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ABSTRACT

INDICATORS OF MISSOURI RIVER PROJECT EFFECTS ON LOCAL RESIDENTS: AN ADVOCACY RESOURCE DEVELOPMENT APPROACH

By

Bernard D. Shanks

Sparsely populated underdeveloped or agricultural areas frequently anticipate major social gains associated with water development projects. The massive main stem Missouri River water developments in Montana and North and South Dakota promised economic and social benefits to the local residents. During the construction of five dams, Fort Peck, Garrison, Oahe, Big Bend, and Fort Randall, local residents hoped for a stable population, social and economic development.

This study uses a local, rural client perspective and an advocacy approach in the examination of the water developments success in meeting local objectives. Several development factors were classified into groups of agriculture, demographic, human resource development, and economic indicators. A comparison was made of the above indicators between developed counties and undeveloped counties. Developed counties were those counties adjacent

to water projects, undeveloped counties were those nearby counties lacking major water developments. The study provided a partial examination of water developments from a primarily local and rural perspective. It was assumed that local groups have a legitimate vested interest in the development of nearby resources as well as the eventual impact of federal development in human terms.

After comparing the four categories of development indicators between the predevelopment and post development phase only small differences were noted between the two sets of counties, those developed and those without such benefits. The development indicators also revealed a relatively poor development position for the northern Great Plains as compared with national development indicators. In every major category the Missouri River counties and states lagged behind the United States averages. Apparently the massive water development projects did little if anything to stem the out migration of people and resources from the Upper and Middle Missouri River country.

The last undeveloped reach of the Missouri, the Missouri River Breaks area in Montana has been proposed for hydroelectric development. From previous water projects in a similar environment no improvement can be expected in the local human environment. From a local perspective the water projects appear to represent an outflow of resources with few if any positive human benefits that accrue to the area adjacent to the developments.

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ON LOCAL RESIDENTS: AN ADVOCACY
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INTRODUCTION

The Great Plains is a sparsely populated agricultural region which has experienced periodic economic difficulties. One of the last regions to be developed in this nation, the plains have experienced a drain of people and resources from the area for fifty years. Soon after the closing of the western frontier and before the region developed its communities and institutions fully, the outflow of people began. In one sense the plains, especially the northern Great Plains, have been a type of aborted frontier. Life and resources began ebbing from the region before full maturity had been reached.

The small communities and their residents have been frustrated developmentally partly by the harsh and variable climate and natural forces, partly because of the proportionately higher economic and social costs of Great Plains space. Water developments have been the focus of many hopes and the cause of much optimism in the Missouri basin and especially in the northern Great Plains. The Missouri has been the recipient of some of the largest water development projects in the world and many smaller projects.

For example, in 1965 the Missouri Basin contained 107 major reservoirs and 1,387 smaller reservoirs with an individual storage capacity of less than 25,000 acre feet. The basin at that time had 112 million acre feet of storage capacity and some \$3 billion had been invested in water storage capacity.¹ During the next fifty years it has been estimated that over \$24.4 billion will be spent on water development investments.² Despite spending over \$3 billion in water developments for the basin, the upper Missouri area and especially the northern Great Plains still suffers relatively serious social and economic problems. Few attempts have been made to evaluate the effectiveness of water projects in solving the social and economic problems of the counties or local areas directly involved in the projects. Spatially, the distribution of both the costs and benefits of Missouri river projects have been largely ignored. Despite the large investment in water developments no retrospective evaluations have been conducted by the federal agencies involved with the Missouri.

This study compares undeveloped areas, that is those counties without major water projects, to those counties with main stem Missouri River water developments. In the homogeneous plains environment it is assumed that

¹Missouri Basin Inter-Agency Committee, Comprehensive Framework Study, Missouri River Basin (Washington, D.C.: Government Printing Office, June, 1969), p. 68.

²Ibid., p. 272.

the relative progress of developed areas will provide some indicator of local benefits that could realistically be anticipated by undeveloped areas. The last major reach of the Missouri River, the Missouri River Breaks region in Montana, has been proposed for development for many years. If this stretch of river is developed what changes can the local residents expect? The conclusion of this study describes types of social and economic changes that can be anticipated in the Missouri Breaks area based on completed main stem Missouri River projects.

The Missouri River

Slicing across the northern plains, the Missouri River is not unlike a linear oasis. Flowing water provides a dark, sharp contrast with the dry hills around it. The river is the largest source of water in the northern Great Plains and a major determinant of man's activities. A combination of river and plains, moisture and dryness, shelter and exposure have directed the activities of early man as well as modern man. The river is a great natural resource, the major resource of the region. It is not surprising that the river has provided the focus for the history, settlement and development on the northern plains.

Three rivers, each named for major political figures involved in the Louisiana Purchase, flow from the mountains of southern Montana to form the Missouri River. Two of these, the Gallatin and Madison rivers, originate in

Yellowstone Park, deep in the mountains and wilderness of that area. The third river, the Jefferson starts in the mountains of southwestern Montana. At Three Forks where the three rivers join it is nearly 2,500 river miles to St. Louis and the Mississippi. At this point in 1805, Meriwether Lewis wrote in his journal that "This surely is an essential point in the geography of North America."³ The Missouri is the longest river in North America and drains one fifth of the United States. When the river emerges from the mountains just above Great Falls it becomes a dominant feature of the Great Plains. The banks of the Missouri contain the bones of long forgotten buffalo, the charcoal of old campfires, old homesteads and the remnants of once thriving Indian villages. "From Three Forks to its mouth, this zigzag watercourse is haunted with great memories."⁴

The Great Plains

Across half a continent the Missouri River flows from its source at Three Forks to meet the Mississippi River seventeen miles above St. Louis. The river and its tributaries drain a half million square miles. Although the Missouri drainage includes many peaks of the Rocky

³Reuben G. Thwaites, ed., Journals of Lewis and Clark 1804-1806 (Cleveland: The Arthur H. Clark Company, 1904), p. 415.

⁴John G. Neihardt, The River and I (New York: The Knickerbocker Press, 1910), p. 20.

Mountains, topographically most of the area drained is gently rolling or plains country.

Climatic and soil conditions vary greatly in different parts of the Missouri Valley. Rainfall averages around ten inches in the arid western portions, twenty-six inches near Sioux City and forty inches near the mouth of the river.

Industry in the Missouri River Basin is largely centered in the eastern portion of the drainage area. Also in this area a stable agriculture economy is possible because most of the soil is fertile and precipitation is nearly always sufficient. Moving west into the central third of the Basin, there is less population and industry, and droughts alternate with periods of abundant rainfall. In the most westerly third, in the shadow of the Rocky Mountains, precipitation is scanty and most of the land is utilized for grazing except where lands are irrigated.

The northern Great Plains and the drainage area of the Upper Missouri River in Montana and the Dakotas roughly coincide. In this area the Missouri River has been radically changed by developments for flood protection, power development and navigation. Six huge earthen dams created what the Corps of Engineers calls "The Great Lakes of the Missouri"⁵ in the states of Montana, and North and South

⁵Corps of Engineers, Missouri River Water Developments (Washington, D.C.: U.S. Government Printing Office, 1965), pamphlet.

Dakota. The first major dam on the Missouri was Fort Peck constructed in eastern Montana. Fort Peck Dam created a reservoir 120 miles long and when full has 1,520 miles of shoreline. Garrison, the next dam downstream in North Dakota created a lake nearly 500,000 acres in size with 1,340 miles of shoreline. Oahe Dam in South Dakota created a lake over 200 miles long and 2,250 miles of shoreline. Three smaller downstream dams, Big Bend, Fort Randall, and Gavins Point have flooded most of the remaining Missouri River bottomland above the Nebraska border. Private power corporation dams and Bureau of Reclamation projects above Fort Peck Dam have innundated most of the area below the headwaters at Three Forks, including the once famous Great Falls of the Missouri. The only exception is an isolated 175 mile reach of river between Fort Benton, Montana and the upper reaches of Fort Peck Reservoir. This area in north central Montana is locally referred to as the Missouri Breaks. It has been the subject of various resource management plans advocated by several federal agencies for nearly fifteen years.

Seasonal contrasts of heat and cold, storm and drought have left an impact on the history and development of the northern Great Plains. Early man lived along the Missouri River and in balance with the riverine resources. Having the ability to adapt to the river and its annual changes resulted in some stability for these early Indians. In this century the white culture has moved into the plains

space, discovered the harsh reality of its limitations and tried to alter the limited water resources to adapt the plains to modern uses. Large dams and water projects resulted. The dominant features of the Great Plains remain and development problems have never been fully overcome. Despite the developments most social and economic indicators show this area lagging behind other regions.

The definition of the Great Plains has been changed and altered many times since "the white men crossed the Wabash River and beheld the prairies in all their splendor and all their monotonous magnitude."⁶ Originally considered part of the Great American Desert, the Great Plains usually are defined now as a region covering one fifth of the United States, stretching from Canada to Mexico, an area 1,300 miles long.⁷

The Great Plains has meant monotonous uniformity of landscape, and endless expanse of flat featureless country covered with grass. It has been characterized as a land of low relief, few trees, and little rainfall, a land of sun, wind, and grass. The geographical limits of the Great Plains have been defined in several ways.⁸ The foothills

⁶B. Shimek, "The Prairies," Bulletin of Natural History, Vol. VI, No. 2 (1911), p. 169.

⁷Howard W. Ottoson, ed., Land and People of the Northern Plains Transition Area (Lincoln: University of Nebraska Press, 1966), p. 2.

⁸Waldo R. Wedel, Prehistoric Man on the Great Plains (Norman: University of Oklahoma Press, 1961), p. 20.

of the Rocky Mountains have served as a convenient boundary on the west, where the characteristic natural vegetation and terrain of the Plains change perceptively. On the east, there are no readily recognized natural borders, but rather zones of transition from one physiographic or vegetational or climatic province to another. West of the hundredth meridian agriculture is precarious and difficult. The term Great Plains often means the generally flat, semiarid grasslands lying west of the Mississippi-Missouri Valley. Vague as this description is it illustrates Walter Prescott Webb's view that the concept of a Great Plains environment may be more satisfactory than that of the Great Plains region. The outstanding characteristics of this environment Webb considers to be a comparatively level surface of great extent, treelessness, and a subhumid or semiarid climate in which the rainfall is insufficient for the sort of agriculture practiced in humid lands.⁹ Each of these characteristics is found over a great part of the United States. The region in which all three coincide and dominate the land constitutes the Great Plains. Webb considered the intermountain valleys and the Great Basin as part of the Great Plains environment. The environmental forces of the area represent a combination of factors, each transcending any set of lines on a map that might delimit

⁹Walter Prescott Webb, The Great Plains (New York: Grosset's University Library, 1931), pp. 3-9.

the plains. Man's use of the plains does not and never has changed immediately when he crossed the hundredth meridian or the boundary between the short grass and the tall grass. Emphasis, values, and techniques of living shifted gradually.

Most people describe the plains from east to west, but Carl Kranzel, a westerner, prefers to define the plains from west to east. "Extending from the foothills of the eastern slope of the Rockies (the 4,500 foot contour) the plains reach eastward to the ninety-eighth meridian. . . ." ¹⁰ Still others have defined the plains through soil differences, plant types, or by state boundaries. In reality the region has subtle differences in surface uniformity and consists of transition zones on its periphery. This paper is primarily concerned with the northern Great Plains and the upper Missouri River, both having roughly similar regional features. The present state of Montana, east of the foothills of the Rockies and the states of North and South Dakota comprise the areal base of this study.

The Great Plains Environment

Climate helped create the plains and climate leaves a dominant mark on many features of the plains, including the people. The plains have some of the widest and most violent seasonal variations in the nation. The winter

¹⁰ Carl F. Kranzel, The Great Plains in Transition (Norman: University of Oklahoma Press, 1955), p. 3.

blizzards can sweep out of the north and rival the cold of Alaska with temperatures dropping to forty below zero. Violent winds can pile a few inches of dry powder snow many feet high and isolate a modern city for days at a time. The summer sun can scorch the plains and when the rains fail, the heat and dryness can rival the Sonoran Desert. Periodic drought and persistent dryness of the air and soil cannot be fully appreciated by those residents of a more humid environment who has not experienced the feeling, the physical sense of the term "dry." Rainfall is sparse, sometimes non-existent for months. Great Plains grassland receives little moisture from November to March and generally little snow. Several inches of rain falls from June to August during the growing seasons, thus making crops possible. Rainfall intensity increases from west to east but days of rainfall do not.¹¹ The Great Plains are best termed semiarid. This means the plains are humid some years and arid others. Drought in the grassland tends to be concentrated in relatively few years and to be widespread in those years. July rainfall can fail completely in drought years. Temperatures are higher during droughts. These high temperatures are accompanied by below average cloud cover and above average frequency of hot continental winds.

¹¹John C. Borchert, "The Climate of the Central North American Grassland," Annals of the Association of American Geographers, Vol. XL, No. 1 (March, 1950), pp. 1-3.

The weather fluctuates cyclically with several wet years followed by several dry years. Rainfall may vary from five to twenty inches per year. Temperatures may fluctuate from fifty or more degrees below zero to one hundred and twenty degrees above. Winter occasionally brings blizzards but large snowfalls are relatively few. Chinook winter winds, near the mountains of the western plains are a welcome and interesting phenomenon. Resulting from the adiabatic heating of air that has moved over the Rockies and onto the plains these winds can provide a dramatic contrast to an otherwise harsh winter. Average January temperatures are near zero in North Dakota. Average summer temperatures are seventy five to eighty degrees. However, it is the temperatures extremes and the arid nature of the climate that has a substantial impact upon life in the region of the upper Missouri River.

Climatic features of importance are low precipitation, especially in winter, irregular and uncertain distribution of moisture both annually and over longer time periods. These moisture fluctuations add greatly to the agricultural uncertainties of the region. The western portion of the plans are usually associated with the short grass plains or steppe. In these areas the subsoil is permanently dry and moisture is at a premium. The characteristic grasses are grama and buffalo grass. They are low-growing, shallow-rooted, sod-forming types, capable of quick growth on the spring moisture after which they may

pass into a dormant stage when the rains cease. These grasses also have a property of curing, without cutting, into a palatable and highly nutritious forage. The native grasses were an enormous natural pasture for buffalo and antelope. On the east of the Great Plains was the tall-grass region, or true prairie. Here the subsoil is permanently moist under the heavier precipitation, and tall growing, luxuriant, deep-rooted grasses, like bluestem, wheatgrass, and other bunch grasses are dominant.¹²

Trees are largely absent from the plains and are associated only with water. Along the Missouri and other major streams such as the Yellowstone, the Little Missouri, the Niobrara and the Platte branching ribbons of cottonwoods extend far to the west. These belts were from two to ten miles wide, covering the valley bottoms. The wooded valley bottoms provided habitat for white tailed deer, elk, and numerous fur bearers. A variety of bird life was found on the prairie such as the Prairie Hen, Turkey Buzzard, Sand-Hill Crane, and Sage Grouse. Small mammals were found in abundance on the plains such as the kit fox, badgers, ferrets, and prairie dogs.

Early Man

The stream valleys of the Great Plains have strongly influenced man's activities, those of ancient and modern

¹²James C. Malin, The Grassland of North America (Ann Arbor: Edwards Brothers, Inc., 1947), p. 2.

man. One important feature of the plains streams were well marked terraces. Occurring at different levels above the well wooded valley floors, the terraces provided sheltered but flood free habitats for early man. Early man first moved into the plains from the north probably finding the region more moist than it is today but still a land of limited precipitation and scanty surface water. Where native peoples lacked the technology for tapping ground water, the rivers, creeks and springs were of great importance. Besides supplying drinking water the valleys provided wood for fuel and building purposes, shelter from the rigorous winters, and a fairly sure supply of meat and fur animals. The valleys furnished cultivable bottomland for garden plots, and the valleys and rivers were convenient routes of travel and trade.¹³

During the nineteenth century, the valley of the Missouri in the Dakotas was a main artery for travel for fur traders, explorers, and others. Many of these left a notable legacy of travel narratives, including accounts of the Indians of the area. Within the narrow confines of its trench, the Middle Missouri holds an amazing wealth of archeologic data. In the Dakotas from the White River to the Little Missouri the ruins of old villages, camp sites, burial grounds, and associated remains are strewn along both banks in extraordinary numbers. Included in the area

¹³Waldo R. Wedel, Prehistoric Man on the Great Plains (Norman: University of Oklahoma Press, 1966), p. 29.

are some of the largest, best preserved and most impressive sites in the entire plains region.¹⁴

The Arikaras and the Mandans lived in both fortified and unfortified communities. Today, this stretch of the Missouri includes the location of three huge multipurpose dams--Garrison, Oahe, and Fort Randall--whose impounded waters submerged more than 550 miles of valley floor and adjacent terraces, together with hundreds of ancient Indian villages and camp sites.¹⁵

In this portion of the river the Missouri follows a winding course between bluffs several hundred feet high, and from one to six miles apart. The sediments laid down by the river in recent times form a low-lying flood plain with islands and bars. Above the flood plains, which vary up to two or three miles in width, terrace remnants rise like benches at various elevations from 20 to 150 feet, or more, above the stream. The river swings across the flood plain with a succession of bottomlands and terraces, above the reach of the floods that predictably sweep the valley. The bottomlands, when cleared of the natural vegetation, provided excellent garden sites as well as sheltered winter villages. The timber that grew naturally in the valley was another important resource for the human inhabitants, furnishing fuel, winter shelter, building supplies and

¹⁴Ibid., p. 157.

¹⁵Ibid.

cover for a variety of game animals. Riverine trees included cottonwood, ash, elm, box elder, hackberry, and oak. Chokecherry, buffalo berry, wild plum, and grape supplied edible fruits to the native population. The Indians also cultivated corn, beans, squash, and sunflower.

The native villages in the area persisted until 1837. Then a smallpox epidemic, touched off by a case on the steamboat Assiniboine, nearly destroyed the river tribes. The handful of survivors were dispossessed by the Arikaras in 1838 and drifted eventually to the vicinity for Fort Berthold, an American Fur Company post.¹⁶ In 1862 the Arikara's, Mandanas, and Hidatsas joined at Like-a-Fishhook, the last earth-lodge town on the Missouri. The heart of this area disappeared beneath the waters of Garrison Reservoir. In the 1960s the Three Affiliated Tribes survivors' and descendents' were forced by rising water of Garrison reservoir to move once again, this time to harsh plains upland.

Great Plains as Space

Settlement of the western United States by immigrants from the East and Europe resulted in a dominant theme regarding the plains. Settlers were impressed with its space, its desert like atmosphere and regarded the area as unsuitable for settlement. The image of the plains

¹⁶Ibid., p. 207.

emphasized in the literature of the period was the space of the plains. The area was often called sealike or compared to the ocean. During the early settlement of the West only three routes were charted across the vastness of the plains. In the 1,300 miles of distance between the Canadian and Mexican border the oldest route was the Santa Fe Trail. A popular route was the Oregon Trail which followed the Platte River road west across the plains. The northern plains route followed the Missouri River. The Missouri was unique in that steam boats could climb the river with cargo and passengers riding in relative comfort to within sight of the Rockies. The pleasant travel up the Missouri was complimented by the scenes of well timbered bottomlands that contrasted with the dry upland plains on either side of the river. It made the travel easier because early settlers were adjusted to the cool forests of the east and frequently dreaded the plains which seemed to stretch out indefinitely with only the receding horizon ahead. Even the brilliant light of the plains impressed those from more humid lands. The clarity of vision, the emptiness, the monotony still leaves an impression on prairie travelers, even on modern highways.

Biologically the plains have acted not unlike an ocean barrier by a distinct isolation of plant and animal species from west to east. Plants of the plains are mobile and flexible in contrast to those east and west of them. The climate and land impose the restriction that all plants

should be drought sustaining, drought evading or drought resistant. Flexibility, mobility, and resourcefulness are built into the native plains vegetation.

Early in American history the plains was a land to cross on the way to more prosperous and inviting places elsewhere.¹⁷ Today with 20 percent of the surface area of the United States the plains has only 3.7 percent of the total population. The last area of the West to be homesteaded, the grassland was one of the first major areas to begin losing substantial numbers of people. Many rural areas still experience this out migration, fifty years after the peak of homesteading. From 1940 to 1950 the northern plains farm population declined by nearly 20 percent while the total population increased by only 2 percent. During the same period the total United States population increased by 15 percent.¹⁸ The northern plains states have four and a half persons per square mile, only one half of the United States population density. In some rural counties of the Dakotas and eastern Montana the population density is less than one person per square mile. The region remains, a place where space dominates the individual, where the sky seems overly large, and where one river, the Missouri, provides a sharp environmental contrast.

¹⁷Kranzel, op. cit., p. 102.

¹⁸Ottoson, op. cit., pp. 131-47.

WATER DEVELOPMENT PROBLEMS ON THE MISSOURI RIVER

The Missouri, the longest river in North America, has been nearly completely controlled by numerous water development projects (see Figure 1). The river has been developed for the past thirty-five years primarily for irrigation, power generation, flood control and navigation. Large earth filled dams and huge reservoirs on the upper and middle sections of the river have created a series of lakes in contrast to the arid northern great plains that surround them.¹ Many of the economic benefits of these projects have accrued outside the northern plains region. A wide variety of problems associated with the developments have been felt by the sparsely populated underdeveloped plains region. Biological and physical problems have

¹The terms "upper Missouri" and "middle Missouri" have had various geographic definitions in the literature. In this study the upper Missouri River is considered that portion above the mouth of the Yellowstone River. The upper Missouri then is entirely within the State of Montana because the Yellowstone River mouth is only a short distance upstream from the North Dakota border. The middle Missouri is that portion between the mouth of the Yellowstone to the head of navigation at Yankton, South Dakota. The middle Missouri is located almost entirely in the states of North and South Dakota.

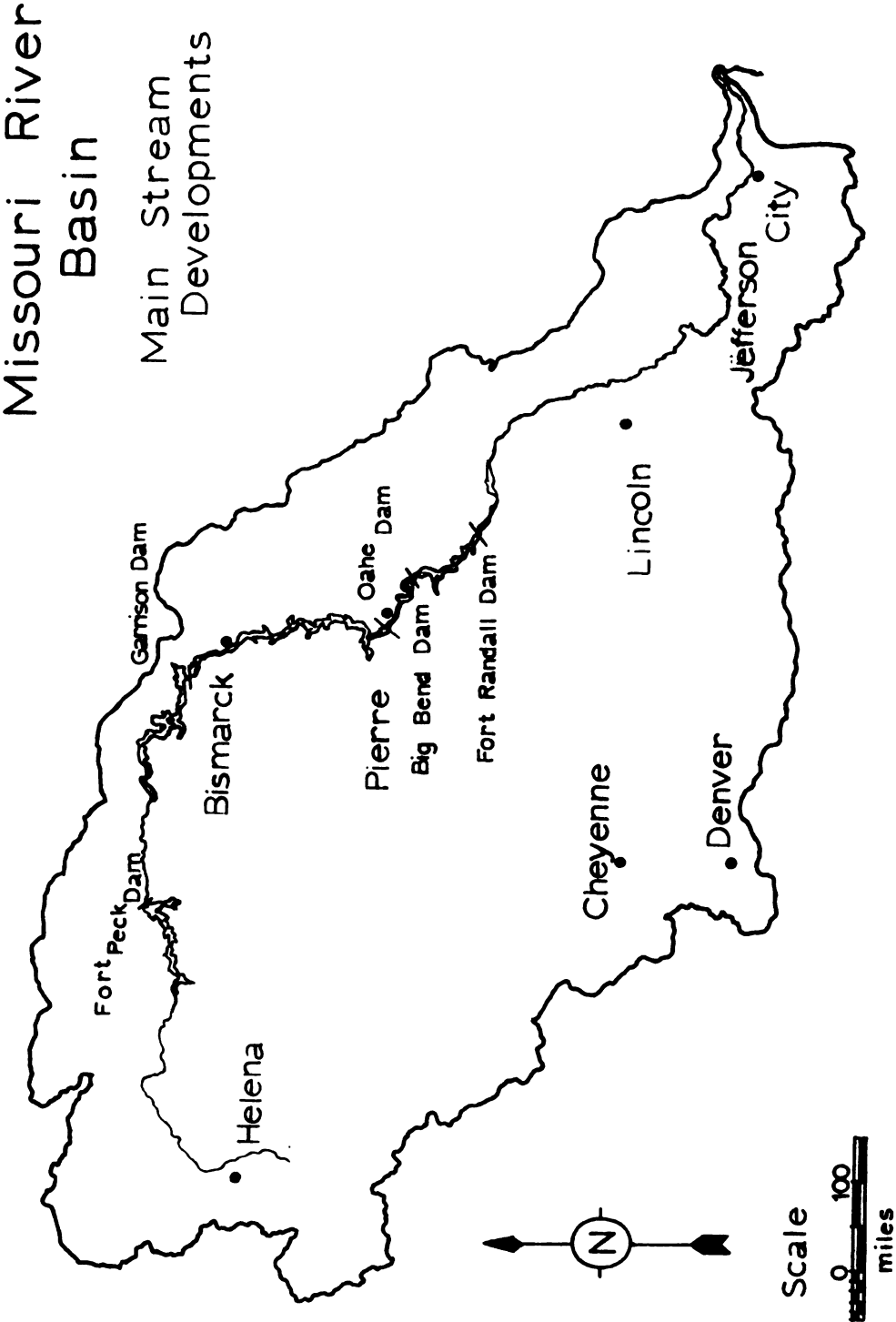


Figure 1

emerged, and development of the Missouri River has had a serious impact on local populations including minority groups. The most disheartening problem was the permanent flooding of several Indian reservations for the protection of downstream developments located on the Missouri's flood plain. The objective of this study, discussed in detail later, is to examine the human resource development changes brought by the Missouri River projects to the local residents. The study is an ex post evaluation of the success of water developments in meeting the social and human needs of the local population. This approach is termed advocacy resource development.

Beginnings of Development--The Corps of Discovery

Traveling by keelboat and canoe, the Lewis and Clark expedition left St. Louis in 1804 and headed up the Missouri River. The Corps of Discovery was the first organized American expedition exploring deep into the Louisiana Purchase. The winter of 1804-5 was spent at the Mandan villages; the summer, spring, and fall of 1805 was spent crossing the Rockies and descending the Columbia River to the Pacific Coast. After wintering at Astoria, the party returned to St. Louis during 1806.

Development started in 1807 when Manuel Lisa traveled up the Missouri by keelboat with trade goods. Lisa built a fort on the Missouri at the mouth of the Yellowstone River and from 1807 to 1840 the bulk of travel

and development along the Missouri was primarily the fur trade. After the decline of beaver fur trade, buffalo hunters and related trade dominated the upper and middle Missouri region. Buffalo hunters were soon succeeded by gold seekers traveling up the Missouri. During this era large steamboats traveled up the Missouri to Fort Benton within sight of the Rockies and the gold fields of Montana and Idaho. Indian reaction to gold seekers brought the U.S. army to the upper Missouri. During this era, logistical support of military activities against the plains Indians kept the Missouri the focus of commerce and travel. Starting in 1859 the great steamboats reached as far upstream as Fort Benton which is 1,500 miles above St. Louis. A colorful era of Missouri River history ended with the completion of the transcontinental railroad. The last steamboat reached Fort Benton with commercial cargo in 1890.² Commercial boat traffic continued on the middle Missouri until 1934.

Original authority to regulate and develop water resources originates with the U.S. Constitution. Article 1, Section 8 of the Constitution states "the Congress have the power . . . to regulate commerce with foreign nations

²The discussion of this era on the Missouri described by Hiram M. Chittenden's History of the Early Steamboat Navigation on the Missouri River (Minneapolis: Ross and Haines, Inc., 1962 reprint of 1903 edition), and The American Fur Trade of the Far West (Stanford: Academic Reprints, 1954 reprint of the 1902 edition).

and among the states . . ." From this provision the Federal government has gained the power to exercise control over navigable streams.

Article IV, Section 3 of the Constitution states that the Congress shall have the power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States. This provides Congress with the authority to enact legislation affecting water sites on public domain.

Beginning in 1879 with the establishment of the Mississippi River Commission, the Federal government began to exercise and expand its jurisdiction over navigable waters.³ The Commission was empowered to consider and devise plans and estimates to correct, permanently locate, and deepen the channel and protect the banks of the Mississippi River. The Commission was also directed to improve the safety and efficiency of navigation and to prevent destructive floods. In 1884 a similar commission was created for the Missouri River. The Corps of Engineers removed snags from the river, blasted rocks and attempted to reduce sandbars and other navigation hazards. However, as upper Missouri commercial boat traffic declined efforts were concentrated on the middle and lower reaches of the Missouri.

³Mississippi River Commission Act, Statutes at Large, XXI, Sec. 37-38 (1879).

The history of water developments in the United States has focused around the expansion of federal authority. After early federal interest in navigation improvements through the commerce clause, the Rivers and Harbors Act of 1890 required an act of Congress to construct any dam or structure on a navigable stream.

The passage of the Newlands Act in 1902 resulted in federal entry into the reclamation field practically to the exclusion of state participation.⁴ In 1907 President Theodore Roosevelt established an Inland Waterways Commission which firmly established the federal government in flood control. The Federal Water Power Act of 1920 expanded the scope of the commerce clause even more.⁵ This act required federal licensing of power sites and established control over the generation and sale of hydroelectric power.

The federal government had authority over navigation, flood control, irrigation and power sites by 1933. The creation of the Tennessee Valley Authority established an entirely new pattern of water development at that time. The completion of the Boulder Canyon Project in 1936, after eight years of construction, ushered in the era of large multi-purpose water developments.

⁴The Reclamation Act, Statutes at Large, XXXII, Sec. 388-90 (1902).

⁵The Federal Power Commission Act, Statutes at Large, XLX, Sec. 1063-77 (1920).

Tennessee Valley Authority

Interest in the development of the Tennessee River began in the 1820s when a survey of Muscle Shoals was recommended. Early surveys and plans pertained solely to navigation, and by 1916 some ten million dollars had been spent for that purpose. In 1899 and again in 1906 combined navigation and power projects were planned by private developers, but never were completed. World War I spurred federal interest in the river once again. In 1922 Senator Norris of Nebraska proposed the creation of a chemical corporation which would have authority to build dams and sell surplus power. The Corporation would be run by a board of three directors. Congress authorized the projects in 1928 and 1931, but both times the bills were vetoed by Presidents Coolidge and Hoover. In 1933, with President Roosevelt's leadership, Senator Norris' plan was approved by Congress. As signed into law the authority was "To improve the navigability and to provide for the flood control of the Tennessee River; to provide for the flood control of the Tennessee River; to provide for reforestation and the proper use of marginal lands in the said valley; to provide for the national defense by the creation of a corporation for the operation of government properties at and near Muscle Shoals in the State of Alabama, and for

other purposes."⁶ To carry out this program Congress authorized the creation of a government corporation with powers to plan, construct, and operate multipurpose water developments. Directly responsible to the President, who nominates the three man board of directors, the Tennessee Valley Authority enjoys greater independence and flexibility than almost any other government department or agency. Independence is strengthened by lump sum appropriations from Congress, revenues from the sale of power, and a wide discretion in the selection and management of personnel. Furthermore the TVA can sue and be sued in its own name, make contracts, may purchase and lease real and personal property and may exercise the right of eminent domain.

The very boldness of the TVA concept, which implemented for the first time in one vast project the theoretical water development concepts of three preceding decades, appeared to be the answer to water development problems throughout the United States. Four years after the creation of TVA, in a message to Congress, June 3, 1937, President Roosevelt proposed to establish seven regional agencies.⁷ These agencies would have integrated plans to conserve and safeguard the prudent use of waters, water

⁶The Tennessee Valley Authority Act, Statutes at Large, XLVII, Sec. 58-72 (1933).

