little direct adverse impact upon employment levels. Similarly, because this sector is highly labor intensive, labor productivity increases relatively slowly. This explains the comparatively high growth rates in non-basic type or residentiary industry employment. As productivity increases in the basic sector, goods are produced with less and less labor expended. Income, thus generated, provides an increasing base or "support" for non-basic employment.

The sector within the noncommodity-producing industrial group projected to expand most rapidly during

Table 39 – NONCOMMODITY-PRODUCING EMPLOYMENT BY SUBREGION, HISTORICAL AND PROJECTIONS

Subregions	1940	1950	1960	1980	2000	2020
			(Thousand)			
Upper Missouri	39.0	53.3	69.1	103.0	138.0	188.0
Yellowstone	31.7	47.2	60.1	96.0	144.0	209.0
Western Dakota	31.3	44.8	56.4	85.0	122.0	170.0
Eastern Dakota	87.3	113.1	128.1	191.0	260.0	349.0
Platte-Niobrara	259.1	372.2	494.6	844.3	1,333.0	2,068.1
Middle Missouri	214.8	257.6	285.1	370.7	493.0	659.9
Kansas	133.7	175.0	221.3	297.0	403.0	535.0
Lower Missouri	337.1	421.2	531.1	792.0	1,131.0	1,618.0
Missouri Region[1]	1,134.2	1,484.3	1,845.8	2,779.0	4,024.0	5,797.0

[1] Totals may not add due to rounding

Table 40 – EMPLOYMENT CHANGES BY INDUSTRIAL CATEGORIES OF NONCOMMODITY PRODUCING INDUSTRIES, MISSOURI REGION – PROJECTIONS

Category	1980	2000	2020	Percent Change 1980-2020
Professional & Personal Services	1,047,515	1,591,131	2,347,420	124.1
Trade, Finance, & Real Estate	1,050,661	1,488,584	2,120,172	101.8
Transportation & Communications	310,445	428,898	610,261	96.6
Government & Armed Forces	370,380	515,389	719,142	94.2
Missouri Region	2,779,001	4,024,002	5,796,995	108.6

the projection period is the professional and personal services sector. Table 40 compares the projected employment in the major SIC divisions of noncommodity-producing employment for the 3 projected years.

Projected growth in noncommodity-producing employment parallels total employment growth within the various subregions. Employment in noncommodity-producing industries is projected to increase most rapidly in the Platte-Niobrara Subregion. Given the projected increases, this subregion will contain the highest proportion of noncommodity-producing employment in the region. Figure 38 shows the distribution of projected employment in noncommodity-producing industries during the projection period.

INCOME AND EARNINGS

Income

Personal income per capita for the Missouri Region has been and is projected to continue below the national average, as shown in table 41. In 1940, personal income per capita was 77.3 percent of the national figure. None of the eight subregions exceeded the national average for 1940. Information available indicates that only the Upper Missouri and Yellowstone subregions were above the region average for that year. By 1950, personal income per capita had improved considerably with the region average moving to within 5 percent of the national average. Three subregions, Upper Missouri, Platte-Niobrara, and Middle Missouri, equaled or exceeded the national average. Western and Eastern Dakota subregions remained considerably below the rest of the subregions, 81.2 and 78.7 percent, respectively. The presence of nine Indian reservations within these two subregions represented isolated areas where the economy was even further depressed. Improvement in incomes that occurred during the 1940's continued to prevail through the next decade for all but one of the Missouri River subregions. Only the Upper Missouri did not improve its position in relation to the 1950 level. The Platte-Niobrara was the only subregion to equal the national personal income per capita level in 1960.

During the historical period, most of the 11 Standard Metropolitan Statistical Areas in the region have equaled or exceeded the national average personal income per capita. In 1940, Sioux Falls, S. Dak., Lincoln, Nebr., Topeka, Kans., and Springfield, Mo., were below the national average. Springfield was only 77.5 percent of the national average. For 1960, only two of the SMSA's, Sioux Falls (85.2 percent) and Springfield (89.3 percent), were substantially below the national per capita personal income average. Lincoln was slightly below the national average. Denver, Topeka, and Kansas City were all about 15 percent above the national average in 1960. Topeka SMSA experienced the greatest change in respect to national averages, ranging from 13.1 percent below in 1940 to 14.3 percent above in 1960. In the years projected, all SMSA's tend to merge on the national average and maintain slightly higher averages than their respective subregions.

Employment growth and the changing composition of employment in various subregions are reflected in the changes that take place in projections in income. Projections to 1980, 2000, and 2020 show that per capita personal income levels in the region should rise during the early part of the projection period in relation to the national level; per capita income remains about 3 percent below the national average for the balance of the projection period. By 1980, six of the eight subregions are projected to be within 5 percent of national average with the Western and Eastern Dakota subregions continuing to lag behind other subregions. Despite this, they are shown to improve their relative position considerably (figure 39).

Projections of total personal income in the United States for 2020 show more than a 10-fold increase. This is exceeded slightly in the Missouri Region even though per capita income in the region is projected to be less than the national average. The Platte-Niobrara Subregion, with a total personal income of $3.9 billion in 1960, is projected to grow about 14 times by 2020, to reach about $53.2 billion. During this same period, total income in the Lower Missouri Subregion is projected to increase about 10.5 times, from $4.1 billion to $43.0 billion. Total personal income increases in the Yellowstone and Eastern and Western Dakota subregions during the 60-year period are also projected to exceed 10 times their 1960 level. The other subregions, Upper Missouri, Middle Missouri, and Kansas, are projected to be about eight times their levels by 2020.

FIGURE 38

DISTRIBUTION OF NONCOMMODITY-PRODUCING EMPLOYMENT
BY SUBREGIONS AND SUBAREAS 1940, 1950, 1960
AND PROJECTIONS FOR 1980, 2000 AND 2020

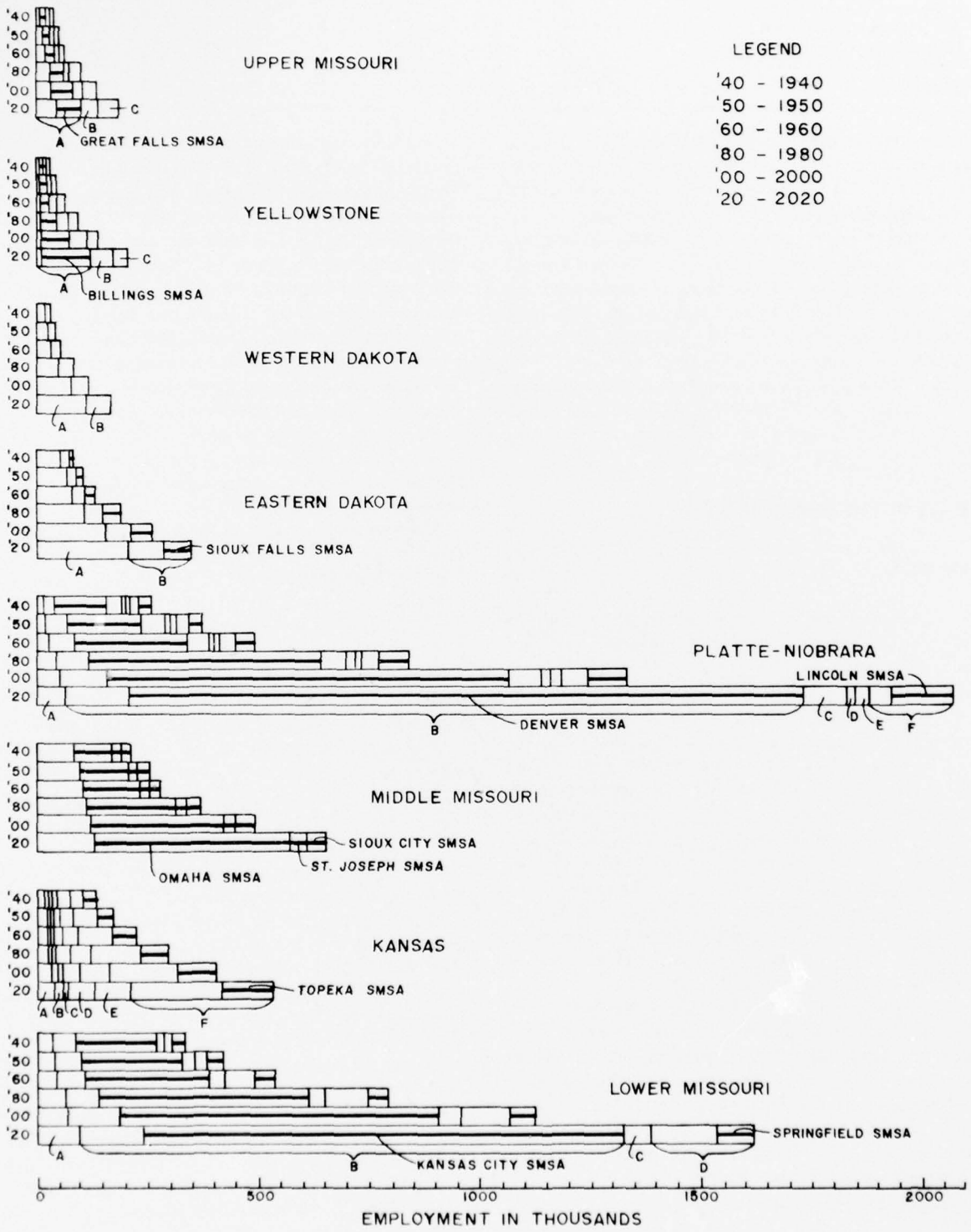
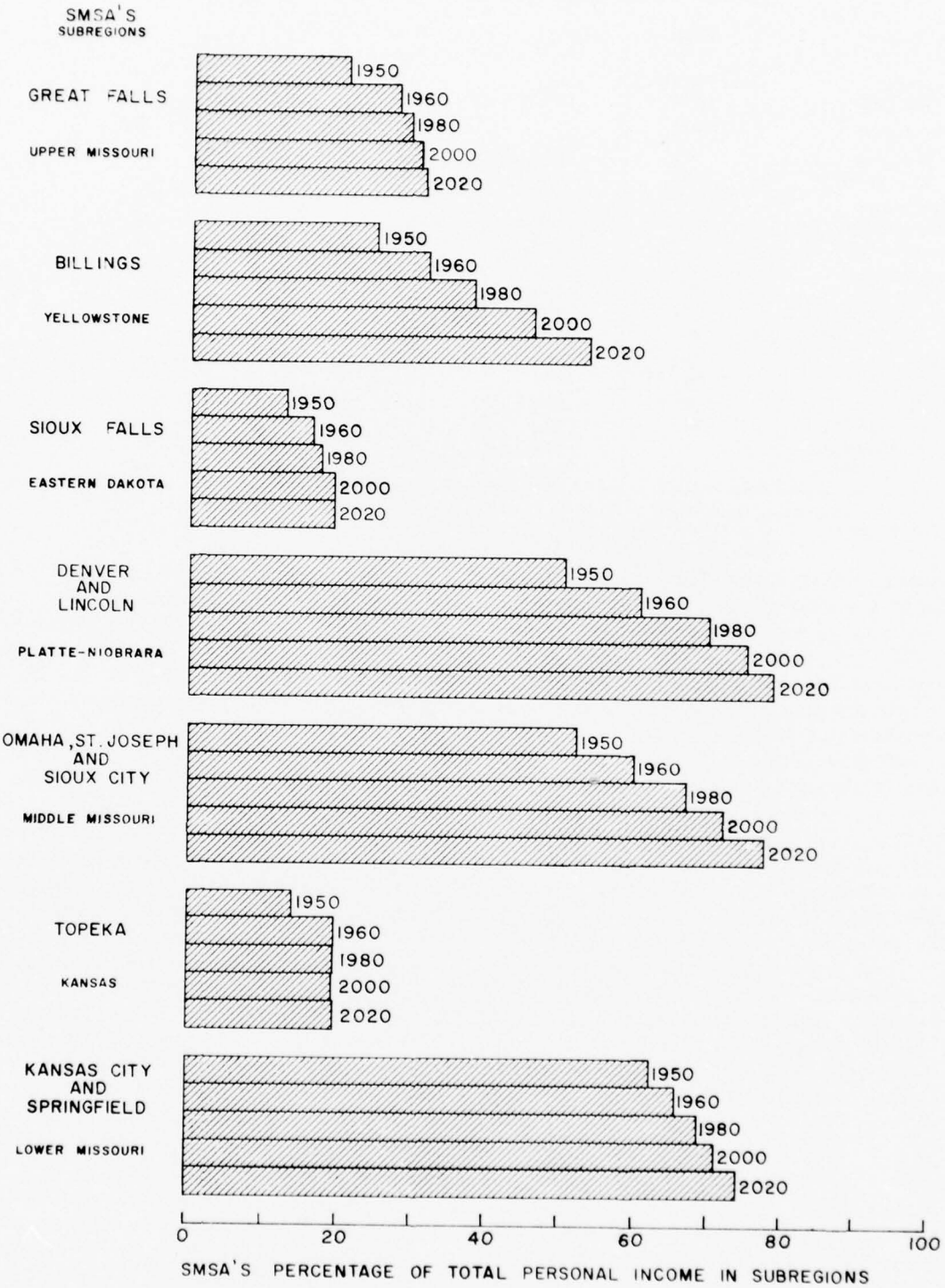


FIGURE 39

TOTAL PERSONAL INCOME, SMSA'S AS A PERCENTAGE OF SUBREGIONS
1950, 1960 AND PROJECTIONS FOR 1980, 2000 AND 2020 [1]



[1] COMPARABLE DATA NOT AVAILABLE FOR 1940. THERE ARE NO SMSA'S IN WESTERN DAKOTA TRIBUTARIES SUBREGION.

Table 41 — PERSONAL INCOME PER CAPITA BY SUBREGION AND SMSA AS A PERCENT OF NATIONAL AVERAGE, HISTORICAL AND PROJECTIONS
(NATION = 100)

Area	1940	1950	1960[1]	1980	2000	2020
Subregions and SMSA's						
Upper Missouri	95.8	120.5	92.5	97.7	97.5	100.2
Great Falls SMSA	117.3	124.1	105.2	97.6	97.3	100.3
Yellowstone	92.7	99.0	90.9	97.7	97.4	97.2
Billings SMSA	105.3	106.8	102.2	103.8	102.6	99.6
Western Dakota	59.2	81.1	72.7	87.5	90.7	99.1
Eastern Dakota	59.8	78.6	66.8	84.3	86.3	91.0
Sioux Falls SMSA	86.8	96.1	85.2	97.7	98.6	100.3
Platte-Niobrara	2	105.0	100.8	103.0	99.9	98.9
Denver SMSA	117.5	115.6	113.7	109.8	102.5	99.4
Lincoln SMSA	92.9	100.7	98.9	99.9	99.8	100.0
Middle Missouri	2	100.4	91.8	98.3	97.8	98.4
Omaha SMSA	92.7	115.4	111.4	110.6	103.6	102.1
Sioux City SMSA	100.1	111.8	99.8	102.5	100.9	99.8
St. Joseph SMSA	100.3	105.9	104.7	102.8	100.9	99.7
Kansas	61.2	89.8	89.0	95.8	95.9	95.6
Topeka SMSA	86.9	102.4	114.3	108.6	102.4	99.6
Lower Missouri	76.6	90.2	92.0	95.1	96.1	96.8
Kansas City SMSA	109.4	120.3	114.3	107.9	105.0	102.7
Springfield SMSA	77.5	86.3	89.3	96.2	96.7	98.2
Missouri Region	77.3	95.2	90.9	97.1	96.8	97.4

[1]1960 population and 1959 income
[2]Not available

The importance of Standard Metropolitan Statistical Areas as areas of economic growth within their respective subregions is illustrated in figure 39. In predominantly rural, agricultural subregions, such as the Upper Missouri, Eastern Dakota and Kansas subregions, the projected change of 3 percent or less from 1960 to 2020 illustrates that the total personal income of the SMSA's will grow at almost the same rate as their respective subregions. In the four other subregions having SMSA's, the growth in total personal income of the SMSA's is greater than the balance of their respective subregions and becomes a greater relative share. By 2020, about 80 percent of the total personal income in the Platte-Niobrara, Middle Missouri, and Lower Missouri subregions will accrue in the SMSA's. The greatest change projected to take place is found in the relative importance of the Billings SMSA to the Yellowstone Subregion. Total personal income in Billings, like the combined Denver-Lincoln SMSA's in the Platte-Niobrara Subregion, is projected to increase about 17.4 times between 1960 and 2020.

Earnings

Earnings per employee for the Missouri Region, the individual subregions, and 11 SMSA's as a percent of the national average are shown in table 42. In 1940, two subregions, the Upper Missouri and Yellowstone, were above the national average in earnings per employee. In 1950, earnings per employee in the Upper Missouri Subregion were about 25 percent above the national average, while the Yellowstone was joined by the Platte-Niobrara and the Middle Missouri in exceeding the national figure. For 1960, none of the subregions equaled the Nation for average earnings per employee. The Kansas Subregion experienced the greatest gain in earnings per employee from 1940 to 1960, 82.5 percent; the Upper Missouri, the least gain, 33.3 percent. This compares to 61.1 percent for the region and 51.5 percent for the Nation. As a whole, the region ranged from 4 to 17 percent below the national average earnings per employee during the 3 historic years. This was slightly less than the range shown in personal income per capita.

Total earnings as a percentage of total personal income were 77.9 percent in 1960 for the region, increasing to 79.6 percent by 1980 and declining to the 1960 level by 2020. Among the eight subregions in 1960, earnings ranged from 72.1 percent of total personal income for the Kansas Subregion to 80 percent for the Yellowstone Subregion. Projected for 1980 is a high of 81 percent in the Eastern Dakota to a low of 76.9 for the Kansas Subregion.

By 2000, the Western Dakota Subregion is projected to have the highest percentage of earnings (81 percent) of total personal income, while the lowest ratios are found in the Upper Missouri with 73.9 percent, and the Kansas Subregion with 73.8 percent. Very similar positions are projected to occur by 2020, with the

Table 42 – EARNINGS PER EMPLOYEE BY SUBREGION AND SMSA, AS PERCENT OF NATIONAL AVERAGE, HISTORICAL AND PROJECTIONS
(NATION = 100)

Subregion and SMSA	1940	1950	1960[1]	1980	2000	2020
Upper Missouri	104.3	125.3	91.7	97.7	95.2	95.0
Great Falls SMSA	119.1	110.6	90.8	97.6	95.2	95.0
Yellowstone	105.1	108.0	96.3	99.3	98.5	100.4
Billings SMSA	116.1	109.3	103.4	103.2	101.0	101.6
Western Dakota	72.4	87.2	75.3	92.2	99.7	108.5
Eastern Dakota	69.4	83.9	70.0	88.1	92.0	95.6
Sioux Falls SMSA	84.1	86.6	84.9	97.6	99.6	99.6
Platte-Niobrara	[2]	102.2	97.0	98.9	97.2	96.1
Denver SMSA	111.6	104.6	107.6	104.9	100.2	97.0
Lincoln SMSA	89.7	91.5	81.4	88.4	90.5	93.2
Middle Missouri	[2]	102.9	91.7	97.4	96.7	96.1
Omaha SMSA	102.8	108.4	107.6	106.3	100.9	98.5
Sioux City SMSA	105.6	110.4	97.8	101.7	99.6	98.2
St. Joseph SMSA	103.1	105.3	103.7	102.4	100.6	98.3
Kansas	66.0	88.3	79.5	89.6	88.7	88.2
Topeka SMSA	85.5	95.4	97.7	97.5	91.3	88.7
Lower Missouri	81.0	89.3	89.0	92.5	95.6	96.5
Kansas City SMSA	100.9	110.1	110.4	105.3	103.4	101.6
Springfield SMSA	86.1	87.3	89.8	93.9	96.9	98.9
Missouri Region	83.5	95.8	88.7	94.8	95.6	96.0

[1]1960 population and 1959 earnings
[2]Not available

Western Dakota at 80.9 percent, Upper Missouri at 72.3 percent, and the Kansas Subregion at 73.5 percent.

Generally, the level of earnings per employee in the region for 1960 and projected years is lower than the national average. While the region level of personal income per capita was 90.9 percent of the national level in 1960, the region's average earnings per employee was 88.7 percent of the national average for the same year. Earnings per employee in the Platte-Niobrara Subregion in 1960 were nearest the national average, followed by Yellowstone, but the other subregion averages fell somewhat below the national average. The Upper Missouri, Middle Missouri, and Lower Missouri subregions averages were also above the region average of 88.7 percent of the Nation. Average earnings per employee in the other three subregions were substantially lower than the 1960 national average: Western Dakota, 75.3 percent; Eastern Dakota, 70.0 percent; and Kansas, 79.5 percent. Projections indicate that by 1980 average earnings per employee in the region will increase to 94.9 percent of the national average. The same three subregions plus the Lower Missouri will be below the region average. Projections for 2000 show that earnings in seven of the subregions will be 95 percent or more of the national average earnings per employee. The Western Dakota Subregion is projected to make the greatest gain over 1960, attaining the highest level in the region, 99.7 percent of the national average. The Eastern Dakota Subregion, with 92.0 percent of the national average, and the Kansas Subregion, with 88.7 percent, remained the lowest in the region. By 2020, earnings per employee in the Yellowstone and Western Dakota subregions should exceed the national average. The Kansas Subregion is projected to remain substantially below the national average earnings per employee, 88.2 percent.

The SMSA's also exhibit a tendency to be less like the Nation in earnings per employee than in per capita income. For 1960, five of the SMSA's, Billings, Denver, Omaha, St. Joseph, and Kansas City, exceeded the national average. The Lincoln and Sioux Falls SMSA's, with 81.4 and 83.9 percent, respectively, were the only SMSA's to have lower average earnings per employee than the region average. Projections indicate that in 1980 Sioux City will exceed the national average in earnings per employee, but that in 2000 it will be slightly below the national average. In 1980, only two SMSA's fall below 97 percent of the national average; Lincoln, with 88.4 percent, and Springfield, with 93.9 percent. Lincoln continues to improve its level by 2000, but Topeka is projected to drop to nearly the same level as Lincoln, about 91 percent of the national average. Only the Billings and Kansas City SMSA's are projected to be above the national average by 2020, each with 101.6 percent. Billings, Lincoln, and Springfield improve their 2020 position over 2000. Sioux Falls retains its relative position, while all other SMSA's decline slightly, except Topeka SMSA which continues its decline to 88.7 percent of the national level for 2020.

Farm Income

Gross farm income in the region is projected to increase by approximately 278 percent during the period

1960-2020 (table 43 and figure 40). The projected increase in the region is somewhat greater than in the Nation. In the 1959-61 period, gross farm income in the region represented about 14 percent of the United States gross farm income. By 2020, this share is projected to increase to 15 percent.

Table 43 – GROSS FARM INCOME BY SUBREGION, 1959-'61 AVERAGE AND PROJECTIONS[1]

Subregion	Estimated 1959-61 Average	Projections		
		1980	2000	2020
	($ Million)			
Upper Missouri	314	390	513	669
Yellowstone	172	253	352	494
Western Dakota	279	452	595	799
Eastern Dakota	655	1,066	1,425	1,922
Platte-Niobrara	802	1,616	2,206	3,060
Middle Missouri	1,451	1,810	2,456	3,376
Kansas	790	1,250	1,636	2,183
Lower Missouri	836	1,217	1,633	2,238
Missouri Region	5,300	8,054	10,816	14,741

[1] Projections are in terms of 1959-61 average prices.

PRODUCTION

Agricultural Production

Projections of the Missouri Region's agricultural economy were built upon the national projections of agricultural production requirements. Once the national agricultural requirements were projected, shares were allocated to the individual producing areas of the United States. The region's share of projected national requirements for feed grains, food crops, livestock, forage, and livestock was determined by projecting regional historic shares. The share allocated to the region was generally favorable as compared to the Nation. Production requirements for feed grain in the region are projected to increase faster than national feed grain requirements, meaning that the region's share is expected to be greater in the future. Projected total production requirements for all crops, except oats, barley, flaxseed, and potatoes, show substantial increases, at least double the current level by 2020.

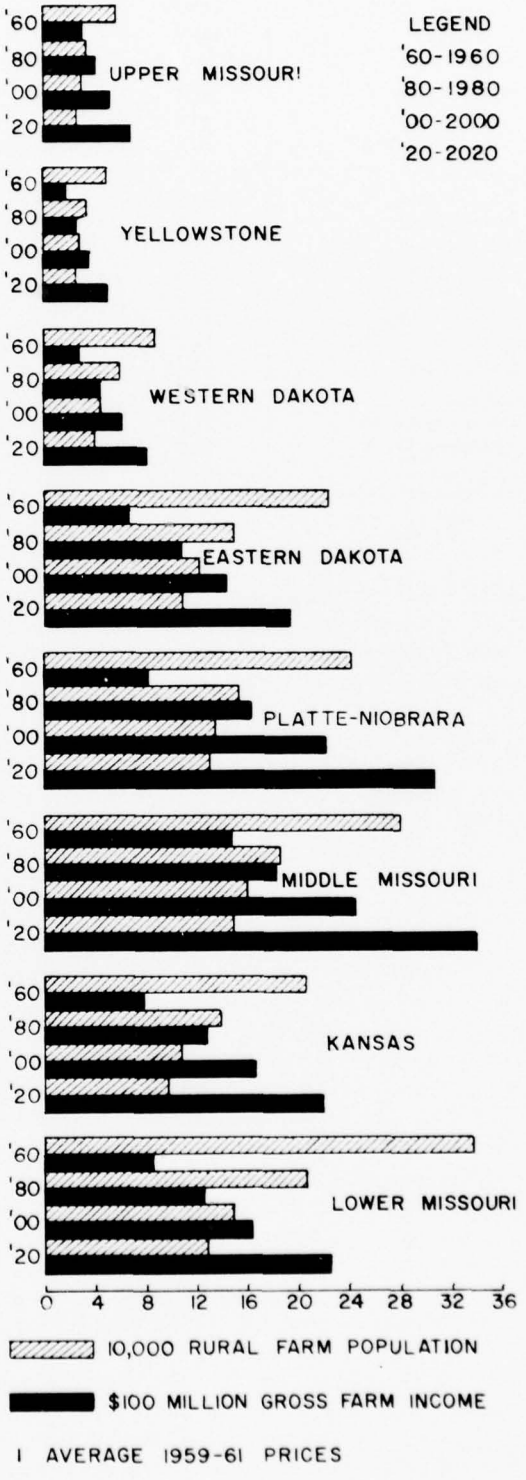
Increases in livestock and livestock product requirements in the region are projected at slightly lower rates than nationally. National requirements for poultry, poultry products, and dairy products are projected to increase substantially faster than the corresponding increase in the region. The production of agricultural commodities for the Nation from 1959 to 1961, with projections to 2020, is shown in table 44.

Forestry Production

Both the quantity and quality of standing timber are of fundamental importance in appraising the Nation's

FIGURE 40

RURAL FARM POPULATION AND GROSS FARM INCOME, MISSOURI RIVER SUBREGIONS, 1960, 1980, 2000 AND 2020 [1]



Significant Inputs to the Agricultural Economy of the Missouri River Basin Are Obtained Through Irrigation and Large Cattle Feeding Operations.

forest situation. Timber inventories represent not only the reservoir of basic raw material from which forest industries must draw their current and future requirements, but they also represent the base for future growth and future forest industry and products.

Total output of timber products in the Missouri Basin increased about 13 percent from 1952 to 1962. This was less than the rise in wood consumption in the United States, which was about 17 percent. Timber harvested in the basin during 1962 was only about one-half of the desired harvest, thus increasing reserve inventory for future harvesting.

In view of an increasing supply of suitable species and raw wood products and of increasing local and national demands for them, a major increase in the production of forest products is anticipated over the next 50 years. Output of saw and veneer logs is expected to increase from about 72 million cubic feet in 1962 to approximately 137 million by 2020. Output of pulpwood and other miscellaneous industrial wood products is expected to increase from 25 million cubic feet in 1962 to 243 million by 2020. Fuelwood will continue its rapid decrease, dropping from 41 million cubic feet in 1962 to 18 million by 2020.

The assumed sawtimber cut in these projections will allow inventory volumes and growth to increase over the projection period. The cut of sawtimber is projected to rise from 554 million board feet in 1962 to 1,365 billion by the year 2020. This will almost equal sawtimber growth by 2020, but during the projection periods the inventory will have increased by 11 billion board feet. Total timber cut is expected to increase from about 104 million cubic feet in 1962 to about 400 million cubic feet by 2020. If good timber management is practiced most of this period, timber cutting may well increase more.

The Lower Missouri Subbasin, with 41 percent of timber output in 1962, will continue to be the major producer, but its share of Missouri Basin output is projected to decline to 31 percent. The Upper Missouri Subbasin, with 16 percent of the output, is projected to increase relatively, from 14 percent of the output in 1962 to 20 percent by 2020.

Most of the forest product industries are located near forested areas in the western and southeastern portions of the region and the Black Hills area of the Western Dakota Subregion. Employment in primary wood-using manufacturing plants and forest-based industries will increase gradually during the study period. To meet requirements of the forest industries, employment in forest management and in timber harvest will increase at about the same rate as shown in figures 41 and 42.

Employment in timber-based manufacturing is projected to increase from about 22,000 in 1962 to 51,500 by 2020. Employment in timber harvesting is expected to increase from 5,100 to 9,600 during the same period.

New Growth For Future Uses.