⁷U.S. Congress, House, Presidential message to Congress, H. Doc. 261, 75th Cong. 1st Sess., June 3, 1937, Congressional Record, pp. 5926-27.

power, soil, forest and other resources in the areas they were responsible. The seven regions proposed were: the Atlantic seaboard, the Great Lakes and Ohio Valley, and the drainage basins of the Tennessee and Cumberland Rivers, the Missouri and Red River, the Arkansas, Red and Rio Grande, the Colorado River, and the Columbia river basins. After World War II, the regions, especially the Columbia and Missouri, were actively backed by the President and extensive hearings were held but the regional plans failed.

The TVA remains the only development authority in the United States, but under the impact of its success the concept was introduced to different parts of the world. The basic TVA concept was that water resources are best managed through a government agency independent of departmental control and hierarchy. In the United States, by the 1970s, many people were complaining that the lack of control over TVA was creating problems. Environmentalists, frustrated over influencing the TVA through the normal political channels, labeled the Authority a major pollutor and initiated legal action in an attempt to control its programs. It is interesting to note that Congress, which has been accused of abdicating its powers to the executive branch of government, has not expanded the idea of independent water development agencies to other regions.

The Pick Plan

During the spring of 1943 the Missouri River flooded the adjoining lands from Pierre, South Dakota downstream to heights not reached since 1881. Over 2.4 million acres of farm land were flooded and nearly \$50 million in damages were caused by the river.⁸

The U.S. House of Representatives Flood Control Committee issued a resolution on May 13, 1943 which asked for a review of flood control needs on the Missouri River. Colonel Lewis A. Pick, Division Engineer of the Missouri River Office of the Corps of Engineers in Omaha was assigned to prepare the report. The Pick report or "Pick Plan" was primarily based on the massive 1934 report on the Missouri River prepared over ten years earlier. A report to the 73rd Congress, House Document 238, titled "Missouri River" was over 1,200 pages long.⁹ The "Pick Plan" was completed by August 10, 1943 and reported to the 78th Congress on March 2, 1944 as House Document 475.¹⁰

The Pick proposal, adopted by the Corps of Engineers, was essentially a flood control and navigation plan for the Missouri River. It consisted of a series of navigation

⁸U.S. Congress, House, Committee on Flood Control, Hearings on Flood Control Plans and New Projects, 78th Cong., 2nd Sess., pt. 1, 1943, pp. 885-87.

⁹U.S. Congress, House, Missouri River, H. Doc. 238, 73d Cong., 2d Sess., 1935.

¹⁰U.S. Congress, House, Missouri River Basin, H. Doc. 475, 78th Cong., 2d Sess., March 2, 1944.

levees below Sioux City and five large main stem dams upstream as well as six large dams on major tributaries. The Pick Plan was incorporated into the Omnibus Flood Control Bill of 1944. Early criticism of the Pick Plan developed because upstream irrigation interests were not considered. The proposed developments were criticized because they were not comprehensive. Basically downstream interests were satisfied because flood control and navigation were the main objectives. Upstream irrigation interests objected at least partly because an extensive study of Missouri River development was being completed by the Bureau of Reclamation which favored large irrigation projects.

Colonel Pick's Plan, calling for massive main stem projects, was a small report, only twelve and one-half pages. Interestingly the Secretary of War, Henry L. Stimson submitted it over the objections of the Bureau of the Budget. In the Pick Plan reservoirs and levees were planned to provide protection against floods equal to the largest on record. Storage of flood waters, the report claimed, would provide for irrigation, navigation, power, domestic and sanitary purposes, wildlife and recreational uses. The completed plan promised to stabilize the valley's economic life, encourage industry and civic growth, and relieve distress caused by the river's uncontrolled behavior.

The Sloan Plan

The Sloan Plan, five years in progress by the Bureau of Reclamation, reached Congress on May 4, 1944. Printed by the 78th Congress as Senate Document 191, the report was larger in scope and more detailed in its presentation than the brief Corps of Engineers plan.¹¹ The Bureau's plan, promptly named the Sloan Plan after W. G. Sloan, the report supervisor, was over 200 pages long. It provided a thorough statement of the Missouri basin's land uses and water resources as well as a variety of physical, biological, economic and demographic details. In comparison the Pick Plan had proposed only the main outlines of its program and had based its brief report on the massive 1934 "308 report."

Sloan's thesis reflected the influence of John Wesley Powell and promised through engineering to diminish the effects of western aridness. The Sloan report maintained that water use in the West should be developed and based upon an agriculture economy. The Sloan Plan included flood control and navigation plans below Sioux City, but modified upstream projects because certain reservoirs could be utilized for more purposes beneficial to upstream residents, such as irrigation.

The Sloan Plan proposed ninety reservoirs with nearly forty-six million acre feet of storage. When fully

¹¹U.S. Congress, Senate, Missouri River Basin, S. Doc. 191, 78th Cong., 2d Sess., April 12, 1944.

developed the plan would provide water to irrigate 4,760,400 acres, and seventeen power plants would supply nearly four billion kilowatt-hours of power annually. The Bureau also proposed a power transmission grid system to serve the basin.

The Corps of Engineers advocated larger main stem reservoirs and were critical of the Bureau's irrigation projects. Many feared that the Missouri River could not supply enough water for the nine foot navigation channel and consumptive upstream uses.

The spring following the 1943 Missouri River floods Congress had before it two massive plans for the development of the Missouri River Basin, the Pick Plan with emphasis on flood control and navigation and the Sloan Plan with its emphasis on irrigation. Power was incidental to both plans but more completely presented in the Bureau's proposal.

The Bureau of Reclamation irrigation proposal for the Missouri would double the total irrigated acres in the basin. At the time of the Sloan Plan, the Bureau supplied water to one out of eight irrigated acres in the Missouri basin--530,670 acres out of a total of 4,400,385 acres.¹² The Bureau had asked for ninety projects in the Sloan Plan when in its previous forty-seven years as a federal bureau,

¹²Henry C. Hart, The Dark Missouri (Madison: University of Wisconsin Press, 1957), p. 110.

it had completed only eleven projects in the basin and seven of these were authorized from 1902-1906--the first four years of the Bureau. With the Sloan project the Bureau would double the total irrigated acreage in the Missouri Basin and raise its share from one-eighth to over one-half of the total land irrigated.

Throughout the summer of 1944 both agencies continued to promote their own proposals. Controversy over the respective plans increased in tempo despite suggestions and even demands from some congressmen that a compromise be reached. On August 18, Senator Murray of Montana introduced a Missouri Valley Authority Bill.¹³ Then on September 21, 1944 President Roosevelt asked for the creation of river basin development agencies patterned after the TVA.¹⁴ Less than one month later the two feuding agencies reached an agreement.

The Pick-Sloan Plan

The contest between the Pick and Sloan plans launched in May of 1944 was over by October. An inter-agency committee, including W. G. Sloan, met in Omaha on

¹³U.S. Congress, Senate, A Bill to Establish a Missouri Valley Authority, S.2089, 78th Cong., 2d Sess., 1944, Congressional Record, p. 7082.

¹⁴U.S. Congress, House, Presidential Message to Congress, H. Doc. 680, 78th Cong., 2d Sess., Sept. 21, 1944, Congressional Record, p. 8056.

October 16 and 17 and arrived at a one page agreement.¹⁵

In two days they had reconciled the Pick and Sloan reports, and in two days the entire development plan of the largest river in North America was decided by two competing federal agencies. Using data already fifteen years old in 1944, the Corps of Engineers continued to develop the Missouri for another twenty-five years based on the two day Pick-Sloan compromise. Nowhere in the history of water development were so many massive water projects approved in such a short time period.

The Omaha meeting settled the jurisdiction and the location of works to be built. The Corps of Engineers would determine mainstem reservoir capacity, and flood control and navigation storage on certain tributary streams. The Bureau of Reclamation would determine the capacity for irrigation. Reconciliation meant chiefly that each agency became reconciled to the works of the other. One Pick project on the mainstem was eliminated, but only because the site would be under water as a result of a Sloan project.

The huge Garrison Reservoir, previously declared unsafe by the original Corps report in 1934 but advocated by Colonel Pick was accepted by Sloan. Only three weeks

¹⁵Marian E. Ridgeway, The Missouri Basin's Pick-Sloan Plan, Vol. 35, Illinois Studies in the Social Sciences (Urbana: University of Illinois Press, 1955), pp. 96-97.

earlier Sloan had testified against the project declaring it wasteful and unsafe. The question of water supply for both irrigation and navigation, bitterly argued only weeks before, was ignored in the final compromise.

Originally, on the mainstem, the Army proposed five reservoirs with a total storage of 35,000,000 acre feet. The Interior agency wanted three reservoirs with 25,000,000 acre feet. Under the adjusted plan all the major mainstem reservoirs were to be built, except the one whose site was submerged, and the total mainstem storage increased to 42,000,000 acre feet.¹⁶

The compromise left Congress with power to decide the development of the Missouri River. The Pick-Sloan plan was generally regarded as "substantially" reducing the chances of a Missouri Valley Authority and an effort to stifle the M.V.A. legislation.¹⁷

The compromise report said nothing about allocation of water to navigation, flood control, power, and other uses. The report even failed to say who would build which dams. More important questions of land-use, regional distribution of economic benefits and integrative resource development were not considered. Navigation had won in the

¹⁶U.S. Congress, Senate, Missouri River Basin, S. Doc. 247, 78th Cong., 2d Sess., Nov. 21, 1944.

¹⁷Ridgeway, The Missouri Basin's Pick-Sloan Plan, p. 90.

lower basin, irrigation in the upper Missouri, but no one knew if the Missouri had enough water for both.

H.R. 4485, the Omnibus Flood Control Act of 1944, passed Congress on December 12, 1944 by voice vote, authorizing the Pick-Sloan Plan.¹⁸ The bill was signed into law by President Roosevelt on December 22. After only a few weeks consideration, the massive water development program on the Missouri was launched. Thirty years later, after billions had been spent, no government agency had evaluated the effectiveness of the Pick-Sloan Plan in meeting the developmental objectives of the northern Great Plains.

The Missouri Valley Authority

The Pick-Sloan compromise was considered by many as an attempt by two federal agencies to forestall the Missouri Valley Authority.

The resumption of this old and apparently irreconcilable feud between two vested government interests convinced many people that the time had come to cut the Gordian knot by advancing the MVA idea. The idea would reserve the Missouri Valley from contending factions and place under harmonious and scientific, but above all, under united and non-political management. As the MVA idea took instant hold upon the imagination of the country, and won the ultimate endorsement of the President in a special message to Congress, a strange and wondrous thing occurred. The feudists, fearful of the MVA idea, lest it invade their bureaucratic

¹⁸U.S. Congress, House, Flood Control Act of 1944, Pub. L.534, 78th Cong., 2d Sess., Dec. 22, 1944.

precincts, began to murmur softly to each other and how marvelous to relate--a marriage has been arranged.¹⁹

Conceptually the Missouri Valley Authority was patterned after the Tennessee Valley Authority which had been in operation since 1933. Impetus to the MVA concept came from a strong editorial in the St. Louis Post Dispatch on May 15, 1944.²⁰ The National Farmers Union also endorsed the proposal. The President and his personnel in the Bureau of Budget first critized specifics in both the Pick and Sloan Plans then supported the administrative shift to a MVA. The proposal for a valley authority attracted no large consensus in the basin. For one thing the MVA proposal offered no specific dams or reclamation projects, only an administrative structure for water developments in the basin.

Montana's Senator James Murray testified before the House Flood Control Committee early in 1944 to protest any hasty action on the Pick Plan. Murray, from a major upstream state, was concerned over the role irrigation would have in the Missouri development. Concerning the basin development Murray advocated three things: first, coordination of plans; second, a clear declaration of basic policy

¹⁹U.S. Congress, Senate, Appendix article on the threat to the MVA, Congressional Record, 78th Cong., 2d Sess., Nov. 14, 1944, pp. A 4381-82.

²⁰"One River--One Problem," St. Louis Post Dispatch, May 15, 1944, editorial.

for the administration of various development projects; and finally, the protection of upstream water uses.

After the St. Louis Post Dispatch editorial supporting a MVA, Murray announced his support for the authority in early August 1944. Senate Bill S.2089 introduced on August 18, 1944 by Murray became the first bill for a Missouri Valley Authority.²¹ Designed to provide unified water control and resource development in the Missouri basin, S.2089 was similar to the 1933 TVA Act. The MVA bill proposed an authority type corporation to assume control of dams on other projects in the 530,000 square mile area of the basin. The proposed three man board would be appointed by the President and have full control over the corporation's policy. Within two years of passage, the board was to prepare a development program for the basin and could request the assistance of any agency in the United States. House Bill H.R.5377 was introduced in the House by John J. Cochran of Missouri on September 18 and was identical to Murray's S.2089. The St. Louis Post Dispatch hailed the MVA bill, but other newspapers in the basin opposed it vigorously. Senator Murray, a long time opponent of the Anaconda Copper Mining Company, was severely criticized by the many daily and weekly papers controlled by the Company in Montana.

²¹U.S. Congress, Senate, A Bill to Establish a Missouri Valley Authority, S.2089.

Strongest support for the MVA came from the National Farmer's Union.

President Roosevelt, in a message sent to Congress on September 21, 1944, advocated the Missouri Valley Authority. The Pick-Sloan compromise was worked out by the Corps of Engineers and Bureau of Reclamation on October 16 and 17. The St. Louis Post Dispatch, as the MVA proposal faced defeat following the Pick-Sloan agreement, editorialized against the "marriage between old and bitter enemies . . . a marriage of convenience, arranged not only to kill off MVA but to save the interests jealously guarded by two powerful government agencies."²² While the compromise left many problems unsolved, Congress was confronted with a solid front of agency demand and related support. House bill 4485, The Omnibus Flood Control bill, passed Congress and was approved on December 22, 1944. Senator Murray had been dissuaded from offering his MVA proposal as an amendment to H.R. 4485 at the last moment by Senator Overton, Chairman of the Commerce Committee's subcommittee on flood control and rivers and harbors.²³ Congress was persuaded to act quickly because of the recent floods on the Missouri and a promise from Senator Overton to Murray

²²U.S. Congress, Senate, Appendix article on the threat to MVA, Congressional Record, 78th Cong., 2d Sess., Nov. 14, 1944, pp. A 4381-82.

²³Ridgeway, The Missouri Basin's Pick-Sloan Plan, p. 101.

that a new MVA bill would receive early hearings in the first session of the 79th Congress.

At the start of the 79th Congress, the MVA appeared to have been discarded by everyone except President Roosevelt and Senator Murray. On February 15, 1945 identical bills for the establishment of a Missouri Valley Authority were introduced by Senator Murray and Representative John L. Cochran (S.555 and H.R.2203).²⁴ The MVA issue became one of the widest discussed domestic issues of its time. Hearings on the proposal were conducted by both the Commerce Committee and the Committee on Irrigation and Reclamation. Both committees issued unfavorable reports and greatly weakened and reduced the effectiveness of the bill. The bill became entangled in harsh public debate over public vs private power, states rights vs federal authority as well as partisan arguments along regional and agency lines. The valley authority idea was so prominent during 1945 that eight bills for various river basin authorities were introduced in that session of Congress.

Partly in response to MVA proposals the Missouri Basin Inter-Agency Committee was established by resolution of the Federal Inter-Agency River Basin Committee on March 29, 1945. The Missouri Basin Inter-Agency Committee

²⁴U.S. Congress, Senate, A Bill to Establish a Missouri Valley Authority, S.555, 79th Cong., 1st Sess., and H.R.2203, 79th Cong., 1st Sess., 1945, Congressional Record, pp. 1121, 1170.

was a unique government entity, it had no legal authority or appropriations. MBIA Committee did provide a mechanism for field representatives of federal agencies to coordinate their activities in the basin in cooperation with state representatives in the basin. The committee was frequently criticized starting with its inability to solve the first dispute which it considered, the height of Garrison Dam.

The Inter-Agency Committee was a voluntary inter-departmental committee that performed primarily informational service. MBIA Committee had no authority to resolve jurisdictional disputes between agencies or to develop comprehensive balanced regional water resource plans. The Hoover Commission, the President's National Water Resources Policy Commission, and Secretary of the Interior, Julius Krug, criticized the Committee at various times. On the other hand, General Lewis A. Pick reportedly said the Committee is "the greatest team ever assembled in the United States for the development of an area for the good of the people."²⁵

The year 1945 was the beginning of the huge construction program for the Missouri River. The MVA bill was not passed as an addition to the Pick-Sloan plan. Congressional leaders felt they had given the basin what basin

²⁵William B. Arthur, "MVA, Its Background and Issues," Congressional Digest (January, 1950), p. 14.

spokemen wanted. By 1949 major main stem dams, Garrison, Oahe, Canyon Ferry, and Fort Randall were under construction.

As the Pick-Sloan plan was developed critics were plentiful. The St. Louis Post Dispatch kept up a running commentary for many years. The sharpest early criticism of the Pick-Sloan plan came from the Hoover Commission.²⁶ The Task Force on National Resources, with former Governor Leslie A. Miller of Wyoming as Chairman denounced the Missouri development project in nearly every particular. President Truman's National Water Resources Policy Commission offered a more general criticism of the Missouri basin program in 1950.

The earliest large main stem development on the Missouri was the Fort Peck Dam in eastern Montana authorized in 1933. This hydraulic earth fill dam is 250 feet high, 21,026 feet long and created a reservoir with 19,000,000 acre feet of storage. When full the reservoir creates a lake 135 miles long with 1,520 miles of shoreline.²⁷

The first main stem dam authorized by the Pick-Sloan plan became operational in 1953 and was Fort Randall.²⁸

²⁶Commission on Organization of the Executive Branch of Government, Task Force Report on Natural Resources, Appendix L, January, 1949.

²⁷U.S. Department of the Army, Corps of Engineers, Water Resources Development by the U.S. Army Corps of Engineers in Montana, January, 1971, p. 1.

²⁸U.S. Department of the Army, Corps of Engineers, Water Resources Development by the U.S. Army Corps of Engineers in South Dakota, January, 1971, pp. 3-4.

Fort Randall Dam is located near the South Dakota-Nebraska border and is of the rolled earth type. The dam itself is 165 feet high and 10,700 feet wide at the top. Lake Francis Case, the name of the reservoir created, has a capacity of 5,700,000 acre feet. When full the lake is 107 miles long and has 540 miles of shoreline.

Gavins Point Dam immediately downstream from Fort Randall became operational in 1955.²⁹ This dam was designed as a regulatory dam for navigation purposes. The lake it created stores only 350,000 acre feet of water and has ninety miles of shoreline, small by Missouri River reservoir standards.

Garrison Dam in North Dakota was one of the largest of the Pick-Sloan project dams. Completed in 1955, Garrison Dam, also a rolled earth type, is 202 feet high and 11,300 feet wide.³⁰ Lake Sakajawea was created by the project with 24,400,000 acre feet of storage capacity. The lake, 178 miles long and with 1,304 miles of shoreline, flooded the heart of the Fort Berthold Indian Reservation and disrupted life there for years.

Another colossal Pick-Sloan project was Oahe Dam completed in 1962. Construction started in 1948 on the rolled earth project. The dam is 245 feet high and

²⁹ Ibid., p. 102.

³⁰ U.S. Department of the Army, Corps of Engineers, Water Resources Development by the U.S. Army Corps of Engineers in North Dakota, January, 1969, pp. 1-2.

9,300 feet long. Located in central South Dakota just above Pierre, the Dam created Lake Oahe which backs water 231 miles through South Dakota into North Dakota. The lake, with 2,250 miles of shoreline, has a storage capacity of 23,600,000 acre feet.³¹

The final main stem Pick-Sloan project completed was Big Bend Dam in South Dakota downstream from Oahe. The 95 foot high rolled earth dam is 10,570 feet long and created Lake Sharpe. The lake has a storage capacity of 1,900,000 acre feet, is 80 miles long at maximum pool, and creates 200 miles of shoreline.³²

Fort Peck in Montana was originally designed to assist downstream navigation. Later Fort Peck became only the first of six large main stem dams on the middle Missouri, and was then considered by the Corps of Engineers as a multiple purpose project. The Pick-Sloan plan led to the great lakes staircase of reservoirs on the Missouri. First Fort Peck, then Lake Sakajawea, Lake Oahe, Lake Sharpe, Lake Francis Case, and Gavin's Point reservoir. These projects were a nearly continuous series of lakes over 750 miles long from central Montana, through North and South Dakota to Sioux Falls, South Dakota. Below Sioux

³¹U.S. Department of the Army, Water Resources Development in South Dakota, pp. 9-10.

³²Ibid., p. 11.

Falls the river is channelized and diked and controlled primarily for navigation purposes.

Upper Missouri Water Developments

Water developments in the Missouri Basin are so widespread and numerous that this study proposes to concentrate generally on the main stem of the river and specifically on the Missouri River Breaks region in Montana. A 1969 report listed over 225 dams in the basin each with a storage capacity over 5,000 acre feet.³³ This includes private power dams, projects designed for domestic water supply, irrigation district projects as well as public dam projects constructed by the Corps of Engineers and Bureau of Reclamation. Small dams are exceptionally numerous in the basin, an estimated 314,000 ponds covering 414,000 acres.

Early main stem dams on the upper Missouri in Montana were private in nature. Most early projects utilized readily available power from the choice power sites. Most notable was the Great Falls of the Missouri, one of the largest falls in the West and a major obstacle of the Lewis and Clark expedition. Originally the Great Falls was utilized for a rope drive power plant in 1893. Starting a few miles below the headwaters of the Missouri at Three Forks is a concrete diversion dam completed in

³³Missouri Basin Inter-Agency Committee, Comprehensive Framework Study Missouri River Basin, Vol. 2, Table 1.

1940. From the dam forty-eight miles of canal irrigate 21,000 acres of land. Immediately downstream is the large Bureau of Reclamation Canyon Ferry project authorized by the Pick-Sloan plan and completed in 1961. Proceeding downstream from Canyon Ferry Dam are two Montana Power Company dams, Hauser and Holter completed in 1911 and 1918, and utilized for hydro power production. A few miles downstream of Great Falls a series of Montana Power Company dams utilize the power from the rapid drop of the Missouri. Black Eagle Dam at Black Eagle Falls, Rainbow Dam at Rainbow Falls, Ryan, Morony, and Cochrane Dams which utilize the lower cascades of what formerly was the Great Falls of the Missouri. The seven Montana Power Company hydro electric dams generate approximately 250,000 kilowatts of power.

Missouri Breaks Area

Below Morony Dam and below the small town of Fort Benton, Montana is a 175 mile reach of river which has no water developments. Downstream from Fort Benton, the head of navigation on the Missouri during the steamboat era, is the area locally called the Missouri Breaks country. It is the last of the wild Missouri River (see Figure 2). Upstream from Three Forks down the Missouri past the Great Falls to Fort Benton, nine dams provide a staircase of reservoirs. Below the Missouri Breaks the huge earthen dams have inundated 750 miles of river bottom.

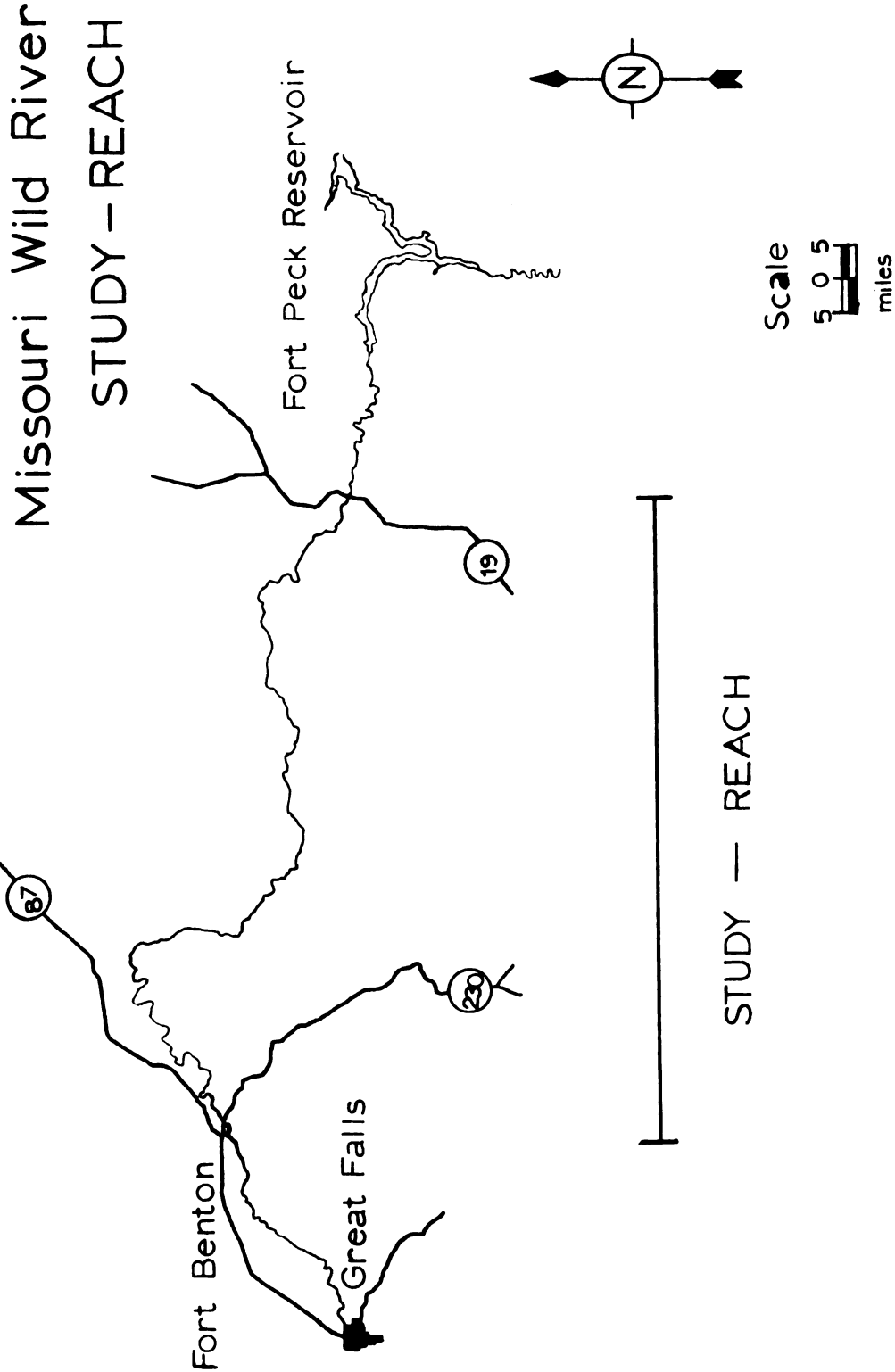


Figure 2

Between Fort Benton, Montana and the upper end of the Fort Peck Reservoir, the Missouri River is crossed only twice by highway. Although a few hundred acres of land are irrigated by pumping from the shore it is the last undeveloped region in the entire 2,500 miles length of river. It is a primitive area, essentially unchanged ". . . here is a section of river suspended in time, seemingly only a step from the lusty epoch of the river boat."³⁴

The Missouri Breaks was first noted historically in the journals of Lewis and Clark in 1805 and 1806. The Corps of Discovery commonly saw buffalo, elk, big horn sheep, and grizzly bear in the Breaks region. This portion of the river is a historic area, a turnpike for Indians, fur trappers, explorers, steamboats, gold rushers, and sod busters. It was one of the three main thoroughfares to the Far West, a route historically equal to the Sante Fe and Oregon Trails. The Missouri Breaks is a rough and isolated section of the river that includes thirty historic sites and forty-five archeological areas.³⁵

From the foot of Morony Dam above Fort Benton to the upper end of Fort Peck Reservoir the river falls a total of 550 feet in this 175 mile undeveloped stretch.

³⁴Bob Cooney, "The Last Wild Reach of the Missouri," The Living Wilderness, Vol. XXI (August, 1967), p. 22.

³⁵Gilbert F. Stucker, "Wither the Wild Missouri?" National Parks Magazine, Vol. LXV, No. 219 (August, 1965), p. 15.

The major tributaries are the Teton and Marias rivers flowing from the north and the Judith which enters the Missouri from the South.

The region consists primarily of rolling plains with distant isolated island-like mountains. The river flows through a relatively deep and narrow gorge-like valley. The flood plain on most of this reach is narrow and lies 550 to 1,000 feet below the uplifted plains. Erosion has produced a highly dissected, rough terrain, some of which is badlands two to ten miles wide on either side of the river. It is this badlands area that is locally termed the Missouri River Breaks.

On the narrow river bottomland and on the upland benchlands, deserted homesteads and cabins dramatize a basic problem of the region--periodic drought. Average rainfall in the area is thirteen inches annually. Rainfall is highly variable from year to year. Homesteading was encouraged in this area because of high grain prices and a series of relatively wet seasons. Latent moisture in the newly plowed grassland also contributed to a period of prosperity and widespread homesteading from 1915-1920. During the early 1920s the entire northern Great Plains experienced several years of below average rainfall and the out migration of farmers began. This outflow of people continues stimulated by the periodic recurring droughts and economic trends.

The Middle Missouri

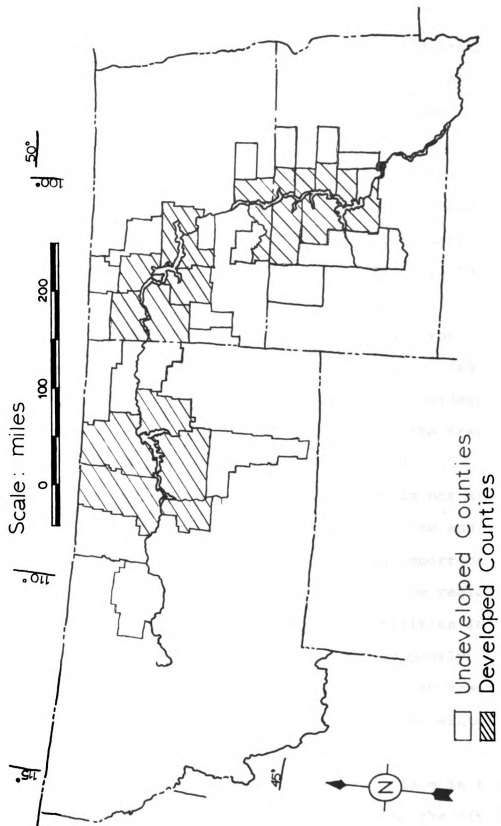


Figure 3

The economic growth of eastern Montana and the northern Great Plains has lagged behind the United States, the Western States, and the Rocky Mountain region. At the same time the proportion of its rural population has remained higher than the national and regional average.

The productive ages of life, 20-64, are represented in lower numbers than the national average in the State of Montana. Agriculture is not only the dominant industry for the Missouri Breaks counties but the only industry. This part of the plains is wheat and livestock country.

Nearly 600,000 acres of wheat, the major crop, was grown in the five county Missouri Breaks region in 1969. Livestock outnumber people fifteen to one. After widespread homesteading began failing over fifty years ago the trend has been toward less cropland and more grassland.

Mining along this portion of the river is not as important as it was in the past. Coal strip mining and associated power plants are of rapidly growing importance in nearby counties, however. Manufacturing in the region is virtually non-existent. Transportation facilities in the Missouri River Breaks country are generally poorly developed. Ferry service on dirt and gravel county roads is available at four crossings, but not during the winter months.

Some recreation development has taken place in this part of Montana due to hunting and boating along the river. Recreation is not a major industry because the area is hot

and dry during the summer, cold and windy during the winter and aesthetically not comparable to the Rocky Mountains a short distance to the west. During the early history of the West the plains were a land to cross on the way to gold fields and more fertile environment farther west. Today this area and much of the northern plains is a land of open space, cattle, isolated towns and ranches largely bypassed by modern industrial and social developments. The region could be considered an aborted frontier. During the frontier, homesteading era the region began to fail before it succeeded in developing the usual social services and industries of a mature economy. The area was homesteaded late in the opening of the West and after a few prosperous years began to decline. It continues to decline today, amidst abundant space, a fickle climate and a dearth of resources.

Development Proposals for the Missouri Breaks Region

The Missouri Breaks and the last undeveloped stretch of Missouri River were originally considered unsuitable for development. The original "308 Report" for the Missouri did not recommend development for the area in 1934 and neither did the Pick-Sloan Plan which had utilized much of the material in the lengthy "308 Report." In 1960, after a period of rapid development on the Missouri the region attracted the attention of several resource development agencies. A development feasibility study was proposed as

a request on March 6, 1961 from Senator Lee Metcalf of Montana. An unusual Joint Report resulted from a memorandum of agreement signed by the Corps of Engineers and the Department of Interior on March 14, 1962. The memo stated that "It is agreed that because both departments (Interior and Defense) have major program interests, a joint study and report should be made on the feasibility of multiple purpose reservoir development on the main stem of the Missouri River between Fort Peck and Fort Benton, Montana."³⁶

A regional coordinator of the Department of Interior and the Missouri River Division of the Corps of Engineers implemented the study in August 1962 on an interdepartmental basis. The unusual Joint Report that resulted was the topic of a lengthy Ph.D dissertation of Carlos Stern. According to Stern the Joint Report did not begin as a needed project advocated by a local public but in one sense was imposed upon a relatively dormant populace by Montana Congressmen. Most flood control and irrigation projects tend to be initiated by those local publics who stand to benefit from the water development projects.

The late Senator Murray of Montana requested early in 1960 that the National Park Service study the recreation

³⁶Carlos D. Stern, "A Critique of Federal Water Resources Policies: Hydroelectric Power Versus Wilderness Waterway on the Upper Missouri River" (Ph.D. dissertation, Cornell University, 1971), Appendix 1, pp. 592-94.

potential of this stretch of river. The Senate Public Works Committee passed a resolution on March 8, 1960 to have the Corps "review the reports of the Chief of Engineers on the Missouri and tributaries with a view to determining whether any modification of the existing project is advisable at this time."³⁷

In a letter to Secretary of Interior Stewart Udall, Senator Metcalf in 1961 requested a comprehensive report from the Interior. Metcalf's request for recommendations on multiple purpose developments expanded the scope of the investigation from the Park Service to other Interior agencies who had interests in the area.

In addition to the Corps of Engineers, the Interior Bureaus that participated in the Joint Study published in 1963 included the Bureau of Land Management, Bureau of Reclamation, National Park Service, Fish and Wildlife Service, and the Geological Survey. The Federal Power Commission, U.S. Public Health Service, and the Bureau of Outdoor Recreation as well as the Department of Agriculture were consulted during the course of the study. Various State of Montana agencies, local interests, and the Governor of Montana also had input into the study.

³⁷Jennings Randolph, Chairman Committee on Public Works, U.S. Senate, personal letter, March 18, 1974.

The joint report was issued in June of 1963.³⁸ Eleven separate management plans were proposed for the river. Although most of the plans involved the construction of large dams and reservoirs, this study and report was the first time that preservation values were given adequate consideration in a river basin plan.³⁹

Although some agencies such as the Geological Survey and Public Health Service acted as a fact finding group, the five federal agencies discussed below have a vested interest in the development of the Missouri Breaks region.

The Corps of Engineers is an old office under the Department of the Army. It has had wide responsibility for construction, operation and maintenance of structures for the improvement of rivers, harbors, and waterways. Its management is responsible for navigation, flood control, and shore protection of navigable waters. In the proposed development of the Missouri River the Corps was to be involved in ten out of eleven of the management plans.

The Bureau of Land Management was organized in 1946 but had its beginnings in the old General Land Office that started in 1812. The Bureau classifies, manages and

³⁸Division Engineer, Missouri River Division, Corps of Engineers, U.S. Army and Regional Coordinator, Missouri Basin Region, Department of Interior, Missouri River, Fort Peck Reservoir to Vicinity of Fort Benton, Montana, Joint Report on Water and Related Land Resources Development, 5 vol., June, 1963.

³⁹Roger Tippy, "Preservation Values in River Basin Development," Natural Resources Journal, Vol. VIII (April, 1968), 259-78.

disposes of the public lands and their related resources. The Bureau of Land Management is in the process of receiving congressional multiple-use management directive that will give them responsibility for recreation, wildlife, watershed management as well as forest and range management. Since they administer over one-half of the land in the Missouri River breaks area they were to lose more responsibility under the eleven management plans than the other agencies. Today the Bureau has multiple use plans of their own for the area, but in 1963 they were involved in only a peripheral manner in the plans.

The Bureau of Reclamation in the Department of the Interior resulted from the Reclamation Act of 1902. Since that time they have had a strong interest in water development projects in the West. They are authorized to locate, construct, operate, and maintain works for storage, diversion and development of water for reclamation of arid and semi-arid lands in the seventeen Western states. This includes developing irrigation facilities, industrial and municipal water supplies, as well as power generation and transmission projects. In the case of the Missouri, the Bureau's flood control and navigation responsibilities had already been transferred to the Corps under the Pick-Sloan agreement of 1944. The high benchland, rough terrain and narrow river bottom restricted irrigable land in the study

area to only 5,500 acres.⁴⁰ The only community needing water was Fort Benton, and there were no anticipated demands for industrial use of water. Therefore, early in the study, the Bureau of Reclamation was excluded from most of the management plans.

The National Park Service was established 1916 and its objective is primarily the promotion and regulation of the National Parks, Monuments and similar federal reservations. Its purpose is to conserve the scenery and leave the areas "unimpaired for future generations" while providing for use and recreation. The Park Service is usually thought of as a purist or preservation agency and was involved in only two of the eleven management plans for the area because its proposal would maintain most of the area in a natural state.

The final agency with a vested interest was the Bureau of Sport Fisheries and Wildlife, a relatively new federal agency. Its objectives are the perpetuation, use and enjoyment of the sportfish and wildlife resources of the nation. They have fishing programs, wildlife refuges and were involved in some way in all of the management plans of the Missouri River breaks development.

⁴⁰Joint Report, Vol. 1, p. 9.

The Management Alternatives in 1963

Most of the management plans presented in the 1963 joint Army-Interior report centered around the dams and reservoirs proposed by the Corps of Engineers. The details of these plans are complex and somewhat outdated. However, the scope of the proposals is interesting.

Ten out of eleven of the proposals involved at least one dam, and in some cases three dams, on the 200 mile reach of river.⁴¹ Six different sites for eight different dams were considered in the joint study.

Each reservoir and dam would incorporate recreation and power into the program. Maximum power development would be 1,114,000 kilowatts, which would utilize all the vertical fall of the river. Maximum water storage of the plans would be 500,000 acre feet and maximum recreation use of 600,000 visitor days a year. Flood control in the study area would not be significant since few people or structures are located in the Missouri Breaks area. However, the reservoirs would be an upstream extension of the existing Missouri River main stem reservoir system. Fort Peck and lower reservoirs provide adequate storage below the breaks areas but increased power could result from raising storage levels in the downstream reservoirs.

Only 5,500 acres of bottomland are cultivable in the river plain. Tablelands above the river do not lend

⁴¹Ibid., pp. 18-41.

themselves to irrigation due to the small acreages involved, difficult drainage problems and the necessity for high pump lifts. Municipal and industrial water supplies are not anticipated in the proposals.

Management of public lands in the area would be broadened and intensified by the development of the area. A balanced program of fish and wildlife development with recreation facilities would be planned. The Bureau of Land Management had planned a Missouri Breaks Public Land Management Plan which was primarily a soil and range conservation plan. Since that time, the Bureau of Land Management has assumed responsibilities that overlap with the plans of the Bureau of Sport Fisheries and Wildlife for wildlife habitat improvements and with the Park Service's recreation plans.

The original Park Service plan, the Lewis and Clark National Wilderness Waterway, would have maintained the area in a primitive state except for recreation and interpretative developments. Historic, aesthetic and wilderness values of the wild Missouri would be maintained as much as possible with this proposal.

Public hearings were held on the various management plans in 1963 but were not conclusive.⁴² Almost all programs had their supporters and opponents. No decisive local preference for a specific plan was shown by the

⁴²Ibid., Vol. V, Appendix IX.

hearings. The Governor attended one meeting and expressed the view that a decision in 1963 would be untimely.

Recent Developments

The Missouri River Breaks area still does not have a specific management plan. The status of each alternative presented in 1963 is not clear, neither is the eventual outcome. Several things have happened which can be discussed that have influenced the federal agencies involved. It would appear that the joint report, while it did give consideration to all feasible alternatives, prevented a clear decision from being made in 1963 or soon after. Support and opposition, both local and national, was fragmented and was not marshalled behind any specific plan. The proposals may have been hopeless from the start since the heart of the federal decision making process is the congressional committees, and at least four committees in each branch of Congress were involved. They included Public Works Committee for the Corps of Engineers, Interior and Unsubular Affairs Committee, Commerce Committee and the Merchant Marine and Fisheries Committee.

"However a lot has happened since 1963. Most of the proposals, for one reason or another are now given little serious consideration."⁴³ The first major decision

⁴³James M. Linne, Acting Montana State Director, Bureau of Land Management, personal letter, February 12, 1971.

to preserve a free-flowing river was made in 1964 when the Ozark National Scenic River Act was passed (78 Stat. 608). This established a legislative precedent for a wild or historic river a year after the study report was made. Public Law 90-542, The Wild and Scenic River Act, was signed on October 2, 1968. The last of the wild Missouri was one of twenty-seven rivers protected by a five year moratorium. The development moratorium is proposed for an additional five year extension. The Bureau of Land Management received a five-year multiple use management directive after the report which gave them a great deal of management leeway which they previously did not have. Since they administer over 50 percent of the land in the study area, they stand to lose the most in terms of management responsibility. This of course is not compatible with most government agencies and the Bureau moved quickly to develop broad multiple use plans for the area.

The Corps received a policy directive in early 1967 that recognized the national concern for preservation of natural areas. Under this directive if a project's "potential net economic benefits do not clearly out-weigh the intangible aesthetic values that would be lost, serious consideration should be given to deferring development until doubts are resolved."⁴⁴ Interest rates have been increased

⁴⁴Luther Cartes, "Dams and Wild Rivers: Looking Beyond the Pork Barrel," Science, Vol. CLVIII (October 13, 1967), pp. 233-46.

and this has resulted in most projects considered now having a benefit-cost ratio of less than unity. Certainly the growing concern for environmental quality and preservation of natural areas has been a reason for delaying a decision on the breaks area. The persistent argument in conservation magazines has been the emphasis on the "last of the wild Missouri." It is a powerful argument despite the fact that the rolling high plains of the region are not ideally suited for recreation. Climate, terrain and the alternative choice of cool mountains to the West prevent the area from having large recreational potential.

It would appear that there has been considerable opposition in Montana to the High Cow Creek Dam and the complete development of the river, although many people favor a compromise between some reservoir development and some wild river. The Montana Fish and Game Department, a major state agency in Montana, has administratively designated the river as a State Historic Waterway. It has developed several campsites on the river and urged public support for maintaining it in this way. An undated informational pamphlet for campers and boaters states,

The day may be near when this pleasant and exciting voyage is left to fantasy alone, for there are plans to impound this last, lovely, wild reach of water. Perhaps our monument to explorers, trappers, adventurers and pioneers will be a pillar of concrete and whirr of generators. If you feel that something should remain of the past, that at least a whisper should remain of

the wild river then let your voice be heard or the voice of the river will be forever stilled.⁴⁵

In December of 1970 Montana Senator Metcalf introduced a bill that would give legislative management directives to the Bureau of Land Management for the river. The bill would appear to be a compromise that favors maintaining the river partially in wild state while providing for some development, access and other uses. The act would essentially zone the river into Wild, Scenic and Recreational river areas. The latter classification could have impoundments and diversion while the other two could not. The proposed act would limit lands that would be acquired to 30,000 acres which is probably satisfactory to local interests, since federal land acquisition is usually locally unpopular in the West.

On March 30, 1971, in the 92nd Congress Senator Metcalf again introduced a bill for the protection of the Missouri River Breaks. S. 1405, "a bill to establish the Missouri Breaks Scenic Recreation River."⁴⁶ S. 1405 would zone the river into recreation, scenic and wild river segments which would be designated by the Secretary of the Interior. Only the recreational river category would have

⁴⁵"Ride the Wide Missouri Historic Waterway," Montana Fish and Game Department, p. 20.

⁴⁶U.S. Congress, Senate, "A Bill to Establish the Missouri Breaks Scenic Recreation River in the State of Montana," S. 1405 92nd Cong., 1st Sess. S. 1405, March 30, 1971.

developments or impoundments. Field hearings were held on the bill in Great Falls, Montana, on August 16, 1971.⁴⁷ The bill generally was well supported, local and state interests favored the Bureau of Land Management administration of the area. The bill, however, was opposed by the administration which argued that a BLM Organic Act would adequately protect the river. Additionally, W. T. Pecora, Under Secretary of the Interior, argued that the bill was not needed because the river was being studied for inclusion under the Wild River Act.

Congress failed to act during the 92nd Congress on Metcalf's bill. Some Montana conservationists believed that Senator Metcalf, up for reelection in November, 1972, did not want to alienate local developers. After his reelection in November, 1972, Metcalf on February 26, 1973, introduced S. 1009, a bill similar to S. 1405 in the 92nd Congress.⁴⁸ Minor changes were made in the bill. For example, a few riverine users feared that existing pump irrigation systems along the river would be prohibited by the Act. Metcalf corrected this point in Section 6 of S. 1009. Section 6 also directed the Secretary to

⁴⁷U.S. Congress, Senate, Committee on Interior and Insular Affairs, Missouri Breaks Scenic Recreation River Hearings before the Subcommittee on Parks and Recreation on S. 1405, 92d Cong. 1st Sess., August 16, 1971.

⁴⁸U.S. Congress, Senate, "A Bill to Establish the Missouri Breaks Scenic Recreation River in the State of Montana," S. 1009, 92d Cong., 1st. Sess., February 26, 1973.

construct a bridge across the river near Winifred, another local issue. The late Congressman, John Saylor, introduced a similar bill in the House on January 11, 1973, HR. 1886.⁴⁹ Saylor's bill did not have the pump irrigation and bridge provisions in Section 6.

The Metcalf-Saylor bills appear to be a compromise to the "preservation" plans of the Park Service and the total development plans of the Corps of Engineers. The Bureau of Land Management has gained considerable local support over the last ten years. Their proposal to protect some wilderness values but not exclude development important to local residents apparently enhanced their position to a large extent. Until recently it appeared that the old line agencies such as the Corps of Engineers and the Bureau of Reclamation had lost their influence along the Missouri. The big question now is the development of massive coal deposits in Eastern Montana and possibility of one of these agencies developing a new marriage for the upper Missouri.

Management choices have become increasingly difficult when historic and cultural values conflict with traditional development objectives. The benefit-cost analysis in solely economic terms has been inadequate to resolve the conflict over the development of the Missouri

⁴⁹U.S. Congress, House, "A Bill to Establish the Missouri Breaks Scenic Recreation River in the State of Montana," H.R. 1886, 93d Cong., 1st Sess., January 11, 1973.

River Breaks. For over ten years the Missouri River in central Montana has been suspended in time. Several federal agencies have been competing quietly and behind the scenes for the control and development of this last reach of the Missouri. The Missouri Breaks buffers the upper Missouri water developments and the massive middle Missouri projects. Across the high Montana plains, through a nearly empty land the river flows while federal agencies plan and propose various management schemes. Past Missouri River developments should provide an indicator for development proposals in the Missouri Breaks, but except for this study, ex post evaluations have not been carried out for the Missouri River developments.

In central Montana, a land of few natural resources and isolated people, resource decisions are sometimes imposed upon the area. Local values and local concerns are not weighed in a larger national decision framework or because of inter-agency manipulations for development authority. The Missouri River in Montana represents the last of the longest rivers in this nation and some exceptional historical and cultural values. This study proposes to evaluate the Missouri River developments in a social sense, including evaluating and advocating a local viewpoint and not a national or even regional perspective.

THE PROBLEM ENVIRONMENT

The arid plains and the dark Missouri were the two opposites that forged development in the northern Great Plains. Mobility and flexibility was the essential relationship between early man and the Great Plains environment. Early Missouri River cultures concentrated their activities near the river. They responded to the seasonal changes of the river, altered their lives accordingly and generally had a stable life and economy. An external economy and technology brought fundamental changes to this early man-land relationship located on the banks of the Missouri River. The first fur traders brought new tools and altered the cultural balance between tribes. Lewis and Clark followed the first traders to explore the upper reaches of the river and established contracts between the native tribes and the United States government. The river became the highway for the fur trade, new technology and rapid change. The fur trader was followed by the gold miner in steam powered boats, and the river became the focal point for westward expansion and development.

Improvements for navigation on the river were carried out by the Army Engineers, first for the miners, then to ease the supplying of troops fighting in the Indian wars. The Missouri River and its fertile bottomlands became the most important part of several Indian reservations at the conclusion of the western Indian wars.

The population of the United States continued to expand westward throughout the 1800s. Public land laws encouraged settlement and development of the western plains. Settlers were lured onto the dry plains by the railroads, merchants and land speculators. Large areas of the western plains were plowed and the residual moisture in the soil and unusual rainfall brought about the rapid development of communities and an agrarian economy. At the end of World War I, European lands were brought back into production, grain prices fell on the world markets. The return of periodic droughts brought heat, winds, erosion and crop failures to the dry plains. The end of a war in Europe, the lack of perennial roots in prairie sod and other factors beyond the control or understanding of the prairie residents brought an end to 100 years of growth on the northern plains. Serious misconceptions and problems of the Great Plains development pattern began to clarify by 1920.

The cycle of drought returned to the Great Plains, and coupled with the collapse of the world wheat market helped contribute to the economic and social decline of the counties along the Missouri River in Montana, North and

South Dakota. Migration from the northern plains has continued in most rural areas for fifty years. This region was the last major area of the United States to become homesteaded and developed. The region became a type of aborted frontier where before social and economic institutions were fully developed outmigration exceeded immigration and births. A variety of institutions sought to reverse the decline of the rural areas in the Great Plains. However, most attempts to solve the economic ills of the region originated in humid areas and failed to fully consider the environmental and spatial limitations of the arid West. The climate, soils, cyclical weather patterns and harsh seasonal changes associated with the area all helped contribute to an unstable agricultural base. The region was subject to periodic floods as well as droughts and lacked the diversity of resources that other areas enjoyed. Partly because it developed later than other regions and lacked diversification in its economy, transportation systems were poorly developed. Locational disadvantages and spatial costs developed with the maturity of the national economy. A variety of factors contributed to large increases in production of agricultural products relative to income and labor inputs. The northern plains region was part of national economic and social trends that

led to rapid growth of urban areas and a decline in rural areas.¹

Water developments have frequently been proposed to improve the viability of the Great Plains. Historically, the first attempts at developing the Missouri River were concerned with improving the navigability of the river. The concept of federal river development was expanded to include irrigation with the 1902 Newlands Act. Prior to this time attitudes and institutions developed in the humid East concerning public land settlement and development gave rise to a variety of problems. John Wesley Powell had argued for some changes in settlement patterns years before and the Newlands Act was a partial solution to the situation that had developed in the West.

Demand for flood control and navigation developments on the lower Missouri River gave rise to multiple purpose developments on the river. The Secretary of War outlined the plans for development of the Missouri by the Corps of Engineers in a lengthy report to Congress in 1934. The reports, called the "308 reports," outlined the proposals for large earth filled dams on the main stem of the Missouri in Montana and the Dakotas.

The out migration of rural residents from the northern plains was accelerated by the economic depression

¹Howard W. Ottoson, et al., Land and People in the Northern Plains Transition Area (Lincoln: University of Nebraska Press, 1966), Part 1.

of the 1930s and World War II. Substantial political pressure developed from the region for large federally funded development projects. At the same time the Tennessee Valley Authority provided a popular model for advocates of regional multiple purpose river developments. Construction began on the Fort Peck Dam during the depression. Located on the Missouri in eastern Montana it was to be the first of five huge earth filled dams on the main stem of the river.

The Corps of Engineers inherited responsibility for the Missouri River developments because of their earlier work on navigation improvements. The 1936 Flood Control Act gave the Corps responsibility for flood control as well as navigation. This Act provided the legislative sanction for the cost-benefit analysis of water development project feasibility. If the goal of Missouri River developments was to develop the Upper Missouri and northern Great Plains, two conceptual problems emerged at this time. It did not provide a framework for evaluating project effectiveness in local or regional terms. Second the "308 reports" were basically designed for flood control and navigation benefits. These two types of benefits accrue downstream to lower Missouri River areas, not to the region of the northern plains.

World War II disrupted plans for developing the river, except for Fort Peck Dam which was largely completed before the war. The Bureau of Reclamation worked on a set

of development plans for the upper basin during the war. In 1944 the Bureau proposed the "Sloan" plan, which was soon followed by a Corps of Engineers plan called the "Pick" plan. Reflecting the basic objectives of the two agencies, the Sloan plan stressed irrigation development and the Pick plan based on the "308 report" emphasized flood control and navigation. A complex political situation emerged over the Pick and Sloan plans and a third proposal for a Missouri Valley Authority patterned after the TVA example. As noted earlier the result was the Pick-Sloan plan.

During the 1950s and 1960s, the dams were built fulfilling the flood control objective and other aspects of the basin development plans. The reservoirs permanently flooded large areas of the Missouri flood plain, especially the lands of six Indian reservations in the Dakotas. Irrigation projects originally planned for the northern plains have not been fully developed for a variety of reasons. The basin developments are not complete. However, selected areas and aspects of the developments provide an excellent opportunity to examine the effectiveness of water development policy.

The fundamental purpose behind the water developments was economic and social development with the projects having regional and national significance. The normal process is for federal water resource projects to originate

at the local level.² On the local level the projects were popular politically, and received local support from rural areas because of the promise of irrigation, power, industry and growth.

Rural areas of the plains certainly lagged behind the rest of the nation in development. The need for economic development in the Great Plains was frequently discussed in several federal agency development proposals. Joseph Kinsey Howard wrote in 1945, concerning the Missouri River plans, "Among the things they expect is that it (the developments) will bring back the 10 percent of their number who have moved away since the war began."³ (There can be little doubt that economic and social development was expected on a national, regional, and local level.)

Today only one substantial reach of the Missouri River is not developed, the Missouri River Breaks area in central Montana. Several different plans for the development

²Daniel W. Bromley, A. Allan Schmid, and William B. Lord, "Public Water Resource Project Planning and Evaluation: Impacts, Incidence and Institutions," Center for Resource Policy Studies and Programs, Working Paper #1 (Madison: September, 1971), p. 1.

³Joseph Kinsey Howard, "Golden River," Harpers, Vol. 190 (1140; May, 1945), p. 511.

(The article cited above is but one of many that refer to the expected development benefits. The belief in population increases and industry attracted to the cheap power resulting from water projects is accepted without question time and time again. The Sloan Plan and other agency reports contributes to this thinking, as do agency representatives stationed in the development region.)

of this part of the river were proposed in 1963. The projects have not yet been authorized because of increases in interest rates, unfavorable benefit-cost ratios and environmental considerations. However, public testimony taken in 1963 in three communities near the proposed dams support the idea that substantial local development is expected by local residents if such projects are authorized. Federal proposals also mention the need for economic development in the area. Inequities have developed in the social and economic life of residents in the northern Great Plains compared to conditions in the rest of the nation. A logical assumption is that the local residents acting through the political process, have tried to correct those inequities by several means, including water development programs.

Statement of Objectives

The objective of this study is to examine the changes in terms of human resource development brought by the Missouri River projects to the local population. The study will be an ex post evaluation of the effectiveness of the water projects. Specifically, the study will focus on selected human development indicators. The information from this part of the study will be applied to the similar environment of the Missouri River Breaks area to estimate some of the effects that proposed water projects are likely to have on that area. Two key concepts developed in the

study are the measurement of human resource development and the definition of the local population. The human resource development indicators selected for this study will be discussed later. The local population is defined as those people in counties immediately adjacent to the water development projects.

The assessment of water development projects is complex and difficult. Historically, public water project investments had to depend almost exclusively on benefit-cost analysis prepared prior to the initiation of a given project. The few ex post studies, such as Haveman's have concluded that ex post estimates of benefits have shown little relationship to their ex ante counterparts.⁴ In addition, benefit-cost analysis of federal water projects does not adequately deal with local benefits and costs, or a rural perspective that is advocated in this study. Development, a widely used term is not readily defined or measured. Economic development is more widely understood but is not the only focus of human resource development.

This study proposes to take indicators, or proxies for measurement of development and compare them over time. The proxies will be concerned with human resource development. The intention of this study is not to arrive at a precise measure for development, but to provide some

⁴Robert H. Haveman, The Economic Performance of Public Investments (Baltimore: The John Hopkins Press, 1972).

indication of trends and success in meeting local objectives outlined by the proposal. A comparison will be made between rural developed and undeveloped counties, that is a comparison between those counties with water projects and those without. These proxies will also be compared to state and national indicators of development. The rural counties are pluralistic and a single measure of development will not meet the interests of the entire population. These indexes will provide a basis for discussion of project achievements and possible alternatives for the Missouri Breaks region.

Advocacy Resource Development

The emphasis on local and county changes and social indicators should be explained at this time. The local counties bear substantial costs that are associated with water developments. In the study area these costs have included the flooding of prime agricultural lands, increased taxes, and the disruption of viable farm units, and established social structures. For example, the water development projects result in property tax losses for local counties. Farming units dependent upon river bottom-lands for winter feed and shelter have lost the winter lands but retained summer grazing lands. Established patterns of roads, bridges, school districts, and social interaction were fragmented by the large Missouri River reservoirs. Coupled with regional development inequities,

these costs provide an argument for the local population to expect tangible benefits for development of the immediate area resources. If the benefits are exported from the local area while a large share of the costs are borne by the population in the area, then a form of colonialism exists. Under such circumstances the rural region provides the resources for the generation of the highly developed urban areas.

That the local population can expect local social benefits, stability and development is an assumption widely held by rural people. It is this expectation of local benefits, beyond the construction phase of development, that supports the political process and helps to bring the projects to fruition. Frequently the local political support is the key role in the authorization of competing federal water development projects.

The client in this study is rural, agrarian and has a vested interest in the development decision. While the rural counties are composed of many publics, it is assumed that our client, although he has pluralistic social objectives, has a time horizon reaching beyond the immediate construction phase and is concerned with long term stability and development.

The process of selecting a client with a vested interest, measuring the effectiveness of developments in meeting his objectives, and improving his involvement in federal development decision making process could be called

advocacy resource development. The exploration of advocacy resource development as an alternative to other methods of evaluating resource development projects is a secondary objective for this research. The basic question asked is: What are the consequences of resource development for the client? Disregarding a national or regional view of resource development, this study examines the needs and objectives of one group, the rural population of the northern Great Plains.

Through the advocacy research approach, the local population presently excluded from much of the planning and evaluation of the proposed federal projects can provide a rational input into the decision process. Advocacy resource development is a form of citizen participation. Objectives and goals are spelled out for the client, information is gathered and the eventual analysis serves the interests of the client. It assumes that the local population has authority over its future, and that federal developments are not imposed arbitrarily from above. In this case advocacy research maintains that water development decisions should be social decisions. Projects should not be judged merely for their techno-economic excellence but among other things by their impact on local people.⁵

⁵Roger E. Kasperson and Myron Breitbart, Participation, Decentralization and Advocacy Planning, Commission on College Geography, Resource Paper No. 25, Association of American Geographers, 1974.

The northern Great Plains environment provides an ideal place to develop an examination of policy based on advocacy research. Water developments have been large, their impacts substantial and some projects completed for many years. In the case of the Missouri River Breaks, proposed developments will take place in an environment similar to completed projects, therefore providing an opportunity for comparison.

However, the specific limitations of the approach must be understood. Goals of development are multi-dimensional and sometimes conflicting. The study proposed selects only local goals and excludes national and regional objectives. It is objective research only for the specified client. The client group is defined and several social indicators will be outlined, since the client group will have pluralistic social objectives. A sound theoretical base is lacking for human resource development, therefore a problem of the research will be the relatively imprecise nature of the analysis. While measurement problems will exist, the proxies may have value. The results may also be unclear with social measures reacting in a conflicting manner between different study areas. Nevertheless the need to develop a social or human accounting system for water development is clear. Prediction is needed for the outcome of resource development projects and a choice of alternatives presented to local people involved. A type of index for human development may provide a basis for

discussion and examination of project impacts and alternatives available to the client. The end result would be one test of the effectiveness of federal water development policy on the Missouri River and an application of a new method of evaluating human resource development. An example of the need for a local perspective, of cultural and social costs associated with water development has been the Missouri River Indians. Their situation resulting from the Missouri River dams illustrates the need for advocacy resource development.

The American Indian and Missouri River Water Developments

A discussion of the Missouri River water developments would be incomplete without a closer look at the special problem of the American Indian and the main stem projects. Virtually all the census data in the Dakotas where water projects and Indian reservations coincide are distorted unfavorably. Counties with reservations have lower incomes, lower education levels, poorer housing, poorer roads, higher birth and death rates. Whether one visits the reservation or the census data, the picture of poverty is clear, in 1940, in 1970, and today.

Despite the obvious reservation poverty, the main stem dams, except Fort Peck, are located to flood nearly all available Indian bottomland. At the same time the dams were located to protect non-reservation cities such as Sioux City, Pierre, Bismarck, and Williston. In terms of

land and social costs the Indians bore a disproportionate share when the Missouri was developed in North and South Dakota. The image of Army Engineers staking out and constructing dams to flood Indian land is haunting. Accounts of the futile Indian efforts in the 1940s and 1950s to protect their land from the Army Engineers are vivid and moving. A hundred years before the same conflict between the U.S. Army and the American Indian was taking place with the same results. The cavalier taking of Indian land illustrates not only a historic social problem but also some of the weaknesses in evaluating the human effects of water developments.

A dichotomy of Indian cultures existed in the northern plains at the time of the first European exploration. The nomadic hunting groups with their horse borne culture occupied the vast upland plains. Riverine groups were dependent upon horticultural products developed along the river.⁶ The primitive sedentary cultures were dependent upon the riparian lands as were present day Indians prior to the Missouri River water developments.

Both prehistoric Missouri River Indians and those that lived near the river prior to the water developments found the riparian lands to supply three major elements of their cultural ecology. First, the river bottom with its

⁶ Preston Holder, The Hoe and the Horse on the Great Plains (Lincoln: University of Nebraska Press, 1970), p. 3.

favorable temperatures, moisture and soil, provided cropland not available on the upland plains. Second, the riverine area provided habitat for game animals and both pasture and shelter for domestic stock.⁷ Third, the bottomlands provided timber used for heat, buildings and shelter.

The loss of Indian land has been consistent throughout the Indians' contact with European culture. The maximum of treaty land was held by Indians in 1873, roughly 150 million acres. By 1933, nearly two-thirds of this maximum amount, ninety-one million acres, was taken over for other uses. This trend has continued with the Missouri River developments during the 1940s, 50s, and 60s.