FIGURE 41

INCOME (PAYROLL) DERIVED FROM TIMBER PRODUCTS

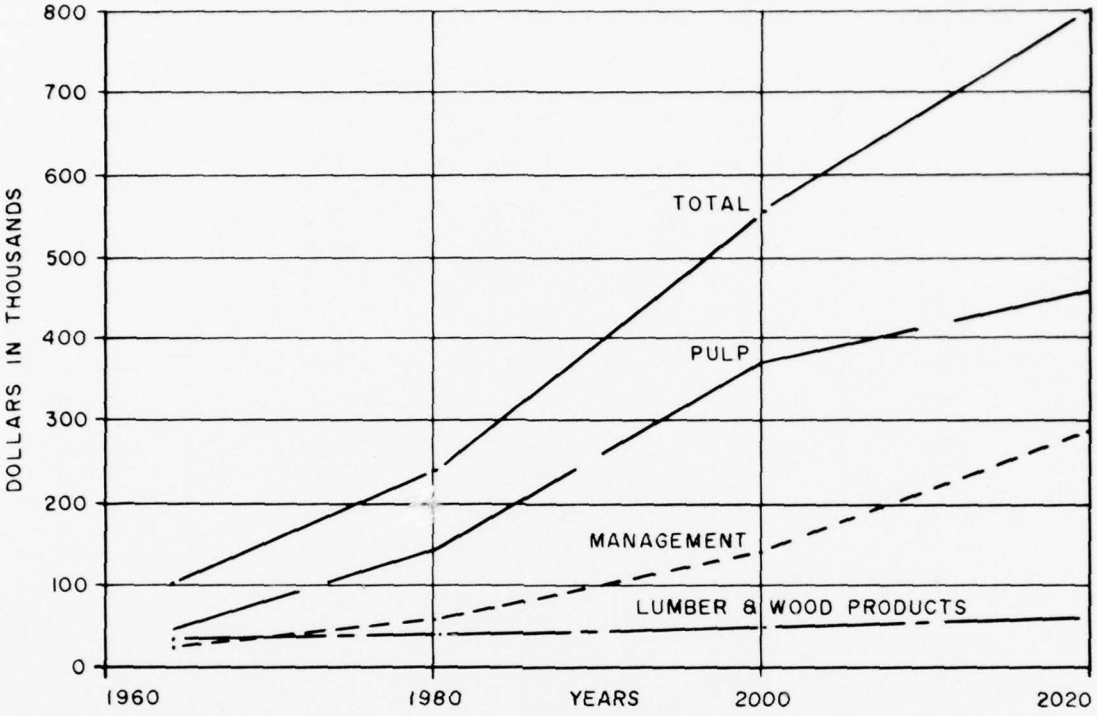


FIGURE 42

EMPLOYMENT IN TIMBER BASED MANUFACTURING

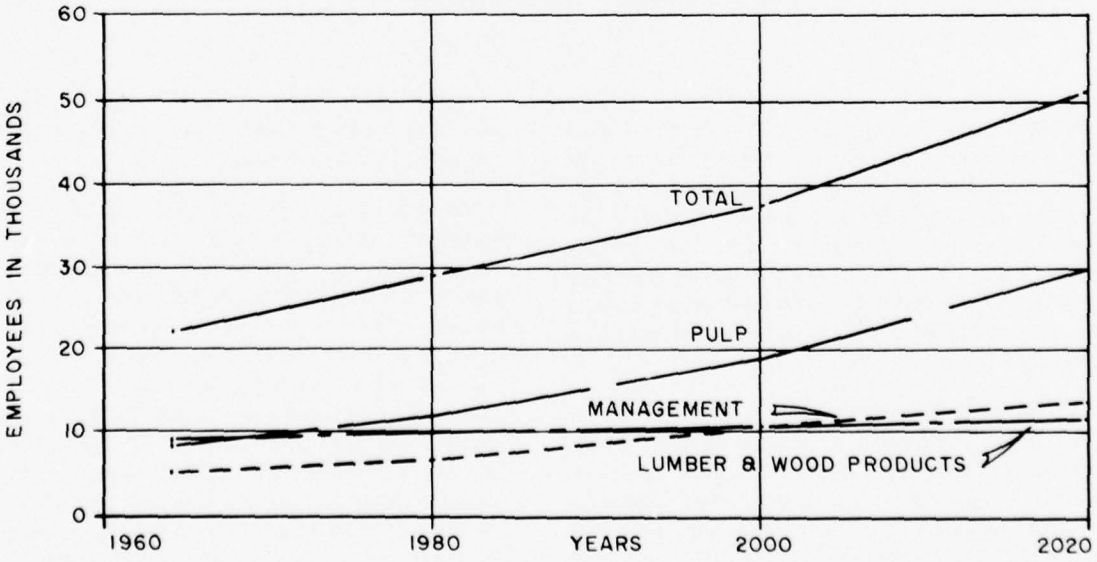


Table 44 – CURRENT NORMAL PRODUCTION AND PROJECTED AGRICULTURAL REQUIREMENTS MISSOURI REGION

Item	Unit	CN[1]		1980		2000		2020	
		Regional Production	% of Nation	Regional Production	% of Nation	Regional Production	% of Nation	Regional Production	% of Nation
	(Thousand)								
Corn	Bu.	845,784	22.0	1,179,679	22.5	1,559,179	22.5	2,077,321	22.5
Oats	Bu	218,645	21.1	263,250	22.8	244,750	22.8	180,438	22.8
Barley	Bu.	128,060	29.1	121,917	23.2	124,250	23.2	116,250	23.2
Sorghum	Bu.	184,993	30.7	324,250	34.4	501,036	34.4	770,036	34.4
Wheat	Bu.	430,855	35.9	635,300	33.6	737,000	33.6	880,300	33.6
Rye	Bu.	13,258	38.8	16,912	41.5	22,379	41.5	30,111	41.5
Soybeans	Bu.	86,269	12.7	115,077	8.5	144,648	8.8	186,558	8.8
Potatoes	Cwt.	8,950	3.2	6,775	2.1	9,273	2.1	12,924	2.1
Sugar Beets	Ton	5,751	29.3	10,936	28.7	17,938	28.7	27,787	28.7
Fruits, Non-citrus	Ton	39	0.4	54	0.4	77	0.4	111	0.4
Vegetables	Cwt.	4,030	1.0	5,780	0.9	7,930	0.9	10,954	0.9
Flaxseed	Bu.	13,457	50.0	9,917	44.0	12,902	44.2	17,036	44.2
Dry Edible Beans	Cwt.	3,542	18.4	4,334	18.5	5,725	18.5	7,684	18.5
Corn Silage Equiv.	Ton	25,448		29,148		34,324		46,059	
Alfalfa Hay Equiv.	Ton	22,628		24,080		27,220		37,007	
Wild Hay	Ton	5,612		5,895		7,202		7,725	
Grazing	(Million) F.U.[2]	59,801		63,033		86,786		92,234	
	(Million)								
Beef & Veal	Lb.	8,107	26.0	11,583	24.4	16,252	24.4	22,833	24.4
Lamb & Mutton	Lb.	478	31.9	506	29.8	708	29.8	992	29.8
Pork[3]	Lb.	4,678	22.6	5,858	21.6	8,089	21.7	11,222	21.6
Chickens[3,4]	Lb.	208	2.5	182	1.5	250	1.5	346	1.5
Turkeys[3]	Lb.	155	9.3	215	6.0	296	6.1	409	6.1
Milk	Lb.	9,780	7.8	9,910	6.8	13,573	6.8	18,733	6.8
Eggs	Each	7,060	11.2	6,148	8.1	8,471	8.1	11,745	8.1

1 The term "current normal (CN)" is a computed weighted average of crop yields, total agricultural production, and farm prices. These values are based on historical data for the period 1939-'63 and adjusted by progressive weighting for each successive year. It thus reflects the impacts of weather and other hazards, and also by the process of progressive weighting reflects the trend of improved technology. Current normal production is indicated to be about 7 percent above current requirements.

2 A Feed Unit (F.U.) is the value of one pound of corn or its equivalent.

3 Live-weight basis.

4 Includes broilers.

By 2020, nearly 50 percent of the total manufacturing employment will be in mills producing pulp, paper, and allied products. This contrasts with the 34 percent employed in this category in 1962. The remaining employees are projected to be divided nearly equally between lumber and wood products plants and timber harvesting (table 45). Over half of the forestry employment will be in the Lower Missouri Subregion (table 46).

The national demand for forest products in the United States is expected to increase by one-third by 1980 over the 1962 use. Projections from the same base indicate a 200-percent increase in demand by 2000 and a 300-percent increase by 2020. In the Missouri Basin, the 1962 timber cut (demand) was 104,197 cubic feet. Projections for the basin show a demand of over 196,000 cubic feet by 1980, 305,700 cubic feet by 2000, and 401,400 cubic feet by 2020 (Statistical Supplement C, Table C-11).

Net annual growth and, therefore, total supply available is expected to increase at about the same rate as the timber cut. This indicates that demand can be supplied from growth throughout the study period. However, much of the present inventory is of low quality for wood product use. Forest management programs will be needed to upgrade the quality and increase the annual growth through 2020. When these programs are put into practice, it should not be necessary to increase land use for timber production purposes. Other forestry benefits and uses of forestry production and programs will include water yield improvement, land resources protection, fisheries and wildlife habitat enhancement, recreation developments, and general environmental enhancement.

Table 45 – EMPLOYMENT IN TIMBER-BASED MANUFACTURING INDUSTRIES BY PRODUCT, HISTORICAL AND PROJECTIONS, MISSOURI REGION

Product	1952	1962	1980	2000	2020
			(Thousand)		
Lumber and Wood Products[1]	7.8	8.9	10.3	10.9	11.9
Sawmills and Planing Mills	(4.2)	(4.4)	(4.8)	(4.6)	(4.5)
Veneer and Plywood Plants	(0.1)	(0.1)	(0.3)	(0.5)	(0.6)
Other	(3.5)	(4.4)	(5.2)	(5.8)	(6.8)
Pulp, Paper and Allied Products[2]	6.3	8.2	12.0	19.0	30.0
Timber Harvesting[3]	6.0	5.1	6.7	8.0	9.6
Missouri Region	20.1	22.2	29.0	37.9	51.5

1 Includes employment at veneer and plywood plants, sawmills, shingle mills, cooperage stock mills, and planing mills engaged in producing lumber and wood basic materials; and establishments engaged in manufacturing finished articles made entirely or mainly of wood. (Major group 24 excluding code No. 241 as defined by the Bureau of the Census.)

2 Includes employment at establishments manufacturing pulp primarily from wood and from rags and other fibers, converting these pulps into paper or board, and the manufacture of paper and paperboard into converted products such as coated paper, paper bags, paperboard boxes, and envelopes. (Major group 26 as defined by the Bureau of the Census.)

3 Includes employment in timber harvesting derived by dividing output of each product by annual output per employee. This includes the employment reported by S. I. C. Code No. 241.

Table 46 – EMPLOYMENT IN TIMBER-BASED MANUFACTURING INDUSTRIES BY SUBREGION HISTORICAL AND PROJECTIONS

Subregion	1962	1980	2000	2020
Upper Missouri	890	1,635	1,720	1,585
Yellowstone	829	950	885	830
Western Dakota	1,388	1,550	1,530	1,425
Eastern Dakota	250	250	270	290
Platte-Niobrara	3,514	5,875	7,160	9,395
Middle Missouri	2,820	3,420	4,090	5,730
Kansas	940	1,040	1,270	1,450
Lower Missouri	11,520	14,230	20,990	30,790
Missouri Region	22,151	28,950	37,915	51,495

Mineral Production

Mineral output in the Missouri Region is projected to increase by 100 percent between 1960 and 1980, by 154 percent between 1980 and 2000, and by 220 percent between 2000 and 2020. By specific mineral groupings, the production value of fuels is projected to increase 1.4 times; nonmetals, 10-fold; and the production value of metals, 4-fold by 2020. Projected production values for minerals by individual mineral class and for individual subregions are shown in table 47.

Figure 43 illustrates the historical fluctuation of production by each mineral classification (metals, nonmetals, and fuels) between 1950 and 1963 and projected production levels for each of the 3 target years. The leveling-off in the projection of fuels production is due primarily to the exhaustion of the petroleum resources. At the same time, the projection is buoyed by expected increases in the production of coal.

The average value of mineral output per employee in the United States is shown in table 48. These projected values are based upon a linear extrapolation of the 1940-63 trend. The projected rate of increase in value of mineral output per employee, as shown in table 49, is probably conservative. Such projections are based upon an assumed one-percent-per year increase in productivity compared with a historical rate of 2 percent per year. The lower rate is more realistic in view of the increasing proportion of nonproduction workers within the mineral industries.

Table 47 – VALUE OF MINERAL PRODUCTION BY SUBREGION AND MINERAL GROUP HISTORICAL AND PROJECTIONS (THOUSANDS OF 1957-59 DOLLARS)

Subregion and Mineral Group	1960	1980	2000	2020
Upper Missouri	63,856	176,000	189,000	96,000
Yellowstone	303,338	720,000	666,000	550,000
Western Dakota	107,644	253,000	330,000	401,000
Eastern Dakota	35,485	68,000	108,000	167,000
Platte-Niobrara	243,350	454,100	638,900	946,000
Middle Missouri	27,955	63,500	134,500	249,000
Kansas	135,065	278,000	389,000	477,000
Lower Missouri	90,870	168,000	317,000	606,000
Undistributed	84,084	---	---	---
Missouri Region	1,091,647	2,180,600	2,772,400	3,492,000
Mineral Group				
Metals	74,954	105,000	181,000	286,000
Nonmetals	209,001	502,100	1,084,900	2,097,000
Fuels	807,692	1,573,500	1,506,500	1,109,000

FIGURE 43
MINERAL PRODUCTION VALUE, METALS, NONMETALS, AND FUELS, 1950 TO 1963 PROJECTIONS TO 1980, 2000, AND 2020

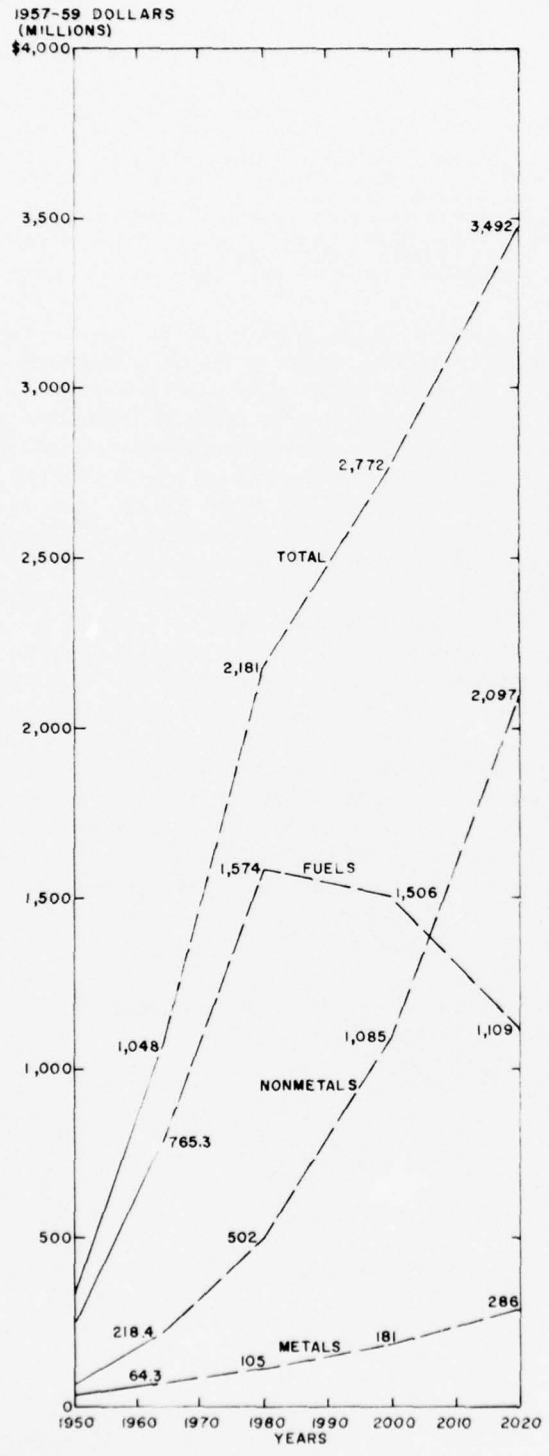


Table 48 – VALUE OF MINERAL PRODUCTION PER EMPLOYEE, UNITED STATES HISTORICAL AND PROJECTIONS (1957-59 CONSTANT DOLLARS)

Mineral Group	1950	1960	1980	2000	2020
Metals	$18,999	$20,289	$25,000	$30,000	$35,000
Nonmetals	23,165	31,228	50,000	67,000	84,000
Fuels	16,394	24,648	38,000	51,000	65,000

Table 49 – VALUE OF MINERAL PRODUCTION PER EMPLOYEE BY SUBREGION AND MINERAL GROUP, HISTORICAL AND PROJECTIONS (1957-59 CONSTANT DOLLARS)

Subregion and Mineral Group	1960	1980	2000	2020
Upper Missouri				
Metals	$18,823	$24,000	$29,000	$35,000
Nonmetals	33,629	49,000	66,000	84,000
Fuels	28,452	38,000	52,000	65,000
Yellowstone				
Metals	32,533	33,000	34,000	35,000
Nonmetals	13,771	37,000	61,000	84,000
Fuels	92,199	205,000	205,000	205,000
Western Dakota				
Metals	11,360	19,000	27,000	35,000
Nonmetals	26,370	46,000	65,000	84,000
Fuels	56,416	59,000	62,000	65,000
Eastern Dakota				
Nonmetals	22,617	49,000	66,000	84,000
Fuels	33,480	38,000	52,000	65,000
Platte-Niobrara				
Metals	10,414	19,000	30,000	35,000
Nonmetals	19,749	42,000	63,000	84,000
Fuels	45,542	52,000	58,000	65,000
Middle Missouri				
Nonmetals	35,642	52,000	68,000	84,000
Fuels	31,200	42,000	54,000	65,000
Kansas				
Nonmetals	15,856	39,000	61,000	84,000
Fuels	24,674	38,000	52,000	65,000
Lower Missouri				
Nonmetals	21,656	42,000	63,000	84,000
Fuels	15,988	32,000	48,000	65,000

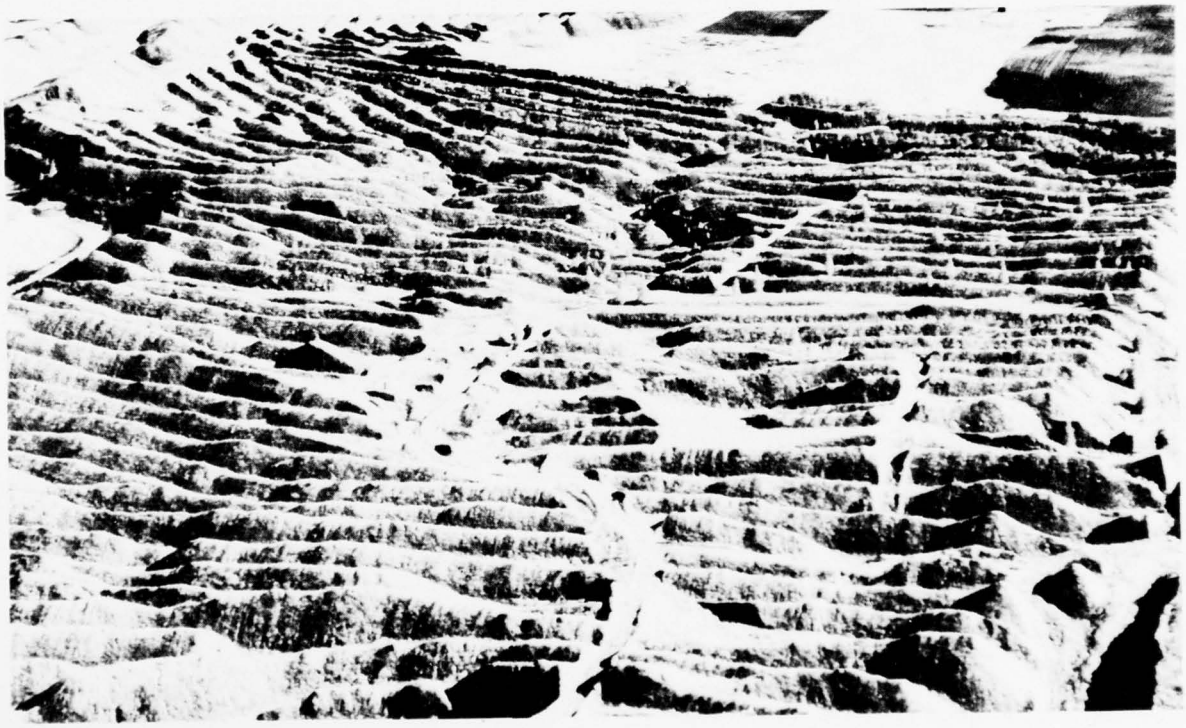
Recreation and Fish and Wildlife

The relative importance of the outdoor recreation and the fish and wildlife industries was discussed in the previous chapter. Available data do not permit a detailed sector-type analysis of the industries because the employment, personal income, and earnings generated by these industries are reported and accounted for in other noncommodity classifications. It is pertinent to consider some economic relevance of these industries within the region because they demand and depend on the development and utilization of significant quantities of water and related land resources.

Coal Reserves of the Missouri River Basin Represent about 55 Percent of the Nation's Known Recoverable Reserve. This Electric Powered Dragline with Its 19-Cubic Yard Bucket Removes Lignite From the Prairie of Western North Dakota.

In 1965 it is estimated that over $1 billion was spent for outdoor recreation within the Missouri Region, about one-half of this by nonresidents. The expenditures by nonresidents are comparable to a commodity-export industry that generates basic employment and income. Projected demands for outdoor recreation are developed in the appendix, "Present and Future Needs," by categories for each subregion. Assuming these demands are met, the annual expenditures for outdoor recreation are projected to be $1.7 billion by 1980, $2.8 billion by 2000, and $4.2 billion by 2020, with about half of these expenditures expected by nonresidents.

Expenditures for outdoor recreation generate employment, predominantly in the trades and services or noncommodity industries. It is estimated that in 1965 about 100,000 jobs were supported by outdoor recreation expenditures, and about one-half accrued from nonresidents. The projected Missouri Region employment associated with outdoor recreation activities is 160,000 by 1980, 260,000 by 2000, and 400,000 by 2020.



Coal Strip Mining

CHAPTER 5

ASSESSMENT OF DEVELOPMENT PLANS

Although needs developed from the projections of population, employment, and income served as guides in determining future levels of water and related land use, development, and investment, other purposes were recognized in the framework plan. In some instances, the plan proposes to provide goods and services beyond the needs of the original projections. In other cases, demand based on the original projections may not be completely fulfilled. Consequently, assessment of the framework plan must be related to the original projections in such a way to provide some measure of the expected deviation which might result from implementation of the framework plan

Details of the proposed comprehensive plan are discussed in the Appendix, "Plan of Development and Management of Water and Related Land Resources." The implementation of this comprehensive plan will be subject to the public decision-making process and to certain modifications through time and the political process. For evaluation purposes, in this chapter, the assumption is made that the framework plan will be fully implemented.

The original projections used in this study were influenced greatly by trends experienced during the period from 1940 to 1960. While the original projections were guided by growth experience, new trends and information evolving from the study provide a basis for modifications in the original projections which may improve the evaluation of the plan in relationship to needs and available resources. These modifications are discussed in the following section and the appropriate adjustments are shown so later assessment and evaluations may be measured from the modified base.

MODIFICATION OF ORIGINAL AGRICULTURAL PROJECTIONS

Studies of this scope and magnitude must be based on preliminary projections of economic activity for study purposes. The original projections, prepared in 1965, were based largely on historical data for the period 1940 to 1960. Disaggregation of the projections relied heavily upon trends of the same period. However, updating of historical data and later findings of the analyses assist in making estimates of future events in the Missouri Region. Without attempting to "reproject" the entire economic framework, modifications are important to this assessment of development plans.

The original projections of regional agricultural activity were disaggregated to subregions on the basis of constant percentage shares of commodity output. A subregional share of each regional commodity total was computed from the 1949, 1954, and 1959 Census of Agriculture. Trends in the base period were considered in a determination of the share of commodity totals used, but no attempt was made to project changing shares. Consequently, projected requirements, by commodities, were allocated to subregions in all time periods on the basis of these constant shares. Aggregation of the commodity shares produced the subregional levels of agricultural activity which determined the original subregion projections of agricultural employment, population, and income.

The original projections were produced in this manner for early planning which required population and employment data. The commodity totals, a necessary interim step, also furnished planning guides, preliminary to an inventory and analysis of projected water and related land resources and their utilization.

The analytical system developed during the study was designed to project agricultural activity based on land use and cropping patterns which might result if the resources were used to meet regional framework production levels as efficiently as possible, considering constraints based on historical information. The analytical model employed an inventory of land resources, current patterns of land use, costs of production, and estimates of production response in future time periods assuming a continuation of research, technology, land conservation, and fertilizer application. In the application of the model, shifts in future cropping patterns in response to economic forces could occur only as trends from current patterns of use at rates which did not exceed historical rates of change.[1]

[1] A detailed discussion of the model, its application, and the data used is included in chapter 2, "Present and Future Needs" Appendix.

This system was used to project crop distribution among the eight subregions which would most efficiently produce the regional framework projections of individual commodity requirements within the conditions specified. The projections are extensions of historical trends of individual commodities among the subregions, except they simultaneously considered the interaction of the total commodity mix within the physical constraint of resource capability. Production was assigned to the most efficient areas and some resource development was necessary to meet goals by 2020.

These modified projections are considered better estimates of subregional activity and thought to be within resource capability. The modified disaggregation of agricultural employment is shown in table 50 and compared to the original projections. The small differences among subregions between the agricultural projections originally used in planning and the modified agricultural projections shown will cause relative changes in total subregion employment and population, but not in the regional totals. The use of the modified projections in this evaluation will provide a consistent system throughout. Changes in economic activity in the agricultural sector in the rest of this chapter will be measured from the modified projections to remove from the system random variation caused by inconsistencies between employment and production data.

Table 50 – AGRICULTURAL EMPLOYMENT AND RURAL FARM POPULATION BY SUBREGION, 1960 AND ORIGINAL AND MODIFIED PROJECTIONS

Subregion	1960	Original Projections[1]			Modified Projections		
		1980	2000	2020	1980	2000	2020
	(Thousand)						
AGRICULTURAL EMPLOYMENT							
Upper Missouri	23	14.0	12.0	11.0	13.1	11.0	8.6
Yellowstone	18	11.0	9.0	9.0	11.4	9.0	7.6
Western Dakota	32	23.0	18.0	16.0	18.8	14.9	12.1
Eastern Dakota	81	57.0	46.0	41.0	53.8	43.0	39.6
Platte-Niobrara	93	60.3	52.4	50.7	56.1	47.0	45.3
Middle Missouri	93	60.7	51.6	48.3	62.2	52.0	46.6
Kansas	74	51.0	40.0	36.0	52.4	43.2	42.3
Lower Missouri	98	59.0	43.0	37.0	68.2	51.9	46.9
Missouri Region	512	336.0	272.0	249.0	336.0	272.0	249.0
RURAL FARM POPULATION							
Upper Missouri	56	33.0	29.0	26.0	30.6	25.7	19.9
Yellowstone	48	31.9	26.5	24.8	32.8	26.5	21.6
Western Dakota	87	57.1	45.1	40.2	46.1	36.6	29.4
Eastern Dakota	222	150.0	120.0	107.0	140.2	111.6	102.0
Platte-Niobrara	241	155.6	134.3	129.4	143.2	119.9	114.6
Middle Missouri	280	184.2	156.7	147.3	186.6	155.6	138.5
Kansas	205	136.0	107.0	95.0	138.5	114.0	110.6
Lower Missouri	333	205.1	149.5	126.9	234.9	178.2	160.0
Missouri Region	1472	952.9	768.1	696.6	952.9	768.1	696.6

[1] December 1965.

SECONDARY EFFECTS

Changes in the distribution of basic employment, such as those described for agriculture, would create changes in secondary employment. This study recognizes only four divisions of employment: Agricultural, manufacturing, other commodity-producing, and noncommodity-producing employment. Normally the three divisions of commodity-producing employment can be considered basic employment and the noncommodity-producing employment is secondary or derivative employment. When the service industries serve needs beyond the level of basic industry needs or the local population this portion can also be considered basic employment, such as serving nonresident recreationists.

In the absence of detail to determine the exact multiplier of direct employment increases and the relationship between direct and indirect employment, a multiplier or ratio between the noncommodity and commodity employment sectors as shown in table 51 was used. Distortion in the subregion multipliers shown may be because they are not oriented to economic areas, but are arbitrarily constituted to agree with drainage boundaries. A greater amount of change appears in those subregions having the smallest amount of population and the greatest proportion (38 to 52 percent) of agricultural employment in 1940: the Upper Missouri, Yellowstone, Western Dakota, Eastern Dakota, and Kansas subregions. These five subregions had less than a one-to-one ratio of noncommodity to commodity employment in 1940. By

Table 51 – RATIOS OF NONCOMMODITY-PRODUCING EMPLOYMENT TO COMMODITY-PRODUCING EMPLOYMENT BY SUBREGION AND UNITED STATES, HISTORICAL AND PROJECTIONS

Subregion	1940	1950	1960	1980	2000	2020
Upper Missouri	0.86	1.19	1.75	2.94	3.63	4.70
Yellowstone	0.87	1.19	1.66	2.67	3.51	4.10
Western Dakota	0.59	0.80	1.18	1.89	2.65	3.21
Eastern Dakota	0.71	1.06	1.16	1.95	2.50	2.81
Platte-Niobrara	1.34	1.58	1.89	2.27	2.69	3.03
Middle Missouri	1.06	1.17	1.44	1.88	2.18	2.33
Kansas River	0.93	1.13	1.81	2.45	3.10	3.54
Lower Missouri	1.10	1.22	1.65	2.03	2.32	2.51
Missouri Region	1.03	1.21	1.62	2.15	2.57	2.86
United States	1.02	1.18	1.42	1.79	2.09	2.30

1960 agricultural employment had decreased about 20 percent in all of the subregions, but remained more than 30 percent of the total employment in the Western Dakota and Eastern Dakota subregions. This, plus other changes in employment, resulted in substantial changes in the ratio, especially in the Upper Missouri and Yellowstone subregions. There appears to be about a 20-year lag in the ratio in half of the subregions. The change that took place in the ratios between 1940 and 1960 is largely the basis for projected change. Therefore, the projected ratios for the Upper Missouri, Yellowstone, Western Dakota, and Kansas subregions may be subject to question. The relatively small change in ratios during the historic period in the Eastern Dakota, Middle Missouri, and Lower Missouri subregions may have resulted in an understatement by 2020. If a small ratio, less than one-to-one, is a measure of immaturity in the economy, these areas may have been experiencing a catch-up process. It might seem logical, once achieving a ratio similar to the more mature areas, that their rate of gain would decelerate. The subregions having a more mature ratio in the historic period may have been penalized in the projection period.