Garrison Dam was started by the Corps of Engineers in 1946 and became operational in 1955. The earthen dam is located in west central North Dakota, approximately seventy miles northwest of Bismarck. Garrison Dam backed water 200 miles upstream and resulted in the taking of 155,000 acres from Fort Berthold Indian Reservation, the home of three affiliated tribes, the Gros Ventre, Mandan, and Arikara. The result was to divide the reservation into five isolated areas of remnant upland plains and to inundate the best and most productive land. Reservation life was completely disrupted, 1,700 people were relocated, or 289 of 357

⁷Donald J. Lehmer, "Climate and Culture History in the Middle Missouri Valley," in Pleistocene and Recent Environments, ed. by Wakefield Dorf, Jr., and J. Knox Jones (1970), p. 118.

reservation families.⁸ The social, economic, and cultural life of the three affiliated tribes was thrown into a turmoil.

The sheltered valleys along the main stem of the Missouri and its tributaries were the best headquarters for livestock ranching operations. After grazing on the upland plains during the summer months the timbered valleys provided protection from winter storms and forage for winter pasture and hay. Comparable shelter and forage was not available elsewhere on the reservation. The economy of the reservation at that time was a subsistence economy based on natural resources. Approximately 70 percent of the small amount of cash income to the reservation was based on the cattle economy.⁹

The Garrison Dam taking resulted in the loss of 90 percent of the reservation's commercial timber. This timber was used by resident Indians for homes, fuel, fence-posts, and shelter. The taking area included 39,082 million board feet of commercial timber.¹⁰

⁸Missouri River Basin Investigations Reports, Land Consolidation Problems on the Fort Berthold Indian Reservation Arising from the Garrison Project (U.S. Department of Interior, Bureau of Indian Affairs, 1948), Report No. 66, p. 1.

⁹M.R.B.I. Reports, Report and Recommendations to the Commissioner of Indian Affairs on the Offer of Lieu Lands to the Indians of the Fort Berthold Reservation, North Dakota (1946), Report No. 11, p. 3.

¹⁰M.R.B.I. Report, Damage to Indians of Five Reservations from Three Missouri River Reservoirs in North and South Dakota (1954), Report No. 138, p. 24.

Other disruptions caused by the development resulted from the loss of wildlife and associated wildlife habitats. Game was an important source of food for those living on the reservation. A hospital, thirty-eight school buildings, six tribal buildings, and 80 percent of the reservation road system were in the taking area.¹¹ The Berthold Reservation had lignite coal seams from which local Indians utilized 8,000 tons of fuel annually. Many of these accessible seams were flooded or otherwise made inaccessible. Eighteen burial grounds, with 1,628 graves were removed or isolated on hilltops that became islands after the flooding.¹² Oahe Dam was started in 1948 and became operational in 1962. Like all the main stem dams in the Dakotas, the project was authorized by the 1944 Flood Control Act. Oahe is located a few miles above Pierre, South Dakota, and when full, backs water 250 miles upstream to within a few miles of Bismarck, North Dakota. The taking area includes the fertile bottomlands of the Standing Rock Reservation and the Cheyenne River Reservation, both of which are populated by subtribes of the Dakota Sioux.

Oahe reservoir disrupted both reservations to a lesser degree than the Garrison project. One hundred seventy families were forced to move on the Standing Rock

¹¹M.R.B.I. Reports, Experience with Small Scale Irrigation Developments on Indian Reservations, 1940-1946 (1948), Report No. 50, p. 15.

¹²M.R.B.I. Reports, No. 11, p. 6.

Reservation, and 181 families on the Cheyenne River Reservation. A total of 150 farms and ranches were relocated on both reservations and 56,000 acres taken from Standing Rock and 104,000 acres from Cheyenne River.¹³ Approximately 80-90 percent of both reservations' timberland was lost.¹⁴ Average Indian family incomes at this time were one-third the national average and this timberland was important for fuel and shelter. It was estimated that 75 percent of both reservations' corn-producing land was submerged.¹⁵ Winter protection for 5,000 head of cattle was flooded by the Oahe project. Additionally, wild fruits, berries, currants annually gathered by 150 Indian families was forfeited. An estimated 1,100 deer and several thousand smaller animals frequently utilized by tribal members were lost. Finally, over 130 miles of roads were flooded, which affected communication and transportation.

Construction of Fort Randall Dam began in 1946 and was completed by the Corps of Engineers in 1962. Fort Randall Dam is located near the Nebraska-South Dakota border. Big Bend Dam is located immediately upstream of the Fort Randall reservoir. The Big Bend project was begun

¹³M.R.B.I. Reports, No. 138, p. 14.

¹⁴M.R.B.I. Reports, Effects of the Oahe Reservoir Project on the Cheyenne River Reservation and Standing Rock Reservation (1947), Report No. 29, p. 1.

¹⁵M.R.B.I. Reports, Oahe Dam and Reservoir: Effect of Its Construction on the Basic Economy of the Cheyenne River Reservation (1947), Report No. 14, p. 14.

by the Corps of Engineers in 1959 and completed in 1963. Indian land (2,851 acres) was taken from the Yankton Reservation and 565 acres on the Rosebud Reservation for Fort Randall Dam and reservoir.¹⁶ More seriously affected by both Big Bend and Fort Randall reservoirs was the Crow Creek and Lower Brule Reservations. Over 17,000 acres were taken from the two reservations and over 120 families forced to move. As was the case with upstream reservations, the Indians on both reservations were dependent upon a natural resource economy for many of their essentials. Wildlife, timber, cropland, and other renewable natural resources were in the taking area.

A Bureau of Indian Affairs report classified damages on the five Missouri River reservations. Direct damages on the five reservations were based on the market value of 330,189 acres of Indian land condemned in the taking area. Market value of this land was appraised at \$7,983,026, or \$24.18 per acre. Indirect damages included moving costs, extra shelters for cattle, new water supplies, additional fences, cost of wildlife, timber and wild products. These indirect costs were estimated to be \$19,308,737. The total of both direct and indirect costs was estimated to be over 27 million dollars, an average of \$82.65 per acre of Indian land taken.

¹⁶M.R.B.I. Reports, Problems of Indian Removal and Rehabilitation Growing Out of the Fort Randall Reservoir Taking on the Crow Creek and Lower Brule Reservations, South Dakota (1953), Report No. 136, p. 1.

The Standing Rock Reservation received the approximate appraised damage estimate of \$5 million by the enactment of Public Law 85-915, approved in 1958. Additionally, the tribe received nearly \$7 million in rehabilitation allotments. Originally, the Corps of Engineers offered \$5,105,625 for the Fort Berthold lands, or approximately \$33 per acre.¹⁷ Congress added over \$7,500,000 to this amount on October 29, 1949 (63 Stat. 1076) for intangible damages. The Cheyenne River Reservation damages were settled by Public Law 83-776 when Congress appropriated \$5,384,014 for all direct and indirect, tangible and intangible damage to the tribal lands. In addition, \$5,160,000 was authorized by Congress for rehabilitation programs. A per capita payment was made to each member of the tribe of \$189.38 for indirect damages.

A problem emerges when a dominant culture imposes water projects upon a sub-culture concerning communication of values and therefore costs of developments between the cultures. Existing benefit-costs analysis fails to adequately consider cultural costs and values. It is an evaluation device for the dominant culture that cannot be translated into the values of another culture.

¹⁷M.R.B.I. Reports, Attitudes of the Fort Berthold Indians Regarding Removal from the Garrison Reservoir Site and Future Administration of Their Reservation (1948), Report No. 69, p. 18.

Environmental perception and ecological adaptation of the Missouri River Indians had evolved out of at least a thousand years' experience with the Missouri River. Overall, they harvested the rich biotic life associated with the river, and lived a subsistence life that our white culture described as poverty. However poor they were, they resisted attempts to take their land and change their life style.

While it is possible to place a dollar value on the price of timber lost it appears that twelve dollars per cord appraised value of firewood is not sufficient if those using the wood have a surplus of time and labor but an extreme shortage of cash. The value of twelve dollars will not transfer from our culture to a natural resources oriented economy.

Deer were valued by economists as worth a hundred dollars each and each Indian family used approximately two deer per year. Such estimation of worth seems futile when the animals are virtually free for the taking, but once the habitat is destroyed by water impoundments, they do not exist. The same holds true for cottontails, pheasants, waterfowl, and wild fruits and berries. The water developments forced the Indians into a cash economy. Water used by the Indians was originally secured from the river, from shallow wells or from springs. After the impoundment, water was usually attained by deep wells using electrical power.

Forcing the Indians to move did not consider the emotional reaction of a minority group that is noted for its attachment to the land resources. Traditional homelands, sacred and religious sites that evolved over their thousand year history cannot be equated to a more recent cash economy. Magical and religious values are non-economic forces important in Indian land ownership, but neglected in our value system.

Amenity values lost were also neglected in the evaluation of project costs. The river bottom was a pleasant environment, protected from harsh storms. It was more varied and more pleasing than the relatively austere uplands.

Disruptions in economic life, social organization, and religious life were forced by the loss of established transportation systems. Also the reservoirs were rather enormous artificial barriers to traffic, communications, social interaction, and economic activity.

The majority of the Indians had little experience away from the reservation and most wanted to remain on the reservation. This is again unlike our culture where shifts in houses, jobs, and environments are readily accepted. Such shifts are traumatic and when forced upon the tribes result in anxiety, distrust, and resentment.

Many archeological sites flooded out after only brief examination by researchers were highly significant to American frontier history. Fort Randall Dam taking area

included 120 historic sites and features. Garrison Dam area covered seventy-seven historic features, and Oahe Dam covered several forts and historic features. Hundreds of archeological sites were concentrated along the Missouri River because of its associated productive lands. Scores of large townsites were covered, some with hundreds of house ruins.¹⁸ In one sense, the loss of these Indian prehistoric features amount to the destruction of human and cultural history of Indians involved. Their scientific worth to our society, as well as their emotional and historic value to the Indians, is not computed in the analysis of project feasibility.

Cultural and social values are not comparable between our culture and the Missouri River Indians if the translation of the costs is based on our economic terms. It also appears that the Missouri River water developments point out the difficulties in balancing costs and benefits across geographic regions. In the case of the Missouri River, heavy costs of development fell upon those living adjacent to the river. For a variety of reasons the benefits are still accruing to other geographic areas. Urban and more fertile environments downstream and to the east receive most of the project benefits. The Indian

¹⁸Merril J. Mattes, Historic Sites Archeology on the Upper Missouri, River Basin Survey Paper No. 15, Bureau of American Ethnology Bulletin 176 (Smithsonian Institution, 1960), p. 9.

minority on the reservations received few economic and social benefits after bearing a disproportionate share of the costs of developments. Relocation was forced on those with the longest historic claim to the land.

Water developments in the Dakota's promised local residents increased prosperity, industry, and a reversal in population outflow.¹⁹ These TVA type benefits did not emerge as expected. Navigation benefits went to the lower Missouri. Flood control also benefits the lower Missouri geographic area. The developments had the opposite result on the middle Missouri. In this area, 775 miles of river bottomland and over one million acres were permanently flooded. Power generated from the projects did not result in substantial industry in the area that bore the social cost of development. Rather, the power was transmitted to urbanized and industrialized areas to the east. Thus, the northern plains have continued to feed and be exploited by urban centers outside the region as pointed out by others.²⁰ Population, a direct indicator of economic growth, continued to decline in those areas of the Missouri River taking area. The project failed to develop the sparsely populated, economically depressed northern Great Plains.

¹⁹Joseph Kinsey Howard, "Golden River," Harpers (May, 1945), p. 511.

²⁰Carl F. Kraenzel, "The Great Plains, Voiceless Region," Montana Magazine, 8 (1958), p. 43.

The Indian population, as late as 1969, had not increased their incomes relative to surrounding areas. Average family income on the Fort Berthold Reservation in 1969 was approximately one-third of the average white family income, the same ratio as was found on the reservation in the 1940s.²¹ In 1967 the cash household incomes on the Fort Berthold Reservation was under \$3,000 for 82.9 percent of the population. Only 5 percent of those on the reservation had incomes of over \$5,000. After the massive Missouri River developments, less than 10 percent of the Indians received income from commercial, industrial, or other enterprises that would reflect economic development. Standing Rock Reservation Indians had incomes less than \$3,000 for 78 percent of its population in 1967.²²

In the Fort Berthold area recreation has not increased nearly as much as downstream urban-oriented reservoirs. No modern recreation marina or motels are found on the reservation. The best developed recreation facilities are found downstream outside the reservation. Substantial recreation benefits failed to materialize for the Indians. Navigation and flood control benefits were certainly not available to the development area. Irrigation

²¹M.R.B.I. Reports, The Fort Berthold Reservation, Its Resources and Development Potential (1971), Report No. 196, p. 63.

²²M.R.B.I. Reports, Evaluation of Livestock Phase of Standing Rock Rehabilitation Program, North Dakota and South Dakota (1967), Report No. 188, p. 2.

projects are not yet completed, some apparently will not be authorized by Congress. The area has not yet replaced the submerged farmland with irrigated land. Power was available but has largely been transmitted elsewhere. Industrial growth has not materialized.

The social costs to the American Indian occasioned by the Missouri River water developments illustrates two broad areas seldom evaluated during the decision making period. First, the unique historic, cultural or religious values of minorities are difficult for the majority culture to appreciate or consider. Second, benefits and costs are distributed disproportionately in a spatial dimension. This allocation of benefits and costs includes social, economic, and cultural considerations in not only a geographic framework but a cultural framework as well. The unequal distribution of social costs demonstrates an ethical problem for water resource developers.

Enormous costs have been experienced by the Indian minority along the Missouri; however, in the thousand-year perspective of Indian experience along the river, the massive earthen dams and their reservoirs do not have the permanence that we associate with them. It appears that research is needed in such areas as a continuing cultural and social ex post evaluation of the Missouri River projects. An ex post evaluation of the Garrison project that included social and cultural costs might reveal that the project is no longer justifiable. The eventual return of the

bottomlands to the Indians seems likely, especially in a long term analysis. Additionally, it is possible that civil rights trends and awareness of minority problems will lend political support to this action. Research will be needed on the best rate of lowering reservoirs, soil stabilization problems, revegetation and re-introduction of productive biological commodities. Research into the dismantling of water projects seems especially appropriate along the Missouri River.

Design of the Study

Essentially the study selected human and social measures from census data and compared them in a before and after situation with developed and undeveloped counties in the northern Great Plains. Rural, agricultural counties were selected in eastern Montana and western North and South Dakota. Counties with an external economic stimulus such as a military base or missile site were excluded. The five dams along the main stem of the Missouri were selected. These dams are Fort Peck, Garrison, Oahe, Fort Randall, and Big Bend. The largest three dams, Fort Peck, Garrison, and Oahe, were emphasized because their impact has been greatest. Gavins Point Dam, the farthest downstream, is smallest, clearly in a more humid environment, and is excluded from the study. Fort Randall and Big Bend dams were combined into one study area because of their size and proximity to each other. The counties adjacent to each dam

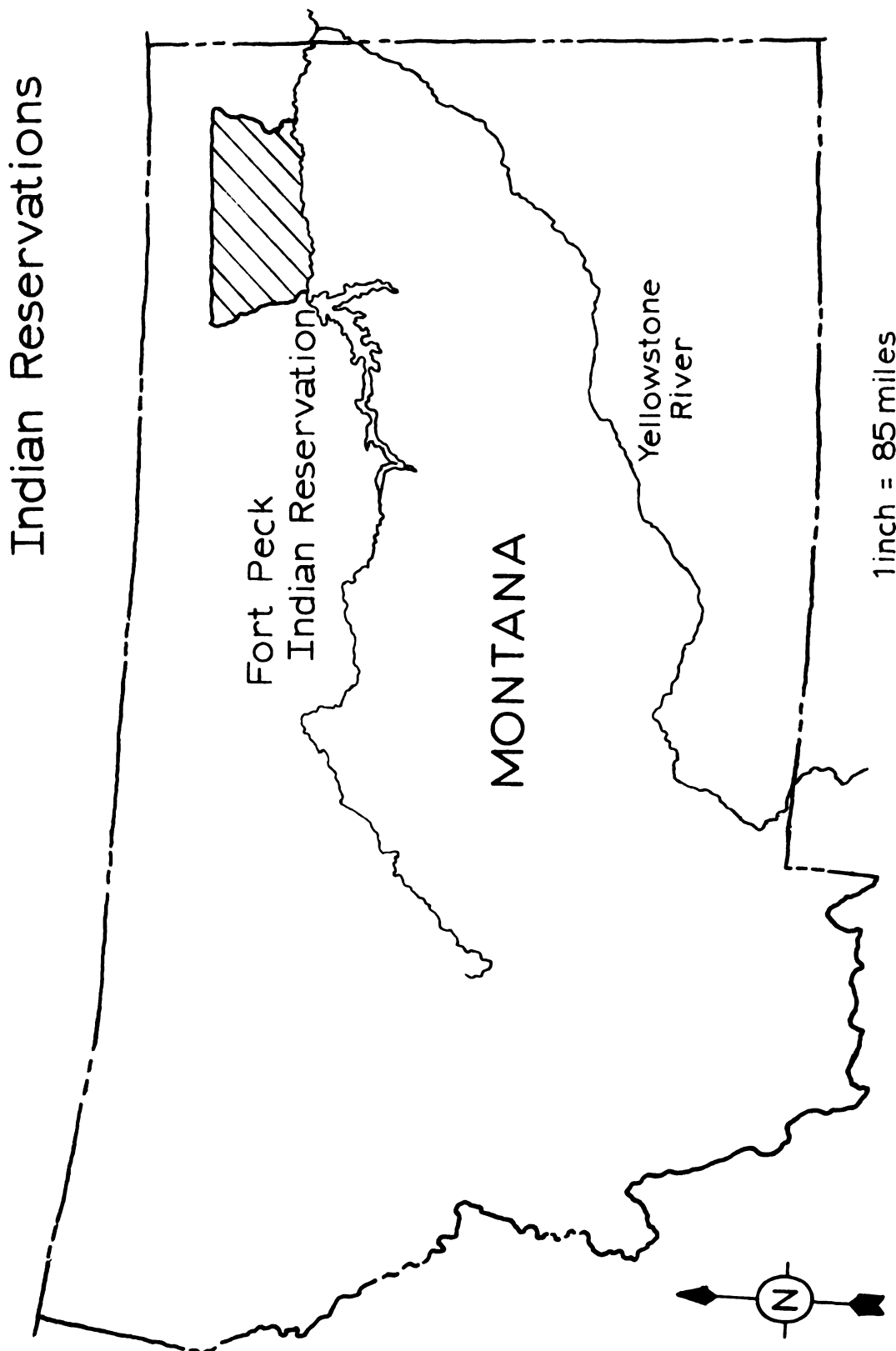
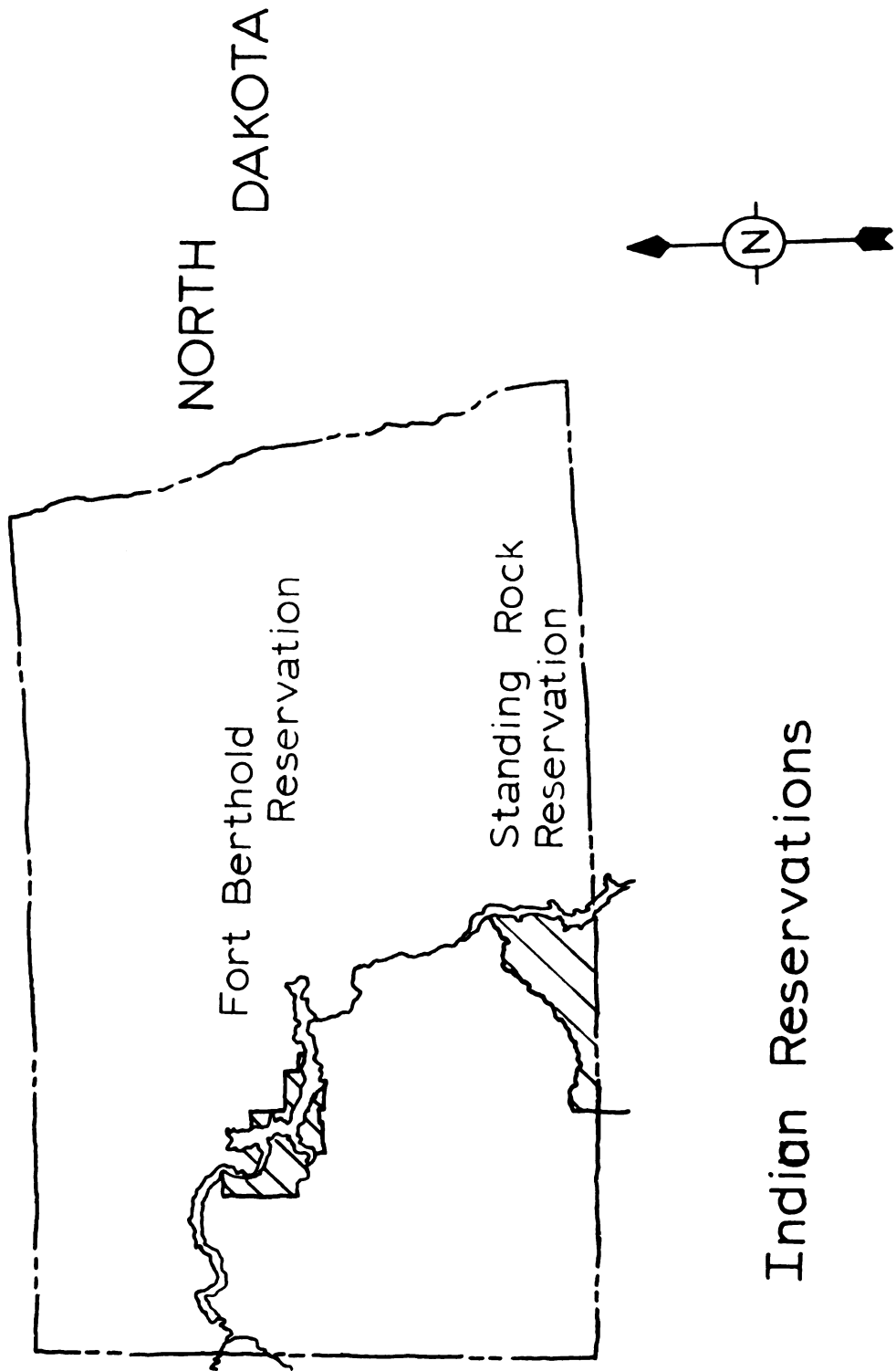


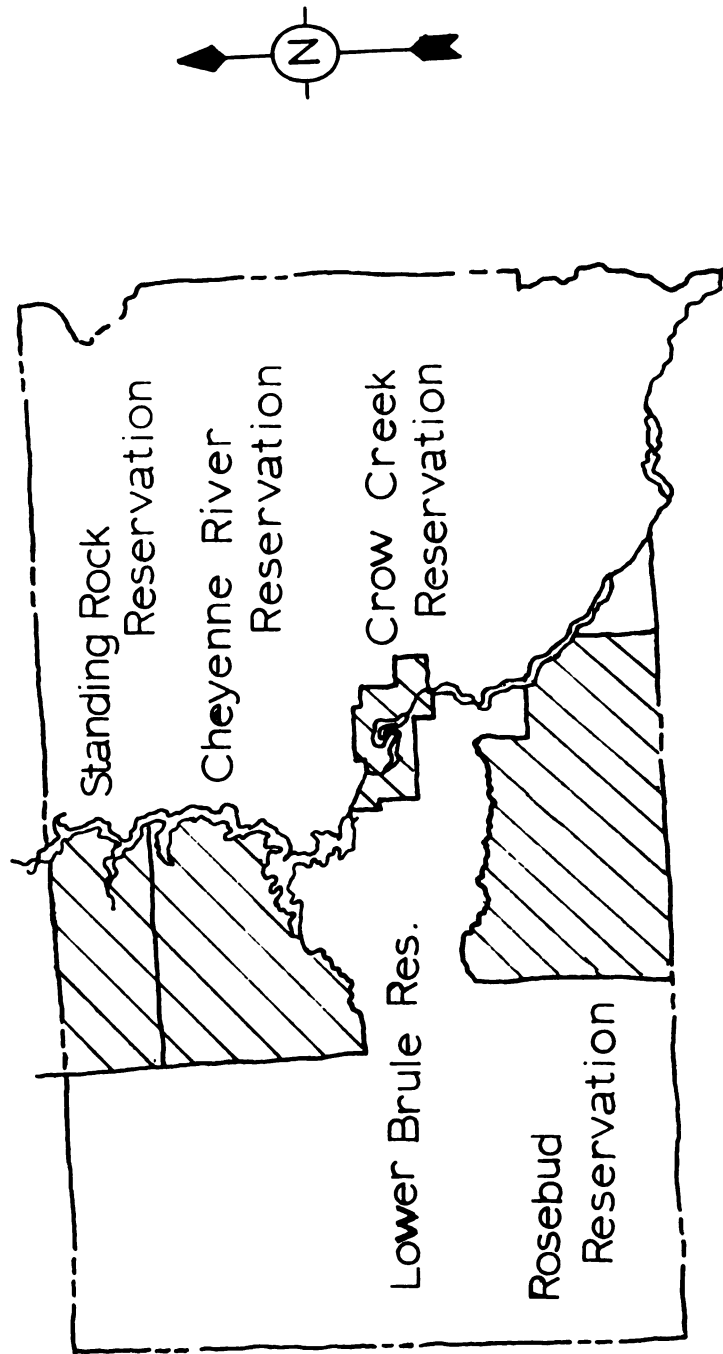
Figure 4



1 inch = 85 miles

Figure 5

Indian Reservations



SOUTH DAKOTA

1 inch = 85 miles

Indian Reservations

Figure 6

and reservoir were compared to nearby undeveloped counties. Trends in the selected indicators were compared using base periods before and after development. In this manner four examples and indexes of development were examined. The water developments are more than thirty years old to less than ten years old. The four sets of indexes provide a springboard for discussion and comparison to the last undeveloped reach of the Missouri River in central Montana. The northern Great Plains provides a homogeneous environment for such an evaluation. Large cities are lacking, the economy and development of the area have been generally similar. The Missouri River is the boundary line for almost every county along the river. That is, the counties in the study area have used the river as one border of the county and few county lines cross the river. These counties provide a political and statistical unit reaching ten to fifty miles back from the river throughout the length of the study area. The study explored the validity of the proposed indicators as a measure of human resource development. Therefore, a central focus of the study was a discussion of the various measures and a comparison between developed and undeveloped areas. A concrete measure of human resource development was not expected given the nature of the subject. The client was served by advocacy resource development even if only a rough measure of development can be determined.

Agriculture Indicators

The counties under consideration have agriculture as the basis of their economy. These indicators should be significant for the study area.

1. The number of farms according to the Census of Agriculture definition.
2. The average size of a farm expressed in acres.
3. The average value of a farm's land and buildings expressed in dollars.
4. The average value of farm products sold.
5. The number of irrigated farms according to the Census of Agriculture.
6. The average acreage of irrigated farmland per farm.

Demographic Indicators

Changes over time in certain demographic indicators may serve as a proxy for development measurement. Base periods for the demographic indicators will be the last census period before the start of a project. Differences between the base period and the most recent census material will be expressed as a percent for each of the indicators listed.

1. The median age of the population.
2. The percentage of the population aged fourteen or less.
3. The percentage of population aged sixty-five or over.

4. The percentage of all persons twenty-five years old and over who were high school graduates.
5. The percentage of all persons twenty-five years old and over who were college graduates.
6. Median school years completed.
7. Percentage of the population classified as the rural non-farm population.
8. Percentage of the population classified as the rural farm population. Standard census definitions will be used for the farm and non-farm category.
9. The percentage of the population living in urban areas. An urban area is defined as a municipality, incorporated or not, with 2,500 or more people.
10. The birth rate per 1,000 population.
11. The death rate per 1,000 population.
12. Total population in the study areas.

Human Resource Development Indicators

The relationship between these proposed indicators and water development projects is not clear. Some of them may emerge as useful measures of development, others may not. Most of the following indicators were selected because the census was available and generally consistent over the entire study period.

1. Total of local taxes in dollars.
2. Per capita county taxes.
3. Total property taxes.

4. Total county expenditures.
5. Total expenditures for police protection.
6. Total expenditures for public welfare.
7. Total expenditures for highways.
8. Total expenditures for health and hospitals.
9. Total expenditures for education.

Economic Indicators

A few economic indicators will be considered as a measure of the water developments impact upon the local economy. Where the census data permits economic stimulus resulting from the construction phase of a project will be avoided and excluded from analysis.

1. Median family income as defined by the Census of Population.
2. The percentage of the total families with annual income less than \$3,000 per year.
3. The percentage of the total families with annual income \$3,000 to \$4,999 per year.
4. The percentage of the total families with annual income \$5,000 to \$6,999 per year.
5. The percentage of the total families with annual income \$10,000 to \$14,999 per year.
6. The percentage of the total families with annual income \$15,000 to \$24,999 per year.
7. The percentage of the total families with annual income \$25,000 or more per year.

8. The dependency ratio, which is expressed as a proportion of the population less than fourteen years and more than sixty-five years, expressed as a ratio to the population aged fourteen to sixty-four.
9. Number of the labor force engaged in manufacturing. This indicator will have limited usefulness because of the disclosure policy of the Bureau of Census. If three or fewer firms are in a given classification the information is not made available. Rural counties in the study area may not exceed the minimum standard for the manufacturing classification. However this is a useful indicator since water developments are frequently advocated because they attract industry. Specific industries associated with a development project may be available from other sources of information.
10. Number of persons employed in agriculture.

Analysis of Data

Change in selected indicators of human resource development was a central focus of the analysis. The data was separated into the four water development project areas on the upper Missouri. After analysis of the completed projects was finished a comparison was made with the Missouri River Breaks area to try and determine probable

changes that would result from the proposed projects at that site.

Each of the four completed projects, Fort Peck, Garrison, Oahe, and the Fort Randall-Big Bend unit, were analyzed separately. Counties adjacent to the dam or reservoir of these projects were selected and termed "developed" counties. Counties with external economic activity not related to the water development were excluded from the analysis. The counties may not be fully developed in a technical sense, but the river resource is considered developed when either part of the reservoir and/or dam site is located in the county. Many alternative uses of the river resource are no longer possible, therefore, the counties involved were defined as developed.

Rural counties, without large urban areas, near or adjacent to the developed counties were designated as control counties or "undeveloped." The selection of counties was not random but can provide, in this uniform rural environment, an approximate comparison of the social aspects of resource development. The undeveloped counties serve as a base for comparison, or the control area. Developed counties should have more favorable trends in their human development indicators because of the assumed beneficial aspects of the water development projects. The developed counties were also compared to state and national development trends to determine if they were progressing faster than the state and national averages.

Base periods were selected according to the beginning of project construction. Census data available just before the initiation of project construction were used as the base period. During project construction many human indicators registered substantial improvement because of the impact of large amounts of federal construction funds. were ignored in an attempt to arrive at permanent, long-term social developments. In the case of Fort Peck Dam which was started in 1933 the 1930 Census of Population was used as the base period. Garrison Dam in South Dakota was started during the 1940s and therefore the 1940 census provided the base period. These base periods were compared to the most recent census material such as the 1970 Census of Population and the 1969 Census of Agriculture.

The data came from census material. The precision of the analysis was not critical. The census is secondary data and subject of error. Definitions have changed and criteria altered between census periods. Due to the nature of our client an elementary proxy of development will suit his objective at this time. Additionally, part of the objective of the development of an advocacy approach is to explore approaches to evaluating resource development effectiveness without a very large expenditure of time and money.

Most of the data was presented in terms of a ratio of change from the base period to the recent census period.

An index of change was determined by comparison between developed and undeveloped areas. Index indicators were developed for each item under all four categories of indicators and for each of the four project areas. Development indicators for each project were compared with state and national indicators for the same time period and for the same material.