Giving consideration to apparent shortcomings of using individual subregional ratios, the conclusion is that when adding employment in the basic or commodity-producing sectors, as suggested in the framework plan, the projected secondary or noncommodity-commodity-producing employment ratios projected for the region would be most appropriate to determine possible levels of total employment in all of the subregions. The use of these ratios would modify the difference which might otherwise appear if the same number of basic employees were added in two or more subregions. Also, this would compensate to some degree for the regenerative effect within the noncommodity sector itself.

Modifications of the original agricultural employment projections resulted in shifting moderate numbers of employment and population from certain subregions to other subregions, but did not change the region's total. Since the number of noncommodity-commodity-producing employees is related by ratio to the agricultural employees the same directional shifts are indicated, as shown in table 52, while the total number of employees in the Missouri Region does not change. This modification of the original projections probably accommodates most of the expected shifts in service industries associated agricultural employment. However, the analysis does not accommodate changes which might take place in other basic or related commodity-producing industries, such as the manufacture of food products. As with the modifications of agricultural employment shifts in related secondary employment the Upper Missouri, Western Dakota, Eastern Dakota and Platte-Niobrara subregions lost employment in all three projected years through the process of modification. The Yellowstone and Middle Missouri did not experience any projected losses over the original projection until 2020. Consistent with the losses in other subregions the Kansas and Lower Missouri subregions gained progressively more employment as a result of modifying the original projections.

ASSESSMENT OF POTENTIAL REGIONAL RESOURCE DEVELOPMENT

Adequate planning of future programs for water and related land resource use and development must consider

Table 52 – NONCOMMODITY–PRODUCING EMPLOYMENT BY SUBREGION 1960 AND ORIGINAL AND MODIFIED PROJECTIONS

Subregion	1960	Original Projections			Modified Projections		
		1980	2000	2020	1980	2000	2020
	(Thousand)						
Upper Missouri	69.1	103.0	138.0	188.0	101.1	135.4	181.1
Yellowstone	60.1	96.0	144.0	209.0	96.9	144.0	205.0
Western Dakota	56.4	85.0	122.0	170.0	76.0	114.0	158.9
Eastern Dakota	128.1	191.0	260.0	349.0	184.1	252.3	345.0
Platte-Niobrara	494.6	844.3	1,333.0	2,068.1	835.3	1,319.2	2,052.7
Middle Missouri	285.1	370.7	493.0	659.9	373.9	494.0	655.0
Kansas	221.3	297.0	403.0	535.0	300.0	411.2	553.0
Lower Missouri	531.1	792.0	1,131.0	1,618.0	811.7	1,153.9	1,646.3
Missouri Region	1,845.8	2,779.0	4,024.0	5,797.0	2,779.0	4,024.0	5,797.0

all foreseeable changes, both public and private. The framework plan, as presented in the Appendix, "Plan of Development and Management of Water and Related Land Resources," is divided into several resource development categories: Specified non-Federal programs and modifications or additions to existing water and related land developments; surface water control and related land developments; and environmental enhancement and nonstructural measures. Analysis of an array of programs, policies, and proposals must evaluate the output potential and cost of these elements and relate this output level to that required to support the original projections.

In most cases, functional demands for goods and services are fulfilled with the framework plan to the extent that little dampening of projected growth is expected from any shortage of resource capability. Outdoor recreation is an exception and not all of the demand for such recreation was met in the Platte-Niobrara and Middle Missouri subregions. The shortage, however, is very similar to shortages in the historical period on which the original projections were based. For this reason, no attempt was made to predict or evaluate any dampening of economic activity in these subregions due to the unmet recreation demand.

The framework plan recognized potential resource capability to support levels of economic activity which exceed those in the original projections for agriculture, outdoor recreation, and mining and related manufacturing. This potential is included in the framework plan in response to many objectives considered to be of prime importance to the residents of the region. These include the development and preservation of natural resources, alleviation of economic losses, maintenance and improvement of the physical and social environment, stabilization of production and income, perpetuation of economic family farm units, and the general stability of the region's economy founded heavily on agriculture.

Realization of this potential by implementation of the framework plan assumes a market for the output not contained in the regional share of the national projections. Development of this region's resource potential under the framework plan in response to regional social and economic goals is also compatible with national objectives if inter-regional or national adjustments take place to provide markets for the output.

Final estimates of the real departure from the national objectives, as measured by the Missouri Region's share of national demands, must await completion of estimates for all regions. In the interim, the Missouri Region projections represent the only measurement device with which to relate this study effort to national projections and similar results from other regions. Therefore, the importance of this analysis is to demonstrate a projected level of output in the region and indicate some of the costs of achieving this output rather than considering the regional requirements as a fixed, inflexible level of demand. Realization of these potentials will occur ultimately as a result of the interregional interaction of relative efficiencies, social and environmental considerations, national policy, and regional endeavor which will produce a changing pattern of regional activity within national demands for goods and services.

Agriculture

The economic structure of the Missouri Region in the projections was based upon certain historical and current relationships between agriculture and the total economy and among agricultural production, employment, income, and rural farm population. The projections as related to agricultural employment and population have been previously discussed in this appendix. Further details of this analysis, as they relate to production, resources, and problems are contained in the Appendix, "Present and Future Needs." Details of the land inventory and analysis are discussed in the Appendix, "Land Resources Availability." Each of these discussions is a part of one consistent analysis and presentation of the agriculture sector of the region's economy which was instrumental in shaping the proposed elements of the framework plan. The material covered in these appendices will not be repeated here, but it is fundamental to the evaluation which follows.

As a basis for measurement, projected agricultural production, as shown in the Appendix, "Present and Future Needs," was multiplied by current normal prices and converted to bushels of corn equivalents to reduce the many and varied mixes of commodities to a common measure of output.[1] Projected requirements and all of the elements of the framework plan which affect agricultural output were similarly evaluated. The results are summarized in table 53. Full implementation of the framework plan will furnish the regional share of projected national requirements for agricultural products as well as providing a potential source of basic activity that exceeds levels of production envisioned in the original projections. The need for additional resource development by 2020 is shown in table 53 (see also Statistical Supplement, Section B, for subregion summaries).

[1] Livestock production is held constant at the framework projection level throughout the analysis. Since feed grains are exported from the basin in all situations, it is assumed that alternate development strategies which vary the supply of feed grains will only change the export level and will have little effect on projected livestock totals in the Missouri Region.

Table 53 – AGRICULTURAL PRODUCTION CAPABILITY, MISSOURI REGION
CURRENT NORMAL AND PROJECTIONS

Item	Current Normal		1980		2000		2020	
	Item[1]	Total[2]	Item[1]	Total[2]	Item[1]	Total[2]	Item[1]	Total[2]
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE[3]		3,572						
Research, technology, land use efficiency, land conservation, and land shifts			1,203		2,281		3,413	
PROJECTED PRODUCTION[3]				4,775		5,853		6,985
Flood Control			36		81		150	
Group Drainage			2		7		11	
Gully Stabilization			5		30		56	
Irrigation								
Private Ground Water Development			129		318		700	
Private Surface Water Development			34		109		256	
Public Project Development			37		115		212	
Improvement in Existing Systems			22		54		108	
Reserve Idle Remaining	248		289		277		0	
Production Losses[4]								
Fish and Wildlife			-11		-17		-23	
Miscellaneous			-1		-2		-2	
Recreation			-8		-25		-47	
Reservoir Construction			-28		-60		-81	
WITH FULL IMPLEMENTATION OF THE FRAMEWORK PLAN		3,820		5,281		6,740		8,325
PROJECTED REQUIREMENTS		3,572		4,775		5,853		7,395
RATIO: Capability to Requirement		1.07		1.11		1.15		1.13

[1]Cumulative by time period.
[2]Cumulative among and within time periods
[3]From Present and Future Needs Appendix.
[4]Losses due to shifts of land use from cropland to purposes indicated.

Agricultural employment was projected originally to decline from 512,000 in 1960 to 336,000 by 1980, a loss of 176,000 farm workers in the original projections. Further declines of 64,000 and 23,000 were projected for the 1980 through 2000 and the 2000 through 2020 periods respectively, or a total decline of 263,000 between 1960 and 2020. Assuming that the same relationship exists between this additional agricultural production and agricultural employment as that reflected in the original projections, the agricultural output associated with full implementation of the framework plan will slow this decline during the projection period. If markets are available for the output, the framework plan would reduce losses in agricultural employment in the Missouri Region 28,000 by 1980, 27,000 by 2000, and 15,000 by 2020, as shown in table 54. This development could mean the retention of 86,000 people in rural areas during the 1960 through 2000 period and 47,000 in 2020.

In addition to those agricultural resource potentials included in the framework plan, a potential for conversions of 20 million acres of cropland currently used for pasture and range to cultivation is discussed in the Appendix, "Land Resources Availability." While such land is physically capable of cultivation under proper management without deterioration, it is economically submarginal at current prices. Nevertheless, at a cost, the production from such land could be intensified. Conversion of this land to cultivation could increase the productive capability of the region by an additional 355 million bushels of corn equivalents by 1980, 407 million by 2000, and 458 million by 2020. It is estimated that this intensified production could create or retain employment opportunities for 23,000 agriculture employees by 1980, 15,000 by 2000, and 10,000 by 2020. Such employment levels, could mean the retention of an additional 59,000 people in rural areas by 1980, 38,000 by 2000, and 26,000 by 2020.

Outdoor Recreation

An appraisal of the potential for outdoor recreation development in the Missouri Region is related to the capability of outdoor recreation resources. The Appendix, "Present and Future Needs," presents projections of the capability of the resources (supply) and estimated demand for outdoor recreation divided into the three categories of fishing, hunting, and other recreation days. With the exception of the Platte-Niobrara and the Middle Missouri subregions, all others have some projected surplus of outdoor recreation in at least one category in some time periods. In addition, implementation of the framework plan will further enhance the capability of the resources to support outdoor recreation through benefits incidental to the main purpose of plans components.

Table 54 – ADDED BASIC AGRICULTURAL EMPLOYMENT AND RURAL FARM POPULATION WITH INCREASES WHICH MAY RESULT FROM FULL IMPLEMENTATION OF THE FRAMEWORK PLAN BY SUBREGION – PROJECTIONS

Subregion	Modified Projection			With Full Implementation of the Framework Plan			Increase Above Modified Level		
	1980	2000	2020	1980	2000	2020	1980	2000	2020
	(Thousand)								
AGRICULTURAL EMPLOYMENT									
Upper Missouri	13.1	11.0	8.6	14.0	12.0	9.5	.9	1.0	.9
Yellowstone	11.4	9.0	7.6	13.4	10.1	9.3	2.0	1.1	1.7
Western Dakota	18.8	14.9	12.1	19.6	16.5	13.0	.8	1.6	.9
Eastern Dakota	53.8	43.0	39.6	56.7	48.2	42.2	2.9	5.2	2.6
Platte-Niobrara	56.1	47.0	45.3	61.8	52.5	48.3	5.7	5.5	3.0
Middle Missouri	62.2	52.0	46.6	65.5	54.5	48.3	3.3	2.5	1.7
Kansas	52.4	43.2	42.3	57.1	48.1	45.2	4.7	4.9	2.9
Lower Missouri	68.2	51.9	46.9	76.1	57.4	48.2	7.9	5.5	1.3
Missouri Region	336.0	272.0	249.0	364.2	299.3	264.0	28.2	27.3	15.0
RURAL FARM POPULATION									
Upper Missouri	30.6	25.7	19.9	33.0	29.0	22.4	2.4	3.3	2.5
Yellowstone	32.8	25.8	21.6	28.6	29.7	25.7	5.8	3.9	4.1
Western Dakota	46.1	36.6	29.4	48.1	41.4	32.6	2.0	4.8	3.2
Eastern Dakota	140.2	111.8	102.0	149.0	125.8	110.1	8.8	14.0	8.1
Platte-Niobrara	143.2	119.9	114.6	159.4	134.6	123.2	16.2	14.7	8.6
Middle Missouri	186.6	155.8	138.5	196.6	165.7	147.3	10.0	9.9	8.8
Kansas	138.5	114.0	110.6	151.1	128.9	117.5	12.6	14.9	6.9
Lower Missouri	234.9	178.5	160.0	262.4	199.8	165.3	27.5	21.3	5.3
Missouri Region	952.9	768.1	696.6	1038.2	854.9	744.1	85.3	86.8	47.5

To obtain some indication of the positive impact the use of such surplus capability might have, the assumption was made that the individual subregion surplus activities would be marketed entirely to non-residents of the region without consideration of leakage to unmet needs in other subregions and transfer between recreation categories within subregions. To evaluate this estimate, it was assumed that the average expenditure per recreation day would be $8.00, 25 percent of which would be assigned to wages or salaries, and the average earnings per employee would equal $2,660 per year. Therefore, a projected surplus of 10,000 recreation days could directly employ about 7.5 people.

The direct employment potential from marketing surplus outdoor recreation using projected capability of present resources, without full implementation of the framework plan, is estimated to be about 10,800 for 1980, 8,100 for 2000, and 4,800 for 2020 as shown in table 55. This surplus is a reflection of the available hunting and fishing days in the Upper Missouri, Yellowstone, Western Dakota, and Eastern Dakota subregions.

Potential direct employment with full implementation of the framework plan for outdoor recreation is also shown in table 55. All of the subregions would share in the potential for adding about 24,000 employees by 1980. Employment increases could create 21,700 new jobs by 2000 and 21,200 by 2020. The largest development potential appears in the Eastern Dakota and Middle Missouri subregions, which in combination represent about 55 percent of the potential jobs in 2000 and 66 percent in 2020. There may be no surplus outdoor recreation to market in the Lower Missouri in 2000 and 2020 and in the Platte-Niobrara Subregion in 2020.

Table 55 – ADDED BASIC EMPLOYMENT POTENTIAL FROM SURPLUS RECREATION CAPACITY BY SUBREGION

Subregion	1980	2000	2020
	(Cumulative Thousand)		
PROJECTED CAPABILITY OF PRESENT RESOURCES			
Upper Missouri	3	2	1
Yellowstone	2	2	1
Western Dakota	2	2	1
Eastern Dakota	4	2	2
Platte-Niobrara	0	0	0
Middle Missouri	0	0	0
Kansas	0	0	0
Lower Missouri	0	0	0
Missouri Region	11	8	5
WITH FULL IMPLEMENTATION OF FRAMEWORK PLAN			
Upper Missouri	4	4	4
Yellowstone	2	2	1
Western Dakota	3	2	2
Eastern Dakota	5	7	7
Platte-Niobrara	3	1	0
Middle Missouri	3	5	7
Kansas	1	1	*
Lower Missouri	3	0	0
Missouri Region	24	22	21

*Less than 500.

Mining and Related Manufacturing

The Missouri Basin has huge reserves of subbituminous and lignite coal in the Yellowstone and Western Dakota subregions, estimated in table 56. These have been reason for recent land and reservoir water-supply options by large corporations for potential industrial development. None of this development was reflected in the original projections. While some development has occurred since 1960 and more is predicted, realization of the full potential of the coal deposits is contingent upon large quantities of industrial water. Recognizing that this emerging need was not reflected in the original projections, the potential industrial demand was incorporated in the water demand in the framework plans for industrial water supply for these two subregions.

Table 56 – ESTIMATED COAL RESERVES OF MONTANA, WYOMING, NORTH DAKOTA AND SOUTH DAKOTA[1]

State	Bituminous	Sub-bituminous	Lignite	Total	Proven Strippable Reserves
	(Billion Tons)				
Montana	2	130	90	222	14
Wyoming	13	110	--	123	13
North Dakota	--	--	350	350	4
South Dakota	--	--	2	2	--

[1]January 1, 1965.

Known processes of mining and converting coal to produce synthetic gasoline (coal hydrogenation) were assumed to determine the approximate employment capacity in utilizing these deposits. In a representative plant, 30,000 tons of coal and 28 million gallons of water per day are required to produce 100,000 barrels per day (bpd) of liquid refinery feedstock. If a plant life of 40 years is assumed, about 360 million tons of coal would be required to sustain this level of output.

The investment requirements for the total operation are great. A capital investment of about $300 million would be necessary to build a coal-hydrogenation plant capable of producing 100,000 bpd of liquid fuel as refinery feedstock. This does not include the equipment necessary to mine 30,000 tons of coal per day or the refinery facilities to produce gasoline. A capital investment of several billion dollars would be necessary to build the several projected coal hydrogenation plants in the 60,000 to 100,000 bpd size that are expected to locate in the Yellowstone and Western Dakota subregions. The employment requirements of this industrial complex are also high. The mining operation, coal hydrogenation plant, and the refinery necessary to produce 100,000 bpd of gasoline would require about 4,000 employees. Assuming continued development, the impact of a coal hydrogenation industry on total basic employment in the Missouri Region should be very significant by the year 2020. Direct employment is estimated to reach 69,000 by 2020 as presented in table 57.

Table 57 – ADDED BASIC EMPLOYMENT EXPECTED FROM A COAL PROCESSING INDUSTRY, YELLOWSTONE AND WESTERN DAKOTA SUBREGIONS

Subregion	1980	2000	2020
	(Cumulative Thousand)		
Yellowstone	2	17	55
Western Dakota	--	4	14
New Basic Employment	2	21	69

Secondary Employment Above Projections

As discussed before, changes in basic employment, such as the shifting of agricultural employment associated with the modification of original projections, results in comparable changes of secondary or non-commodity-producing employment. Therefore, increases in basic employment above the modified projections due to full implementation of the framework plan, as described for agriculture, outdoor recreation, and mining and related manufacturing, will create comparable increases or projected secondary employment potential above the modified projections. This secondary employment potential is shown in table 58 by basic commodity

Table 58 – ADDED SECONDARY EMPLOYMENT POTENTIAL ABOVE THE MODIFIED PROJECTIONS WITH FULL IMPLEMENTATION OF THE FRAMEWORK PLAN, BY SUBREGION

Basic Commodity Source and Subregion	1980	2000	2020
AGRICULTURE	(Thousands)		
Upper Missouri	1.9	2.6	2.6
Yellowstone	4.3	2.8	4.9
Western Dakota	1.7	4.1	2.6
Eastern Dakota	6.2	15.9	7.4
Platte-Niobrara	12.3	14.4	8.6
Middle Missouri	7.1	6.7	4.9
Kansas	10.1	12.6	8.3
Lower Missouri	17.0	14.1	3.7
Missouri Region	60.6	73.2	43.0
OUTDOOR RECREATION			
Upper Missouri	9.0	11.1	11.7
Yellowstone	4.5	4.6	2.3
Western Dakota	6.0	6.4	6.0
Eastern Dakota	10.8	18.2	19.4
Platte-Niobrara	5.2	1.3	0.0
Middle Missouri	7.3	12.6	20.3
Kansas	2.2	2.6	0.9
Lower Missouri	5.8	0.0	0.0
Missouri Region	50.8	56.8	60.6
COAL HYDROGENATION			
Yellowstone	4.3	43.4	157.3
Western Dakota	0.0	10.3	40.0
Missouri Region	4.3	53.7	197.3

source and subregion for the years 1980, 2000, and 2020. Secondary employment related to agricultural development means an increase of 60,600 by 1980, 73,200 by 2000, and 43,000 by 2020 over the modified projections. The marketing of potential outdoor recreation opportunities supports the addition of 50,800 by 1980, 56,800 by 2000, and 60,600 by 2020 in secondary employment potential. By far the greatest potential impact on secondary employment will be coal hydrogenation and related employment which will add 4,300 by 1980, 53,700 by 2000, and 197,300 by 2020 associated with the Yellowstone and Western Dakota subregions. All of the subregions gained secondary employment over the modified projections. However, in two instances—projections for the Western Dakota Subregion in 1980 and the Platte-Niobrara Subregion in 2020—these gains were not sufficient to offset the losses of secondary employment sustained as a result of modification of the original projections.

Total Added Employment And Population Above Projections

Total employment potential with full implementation of the framework plan shows increases over the modified projections of 169,900 by 1980, 254,000 by 2000, and 405,900 by 2020 as presented in table 59. The potential basic employment accommodated by the framework plan has been limited to the development of certain agricultural resources, outdoor recreation, and mining and related manufacturing industries. This resulted in 54,200 more basic employment opportunities than the modified projections by 1980, 70,300 by 2000, and about 105,000 by 2020. Using region-wide ratios of secondary or supportive employment to basic employment the potential secondary employment was estimated to be projected 115,700 over the modified projections by 1980, add 183,700 by 2000, and 300,900 by 2020. The greatest potential employment gain over the modified projections, 222,200 by 2020, takes place in the Yellowstone Subregion where it is the greatest potential relative increase, or about 85 percent over the original projections. The next largest potential increase of total employment, 65,500, is projected about 30 percent above the original 2020 projections for the Western Dakota Subregion. Potential differences in employment and population, as shown in table 60, for the Missouri Region above the original and modified projections are about 4 to 5 percent. When the plan is fully implemented the Eastern Dakota and Middle Missouri subregions will experience large shares of the population and employment potential increase, behind the Yellowstone and Western Dakota subregions, but the Upper Missouri Subregion is projected to experience large growth relative to the original and modified projections.

Table 59 – BASIC AND SECONDARY EMPLOYMENT POTENTIAL ABOVE MODIFIED PROJECTIONS WITH FULL IMPLEMENTATION OF THE FRAMEWORK PLAN, BY SUBREGION

Subregion	1980	2000	2020
	(Thousand)		
Potential Basic Employment			
Upper Missouri	4.9	5.0	4.9
Yellowstone	6.0	20.1	57.7
Western Dakota	3.8	7.6	16.9
Eastern Dakota	7.9	12.2	9.6
Platte-Niobrara	8.7	6.5	3.0
Middle Missouri	6.3	7.5	8.7
Kansas	5.7	5.9	2.9
Lower Missouri	10.9	5.5	1.3
Missouri Region	54.2	70.3	105.0
Potential Secondary Employment			
Upper Missouri	10.9	13.7	14.3
Yellowstone	13.1	50.8	164.5
Western Dakota	7.7	20.8	48.6
Eastern Dakota	17.0	34.1	26.8
Platte-Niobrara	17.5	15.7	8.6
Middle Missouri	14.4	19.3	25.2
Kansas	12.3	15.2	9.2
Lower Missouri	22.8	14.1	3.7
Missouri Region	115.7	183.7	300.9
Potential Total Employment			
Upper Missouri	15.8	18.7	19.2
Yellowstone	19.1	70.9	222.2
Western Dakota	11.5	28.4	65.5
Eastern Dakota	24.9	46.3	36.4
Platte-Niobrara	26.2	22.2	11.6
Middle Missouri	20.7	26.8	33.9
Kansas	18.0	21.1	12.1
Lower Missouri	33.7	19.6	5.0
Missouri Region	169.9	254.0	405.9

Table 60 – POPULATION POTENTIAL ABOVE THE MODIFIED PROJECTIONS WITH FULL IMPLEMENTATION OF THE FRAMEWORK PLAN, BY SUBREGION

Subregion	1980	2000	2020
	(Thousand)		
Upper Missouri	40.5	47.9	49.2
Yellowstone	48.9	181.5	568.8
Western Dakota	29.4	72.7	167.7
Eastern Dakota	63.7	118.5	93.2
Platte-Niobrara	67.1	56.8	29.7
Middle Missouri	53.0	68.6	86.8
Kansas	46.1	54.0	31.0
Lower Missouri	86.3	50.2	12.8
Missouri Region	435.0	650.2	1,039.2

CHAPTER 6

DISAGGREGATION AND PROJECTIONS METHODOLOGY

The analysis of the economy in the Missouri Region during the 1940-1960 period and the preliminary projections of income, employment, and population presented in this appendix are provided primarily as data inputs for comprehensive planning studies in the basin. Economic projections and comprehensive planning studies of water and related land resource development are to be made for 20 major river basins including 17 comprising the conterminous United States. To assure a consistent national and regional framework of projections, the Interdepartmental Staff Committee, Water Resources Council, made formal arrangements with the Office of Business Economics (OBE) and the Economic Research Service (ERS) of the Departments of Commerce and Agriculture, respectively, to develop national projections and disaggregate them to the major river basins.

In the Missouri Region, further disaggregation was provided by OBE-ERS for the eight major subregions. Consequently, the primary task of the Economic Work Group was to further disaggregate the subregional data among the various subareas within each of the subregions.

In the process of disaggregation, the several economic series, population, employment, income, and earnings, were considered as an internally dependent set of economic variables. An analysis of each series separately may yield independent trends resulting in distorted relationships among them. Resolutions of conflicting trends into consistent relationships is an important aspect of disaggregating the total values. This process also provides an evaluation of the subregional projections.

While this appendix and the economic projections it contains have been prepared within the control of the national and regional projections, the analysis entails many of the aspects of an economic base study. The development of the projections includes a study of the history of the area; changes in industry composition; classification of economic activities into basic and nonbasic sectors; consideration of resources likely to be developed; and use of multiplier effects in the projection of nonbasic activities.

This economic study provides information concerning the projected economy of the area, including its needs, potentialities, and the interacting effects. Projections of population, income, and employment and their relationships were used as the basis for estimating future demands for water and related land resources. The projections also furnish information to be used to estimate the probable costs of possible resource development.

While it is recognized that the reliability of projections based on historical trends tends to diminish as the size of the variable being projected decreases, the virtue of staying within basin control totals must be reemphasized. Planning of water resource management and development must take place within a national framework, and the reliability of economic and population projections, even to 2020, is substantially more reliable for the Nation. Therefore, in order to insure maximum accuracy overall for the Nation and for each of the major river basins, the projected economy has been held within the national framework. While the disaggregation procedure may result in questionable projections for some small part of the total, the overall consistency that is retained does provide for maintaining reasonable statistical validity for the Nation.

The process of projecting national values through 2020 and the disaggregation of the various economic and demographic components are described in the following methodological statements.

METHODOLOGY FOR PROJECTING NATIONAL AND REGIONAL POPULATION AND EMPLOYMENT ESTIMATES

These projections were prepared in 1965 by the Office of Business Economics of the Department of Commerce pursuant to the agreement executed by the Water Resources Council and that agency. They incorporate preliminary projections of agricultural employment developed by the Economic Research Service of the Department of Agriculture. These agricultural projections are consistent with preliminary estimates of

production requirements and productivity trends which affect the number and income levels of people living and working on farms in the region.

Both the national and regional projections are preliminary in nature, because the requisite data and methodology for making economic projections are in the developmental stage and significant improvements in both areas are expected to be made. With regard to future methodology, the Office of Business Economics expects to use a dynamic input-output model of the Nation's economy to generate national totals and a comprehensive regional model to allocate such totals to individual regions.

These preliminary projections are intended to portray the future course of the Missouri Region's economy relative to that of the Nation as a whole. However, it should be noted that the final projections may differ from the preliminary ones in magnitude as a result of improved precision and reliability. (Revised projections were prepared and they are discussed in the Statistical Supplement, "Section E, Supplemental Projections.")

Listed below are the assumptions used in developing the national totals needed to prepare the geographical projections.

1. National population totals used are from the Series B projection published by the Bureau of the Census in "Projections of the Population of the United States by Age and Sex: 1964 to 1985 with Extensions to 2010, Population Estimates Series P-25, No. 286, July 1964." The 2010 figures in that publication were extended to 2020 in accordance with the projected average rate of growth from 1960 to 2010. A discussion of the characteristics of the population projection, together with assumptions used, is contained in the foregoing reference.
2. Nationwide labor force figures were calculated by applying to projected population the labor force participation rates of 1955-1957, which are higher than current rates but which are close to those obtained when the 1980 projections of labor force by the Bureau of Labor Statistics and the 1980 population projections of the Census are compared.
3. National totals of all-industry employment were derived from the labor force projections by assuming a 4-percent rate of unemployment in the target years.
4. Total gross national product was derived as the product of projected employment and projected productivity per man. The trend in productivity was calculated from the Office of Business Economics data covering the 1947-1963 span. Projected productivity reflected the combined effect of changes in productivity per man hour and of changes in the length of the work week without either being made explicit.
5. National personal income was derived from projected Gross National Product on the basis of the past relationship between the two.
6. National totals of employment and of personal income by industry were derived from the projected totals of Gross National Product and personal income on the basis of 1947-63 trends of productivity, industrial structure of national output, and composition of income. These were allocated by industry to the regions and from them was derived the regional population.

PROCEDURES FOR DISAGGREGATING EMPLOYMENT PROJECTIONS BY INDUSTRY AND SUBAREA

Employment projections for the subareas were derived based on a method of spatial and functional disaggregation combined with techniques to correlate with and evolve associated projections of subarea population, income, and earnings characteristics. The procedure follows:

1. The Office of Business Economics employment estimates for each of the four principal sectors of agriculture, manufacturing, other commodity-producing, and noncommodity-producing employment, were used as control totals for all subsequent projections. These four major employment sectors were further broken down into 32 industry sectors by the Standard Industrial Classification (SIC) system. In using historic employment data, forestry and fisheries employment was included with agriculture, and industry not reported was distributed proportionately among all other industries (thus reducing the 32 industry sectors to 30 sectors for detailed projection purposes).
2. Subarea estimates were obtained in several stages. First, projections of employment in agriculture and mining were made independently for each subarea and included in the model as "fixed" projections. Second, employment in the railroad and railway express sector was assumed as changing at the same rate for each subarea as for the Nation. Third, employment in the Armed Forces was held constant at the 1960 levels for each subarea. Fourth, the remaining subregional employment was allocated among subareas according to 1940-'60 trends in area employment structures.
3. Initially, subarea employment projections were derived as follows: Except for those sectors noted in 2 above, total subregional employment was allocated among subareas using dampened 1940-'60 and 1950-'60 trends based on percentage shares of total subregional employment in each

subarea. Two dampening rates were used: One, the 1960-1980, 1980-2000, and 2000-2020 employment rates were multiplied by factors 1, 1/2, and 1/4, respectively; two, these employment rates were multiplied by the factors 1/2, 1/4, and 1/8. A simple average of these four estimates for each projection period was used in the derivation of the percentage distribution of employment by subarea. For other commodity-producing employment, mining employment was deducted from this series and the residual, i.e., contract construction employment, was distributed in the same manner. Finally, the estimated employment in railroads and railway express and in the Armed Forces was deducted from total noncommodity-producing employment before the residual series was allocated among subareas.

4. Industry detail then was obtained for each subarea following the allocation procedure described in step 3.
5. The use of the mathematical model as described resulted in subarea projections in 30-industry detail. These projections were then subjected to a series of tests and analyses. These analyses generally confirmed the usefulness of the disaggregation model, but also indicated unlikely trends for some cells in projected growth rates, area or sector distributions, and location quotients. A need for adjusting both individual cells and industry subtotals was indicated. This need and a desire for obtaining some comprehension of the interrelationships of income, earnings, population, and employment pointed out the need for further study of total personal income and total civilian earnings, both historic and projected.
6. The procedure suggested the need to make additional independent projections of individual economic parameters for each subarea and to subject them to a series of cross-checks. Ultimately, some adjustment was required to obtain consistency between these parameters and to maintain the sum of the subareas within the OBE projection for the total subregion.
7. Special consideration was given to individual manufacturing sectors which are heavy users of water. These industries are food and kindred products, textile mill products, chemicals and allied products, paper and allied products, petroleum refining, and primary metals.

Final projection of employment by subarea was accomplished from the study of income and earnings, from perspective obtained from the disaggregation model, from use of various analytical techniques, and in coordination with the studies and findings of all task forces of the work group. The projections in the 30-industry detail generated by the disaggregation model were not fully perfected but supplied insight of employment composition. Employment detail obtained is consistent with the OBE projections for each of the subregions.

PROCEDURE FOR DISAGGREGATING POPULATION

Basic Data

Basic data provided for use in disaggregating population of the subregions included:

1. OBE projections of employment, population, and income for the subregion as a whole.
2. Disaggregated employment data generated by the disaggregation model described.
3. Rural farm population for each of the subareas developed independently.

Procedure

The objective was to disaggregate population in a manner that would maintain consistent relationships with the employment data. An analysis of employment participation rates was made by computing the percentage relationship between historic employment and population for each subarea for 1940, 1950, and 1960. Participation rates for 1940 were not considered to be representative of the future because there was still considerable unemployment in that year, which resulted in abnormally low participation rates.

With population given for the region and each of the subregions, the disaggregation of population by components for the subareas was made as follows:

1. Total historic population was taken from census data and projections were derived through analysis of employment participation rates.
2. Historic and projected farm population was deducted from the subregion totals, leaving the remaining nonfarm population.
3. Historic nonfarm population for 1940, 1950, and 1960 was segregated into rural nonfarm and urban components with subsequent breakdown of urban components into size class groups based on 1960 population.
4. A percentage distribution of the historic nonfarm population was made for each subarea by the components described in 3.
5. Ten-year percentage points changes for 1940-60 and 1950-60 with an average decade change were then computed.
6. The historic percentage point changes were then applied to the 1960 percentage distribution into 1980, 2000, and 2020 with use of selected dampening factors, so as to derive percentage distributions for those projection years.

7. The projected percentage distributions were then used to disaggregate the total nonfarm population for 1980, 2000, and 2020.

AGRICULTURAL METHODOLOGY

Projections of agricultural employment and production were made by the Economic Research Service under an interdepartmental agreement dated March 6, 1964, with the Water Resources Council. The projections were a part of an interdepartmental framework of economic data which were consistent with other sectors of the economy, compatible with the other regions, and capable of being aggregated to the projected national requirements. Similar to the employment and population projections of OBE, they were made within the framework of a national projection model with the region's share of each parameter being allocated on the basis of historical trend relations. Unlike OBE projections, however, the allocation procedure recognized that agriculture in the region is but one part of the total agricultural industry, and farm products are produced for and sold within the national market. Hence, national food and fiber requirements were determined for future periods, and shares of these requirements were allocated by geographic region based on each region's historical share modified by trends in changing relationships. In short, the national requirements were of critical importance in determining the region's probable share in national agricultural output levels for future years.

Total national production requirements for projected periods were taken to be the sum of total domestic demand and net demand for exports (i.e. exports less imports). The parameters included in the national projection model and assumed to be functionally related in agricultural demand were population, per capita income, relative rates of change in consumption of various crops (this serves as a variable for both changes in consumer rates and changes in relative prices), livestock feeding efficiencies, and net exports.

Based on historical trend relationships, future requirements were projected for each crop. The historical rates of change in per capita consumption for each crop were projected to 1980 and held constant thereafter. Industrial demands for major agricultural commodities were maintained at a constant per capita level throughout the projection period. Industrial demand thus became a direct function of population and was projected to increase proportionately with increases in population. Net export requirements were determined by projecting trends of United States trade of agricultural commodities to 1980. The 1980 level of net foreign export demand was then held constant to 2020.

Projections of total demand for feed grain were made, exclusive of roughage requirements for livestock. Since roughage production was linked geographically to livestock production, the share of total livestock production allocated to the basin was translated into demands for pasture and forage under the assumption that all roughage needed to satisfy livestock feeding requirements would be produced in the region. This translation was accomplished by the use of projected livestock feeding efficiencies and ration composition.

Currently, the four classes of roughage-consuming livestock included in the analysis consume approximately 70 percent of the roughage feed units produced in the current normal inventory. The balance of the production is assumed to be unharvested, undergrazed or deferred grazing land, and roughage consumed by horses, wildlife, and miscellaneous animals. This current relationship of harvest by the four classes of livestock to total production requirements was projected to remain constant to 2020. Projected roughage consumption requirements for these four classes of livestock were then expanded into total roughage demands on the basis of current usage.

Projected roughage requirements less the projected roughage production for native hay, pasture, range grasses, forests, and Federal land determined the residual roughage requirement for crop land. This residual requirement was allocated to corn silage, sorghum silage, sorghum forage, alfalfa hay, and other hay in the same ratio as in the current normal inventory. This requirement was then converted to units consistent with yields in the input data.

Missouri River Region Allocative Methodology

The analytical model developed for determining the region's share of various crop requirements was a minimum cost linear programming model. In the application of the model, agricultural production and projections of cropping patterns were made by land resource areas. Land resource areas were selected as the common geographic unit since subbasin boundaries have little real significance in the analysis of agricultural production. The results obtained by land resource areas were then disaggregated to subbasin solutions.

In the operation of the model, the cropping pattern selected from the possible alternatives was the one which would minimize the cost of meeting the given level of production within the restraints likely to confront agriculture. All analyses were accomplished on the basis of land resource areas and the associated soil resource groups. An additional constraint applied to these projected production patterns is the capability of the soil and water resources.

Given the basic minimum cost path of the model, the principal purpose was to solve for the most efficient patterns of land use at given levels of production which might be expected in future time periods. A basic

assumption was that all future production patterns will be related to and restricted by the current pattern of land use.[1]

Thus, any future changes in production levels and/or cropping patterns would result in shifts toward more efficient use of the resources within recognizable limits imposed by crop rotations and diversifications, institutional restrictions, complementarity of roughage production, range and pasture land, and livestock enterprises.

In projecting the various individual parameters within the agricultural economy certain considerations were necessary. These serve to insure realism in the total agricultural economy and consistency between individual economic and population components in agriculture. These considerations were:

1. Trends in the location of agricultural enterprises will depart from the relationships existing between land resource areas and subbasins only in response to economic forces within the limits of change exhibited during the 1950-1960 base period.
2. Employment in agriculture is assumed to be on a constant relationship with agricultural output, with appropriate modifications in projected trends to take account of changes in labor productivity.
3. Changes in farm labor productivity in the basin are assumed to be similar to changes for the Nation. National productivity rates have been held constant through the projection period.
4. Rural farm population is related directly to farm employment. Thus, farm employment will determine farm population rather than vice versa.
5. The ratio of farm workers to rural farm people will remain essentially unchanged during the projection period from that which existed during 1950-1960. In addition, the change in the number of families employed on the farm but living off-farm will be about equal to the change in the number of farm people living on farms but employed off-farm.
6. Gross farm income in the subregions is functionally related with total farm output.
7. Programs of research, extension, and on-farm conservation management are assumed to continue at current levels.

[1] The current patterns of use were developed using a normalizing process. Current normal is a concept used to describe estimates which conform with or constitute an acceptable model or pattern. In this study, acreage, production, and price and value of crop production; and production, price, and value of livestock production have been adjusted to conform to a consistent pattern. Current normal values of the parameters are estimates which reflect current production technology and prices, from which the impacts of abnormalities caused by weather and other hazards in a single year were weighted by their historical occurrence. It may also be described as a *geometrically weighted moving* average. The process, as used in this report, was based on historical data for the years 1939 to 1963. It is possible that this weighting process could introduce some bias in the inventory of current production capabilities of the agronomic resources of the basin, if the later years of the historical data were completely untypical crop years. The fluctuating characteristics of Great Plains agricultural production resulting from random droughts and periodic wet spells may not be recognized by mathematical averages. However, the Agricultural Task Forces have accepted the current normal inventory of existing use and production of the agricultural resources in the Missouri Basin.

MINERALS METHODOLOGY

Projections of mineral production and employment in the minerals industry and disaggregations to various geographic levels were made in several stages. The first step was to review all available employment and projection data, both historic and projected, for the region and the eight subregions in order to develop historic trends. Estimates of total annual mineral production and value in the region were available in the Bureau of Mines for the period 1910-1950. In addition, data on annual mineral production volume and value were available by county for the period 1947-1963. These county production data were grouped by allied commodities (metals, nonmetals, and fuels) and were aggregated into subregional and region totals. Thus, historic production trends were developed for each mineral and major minerals grouping.

Projections of production levels for the target years were made first for the region as a whole. Underlying these projections were the following four basic considerations:

1. Past relationships between regional and national production levels were held reasonably constant throughout the future.
2. Future demands for minerals as indicated independently by resources for the future were considered.
3. Projections were constrained within potential resource availability.
4. Within these constraints with certain modifications, projections of future production levels were made from historical production trends.

The allocation of region totals to the subregions was made based primarily upon past production trends and the changing relationships between trends. Subregional projections were subsequently reconciled within region totals. In many cases, particularly through 1980, subregion projections were relatively well defined and reasonably consistent with national and regional projections. In other cases where future shortages in the resource base were apparent, modifications were made in the projections. In a few other cases, adjustments were made where past trends were fairly rapid and where

simple linear extrapolation resulted in unrealistically high projections. In all cases throughout the projection procedure, subregional estimates were reconciled within overall region totals.

Once subregional production estimates were established, mining employment was then derived from these production levels. Using the projected values of the three mineral groups, estimates of employment were made by dividing the total value of production in constant dollars by the projected value of output per employee in constant dollars. This latter value was derived by assuming a constant rate of labor productivity increase based on historic rates of productivity in mining. Employment estimates so derived were consistent with past production trends, resource availability, and historic changes in productivity.

The above procedure was applied generally for the minerals industry, with the following exceptions: In projecting nonmetal production, primarily those nonmetals associated with the construction industry, it was assumed that this was highly correlated with population growth. Therefore, projections of output of nonmetals construction materials were proportionate with increases in population. Historic per capita relationships were held constant during the projection period. Bentonite clays were treated similarly. Future output was assumed to increase in some constant proportion with increases in petroleum output.

Projections of petroleum and natural gas production in specific subregions were based on their past contribution to total region production, as modified by reserve and resource estimates. The region projection, in turn, was based on future demand and resource estimates and historical relationships of region production to the national total.

The oil and gas projection estimates are a weighted "medium." A "low" estimate has influenced the "medium" level projection more heavily in the 2000 estimate than in the 1980 estimate and more heavily in the 2020 estimate than in the 2000 estimate because of the expectation that the true limit of recoverable reserves will be approached by the end of the century.

Coal-lignite estimates were derived from a Federal Power Commission projection of coal requirements for various study areas in the upper Midwest. The portion of this market to be supplied by each subregion, considering reserves, was estimated on the basis of historical trends.

STATISTICAL SUPPLEMENT

The following statistics are provided to supplement information given in the preceding appendix:

CONTENTS

STATISTICAL SUPPLEMENT

STATISTICAL SUPPLEMENT (Continued)

STATISTICAL SUPPLEMENT (CONTINUED)

STATISTICAL SUPPLEMENT (Continued)

PART A -

POPULATION, EMPLOYMENT, AND INCOME

Table A-1 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
UPPER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	287	509	550	1,150	2,300	4,700
Per capita personal income 1/ (54$)	1,148	1,998	1,844	3,125	4,873	7,769
Total earnings (000,000) (54$)	246	431	421	900	1,700	3,400
Earnings per employee 1/ (54$)	2,910	4,386	3,879	6,522	9,659	14,912
Population	249,907	254,734	298,191	368,000	472,000	605,000
Urban	80,454	102,060	137,101	199,600	266,700	351,400
Rural	169,453	152,674	161,090	168,400	205,300	253,600
Non-farm	83,674	86,291	104,700	135,400	176,300	227,600
Farm	85,779	66,383	56,390	33,000	29,000	26,000
Employment	84,527	98,274	108,540	138,000	176,000	228,000
Agriculture	31,944	30,197	23,332	14,000	12,000	11,000
Manufacturing	5,080	6,068	7,063	8,000	9,000	10,000
Petroleum refining	507	303	353	a/	a/	a/
Paper and allied products	4	11	0	a/	a/	a/
Primary metals	1,544	2,285	1,755	2,000	2,000	2,000
Chemical products	33	54	89	a/	a/	a/
Food products	1,123	1,338	1,748	2,000	3,000	3,000
Textile mill products	11	23	11	a/	a/	a/
Other commodity-producing industries	8,484	8,677	8,996	13,000	17,000	19,000
Noncommodity-producing industries	39,019	53,332	69,149	103,000	138,000	188,000

Table A-2 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 1A LESS GREAT FALLS SMSA – UPPER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	143	141	278	560	1,155
Per capita personal income 1/ (54$)	a/	2,240	1,948	3,120	4,904	7,773
Total earnings (000,000) (54$)	a/	125	113	219	413	832
Earnings per employee 1/ (54$)	a/	4,950	4,249	6,518	9,672	14,910
Population	61,097	63,830	72,395	89,100	114,200	148,600
Urban	20,103	24,360	31,448	46,900	61,500	82,600
Rural	40,994	39,470	40,947	42,200	52,700	66,000
Non-farm	20,853	22,690	26,256	33,800	45,300	59,500
Farm	20,141	16,780	14,691	8,400	7,400	6,500
Employment	21,336	25,254	26,597	33,600	42,700	55,800
Agriculture	7,759	7,325	5,977	3,400	3,000	2,600
Manufacturing	1,290	1,380	1,438	1,300	1,300	1,400
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	21	11	30	a/	a/	a/
Food products	185	190	275	a/	a/	a/
Textile mill products	1	12	3	a/	a/	a/
Other commodity-producing industries	2,291	2,822	2,248	2,400	2,600	2,600
Noncommodity-producing industries	9,996	13,727	16,934	26,500	35,800	49,200

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-3 — INCOME, POPULATION, AND EMPLOYMENT — HISTORIC AND PROJECTED
GREAT FALLS SMSA — UPPER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	59	109	154	335	702	1,471
Per capita personal income 1/ (54$)	1,405	2,056	2,098	3,122	4,865	7,771
Total earnings (000,000) (54$)	50	83	109	273	543	1,108
Earnings per employee 1/ (54$)	3,322	3,872	3,839	6,516	9,662	14,913
Population	41,999	53,027	73,418	107,300	144,300	189,300
Urban	29,928	39,214	57,629	87,900	119,800	158,200
Rural	12,071	13,813	15,789	19,400	24,500	31,100
Non-farm	6,357	9,427	12,307	17,500	22,900	29,700
Farm	5,714	4,386	3,482	1,900	1,600	1,400
Employment	15,053	21,438	28,392	41,900	56,200	74,300
Agriculture	2,046	1,959	1,542	900	700	600
Manufacturing	2,523	2,974	3,333	3,600	3,900	4,300
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	2,000	2,000	2,000
Chemical products	7	21	4	a/	a/	a/
Food products	415	527	827	1,200	1,300	1,300
Textile mill products	4	3	0	a/	a/	a/
Other commodity-producing industries	1,284	1,600	2,249	4,400	6,400	7,500
Noncommodity-producing industries	9,200	14,905	21,268	33,000	45,200	61,900

Table A-4 — INCOME, POPULATION, AND EMPLOYMENT — HISTORIC AND PROJECTED
SUBAREA 1B — UPPER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	77	76	178	358	747
Per capita personal income 1/ (54$)	a/	1,855	1,668	3,123	4,851	7,765
Total earnings (000,000) (54$)	a/	67	60	137	261	533
Earnings per employee 1/ (54$)	a/	4,267	3,613	6,493	9,631	14,930
Population	40,621	41,507	45,551	57,000	73,800	96,200
Urban	11,679	14,593	17,051	23,800	31,500	41,700
Rural	28,942	26,914	28,500	33,200	42,300	54,500
Non-farm	14,441	15,367	19,248	27,800	37,400	50,000
Farm	14,501	11,547	9,252	5,400	4,900	4,500
Employment	14,297	15,702	16,609	21,100	27,100	35,700
Agriculture	5,696	5,362	4,243	2,700	2,300	2,300
Manufacturing	457	793	1,062	1,500	1,900	2,200
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	2	9	23	a/	a/	a/
Food products	224	256	297	a/	a/	a/
Textile mill products	3	2	4	a/	a/	a/
Other commodity-producing industries	2,133	1,327	1,217	1,000	1,000	1,000
Noncommodity-producing industries	6,011	8,220	10,087	15,900	21,900	30,200

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-5 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 1C – UPPER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	180	179	359	680	1,327
Per capita personal income 1/ (54$)	a/	1,868	1,676	3,133	4,868	7,765
Total earnings (000,000) (54$)	a/	156	139	271	483	927
Earnings per employee 1/ (54$)	a/	4,348	3,763	6,546	9,660	14,904
Population	106,190	96,370	106,827	114,600	139,700	170,900
Urban	18,744	23,893	30,973	41,000	53,900	68,900
Rural	87,446	72,477	75,854	73,600	85,800	102,000
Non-farm	42,023	38,807	46,889	56,300	70,700	88,400
Farm	45,423	33,670	28,965	17,300	15,100	13,600
Employment	33,841	35,880	36,942	41,400	50,000	62,200
Agriculture	16,443	15,551	11,570	7,000	6,000	5,500
Manufacturing	810	921	1,230	1,600	1,900	2,100
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	3	13	32	a/	a/	a/
Food products	299	365	349	a/	a/	a/
Textile mill products	3	6	4	a/	a/	a/
Other commodity-producing industries	2,776	2,928	3,282	5,200	7,000	7,900
Noncommodity-producing industries	13,812	16,480	20,860	27,600	35,100	46,700

Table A-6 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
YELLOWSTONE SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	234	385	490	1,100	2,400	5,200
Per capita personal income 1/ (54$)	1,111	1,641	1,812	3,125	4,868	7,536
Total earnings (000,000) (54$)	200	328	392	875	1,850	4,100
Earnings per employee 1/ (54$)	2,931	3,782	4,070	6,629	10,000	15,769
Population	210,589	234,626	270,382	352,000	493,000	690,000
Urban	71,331	103,315	146,122	216,700	334,000	500,900
Rural	139,258	131,311	124,260	135,300	159,000	189,100
Non-farm	57,627	67,223	76,100	103,400	132,500	164,300
Farm	81,631	64,088	48,160	31,900	26,500	24,800
Employment	68,241	86,728	96,322	132,000	185,000	260,000
Agriculture	28,159	24,598	17,900	11,000	9,000	9,000
Manufacturing	3,091	4,454	6,803	10,000	12,000	15,000
Petroleum refining	516	1,113	1,465	2,000	3,000	3,000
Paper and allied products	3	9	4	a/	a/	a/
Primary metals	15	40	26	a/	a/	a/
Chemical products	15	139	186	a/	a/	a/
Food products	1,285	1,479	2,083	2,000	3,000	4,000
Textile mill products	14	18	24	a/	a/	a/
Other commodity-producing industries	5,247	10,524	11,537	15,000	20,000	27,000
Noncommodity-producing industries	31,744	47,152	60,082	96,000	144,000	209,000

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-7 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 2A, LESS BILLINGS SMSA – YELLOWSTONE SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	50	51	96	165	290
Per capita personal income 1/ (54$)	a/	1,577	1,656	3,000	4,648	7,342
Total earnings (000,000) (54$)	a/	43	41	76	129	226
Earnings per employee 1/ (54$)	a/	3,628	3,687	6,387	9,773	15,479
Population	33,303	31,688	30,768	32,000	35,500	39,500
Urban	9,592	10,413	8,229	9,600	11,100	12,700
Rural	23,711	21,275	22,539	22,400	24,400	26,800
Non-farm	10,022	10,173	14,488	16,900	19,800	22,400
Farm	13,689	11,102	8,051	5,500	4,600	4,400
Employment	10,873	11,852	11,117	11,900	13,200	14,600
Agriculture	5,097	4,581	3,041	2,000	1,600	1,600
Manufacturing	225	291	681	900	1,000	1,200
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	0	3	8	a/	a/	a/
Food products	74	93	127	a/	a/	a/
Textile mill products	0	3	0	a/	a/	a/
Other commodity-producing industries	904	937	959	1,000	1,200	1,300
Noncommodity-producing industries	4,647	6,043	6,436	8,000	9,400	10,500

Table A-8 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
BILLINGS SMSA – YELLOWSTONE SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	52	99	161	426	1,126	2,806
Per capita personal income 1/ (54$)	1,262	1,771	2,038	3,320	5,130	7,720
Total earnings (000,000) (54$)	45	82	129	346	871	2,233
Earnings per employee 1/ (54$)	3,239	3,828	4,373	6,890	10,247	15,950
Population	41,182	55,875	79,016	128,300	219,500	363,500
Urban	26,015	35,497	65,313	111,000	199,000	336,000
Rural	15,167	20,378	13,703	17,300	20,500	27,500
Non-farm	5,719	13,401	8,953	14,100	18,000	25,200
Farm	9,448	6,977	4,750	3,200	2,500	2,300
Employment	13,893	21,420	29,497	50,200	85,000	140,000
Agriculture	2,851	2,413	1,983	1,200	900	900
Manufacturing	1,176	2,060	3,454	5,600	7,000	9,200
Petroleum refining	a/	a/	a/	1,500	2,200	2,300
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	14	40	81	a/	a/	a/
Food products	518	666	1,010	1,100	1,800	2,500
Textile mill products	7	7	4	a/	a/	a/
Other commodity-producing industries	1,018	1,977	2,456	4,400	7,200	11,500
Noncommodity-producing industries	8,848	14,970	21,604	39,000	69,900	118,400

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-9 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 2B – YELLOWSTONE SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	104	122	286	592	1,188
Per capita personal income 1/ (54$)	a/	1,722	1,738	3,017	4,661	7,333
Total earnings (000,000) (54$)	a/	90	97	227	455	927
Earnings per employee 1/ (54$)	a/	4,091	3,913	6,486	9,785	15,580
Population	50,447	60,440	70,188	94,800	127,000	162,000
Urban	10,380	24,747	30,366	47,200	66,500	86,800
Rural	40,067	35,693	39,822	47,600	60,500	75,200
Non-farm	17,784	16,934	25,790	38,200	52,500	67,600
Farm	22,283	18,759	14,032	9,400	8,000	7,600
Employment	15,963	21,999	24,790	35,000	46,500	59,500
Agriculture	7,558	6,687	4,923	3,000	2,600	2,600
Manufacturing	882	1,144	1,456	1,900	2,200	2,500
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	0	72	77	a/	a/	a/
Food products	254	285	388	a/	a/	a/
Textile mill products	1	2	4	a/	a/	a/
Other commodity-producing industries	1,533	4,402	4,994	6,600	8,300	10,500
Noncommodity-producing industries	5,990	9,766	13,417	23,500	33,400	43,900

Table A-10 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 2C – YELLOWSTONE SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	132	156	292	517	916
Per capita personal income 1/ (54$)	a/	1,524	1,726	3,013	4,658	7,328
Total earnings (000,000) (54$)	a/	113	125	226	395	714
Earnings per employee 1/ (54$)	a/	3,592	4,043	6,476	9,801	15,556
Population	85,657	86,623	90,410	96,900	111,000	125,000
Urban	25,344	32,658	42,214	48,900	57,400	65,400
Rural	60,313	53,965	48,196	48,000	53,600	59,600
Non-farm	24,102	26,715	26,869	34,200	42,200	49,100
Farm	36,211	27,250	21,327	13,800	11,400	10,500
Employment	27,512	31,457	30,918	34,900	40,300	45,900
Agriculture	12,653	10,917	7,953	4,800	3,900	3,900
Manufacturing	808	959	1,212	1,600	1,800	2,100
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	1	24	20	a/	a/	a/
Food products	439	435	558	a/	a/	a/
Textile mill products	6	5	16	a/	a/	a/
Other commodity-producing industries	1,792	3,208	3,128	3,000	3,300	3,700
Noncommodity-producing industries	12,259	16,373	18,625	25,500	31,300	36,200

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-11 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
WESTERN DAKOTA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	200	373	434	1,000	2,100	4,700
Per capita personal income 1/ (54$)	709	1,345	1,449	2,801	4,536	7,680
Total earnings (000,000) (54$)	171	307	332	800	1,700	3,800
Earnings per employee 1/ (54$)	2,021	3,052	3,183	6,154	10,119	17,040
Population	282,246	277,411	299,545	357,000	463,000	612,000
Urban	45,079	73,990	100,201	156,900	238,000	338,600
Rural	237,167	203,421	199,344	200,100	225,000	273,400
Non-farm	94,671	94,166	112,478	143,000	179,900	233,200
Farm	142,496	109,255	86,866	57,100	45,100	40,200
Employment	84,612	100,585	104,293	130,000	168,000	223,000
Agriculture	44,018	43,274	32,091	23,000	18,000	16,000
Manufacturing	2,942	3,395	4,987	7,000	10,000	13,000
Petroleum refining	214	125	420	a/	a/	a/
Paper and allied products	7	1	0	a/	a/	a/
Primary metals	3	22	17	a/	a/	a/
Chemical products	26	36	66	a/	a/	a/
Food products	701	888	1,403	2,000	2,000	2,000
Textile mill products	12	17	27	a/	a/	a/
Other commodity-producing industries	6,314	9,158	10,788	15,000	18,000	24,000
Noncommodity-producing industries	31,338	44,758	56,427	85,000	122,000	170,000

Table A-12 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 3A – WESTERN DAKOTA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	153	226	590	1,368	3,292
Per capita personal income 1/ (54$)	a/	1,493	1,767	3,315	5,067	8,573
Total earnings (000,000) (54$)	a/	120	163	450	1,112	2,699
Earnings per employee 1/ (54$)	a/	2,997	3,364	6,522	10,881	18,601
Population	91,152	102,506	127,870	178,000	270,000	384,000
Urban	32,555	53,211	73,351	117,600	189,100	275,900
Rural	58,597	49,295	54,519	60,400	80,900	108,100
Non-farm	31,409	29,403	37,829	50,000	72,600	100,500
Farm	27,188	19,892	16,690	10,400	8,300	7,600
Employment	29,266	40,045	48,459	69,000	102,200	145,100
Agriculture	8,785	8,470	6,260	4,300	3,400	3,100
Manufacturing	2,229	2,487	3,580	4,800	6,600	8,200
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	20	20	39	a/	a/	a/
Food products	380	517	863	1,000	1,000	1,000
Textile mill products	7	9	11	a/	a/	a/
Other commodity-producing industries	4,723	5,991	7,167	9,600	11,300	14,900
Noncommodity-producing industries	13,529	23,097	31,452	50,300	80,900	118,900

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-13 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 3B – WESTERN DAKOTA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	220	208	410	732	1,408
Per capita personal income 1/ (54$)	a/	1,258	1,212	2,291	3,793	6,175
Total earnings (000,000) (54$)	a/	187	169	350	588	1,101
Earnings per employee 1/ (54$)	a/	3,089	3,027	5,738	8,936	14,134
Population	191,094	174,905	171,675	179,000	193,000	228,000
Urban	12,524	20,779	26,850	39,300	48,900	62,700
Rural	178,570	154,126	144,825	139,700	144,100	165,300
Non-farm	63,262	64,763	74,649	93,000	107,300	132,700
Farm	115,308	89,363	70,176	46,700	36,800	32,600
Employment	55,346	60,540	55,834	61,000	65,800	77,900
Agriculture	35,233	34,804	25,831	18,700	14,600	12,900
Manufacturing	713	908	1,407	2,200	3,400	4,800
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	6	15	27	a/	a/	a/
Food products	323	371	542	1,000	1,000	1,000
Textile mill products	5	8	15	a/	a/	a/
Other commodity-producing industries	1,591	3,167	3,621	5,400	6,700	9,100
Noncommodity-producing industries	17,809	21,661	24,975	34,700	41,100	51,100