Analysis and discussion of the indexes included the following steps:

1. First, the trends of each of the development indicators were examined and discussed. In a preliminary test of the validity of the indexes, the meaning of the trend and its relevance for the client was considered. Some indicators were rejected at this point when they prove to be unrelated to water developments.
2. Next, an examination of historic trends and relevant studies was considered. The success or failure of some proxies were explained by historic trends or other external factors unrelated to water developments.
3. The remaining indexes were discussed in light of their success at indicating the specific goals of water developments. Such things as increases in median income, increases in the number of people employed in manufacturing and population increases were examined. Those indexes that show viability

were examined in detail for specific cause and effect relationships between the indicator and water developments.

4. The specific impact of the water development projects in terms of the Indians of the area was included in the discussion. As a minority group with little political impact on the decision making process, their interests are usually not articulated. However, the advocacy research approach can single out their specific areas of concern for examination. Their unique situation concerning the Missouri River developments warrants some discussion outside the framework of the development indicators. Various methods of improving their input into the decision making process was suggested. More important was the delineation of general guidelines for an outsider to consider which have been ignored in the past.
5. A summary evaluates the advocacy method and the specific indexes. The effectiveness of the approach was discussed and methods of improvement outlined.
6. At this point based upon the trends that emerged from the analysis of the data, probable changes in the Missouri River Breaks area was discussed. This area provides an application of the advocacy approach to an undeveloped area. The analysis of project effectiveness using a local perspective

should open several areas of discussion where development alternatives could improve the local human resource development. The scope and depth of the discussion will depend largely upon the validity of the indicators as an accounting system.

ANALYSIS OF DATA

The Missouri water development projects were divided into four separate groups. These were Fort Peck in eastern Montana, Garrison in western North Dakota, Oahe straddling both North and South Dakota, and finally South Dakota's Fort Randall and Big Bend projects which were considered together because of their proximity and relatively small size. Two sets of counties, one developed, the other undeveloped, were selected for analysis for each of the four water development projects. These counties were not selected randomly. Criteria for selection were proximity to the water development area and counties of essentially rural agricultural character.

Counties with regional trade centers were rejected because of the atypical nature of their growth. Examples would be Miles City, Montana, and Rapid City, South Dakota. Additionally, counties with large missile bases, military establishments or other growth generated by large scale federal expenditures were rejected. Those counties that included part of the water development project, either the dam or reservoir were considered "developed." Nearby

non-urban and agriculture counties were considered "undeveloped." Throughout its length the Missouri River is usually the boundary between counties, consequently any water project has several counties adjacent to it.

Developed counties adjacent to the Fort Peck project were Garfield, McCone, Petroleum, Phillips, and Valley Counties. Related nearly undeveloped counties selected were Blaine, Chouteau, Daniels, Richland, and Rosebud Counties. All the above counties are located in the plains country of eastern Montana. The developed counties are grouped around Fort Peck Dam and Reservoir. Undeveloped counties are north, south, east, and west of the developed region. Some nearby counties were excluded from the study. Fergus County was rejected because the city of Lewistown is a fairly large regional service center prior to the dam construction. Roosevelt County was adjacent to the Missouri River below Fort Peck and closer than Daniels County. Despite this, Roosevelt County was rejected because a large portion of the county contains the Fort Peck Indian Reservation. The unique social-economic status of this area is not comparable to the rest of eastern Montana. Valley County was included in the developed county although it, at one time, had a large military base. The base had closed by 1969 and 1970, the most recent census years.

Developed counties adjacent to the Garrison project were Dunn, McKenzie, McLean, Mercer, Mountrail, and William Counties. Undeveloped counties, all in the similar western

North Dakota environments, were Billings, Burke, Divide, Golden Valley, Oliver, and Ward Counties. The city of Williston was included in the developed counties because of the impact the Garrison Reservoir had on the area. Although the city has a population over 10,000, an attempt to balance it was made by including Ward County in the undeveloped sector. Ward County has the city of Minot within its boundaries. An attempt was made to select counties in the western half of the state since the eastern portion of the Dakotas is more humid and fertile.

Oahe Dam and Reservoir straddles the border between the Dakotas. Two North Dakota counties were selected as developed. Emmons and Sioux counties, and two as undeveloped, Grant and Logan counties. In South Dakota, Carson, Dewey, Potter, Standley, Sully, and Walworth Counties were adjacent to the Oahe project and considered developed. Haakon, Hyde, Jackson, Perkins, McPherson, and Ziebach Counties were selected as undeveloped. Hughes County with the state capitol of Pierre, South Dakota, was excluded from both categories although it is adjacent to the Missouri and Oahe Dams. An attempt was made to balance the counties on both the east and west side of the Missouri. Throughout the length of South Dakota the Missouri is frequently considered the boundary between the arid west and humid east, especially important for its impact on agricultural census data.

Developed counties for Big Bend and Fort Randall projects were Brule, Buffalo, Charles Mix, Gregory, and Lyman. Aurora, Douglas, Jerauld, Jones, and Tripp were considered undeveloped. At this point on the Missouri, the agriculture data illustrated the changing characteristics of the environment by smaller farms and more productive farmland. Again, a balance was attempted between those areas east and west of the Missouri. Gavin's Point, immediately downstream from Fort Randall, was rejected as a study area because of its relatively small size and because of the more humid and productive nature of the area.

Problems of Census Data

One objective of this research effort was to test the effectiveness of water development projects in meeting local objectives. Because of time limitations and economic constraints on the research project, census data were the only feasible source of information. The original intent of comparing developments prior to a water project to present day situation was more difficult than anticipated.

The county level was the basic building block of data. Immediately, the various county boundaries influenced the data. Some counties in the northern Great Plains are very large, some are small. Some counties extended only a few miles from the Missouri River, other counties reached forty or fifty or more miles from the River. All counties are influenced by geographic, economic, and social

variations. The Great Plains is a relatively homogeneous environment, but environmental differences exist as well as man-made changes.

A major data problem was handling differences within and between time periods. The time period between the collection of census data varies. For example, agricultural data was collected in 1969, population data in 1970, but county government data was last collected in 1972. The time lag between data gathering and publication is a major problem. Some 1969 agriculture data for counties was not available until late 1972. County government expenditures data for 1972 will not be available until 1975. Therefore, for this study, the most recent county expenditure information is taken from 1967 census.

A more fundamental problem has been the changing of definitions. Every new census has new definitions; old ones are dropped; others are modified. Inflation, changes, and economic values have greatly distorted any information measured in dollars. An aggregate index is greatly distorted by the disproportionate increases in economic measures. Relative differences between counties for a given time period is possible. Historical trends are much more difficult to develop. Social information has changed considerably over the past thirty years, as have some types of economic information. For example, family income breakdowns on a county level were not made prior to 1950. Some types of farm information collected in 1940 are outdated

in 1969. Throughout the study many good census indicators were not used because the information was not available through the study period. A good census indicator might have been collected in 1942 but not in 1970. More typically, the expanded 1970 census information was not collected in 1930 or 1940.

Fort Peck Dam

Construction of the Fort Peck project began in 1933, the earliest of the large main stem developments. Census data from 1930 was used in part of the research evaluation. The Fort Peck project, due to the starting date, presented data gathering problems that the post-World War II projects did not present. Despite this, the project is important to evaluate since it has been completed over thirty-five years, the longest of any major development on the main stem.

Fort Peck is one of the world's largest dams, an earthen structure 21,026 feet long, and 250.5 feet high. The reservoir has a storage capacity of 19,100,000 acre-feet and a shoreline of 1,520 miles. Originally conceived as a navigation project for the lower Missouri, the Corps of Engineers has expanded the operation of the dam to include flood control, and installed 165,000 kilowatts generator capacity.

Agricultural Indicators--1930-
1970 Fort Peck Dam

The indicators above are a collective measure of change from 1930 to 1969. The average number of farms in the five developed counties in 1930 is compared to the average in 1969. A number less than one indicates major industry of the States of Montana, North Dakota, and South Dakota. If the water development projects had a direct impact on agriculture this would be a significant aspect for the local areas. In the case of Fort Peck, no irrigation projects were planned because the basic development objective was navigation and later flood control and power production. However, negative impacts might be present since the reservoir floods nearly a quarter of a million acres of land. Much of the river bottomland had been fertile and productive. Virtually no records were found during the course of the study as to the number of farms flooded, number of irrigated acres, amount of private and public land affected. A detailed search of Montana libraries and the district office of the Corps of Engineers in Omaha and other areas failed to locate this data.

The only other simple and economical approach was to examine the Census of Agriculture data for the developed counties to determine the influence of the Fort Peck project. The number of farms in the five developed counties averaged 1,158 per county in 1930 and had declined to 426 per county in 1969, giving an index of .35. In the

control counties there was an average of 1,212 farms in 1930 and an average of 608 farms in 1969 for a relative index of .49. The control counties had fewer farms being consolidated than the developed counties. Average farm size increased from 963 acres in 1930 to 4,749 acres in 1969 in developed counties. In undeveloped counties the farm size was higher in 1930: 1,207 acres, and increased relatively less to 3,556 acres by 1969, giving a developed county growth index of 4.93 compared to 3.46 in undeveloped counties.

It is impossible in this study to determine whether or not the Fort Peck project affected the larger farm size in the developed counties. Many ranches and farm units in the area need fertile hay land on river bottoms for winter shelter and cattle. Without it economically viable farm units have to be larger in size. The trend toward fewer farms and larger size has been continuing in this area for fifty years.

The average value of land and buildings increased over twenty times in developed counties from 1930 to 1969, and about sixteen times in undeveloped counties. The average value of farm products sold increased 224 times in developed counties and nearly 150 times in undeveloped counties. The value of farm products sold, starting with a farm depression low in 1930, illustrates the difficulty in combining indexes over time to arrive at an overall development index. Some small increases or decreases in

other indicators are relatively insignificant in comparison to such large increases. The problem might be solved by a system of weighed values in a larger, more detailed, study.

The large increases in the value of farm products sold and increases in land and buildings relative to the undeveloped counties is somewhat confusing because of the different average size of farms. The value of land and buildings averaged \$8.49 per acre in developed counties in 1930. Per acre, the average value of land and buildings, has increased 416 percent by 1969 to \$35.30.

The undeveloped counties increased a larger percent: 459 percent in the same time period. Average per acre value of land and buildings was higher at both periods for undeveloped counties: \$10.25 per acre in 1930 and \$47.05 per acre in 1969. Reflecting the depression lows, the average value of farm products sold per acre for developed counties was \$.125 in 1930 and \$.16 in undeveloped counties. The per acre value of farm products sold jumped 4,500 percent in developed counties to \$5.72 and in undeveloped counties 4,300 percent to \$6.93.

Data on irrigated farms is difficult to interpret. Overall, the developed areas reflected greater growth in the number of irrigated farms. A closer look at the census data in 1930 reveals that Blaine and Richland counties were the two most heavily developed irrigation areas. Both counties had fewer irrigated farms in 1969 than in 1930, the only two counties to experience such a decline.

Although the total number of farms decreased over one-half, the normal pattern was for an expansion in irrigated farms.

Demographic Indicators--1930-1970, Fort Peck Dam

Demographic data and shifts in human population frequently are used to indicate the development or decline of a specific area. Overall, the demographic indicators in the Fort Peck project area are uniform between developed and undeveloped counties. For example, median age of the developed counties went from 18.1 in 1930 to 29.9 in 1970. The other counties studied had a median age of 17.2 years in 1930 and most recently, a median age of 28.9 years. The relative changes were 1.65 developed areas and 1.68 undeveloped areas.

In the area of education developed counties reflected slightly better performance during the 1940-1970 period when data were available. The percent of those with a high school education increased over four times. The percent of the total population with a four-year college education increased over two times. For developed counties the percent of those with a high school education (four years completed) went from 11.8 percent to 53.6 percent, or 4.54 times from 1930 to 1970. The percent of the population with college education went from 3.3 percent to 7.4 percent, or 2.26 times. For some unknown reason the control counties lagged. A 4.11 increase in those with high school education was less than those counties

Table 1.--Agricultural Data--Montana.

	Number of Farms	Average Farm Size	Average Value Land & Buildings
1930 U.S.	6,288,648	156.9	\$ 7,614
1969 U.S.	2,730,250	389.0	76,000
	.43	2.48	9.98
1930 Montana	47,495	940.3	11,109
1969 Montana	24,951	2,522.0	150,222
	.53	2.68	13.52
<u>Fort Peck Dam Project</u>			
1930 Ave. D.C.	1,158	963.5	8,406
1969 Ave. D.C.	426	4,749.1	167,659
	.35	4.93	19.95
1930 Ave. U.C.	1,212	1,207.1	10,528
1969 Ave. U.C.	608	3,556.1	167,313
	.49	3.46	15.89
	Average Value Farms Products Sold	Number Irrigated Farms	Average Area Irrigated Per Farm (Acres)
1930 U.S.	\$ 1,835	265,147	53
1969 U.S.	25,680	257,000	156
	13.99	.97	2.94
1930 Montana	3,052	11,925	133
1969 Montana	27,602	9,197	200
	9.04	.77	1.50
<u>Fort Peck Dam Project</u>			
1930 Ave. D.C.	121	55	172
1969 Ave. D.C.	27,293	104	183
	224.19	1.88	1.06
1930 Ave. U.C.	165	142	117
1969 Ave. U.C.	24,672	137	162
	149.25	.97	1.39

immediately adjacent to the Fort Peck project but statistically may not be relevant. The increase in those with four years of college was less significant, 2.17 times, or a shift from 3.0 percent to 6.5 percent. The lower index for those with a high school education results partly from the undeveloped counties having a higher percentage of high school graduates in 1930 (12.5 percent average) relative to the developed counties (11.8 percent average). Interestingly, when the increase in median school years completed at twenty-five is compared between the two groups the growth is nearly identical. Developed counties averaged 8.6 years of schooling in 1930 compared to 8.5 in the control. By 1970, this was 12.1 years and 11.8 years for a ratio of 1.40 times in developed areas to 1.39 in undeveloped.

Nationally, over the past several decades, we have experienced dramatic rural to urban shifts in the United States population. In 1930 none of the counties studies around Fort Peck was classified as urban. In 1970 41.0 percent of Valley County (developed) and 46.2 percent of Richland County (undeveloped) were considered urban. Average percent urban was 8.2 percent in the five developed areas and 9.2 percent in the other five counties. The rural farm population dropped in all ten counties studied near Fort Peck. By 1970 developed counties were 39.6 percent rural and others were 32.4 percent rural. The

relative index of change from 1930 levels was .52 (developed) and .50 (undeveloped). Most of the shift from rural areas was due to small communities considered by the Census Bureau to be rural non-farm. During the study period developed counties increased from 24.6 percent rural non-farm to 48.2 percent or 1.95 times. Undeveloped areas went from an average of 35.6 percent rural non-farm in 1930 to 58.1 percent in 1970, or 1.63 times. The rural non-farm index might reflect the development of small communities near the Fort Peck project. However, in 1930, the rural population in this area averaged 75.2 percent compared to only 64.2 percent in the undeveloped counties more distant from the Missouri River. The rural non-farm population, small communities with less than 2,500 people, was only 24.6 percent of the total in the Missouri River counties and 35.6 percent of the total in undeveloped counties.

The probable reason for this is that the routes of the two main railroads in Montana, the Great Northern and Northern Pacific, were located parallel to the Missouri River. The Great Northern went across northern Montana, north of the Missouri, and the Northern Pacific went south of the Missouri, up the Yellowstone River valley. The railroads attracted people and built small communities which, in 1930, accounted for the larger percentage of the population classified as rural non-farm. Missouri River counties were more distant from the railroads and therefore had a larger rural population. One exception was Valley

County, which was 37.9 percent rural non-farm in 1930. In 1970 the Missouri River counties' population was more concentrated in rural non-farm areas (48.2 percent), but still lagged behind the undeveloped areas which were 58.1 percent rural non-farm. Despite this, the index of change was 1.95 for developed counties compared to 1.63 for undeveloped regions. At first this appears to be a favorable growth figure, but in reality, the Missouri River counties or developed still lag in the development of small towns and cities.

The birth rate shifted for all the counties in both study groups. The Fort Peck project counties increased by 1.09, from 15.1 per 1,000 population in 1930, to 16.5 births per 1,000. The control counties started with a higher birth rate, 20.6 per 1,000, and dropped by a factor of .71 to 14.6 births per 1,000.

The average death rate for the two groups of counties increased relatively the same, by a factor of 1.81 in developed counties and 1.69 in undeveloped areas. More than likely, this increase is due to the larger relative portion of the population aged sixty-five or older in recent years. As the rural population shrunk, it was the older people who stayed behind, others retiring near the farms and ranches where they worked. Nationally, the United States increased 1.65 times during the 1930-1970 Fort Peck Dam study period. Montana's population increased 1.29 times, but the developed counties lost people, over 1,500 on the average, or an

index of .73. Undeveloped counties lost an average of 1,600 people during the forty-year period, or 20 percent of their total.

Human Resource Development
Indicators--1932-1967
Fort Peck Dam

Most of the county tax data were available in 1932. The most recent county tax data available for this study dates from 1967. Unless noted otherwise, data in this section is for the 1932-1967 period. Total taxes increased in developed areas by a factor of 4.97 and 3.40 in undeveloped regions. As might be expected, all counties increased their taxes during the 1932-1967 period. Daniels County, considered undeveloped, increased its taxes only 2.8 times. Nearby Richland County, also undeveloped, increased their total taxes over eight times during the thirty-five year period.

If substantial social costs emerge from water developments, increases might be expected in developed areas in county expenditures, especially for social services. Total expenditures increased in the developed counties; 6.02 times compared to only 5.28 times in non-developed areas. During the study period all counties experienced large increases in expenditures, but considerable variation existed between counties. Such wide fluctuations from a small non-random sample are difficult to interpret in a study of this size. Expenditures for

Table 2.--Demographic Indicators--Montana.

	Median Age Population	Percent Population 14 Years or Less	Percent Population 65 Years or More
1930 U.S.	26.4	29.4	5.4
1970 U.S.	28.3	28.5	9.9
	1.07	.95	1.83
1930 Montana	27.0	29.7	5.0
1970 Montana	27.2	27.7	9.9
	1.01	.93	1.98
<u>Fort Peck Dam Project</u>			
1930 Ave. D.C.	18.1	34.8	3.8
1970 Ave. D.C.	29.9	39.3	10.2
	1.65	1.13	2.70
1930 Ave. U.C.	17.2	31.7	3.9
1970 Ave. U.C.	28.9	37.9	11.5
	1.68	1.19	2.95
	% Population/ 4 Years High School	% Population/ 4 Years College	Median School Years Completed
1940 U.S.*	14.0	5.0	8.6
1970 U.S.	52.3	10.7	12.1
	3.74	2.14	1.41
1940 Montana*	15.7	4.8	8.7
1970 Montana	59.2	11.0	12.3
	3.77	2.29	1.41
<u>Fort Peck Dam Project</u>			
1940 Ave. D.C.*	11.8	3.3	8.6
1970 Ave. D.C.	53.6	7.4	12.1
	4.54	2.26	1.40
1940 Ave. U.C.*	12.5	3.0	8.5
1970 Ave. U.C.	51.4	6.5	11.8
	4.11	2.17	1.39

*Data not available in 1930 census.

Table 2.--Continued.

	% Population Rural Non-Farm	% Population Rural Farm	% Population Urban
1930 U.S.	19.3	24.6	56.1
1970 U.S.	5.2	21.3	73.5
	.27	.87	1.31
1930 Montana	28.4	37.9	33.7
1970 Montana	12.2	34.4	53.4
	.43	.91	1.58
<u>Fort Peck Dam Project</u>			
1930 Ave. D.C.	24.6	75.2	0.0
1970 Ave. D.C.	48.2	39.5	8.2
	1.95	.52	. .
1930 Ave. U.C.	35.6	64.2	0.0
1970 Ave. U.C.	58.1	32.4	9.2
	1.63	.50	
	Birth Rate Per 1,000	Death Rate Per 1,000	Population
1930 U.S.	18.9	11.3	123,091,000
1970 U.S.	17.5	9.5	203,212,877
	.93	.84	1.65
1930 Montana	18.6	10.1	535,606
1970 Montana	17.3	9.7	694,409
	.93	.96	1.29
<u>Fort Peck Dam Project</u>			
1930 Ave. D.C.	15.1	5.24	6,095
1970 Ave. D.C.	16.5	9.5	4,441
	1.09	1.81	.73
1930 Ave. U.C.	20.46	6.74	8,035
1970 Ave. U.C.	14.6	11.4	6,430
	.71	1.69	.80

police protection increased 4.16 times in developed counties and 4.75 times in undeveloped areas. Expenditures for public welfare increased the least of all major categories of county expenses, less than twice the 1932 levels in 1967. Highway expenses increased over twelve times in developed counties and nearly seven times in undeveloped counties. Health and hospital expenses during the thirty-five year era rose over sixteen times in the control group of counties, but only five times in the Fort Peck project area.

Expenditures for schools reflected the large increases for county expenses. The Missouri River counties' school expenses rose nearly ten times during the thirty-five year period. The group of five control counties experienced a nearly eight-fold rise in education-related expenses at the same time. County expenses for fire protection were available but incomplete for the entire study period.

Overall, the developed counties had larger increases in county expenses and per capita taxes. Whether or not this reflects extra social costs of the Fort Peck project is not clear. Fort Peck reservoir has straddled this part of Montana for thirty-five years. By virtue of the size of the water body it is reasonable to expect some impact on the surrounding people. The huge reservoir is very much like an inland sea and is the largest geographic barrier

in eastern Montana. Extra expenses for highways and other social services may have resulted from the reservoir.

Economic Indicators--1950-1970
Fort Peck Dam

Water developments have been required to be economically justifiable since the Flood Control Act of 1936, which established that benefits of projects must exceed costs. Fort Peck Dam was first studied in 1928 and authorized in 1933. Although the benefits and costs are not examined in this study, the economic indicators are an attempt to measure economic performance of Fort Peck Dam on a local level, at least in a rustic fashion.

Family economic census data for counties were not available until 1950. Therefore, family income distribution is available only for 1950-1970. Employment data and the dependency ratio are available from 1930. Such a variety of census data illustrates the nearly impossible task of developing a single development index. Nevertheless, the economic indicators may illustrate some differences between the two groups of counties.

During the 20-year period, 1950-1970, the median family income increased 3.30 times in both developed and undeveloped counties. Not only were relative increases nearly identical, but average family income was also nearly the same. For example from 1950 to 1970 the percent of families with income \$3,000 or less declined by a factor of .21 in both study areas. Missouri River counties averaged

Table 3.--Human Resource Development Indicators--Montana.

	Total Local Taxes	Per Capita County Taxes	Total Property Taxes
1932 U.S.	\$ 4,274 million	\$ 54.53	\$ 4,159 million
1967 U.S.	29,074 million	192.28	25,186 million
	6.80	3.53	6.06
1932 Montana	42.9 million	79.80	23.5 million
1967 Montana	119.9 million	163.00	112.2 million
	2.79	2.04	4.77
<u>Fort Peck Dam Project</u>			
1932 Ave. D.C.	287,400	47.52	212,000
1967 Ave. D.C.	1,426,500	144.90	1,382,100
	4.97	3.02	6.52
1932 Ave. U.C.	450,200	55.74	322,000
1967 Ave. U.C.	1,531,500	157.40	1,486,600
	3.40	2.80	4.61

	Total County Expenditures	Expenditures* for Police Protection	Expenditures** for Public Welfare
1932 U.S.	\$ 7,351 million	\$ 303 million	\$ 370 million
1967 U.S.	66,648 million	2,609 million	3,927 million
	9.07	8.61	10.61
1932 Montana	29.9 million	1.83 million	2.41 million
1967 Montana	180.9 million	1.79 million	4.34 million
	6.05	.98	1.80
<u>Fort Peck Dam Project</u>			
1932 Ave. D.C.	250,800	8,600	14,600
1967 Ave. D.C.	1,510,600	35,800	26,800
	6.02	4.16	1.84
1932 Ave. U.C.	335,000	11,200	22,400
1967 Ave. U.C.	1,768,200	53,200	31,800
	5.28	4.75	1.42

*1932 data includes "Protection of Personal Property."

**1932 data includes "Charities, Hospitals, and Corrections."

Table 3.--Continued.

	Expenditures for Highways	Expenditures for Health & Hospitals*	Expenditures for Education
1932 U.S.	\$ 898 million	\$ 241 million	\$ 2,033 million
1967 U.S.	4,510 million	3,283 million	28,534 million
	5.02	13.62	14.04
1932 Montana	4.45 million	.5 million	14.32 million
1967 Montana	17.91 million	5.97 million	102.03 million
	4.02	11.94	7.12
<u>Fort Peck Dam Project</u>			
1932 Ave. D.C.	25,200	1,600	141,800
1967 Ave. D.C.	316,500	8,500	1,336,000
	12.64	5.31	9.41
1932 Ave. U.C.	41,400	2,200	180,400
1967 Ave. U.C.	281,500	36,830	1,382,120
	6.85	16.73	7.68

*1932 data included "Health & Sanitation."

57.5 percent and undeveloped counties 59.0 percent of the total families with income less than \$3,000 in 1950.

Approximately 12.5 percent of the families had such an income level in 1970 in both study areas.

The dependency ratio expresses the ratio of young and old dependents upon the viable working population. In 1970 the dependency ratio was roughly the same for both study areas 98.6 to 98.1, developed and undeveloped. The increase from 1930 to 1970 was 1.56 times for the developed areas compared to 1.75 times for undeveloped areas.

A major premise of water development projects is that industry and manufacturing will be attracted to the area. Developed counties in 1930 had averaged 22 people employed in manufacturing. By 1970, 122 people were employed in manufacturing, a 5.55 increase. The undeveloped counties had more people employed by manufacturing in 1930: 33, and the number increased in 1970 to 113, an increase of 3.42.

The number of people employed in agriculture decreased in both study areas. Developed areas dropped by a factor of .31 from 1930 to 1970. The number of people employed in agriculture dropped in the undeveloped areas from 1,952 in 1930, to 674 in 1970, a .34 loss. In 1970 developed counties had 39 percent of its population employed in agriculture, a less favorable percentage than the undeveloped counties.

Economic comparisons between the two study areas over a thirty- or forty-year period is difficult. However, from a local county perspective, the economic indicators are frequently identical for both developed counties and those removed from the Fort Peck project. The few differences in economic measurements usually favored the undeveloped counties. While no conclusions can be reached for the Fort Peck Dam and Reservoir, there is little evidence of substantial assistance to the economic development of adjacent counties.

Garrison Dam

Garrison Dam, the largest water project in North Dakota, created the largest storage reservoir in the Missouri River basin. Garrison Dam has been one of the most controversial Missouri River projects and also one of the most disappointing for its supporters. It was claimed that irrigation in North Dakota and power generation developed by Garrison Dam would check the loss of population, help local business and bring agricultural and economic stability to the region. Small irrigation projects were developed in North Dakota, but the greatest hope for irrigation was based upon the Garrison Dam. The Garrison Dam project originally was declared infeasible by the 1928 Corps of Engineers "308" report. In 1942, the Bureau of Reclamation proposed diverting Fort Peck water into North Dakota for irrigation purposes. In 1944 the Pick Plan, appealing to

Table 4.--Economic Indicators*--Montana.

	Median Family Income	% Families/ Income Less Than \$3,000/Yr	% Families/ Income \$3,000- 4,999/Yr
1950 U.S.	\$3,096	48.4	33.7
1970 U.S.	9,586	10.3	10.0
	3.10	.21	.30
1950 Montana	3,255	43.4	35.8
1970 Montana	8,509 (33rd)	10.5	11.5
	2.61	.24	.32

Fort Peck Dam Project

1950 Ave. D.C.	2,281.70	57.5	21.8
1970 Ave. D.C.	7,542.80	12.4	14.8
	3.30	.21	.68
1950 Ave. U.C.	2,282.80	59.0	20.6
1970 Ave. U.C.	7,541.40	12.6	14.0
	3.30	.21	.68

*County income data not available in census until 1950.

	% Families/ Income \$5,000- 6,999/yr	% Families/ Income \$10,000- 14,999/yr	% Families/ Income \$15,000- 24,999/yr*
1950 U.S.	12.1	3.1	. .
1970 U.S.	11.9	26.6	16.0
	.98	8.58	. .
1950 Montana	12.0	3.7	. .
1970 Montana	15.1	24.8	10.7
	1.26	6.70	. .

Fort Peck Dam Project

1950 Ave. D.C.	8.2	3.5	. .
1970 Ave. D.C.	18.5	16.0	10.3
	2.25	4.57	. .
1950 Ave. U.C.	7.3	5.0	. .
1970 Ave. U.C.	19.0	20.7	9.9
	2.60	5.17	. .

*1950 upper level incomes listed as "\$10,000 or more per year."

Table 4.--Continued.

	1950-1970* Percent Families With Income \$25,000 or more/yr	1930-1970 Dependency Ratio	Number Employed in Manufacturing	Number Employed in Agriculture
1930 U.S.	. .	53	14,110,653	10,471,998
1970 U.S.	4.6	62	19,393,000	3,462,000
	. .	1.17	1.37	.33
1930 Montana	. .	53	33,618	79,518
1970 Montana	2.9	33	23,727	29,064
	. .	.62	.71	.37
<u>Fort Peck Dam Project</u>				
1930 Ave. D.C.	. .	63.1	22	1,646
1970 Ave. D.C.	2.1	98.6	122	513
	. .	1.56	5.55	.31
1930 Ave. U.C.	. .	56.0	33	1,952
1970 Ave. U.C.	2.4	98.1	113	674
	. .	1.75	3.42	.34

*1950 upper family income data listed only as "\$10,000 or more per year."

downstream interests, proposed the giant Garrison Dam. The Pick-Sloan compromise allowed the Garrison Dam project for flood control and power, and also permitted the Bureau of Reclamation's Missouri-Souris Diversion for irrigation.

Over the strenuous objections of members of the Fort Berthold Indian Reservation, construction began in 1947 on Garrison Dam, the largest earth dam in the world at that time. The 12,000 feet long, 210 feet high dam was completed in 1960 and water backed up to Williston, 200 miles upstream. At the time of the dam construction, the Bureau of Reclamation built three multiple-purpose dams located at Dickinson, Heart Butte, and Jamestown. Benefits from the projects were small and available land was not irrigated. By 1959 only 2/10 of 1 percent of North Dakota's crop land, 48,000 acres, was irrigated. The plans for Missouri River diversions for irrigation have been delayed again and again. The original Bureau of Reclamation Sloan plan, called the Missouri Souris Diversion Unit, would have carried Fort Peck water to the Crosby-Mobill region of North Dakota and irrigated a million acres. In 1947 soil surveys revealed glacial sub soil that was unfit for irrigation. Another location near Devil's Lake was found, but irrigable land was scattered and rainfall much more abundant than in Western North Dakota. Therefore, the need for irrigation was less.

In 1957 the Bureau of Reclamation reported on its new plan--the Garrison Diversion Unit. A complicated

pumping canal and reservoir system would lift water from Garrison Reservoir and carry it eastward. The plan called for 6,773 miles of canals, 8 reservoirs, 41 city water supply systems, 656 pumping stations, and 9,300 miles of drains. In 1956 its cost was estimated in excess of \$500,000,000 or one-third the value of all farm land and buildings in North Dakota. The system was so costly that irrigators would pay 15 percent of the cost and no interest for 50 years. (The Newlands Act in 1902 expected irrigators to pay 100 percent of the cost.) Most of the cost was to be borne by revenues from basin hydroelectric plants. Despite a proposed cost of over \$500 per acre and knowledge that North Dakota farmers had taken over three times the proposed irrigated acreage out of production during the decade of the 1950s, "no one in North Dakota publicly questioned the benefits of diversion. Any doubters remained silent."¹ Many felt that the state was owed irrigated land for the 550,000 lost to Garrison and Oahe reservoirs. A smaller 250,000 acre plan was finally accepted by Congress in 1965. To date no funds have been appropriated for its construction.