Table A-14 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
EASTERN DAKOTA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	472	863	892	2,100	4,300	9,200
Per capita personal income 1/ (54$)	716	1,303	1,332	2,699	4,313	7,050
Total earnings (000,000) (54$)	406	731	705	1,700	3,400	7,100
Earnings per employee 1/ (54$)	1,937	2,939	2,959	5,882	9,341	15,011
Population	659,248	662,431	669,635	778,000	997,000	1,305,000
Urban	155,608	197,044	246,519	356,800	508,350	701,100
Rural	503,640	465,387	423,116	421,200	488,650	603,900
Non-farm	177,322	193,232	201,030	271,200	368,650	496,900
Farm	326,318	272,155	222,086	150,000	120,000	107,000
Employment	209,639	248,710	238,266	289,000	364,000	473,000
Agriculture	108,106	108,488	80,434	57,000	46,000	41,000
Manufacturing	8,431	10,888	14,624	20,000	31,000	48,000
Petroleum refining	63	8	39	a/	a/	a/
Paper and allied products	24	39	41	a/	a/	a/
Primary metals	5	110	69	a/	a/	a/
Chemical products	187	330	299	a/	a/	a/
Food products	5,183	6,311	8,554	9,000	11,000	11,000
Textile mill products	26	54	83	a/	a/	a/
Other commodity-producing industries	5,817	16,274	15,101	21,000	27,000	35,000
Noncommodity-producing industries	87,285	113,060	128,107	191,000	260,000	349,000

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-15 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 4A – EASTERN DAKOTA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	299	546	546	1,258	2,547	5,381
Per capita personal income 1/ (54$)	698	1,292	1,304	2,632	4,231	6,908
Total earnings (000,000) (54$)	258	468	432	1,016	2,019	4,181
Earnings per employee 1/ (54$)	1,945	2,959	2,927	5,789	9,261	14,901
Population	428,605	422,616	418,602	478,000	602,000	779,000
Urban	82,695	105,012	133,815	195,900	275,550	377,600
Rural	345,910	317,604	284,787	282,100	326,450	401,400
Non-farm	126,836	137,150	138,778	185,650	249,700	333,300
Farm	219,074	180,454	146,009	96,450	76,750	68,100
Employment	132,618	158,149	147,611	175,500	218,000	280,600
Agriculture	71,673	73,461	53,670	37,400	30,000	26,600
Manufacturing	3,211	4,028	5,759	8,300	13,300	20,800
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	41	97	142	a/	a/	a/
Food products	1,587	1,676	2,594	2,900	3,600	3,700
Textile mill products	15	26	36	a/	a/	a/
Other commodity-producing industries	3,239	10,970	10,269	15,600	20,500	27,000
Noncommodity-producing industries	54,495	69,690	77,913	114,200	154,200	206,200

Table A-16 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 4B LESS SIOUX FALLS SMSA – EASTERN DAKOTA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	113	204	199	473	915	2,016
Per capita personal income 1/ (54$)	653	1,208	1,210	2,599	4,067	6,857
Total earnings (000,000) (54$)	99	174	158	381	736	1,562
Earnings per employee 1/ (54$)	1,764	2,843	2,713	5,687	8,954	14,792
Population	172,946	168,905	164,458	182,000	225,000	294,000
Urban	32,081	39,336	46,122	65,900	93,500	132,000
Rural	140,865	129,569	118,336	116,100	131,500	162,000
Non-farm	44,647	47,390	50,389	68,100	92,650	127,000
Farm	96,218	82,179	67,947	48,000	38,850	35,000
Employment	56,137	61,193	58,245	67,000	82,200	105,600
Agriculture	32,474	30,934	23,652	17,500	14,400	13,000
Manufacturing	1,435	1,987	3,237	5,400	9,100	14,700
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	31	64	22	a/	a/	a/
Food products	772	1,029	2,021	3,000	4,100	4,300
Textile mill products	4	12	35	a/	a/	a/
Other commodity-producing industries	1,713	3,284	2,668	2,000	1,900	2,000
Noncommodity-producing industries	20,515	24,988	28,688	42,100	56,800	75,900

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-17 — INCOME, POPULATION, AND EMPLOYMENT — HISTORIC AND PROJECTED
SIOUX FALLS SMSA — EASTERN DAKOTA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	60	113	147	369	838	1,803
Per capita personal income 1/ (54$)	1,040	1,594	1,698	3,127	4,929	7,772
Total earnings (000,000) (54$)	49	89	115	303	645	1,357
Earnings per employee 1/ (54$)	2,346	3,031	3,548	6,516	10,110	15,634
Population	57,697	70,910	86,575	118,000	170,000	232,000
Urban	40,832	52,696	66,582	95,000	139,300	191,500
Rural	16,865	18,214	19,993	23,000	30,700	40,500
Non-farm	5,839	8,692	11,863	17,450	26,300	36,600
Farm	11,026	9,522	8,130	5,550	4,400	3,900
Employment	20,884	29,368	32,410	46,500	63,800	86,800
Agriculture	3,959	4,093	3,112	2,100	1,600	1,400
Manufacturing	3,785	4,873	5,628	6,300	8,600	12,500
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	114	170	137	a/	a/	a/
Food products	2,891	3,610	3,982	3,100	3,200	3,000
Textile mill products	7	15	12	a/	a/	a/
Other commodity-producing industries	865	2,020	2,164	3,400	4,600	6,000
Noncommodity-producing industries	12,275	18,382	21,506	34,700	49,000	66,900

Table A-18 — INCOME, POPULATION, AND EMPLOYMENT — HISTORIC AND PROJECTED
PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	2,714	3,947	10,088	23,029	53,169
Per capita personal income 1/ (54$)	a/	1,741	2,010	3,297	4,993	7,661
Total earnings (000,000) (54$)	a/	2,173	3,107	8,031	18,043	41,469
Earnings per employee 1/ (54$)	a/	3,577	4,103	6,604	9,870	15,080
Population	1,352,495	1,559,170	1,963,857	3,060,000	4,612,000	6,940,000
Urban	675,005	944,176	1,392,371	2,509,300	3,996,200	6,219,200
Rural	677,490	614,994	571,486	550,700	615,800	720,800
Non-farm	283,243	300,342	330,125	395,100	481,500	591,400
Farm	394,247	314,652	241,361	155,600	134,300	129,400
Employment	452,043	607,506	757,229	1,216,000	1,828,000	2,750,000
Agriculture	129,703	123,951	93,427	60,300	52,400	50,700
Manufacturing	35,041	60,879	106,548	216,000	307,500	435,600
Petroleum refining	1,680	3,078	4,051	4,000	4,000	5,000
Paper and allied products	364	805	972	1,000	1,000	3,000
Primary metals	1,132	2,014	1,709	1,000	1,000	2,000
Chemical products	1,124	2,362	3,748	11,900	14,500	25,700
Food products	11,349	16,043	23,868	28,400	37,200	42,400
Textile mill products	182	329	330	a/	a/	a/
Other commodity-producing industries	28,151	50,485	62,625	95,400	135,100	195,600
Noncommodity-producing industries	259,148	372,191	494,629	844,300	1,333,000	2,068,100

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-19 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 5A – PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	185	227	465	883	1,625
Per capita personal income 1/ (54$)	a/	2,254	2,244	3,185	4,961	7,701
Total earnings (000,000) (54$)	a/	153	181	367	679	1,235
Earnings per employee 1/ (54$)	a/	4,659	4,755	6,542	9,855	15,024
Population	66,890	82,068	101,169	146,000	178,000	211,000
Urban	34,122	49,213	68,240	109,700	139,500	168,700
Rural	32,768	32,855	32,929	36,300	38,500	42,300
Non-farm	19,566	22,977	25,782	31,400	34,200	38,100
Farm	13,202	9,878	7,147	4,900	4,300	4,200
Employment	23,106	32,840	38,063	56,100	68,900	82,200
Agriculture	5,422	4,778	3,520	2,150	1,900	1,850
Manufacturing	2,084	3,555	3,605	6,100	8,000	10,400
Petroleum refining	a/	a/	a/	1,700	1,700	2,000
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	18	30	56	a/	a/	a/
Food products	225	273	370	a/	a/	a/
Textile mill products	8	5	4	a/	a/	a/
Other commodity-producing industries	2,698	5,630	6,262	9,100	9,300	9,400
Noncommodity-producing industries	12,902	18,877	24,676	38,750	49,700	60,550

Table A-20 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 5B LESS DENVER SMSA, PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	406	522	1,023	2,018	4,087
Per capita personal income 1/ (54$)	a/	1,690	1,878	3,081	4,828	7,639
Total earnings (000,000) (54$)	a/	336	415	806	1,550	3,106
Earnings per employee 1/ (54$)	a/	3,698	4,057	6,387	9,580	14,961
Population	216,786	240,283	277,949	332,000	418,000	535,000
Urban	72,548	91,760	138,719	196,600	265,000	351,400
Rural	144,238	148,523	139,230	135,400	153,000	183,600
Non-farm	61,018	78,722	88,452	101,900	123,200	154,500
Farm	83,220	69,801	50,778	33,500	29,800	29,100
Employment	69,566	90,870	102,282	126,200	161,800	207,600
Agriculture	25,795	25,514	18,323	12,300	11,000	10,900
Manufacturing	2,957	4,587	9,802	18,500	23,800	31,000
Petroleum refining	a/	a/	a/	800	800	1,100
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	125	240	348	700	1,300	2,300
Food products	1,495	1,942	2,583	2,900	3,600	4,100
Textile mill products	7	8	4	a/	a/	a/
Other commodity-producing industries	4,714	7,833	11,750	11,800	14,200	17,400
Noncommodity-producing industries	36,100	52,936	62,407	83,600	112,800	148,300

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-21 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
DENVER SMSA – PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	627	1,173	2,107	6,360	15,671	38,637
Per capita personal income 1/ (54$)	1,408	1,916	2,267	3,514	5,123	7,704
Total earnings (000,000) (54$)	483	895	1,664	5,118	12,448	30,454
Earnings per employee 1/ (54$)	3,115	3,661	4,548	7,001	10,170	15,227
Population	445,206	612,128	929,383	1,810,000	3,059,000	5,015,000
Urban	363,097	543,062	867,033	1,745,000	2,980,000	4,915,000
Rural	82,109	69,066	62,350	65,000	79,000	100,000
Non-farm	52,219	47,660	51,353	60,000	75,300	96,500
Farm	29,890	21,406	10,997	5,000	3,700	3,500
Employment	155,042	244,458	365,863	731,000	1,224,000	2,000,000
Agriculture	9,162	8,981	7,241	2,600	2,000	1,900
Manufacturing	21,953	37,980	70,197	155,000	230,000	337,000
Petroleum refining	a/	a/	a/	1,400	1,400	1,700
Paper and allied products	a/	a/	a/	900	900	2,400
Primary metals	a/	a/	a/	900	900	1,500
Chemical products	757	1,679	2,744	6,000	11,100	19,800
Food products	6,054	8,744	11,939	13,600	17,600	20,300
Textile mill products	133	259	212	a/	a/	a/
Other commodity-producing industries	12,027	21,178	29,056	53,800	85,600	135,000
Noncommodity-producing industries	111,900	176,319	259,369	519,600	906,400	1,526,100

Table A-22 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 5C – PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	319	346	655	1,242	2,463
Per capita personal income 1/ (54$)	a/	1,627	1,729	2,937	4,617	7,532
Total earnings (000,000) (54$)	a/	264	275	516	955	1,872
Earnings per employee 1/ (54$)	a/	3,590	3,718	6,007	9,183	14,740
Population	189,129	196,086	200,138	223,000	269,000	327,000
Urban	66,570	88,969	100,568	128,600	165,800	209,500
Rural	122,559	107,117	99,570	94,400	103,200	117,500
Non-farm	45,823	45,991	51,008	61,200	74,500	89,800
Farm	76,736	61,126	48,562	33,200	28,700	27,700
Employment	60,938	73,541	73,968	85,900	104,000	127,000
Agriculture	25,421	23,834	18,305	12,700	11,100	10,750
Manufacturing	2,619	4,128	6,305	11,000	13,800	17,700
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	61	173	95	a/	a/	a/
Food products	1,559	2,160	3,012	3,400	4,400	5,100
Textile mill products	15	12	58	a/	a/	a/
Other commodity-producing industries	3,314	5,524	5,003	6,700	7,800	9,000
Noncommodity-producing industries	29,584	40,055	44,355	55,500	71,300	89,550

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-23 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 5D – PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	103	107	181	323	609
Per capita personal income 1/ (54$)	a/	1,408	1,574	2,785	4,486	7,427
Total earnings (000,000) (54$)	a/	85	85	142	248	463
Earnings per employee 1/ (54$)	a/	3,156	3,377	5,657	8,921	14,560
Population	80,157	73,167	67,963	65,000	72,000	82,000
Urban	13,047	18,305	18,980	24,000	30,000	36,100
Rural	67,110	54,862	48,983	41,000	42,000	45,900
Non-farm	24,118	22,403	21,310	23,100	26,600	30,800
Farm	42,992	32,459	27,673	17,900	15,400	15,100
Employment	26,967	26,934	25,170	25,100	27,800	31,800
Agriculture	14,515	12,690	10,421	6,750	5,900	5,750
Manufacturing	555	639	849	1,200	1,400	1,800
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	8	20	25	a/	a/	a/
Food products	256	286	307	a/	a/	a/
Textile mill products	2	3	12	a/	a/	a/
Other commodity-producing industries	850	1,613	1,185	1,300	1,600	2,000
Noncommodity-producing industries	11,047	11,992	12,715	15,850	18,900	22,250

Table A-24 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 5E – PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	124	119	227	428	867
Per capita personal income 1/ (54$)	a/	1,291	1,319	2,467	4,196	7,225
Total earnings (000,000) (54$)	a/	102	95	179	329	659
Earnings per employee 1/ (54$)	a/	2,732	2,812	5,014	8,329	14,203
Population	110,780	96,085	90,235	92,000	102,000	120,000
Urban	10,600	12,280	15,958	26,000	34,200	44,000
Rural	100,180	83,805	74,277	66,000	67,800	76,000
Non-farm	34,985	33,336	33,735	40,100	45,400	54,400
Farm	65,195	50,469	40,542	25,900	22,400	21,600
Employment	34,573	37,333	33,779	35,700	39,500	46,400
Agriculture	20,992	20,529	15,146	10,500	9,100	8,850
Manufacturing	584	1,000	2,432	4,200	5,000	6,100
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	7	16	8	a/	a/	a/
Food products	259	258	392	a/	a/	a/
Textile mill products	2	3	9	a/	a/	a/
Other commodity-producing industries	988	2,005	1,815	2,300	2,500	3,200
Noncommodity-producing industries	12,009	13,799	14,386	18,700	22,900	28,250

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-25 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 5F – PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	404	519	1,170	2,464	4,881
Per capita personal income 1/ (54$)	a/	1,558	1,747	2,985	4,794	7,509
Total earnings (000,000) (54$)	a/	338	392	903	1,834	3,680
Earnings per employee 1/ (54$)	a/	3,329	3,319	5,788	9,079	14,431
Population	243,547	259,353	297,020	392,000	514,000	650,000
Urban	115,021	140,587	182,873	279,400	381,700	494,500
Rural	128,526	118,766	114,147	112,600	132,300	155,500
Non-farm	45,514	49,253	58,485	77,400	102,300	127,300
Farm	83,012	69,513	55,662	35,200	30,000	28,200
Employment	81,851	101,530	118,104	156,000	202,000	255,000
Agriculture	28,396	27,625	20,471	13,300	11,400	10,700
Manufacturing	4,289	8,990	13,358	20,000	25,500	31,600
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	148	204	472	900	1,500	2,700
Food products	1,501	2,380	5,265	7,400	10,200	11,400
Textile mill products	15	39	31	a/	a/	a/
Other commodity-producing industries	3,560	6,702	7,554	10,400	14,100	19,600
Noncommodity-producing industries	45,606	58,213	76,721	112,300	151,000	193,100

Table A-26 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 5F – LESS LINCOLN SMSA – PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	204	213	410	752	1,369
Per capita personal income 1/ (54$)	a/	1,461	1,503	2,697	4,398	6,949
Total earnings (000,000) (54$)	a/	180	166	325	575	1,045
Earnings per employee 1/ (54$)	a/	3,448	3,166	5,603	8,846	13,933
Population	142,962	139,611	141,748	152,000	171,000	197,000
Urban	33,037	38,361	46,653	65,400	81,700	100,500
Rural	109,925	101,250	95,095	86,600	89,300	96,500
Non-farm	37,967	40,400	46,026	55,200	62,400	71,100
Farm	71,958	60,850	49,069	31,400	26,900	25,400
Employment	46,677	52,209	52,430	58,000	65,000	75,000
Agriculture	24,561	23,900	18,090	11,900	10,200	9,700
Manufacturing	1,408	2,446	4,772	7,000	8,500	10,200
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	56	98	43	a/	a/	a/
Food products	571	1,210	2,693	4,000	5,700	6,400
Textile mill products	6	12	8	a/	a/	a/
Other commodity-producing industries	1,572	3,204	3,011	3,600	4,200	5,300
Noncommodity-producing industries	19,136	22,659	26,557	35,500	42,100	49,800

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-27 — INCOME, POPULATION, AND EMPLOYMENT — HISTORIC AND PROJECTED
LINCOLN SMSA — PLATTE-NIOBRARA SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	112	200	306	767	1,712	3,512
Per capital personal income 1/ (54$)	1,113	1,670	1,971	3,196	4,991	7,753
Total earnings (000,000) (54$)	88	158	226	578	1,259	2,635
Earnings per employee 1/ (54$)	2,502	3,204	3,441	5,898	9,190	14,639
Population	100,585	119,742	155,272	240,000	343,000	453,000
Urban	81,984	102,226	136,220	214,000	300,000	394,000
Rural	18,601	17,516	19,052	26,000	43,000	59,000
Non-farm	7,547	8,853	12,459	22,200	39,900	56,200
Farm	11,054	8,663	6,593	3,800	3,100	2,800
Employment	35,174	49,321	65,674	98,000	137,000	180,000
Agriculture	3,835	3,725	2,381	1,400	1,200	1,000
Manufacturing	2,881	6,544	8,586	13,000	17,000	21,400
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	92	106	429	900	1,500	2,700
Food products	930	1,170	2,572	3,400	4,500	5,000
Textile mill products	9	27	23	a/	a/	a/
Other commodity-producing industries	1,988	3,498	4,543	6,800	9,900	14,300
Noncommodity-producing industries	26,470	35,554	50,164	76,800	108,900	143,300

Table A-28 — INCOME, POPULATION, AND EMPLOYMENT — HISTORIC AND PROJECTED
MIDDLE MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	2,069	2,367	4,612	9,071	18,531
Per capita personal income 1/ (54$)	a/	1,665	1,830	3,144	4,890	7,626
Total earnings (000,000) (54$)	a/	1,723	1,873	3,694	7,057	14,231
Earnings per employee 1/ (54$)	a/	3,603	3,878	6,504	9,815	15,091
Population	1,247,064	1,242,428	1,293,481	1,467,000	1,855,000	2,430,000
Urban	565,415	634,475	740,373	988,000	1,371,600	1,926,200
Rural	681,649	607,953	553,108	479,000	483,400	503,800
Non-farm	256,812	258,484	273,058	294,800	326,700	356,500
Farm	424,837	349,469	280,050	184,200	156,700	147,300
Employment	416,760	478,245	482,999	568,000	719,000	943,000
Agriculture	143,630	132,570	92,929	60,700	51,600	48,300
Manufacturing	39,551	58,499	75,611	99,000	124,500	162,400
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	2,000	3,000	4,000
Primary metals	a/	a/	a/	2,000	3,000	3,000
Chemical products	1,095	1,867	2,438	5,100	8,500	15,300
Food products	21,320	30,298	35,017	36,600	41,800	41,600
Textile mill products	126	227	164	a/	a/	a/
Other commodity-producing industries	18,776	29,567	29,377	37,600	49,900	72,400
Noncommodity-producing industries	214,803	257,609	285,082	370,700	493,000	659,900

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-29 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 6B LESS 3 SMSA'S – MIDDLE MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	986	922	1,494	2,472	4,061
Per capita personal income 1/ (54$)	a/	1,483	1,475	2,626	4,314	6,848
Total earnings (000,000) (54$)	a/	839	711	1,187	1,885	3,106
Earnings per employee 1/ (54$)	a/	3,423	3,198	5,626	8,850	13,928
Population	714,381	664,889	625,010	569,000	573,000	593,000
Urban	137,501	149,508	164,475	180,000	194,600	208,200
Rural	576,880	515,381	460,535	389,000	378,400	384,800
Non-farm	206,845	209,882	212,205	224,300	236,700	250,200
Farm	370,035	305,499	248,330	164,700	141,700	134,600
Employment	232,037	245,080	222,361	211,000	213,000	223,000
Agriculture	125,216	116,543	81,996	54,100	46,500	44,100
Manufacturing	7,552	11,763	19,184	25,300	27,700	30,100
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	226	575	688	1,500	2,400	4,300
Food products	3,031	4,314	7,981	10,800	15,500	16,200
Textile mill products	43	56	87	a/	a/	a/
Other commodity-producing industries	10,424	15,431	12,919	13,300	13,600	15,400
Noncommodity-producing industries	88,845	101,343	108,262	118,300	125,200	133,400

Table A-30 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
OMAHA SMSA – MIDDLE MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	400	701	1,017	2,343	5,222	11,934
Per capita personal income 1/ (54$)	1,230	1,913	2,221	3,539	5,175	7,909
Total earnings (000,000) (54$)	326	570	825	1,901	4,116	9,197
Earnings per employee 1/ (54$)	2,867	3,795	4,551	7,093	10,239	15,457
Population	325,153	366,395	457,873	662,000	1,009,000	1,509,000
Urban	265,283	314,149	398,712	601,000	933,000	1,420,000
Rural	59,870	52,246	59,161	61,000	76,000	89,000
Non-farm	31,711	29,958	43,066	51,100	68,200	82,300
Farm	28,159	22,288	16,095	9,900	7,800	6,700
Employment	113,693	150,197	181,262	268,000	402,000	595,000
Agriculture	9,338	8,402	6,094	3,700	2,900	2,400
Manufacturing	17,898	27,454	36,990	51,700	72,300	104,000
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	800	1,200	1,600
Primary metals	a/	a/	a/	1,500	2,200	2,300
Chemical products	529	788	1,236	2,500	4,200	7,600
Food products	9,781	14,823	16,392	17,000	18,000	18,000
Textile mill products	66	134	61	a/	a/	a/
Other commodity-producing industries	5,100	9,479	11,887	18,700	29,300	47,300
Noncommodity-producing industries	81,357	104,862	126,291	193,900	297,500	441,300

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-31 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
ST. JOSEPH SMSA – MIDDLE MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	113	170	189	319	555	974
Per capita personal income 1/ (54$)	1,201	1,756	2,087	3,289	5,045	7,730
Total earnings (000,000) (54$)	92	137	153	253	429	741
Earnings per employee 1/ (54$)	2,876	3,685	4,385	6,838	10,214	15,438
Population	94,067	96,826	90,581	97,000	110,000	126,000
Urban	75,711	81,270	79,996	88,000	102,000	119,000
Rural	18,356	15,556	10,585	9,000	8,000	7,000
Non-farm	8,404	7,633	6,712	6,600	6,300	5,600
Farm	9,952	7,923	3,873	2,400	1,700	1,400
Employment	31,992	37,174	34,891	37,000	42,000	48,000
Agriculture	2,827	2,416	1,324	800	500	400
Manufacturing	7,491	9,941	10,368	11,000	12,000	13,000
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	1,100	1,600	2,000
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	179	294	429	800	1,400	2,500
Food products	4,351	5,880	5,568	4,600	4,300	3,800
Textile mill products	10	19	8	a/	a/	a/
Other commodity-producing industries	1,604	2,161	1,926	2,200	2,700	3,700
Noncommodity-producing industries	20,070	22,656	21,273	23,000	26,800	30,900

Table A-32 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SIOUX CITY SMSA – MIDDLE MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	136	212	239	456	822	1,562
Per capita personal income 1/ (54$)	1,199	1,854	1,991	3,281	5,043	7,733
Total earnings (000,000) (54$)	115	177	184	353	627	1,187
Earnings per employee 1/ (54$)	2,946	3,865	4,136	6,788	10,113	15,416
Population	113,463	114,318	120,017	139,000	163,000	202,000
Urban	86,920	89,548	97,190	119,000	142,000	179,000
Rural	26,543	24,770	22,827	20,000	21,000	23,000
Non-farm	9,852	11,011	11,075	12,800	15,500	18,400
Farm	16,691	13,759	11,752	7,200	5,500	4,600
Employment	39,038	45,794	44,485	52,000	62,000	77,000
Agriculture	6,249	5,209	3,515	2,100	1,700	1,400
Manufacturing	6,610	9,341	9,069	11,000	12,500	15,300
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	161	210	85	a/	a/	a/
Food products	4,157	5,281	5,076	4,100	4,000	3,600
Textile mill products	7	18	8	a/	a/	a/
Other commodity-producing industries	1,648	2,496	2,645	3,400	4,300	6,000
Noncommodity-producing industries	24,531	28,748	29,256	35,500	43,500	54,300

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-33 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	630	1,283	1,602	3,250	6,500	12,925
Per capita personal income 1/ (54$)	733	1,489	1,775	3,066	4,797	7,403
Total earnings (000,000) (54$)	510	1,019	1,155	2,500	4,800	9,500
Earnings per employee 1/ (54$)	1,841	3,093	3,360	5,981	9,006	13,848
Population	859,603	861,768	902,519	1,060,000	1,355,000	1,746,000
Urban	243,043	321,297	401,937	549,400	753,850	1,005,700
Rural	616,560	540,471	500,582	510,600	601,150	740,300
Non-farm	248,559	267,047	296,155	374,600	494,150	645,300
Farm	368,001	273,424	204,427	136,000	107,000	95,000
Employment	276,983	329,478	343,786	418,000	533,000	686,000
Agriculture	116,794	108,987	74,047	51,000	40,000	36,000
Manufacturing	14,011	19,365	24,190	35,000	44,000	57,000
Petroleum refining	223	77	182	a/	a/	a/
Paper and allied products	225	316	457	a/	a/	a/
Primary metals	106	431	186	a/	a/	a/
Chemical products	157	282	1,502	3,000	4,000	7,000
Food products	5,877	6,706	6,508	7,000	8,000	8,000
Textile mill products	51	56	284	a/	a/	a/
Other commodity-producing industries	12,467	26,127	24,256	35,000	46,000	58,000
Noncommodity-producing industries	133,711	174,999	221,293	297,000	403,000	535,000

Table A-34 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 7A – KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	96	195	189	322	566	1,060
Per capita personal income 1/ (54$)	728	1,549	1,726	3,081	4,809	7,496
Total earnings (000,000) (54$)	78	154	136	248	418	779
Earnings per employee 1/ (54$)	1,861	3,183	3,338	6,200	9,310	14,480
Population	131,786	125,862	109,505	104,500	117,700	141,400
Urban	12,280	19,287	20,315	26,400	34,000	43,900
Rural	119,506	106,575	89,190	78,100	83,700	97,500
Non-farm	47,991	52,733	48,022	54,050	65,000	81,150
Farm	71,515	53,842	41,168	24,050	18,700	16,350
Employment	41,905	48,388	40,737	40,000	44,900	53,800
Agriculture	22,964	22,218	15,344	9,600	7,400	6,000
Manufacturing	758	968	1,178	1,600	2,000	2,500
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	18	21	23	a/	a/	a/
Food products	352	389	463	700	900	1,000
Textile mill products	6	4	0	a/	a/	a/
Other commodity-producing industries	1,308	4,661	2,723	2,500	2,900	3,600
Noncommodity-producing industries	16,875	20,541	21,492	26,300	32,600	41,100

1/ Per capita income and earnings per employee computed from unrounded data.

a/ Not available or not projected.

Table A-35 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 7B – KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	43	79	80	130	228	414
Per capita personal income 1/ (54$)	602	1,245	1,489	2,692	4,393	6,787
Total earnings (000,000) (54$)	34	62	58	100	168	304
Earnings per employee 1/ (54$)	1,476	2,593	2,905	5,405	8,485	13,103
Population	71,433	63,468	53,740	48,300	51,900	61,000
Urban	13,353	14,561	14,575	14,050	16,300	20,100
Rural	58,080	48,907	39,165	34,250	35,600	40,900
Non-farm	19,298	20,437	18,901	20,100	24,500	31,100
Farm	38,782	28,470	20,264	14,150	11,100	9,800
Employment	23,033	23,911	19,968	18,500	19,800	23,200
Agriculture	12,547	11,236	7,282	5,100	4,000	3,600
Manufacturing	743	699	864	1,000	1,100	1,400
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	23	17	8	a/	a/	a/
Food products	457	265	385	a/	a/	a/
Textile mill products	1	2	4	a/	a/	a/
Other commodity-producing industries	743	1,909	1,322	1,300	1,400	1,700
Noncommodity-producing industries	9,000	10,067	10,500	11,100	13,300	16,500

Table A-36 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 7C – KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	11	30	38	71	143	284
Per capita personal income 1/ (54$)	668	1,520	2,003	3,087	4,847	7,454
Total earnings (000,000) (54$)	8	24	27	55	106	209
Earnings per employee 1/ (54$)	1,500	3,339	3,878	6,322	9,550	14,615
Population	16,464	19,738	18,974	23,000	29,500	38,100
Urban	0	3,204	3,555	6,100	8,600	11,600
Rural	16,464	16,534	15,419	16,900	20,900	26,500
Non-farm	7,996	8,974	9,530	14,000	18,700	24,550
Farm	8,468	7,560	5,889	2,900	2,200	1,950
Employment	5,332	7,187	6,962	8,700	11,100	14,300
Agriculture	2,839	3,290	2,585	1,500	1,100	1,000
Manufacturing	101	168	213	300	400	600
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	0	3	3	a/	a/	a/
Food products	25	29	32	a/	a/	a/
Textile mill products	1	0	0	a/	a/	a/
Other commodity-producing industries	151	583	467	700	900	1,100
Noncommodity-producing industries	2,241	3,146	3,697	6,200	8,700	11,600

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-37 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 7D – KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	91	176	189	390	793	1,603
Per capita personal income 1/ (54$)	694	1,457	1,648	2,906	4,602	7,179
Total earnings (000,000) (54$)	74	139	136	300	585	1,178
Earnings per employee 1/ (54$)	1,854	3,082	3,152	5,780	8,810	13,714
Population	131,075	120,804	114,654	134,200	172,300	223,300
Urban	14,969	24,431	31,042	49,200	73,300	102,600
Rural	116,106	96,373	83,612	85,000	99,000	120,700
Non-farm	47,038	48,748	47,946	58,900	78,800	103,050
Farm	69,068	47,625	35,666	26,100	20,200	17,650
Employment	39,911	45,094	43,143	51,900	66,400	85,900
Agriculture	20,533	19,594	13,401	9,500	7,300	6,500
Manufacturing	843	1,020	1,536	2,600	3,400	4,500
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	12	22	27	a/	a/	a/
Food products	329	375	571	1,100	1,700	1,800
Textile mill products	1	1	0	a/	a/	a/
Other commodity-producing industries	2,982	6,067	4,865	5,600	6,500	7,600
Noncommodity-producing industries	15,553	18,413	23,341	34,200	49,200	67,300

Table A-38 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 7E – KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	155	298	291	530	1,007	1,926
Per capita personal income 1/ (54$)	683	1,421	1,490	2,696	4,401	6,869
Total earnings (000,000) (54$)	127	235	210	407	744	1,416
Earnings per employee 1/ (54$)	1,758	2,982	2,945	5,441	8,591	13,371
Population	227,060	209,716	195,279	196,600	228,800	280,400
Urban	50,284	58,536	62,697	73,700	93,700	120,400
Rural	176,776	151,180	132,582	122,900	135,100	160,000
Non-farm	67,992	66,631	69,023	80,150	101,000	129,400
Farm	108,784	84,549	63,559	42,750	34,100	30,600
Employment	72,226	78,817	71,305	74,800	86,600	105,900
Agriculture	35,798	33,974	23,302	16,500	13,200	11,900
Manufacturing	3,586	5,094	5,887	7,800	9,400	11,900
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	30	64	70	a/	a/	a/
Food products	1,138	1,479	1,651	2,500	3,300	3,400
Textile mill products	16	14	0	a/	a/	a/
Other commodity-producing industries	2,303	4,643	3,938	5,000	6,000	7,200
Noncommodity-producing industries	30,539	35,106	38,178	45,500	58,000	74,900

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-39 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 7F LESS TOPEKA SMSA – KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	139	326	493	1,154	2,450	5,002
Per capita personal income 1/ (54$)	730	1,504	1,832	3,157	4,917	7,574
Total earnings (000,000) (54$)	113	258	355	888	1,809	3,676
Earnings per employee 1/ (54$)	1,802	3,144	3,373	6,041	9,068	13,935
Population	190,538	216,762	269,081	365,500	498,300	660,400
Urban	84,324	112,174	150,253	216,000	300,800	402,900
Rural	106,214	104,588	118,828	149,500	197,500	257,500
Non-farm	44,342	60,198	85,227	126,300	178,950	240,750
Farm	61,872	44,390	33,601	23,200	18,550	16,750
Employment	62,718	82,065	105,240	147,000	199,500	263,800
Agriculture	19,521	16,269	10,799	7,900	6,300	5,800
Manufacturing	3,852	5,323	8,394	15,000	20,600	27,900
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	45	80	925	2,200	3,200	5,700
Food products	1,641	1,792	1,980	1,600	1,300	1,000
Textile mill products	21	13	273	a/	a/	a/
Other commodity-producing industries	2,912	5,062	6,885	12,900	18,500	24,200
Noncommodity-producing industries	36,433	55,411	79,162	111,200	154,100	205,900

Table A-40 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
TOPEKA SMSA – KANSAS RIVER SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	95	179	322	653	1,313	2,636
Per capita personal income 1/ (54$)	1,041	1,698	2,279	3,475	5,119	7,721
Total earnings (000,000) (54$)	76	147	233	502	970	1,938
Earnings per employee 1/ (54$)	2,386	3,340	4,129	6,511	9,265	13,932
Population	91,247	105,418	141,286	187,900	256,500	341,400
Urban	67,833	89,104	119,500	163,950	227,150	304,200
Rural	23,414	16,314	21,786	23,950	29,350	37,200
Non-farm	13,902	9,326	17,506	21,100	27,200	35,300
Farm	9,512	6,988	4,280	2,850	2,150	1,900
Employment	31,858	44,016	56,431	77,100	104,700	139,100
Agriculture	2,592	2,406	1,334	900	700	600
Manufacturing	4,128	6,093	6,118	6,700	7,100	8,200
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	29	75	436	600	800	1,100
Food products	1,935	2,377	1,426	a/	a/	a/
Textile mill products	5	22	7	a/	a/	a/
Other commodity-producing industries	2,068	3,202	4,056	7,000	9,800	12,600
Noncommodity-producing industries	23,070	32,315	44,923	62,500	87,100	117,700

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-41 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
LOWER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	1,754	2,948	4,099	9,100	19,700	43,000
Per capita personal income 1/ (54$)	918	1,496	1,835	3,042	4,807	7,502
Total earnings (000,000) (54$)	1,454	2,396	3,211	7,300	15,700	34,300
Earnings per employee 1/ (54$)	2,260	3,128	3,763	6,176	9,703	15,157
Population	1,910,828	1,970,873	2,233,493	2,991,000	4,098,000	5,732,000
Urban	875,934	1,096,731	1,391,330	2,058,500	3,006,900	4,409,700
Rural	1,034,894	874,142	842,163	932,500	1,091,100	1,322,300
Non-farm	386,136	376,430	509,600	727,400	941,600	1,195,400
Farm	648,758	497,712	332,563	205,100	149,500	126,900
Employment	643,394	765,958	853,198	1,182,000	1,618,000	2,263,000
Agriculture	189,551	168,522	98,086	59,000	43,000	37,000
Manufacturing	81,531	124,171	170,808	257,000	341,000	461,000
Petroleum refining	3,146	4,684	4,164	5,000	5,000	6,000
Paper and allied products	1,726	2,895	5,960	8,000	11,000	17,000
Primary metals	2,277	6,715	6,403	7,000	8,000	8,000
Chemical products	3,838	5,098	7,774	12,000	17,000	25,000
Food products	20,157	25,114	27,587	30,000	37,000	39,000
Textile mill products	578	1,104	622	a/	a/	a/
Other commodity-producing industries	35,202	52,017	53,225	74,000	103,000	147,000
Noncommodity-producing industries	337,110	421,248	531,079	792,000	1,131,000	1,618,000

Table A-42 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 8A – LOWER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	317	310	580	1,086	2,120
Per capita personal income 1/ (54$)	a/	1,142	1,268	2,450	4,071	6,598
Total earnings (000,000) (54$)	a/	262	249	465	868	1,691
Earnings per employee 1/ (54$)	a/	2,577	2,840	5,196	8,654	13,929
Population	318,276	277,601	244,384	236,700	266,800	321,300
Urban	74,387	74,436	75,645	92,100	115,400	146,700
Rural	243,889	203,165	168,739	144,600	151,400	174,600
Non-farm	85,770	82,689	81,229	93,500	114,200	143,100
Farm	158,119	120,476	87,510	51,100	37,200	31,500
Employment	101,476	101,659	87,672	89,500	100,300	121,400
Agriculture	50,456	44,797	27,898	15,000	10,900	9,400
Manufacturing	4,417	6,385	8,887	14,200	18,100	22,600
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	59	112	149	a/	a/	a/
Food products	947	1,367	2,512	3,300	4,800	5,000
Textile mill products	64	48	36	a/	a/	a/
Other commodity-producing industries	6,218	6,251	5,431	5,600	6,400	7,900
Noncommodity-producing industries	40,385	44,226	45,456	54,700	64,900	81,500

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-43 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 8B LESS KANSAS CITY SMSA – LOWER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	414	528	947	2,021	4,212
Per capita personal income 1/ (54$)	a/	1,217	1,480	2,484	4,119	6,678
Total earnings (000,000) (54$)	a/	343	413	748	1,604	3,348
Earnings per employee 1/ (54$)	a/	2,681	3,145	5,064	8,496	13,721
Population	347,545	340,105	356,702	381,200	490,600	630,700
Urban	117,269	138,219	158,880	183,000	242,700	315,400
Rural	230,276	201,886	197,822	198,200	247,900	315,300
Non-farm	74,707	80,693	112,854	149,100	211,400	284,300
Farm	155,569	121,193	84,968	49,100	36,500	31,000
Employment	115,852	127,937	131,331	147,700	188,800	244,000
Agriculture	48,290	41,819	25,551	12,800	10,000	9,100
Manufacturing	9,945	15,550	21,525	34,200	43,500	54,400
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	78	222	373	600	900	1,400
Food products	1,338	1,718	2,822	3,700	5,400	5,600
Textile mill products	250	217	150	a/	a/	a/
Other commodity-producing industries	7,777	9,340	9,330	9,200	12,000	15,800
Noncommodity-producing industries	49,840	61,228	74,925	91,500	123,300	164,700

Table A-44 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
KANSAS CITY SMSA – LOWER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	944	1,693	2,490	5,800	13,000	29,200
Per capita personal income 1/ (54$)	1,311	1,995	2,279	3,452	5,248	7,959
Total earnings (000,000) (54$)	758	1,363	2,007	4,750	10,450	23,410
Earnings per employee 1/ (54$)	2,816	3,854	4,666	7,028	10,496	15,953
Population	720,039	848,655	1,092,545	1,680,000	2,477,000	3,669,000
Urban	551,831	723,422	963,615	1,522,000	2,298,000	3,469,000
Rural	168,208	125,233	128,930	158,000	179,000	200,000
Non-farm	111,084	84,693	103,512	144,900	170,200	192,500
Farm	57,124	40,540	25,418	13,100	8,800	7,500
Employment	269,188	353,640	430,089	675,900	995,600	1,467,400
Agriculture	16,880	12,686	8,235	5,000	3,000	2,000
Manufacturing	56,794	84,563	111,025	159,000	213,000	296,000
Petroleum refining	2,925	4,567	3,881	5,000	5,000	6,000
Paper and allied products	1,618	2,716	4,166	6,000	9,000	15,000
Primary metals	2,033	5,914	5,405	6,000	7,000	7,000
Chemical products	3,622	4,567	6,722	10,000	14,000	20,000
Food products	15,023	18,176	16,830	16,000	17,000	18,000
Textile mill products	226	713	333	a/	a/	a/
Other commodity-producing industries	13,660	24,336	24,694	42,300	63,400	95,300
Noncommodity-producing industries	181,854	232,055	286,135	469,600	716,200	1,074,100

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.
Note: Kansas City SMSA as used herein includes the counties of: Cass, Clay, Jackson, and Platte in Missouri, and Johnson and Wyandotte in Kansas.

Table A-45 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 8C – LOWER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	167	182	367	732	1,503
Per capita personal income 1/ (54$)	a/	1,153	1,365	2,407	4,000	6,481
Total earnings (000,000) (54$)	a/	138	147	294	585	1,198
Earnings per employee 1/ (54$)	a/	2,585	3,131	5,185	8,641	13,898
Population	159,332	144,807	133,275	152,500	183,000	231,900
Urban	45,144	46,003	48,338	64,000	82,600	108,500
Rural	114,188	98,804	84,937	88,500	100,400	123,400
Non-farm	34,660	38,148	41,720	59,200	79,300	105,800
Farm	79,528	60,656	43,217	29,300	21,100	17,600
Employment	50,184	53,377	46,949	56,700	67,700	86,200
Agriculture	23,964	21,633	12,339	8,400	6,000	5,100
Manufacturing	1,821	3,081	5,313	10,000	13,500	17,600
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	22	27	73	a/	a/	a/
Food products	608	657	741	800	900	1,000
Textile mill products	11	29	17	a/	a/	a/
Other commodity-producing industries	2,961	4,097	3,499	3,600	4,300	5,600
Noncommodity-producing industries	21,438	24,566	25,798	34,700	43,900	57,900

Table A-46 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SUBAREA 8D LESS SPRINGFIELD SMSA – LOWER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	a/	207	364	886	1,701	3,385
Per capita personal income 1/ (54$)	a/	812	1,299	2,384	3,861	6,267
Total earnings (000,000) (54$)	a/	171	215	633	1,283	2,623
Earnings per employee 1/ (54$)	a/	1,892	1,959	4,312	7,412	12,297
Population	275,095	254,882	280,311	371,600	440,600	540,100
Urban	26,065	39,102	47,628	69,200	82,200	101,100
Rural	249,030	215,780	232,683	302,400	358,400	439,000
Non-farm	68,783	75,265	149,171	245,200	316,400	403,000
Farm	180,247	140,515	83,512	57,200	42,000	36,000
Employment	78,400	90,390	109,726	146,800	173,100	213,300
Agriculture	45,707	43,744	21,950	16,100	11,900	10,400
Manufacturing	4,839	9,092	13,754	23,600	30,900	39,400
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	31	60	217	500	700	1,300
Food products	966	1,568	2,243	2,900	4,300	4,500
Textile mill products	13	45	44	a/	a/	a/
Other commodity-producing industries	2,988	5,256	6,820	9,200	11,000	13,900
Noncommodity-producing industries	24,866	32,298	67,202	97,900	119,300	149,600

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

Table A-47 – INCOME, POPULATION, AND EMPLOYMENT – HISTORIC AND PROJECTED
SPRINGFIELD SMSA – LOWER MISSOURI SUBREGION

Item	1940	1950	1960	1980	2000	2020
Total personal income (000,000) (54$)	84	150	225	520	1,160	2,580
Per capita personal income 1/ (54$)	928	1,431	1,781	3,077	4,833	7,611
Total earnings (000,000) (54$)	68	119	180	410	910	2,030
Earnings per employee 1/ (54$)	2,403	3,055	3,795	6,269	9,838	15,532
Population	90,541	104,823	126,276	169,000	240,000	339,000
Urban	61,238	75,549	97,224	128,200	186,000	269,000
Rural	29,303	29,274	29,052	40,800	54,000	70,000
Non-farm	11,132	14,942	21,114	35,500	50,100	66,700
Farm	18,171	14,332	7,938	5,300	3,900	3,300
Employment	28,294	38,955	47,431	65,400	92,500	130,700
Agriculture	4,254	3,843	2,113	1,700	1,200	1,000
Manufacturing	3,715	5,500	10,304	16,000	22,000	31,000
Petroleum refining	a/	a/	a/	a/	a/	a/
Paper and allied products	a/	a/	a/	a/	a/	a/
Primary metals	a/	a/	a/	a/	a/	a/
Chemical products	26	110	240	500	800	1,400
Food products	1,275	1,628	2,439	3,200	4,600	4,900
Textile mill products	10	36	21	a/	a/	a/
Other commodity-producing industries	1,598	2,737	3,451	4,100	5,900	8,500
Noncommodity-producing industries	18,727	26,875	31,563	43,600	63,400	90,200

1/ Per capita income and earnings per employee computed from unrounded data.
a/ Not available or not projected.

PART B - AGRICULTURE

Table B-1 – CROP REQUIREMENTS; UNITED STATES AND MISSOURI REGION, CURRENT AND PROJECTED SUMMARY; CURRENT NORMAL PRODUCTION AND PROJECTED REQUIREMENTS, WITH INDEXES OF PRODUCTION REQUIREMENTS

Commodity and Area	Unit	Current Normal	Requirements			Index of Production		
			1980	2000	2020	1980	2000	2020
				(1,000's)		(Current Normal = 100)		
Feed grains:	Tons							
United States		151,879	199,683	259,571	339,956	131	171	224
Missouri Basin		35,433	49,248	64,584	85,400	139	182	241
Wheat:	Bu.							
United States		1,199,645	1,889,600	2,192,200	2,618,600	158	183	218
Missouri Basin		430,855	635,300	737,000	880,300	147	171	204
Rye:	Bu.							
United States		34,140	40,732	53,893	72,518	119	158	212
Missouri Basin		13,258	16,912	22,379	30,111	128	169	227
Soybeans:	Bu.							
United States		679,056	1,350,467	1,640,933	2,116,367	192	242	312
Missouri Basin		86,269	115,077	144,648	186,558	133	168	216
Potatoes:	Cwt.							
United States		276,056	328,876	450,136	627,396	119	163	227
Missouri Basin		8,950	6,775	9,273	12,924	76	104	144
Sugar beets:	Tons							
United States		19,615	38,092	62,482	96,785	194	318	493
Missouri Basin		5,751	10,936	17,938	27,787	190	312	483
Fruits, non-citrus	Tons							
United States		9,461	13,123	18,887	26,995	139	200	285
Missouri Basin		39	54	77	111	139	200	285
Vegetables:	Cwt.							
United States		389,432	642,235	881,055	1,217,135	165	226	312
Missouri Basin		4,030	5,780	7,930	10,954	143	197	272
Flaxseed:	Bu.							
United States		26,924	22,518	29,161	38,500	84	108	143
Missouri Basin		13,457	9,917	12,902	17,036	74	96	126
Beans, dry edible:	Cwt.							
United States		19,194	23,450	30,980	41,580	122	161	217
Missouri Basin		3,542	4,334	5,725	7,684	122	161	217

Table B-2 – FEED GRAIN REQUIREMENT; UNITED STATES AND MISSOURI REGION, CURRENT AND PROJECT SUMMARY; CURRENT NORMAL PRODUCTION AND PROJECTED REQUIREMENTS, WITH INDEXES OF PRODUCTION REQUIREMENTS

Commodity and Area	Current Normal	Requirements			Index of Production		
		1980	2000	2020	1980	2000	2020
		(1,000 Bushels)			(Current Normal = 100)		
Corn:							
United States	3,853,138	5,237,143	6,921,893	9,222,214	136	180	239
Missouri Basin	845,784	1,179,679	1,559,179	2,077,321	139	184	246
Oats:							
United States	1,035,815	1,154,438	1,072,938	791,375	111	104	76
Missouri Basin	218,645	263,250	244,750	180,438	120	112	82
Barley:							
United States	439,720	526,000	536,083	401,458	120	122	114
Missouri Basin	128,060	121,917	124,250	116,250	95	97	91
Sorghum:							
United States	602,342	942,036	1,455,679	2,237,143	156	242	371
Missouri Basin	184,993	324,250	501,036	770,036	175	271	416

Table B-3 – LIVESTOCK AND LIVESTOCK PRODUCT REQUIREMENTS; UNITED STATES AND MISSOURI REGION CURRENT AND PROJECTED SUMMARY; CURRENT NORMAL PRODUCTION AND PROJECTED REQUIREMENTS, WITH INDEXES OF PRODUCTION REQUIREMENTS

Product and Area	Current Normal	Requirements			Index of Production		
		1980	2000	2020	1980	2000	2020
		(Million Pounds)			(Current Normal=100)		
Beef and veal: 1/							
United States	31,181	47,451	66,580	93,537	152	214	300
Missouri Basin	8,107	11,583	16,252	22,833	143	200	282
Lamb and mutton: 1/							
United States	1,497	1,700	2,378	3,331	114	159	222
Missouri Basin	478	506	708	992	106	148	208
Pork: 1/							
United States	20,737	27,056	37,352	51,830	130	180	250
Missouri Basin	4,678	5,858	8,089	11,222	125	173	240
Chickens: 1/2/							
United States	8,440	12,158	16,613	22,890	144	197	271
Missouri Basin	208	182	250	346	88	120	166
Turkeys: 1/							
United States	1,666	3,559	4,888	6,760	214	293	406
Missouri Basin	155	215	296	409	139	191	264
Milk:							
United States	124,840	145,089	198,719	274,269	116	159	220
Missouri Basin	9,780	9,910	13,573	18,733	101	139	192
Eggs: 3/							
United States	62,974	75,528	104,065	144,289	120	165	229
Missouri Basin	7,060	6,148	8,471	11,745	87	120	166

1/ Liveweight basis.
2/ Includes broilers.
3/ Requirements expressed as million eggs.

Table B-4 – CROPLAND ROUGHAGE REQUIREMENTS; MISSOURI REGION, CURRENT NORMAL PRODUCTION AND PROJECTED REQUIREMENTS

Item	Unit	Current Normal	1980	2000	2020
Alfalfa hay	Ton	17,177	20,162	22,713	30,970
Other hay	Ton	4,932	5,593	6,440	9,197
Corn silage	Ton	16,527	18,862	21,704	30,110
Sorghum silage	Ton	6,357	7,407	8,330	11,851
Sorghum forage	Ton	1,599	1,810	2,062	2,984
Cropland pasture	F.U.	4,414,608	5,831,407	6,686,771	7,229,890

Table B-5 – SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY, CURRENT NORMAL, WITH PROJECTIONS, UPPER MISSOURI SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		256						
Research, technology, land use efficiency, land conservation, and land shifts			58		61		23	
PROJECTED PRODUCTION 3/		256		314		375		398
Flood Control			0.2		1.0		2.6	
Group Drainage			0		0		0	
Gully Stabilization			0		0		0	
Irrigation								
Private ground water development			0		1.8		3.8	
Private surface water development			0		0		0	
Public project development			8.8		23.5		34.0	
Improvement in existing system			3.5		10.6		16.4	
Reserve Idle Remaining	0		10		9		0	
Production Losses								
Fish & wildlife			-0.1		-0.4		-0.6	
Miscellaneous			0		0		0	
Recreation			-0.1		-0.8		-1.8	
Reservoir construction			-0.3		-1.1		-1.5	
WITH FULL IMPLEMENTATION		256		336		419		451

Table B-6 – SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY, CURRENT NORMAL, WITH PROJECTIONS, YELLOWSTONE SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		134						
Research, technology, land use efficiency, land conservation, and land shifts			38		44		29	
PROJECTED PRODUCTION 3/		134		172		216		245
Flood Control			0.2		0.4		0.8	
Group Drainage			0		0		0	
Gully Stabilization			0		0		0	
Irrigation								
Private ground water development			0.5		1.8		3.0	
Private surface water development			8.7		28.1		49.1	
Public project development			2.5		7.1		14.5	
Improvement in existing system			3.7		8.8		13.8	
Reserve Idle Remaining	2		10		4		0	
Production Losses								
Fish & wildlife			-*		-0.1		-0.1	
Miscellaneous			-*		-*		-*	
Recreation			-0.2		-0.7		-0.8	
Reservoir construction			-0.1		-0.2		-0.5	
WITH FULL IMPLEMENTATION		136		197		265		325

1/ Cumulative by time period.
2/ Cumulative among and within time periods.
3/ From Problems and Needs.

Table B-7 — SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY, CURRENT NORMAL, WITH PROJECTIONS, WESTERN DAKOTA SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		253						
Research, technology, land use efficiency, land conservation, and land shifts			61		46		51	
PROJECTED PRODUCTION 3/		253		314		360		411
Flood Control			0.3		0.7		1.4	
Group Drainage			*		*		*	
Gully Stabilization			*		0.1		0.2	
Irrigation								
Private ground water development			0.4		2.8		10.0	
Private surface water development			6.2		16.7		42.7	
Public project development			1.6		7.2		11.5	
Improvement in existing system			0.1		0.2		0.6	
Reserve Idle Remaining	4		7		26		0	
Production Losses								
Fish & wildlife			-0.1		-0.2		-0.2	
Miscellaneous			-*		-*		-*	
Recreation			-0.6		-1.4		-2.5	
Reservoir construction			-*		-0.3		-0.4	
WITH FULL IMPLEMENTATION		257		329		412		474

Table B-8 — SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY, CURRENT NORMAL, WITH PROJECTIONS, EASTERN DAKOTA SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		607						
Research, technology, land use efficiency, land conservation, and land shifts			181		154		296	
PROJECTED PRODUCTION 3/		607		788		942		1,238
Flood Control			3.5		7.3		16.4	
Group Drainage			*		1.0		1.3	
Gully Stabilization			0.3		1.4		3.1	
Irrigation								
Private ground water development			5.4		16.3		32.5	
Private surface water development			4.0		16.3		32.5	
Public project development			4.4		25.9		67.3	
Improvement in existing system			0		0		0	
Reserve Idle Remaining	50		40		77		0	
Production Losses								
Fish & wildlife			-5.3		-6.4		-9.1	
Miscellaneous			-0.2		-0.4		-0.6	
Recreation			-0.2		-1.7		-7.0	
Reservoir construction			-2.7		-5.1		-7.5	
WITH FULL IMPLEMENTATION		657		837		1,074		1,367

1/ Cumulative by time period.
2/ Cumulative among and within time periods.
3/ From Problems and Needs.

Table B-9 — SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY, CURRENT NORMAL, WITH PROJECTIONS, PLATTE-NIOBRARA SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		644						
Research, technology, land use efficiency, land conservation, and land shifts			218		168		266	
PROJECTED PRODUCTION 3/		644		862		1,030		1,296
Flood Control			3.7		10.4		20.5	
Group Drainage			1.1		2.0		3.5	
Gully Stabilization			0.1		0.3		0.8	
Irrigation								
Private ground water development			42.1		98.8		190.6	
Private surface water development			4.7		11.3		21.1	
Public project development			13.8		32.7		48.1	
Improvement in existing system			14.8		31.9		53.0	
Reserve Idle Remaining	20		35		24		0	
Production Losses								
Fish & wildlife			-2.2		-2.7		-3.4	
Miscellaneous			0		0		0	
Recreation			-0.9		-2.8		-7.0	
Reservoir construction			-1.2		-3.4		-5.4	
WITH FULL IMPLEMENTATION		644		973		1,232		1,618

Table B-10 — SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY, CURRENT NORMAL, WITH PROJECTIONS, MIDDLE MISSOURI SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		544						
Research, technology, land use efficiency, land conservation, and land shifts			230		225		177	
PROJECTED PRODUCTION 3/		544		774		999		1,176
Flood Control			3.6		9.6		21.0	
Group Drainage			0.1		2.4		3.8	
Gully Stabilization			3.2		20.3		35.0	
Irrigation								
Private ground water development			14.0		56.0		138.7	
Private surface water development			1.4		6.8		34.8	
Public project development			0		0		2.9	
Improvement in existing system			0		0		0	
Reserve Idle Remaining	55		57		21		0	
Production Losses								
Fish & wildlife			-0.1		-1.8		-1.9	
Miscellaneous			0		0		0	
Recreation			-4.0		-11.3		-17.1	
Reservoir construction			-3.5		-8.1		-13.5	
WITH FULL IMPLEMENTATION		599		846		1,094		1,380

1/ Cumulative by time period.
2/ Cumulative among and within time periods.
3/ From Problems and Needs.

Table B-11 — SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY, CURRENT NORMAL, WITH PROJECTIONS, KANSAS SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		689						
Research, technology, land use efficiency, land conservation, and land shifts			253		224		148	
PROJECTED PRODUCTION 3/		689		942		1,166		1,314
Flood Control			6.6		15.0		25.1	
Group Drainage			0.1		0.3		0.4	
Gully Stabilization			0.3		1.0		2.2	
Irrigation								
Private ground water development			59.1		119.3		275.0	
Private surface water development			1.2		4.4		12.6	
Public project development			6.1		18.7		33.6	
Improvement in existing system			0		2.3		23.7	
Reserve Idle Remaining	42		36		32			
Production Losses								
Fish & wildlife			-1.1		-2.4		-4.2	
Miscellaneous			-*		-0.2		-0.3	
Recreation			-0.3		-0.7		-1.2	
Reservoir construction			-4.9		-10.7		-15.4	
WITH FULL IMPLEMENTATION		731		1,045		1,345		1,666

Table B-12 — SUMMARY OF AGRICULTURAL PRODUCTION CAPABILITY CURRENT NORMAL, WITH PROJECTIONS, LOWER MISSOURI SUBREGION

Item	Current Normal		1980		2000		2020	
	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/	Item 1/	Total 2/
	(Million Bushels of Corn Equivalents)							
CURRENT NORMAL BASE 3/		520						
Research, technology, land use efficiency, land conservation, and land shifts			166		154		142	
PROJECTED PRODUCTION 3/		445		611		765		907
Flood Control			17.9		37.0		61.9	
Group Drainage			0.5		1.0		1.6	
Gully Stabilization			1.6		6.5		15.2	
Irrigation								
Private ground water development			7.2		20.7		46.8	
Private surface water development			8.1		25.2		63.4	
Public project development			0		0		0	
Improvement in existing system			0		0		0	
Reserve Idle Remaining	75		94		84		0	
Production Losses								
Fish & wildlife			-1.7		-2.6		-3.4	
Miscellaneous			-0.7		-1.1		-1.3	
Recreation			-2.0		-5.7		-9.8	
Reservoir construction			-15.5		-13.2		-37.0	
WITH FULL IMPLEMENTATION		520		720		899		1,044

1/ Cumulative by time period.
2/ Cumulative among and within time periods.
3/ From Problems and Needs.