Problems and social costs of Garrison Dam allocated to the minority Indian culture at the Fort Berthold Reservation will be discussed in the Problem Environment section.

¹Elwyn B. Robinson, History of North Dakota (Lincoln: University of Nebraska Press, 1966), pp. 464-65.

Agricultural Indicators--1940-
1970 Garrison Dam

As discussed previously, over 500,000 acres of North Dakota farm land was lost to Missouri River reservoirs. To date only a small part of this has been replaced by irrigated farm land. Negative impacts of the Garrison development might be reflected in the loss of irrigated farm land. Garrison Dam affected six counties adjacent to the project, which were considered developed. Six comparable undeveloped or control counties were selected nearby. In 1940 developed farms averaged over 1,700 per county and dropped to an average 1,000 per county in 1969. This resulted in an index of .60. Similarly, undeveloped counties averaged nearly 1,100 farms per county in 1940 and dropped to 676 in 1969. The index of change was .62, nearly identical for both sets of counties. Therefore, the trends toward fewer farms appear to be unchanged with or without water developments.

Average value of land and buildings per farm has increased dramatically during the study period. In 1940 the average farm, now considered in a developed area, was valued at nearly \$5,000. This was compared to a somewhat higher value or \$5,400 in undeveloped areas. This value increased over 16 times to \$81,770 for developed counties, and over 15 times to \$84,122 in undeveloped counties during the 1940-1969 study period.

The difference between the increases appears slight. Undeveloped farms started with a slightly higher value in 1940, did not increase quite as much, but still retained their relative lead in the value of land and buildings as compared to developed areas. If the water developments enhanced the value of land and buildings per farm, the change was slight. Since the Garrison project irrigation program has not been built, it is unlikely that the irrigation projects reflect any value change on the average farm. Due to the climate and isolation of the area, land adjacent to the Garrison reservoir has apparently not increased markedly in value.

The number of irrigated farms increased from an average of 33 per county to 41 per county in developed regions. However, one county lost irrigated farms--42 in McKenzie County. Another county stayed the same, and three counties had only modest increases in the number of irrigated farms. However, Williams County from 1940 to 1969 increased from 10 irrigated farms to 77. This accounted for most of the change in the average number of irrigated farms. Interestingly, North Dakota increased the number of irrigated farms from 479 in 1940 to 480 in 1969. During the decade prior to 1940, irrigated farms increased from 113 statewide to 479. Irrigated farms in the undeveloped counties dropped from an average of slightly over six farms per county to five irrigated farms per county. The biggest change was due to Ward County which dropped from

30 irrigated farms in 1940 to only 6 in 1969. During the same period, three counties which had no irrigated farms in 1940 developed several in each county. The remaining two undeveloped counties dropped slightly. Most irrigated farms in both study groups were in McKenzie and Williams Counties. These two counties heavily distorted any comparisons between the two study groups.

The agricultural indicators for the two groups of counties are basically similar. Developed areas appear to have higher returns per acre and more irrigated farms. Gains in irrigated acreage have been greater in undeveloped areas, although the average area irrigated is considerably higher in river oriented counties. In 1969, 47.6 percent, or 30, 140 acres out of North Dakota's 63,238 acres irrigated, were in McKenzie and Williams Counties, both considered developed. The total irrigated acreage in all six of the undeveloped counties was only 4,522 acres. Any comparisons, especially of irrigation data, between the two study groups is difficult with the atypical counties included. As might be expected in the semi-arid western Dakotas, the prime agriculture land and best irrigation opportunities would be found near major rivers such as the Missouri. A substantial portion of this prime agricultural land, 550,000 acres, was included in the taking area of Missouri River water developments. Despite this, it is difficult to determine a negative impact caused by the reservoirs from Census of Agriculture data. On the other

hand, no positive benefits can be inferred from the data either.

Demographic Indicators--1940-
1970 Garrison Dam

Demographic changes between the six counties adjacent to Garrison Dam and reservoir were compared with six nearby counties. Median age of the two populations was compared between 1940 and 1970. Median age in the average developed counties increased from 18.5 years to 29 years. Undeveloped areas' population rose from 19.6 years to 29. The ratio of change from 1942 to 1970 was 1.57 in developed areas compared to 1.48 in the control group. Such an increase in median age is expected for areas with declining population. The difference between the two study areas is small.

Both groups of counties lagged behind statewide education levels in 1970 which were 50.3 percent with high school education and 8.4 percent with college education. Median school years completed in North Dakota was 12.0 years in 1970, 10.3 years in developed counties and 10.4 years in undeveloped areas. Relative change between the two study areas was very small, 1.28 developed, 1.27 undeveloped.

In conclusion education differences between the study groups are very slight. Both groups clearly lag behind statewide educational levels. Shifts in population are somewhat different between the two groups of six

Table 5.--Agricultural Indicators--North Dakota.

	Number of Farms	Average Farm Size	Average Value Land and Buildings
1940 U.S.	6,096,799	174.0	\$ 5,518
1969 U.S.	2,730,250	389.0	76,000
	.45	2.24	13.77
1940 N.D.	73,962	512.9	6,628
1969 N.D.	46,381	930.0	87,000
	.63	1.81	13.13
<u>Garrison Dam Project</u>			
1940 Ave. D.C.	1,719	571.9	4,918
1969 Ave. D.C.	1,023	1,256.0	81,770
	.60	2.20	16.63
1940 Ave. U.C.	1,095	629.2	5,408
1969 Ave. U.C.	676	1,370.9	84,122
	.62	2.18	15.56
	Average Value Farm Products Sold	Number Irrigated Farms	Average Area Irrigated Per Farm (Acres)
1940 U.S.	\$ 1,283	291,655	61
1969 U.S.	25,680	257,000	156
	20.02	.88	2.56
1940 N.D.	1,558	479	45
1969 N.D.	16,146	480	132
	10.36	1.00	2.93
<u>Garrison Dam Project</u>			
1940 Ave. D.C.	1,084	33.5	81
1969 Ave. D.C.	13,748	41.0	136
	12.68	1.22	1.68
1940 Ave. U.C.	1,162	6.3	23
1969 Ave. U.C.	13,417	5.0	151
	11.55	.79	6.57

counties. The percent of the rural non-farm population changes from 31.4 to 50.2 percent, 1940 to 1970, or an increase of 1.60 in water related counties. Undeveloped counties averaged 29.9 percent rural non-farm in 1940 and increased to 41.7 percent in 1970, an increase of 1.39. Developed counties and undeveloped counties were nearly identical in 1940, but developed counties experienced greater movement into small rural towns.

Rural farm population has dropped throughout the United States, including North Dakota and the two study areas. Developed areas averaged 62.5 percent rural farm in 1940 and 39.8 percent in 1970, declining by a ratio of 0.64. Undeveloped counties were 61.3 percent rural in 1940, and went to only 45.6 percent rural in 1970, a drop of 0.74. Therefore, the loss of rural farm population was less severe in undeveloped areas. Both groups had a rural population that was higher than the statewide average of 32.9 percent. Two counties, one developed, Williams and one undeveloped, Ward had fewer rural people than the state average. These two counties also contain the only urban areas in the study area. Williams County includes the city of Williston, a regional oil development center. Ward County contains Minot, North Dakota, a regional trade center. Williams County was 35.4 percent urban in 1940 and grew to 58.4 percent urban in 1970, increasing 1.64. Ward County in 1940 was 51.8 percent and grew to 75.8 percent in 1970, a growth rate of 1.46 times. Williston has grown

rapidly because of an oil boom starting in 1951. Minot, the other growth center, has grown as a regional trade center and because of a state college located in the town. Comparison between urban growth rates is difficult but appears to be only indirectly related to any Missouri River water developments.

Overall the difference between the two study groups is small, although individual counties have surprisingly small death rates. Oliver County, for example, had a death rate of 5.3 per 1,000 in 1940 and only 4.3 per 1,000 in 1970. Oliver County also had a high rural farm population and a low percentage of its population sixty-five or over. Apparently it has a high ratio of working age rural people to the local population. While comparison are difficult between the two study groups, there is little difference that is related to water developments.

Human Resource Development
Indicators--1942-1967
Garrison Dam

Total county expenditures rose 12.17 times in developed areas compared to 13.31 in undeveloped regions. Undeveloped areas spent slightly less (3 percent) on the average than developed counties in 1942, prior to the Garrison Dam. After the project, in 1967, the average total expenditures of undeveloped areas exceeded the developed areas by 7 percent.

Table 6.--Demographic Indicators--North Dakota.

	Median Age Population	Percent Population 14 Years or Less	Percent Population 65 Years or More
1940 U.S.	29.0	25.0	6.8
1970 U.S.	28.3	28.5	9.9
	.98	1.14	1.46
1940 N.D.	25.7	29.6	6.1
1970 N.D.	26.4	29.7	10.7
	1.03	1.00	1.75
<u>Garrison Dam Project</u>			
1940 Ave. D.C.	18.5	31.7	5.3
1970 Ave. D.C.	29.0	38.5	10.4
	1.57	1.21	1.96
1940 Ave. U.C.	19.6	30.6	5.5
1970 Ave. U.C.	29.0	37.5	10.0
	1.48	1.23	1.81
	% Population/4 Years High School	% Population/4 Years College	Median School Years Completed
1940 U.S.	14.0	5.0	8.6
1970 U.S.	52.3	10.7	12.1
	3.74	2.14	1.41
1940 N.D.	10.8	3.5	8.5
1970 N.D.	50.3	8.4	12.0
	4.66	2.40	1.41
<u>Garrison Dam Project</u>			
1940 Ave. D.C.	8.3	2.1	8.0
1970 Ave. D.C.	41.8	4.8	10.3
	5.04	2.29	1.29
1940 Ave. U.C.	9.7	2.6	8.2
1970 Ave. U.C.	42.5	5.1	10.4
	4.38	1.96	1.27

Table 6.--Continued.

	% Population Rural Non-Farm	% Population Rural Farm	% Population Urban
1940 U.S.	20.6	22.9	56.5
1970 U.S.	5.2	21.3	73.5
	.25	.93	1.30
1940 N.D.	28.4	51.1	20.6
1970 N.D.	22.8	32.9	44.3
	.80	.64	2.15
<u>Garrison Dam Project</u>			
1940 Ave. D.C.	31.4	62.4	5.9
1970 Ave. D.C.	50.2	39.8	9.7
	1.60	.64	1.64
1940 Ave. U.C.	29.9	61.3	8.6
1970 Ave. U.C.	41.7	45.6	12.6
	1.39	.74	1.46
	Birth Rate Per 1,000	Death Rate Per 1,000	Population
1940 U.S.	17.9	10.8	131,669,275
1970 U.S.	17.5	9.5	203,212,877
	.98	.88	1.54
1940 N.D.	20.8	8.2	614,935
1970 N.D.	17.1	9.1	617,761 (46th)
	.82	1.11	1.06
<u>Garrison Dam Project</u>			
1940 Ave. D.C.	20.5	7.3	11,549
1970 Ave. D.C.	15.6	10.0	9,364
	.76	1.37	.81
1940 Ave. U.C.	19.0	7.1	9,435
1970 Ave. U.C.	15.3	9.0	12,332
	.80	1.27	1.31

Police protection expenditures increased dramatically for both study groups: 14 times in developed areas, 22 times in undeveloped areas during the 25 year comparison. In 1942, developed counties spent more on police protection than undeveloped. In 1967 undeveloped counties spent more than the other group of counties on police protection.

Interestingly, public welfare expenditures increased very little during the 1942-1967 study period. In developed areas welfare increased only 1.28 times and in undeveloped areas 1.73 times. The amount spent on welfare actually dropped in three developed counties and four undeveloped counties. If the two counties with urban areas, Williams and Ward Counties, were excluded, expenditures for welfare would be exactly the same for the remaining five developed counties in 1942 and 1967, and 13 percent higher for the remaining five undeveloped counties.

Highway expenditures increased twenty-four times in water development areas and over thirteen times in the six control counties. Virtually every county in both study groups received large increases in highway expenditures--increases from seven to one hundred times in size. While differences in highway expenditures were not examined in detail, water development projects of the magnitude of Garrison Dam required many hundreds of miles of roads to be relocated and rebuilt.

County expenditures for health and hospitals increased in both groups. The data is especially hard to

evaluate because in 1942 all but three of the twelve study counties listed \$1,000 as expenditures for health and hospitals. The \$1,000 was rounding off the actual expenditure to the nearest \$1,000 figure. The three remaining counties listed no expenditures in this category. In 1967 two counties still listed no expenditures. Ward County, considered undeveloped, greatly distorts the study sample. Ward County expenses are listed in the Census of Governments as increasing from \$1,000 to \$198,000 during the twenty-five year period. Ward County's health and hospital expenses represents 90 percent of the total health and hospital expense for the six undeveloped counties. Williams County, which is considered a developed county, increased its health expenses twenty-seven times and represents over 50 percent of the six developed counties' expenses. If the urban counties are excluded, the increases in health and hospital expenses for the remaining two groups of five counties are nearly the same--approximately a six fold increase.

In conclusion, it appears that comparison of expenditures for groups of people relatively stable may explain differences in development. Comparisons between expenditures for institutions such as schools and highways are more difficult to explain as straightforward increases or decreases without more detailed examination of their meaning. Certainly it is not clearly beneficial to an area to have water developments based of county expenditure data.

Table 7.--Human Resource Development Indicators--North Dakota.

	Total Local Taxes	Per Capita County Taxes	Total Property Taxes
1942 U.S.	\$ 5,252 million	\$ 46.67	\$ 4,499 million
1967 U.S.	29,074 million	192.28	25,186 million
	5.54	4.12	5.60
1942 N.D.	19.4 million	41.43	9.4 million
1967 N.D.	50.6 million	161.60	25.8 million
	2.61	3.90	2.74
<u>Garrison Dam Project</u>			
1942 Ave. D.C.	217,300	21.10	216,500
1967 Ave. D.C.	1,426,500	144.90	1,382,100
	6.56	6.87	6.38
1942 Ave. U.C.	176,100	23.50	175,800
1967 Ave. U.C.	1,531,500	157.40	1,486,600
	8.70	6.70	8.46

	Total County Expenditures	Expenditures for Police Protection	Expenditures for Public Welfare
1942 U.S.	\$ 7,351 million	\$ 354 million	\$ 702 million
1967 U.S.	66,648 million	2,609 million	3,927 million
	9.07	7.37	5.59
1942 N.D.	10.32 million	271,000	2,319,000
1967 N.D.	169.4 million	1,069,000	3,967,000
	16.41	3.94	1.71
<u>Garrison Dam Project</u>			
1942 Ave. D.C.	214,830	4,800	38,000
1942 Ave. D.C.	2,612,670	67,670	48,830
	12.17	14.10	1.28
1942 Ave. U.C.	209,170	3,500	35,170
1967 Ave. U.C.	2,783,500	79,330	60,830
	13.31	22.67	1.73

Table 7.--Continued.

	Expenditures for Highways	Expenditures for Health & Hospitals	Expenditures for Education
1942 U.S.	\$ 1,469 million	\$ 844 million	\$ 2,434 million
1967 U.S.	4,510 million	3,283 million	28,534 million
	3.07	3.89	11.72
1942 N.D.	2,573,000	59,000	234,000
1967 N.D.	10,974,000	873,000	16,646,000
	4.23	14.80	71.14
<u>Garrison Dam Project</u>			
1942 Ave. D.C.	13,170	830	3,170
1967 Ave. D.C.	316,500	8,500	1,336,170
	24.03	10.24	421.50
1942 Ave. U.C.	21,000	670	2,330
1967 Ave. U.C.	281,500	36,830	1,382,170
	13.40	54.97	593.21

Economic Indicators--1950-1970 Garrison Dam

Most of the economic indicators cover only the 1950-1970 time period. All county family income data started in 1950, but dependency ratio and employment data were taken from the 1940 census as well as 1970. Median family income from 1950 to 1970 increased 2.78 times in developed areas, starting at \$2,573 and was most recently \$7,146. Undeveloped counties started in 1950 at a slightly lower level--\$2,586, and increased 2.61 times to \$6,749, remaining relatively behind the developed counties. The average of the six counties is again distorted by the inclusion of the two urban counties, Williams and Ward, both of which had median family incomes over \$8,000 in 1970.

When differences in income distribution are compared between the areas with water development projects and those without, only small distinction can be made in the lower income levels. One example would be in developed counties in 1950 which had 55.6 percent of their population with an income of \$3,000 or less. Non-developed counties had 55.4 percent of the families in this category. By 1970 those with poverty level incomes had dropped to 16.5 percent and 16.1 percent in developed and undeveloped counties. The rate of change was the same for both groups--.29. The changes in the 1950-1970 income level for \$3,000 to \$4,999 were also very close--.65 for water development counties and .71 for undeveloped areas.

Manufacturing employment was compared prior to dam construction in 1940 and again in 1970. Manufacturing is a very small part of the local economy. The developed counties appear to have developed manufacturing faster than the undeveloped counties. In 1940 the six water project counties average less than 1 percent of the work force engaged in manufacturing. By 1970 this rose to only 2.4 percent. Four of the six counties still had an average of 1 percent of their population working in manufacturing. Mountrail and Williams Counties had 6.2 percent and 4.4 percent respectively, working in manufacturing. Both counties had considerable oil development, and the manufacturing is probably related to it. Manufacturing is still a small part of the developed counties, only ninety-two people were employed in manufacturing in 1970.

The number of people employed in agriculture, the basic industry of the State of North Dakota and the study areas, has dropped from 1940 to 1970. In the developed counties, 2,262 people, or 67 percent, worked in some aspect of agriculture in 1940. By 1970 this dropped to 912 or 35.8 percent. The control group of counties averages 1,426 people working in agriculture or 63 percent. This dropped to 600, or 40.6 percent in 1970. The ratio of change was nearly the same for both groups of counties. Although agriculture has decreased to 40 percent of the 1940 employment level, it is still much more important to the counties than manufacturing employment.

Table 8.--Economic Indicators*--North Dakota.

	Median Family Income	% Families/ Income Less Than \$3,000/Year	% Families/ Income \$3,000- 4,999/Year
1950 U.S.	\$3,096	48.4	33.7
1970 U.S.	9,586	10.3	10.0
	3.10	.21	.30
1950 N.D.	2,933	51.2	29.4
1970 N.D.	7,836(40th)	12.1	14.3
	2.67	.24	.49

Garrison Dam Project

1950 Ave. D.C.	2,573	55.6	24.4
1970 Ave. D.C.	7,146	16.5	15.8
	2.78	.29	.65
1950 Ave. U.C.	2,586	55.4	24.1
1970 Ave. U.C.	6,749	16.1	17.2
	2.61	.29	.71

*County income data not available in census until 1950.

	% Families/ Income \$5,000- 6,999/Year	% Families/ Income \$10,000- 14,999/Year	% Families/ Income \$15,000- 24,999/Year*
1950 U.S.	12.1	3.1	. .
1970 U.S.	11.9	26.6	16.0
	.98	8.58	. .
1950 N.D.	10.9	3.5	. .
1970 N.D.	16.9	21.4	9.9
	1.55	6.11	. .

Garrison Dam Project

1950 Ave. D.C.	9.2	3.1	. .
1970 Ave. D.C.	16.2	19.1	7.2
	1.76	6.16	. .
1950 Ave. U.C.	8.1	3.5	. .
1970 Ave. U.C.	19.7	18.0	7.0
	2.43	5.14	. .

*1950 upper local income listed as "\$10,000 or more per year."

Table 8.--Continued.

	1950-1970* Percent Families With Income \$25,000 or More/Year	1940-1970 Dependency Ratio	Number Employed in Manufacturing	Number Employed in Agriculture
1940 U.S.	. .	92	10,573,000	8,372,000
1970 U.S.	4.6	62	19,393,000	8,462,000
	. .	.67	1.83	.41
1940 N.D.	. .	57	5,002	106,962
1970 N.D.	2.9	68	9,419**	43,847
	. .	1.19	1.88	.41
<u>Garrison Dam Project</u>				
1940 Ave. D.C.	. .	58.9	31	2,262
1970 Ave. D.C.	2.1	95.9	92	912
	. .	1.63	2.97	.40
1940 Ave. U.C.	. .	56.5	85	1,426
1970 Ave. U.C.	.9	90.5	153	600
	. .	1.61	1.80	.42

*1950 upper income level listed only as "\$10,000 or more per year."

**Lowest percentage of state population engaged in manufacturing of all states in United States.

Oahe Dam

Authorized by the 1944 Flood Control Act, construction began on Oahe Dam in September 1948. Completed in 1964, the 242 feet high dam was then the largest rolled earth dam in the world. The dam created a reservoir 250 miles long, and with 2,500 miles of shoreline. When the reservoir is full, it covers 313,000 acres.

Originally the Oahe Irrigation Project was planned to irrigate one million acres of farm land in South Dakota. Water was to be carried from the Oahe Reservoir by means of a main pumping plant, a series of secondary pumping plants and a network of 1,200 miles of canals. In 1969 only 145,000 acres of land were irrigated in South Dakota and most of this land was west of the Missouri. None of the land was irrigated as a result of the Oahe Irrigation Project. Early in 1974 the Oahe Irrigation Project, reduced to 190,000 acres, was apparently ready for the start of construction after a twenty-five year delay. However, growing environmental concerns, increased costs and an irrigation project related farm land loss of 110,000 acres had resulted in considerable local opposition to the project. The Environmental Protection Agency, after reviewing the Oahe Irrigation Project Environmental Impact Statement draft, found the report deficient in the areas of water quality, flooding potential, wildlife, and economics.

Oahe Dam has a generating capacity of 595,000 kilowatts and numerous recreation facilities nearby. The reservoir backs water to Bismarck, North Dakota from Pierre, South Dakota, the centrally located capital city.

Big Bend and Fort Randall Dams

The last two dams examined have been combined into one study area. Big Bend and Fort Randall Dams are smaller projects relative to the three upstream developments. Big Bend Dam has a reservoir capacity (Lake Sharpe) of 1,900,000 acre feet. The dam is 10,570 feet long and 45 feet high. The reservoir created by the rolled earth dam is 80 miles long at maximum pool and covers nearly 56,000 acres. Generating capacity of the Big Bend powerhouse is nearly 500,000 kilowatts. The dam, authorized by the 1944 Pick-Sloan Plan, was begun in 1960 and completed in 1969 at a cost of over one hundred and five million dollars.

Fort Randall Dam is immediately downstream from Big Bend. Its reservoir, Lake Francis Case, backs water practically to the base of Big Bend Dam. Fort Randall Dam was the first main stem, Pick-Sloan project. Construction began in 1946 and was completed in 1966 at an expense of nearly two hundred million dollars. The dam is 10,700 feet long and 165 feet high. Lake Francis Case is 107 miles long, and when full has a shoreline of 540 miles and a surface area of 80,000 acres. The reservoir has a storage capacity of 6,100,000 acre-feet, and the power plant has a

capacity of 320,000 kilowatts of power. Fort Randall Dam is located in the southern portion of South Dakota, near the Nebraska border. The two dams flooded portions of the Yankton, Rosebud, Crow Creek, and Lower Brule Indian Reservations.

Gavin's Point Dam, immediately below Fort Randall, is the last of the main stem dams constructed between the years 1952 and 1961. Gavin's Point, only seventy-four feet high, was primarily a regulation dam for the hydroelectric discharges of Fort Randall, and it also serves to stabilize the lower Missouri navigational channel. Gavin's Point is small, located in fertile farming country and was excluded from the study.

Big Bend and Fort Randall Dams directly affect five counties adjacent to the Missouri River: Brule, Buffalo, Charles Mix, Gregory, and Lyman. All are in South Dakota. Three counties were east of the Missouri and two are west. Three nearby undeveloped counties were selected lying east of the Missouri. These are Aurora, Douglas, and Jerauld. Two remaining counties were selected from west of the Missouri. These are Jones and Tripp Counties. Parts of Lyman, Buffalo, Gregory, and Charles Mix Counties include Indian reservations. Parts of Douglas and Tripp Counties, which are considered undeveloped, also include Indian reservations.

Agricultural Indicators--
1940-1969 Oahe Dam

The selected six counties are on both sides of the Missouri, with an equal number both east and west of the Missouri and are both developed and undeveloped counties. The average farm size by county reflects the different environments. In 1969 Emmons County, North Dakota had an average farm size of 860 acres. Emmons County is located east of the Missouri. Dewey County, South Dakota, also adjacent to the Oahe Project, but west of the Missouri, had an average farm size of 4,051 acres. Standley County, also a western county adjacent to Oahe, had in 1969 a 5,027 acre average farm size. Undeveloped counties have an average farm size ranging from 860 acres (Hogan, North Dakota) to 5,300 acres (Ziebach, South Dakota), east and west counties respectively. Despite the differences in average farm size, the relative difference is small between the undeveloped counties and developed counties.

The area irrigated increased most in the developed counties. In 1940, the nine counties considered developed in this study reported only 176 acres irrigated in the entire area. In 1969 over 6,300 acres were considered irrigated. Undeveloped counties reported a total of 402 acres irrigated in 1940 and nearly 9,500 acres irrigated in 1969. Undeveloped areas had more land under irrigation in 1969 than the water development counties. However, the Oahe Irrigation Project has not been funded, and irrigation

lands lost to reservoir taking areas were not replaced. The average of less than 1,000 acres of irrigated land per county reveals the relatively small importance of this aspect of agriculture to the counties under study. If the proposed irrigation projects are ever completed, the Missouri River Water Projects may favorably affect agriculture in the nearby areas.

Agriculture Indicators--1940-1969 Big Bend and Fort Randall

As might be expected, farm size increased during the twenty-nine year period. The average water-oriented farm increased from 713 acres to 1,414 acres, which was almost a twofold increase in size during the period covered by the study. All counties increased, but Charles Mix County farms averaged only 565 acres in 1969 compared to 2,850 acres in Buffalo County. Those counties considered undeveloped by this study were smaller, 590 acres, in 1940, and increased less at 1.74 times to an average of 1,028 acres in 1969. Farms in Jones County, west of the Missouri, averaged 2,228 acres in size, Douglas County farms, east of the Missouri, averaged 428 acres in size. The average South Dakota farm in 1969 was 997 acres in size.

The average value of land and buildings increased many times over the 1949 to 1969 period. In 1940 developed county values averaged \$5,378 per farm. This increased twenty times by 1969 to \$108,158. Undeveloped farms were

valued less in 1940 at \$4,960 per farm. They increased in value over 16 times by 1969 to an average of \$82,622 per farm. During the same period, the average South Dakota farm value increases 12 times to an average value of \$83,427 per farm.

The average value of farm products sold increased over seventeen times for both study groups. As might be expected the lower Missouri River farms sold more in products in 1940 than did the upland, non-riparian counties. By 1969, the average Missouri River farm in the group of five developed counties sold over \$24,000 worth of farm products. The same year those five counties considered undeveloped sold \$20,000 worth of farm products. The rate of increase during the study period was essentially the same for both groups.

The information about the number of irrigated farms is interesting. The river counties reported seventeen irrigated farms in three counties in 1940, and the undeveloped counties reported only one irrigated farm. By 1969 the developed counties reported sixty-six irrigated farms compared to twenty-six such farms in the five undeveloped areas. The rate of increase is misleading because of the very low starting base in the undeveloped counties, which is one irrigated farm. Overall, by 1969, the developed areas had more irrigated farms (66) than did the undeveloped areas (26). However, this represented only eighty-eight farms out of a total of 6,000 farms in

the ten counties. Irrigated farms represented only 1.5 percent of the total farms, and therefore any changes in this small population are not significant from a development standpoint.

The average area irrigated per farm is also difficult to interpret because of small acreages involved. Total area irrigated in developed areas was 7.672 acres in 1969, or 116 acres per farm. Undeveloped counties reported 2,555 acres irrigated or 98 acres irrigated per farm.

Demographic Indicators--
1940-1970 Oahe Dam

The developed Oahe Project counties have, on the average, a younger population than those undeveloped areas studied. In 1940 the average age in the developed areas was 17.9 years compared to 19.2 years in the undeveloped areas. By 1970 the average age had increased to 25.2 years and 29.4 years in the sets of developed and undeveloped counties. The Oahe set of counties illustrated a much wider range of median age than other study groups. Standley County's median age increased only from 25.3 years in 1940 to 25.9 years in 1970. Walworth County's median age in 1970 was 30.5 years compared to 17.6 years in Sioux County. Sioux County included part of the Standing Rock Indian Reservation which has a higher birth rate thus lowering the median age. Ziebach County, considered undeveloped, has a median age of 18.6 years. Ziebach also

Table 9.--Agricultural Indicators--South Dakota.

	Number of Farms	Average Farm Size	Average Value Land and Buildings
1940 U.S.	6,096,799	174.0	\$ 5,518
1969 U.S.	2,730,250	389.0	76,000
	.45	2.24	13.77
1940 S.D.	72,454	544.8	6,976
1969 S.D.	45,726	977.0	83,427
	.63	1.83	11.96
<u>Oahe Dam Project*</u>			
1940 Ave. D.C.	684	951.0	5,229
1969 Ave. D.C.	444	2,333.9	134,573
	.65	2.45	25.74
1940 Ave. U.C.	821	1,017.5	4,701
1969 Ave. U.C.	499	2,273.3	116,119
	.61	2.23	24.70
<u>Big Bend & Fort Randall Dam Projects</u>			
1940 Ave. D.C.	1,031	712.9	5,378
1969 Ave. D.C.	634	1,414.0	108,158
	.61	1.98	20.11
1940 Ave. U.C.	911	589.8	4,960
1969 Ave. U.C.	567	1,027.9	82,622
	.62	1.74	16.66

*Oahe Dam data includes four North Dakota counties, two developed and two undeveloped.

Table 9.--Continued.

	Average Value Farm Products Sold	Number Irrigated Farm	Average Area Irrigated Per Farm (Acres)
1940 U.S.	\$ 1,283	291,655	61
1969 U.S.	25,680	257,000	156
	20.02	.87	2.56
1940 S.D.	1,538	967	62.2
1969 S.D.	23,485	1,063	139.6
	15.27	1.10	2.24
<u>Oahe Dam Project</u>			
1940 Ave. D.C.	932	7.8	19.5
1969 Ave. D.C.	23,813	5.3	131.7
	25.55	.68	6.75
1940 Ave. U.C.	1,012	3.0	44.7
1969 Ave. U.C.	21,047	10.1	93.28
	20.80	3.37	2.08
<u>Big Bend & Fort Randall Dam Projects</u>			
1940 Ave. D.C.	1,374	3.4	37.65
1969 Ave. D.C.	24,195	13.2	116.24
	17.61	3.88	3.09
1940 Ave. U.C.	1,141	1.2	51.83
1969 Ave. U.C.	20,063	5.2	98.27
	17.58	4.33	1.90

includes the Cheyenne Indian Reservation. Contrasting it is McPherson County with a median age of 33.9 years in 1970.

Throughout the northern Great Plains there has been a shift from rural areas to small towns and cities. The study areas have a larger percentage of those listed as rural non-farm than the state average. In 1970 South Dakota had 19.8 percent of its population classified as rural non-farm. Developed counties during the most recent census year listed 55.8 percent rural non-farm. Undeveloped counties averaged 53.5 percent of their population as rural non-farm. The rate of growth was nearly the same for both study areas--1.43 in developed regions up from 38.9 percent in 1940, and 1.48 in undeveloped areas. This was the opposite of state trends which has this segment of the population declining by a factor of .71. All of the eighteen counties studied exceeded the state average of 19.8 percent rural non-farm. Some counties had three times the percentage of rural non-farm than the state. For example Potter County was 70.5 percent and Jackson County 69.3 percent. The average rate of change between study groups was similar however.