PART C - TIMBER RESOURCES

Table C-1 – AREA OF COMMERCIAL FOREST LAND BY OWNERSHIP CLASSES
CURRENT INVENTORY, MISSOURI REGION

Ownership Classes	Subbasins								Missouri Basin
	Upper Missouri	Yellow-stone	Western Dakota	Eastern Dakota	Platte-Niobrara	Middle Missouri	Kansas	Lower Missouri	
	(1,000's of acres)								
Federal	3,705	2,145	1,235	28	2,498	1	20	193	9,824
State, county, and municipal 1/	162	65	91	5	192	4	4	39	563
Private	1,633	956	892	96	1,460	1,014	476	6,419	12,946
All ownership	5,500	3,166	2,218	129	4,150	1,019	500	6,651	23,333

1/ Includes lands which are privately owned by the Indians; however, title is held in trust by the Government.

Table C-2 – VOLUME OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND, MISSOURI REGION: BY SPECIES AND STAND-SIZE CLASSES, 1962

Species	Growing Stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In Sawtimber Stands	In Other Stands
	(1,000 Cubic Feet)			(1,000 Board Feet)		
Softwoods:						
Douglas-fir	2,886,453	663,960	2,222,493	10,876,713	7,160,540	3,716,173
Ponderosa pine	2,900,379	711,362	2,189,017	10,061,321	7,446,668	2,614,653
True firs	768,728	302,480	466,248	2,218,741	1,881,206	337,535
Spruce	2,300,794	353,305	1,947,489	10,737,652	9,920,123	817,529
Lodgepole pine	6,132,230	2,934,218	3,198,012	15,953,405	9,591,177	6,362,228
Southern pines	19,600	9,500	10,100	64,500	20,700	43,800
Eastern red cedar	10,300	9,100	1,200	7,500	1,100	6,400
Other softwoods	650,647	198,942	451,705	2,255,018	1,650,833	604,185
Total softwoods	15,669,131	5,182,867	10,486,264	52,174,850	37,672,347	14,502,503
Hardwoods:						
Select oaks	628,200	268,000	360,200	2,138,900	1,635,900	503,000
Other oaks	710,300	405,600	304,700	1,805,200	1,120,200	685,000
Hickory	165,700	101,600	64,100	395,000	284,900	110,100
Ash and walnut	235,300	98,000	137,300	710,500	558,100	152,400
Cottonwood and aspen	957,598	368,642	588,956	2,560,574	2,243,871	316,703
Other hardwoods	764,873	258,304	506,569	2,751,901	2,211,212	540,689
Total hardwoods	3,461,971	1,500,146	1,961,825	10,362,075	8,054,183	2,307,892
Missouri Basin	19,131,102	6,683,013	12,448,089	62,536,925	45,726,530	16,810,395

Table C-3 — VOLUME OF GROWING STOCK AND SAWTIMBER ON COMMERCIAL FOREST LAND, MISSOURI REGION, 1962

Ownership Class	All Species	Softwoods	Hardwoods
	GROWING STOCK (1,000 Cubic Feet)		
Federal:			
National Forests	11,918,947	11,648,903	270,044
Bureau of Land Management	539,589	508,269	31,320
Other Federal	50,613	10,569	40,044
State, County,& Municipal	422,698	363,740	58,958
Private:			
Indian	263,413	216,721	46,692
Forest industry	4,500	500	4,000
Other private 1/	5,931,342	2,920,429	3,010,913
Total all ownerships	19,131,102	15,669,131	3,461,971
	SAWTIMBER (1,000 Board Feet) 2/		
Federal:			
National Forests	39,073,409	38,793,913	279,496
Bureau of Land Management	1,708,189	1,654,950	53,239
Other Federal	183,757	30,284	153,473
State, County, & Municipal	1,347,340	1,214,122	133,218
Private:			
Indian	804,941	670,032	134,909
Forest industry	11,500	1,500	10,000
Other private 2/	19,407,789	9,810,049	9,597,740
Total all ownerships	62,536,925	52,174,850	10,362,075

1/ Includes farmer-owned.
2/ International 1/4-inch rule.

Table C-4 — VOLUME OF SAWTIMBER ON COMMERCIAL FOREST LAND, MISSOURI REGION, 1962

Species	Diameter Class (Inches at breast height)							
	All classes	9.0 - 10.9	11.0 - 12.9	13.0 - 14.9	15.0 - 16.9	17.0 - 18.9	19.0 - 20.9	21.0 & larger
				(1,000 Board Feet) 1/				
Softwoods:								
Douglas fir	10,876,713	2,146,464	1,462,294	1,494,773	1,466,381	1,096,373	847,256	2,363,172
Ponderosa pine	10,061,321	2,084,871	1,832,837	1,765,238	1,549,532	1,163,280	768,582	896,981
True firs	2,218,741	867,327	501,707	352,683	261,769	130,678	50,553	54,024
Spruce	10,737,652	1,174,387	1,473,271	1,603,693	1,580,151	1,328,383	1,061,034	2,516,733
Lodgepole pine	15,953,405	6,695,752	3,932,715	2,631,094	1,480,194	733,264	282,817	197,569
Southern pines	64,500	31,100	16,000	12,700	4,300	-	400	-
Eastern red cedar	7,500	2,900	1,900	1,700	1,000	-	-	-
Other softwoods	2,255,018	699,234	436,426	369,753	284,121	190,671	93,866	180,947
Total, softwoods	52,174,850	13,702,035	9,657,150	8,231,634	6,627,448	4,642,649	3,104,508	6,209,426
Hardwoods:								
Select oaks	2,138,900	-	649,800	491,400	363,400	207,300	171,700	255,300
Other oaks	1,805,200	-	505,400	338,000	269,500	187,500	157,500	297,300
Hickory	395,000	-	97,200	89,600	80,100	57,300	35,200	35,600
Ash and walnut	710,500	-	154,600	195,700	145,900	89,400	68,200	56,700
Cottonwood and aspen	2,560,574	-	524,004	290,905	285,207	254,747	253,573	952,138
Other hardwoods	2,751,901	-	459,824	385,745	444,638	318,492	346,602	796,600
Total, hardwoods	10,362,075	-	2,390,828	1,841,350	1,588,745	1,114,739	1,032,775	2,393,633
All species:	62,536,925	13,702,035	12,047,978	10,072,984	8,216,193	5,757,388	4,137,283	8,603,064

1/ International 1/4-inch rule

Table C-5 – NET ANNUAL GROWTH OF TIMBER ON COMMERCIAL FOREST LAND
MISSOURI REGION, 1962

Species	Growing Stock (1,000 cubic feet)	Sawtimber (1,000 board feet)
Softwoods:		
Douglas-fir	26,646	91,027
Ponderosa pine	50,570	178,562
True firs	2,822	7,331
Spruce	22,340	107,899
Lodgepole pine	66,093	144,067
Southern pines	490	2,390
Eastern red cedar	930	730
Other softwoods	6,566	23,874
Total,softwoods	176,457	555,880
Hardwoods:		
Select oaks	24,300	106,840
Other oaks	22,470	50,680
Hickory	9,070	18,050
Ash and walnut	14,890	53,818
Cottonwood and aspen	18,134	57,234
Other hardwoods	41,080	133,252
Total, hardwoods	129,944	419,874
Missouri Basin	306,401	961,092

Table C-6 – TIMBER CUT ON COMMERCIAL FOREST LAND
MISSOURI REGION, 1962

Species	Growing Stock (1,000 cubic feet)	Sawtimber (1,000 board feet)
Softwoods:		
Douglas-fir	11,029	75,679
Ponderosa pine	18,501	88,907
True firs	594	3,258
Spruce	6,139	33,939
Lodgepole pine	29,242	170,497
Southern pines	389	1,724
Eastern red cedar	243	713
Other softwoods	-	-
Total,softwoods	66,137	374,717
Hardwoods:		
Select oaks	16,207	76,123
Other oaks	6,858	31,982
Hickory	1,221	4,472
Ash and walnut	3,222	15,892
Cottonwood and aspen	4,467	25,455
Other hardwoods	6,085	25,652
Total, hardwoods	38,060	179,576
Missouri Basin	104,197	554,293

Table C-7 — TOTAL OUTPUT, TIMBER PRODUCTS, BY PRODUCTS, AND BY SOFTWOODS AND HARDWOODS, MISSOURI REGION, 1962

Product and Species Group	Total Output in Standard Units		Output From Roundwood		Output From Plant By-products (Standard Units)
	Unit	Number	Standard Units	M Cubic Feet	
Saw Logs:					
Softwood	M bd.ft. 1/	317,298	317,298	50,032	
Hardwood	M bd.ft. 1/	144,158	144,158	21,407	
Total	M bd.ft. 1/	461,456	461,456	71,439	
Veneer logs and bolts:					
Softwood	M bd.ft. 1/				
Hardwood	M bd.ft. 1/	7,535	7,535	1,081	
Total	M bd.ft. 1/	7,535	7,535	1,081	
Pulpwood:					
Softwood	MStd.cords 2/	111	67	5,846	44
Hardwood	MStd.cords 2/	13	13	1,027	--
Total	MStd.cords 2/	124	80	6,873	44
Fuelwood:					
Softwood	MStd.cords 2/	41	14	1,063	27
Hardwood	MStd.cords 2/	530	457	31,942	73
Total	MStd.cords 2/	571	471	33,005	100
All other industrial wood 2/ 3/					
Softwood	M cu.ft.	4,763	4,763	4,763	
Hardwood	M cu.ft.	10,444	10,444	10,444	
Total	M cu.ft.	15,207	15,207	15,207	
Totals of all products:					
Softwood	M cu.ft.	67,209	61,704	61,704	5,505
Hardwood	M cu.ft.	71,745	65,901	65,901	5,844
Missouri Basin	M cu.ft.	138,954	127,605	127,605	11,349

1/ International ¼-inch rule. 2/ Rough wood basis (for example, units or tons of chips converted to equivalent standard cords). 3/ Includes: excelsior bolts, shingle bolts, turney and particle board bolts, chemical wood, cooperage, piling, poles, mine timbers, posts, box bolts and a miscellaneous assortment of similar items.

Table C-8 – TIMBER PRODUCTS OUTPUT, MISSOURI REGION
HISTORICAL AND PROJECTIONS

Year	Total Output	Subbasins							
		Upper Missouri	Yellow-stone	Western Dakota	Eastern Dakota	Platte-Niobrara	Middle Missouri	Kansas	Lower Missouri
		(1,000 cubic feet)							
1952	125,798	15,572	5,953	14,542	2,164	18,180	6,165	3,633	59,589
1962	138,954	22,585	11,427	17,684	1,808	19,236	6,401	3,500	56,313
1980	234,100	44,060	23,400	34,900	1,570	51,700	6,860	4,310	67,300
2000	321,200	57,630	33,700	52,580	1,460	73,300	7,930	5,790	88,810
2020	398,200	62,430	41,200	71,040	1,680	80,600	9,970	8,570	122,710

Table C-9 – TIMBER PRODUCTS OUTPUT BY TYPE, MISSOURI REGION,
HISTORICAL AND PROJECTIONS

Year	Total Out-put	Saw Logs	Veneer Logs	Pulpwood			Fuelwood			All Other Industrial Wood Products 1/
				Total	Roundwood	Plant By-products	Total	Roundwood	Plant By-products	
				(1,000 cubic feet)						
1952	125,798	45,271	1,253	12,197	12,197	-	53,529	37,385	16,144	13,548
1962	138,954	71,439	1,081	10,041	6,873	3,168	41,186	33,005	8,181	15,207
1980	234,100	98,900	8,600	74,500	55,700	18,800	28,300	21,400	6,900	23,800
2000	321,200	110,000	16,400	132,800	108,900	23,900	21,800	15,300	6,500	40,200
2020	398,200	113,000	23,700	178,300	154,300	24,000	18,400	12,200	6,200	64,800

1/ Includes: excelsior bolts, shingle bolts, turnery bolts, chemical wood, cooperage logs, poles, piling, mine timbers, posts, box bolts and a miscellaneous assortment of similar items.

Table C-10 — TIMBER CUT, GROWTH, AND INVENTORY OF SAWTIMBER ON COMMERCIAL FOREST LAND, MISSOURI REGION, HISTORICAL AND PROJECTIONS

Year	Inventory 1/			Growth			Cut		
	All Species	Softwoods	Hardwoods	All Species	Softwoods	Hardwoods	All Species	Softwoods	Hardwoods
	(1,000 Board Feet)								
1952	48,699,274	40,047,537	8,651,737	743,042	424,541	318,501	318,340	154,565	163,775
1962	62,536,925	52,174,860	10,362,075	961,092	541,218	419,874	554,293	374,717	179,576
1980	67,834,400	54,379,800	13,454,600	1,138,500	636,400	452,100	877,400	581,700	295,700
2000	71,700,900	55,969,900	15,731,000	1,315,100	800,300	514,800	1,145,200	735,500	409,700
2020	73,604,100	56,977,200	16,626,900	1,430,700	855,800	574,900	1,365,400	810,400	555,000

1/ As of January 1, 1953 and 1963.

Table C-11 — TIMBER CUT, GROWTH, AND INVENTORY OF GROWING STOCK ON COMMERCIAL FOREST LAND, MISSOURI REGION, HISTORICAL AND PROJECTIONS

Year	Inventory 1/			Growth 2/			Cut 3/		
	All Species	Softwoods	Hardwoods	All Species	Softwoods	Hardwoods	All Species	Softwoods	Hardwoods
	(1,000 cubic feet)								
1952	13,400,455	10,758,403	2,642,052	233,114	139,689	93,425	91,856	44,202	47,654
1962	19,131,102	15,669,131	3,461,971	306,401	176,457	129,944	104,197	66,137	38,060
1980	22,595,500	17,418,900	5,176,600	409,700	232,900	176,800	196,400	131,800	64,600
2000	26,740,400	19,394,800	7,345,600	522,200	290,800	231,400	305,700	187,800	117,900
2020	30,984,600	21,516,000	9,468,600	626,300	338,400	287,900	401,400	223,700	177,700

1/ As of January 1, 1953 and 1963.

2/ The growth in 1962 is gross growth reduced by current mortality. For other years growth is reduced by average mortality.

3/ The cut in 1962 is timber harvested. For other years it also includes volume "lost" due to flooding, land clearing and land reclassification.

PART D - MINERAL RESOURCES

Table D-1 – SUMMARY OF MISSOURI RIVER BASIN MINERAL RESOURCES[1] AND ESTIMATES OF PRODUCTION POTENTIAL, 1960 AND PROJECTIONS

Table D-1 — SUMMARY OF MISSOURI RIVER BASIN MINERAL RESOURCES AND ESTIMATES OF PRODUCTION POTENTIAL

Subregion and Subarea	States and number of Counties	Fuels[2] Uranium (including thorium)	Natural gas	Petroleum	Coal	Metals[2] Gold	Silver	Tungsten	Molybdenum	Vanadium	Copper	Lead and zinc	Iron	Nonmetals[2] Mica	Cement	Feldspar	Clay	Lime	Gypsum	Additional metals and minerals[2,3]
1-A	Montana 8		A	A	AAB?	aA	aA		b8?		a	a	aa	a	a	a	A		a	Chromium (b), vermiculite (aa)
1-B	Montana 15	aAAA			a	aA	b	aAA	aA	aaAA	a	b	aa	a	AAAA	a	A		a	Chromium (b), graphite (a), vermiculite (aa), phosphate (AAAA)
1-C	Montana 16	b8	AB	A	AAAA	aA	b	b8?			a	b	aaa	a	a	a	A		AAAA	Potash (?)
2-A	Montana 5 Wyoming 1	b8	AB	AB	AAAB	aA	aA	aA	a		a				a		A	A	a	Chromium (a)
2-B	Wyoming 5	AB	AA	AA	AAAA								AA				A	A	A	Beryllium (A), phosphate (a)
2-C	Montana 9 Wyoming 1	A	AB	A	AAAA										a		AAA	A	a	
3-A	South Dakota 6 Wyoming 3	A	AB	A	a	Aa	AA	?	a	A			?	aAAA	aA	AA	AA	AAA	AA	aa	Beryllium (a), lithium (aA), *manganese (b), salt (aaa)*
3-B	Montana 2 North Dakota 14 South Dakota 17	AAAA	AA	AA	AAAA								aaa				A			Beryllium (aaa), manganese (aaa), salt (a)
4-A	North Dakota 15 South Dakota 23	?	AB	AB	AAAA								?				A			Potash (aa), salt (AA)
4-B	South Dakota 16																A			
5-A	Colorado 1 Wyoming 5	AA	AB	AB	AAAA					AA			AA		AAAA		A	A	A	Vermiculite (A), sodium sulfate (?)
5-B	Colorado 16 Nebraska 3 Wyoming 1	AB	AB	AB	AABb	aA	aA	aA	AA?	A	a	a		A	AAAA	a	AAAA	AA	AAAA	Beryllium (AA), fluorspar (b), peat (AA)
5-C	Nebraska 12 Wyoming 1		A	a	a													A		
5-D	Nebraska 10																			
5-E	Nebraska 18																			Pumice (?)
5-F	Nebraska 11																A			
6	Iowa 24 Kansas 5 Minnesota 3 Missouri 5 Nebraska 14			a	AABb										AAAA		A			
7-A	Colorado 3 Kansas 6 Nebraska 10			B																Salt (a), pumice (AA)
7-B	Kansas 4 Nebraska 2			a											a		A			Pumice (a)
7-C	Colorado 1 Kansas 5		a	a											b					Salt (a), pumice (a), *diatomaceous marl (A)*
7-D	Kansas 14		B	AB											a					Salt (AAAA), pumice (AA)
7-E	Kansas 2 Nebraska 13														a		AA		A	Peat (A), pumice (a)
7-F	Kansas 10		B	A	aaaa										AAAA			AA	a	
8-A	Iowa 5 Missouri 16		a*	a	AABb															
8-B	Missouri 23			aaAB	A										AAAA		a	AA		Barite (b)
8-C	Kansas 6 Missouri 3			aAAA	AABb										AAAA		A			Asphaltic sandstone (a)
8-D	Missouri 20				AABb										a					Barite (b)

1/ Source: Federal Bureau of Mines, Federal Geological Survey, and State publications.

2/ Symbols indicate the presence of mineral reserves or resources (possible future economic reserves). Estimates of conditions at four different dates —1960, 1980, 2000, and 2020— are indicated in sequence. Fewer than four symbols indicates that a reasonable estimate is not possible for the later years. Symbols are defined as follows: A = reserves are estimated sufficient to meet all foreseeable demands for a 20-year interval, B = reserves are estimated insufficient to meet all foreseeable demands for a 20-year interval, a = resources are uneconomic but estimated sufficient in size to support a mineral industry operation for some future 20-year interval, b = resources are uneconomic and estimated insufficient in size to support a mineral industry operation for some future 20-year interval, ? = negligible reserves, ? = resource present but data are insufficient to further classify.

3/ Sand, gravel, and stone are available in sufficient quantity throughout most subareas to meet all foreseeable demands through 2020.

PART E

SUPPLEMENTAL PROJECTIONS

The Office of Business Economics, U.S. Department of Commerce, at the request of the Water Resources Council, prepared revised demographic and economic projections for the United States and the major river basins, including the Missouri River Basin, or Region. These projections were forwarded with a memorandum from the Executive Director of the Water Resources Council, dated January 23, 1969. The memorandum requested the field study groups to evaluate the significance of any changes in economic data and projections in terms of the planning objectives and alternative solutions. The suggestion was made also that it should be possible to accommodate the changes by reference in the economic appendix and in the main report. At the time of this request the Missouri River Basin Comprehensive *Framework Study* was in the final draft stage. An analysis of the new or revised projection components indicated extensive changes in the economic appendix would be necessary, which in turn would necessitate changes in the evaluation of needs and problems, as well as the plan formulation procedure. At a meeting of the Missouri Basin Inter-Agency Committee, March 19-20, 1969, the Committee deemed it inadvisable to interrupt the completion of the study at this point in time; however, differences in the two levels of projections would be noted. Thus, the purpose of this discussion is to note the basic differences between the original and revised projections, the actual differences as they occur in the eight subregions of the Missouri Region, and the implications the revised projections would have on the plan as it has been devised.

As described in chapter 6, the original projections utilized the Bureau of Census Series B annual growth rate for population at 1.6 percent implying a national population of 468 million by the year 2020. A recent downward trend in the birth rate has indicated that the Series C annual growth rate of 1.3 percent, would result in a revised national population projection of about 398 million by 2020. The accompanying assumptions used to arrive at revised economic projections were that the total labor force as a percentage of the working age population is expected to rise from its 1965 level of 56.7 to 58.3 in 1990 and then remain constant to 2020. Hours of work are expected to decline at an annual rate of 0.26 percent, reaching 1749 annual hours of work by 2020. Productivity is expected to grow at a 3.0 percent annual rate. Personal income as a percentage of Gross National Product is forecast to increase from 80.2 percent to 94.1 percent by 2020. Other criteria used were more stringent recognition of growth industries and projections of increased productivity among employees. This permitted more modest growth industries to experience absolute growth in production with a projected decline in the number of employees. An essential difference in arriving at revised projections was the aggregation of counties into economic areas, 22 of these areas were all or in part within the Missouri Region. The economic areas were reaggregated into water resources planning areas corresponding to the 27 subareas in the Missouri Region.

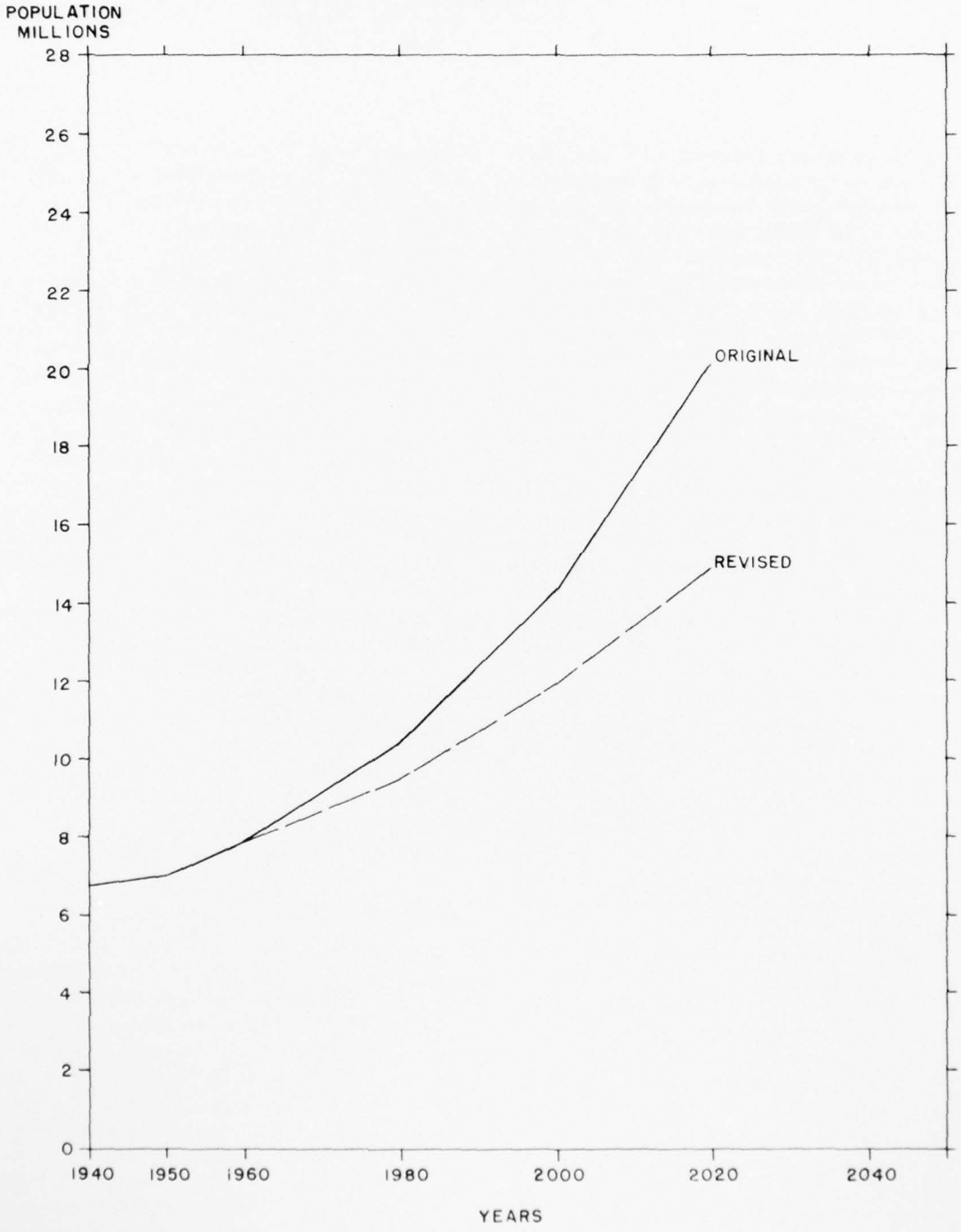
There are several additional differences between the revised projections as discussed and the original projections used in the present framework study. The original projections were furnished for eight subregions having not been subjected to the intermediate step of economic area analysis. The Economic Work Group then disaggregated the eight subregions into 27 subareas and 11 SMSA's, as well as urban and rural components. The summation of the differences between the original and revised projections is demonstrated in the following discussion at the subregional level which eliminates the Work Group's possible distortion in disaggregation of original projections.

POPULATION

Revised population projections for the Missouri Region indicate a terminal year projection for the year 2020 at 14.9 million, as shown in figure E-1. This approximates the original projections of 14.3 million for the year 2000, as compared to original projections for 20.1 million in the Missouri Region to be attained by 2020. For 1980, the revised projection of 9.55 million people in the Missouri Region suggests a level about 8.4 percent below the original projections, while 11.9 million for 2000 is 17.1 percent less, and the projection for 2020 falls 25.9 percent lower. The revised projections indicate the Missouri Region will have a somewhat smaller share of the total U.S. population than suggested

FIGURE E-1

MISSOURI RIVER REGION POPULATION
1940, 1950, 1960 AND ORIGINAL
AND REVISED PROJECTIONS TO 1980,
2000, AND 2020



in the original projections: 4.08 to 4.28 percent in 1980, 3.89 to 4.26 percent in 2000, and 3.75 to 4.29 percent in 2020.

Revised population projections for the eight subregions appear in table E-1.

Table E-1 – REVISED POPULATION PROJECTIONS BY SUBREGION

Subregion	Population		
	1980	2000	2020
	(Thousand)		
Upper Missouri	328.2	376.5	433.6
Yellowstone	312.0	369.7	437.4
Western Dakota	302.9	344.9	399.2
Eastern Dakota	722.8	792.5	862.1
Platte-Niobrara	2,693.8	3,688.1	4,929.1
Middle Missouri	1,395.9	1,554.9	1,757.0
Kansas	971.6	1,147.7	1,370.9
Lower Missouri	2,819.3	3,656.6	4,719.4
Missouri Region	9,546.4	11,930.7	14,908.6

Analysis of the differences between the original and revised population projections at the subregion level indicates a divergence of growth trends. Figure E-2 indicates the percentage difference by subregions. The revised projections are below the original projections. The difference ranges from -4.8 to -15.2 percent by 1980, -10.8 to -25.5 percent by 2000, and from -17.7 to -36.6 percent by 2020. While the trend for the Middle Missouri and Eastern Dakota subregions is a somewhat moderate difference between 1960 and 1980, their differences generally follow that set by the Yellowstone Subregion from 1980 to 2020. Both the Yellowstone and the Western Dakota subregions receive the greatest revision downward through all three projected time periods. Examination of the revised population projections for subareas indicates even greater variances ranging from 6 percent higher to nearly 50 percent lower than original projections by 2020.

EMPLOYMENT

No attempt has been made to illustrate the differences between the revised and original projections of total employment for the Missouri Region, or for the subregions, because the changes involved would be nearly identical to those discussed for population. The population projections and their distribution among the subregions are basically functions of employment projections for economic areas which have been reaggregated to water resource planning areas.

Only two sectors of employment agriculture and manufacturing are comparable in the original and revised projections, because contract construction was combined with mining to constitute other commodity employment in the original projections. In the revised projections contract construction was included in other employment.

Projections of agricultural employment are dependent on projections of food and fiber requirements. With substantial changes in population growth, somewhat comparable reductions may be expected in the level of agricultural employment. In addition to the national changes as the resource capabilities and comparative advantages of the Missouri Region and the other major river basins of the Nation are assessed, a reallocation of regional shares will probably be made. With these factors in mind there is reasonable assurance that final projections of agricultural employment in the Missouri Region will be substantially different than those presented in these revised projections. Subregional projections may be even more arbitrary since they are completely unrelated to final production level analysis.

Figure E-3 indicates agricultural employment in the Missouri Region in the revised projections is not expected to decline at as great a rate during the 1960 to 1980 period, reaching 391,500 as compared to 336,000 in the original projections. By 2000, the spread between the two projections is less, but the revised projection, 305,200, still exceed the original projection of 272,000. Rather than having the decline flatten out as the original projections would have it, the revised projections for 2020 indicate an agricultural employment of 235,000, slightly lower than the original projection of 249,000. These revised projections indicate a somewhat larger rural farm population, since the agricultural share of total employment is 2.2, 1.5, and 0.8 percent greater than the original projections.

Revised projections of manufacturing employment for the Missouri Region illustrate trends which more closely follow projections of population and employment trends, as indicated in figure E-4. While manufacturing employment for the region grows at a lesser rate between 1960 and 2000, the revised projections attain a slightly greater portion of total employment, 16.1 percent by 2020, than the original projections for that year at 15.4 percent. Table E-2 presents the percentage difference between the revised and original projections of manufacturing employment for the eight subregions.