The rural farm population declined during the thirty year study period, but still exceeded the state average of 35.6 percent. Developed areas dropped by a factor of .67 from 56.4 percent to 37.6 percent in 1970. The control group of counties dropped by an index of .73

from 63.7 percent to 46.4 percent. Developed counties changed at the same rate but had fewer people classified as rural than the control counties. This was partially the result of including Walworth County which has a low (20.1) rural population and an urban population.

The urban population is found in only one county, Walworth. Its major city, Selby, accounts for 41.4 percent of the total county population in 1940 and 58.0 percent in 1970. None of the remaining seventeen counties studied listed any urban population during the 1940 or 1970 census years. The State of South Dakota was classified as 24.6 percent urban in 1940 and 44.6 percent urban in 1970.

The birth rate per 1,000 and death rate data are for the years 1940 to 1968. Birth rate declined from 20.3 per 1,000 to 19.3 during the 28 year period for the developed counties, a ratio of .95. Undeveloped areas had a drop in the birth rate from 19.9 to 16.0 or an index of .80 during the same 28 year period. The 1968 birth rate for South Dakota was 17.1 per 1,000 people. The counties varied to a large extent as to the number of births. Campbell County had a rate of only 10.2, well below the state average. Corson County had a rate of 27.8, much higher than the state figure. Both counties are considered developed in this study. Standley, Ziebach, Sioux, and Dewey Counties all had birth rates over 20 per 1,000. All four counties have Indian reservations within their boundaries that probably account for the higher birth rates. Corson

County is adjacent to a large reservation and includes the Standing Rock Sioux Reservation.

Death rates per 1,000 increased in both study groups, largely because of the increased age of the population. In 1940 the death rate in developed areas was 8.7 per 1,000, and this increased to 9.1 by 1968 or 1.05 times. The death rate in undeveloped areas was slightly less in 1940, 8.4, and increased 1.31 times to 11.0 per 1,000 in 1968. The South Dakota death rate was 10.1 per 1,000 in 1968. The undeveloped counties had a higher death rate, but this is probably related to a higher median age, 29.4 years compared to 25.2 for developed areas. Also the undeveloped counties had nearly 2 percent more of its population (11.5 percent) 65 years or older than did the developed counties (9.6 percent).

During the thirty year period, both sets of counties lost population, but the undeveloped counties declined faster (.68) than the Oahe Project counties (.81). This data is also difficult to interpret. The water developed counties had a faster birth rate and because of large Indian reservations may have lost population at a slower rate.

Demographic Indictors--1940-1970
Big Bend and Fort Randall Dams

Median age of the population was investigated for the years 1940 to 1970. Relative differences between the two study areas were small. The index of change was 1.42

for developed counties and 1.49 for undeveloped counties. The 1940 median age was 19.8 and 21.1 respectively. By 1970 the median age in the developed counties was 28.1 years. Buffalo County was far below the average with a 19.7 median age. The undeveloped counties had a higher median age, 31.4 years. Both sets of counties were higher than the South Dakota median age of 27.5 years.

The percent of the population 14 years or less in 1970 was 39.8 for developed areas; 37.3 for undeveloped. This percentage had increased from 29.8 for developed and 28.6 for undeveloped in 1940. The index of change for that study period was practically the same for both groups of counties. Undeveloped areas increased by 1.30 and developed areas changed by a factor of 1.34. Of the ten counties considered, nine had percentages of youth ranging from 34.6 to 39.8 which is a fairly close range. Buffalo County in 1970 reported 47.7 percent of its population in this age class.

The percentage of the population sixty-five years or older increased more rapidly in the undeveloped counties. In those five areas the percentage of older people from 7 to nearly 14, a two fold increase. At the same time, 1940 to 1970, the developed counties increased 1.44 times from 7 percent to 10 percent.

The rural population declined in all ten of the counties studied near Big Bend and Fort Randall Dams. Developed counties' rural population declined .67 times

from 58 percent in 1940 to 38.7 percent in 1970. Undeveloped areas declined slightly less--.70 times, from 63.9 percent to 44.9 percent in 1970.

Only two counties listed an urban area in 1970 and none listed an urban area in 1940. Tripp County, considered undeveloped, listed 46.4 percent of its population as urban in 1970. The urban area accounting for this was the town of Winner, South Dakota. Brule County, developed, had 44.7 percent of its population considered urban in 1970. Chamberlain, South Dakota, located in the bluffs overlooking the Missouri and upper reaches of Lake Francis Case, accounted for this urban population.

The birth rate per 1,000 people declined .89 times in developed areas and .86 times in non-developed regions. The 1970 average birth rate was 18.1 per 1,000 in developed areas compared to 16.5 in the control group of counties. However considerable variation existed between individual counties. Buffalo County for example had 26.9 births per 1,000 and Aurora County only 11.8 births per 1,000.

The death rate per 1,000 rose in all counties except Buffalo County from 1940 to 1970. Developed counties increased the death rate per 1,000 from 10.0 to 11.2 during the study period. Undeveloped areas increased the death rate from 8.0 to 11.3. The non-developed areas increased the death rate more, but the 1970 rate was very similar for both groups--11.2 and 11.3 per 1,000.

Table 10.--Demographic Indicators--South Dakota.

	Median Age Population	Percent Population 14 Years or Less	Percent Population 65 Years or More
1940 U.S.	29.0	25.0	6.8
1970 U.S.	28.3	28.5	9.9
	.98	1.14	1.46
1940 S.D.	27.4	27.7	6.8
1970 S.D.	27.5	30.1	12.1
	1.00	1.09	1.78
<u>Oahe Dam Project</u>			
1940 Ave. D.C.	17.9	33.1	5.6
1970 Ave. D.C.	25.2	42.8	9.6
	1.41	1.29	1.71
1940 Ave. U.C.	19.2	31.4	6.2
1970 Ave. U.C.	29.4	39.1	11.5
	1.53	1.24	1.85
<u>Big Bend & Fort Randall Dam Projects</u>			
1940 Ave. D.C.	19.8	29.8	7.0
1970 Ave. D.C.	28.1	39.8	10.1
	1.42	1.34	1.44
1940 Ave. U.C.	21.1	28.6	7.0
1970 Ave. U.C.	31.4	37.3	13.8
	1.49	1.30	1.97

Table 10.--Continued.

	% Population/4 Years High School	% Population/ 4 Years College	Median School Years Completed
1940 U.S.	14.0	5.0	8.6
1970 U.S.	52.3	10.7	12.1
	3.74	2.14	1.41
1940 S.D.	12.9	3.8	8.5
1970 S.D.	53.3	8.6	12.1
	4.13	2.26	1.42
<u>Oahe Dam Project</u>			
1950 Ave. D.C.	9.1	2.7	8.1
1970 Ave. D.C.	43.0	5.7	10.4
	4.73	2.11	1.28
1940 Ave. U.C.	9.1	2.4	8.0
1970 Ave. U.C.	42.6	5.5	10.6
	4.68	2.29	1.32
<u>Big Bend & Fort Randall Dam Projects</u>			
1940 Ave. D.C.	10.9	2.6	8.3
1970 Ave. D.C.	43.5	5.7	10.8
	3.99	2.19	1.30
1940 Ave. U.C.	10.8	2.7	8.4
1970 Ave. U.C.	44.6	4.6	10.8
	4.13	1.70	1.28

Table 10.--Continued.

	% Population Rural Non-Farm	% Population Rural Farm	% Population Urban
1940 U.S.	20.6	22.9	56.5
1970 U.S.	5.2	21.3	73.5
	.25	.93	1.30
1940 S.D.	27.7	47.7	24.6
1970 S.D.	19.8	35.6	44.6
	.71	.75	1.81
<u>Oahe Dam Project</u>			
1940 Ave. D.C.	38.9	56.4	4.6
1970 Ave. D.C.	55.8	37.6	6.4
	1.43	.67	1.39
1940 Ave. U.C.	36.1	63.7	0
1970 Ave. U.C.	53.5	46.4	0
	1.48	.73	. .
<u>Big Bend & Fort Randall Dam Projects</u>			
1940 Ave. D.C.	41.7	58.1	.0
1970 Ave. D.C.	52.8	38.7	8.9
	1.27	.67	. .
1940 Ave. U.C.	35.9	63.9	.0
1970 Ave. U.C.	45.5	44.9	9.2
	1.27	.70	. .

Table 10.--Continued.

	Birth Rate Per 1,000	Death Rate Per 1,000	Population
1940 U.S.	17.9	10.8	131,699,275
1970 U.S.	17.5	9.5	203,212,877
	.98	.88	1.54
1940 S.D.	18.1	8.6	642,961
1970 S.D.	17.1	10.1	665,407 (45th)
	.94	1.17	1.04
<u>Oahe Dam Project</u>			
1940 Ave. D.C.	20.3	8.7	5,570
1970 Ave. D.C.	19.3	9.1	4,530
	.95	1.05	.81
1940 Ave. U.C.	19.9	8.4	5,265
1970 Ave. U.C.	16.0	11.0	3,556
	.80	1.31	.68
<u>Big Bend & Fort Randall Dam Projects</u>			
1940 Ave. D.C.	20.3	10.0	7,219
1970 Ave. D.C.	18.1	11.2	5,675
	.89	1.12	.79
1940 Ave. U.C.	19.1	8.0	5,787
1970 Ave. U.C.	16.5	11.3	4,423
	.86	1.41	.76

Human Resource Development
Indicators--1942-1967
Oahe Dam

County tax data available from 1942 to 1967 is one possible indicator of local costs resulting from large water development projects. During the twenty-five year study period county taxes per capita increased dramatically in both groups of counties. Developed counties had an average of \$16.00 county taxes per capita in 1942. The latest data for the year 1967 revealed that on the average the nine developed counties increased their county taxes to \$184.30 per person or 11.52 times.

Undeveloped counties started with a higher average per capita local tax bill, \$21.60, but increased only 8.80 times to \$190.10. The Oahe Project counties varied in the level of taxes per person as with other types of data. The average tax bill in Sioux County was only \$64.84 per person in 1967 compared to \$296.06 per person in Sully County.

Total property taxes increased at a similar rate as per capita taxes. Total property taxes increased 10.89 times in developed counties during the 25 year study period and 7.21 times in undeveloped counties. Property tax increases varied considerably between counties. Grant County, North Dakota had total property taxes which increased 2.9 times during the 25 year period. Corson County, South Dakota increased taxes 17.9 times, from a total of \$51,000 to \$913,000, during the study period.

Total county expenditures are examined for any differences between the developed areas and those without water development projects. Developed counties increased county expenditures 13.21 times, based on the average of the nine study counties. During the same period, 1942 to 1967, the undeveloped counties increased their taxes only 9.25 times. Some counties, such as Perkins, increased their total expenditures at a much larger rate. Others, such as Ziebach County, increased their expenditures less than five times during the twenty-five year period.

A more detailed look at expenditures was made to see if any particular increases or decreases resulted from water projects. Police protection for the water oriented counties cost 10.90 times more during the 1942-1967 study period. Undeveloped counties had lower expenditures for police protection in both 1942 and 1967. However, the rate of increase was somewhat more than the developed areas. Expenditures grew thirteen times compared to nearly eleven times for the developed counties.

Public welfare expenditures have not increased nearly as much as more respectful county expenses such as education and police protection. Developed counties increased their welfare expenses only 1.15 times during the 25 year study era. Thus welfare expenses certainly did not keep pace with inflation. Undeveloped counties managed to reduce their welfare expenses by a factor of .80 times. Only four undeveloped counties increased their welfare

costs and four developed counties reduced their expenses, although the nine counties studied increased their expenditures on the average.

Highway expenses increased for both groups of counties. Developed areas spent ten times more on roads and highways compared to an eight time increase for undeveloped areas. All the counties increased their operations significantly in this area. The water development counties spent less money than undeveloped counties prior to the Oahe Project. By 1967 the counties adjacent to Oahe reservoir were spending more money. Whether or not the increase was related to new roads resulting from the huge reservoir is unknown.

Health and hospital expenses increased for both sets of counties. Oahe Project counties spent 7.61 times more and non-project counties spent 7.94 times more. The increases are somewhat deceptive in that in 1942 eight counties out of eighteen reported no health and hospital expenses. Also, in 1942, four other counties reported expenditures only one or two thousand dollars. In 1967 five counties reported no outlays for health and hospital care and seven counties reported small expenses of \$2,000 or less. However, the average figures are distorted by an \$80,000 expenditure in this category by Sully County (developed) and a \$184,000 outlay by Faulk County (undeveloped). Without these very large expenditures, the average increase for the remaining eight counties is

small, less than a two fold increase for the twenty-five year period.

The most dramatic increase in county expenses in all the study areas has been in the area of education costs. Developed areas increased school spending 584 times during the study period and non-developed areas 350 times. Increases in the educational level and number of high school graduates have not been as dramatic as the increased expenditures. The average developed county in pre-Oahe Dam days spent less than the control counties now considered undeveloped. In 1967 the Oahe counties spent nearly \$150,000 more per county than did non-developed areas. It is interesting to note that other types of expenditures have not been comparable to increased education expenses.

In all of the human resource development indicators the Oahe project counties have spent more money for services and have increased taxes more. In most of the water projects differences have been smaller among individual counties. The differences have not been as clearly delineated with the Oahe project. The counties varied more in their census data, probably because of the minority populations in some areas and their lower economic and educational levels. Oahe reservoir is a very large project which due to its size may have had a more varied effect on the surrounding area than other projects. Conclusions are difficult to arrive at, and relationships between water developments and local development are far from clear.

Human Resource Development
Indicators--1942-1967
Big Bend and Fort
Randall Dams

When total local taxes collected were compared between the two groups of counties, the rate of increase was faster for undeveloped areas. Starting with an average county tax bill of \$78,600 in 1942, the average undeveloped county rose 12 times to nearly \$1,000,000 per county. However, the average tax bill for developed areas was higher in 1942--\$132,803--and although it increased at a slower rate (8.5 times), the average bill remained higher--\$1,170,000 in 1967.

Per capita county taxes rose 8.7 times in developed areas during the 25 year study period. In 1942 the average per capita tax bill for the five developed counties was \$21.30, and this increased to \$185.70 by 1967. Undeveloped counties per capita tax bill went from \$15.80 in 1942 to \$198.40 in 1967--an increase of 12.56 times.

Expenditures were compared for five categories of public spending from 1942 to 1967. Police protection expenses rose twelve times in developed areas and thirteen times in non-developed counties. Starting at a lower level in 1942, police protection remained nearly one-third less in undeveloped areas in 1967. Public welfare expenses increased only slightly during the study period in both groups of counties. Welfare expenditures declined in six out of the ten counties studied. Two counties, Brule and

Aurora, more than doubled their welfare expenses and pulled the average up for all the areas. During the study period, public welfare expenses for South Dakota increased from 1.3 million to 1.9 million.

The health and hospital expenses are greatly distorted by large increases in two undeveloped counties, Douglas and Jerauld. In Douglas County expenses rose from \$3,000 to \$95,000 during the study era. In Jerauld County expenses rose from \$4,000 to \$219,000 during the same time period. The remaining eight counties experienced small increases, and in three cases small declines in expenses occurred.

Education expenses increased dramatically in both groups of counties. Developed counties averaged over a thousand fold increase, and undeveloped areas increased over 3,000 times. Both groups of counties reported spending less than \$1,000 per county in 1942. By 1967 developed counties averaged \$930,000 expenses for school and undeveloped counties spent over \$602,000 per county. During the same time frame, South Dakota's school expenses rose from \$112,000 to nearly \$15 million, a 134 fold increase. In 1967 state expenditures for education represented 58.6 percent of the total state expenses.

Human development indicators are not entirely clear. Developed counties averaged more expenses for police protection, welfare, highways, health and education than did undeveloped regions. Rates of increase were

nearly the same except for health and hospitals which were distorted by two counties and the massive increase in educational expenses. Taxes rose faster in undeveloped areas, but total taxes were less than the developed areas. Per capita, taxes were approximately the same for both groups. Both groups of counties were also nearly the same as the South Dakota state average for per capita taxes. Generally, the taxes and county expenditure data require more interpretation to be useful as development indicators.

Economic Indicators--
1950-1970 Oahe Dam

Median family income, a good indicator of economic development for individual families, grew at nearly the same rate for both study groups. Income information is available for the study area only from 1950 to 1970. During this period developed areas increased median family income by a factor of 2.96. Undeveloped area increased 2.93 times. Fairly large differences existed between individual counties but not between the average of nine counties. In 1950 family income was \$2,215 and \$2,219 in developed and undeveloped areas. By 1970 the developed areas increased slightly more--\$6,556 compared to \$6,498. Individual county incomes ranged from \$8,193 in Logan County, North Dakota (undeveloped) to \$4,738 in Ziebach County, South Dakota (also undeveloped). Logan County is east of the Missouri in more fertile farming country. Ziebach County,

Table 11.--Human Resource Development Indicators--South Dakota.

	Total Local Taxes	Per Capita County Taxes	Total Property Taxes
1942 U.S.	\$ 5,252 million	\$ 46.67	\$ 4,499 million
1967 U.S.	29,074 million	192.28	25,186 million
	5.54	4.12	5.60
1942 S.D.	8.38 million	14.27	7.94 million
1967 S.D.	60.90 million	134.14	34.10 million
	7.26	9.40	4.29
<u>Oahe Dam Project</u>			
1942 Ave. D.C.	76,100	16.00	75,700
1967 Ave. D.C.	860,200	184.30	824,800
	11.30	11.52	10.89
1942 Ave. U.C.	103,600	21.60	99,100
1967 Ave. U.C.	746,300	190.10	714,700
	7.20	8.80	7.21
<u>Big Bend & Fort Randall Dam Projects</u>			
1942 Ave. D.C.	136,800	21.30	126,000
1967 Ave. D.C.	1,170,800	185.70	1,113,600
	8.56	8.72	8.84
1942 Ave. U.C.	78,600	15.80	75,600
1967 Ave. U.C.	959,000	198.40	896,800
	12.20	12.56	11.86

Table 11.--Continued.

	Total County Expenditures	Expenditures for Police Protection	Expenditures for Public Welfare
1942 U.S.	\$ 7,351 million	\$ 354 million	\$ 702 million
1967 U.S.	66,648 million 9.07	2,609 million 7.37	3,927 million 5.59
1942 S.D.	9,399,000	229,000	1,271,000
1967 S.D.	107,100,000 18.10	1,084,000 4.73	1,889,000 1.48
<u>Oahe Dam Project</u>			
1942 Ave. D.C.	96,000	2,110	15,000
1967 Ave. D.C.	1,268,110 13.21	23,000 10.90	17,330 1.15
1942 Ave. U.C.	110,440	1,440	13,110
1967 Ave. U.C.	1,021,220 9.25	18,890 13.12	10,440 .80
<u>Big Bend & Fort Randall Dam Projects</u>			
1942 Ave. D.C.	139,000	2,800	13,200
1967 Ave. D.C.	1,649,200 11.86	34,000 12.14	13,500 1.02
1942 Ave. U.C.	114,600	1,800	5,800
1967 Ave. U.C.	1,236,600 10.79	24,400 13.56	9,200 1.59

Table 11.--Continued.

	Expenditure for Highways	Expenditures for Health & Hospitals	Expenditures for Education
1942 U.S.	\$ 1,469 million	\$ 844 million	\$ 2,434 million
1967 U.S.	4,510 million	3,283 million	28,534 million
	3.07	3.89	11.72
1942 S.D.	2,629,000	402,000	112,000
1967 S.D.	18,916,000	2,507,000	15,018,000
	7.20	6.24	134.09
<u>Oahe Dam Project</u>			
1942 Ave. D.C.	16,670	1,890	1,110
1967 Ave. D.C.	167,550	14,390	648,650
	10.05	7.61	584.37
1942 Ave. U.C.	17,440	3,330	1,440
1967 Ave. U.C.	140,670	26,440	505,330
	8.07	7.94	350.92
<u>Big Bend & Fort Randall Dam Projects</u>			
1942 Ave. D.C.	33,600	3,200	800
1967 Ave. D.C.	195,200	7,300	930,200
	5.81	2.28	1,162.75
1942 Ave. U.C.	22,800	2,800	200
1967 Ave. U.C.	167,800	69,600	602,000
	7.36	24.86	3,010.00

as mentioned before, includes an Indian reservation and considerable poverty.

In 1950 none of the counties studied had families reporting income in the \$15,000 to \$24,999 category. By 1970, 7.7 percent of the developed areas and 7.5 percent of the undeveloped areas reported family income in this range. The \$25,000 or greater income level also was not utilized in the 1950 census. In 1970, 3.9 percent of the Oahe counties and 4.1 percent of the non-water developed counties had incomes in this bracket. The individual counties ranged from 11.4 percent at the \$25,000 or greater income level in Logan County to no families reported in this income class in Sioux County.

The dependency ratio was changed by a factor of 1.75 times from 1940 to 1970 in Oahe counties compared to 1.69 times in non-developed areas. The dependency ratio ranged in 1942 from 44.0 to 74.2 in Oahe Project counties--an average of 63.5. This range in 1970 was 91.9 to 126.7 for an average of 111.0. Undeveloped areas ranged from only 52.4 to 70.6, an average of 60.8, slightly less than the other group of counties. In 1970 the control group of counties had a dependency ratio range of 89.7 to 113.6, an average of 103.00, 8 points less than the developed Oahe counties. The lower dependency ratio has some advantages to a society, however, the differences between the two study groups in South Dakota is small.

The number of people employed in manufacturing increased only slightly in both groups of counties during the 1940-1970 study period. However, the percentage of people employed in manufacturing remained small--1.6 percent in Oahe counties, 1.3 percent in the control counties. Oahe counties had only .4 percent of its population employed in manufacturing in 1940. The control group had .3 percent working in manufacturing at that time.

The number of people employed in agriculture, the basic industry of the area, declined in both study groups at nearly the same rate. In 1940 the average number employed in agriculture was 862 in Oahe counties, and this had declined .55 times to 482 in 1970. The same year the average in the control group of counties was 1,087 employed in agriculture. Thirty years later this fell .54 times to 598 per county.

The ratio of change for economic indicators was nearly the same between the Oahe project counties and the control group of undeveloped counties. The major indicators, median family income, dependency ratio and the number employed in agriculture and manufacturing were nearly identical. Considerable differences existed between income levels of individual counties. When the nine developed counties were compared to the nine undeveloped, these differences were relatively small. It appears that by 1970, a number of years after the completion of Oahe Dam, few economic differences could be found between projects

adjacent to the development and similar counties removed from the immediate impact area.

Economic Indicators--1950-1970
Big Bend and Fort Randall Dams

The economic data which was evaluated was available only from 1950 to 1970. Median family income rose substantially in all ten counties studied during the twenty year period. Developed counties had a higher median family income in 1950 than did undeveloped counties. However, this income increased only 2.83 times during the next twenty years when the undeveloped counties increased the median family income 3.16 times. In 1970 undeveloped counties had an average income \$275 higher than the developed counties. Both groups were \$1,000 less than the South Dakota state median income level of \$7,490. Only three counties out of ten exceeded the state average in 1970.

The percent of the population with incomes of \$3,000 or less declined in both study groups and in all ten counties. The rate of decline was .35 for developed areas and .30 for undeveloped counties. In 1970 developed counties had slightly more people (22.9 percent) in this income category than did undeveloped counties (19.7 percent). The State of South Dakota had 15 percent of its population in this income level the same year. Only two counties, Lyman and Tripp, had fewer people in the low income class than the state average.

The \$10,000 to \$14,999 income level grew substantially in all counties studied. The five developed counties had an average of 16.6 percent of the population in this class in 1970 which was an 8.30 increase from 1950. The 5 control counties increased 5.87 times to an average of 14.1 percent of their population with an annual income level of \$10,000-14,999.

The last two income groups were not designated in the 1950 census. The \$15,000-24,999 income level had 6.8 percent of the developed counties' families with this income in 1970 compared to 7.3 percent in the control counties. The highest income level denoted in 1970 was family income of \$25,000 or greater, and there were 2.5 percent represented in developed areas and 1.9 percent in undeveloped areas. Aurora County, was the only county of the ten examined with no families in this income class. Without Aurora County, the average of the remaining undeveloped counties would have been nearly the same percentage of families in this income class as the developed counties. The statewide percentage was 2.7 for this category and it was equalled or exceeded by four out of the ten counties.

The number of people employed in the field of manufacturing is one indicator of development. The water development counties had 1.8 percent of their adult population employed in manufacturing in 1970 compared to 1.6 percent in undeveloped areas. Both sets of counties

increase the percentage of working population in manufacturing over three times during the study period. In 1970 the State of South Dakota reported 7.4 percent of its working population employed in manufacturing. However, in 1970 developed counties averaged thirty-four persons and undeveloped areas twenty-six persons employed in manufacturing. Employment in agriculture has declined during the thirty year study period. Both groups of counties have approximately one-half the number of people employed in agriculture in 1970 as in 1940. Developed counties averaged 710 people employed in this manner, or 37 percent of the total number of people employed. Non-developed counties reported 650 people employed in agriculture or 40 percent of the total work force.

Overall income levels and relative improvements in income were greater in undeveloped counties than developed counties. Differences, however, were small. Undeveloped and developed counties were nearly identical with respect to dependency ratios. The developed counties had slightly more people employed in manufacturing, on the average, but the difference was small, averaging only eight people per county. All the counties studied lagged behind the state average in manufacturing employment. Both groups of counties and all ten counties had a decline in people in agriculture. Differences between the two groups were small in nearly all the development indicators examined.

Table 12.--Economic Indicators--South Dakota.

	Median Family Income	% Families/ Income Less Than \$3,000/Year	% Families/ Income \$3,000- 4,999/Year
1950 U.S.	\$ 3,096	48.4	33.7
1970 U.S.	9,586	10.3	10.0
	3.10	.21	.30
1950 S.D.	2,771	54.6	28.9
1970 S.D.	7,490 (45th)	15.0	15.0
	2.70	.27	.52
<u>Oahe Dam Project</u>			
1950 Ave. D.C.	2,215	62.8	19.8
1970 Ave. D.C.	6,557	17.9	17.7
	2.96	.28	.89
1950 Ave. U.C.	2,219	62.1	20.2
1970 Ave. U.C.	6,498	19.9	17.1
	2.93	.32	.85
<u>Big Bend & Fort Randall Dam Projects</u>			
1950 Ave. D.C.	2,233	63.9	18.8
1970 Ave. D.C.	6,309	22.9	16.5
	2.83	.36	.88
1950 Ave. U.C.	2,075	65.4	20.7
1970 Ave. U.C.	6,575	19.7	16.9
	3.17	.30	.82

*County income data not available in census until 1950.

Table 12.--Continued.

	% Families/ Income \$5,000- 6,999/Year	% Families/ Income \$10,000- 14,999/Year	% Families/ Income \$15,000- 24,999/Year*
1950 U.S.	12.1	3.1	. .
1970 U.S.	11.9	26.6	16.0
	.98	8.58	. .
1950 S.D.	9.5	2.8	. .
1970 S.D.	16.2	20.3	8.8
	1.71	7.25	. .
<u>Oahe Dam Project</u>			
1950 Ave. D.C.	5.8	4.5	. .
1970 Ave. D.C.	17.8	17.2	7.7
	3.07	3.82	. .
1950 Ave. U.C.	6.6	3.4	. .
1970 Ave. U.C.	17.3	15.6	7.5
	2.62	4.58	. .
<u>Big Bend & Fort Randall Dam Projects</u>			
1950 Ave. D.C.	7.6	2.0	. .
1970 Ave. D.C.	16.0	16.6	6.8
	2.11	8.30	. .
1950 Ave. U.C.	6.4	2.4	. .
1970 Ave. U.C.	18.0	14.1	7.3
	2.81	5.87	. .

*1950 upper income levels listed only as "\$10,000 or more per years."

Table 12.--Continued.

	1950-1970* Percent Families With Income \$25,000 or More/Year	1940-1970 Dependency Ratio	Number Employed in Manufacturing	Number Employed in Agriculture
1940 U.S.	. .	92	10,573,000	8,372,000
1970 U.S.	4.6	62	19,393,000	3,462,000
	. .	.67	1.83	.41
1940 S.D.	. .	53	9,269	98,294
1970 S.D.	2.7	73	16,000	52,856
		1.38	1.73	.54
<u>Oahe Dam Project</u>				
1940 Ave. D.C.	. .	63.5	15.0	862
1970 Ave. D.C.	3.9	111.0	28.0	482
	. .	1.75	1.87	.56
1940 Ave. U.C.	. .	60.8	13.0	1,087
1970 Ave. U.C.	4.1	103.0	17.0	598
	. .	1.69	1.31	.55
<u>Big Bend & Fort Randall Dam Projects</u>				
1940 Ave. D.C.	. .	58	29.0	1,372
1970 Ave. D.C.	2.5	109	34.0	710
	. .	1.88	1.17	.52
1940 Ave. U.C.	. .	55	23.0	1,176
1970 Ave. U.C.	1.9	105	26.0	650
		1.91	1.13	.55

*1950 upper income level listed only as "\$10,000 or more per years."

STATE AND NATIONAL INDICATORS

Indicators of change have been discussed on a county level for both developed and undeveloped areas in close proximity to Missouri River water development projects. The main focus of this study was to examine local changes that might be related to the main stem Missouri Basin projects. However, it is useful to examine the statewide trends for Montana, North and South Dakota concerning the various development indicators. Some national trends such as increasing population and declining farm numbers are compared not only on a local level but also statewide and nationally.

The total number of farms in the United States dropped by over 3.5 million from 1930 to 1969. Nationally the total number of farms increased in the 1930 and 1935 census. By 1940 the decline in farms was nearly 100,000 annually. During the early 1950s the total number of farms dropped over 200,000 annually, and continued dropping at a rate over 100,000 farms a year until 1967.¹ During the

¹U.S. Bureau of the Census, Statistical Abstract of the United States (Washington, D.C.: U.S. Government Printing Office, 1971), Table 924, p. 573.

study period for Fort Peck Dam, Montana's number of farms dropped from 47,495 in 1930 to just under 25,000 in 1969. The rate of decline was .53, somewhat less than the national farm rate of .43. (For state and national indicators of change see appendix,) Montana's undeveloped counties near Fort Peck lost farms at nearly the statewide rate. However, the developed counties near Fort Peck lost farms at a rate of .35 between 1930 and 1969, faster than the state or national rate.

North Dakota and South Dakota lost farms in the water development counties at the same rate of .63 during the 1940 to 1969 study period. This rate was more favorable than the national rate of .45. The study counties, both developed and non-developed, in the Dakotas lost farms at nearly the same rate as the states.

The average farm size in the United States has been going up as the number of farms has declined. Between 1930 and 1969 the average farm increased nearly 2.5 times and between 1940 and 1969 2.24 times. During the 39 year study period, Montana increased its average farm size 2.68 times. The Fort Peck Dam area developed counties increased their farms nearly five times, far more than the national and state averages. Undeveloped Fort Peck Dam counties increased farms 3.5 times.

North and South Dakota increased their average farm size less than the national average, approximately 1.8 times. However, Oahe Dam counties increased faster than

the state or national average. Big Bend, Fort Randall, and Garrison Dam developed counties increased farm size faster than the state average but not as fast as the national average.

The rapid increases in the average value of land and buildings of farms is one of the dramatic aspects of the agricultural indicators section. In the United States the average value of land and buildings on a typical farm was \$7,614 in 1930. This value had declined to \$5,518 by 1940 but increased 13.77 times by 1969 to over \$76,000. The Montana average farm value in 1969 was twice as high as the national average. The typical Montana farm was valued at \$150,000 in 1969. North and South Dakota's land and building value was higher than the national average but not nearly as large as Montana's. The four sets of developed counties studied increased at a faster rate than the state or national rates. The value of land and buildings for the four sets of undeveloped counties increases less rapidly than the developed counties but faster than state and national averages.