Table E-2 – MANUFACTURING EMPLOYMENT, BY SUBREGION, PERCENT DIFFERENCE, REVISED AND ORIGINAL PROJECTIONS

Subregion	1980	2000	2020
Upper Missouri	-8.7	-13.3	-14.0
Yellowstone	-19.0	-22.5	-34.0
Western Dakota	-12.8	-28.0	-33.8
Eastern Dakota	-22.0	-46.1	-62.3
Platte-Niobrara	-24.9	-22.1	-23.4
Middle Missouri	-7.1	-14.2	-22.8
Kansas	-19.1	-27.0	-34.7
Lower Missouri	-4.2	-6.6	-11.2
Missouri Region	-13.0	-15.8	-20.6

FIGURE E-2

POPULATION

MISSOURI RIVER SUBREGIONS

PERCENT DIFFERENCE REVISED PROJECTIONS

1980, 2000, AND 2020

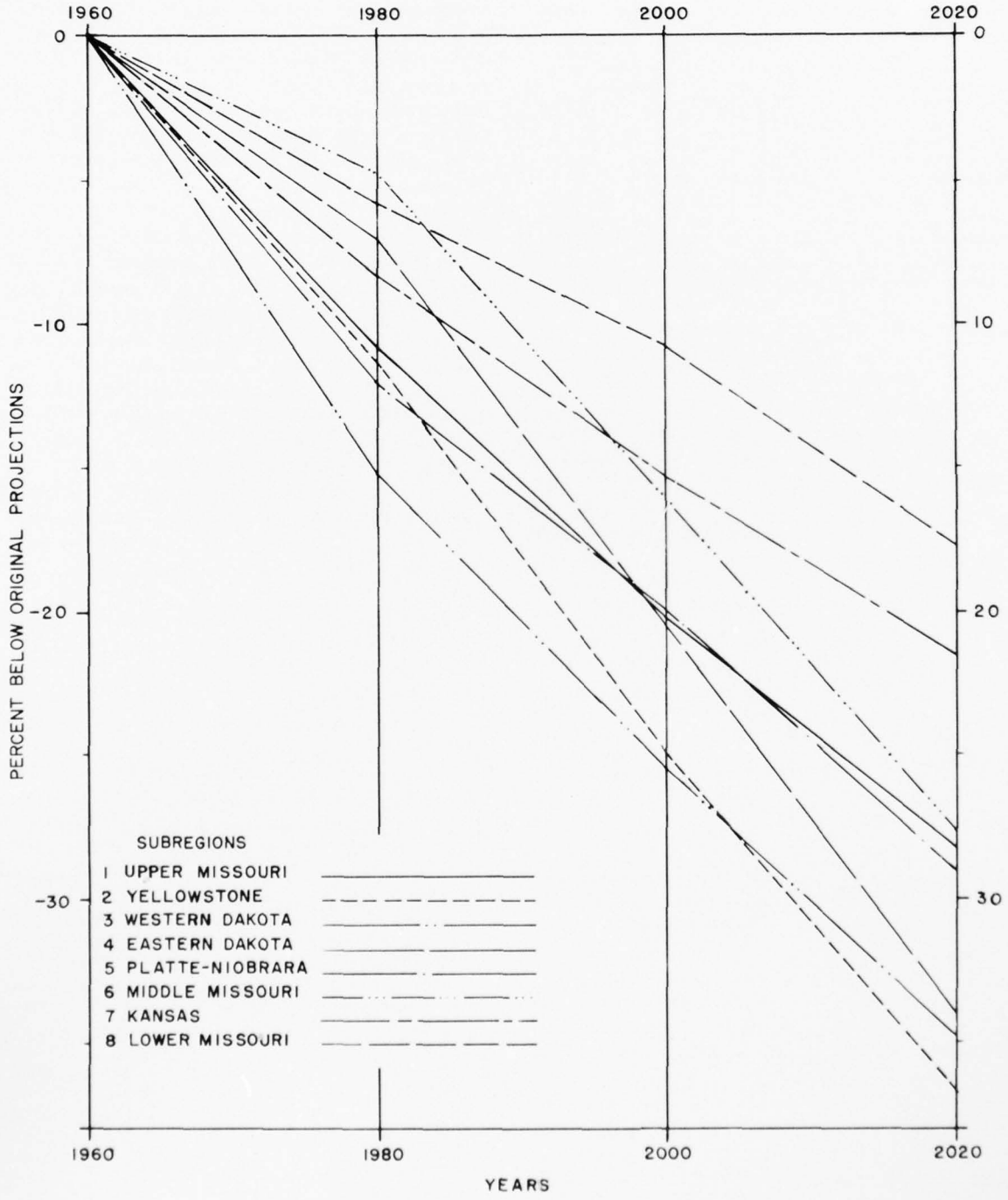


FIGURE E-3

AGRICULTURAL EMPLOYMENT, MISSOURI RIVER REGION
1940, 1950, 1960 AND ORIGINAL
AND REVISED PROJECTIONS TO 1980,
2000, AND 2020

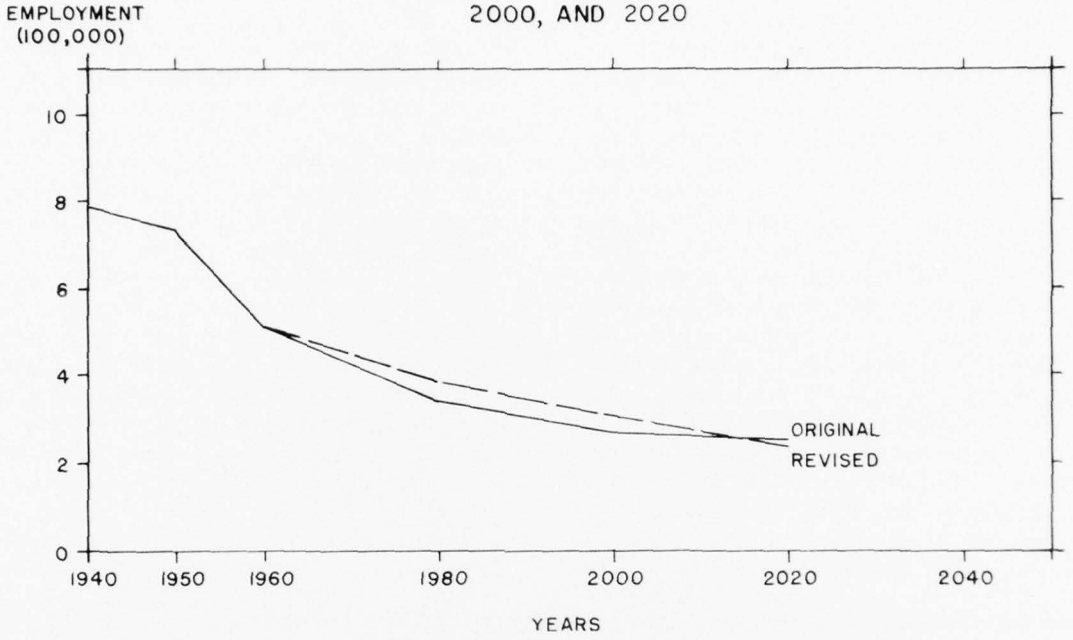
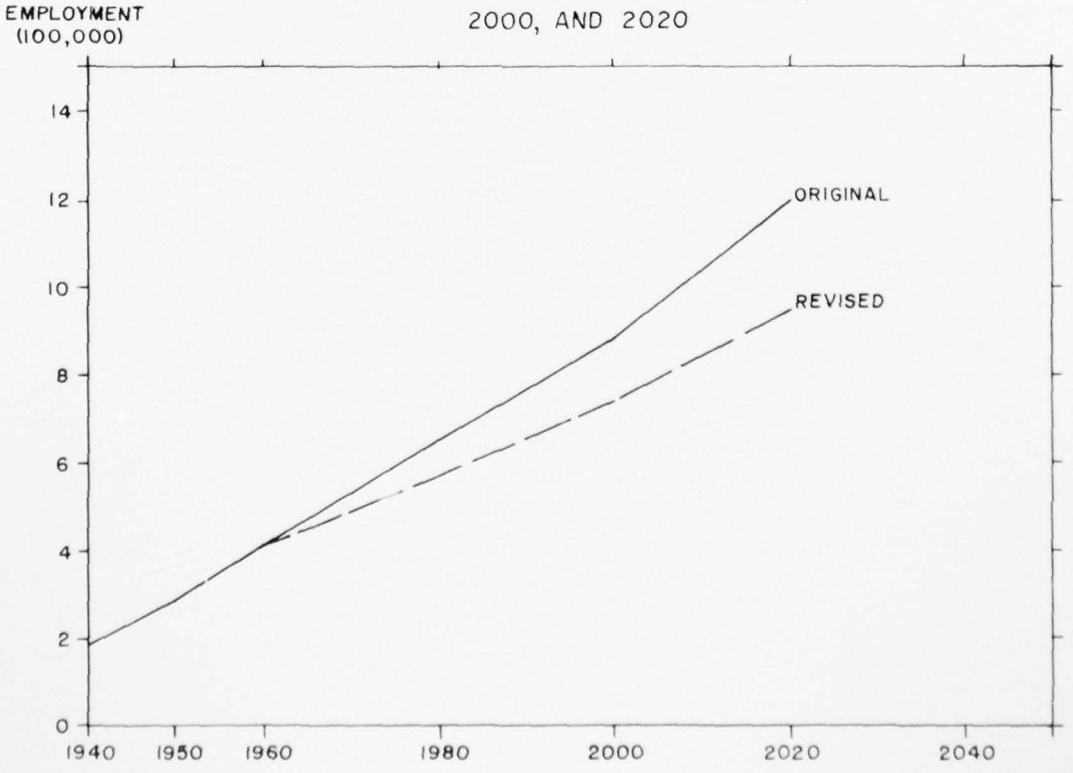


FIGURE E-4

MANUFACTURING EMPLOYMENT, MISSOURI RIVER REGION
1940, 1950, 1960 AND ORIGINAL
AND REVISED PROJECTIONS TO 1980,
2000, AND 2020



Only the Upper Missouri Subregion has higher revised projections of manufacturing employment, ranging from 8.7 percent in 1980 to 14.0 percent by 2020. It should be noted that the Upper Missouri Subregion had only 4.4 percent of its total employment in manufacturing in the original projections for 2020, and it has 6.6 percent in this category in the revised projections, the difference being 1,400 employees. The greatest percentage reduction between the revised and original projections of manufacturing employment is in the Eastern Dakota Subregion, where it is -62.3 percent by 2020, adjusted downward from 48,000 to 18,100. Of the seven subregions expected to have fewer manufacturing employees under the revised projections, all except the Platte-Niobrara appear to have an increasing percentage difference below the original projections. The Lower Missouri Subregion seems to have the smallest percentage difference for the 3 target years. The most drastic difference appears in the Eastern Dakota Subregion where the revised projections have only 5.4 percent of total employment in manufacturing by 2020, as compared to 10.15 percent in the original projections and 6.14 percent for 1960. The six remaining subregions have differences of less than 2 percent between the original and revised projections.

Of particular consequence in water use planning are the projections of employment in heavy water-using industries. Figure E-5 illustrates projected levels of employment in selected heavy water-using industries in the Missouri Region. While projections of total employment and/or population under the revised projections seem to indicate the economic and demographic growth of the basin is being modified or delayed, these five graphs show the modification takes place in various ways. The shape of the graph showing employment projected in the chemical products industry is much like the graph illustrating the earlier and revised projections of population for the Missouri Region. Employment in the paper and allied products industry seems to be just a refinement and modification of earlier projections, as may be said also in the case of primary metal products industry employment. The most striking graphs are those for the food products, and to a lesser extent the petroleum refining industries. Here the revised projections of employment decline to 86,000 for food products and 3,600 for petroleum refining by 2020, as compared to the original projected increases to 151,000 and 16,000 respectively.

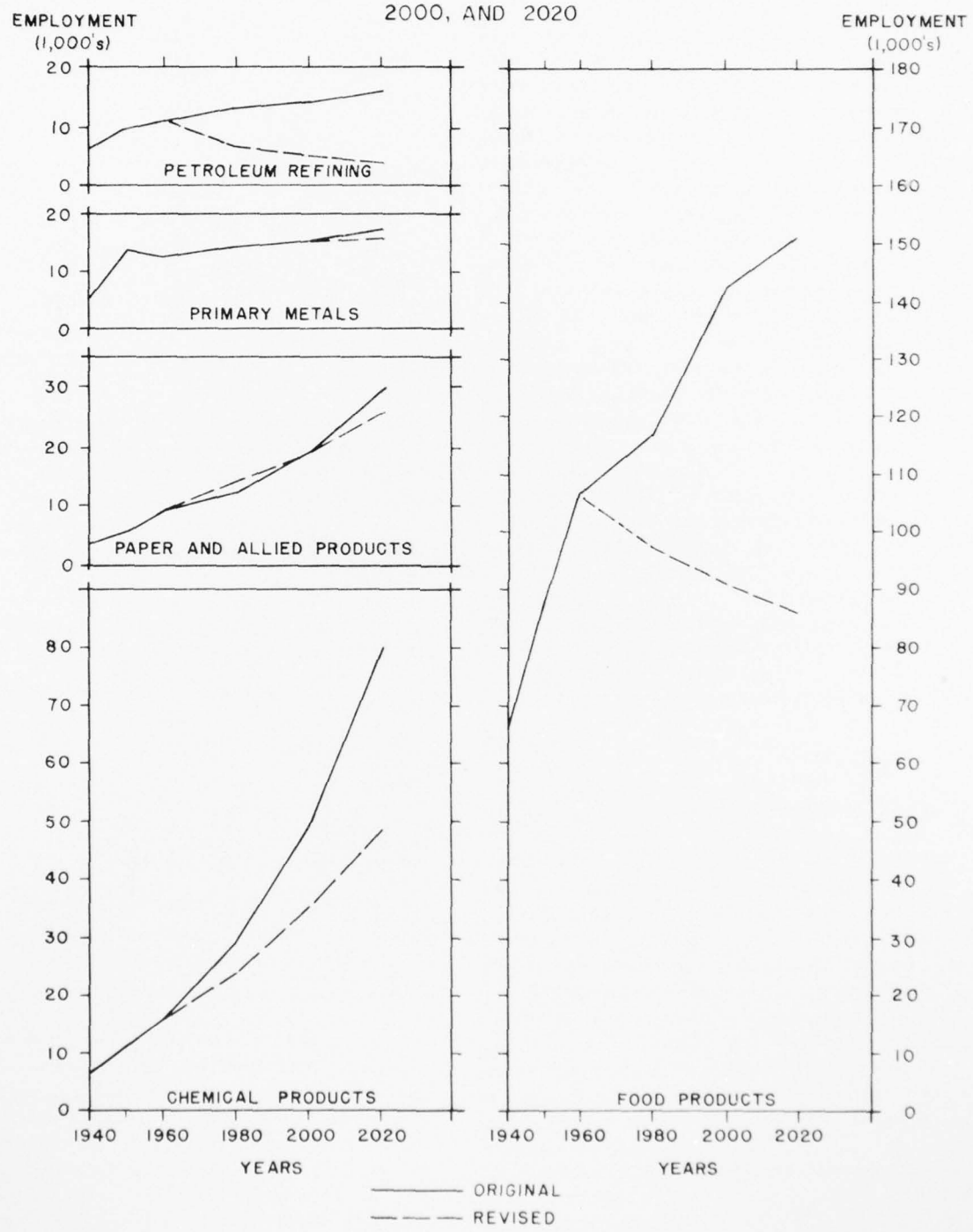
Examination of employment in heavy water-using industries by subregions comparing 1960 levels with

Table E-3 — EMPLOYMENT IN HEAVY WATER-USING INDUSTRIES BY SUBREGION, 1960 COMPARED TO ORIGINAL AND REVISED PROJECTIONS FOR 2020

Subregion	Petroleum Products	Paper Products	Primary Metal Products	Chemical Products	Food Products	Textile Products
	(Thousand)					
Upper Missouri						
1960	0.4	---	1.8	---	1.7	---
Orig. 2020	---	---	2.0	---	3.0	---
Rev. 2020	---	---	2.4	---	1.7	---
Yellowstone						
1960	1.5	---	---	---	2.1	---
Orig. 2020	3.0	---	---	---	4.0	---
Rev. 2020	0.7	---	---	---	2.1	---
Western Dakota						
1960	---	---	---	---	1.4	---
Orig. 2020	---	---	---	---	2.0	---
Rev. 2020	---	---	---	---	1.9	---
Eastern Dakota						
1960	---	---	0.3	---	8.6	---
Orig. 2020	---	---	---	---	11.0	---
Rev. 2020	---	---	---	---	5.7	---
Platte-Niobrara						
1960	4.1	1.0	1.7	3.7	23.9	---
Orig. 2020	5.0	3.0	2.0	25.7	42.4	---
Rev. 2020	0.6	6.2	2.5	10.2	28.0	---
Middle Missouri						
1960	---	---	---	2.4	35.0	---
Orig. 2020	---	4.0	3.0	15.3	41.6	---
Rev. 2020	---	3.5	3.4	7.8	23.8	---
Kansas						
1960	0.2	0.5	0.2	1.5	6.5	0.3
Orig. 2020	---	---	---	7.0	8.0	---
Rev. 2020	---	0.4	---	7.6	2.7	0.3
Lower Missouri						
1960	4.2	6.0	6.4	7.8	27.6	0.6
Orig. 2020	6.0	17.0	8.0	25.0	39.0	---
Rev. 2020	1.1	16.6	6.5	17.4	19.4	0.5

FIGURE E-5

MISSOURI RIVER REGION EMPLOYMENT,
HEAVY WATER-USING INDUSTRIES
1940, 1950, 1960 AND ORIGINAL
AND REVISED PROJECTIONS TO 1980,
2000, AND 2020



original and revised projections for 2020 indicates reductions in almost every instance, as shown in table E-3.

The original projections were not accompanied by projections of productivity rates; therefore, the projected employment was not necessarily a reflection of output for the selected industries. Projected levels of production per employee, expressed in constant (1958) dollars, were made available in conjunction with revised projections of economic areas. Since these productivity rates were not available for the subregions, the national average was multiplied by the projected number of employees in selected heavy water-using industries to obtain the percentage growth of projected production, as shown in figure E-6. Contrary to what is suggested by the observation of employment levels alone, the revised levels of employment when coupled with increasing productivity per employee indicate substantial total production increases. The food products industry employing the largest portion of the heavy water-using employment, and declining from the 1960 base employment, is expected to increase its total productivity about 400 percent by 2020. The chemical products industry, while revised projections indicate about three times the 1960 level of employment, appears to increase about 3,333 percent in production by 2020. Although the revised level of employees in paper and allied products industry is modified only slightly for 2020, production will increase about 1,000 percent. Primary metals employment is expected to change relatively little through the projection period but will increase over 500 percent. Employment in petroleum refining is expected to be one-third its 1960 level by 2020 and total production is indicated to increase over 1,300 percent.

INCOME AND EARNINGS

An analysis of income and earnings indicates there is a problem of comparability between the original and the revised projections. The original projections presented income and earnings data in 1954 dollars and the revised projections in 1958 dollars. Table E-4 compares both sets of projections on a basis of 100 equaling 1960, and the lack of comparability becomes apparent because the historical data, 1940 and 1950, are not the same percentages of the 1960 data. Presumably, the revised projections have utilized improved earnings and income data. The table indicates that even though the revised projections have a smaller employment and/or population base in the Missouri Region by 2020, total personal income is expected to be about 12 percent greater. Illustrated in a different manner, the revised projections for per capita personal income appear to be almost 50 percent greater in 2020.

Table E-4 – TOTAL PERSONAL AND PER CAPITA INCOME INDEXES, MISSOURI REGION, ORIGINAL AND REVISED

Total Personal Income		
Original (1954 $)	Year	Revised [1] (1958 $)
43.6	1940	44.5
77.5	1950	80.5
100.0	1960	100.0
225.3	1980	242.8
482.6	2000	537.1
1,052.9	2020	1,180.2
Per Capita Personal Income		
Original (1954 $)	Year	Revised (1958 $)
51.1	1940	51.4
87.0	1950	88.8
100.0	1960	100.0
171.3	1980	198.2
266.8	2000	350.7
416.3	2020	616.8

[1] Revised does not include Montgomery and Warren Counties, Missouri.

Due to a different earnings series and different trends in employment being utilized in the revised projections, the differences which present themselves for the Missouri Region as a whole were even more scattered when a comparison was made at the subregion level. Table E-5 indicates an adjustment factor between the two series.

Table E-5 – PERSONAL INCOME, BY SUBREGION, PERCENT DIFFERENCE REVISED PROJECTIONS

Subregion	1960 Factor [1]	Percent Difference 1980	2000	2020
Upper Missouri	108.1%	5.5	4.7	2.2
Yellowstone	109.4	-0.3	-3.6	-6.6
Western Dakota	106.5	-1.8	-2.5	-9.1
Eastern Dakota	100.6	13.1	11.3	3.6
Platte-Niobrara	100.9	8.0	13.3	14.4
Middle Missouri	104.1	12.4	13.5	11.0
Kansas	104.3	6.2	10.1	15.5
Lower Missouri [2]	106.0	13.9	19.9	23.9
Missouri Region	105.7	7.8	11.3	12.1

[1] 1960 Adjustment Factor equals percent revised of original total income data.
[2] Revised excludes Montgomery and Warren Counties, Missouri.

This was done to eliminate the differences due to the changes in price level and other differences in the income series. For example, the total personal income given in the revised data was 108.1 percent of the original 1960 data for the Upper Missouri Subregion. If the only difference between the two series of projections was the change from 1954 to 1958 constant dollars, the adjustment factor would be the same for each subregion. The revised projected amounts in total personal income were adjusted by the 1960 adjustment factors for each

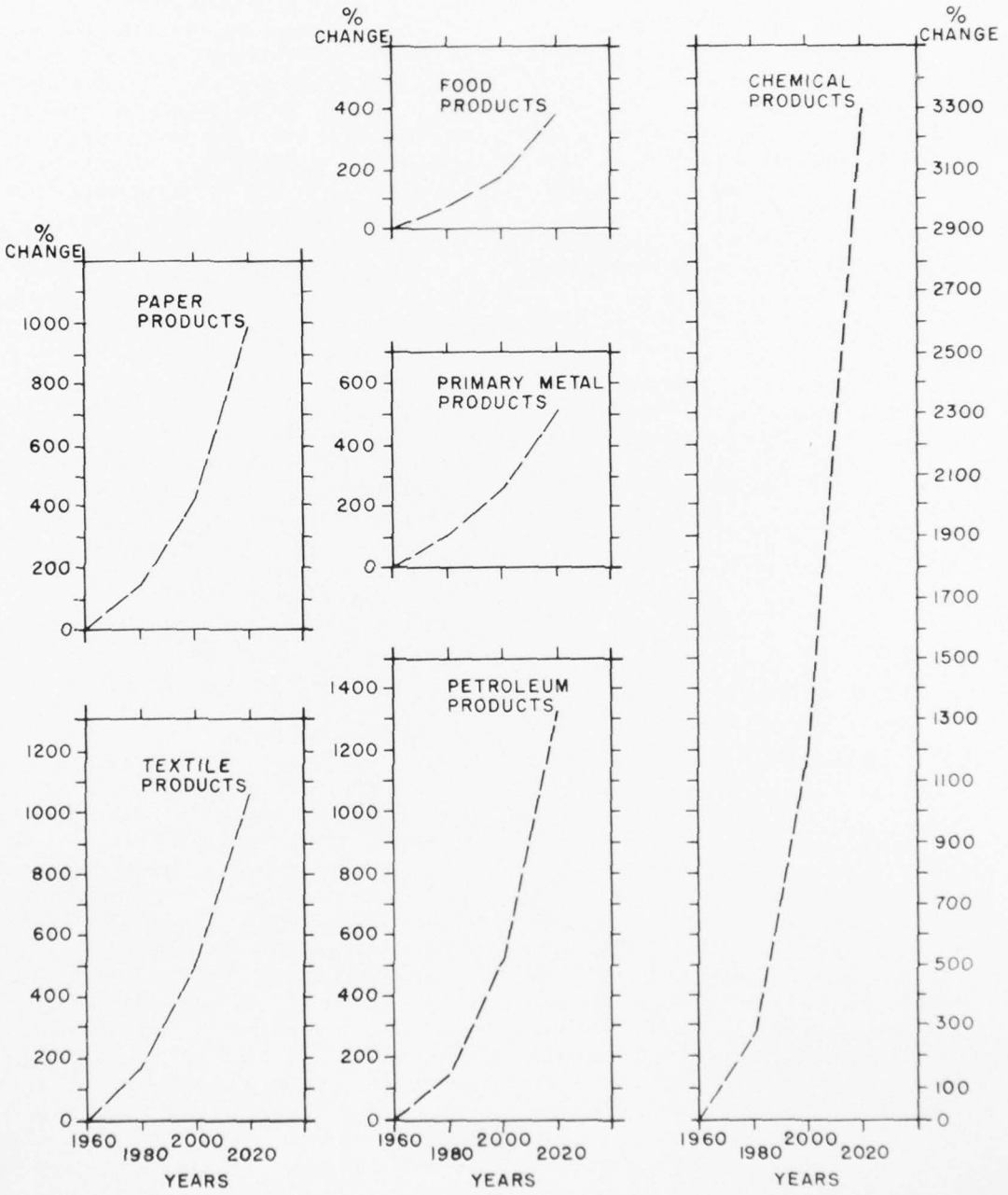
FIGURE E-6

MISSOURI RIVER REGION

HEAVY WATER-USING INDUSTRIES

PERCENTAGE GROWTH OF PRODUCTION

REVISED PROJECTIONS FOR 1980, 2000, AND 2020 [1]



1 PRODUCTION BASED ON U.S. AVERAGE PRODUCTION PER EMPLOYEE (1958 $) TIMES NUMBER OF EMPLOYEES IN MISSOURI RIVER REGION REVISED PROJECTIONS.

subregion before the percentage difference between the revised and original data could be calculated. Population and employment data for all of the subregions demonstrated negative relationships when comparing the revised and original projections. However, greater earnings and income levels in the revised data resulted in higher total personal income levels in six of the subregions and modified differences in the Yellowstone and Western Dakota subregions, indicating higher projected per capita personal income levels in all subregions. The greatest difference was projected in the Lower Missouri Subregion where 2020 total personal income levels are expected to be near 24 percent higher than the original projections, with about 18 percent fewer people. Examination of the subareas indicated variations ranging from minus 34.4 to about 82.7 percent in 2020.

Similar analyses were made between the revised and original total earnings projections for the eight subregions (table E-6).

Table E-6 – TOTAL EARNINGS, BY SUBREGION, PERCENT DIFFERENCE REVISED PROJECTIONS

Subregion	1960 Factor[1]	Percent Difference		
		1980	2000	2020
Upper Missouri	113.2%	2.3	4.2	2.4
Yellowstone	111.0	-4.3	-6.4	-12.1
Western Dakota	112.4	-7.5	-11.8	-18.7
Eastern Dakota	98.9	8.9	8.0	2.6
Platte-Niobrara	102.4	3.2	7.9	8.7
Middle Missouri	107.7	5.7	7.4	5.4
Kansas	113.7	-4.8	2.3	8.0
Lower Missouri[2]	109.8	6.0	9.7	12.4
Missouri Region	109.2	1.2	4.4	4.8

[1]1960 Adjustment Factor equals percent revised of original earnings data.
[2]Revised excludes Montgomery and Warren Counties, Missouri.

Adjustment factors were calculated for each subregion. Adjustment factors were slightly higher than for total personal income except in the Eastern Dakota Subregion. As indicated, six of the subregions had higher revised total earnings levels, although when compared with personal income levels the percentage differences were not as great, implying that income other than earnings was slated to become increasingly important in total income levels. The same conclusion is drawn in the Yellowstone and Western Dakota subregions where differences in earnings were greater than income. Percentage differences in the revised projections among the subregions range from -18.7 to +12.4 percent, while differences of total earnings among the subareas resulted in an even greater spread from -40.3 to +43.5 percent by 2020.

IMPLICATIONS ON THE PLAN

The revised levels of demographic and economic projections could have significant implications in terms of planning objectives and alternative solutions. Since the revised level of projected population in the Missouri Region indicates the population will be about 26 percent less by 2020 than the plan had originally been geared to accommodate, it would seem the schedule of development and the budgeting for water resource program investments could be relaxed somewhat by simply extending the development program to the year 2035 or 2040. However, such a simple alternative is not likely because the level of projected per capita personal income under the revised projections is roughly 50 percent higher than the original projections by 2020 and the level of total personal income in the Missouri Region is projected to be about 12 percent greater.

Adjusting the plan to fit a schedule of development for fewer people who have greater levels of productivity and consequently higher levels of income and demand, presents many conflicting problems. Domestic water demand would normally be less with fewer people, but their higher income levels would be expected to increase these demands per capita. Municipal and industrial water supply, water quality, and sewage treatment will probably need to be adjusted upwards in respect to the levels of income, but compensating adjustments may be possible due to adjustments in employment distribution, particularly in the heavy water-using industries. The need for flood control at any given point in time may be less extensive; however, higher income levels may imply either higher potential damages per acre or the ability to invest in structural methods to reduce the amount of flood damages. Demands for power, recreation, fish, and wildlife development would be somewhat modified, but not in direct relation to the lower population levels, because of higher levels of income. The complexities of the changes in demands suggested by the revised levels of population, employment, and income make them difficult to assess with any degree of accuracy at the subregion or subbasin level. In general, the lower levels of population suggest the framework planning schedule may be activated over a longer period of time and the higher levels of income may provide an opportunity to consider a wider variety of alternative solutions. Overall, the revised projections will have little consequence on the framework plan as it is now devised for 1980.

End 10-77