The average value of farm products sold per farm was \$1,835 in 1930. This value had dropped to \$1,283 by 1940 for the United States. The average farm sold \$25,680 worth of products in 1969, a twenty fold increase since 1940. The rates of increase for all three states studied were less than the national average. However, the value of products sold was higher for Montana than the national

average, but \$2,000 less per farm in South Dakota and \$9,500 less per farm in North Dakota.

Montana counties appeared to improve most rapidly in the farm sector of the three states studied. However, due to droughts during the 1930 study period, developed Montana counties averaged only \$121 worth of farm products and undeveloped counties only \$165 worth. By 1969 this value had increased rapidly until both sets of counties, those developed and undeveloped, were near the statewide average. The Dakota counties studied lagged behind the states' average for farm products sold in 1940. By 1969 North Dakota counties still lagged behind the statewide average and far behind the United State average.

South Dakota's counties sold fewer products than the statewide average in 1940. By 1969 the developed counties studied had exceeded the state average in this category but not the national average. Undeveloped counties in 1969 were still behind both state and national averages for farm products sold.

The agricultural indicators for the number of irrigated farms and the area irrigated per farm is more difficult to interpret. First the number of irrigated farms has declined nationally but not nearly as rapidly as the total number of farms. From 1930 and 1940 until 1969 the average area irrigated per farm increased by 3.0 and 2.5 times. South Dakota increased in number of irrigated farms slightly and North Dakota stayed nearly the same.

During its 1930-1969 study period, Montana lost over 2,700 irrigated farms.

The results for the four sets of study counties are more difficult to interpret, often because of the small sample size (see appendix). Frequently the average county had ten or fewer irrigated farms, especially in South Dakota.

In the Fort Peck Dam area the developed counties increased the number of irrigated farms, but the average non-developed county still had more irrigated farms in 1969. The average area irrigated per farm increased nationally and in each of the three states studied. All the sets of counties increased at widely different rates. The small sample of irrigated farms tended to distort differences in the average acreage irrigated per farm.

Median age of the population of the United States was 28.3 years in 1970, 29.0 years in 1940 and 26.4 years in 1930. The differences between the three have been small. However, the sets of study counties all had a younger median age than the state or national figure. By 1970 all the sets of counties except those developed counties adjacent to the Oahe project had a median age of the population older than the state and national averages.

The youthful portion of the population, expressed as a percentage of the total 14 years or less, was 28.5 for the nation in 1970, 25.0 in 1940, and 29.4 in 1930. As for the individual states, Montana dropped from 29 percent

to 27 percent during its 40 year study period. North Dakota had a youthful population of 29.6 percent in 1940 and 29.7 percent in 1970. South Dakota increased its population in the category of 14 years and under from 27.7 percent to 30.1 percent during the 1940-70 study period.

Nationally nearly 10 percent of the population was 65 years or older by 1970. This percentage had been only 5.4 in 1930 and 6.8 in 1940. In 1930 Montana had slightly fewer older people than the national average and by 1970 was equal to the United States figure.

North Dakota had fewer old people in 1940 but by 1970 exceeded the national average. South Dakota, nearly equal to the national average for older people in 1940, was 2.2 percent higher by 1970. The sets of counties studied tended to have more older people than the national average in 1970. The exceptions to this were the Oahe Dam developed counties, largely because of several Indian reservations.

Three measures of education were studied in the research project: first, the percent of the population twenty-five years or older with four years of high school completed; second, was the percent of the population twenty-five years or older with four years of college completed; and finally, the median school years completed. In 1970, 52.3 percent of the adult United States population had a high school education. This was a 3.74 relative increase since 1940 when only 14 percent of the population was this

well educated. At the start of the study period, Montana had a higher percentage of high school graduates than the national average, and it increased at nearly the same rate as the national rate and has remained higher in 1970.

North Dakota was far off the national pace in 1940 with only 10.8 percent with four years of high school. Improving at a rate higher than the national average, North Dakota was only slightly below the United States average by 1970. South Dakota had 12.9 percent high school graduates in 1940 and 53.3 percent in 1970.

During this three decade study period, most of the Missouri River counties, both developed and undeveloped, lagged well behind national and state high school education levels. By 1970 many sets of counties were lagging far behind state and national education levels. Individuals with four years of college were 5 percent of the adult population in the United States in 1940. In 1970 the percentage of persons completing four years of college was 10.7. The rate of increase was 2.14 compared to 3.74 for the relative increase in high school graduates. Montana's college level was nearly equal to the nation's in both 1940 and 1970. North and South Dakota lagged behind in 1940 and remained behind the United States average in 1970. As might be expected the rural Missouri River counties lagged far behind state and national educational levels. In most sets of counties the percentage of the population with a college education was roughly one-half the national average.

The last education measure to be considered was median school years completed. The United States average was 8.6 years in 1940; 12.1 years in 1970. Montana's median school years completed was 8.7 years in 1940 and 12.3 years in 1970. North Dakota was 8.5 years completed (1940) and 12.0 years (1970). In South Dakota the number of median school years completed was 8.5 in 1940 and 12.1 in 1970. On a county level the median school years were, as expected, less than state averages. Interestingly while most sets of rural counties were less educated in 1940 than the national average, the difference was small. By 1970 the rural river counties had fallen further behind state and national levels for median school years completed. Differences between developed counties and undeveloped counties were generally small.

Three classifications of population were compared. These were the percentages of the total population considered rural non-farm, rural farm, and the percentage of the population classified as urban. The population of the nation considered rural non-farm in 1970 was 5.2 percent. This represented a decline from 20.6 percent in 1940 and 19.3 percent in 1930. The three states all had higher rural non-farm populations in 1970 than the nation. Montana's 12.2 percent in 1970 was down from 28.4 percent in 1930. In contrast the Fort Peck Dam counties had increased the percentage of their population in this category. The shift in this case was from rural farm areas to rural

non-farm areas. The shift nationally has been a shift from rural non-farm to urban.

North Dakota's small town population dropped only slightly from 28.4 percent in 1940 to 22.8 percent in the last census year.

Garrison Dam counties had a major increase in the rural non-farm population. In South Dakota from 1940 to 1970 the small town portion of the population dropped from 27.7 percent to 19.8 percent. All four sets of study counties in South Dakota increased the rural non-farm population.

Nationally the rural farm population only dropped from 24.6 percent to 21.3 percent from 1930 to 1970, and from 22.9 percent in 1940. Montana's rural population dropped only slightly during the forty year period, and it remained much higher than the nation's. Fort Peck counties dropped dramatically during the 1930-1970 period. In the case of the project counties, the decrease was from 75.2 percent rural to only 39.5 percent. North Dakota, during its thirty year study time-frame, dropped from 51.1 percent to 32.9 percent. The Garrison Dam area has remained more rural than the State of North Dakota. South Dakota has followed the same pattern as North Dakota. The state has rapidly lost rural people but still has a higher percentage than the nation. The study counties remain more rural than the state average.

The percentage of the United States population considered urban rose from 56.1 in 1930 to 73.5 in 1970. Montana increased at a faster rate from 33.7 percent to 53.4 percent. North Dakota went from 20.6 percent urban to 44.3 percent. During the same 1940 to 1970 era, South Dakota increased its urban population from 24.6 to 44.6 percent. Increases in the study counties are difficult to interpret. Most counties had no urban areas in 1930 or 1940. By 1970 often only one county out of a set of study counties had an urban population. The average urban population is frequently based on one city in several counties.

Birth and death rates per 1,000 population were compared in the study. The national birth rate was 17.5 in 1958, and the death rate was 9.5 in 1969. The death rate has dropped somewhat since 1930 and 1940. The birth rate was nearly the same in 1940 and 1968, after being quite high during the 1950s.² Montana's birth and death rates have been slightly less than the nation during the 1930-1970 study period. The Fort Peck area counties had a low death rate in 1930--5.2 per 1,000 for developed areas and 6.7 per 1,000 in non-developed areas. This probably reflected the relatively young population from the recent homesteading period in Eastern Montana.

²U.S. Bureau of the Census, Statistical Abstract of the United States, Table 57, p. 48.

North Dakota's birth and death rates have been similar in recent years to the national average. South Dakota has had a birth rate the same as the national average and a higher death rate. County data for South Dakota's projects are somewhat inconsistent. However, generally the death rate has been higher than the state or national average, a reflection of the poor health of the Indian population.

Population is considered by some to be one of the best indicators of development. Nationally the total population has increased rapidly. In 1930 slightly over 123 million people were in the United States, and this figure increased to 131.7 million in 1940 and 203.2 million in 1970. During the forty year Montana study period, the state's population rose by a factor of 1.29 compared to 1.65 nationally. North Dakota lost population from 1940 to 1970 dropping from 641,935 to 617,761. South Dakota, during the same time period, gained only slightly--about 13,000 for a factor of 1.04.

From 1930 to 1970 Montana's rural study areas lost people, and developed Fort Peck Dam counties lost at a faster rate than undeveloped areas. In North Dakota's Garrison Dam region, developed counties had an average relative loss of .81 or 2,000 people per county. During the same time the undeveloped areas gained population, a relative increase of 1.31. During the same period all of

South Dakota's sets of counties studied--both developed and undeveloped--lost population.

Montana's tax data is available only for the 1932-1967 period. Nationally total local taxes increased 618 times from 1932-1967, while Montana increased its total local tax bill only 2.79 times. The study counties increased faster than the state rate.

North and South Dakota's tax information is taken from 1942 until 1967. In the United States local taxes rose 5.54 times during the twenty-five year period. North Dakota increased only 2.61 times; South Dakota 7.26 times. South Dakota had a very small 1942 tax base of \$8.3 million compared to \$19.4 million for North Dakota with similar population. The study counties exceeded state and national rates of increase.

Local taxes were compared on a per capita basis. Nationally from 1932 to 1967 taxes increased from \$54.53 to \$192.28 per person. Montana's per capita taxes rose from \$9.80 to \$163.00 nationally. From 1942 to 1967 local taxes increased nationally 4.12 times, from \$46.67 per person to \$192.28. North Dakota increases its per capita taxes from \$41.43 to \$161.60. South Dakota, at the same time, increased taxes from only \$14.27 per person in 1942 to \$134.14 in 1967, a 9.4 fold increase. In South Dakota by 1967 the study counties had higher per capita taxes than the state's average. Garrison Dam counties' taxes rose

nearly 7 times during the 25 year period compared to a 4 fold increase for North Dakota.

Total property taxes nationally rose 6 times from 1932 to 1967. Montana's property taxes increased 4.77 times during the same time frame. During the 1942-1967 study period, property taxes increased 5.6 times nationally, 2.7 times in North Dakota and 4.3 times in South Dakota. Montana's property tax bill, \$112.2 million in 1967, was considerably higher than North Dakota's \$25.8 million bill and South Dakota's \$34.1 million property tax total.

During the 1932 to 1967 period, total local government expenditures rose nationally nine times, but in Montana the relative increases over 1932 levels were only slightly over six times. North Dakota's local government expenditures increased 16.4 times and South Dakota's expenditures increased 18.1 times during the 1942-1967 era. During the same time period the national average increase in local government expenditures was slightly over nine times. Total expenditures for each of the three study states were roughly comparable in 1967. North Dakota spent \$169.4 million, South Dakota 170.1 million, and Montana \$180.9 million.

Police protection expenditures increased 8.6 times nationally from 1932 to 1967 and 7.4 times from 1942 to 1967. Montana's expenditures appeared to drop during the thirty-five year study period. However, the 1932 census data was listed as "Protection of personal property" and included fire protection as well as police protection.

North Dakota increased its police protection expenses nearly four times during the twenty-five year era while South Dakota increased its expenses in this area nearly five times. The study counties generally increased their police protection at a much higher rate than the state average.

Public welfare expenses increased 10.6 times nationally in the thirty-five year Fort Peck project study period. However, the 1932 data included expenditures for "charities, hospitals, and corrections." Montana, during this era, increased its welfare expenses only 1.8 times. The United States total welfare expenses rose 5.6 times during the 1942-1967 study period. North Dakota spent 1.7 times more; South Dakota 1.5 times more. Generally county welfare expenses rose at a much slower rate than national averages, partly because of the declining population in the area.

Highway expenses rose in the United States 5 times from 1932 to 1967 and 3 times during the last 25 year time frame. Montana increased its expenses at a slower rate of four times. During the last 25 year period, North Dakota increased its highway expenses 4.23 times, and South Dakota increased its highway expenses 7.20 times. Without exception the counties studied increased highway expenses faster than the national rate.

Expenditures for health and hospitals rose 13.6 times in the United States from 1932 to 1967. During the thirty-five year investigation period, Montana increased

its expenses nearly twelve times. North Dakota during the 1940-1970 study period, increased its expenses for health 14.80 times; South Dakota, during the same time period, increased its expenditures 6.2 times. County data varied greatly among individual counties and sets of counties.

Expenses for education have increased most dramatically of all local expenditures. Nationally the increase was over 14 times from 1932 to 1967 and 11.7 times from 1942 to 1967. Montana increased its education spending 7 times in the 35 year period. North Dakota increased its school spending 71 times. The Garrison Dam counties spent 421 times more for education from 1942 to 1967, and during the 35 year period undeveloped counties nearby spent 593 times more for education.

South Dakota increased state spending 134 times in 25 years. Oahe Dam developed counties spent 584 times as much in 1967 as in 1942. Big Bend and Fort Randall Dam developed counties spent 1,162 times more in 1967 than in 1942. The average undeveloped county nearby had a 3,000 fold increase in school expenses. Undoubtedly some distortion has taken place because of school consolidation, federal school expenditures for Indians and other factors. However, a striking increase in education spending has occurred.

County economic data has been available in the United States Census only since 1950. The 1950-70 period in the United States was a time of three fold increase in

median family income. By 1970 the median family income in the United States was \$9,586. During the same time frame, Montana family income increased 2.6 times and in 1970 was \$8,509, or thirty-third in the United States. North Dakota with a family income of \$7,836 in 1970 was fortieth in the United States. South Dakota was the lowest of the three states and forty-fifth in the United States, with a family income of \$7,490 in 1970. All sets of counties studied lagged behind state and national median income levels in 1970.

The lowest level of income examined was family income of less than \$3,000 per year. The percentage of families with this income in the United States was 48.4 percent of the total population in the year 1950 and 10.3 percent in 1970. Montana's families in the lowest income category comprised 10.5 percent of the total in 1970, which was down from 43.4 percent in 1950. North Dakota families in the lowest income category dropped from 51.2 percent in 1950 to 12.1 percent in 1970. South Dakota has the highest percentage of families in the poverty income bracket--54.6 percent in 1950 and 15.0 percent in 1970.

The percentage of families with an annual income of \$3,000-4,999 per year in the United States was 10.0 percent in 1970. Of the three states studied, Montana had the lowest percentage of families in this category--11.5 percent in 1970. North Dakota had 14.3 percent and South

Dakota 15.0 percent of their families in this income level during the last census year.

The \$5,000-6,999 income category followed the same pattern as the two lower categories, with 11.9 percent of families in the United States at this income level. All three study states had a higher percentage of families in the \$5,000-6,999 income category than the national percentage. The next family income category examined is the \$10,000-14,999 bracket. In this income range Montana, North and South Dakota begin falling behind the national standard. Montana retained the most favorable position of the three states studied. As with the other income categories, the counties studied were in a less favorable economic position than the states. The \$15,000-24,999 per year family income bracket was examined only for the 1970 census year. Prior to 1970 the upper income category was not designated in the county census data. Nationally 16 percent of the total families had incomes in this category. Once again the same pattern continued. All three states lagged behind the national average with Montana being in the best relative position with 10.7 percent compared to 9.9 percent in North Dakota and 8.8 percent in South Dakota.

The final income category, a family annual income of \$25,000 or more, was reported by 4.6 percent of the United States families. Montana and North Dakota report only 2.9 percent of their families with this income, and

South Dakota reports only 2.7 percent. Once again the water project counties that were studied were far behind the United States average and usually behind state averages.

The dependency ratio--the proportion of those under 14 years, and 65 years and older, to those 14 to 64 years old--has been expressed as a percentage. Nationally the dependency ratio was 62 percent in 1970. Montana's dependency ratio was 60.7, North Dakota's 68 percent, and South Dakota's 73 percent in 1970. In all cases the counties studied had higher dependency ratios than the states.

The number of people employed in manufacturing is one measure of successful development. Nationally those employed in manufacturing increased 1.37 times from 1930 to 1970 and 1.83 times 1940 to 1970. During Montana's study era those employed in manufacturing declined in number. North and South Dakota increased during their thirty year study period at nearly the same rate as the nation as a whole. However, North Dakota in 1970 had the lowest percentage of its working population engaged in manufacturing of all fifty states. South Dakota was ranked forty-fifth of fifty states.

The number of people employed in agriculture was compared among the three states. During the 1930-1970 period those employed in agriculture were reduced by approximately two-thirds. Montana's agriculture employment dropped by a factor of .37, North Dakota's by a factor of .41, and South Dakota's by a factor of .54.

SUMMARY AND RECOMMENDATIONS

Summary

Social and economic accounts available from census data were used to analyze the developed region. Water development effectiveness was measured by comparative analysis to identical state and national human accounts. The same set of accounts was developed for the Missouri Breaks region. In this way expected social and economic changes were estimated based on a ex post evaluation of the Middle Missouri region.

Advocacy resource development is concerned with a client who is under-represented in the decision making process. In this study, the rural population in the northern Great Plains was the client. In urban advocacy planning the client nearly always asks for assistance or asks to participate in the decision process. In the case of this research the concept of advocacy resource development was tested. The client was selected by the researcher and did not request assistance. However, the space of the plains with its isolation demands a different advocacy approach than that used in a heavily populated urban area.

The costs in time and space as well as budget limitation provides additional rationale for this approach.

Throughout the northern Great Plains there appeared to be very little difference between regions when social, economic, and demographic accounts were compared. The differences that did exist between the undeveloped areas and the developed regions could be explained by environmental or institutional differences. For example, one area might have more irrigated farms but the region was especially suitable for such developments. Another region might have gained slightly in population while other areas lost people. Closer examination would reveal an oil field or missile site in the area that was responsible for the increased population.

Notable differences in the accounts were found when compared with state and national accounts. An examination of the agricultural accounts revealed that the number of farms in the Middle Missouri had dropped faster than the state and national average. At the same time, the average farm size had increased faster than the state and national accounts. However the value of farms (land and buildings) and farm products sold increased faster than the state and national averages. Irrigation data were mixed in the study area, largely because of the small role that irrigation plays in the regions agricultural economy. In 1969, North

Dakota had only three tenths of 1 percent of its farm land irrigated and South Dakota only 1 percent.¹

Demographic indicators that were compared indicated that the study region's population was aging faster than the state and national population. The Middle Missouri area had more younger people and more older people and therefore a higher dependency ratio. During the study period the United States was having a rural to urban shift in the population. The counties in the study area were nearly lacking in cities and rapidly losing population. Interestingly, the study area was also having a shift in its population, but the shift was rural to rural non-farm. Many people in the region were moving from farms to small communities of less than 2,500 people. Overall the population of both developed and non-developed regions declined while the national population increased 50 percent during the same study period (1940-1970). The states of North and South Dakota experienced only slight population increases during the study era. Other demographic accounts of interest was an increasing death rate for the study region in contrast to national trends. Also, while the education level rose throughout the study period, all measures of education achievement lagged behind national levels.

¹U.S. Bureau of Census, Census of Agriculture, 1969, Vol. IV, Irrigation, Table 11.

The Census of Governments provided data on local taxes and expenditures for what was termed human resource development indicators. Collectively, this account was an indication of the cost and investment in human resources. Local taxes, property taxes, and expenditures for education, highways, health, welfare and police protection were analyzed inter-regionally and also compared with state and national averages. Taxes rose at a faster rate in the study areas than the national average. However, the individual tax bill remained lower than the national average. Expenditures rose most rapidly for education, police protection, and highways. The lowest increase in expenditures for the study area was for public welfare, in notable contrast with national figures.

The economic accounts lagged far behind state and national average in all categories studied. The ratio of change for the economic indicators, while improving during the study period, had not kept pace with the same income improvements nationally. Two categories of employment were compared. Agriculture, the primary industry in the study region, declined at approximately the national rate. Manufacturing employment was expected to increase because of the cheap hydroelectric power attracting new industries. The developed region in 1970 still had only a handful of people employed in manufacturing. The water development projects did not attract any new industry.

Essentially the inter-regional differences, between developed and undeveloped areas, were unchanged by the water developments. The relative differences between the study region and state and national development indicators also remained essentially unchanged. In nearly every important human category of development; family income, education, dependency ratio and population the study region was in an inferior position to the state and national indicators. The rural regions social and economic accounts were inferior prior to the construction of the Missouri main stem dams. The same social and economic measure illustrate the same inferior position after construction of dams. The region immediately adjacent to the water development projects do not appear to benefit significantly according to the social and economic indicators studied. Apparently the primary benefits of the water project, after the construction phase, were exported to Eastern and downstream regions. Flood control benefits undoubtedly accrued to the flood plains of the lower Missouri. Navigation benefits reached no farther upstream than Yankton, South Dakota, the new head of navigation on the river. Most navigation on the river takes place between Omaha and the Mississippi. Hydroelectric power did not attract industry but was transmitted to existing cities and industrial centers. Planned irrigation projects have never been authorized by Congress and those now considered will benefit eastern North and South Dakota and not the Middle Missouri.

Recreation benefits also have gone largely elsewhere. The lack of nearby population centers and the Great Plains space have inhibited this water development benefit. Most of the huge reservoirs, with hundreds of miles of shoreline, have only a few boat launching sites, marinas and other recreation developments. Those who benefit from the projects are separate from those who bear the costs.²

One problem of the study was the definitional changes in the census data during the study period. For example, expenditures for police protection in 1967 included only those monies spent on police activities. To utilize this data for the Fort Peck project the 1932 census was consulted. In 1932 this information was included in a broader classification termed "expenditures for the protection of personal property." Fire protection and police protection were combined into the one expenditure category. Frequent definitional changes in the census made it impossible to use much potentially interesting data throughout the study period. The more recent Census of Agriculture includes information on recreation income. Unfortunately, this information was not available in the 1940 census. Family income data for counties was not available until the 1950 census. The 1950-1970 census data

²Robert H. Haveman, "Efficiency and Equity in National Resources and Environmental Policy," American Journal of Agriculture Economics, Vol. 55, 5 (December, 1973), 874.

was used despite the fact that most dams included in the study were completed or under construction in 1950. Whenever possible the census data utilized were taken from prior to the start of dam construction.

Fort Peck Dam construction began in 1933 and the next earliest census data were from 1930 or 1932. The other four dams studied were constructed in the post World War II period. Most of the information was taken from the 1940 census for the last dams constructed. The most recent census information illustrates the problem of gaining data from a uniform time period. The most recent Census of Governments available with county data was the 1967 census year. Most recent birth rates date from 1968, death rates from 1969. The latest Census of Agriculture data were gathered in 1969 but detailed state information was not available until 1972. Social and economic information for counties was taken in 1970 but also was not available for use until 1972.

One of the difficulties in determining the impact of the reservoirs is the larger problem of migration from agriculture.³ The Great Plains environment, with all its limitations, and agricultural economic forces on a national scale have served to dwarf the water development impact. Over the last fifty years the Great Plains have gained

³Dale E. Hathaway, "Migration from Agriculture: The Historical Record and Its Meaning," American Economic Review, Vol. 49, 2 (May, 1960), p. 380.

population at the slowest rate of any major region in the United States. Most rural areas, including the Middle Missouri, have lost people for every census period the last fifty years. The open economic and social system in the study region contributed to the difficulty in determining what has happened as a result of the water projects. Dams and reservoirs had a marked influence on the region, but environmental limitations of climate, soil and rainfall were probably more important. The social costs of space, distance from markets, added transportation costs and the paucity of resources could not be overwhelmed by a dam, no matter how large. Short term inputs from the national economy probably had a regional impact for a short time. The long term impact, which this study tried to find an indication of, remains difficult to isolate from the larger social, spatial and economic issues.

The loss of some farm land, reportedly the best in the region, disruption of the established economic patterns combined with the exportation of water and power from the region drained some of the vitality from the study region. The nature of the census data and the research methods could not provide the precision to determine the negative impacts. The study did serve to illustrate some of the regional and social issues of concern to the development area. The need for a regional account for planning water development projects has been well established. The development planning process underwent a major revision

when the Water Resources Council developed new standards for such projects in 1973.⁴ The new standards for planning water resources include a regional account as well as encouraging public participation. The new regional standards would be concerned with population distribution, environmental factors, health, safety, educational, cultural and other impacts. Many of these factors were never considered by the Pick-Sloan Plan and never in a regional framework.

Normally a research project such as this would try to develop either a forecasting model for the area or a planning model. A forecasting model for the region would usually be a short term dynamic model that assumed the economy would be allowed to develop normally. Such a model's accuracy would diminish rapidly through time. The initial conditions would be replaced by a set of objectives in the planning model. The planning model would be a long term model, but the problem is to decide what parameters to change in order to realize the objectives.⁵ In this study a third approach was taken. The social accounts and regional development indicators were viewed from a local rural perspective. The concept was not a planning or

⁴Water Resources Council, "Principles and Standards for Planning Water and Related Land Resources," Federal Register, Vol. 38, 174 (September 10, 1973), p. 24782.

⁵Richard Stone, "The Social Accounts from a Consumers Point of View." Review of Income and Wealth, Vol. 12, 1 (March, 1966), p. 3.

forecasting model for a system of development accounts that could be used by the isolated population within the development region for their own objectives. The research was an attempt at providing a set of accounts to indicate water development effectiveness for a specific client. Due to the isolation of the researcher the information sought in the accounts was inferred rather than developed at the specific request of the client.

While a combination of counties were aggregated into a study region, the problem of analysis exists on an operation level.⁶ The data for regional development analysis is largely disconnected empirical information. The data illustrates how the study region and the northern Great Plains lags behind state and national development standards. Nevertheless, there are rationale very important to the client in the study area as to why that person remains while others migrate. The human accounts of a subjective nature are not included in the census data. In many cases the subjective values are more critical on the operational level for the individual but they are not included in the analysis.

The Water Resources Council, in establishing new development standards, made the criteria retroactive to all authorized but unfunded projects. Although the new

⁶Charles L. Leven, "A Theory of Regional Social Accounting," Regional Science Association, Papers, Vol. 4 (1958), p. 221.

criteria will be applied to the Missouri Breaks area, water policies are in the process of evolving and make analysis of the development effectiveness of past projects difficult.⁷ Traditionally, questions of economic development, including water developments, were addressed either to the national (macro) level of economic decision making or to the local (micro) level of the firm.⁸ A region such as the Middle Missouri is concerned with a third level of decision making. Even an isolated rural area, with mass media and intensified information flows, have increased awareness of such issues as a disparity in welfare levels. There has also been an increased sensitivity on the part of the national government to local and regional problems and pressures. The trend appears to be toward more regional consideration in national policies and objectives. Despite this the methodology for evaluating a local or regional perspective is not as well refined as a national analysis of the entire benefits and costs. In the case of the Pick-Sloan Plan, the entire program was agreed upon in two days. Fort Peck Dam was the result of one man's efforts, President Franklin Roosevelt. It now appears that the

⁷Gary D. Cobb, "Evolving Water Policies in the United States," Journal of Agriculture Economics, Vol. 55, 5 (December, 1973), 1003-07.

⁸Walter B. Stöhr, "Interurban Systems and Regional Economic Development," Commission on College Geography, Resource Paper No. 26, Association of American Geographers, 1974, p. 1.

eventual decision on the Missouri Breaks development will be made with more public input and with both environmental and regional considerations included in the process. The specific inputs into the final decision process will include a variety of human development considerations.

The population movement out of the study area provides one of the most sensitive indicators of social and economic change. The northern Plains rural areas have accounted for most of the immigration to the Upper Midwest cities.⁹ The high turnover of population affects schools, real estate markets, retail business, and other activities. Uncertainty is introduced into the planning process and public participation is diminished. The social costs of migration are often overlooked.¹⁰ Low levels of education as well as the lack of a substantial middle class while collar population, discourages industrial location. The age structure of the population, the lack of skills and education all combine to be a significant obstacle to the Middle Missouri's ability to follow national development trends.¹¹

⁹Russell B. Adams, "Population Mobility in the Upper Midwest," Upper Midwest Economic Study, Urban Report No. 6 (May, 1964), p. 32.

¹⁰John Riew, "Migration and Public Policy," Journal of Regional Science, Vol. 13, 1 (1973), 65-76.

¹¹G. Randolph Rice, "Poverty and Industrial Growth Patterns: Some Cross-State Evidence," Journal of Regional Science, Vol. 13, 3 (1973), 384.

Natural resources are usually considered fixed relative to a more mobile human population. In the case of the Missouri River, the mobility of the regional resources was enhanced by the water developments, resulting in a shift of natural resources out of the region. The analysis in the study revealed that the manufacturing employment did not rise. Traditional economic indicators remained relatively unchanged after the construction of the dams. Previously the river had been the center of commerce with cross river traffic fairly easy with bridges and ferryboats. After the water developments transportation was enhanced on the lower Missouri but greatly hindered in the Middle Missouri area. Prior to the Pick-Sloan Plan the Tennessee Valley Authority was the basic regional water development model. New technology and the irrational decision process used in authorizing the Missouri River development resulted in the transfer of substantial economic benefits out of the region where projects were located.

The implementation of the social accounting system into the decision process will be difficult. First, the process is undergoing rapid change. Second, the policy making is pluralistic and fragmented geographically. While the analysis used has potential application, it must be refined and expanded by some group or organization that has a material role in the eventual development decision for the Missouri Breaks.

Urbanization in the Upper Midwest, which includes the Middle Missouri, has taken place in a framework of local government units and urban settlement patterns laid down by the pioneers. The population shifts have been directed toward a few selected cities and trade centers.¹² The analysis of the study area strongly suggests that the water developments themselves need additional institutional and development changes to alter the historic patterns of growth. The temporary stimulation of dam construction has not overcome the more influential adjustments caused by the trade centers and national agricultural forces, as well as spatial and environmental limitations inherent to the region.

Since 1963, the combination of special interests involved in the development decision have created a stalemate over the Missouri River Breaks. The specialized role of government decision making has contributed to the stalemate. Each public and private sector organization involved in water policy appears to have a unique domain. In one sense, each group involved has a territorial sphere of influence and policy space. Alliances shift and various combination of allegiance change to intervene in the policy process. During the past decade the balance of power has shifted but not enough to break the stalemate. The Bureau

¹²John R. Borchert, "The Urbanization of the Upper Midwest 1930-1960," Upper Midwest Economic Study, Urban Report No. 2 (February, 1963), p. iv.

of Land Management, a policy lightweight in 1963, appears to have had the upper hand the last few years. Bills were introduced in Congress to make this part of the Missouri a wild and scenic river, administered by the Bureau. The emerging megapower on the horizon of policy making are the coal companies, recently moving into the Great Plains. Proposed power plants, fired by coal, will need enormous amounts of water. The Missouri River is the last large unappropriated source of water in the entire northern plains. The balance of power is still shifting in response to the coal companies. New alliances are forming, such as cattlemen and conservationists, that would have been impossible only a few years ago. The decision remains to be made for the Missouri Breaks. If a decision is to benefit the local population in human terms, a coalition of local and regional organizations will have to cooperate. Without the cooperation of public interest groups the development plan will favor those with economic interest in the development. Past experience has shown that the benefits and resources will be exported from this open land to more prosperous regions.

The outcome of the Missouri Breaks is still in doubt. The time lag between problem perception, policy response and program implementation appears to be getting longer. The regional problems and solutions encountered have been complex, amorphous and difficult to define concisely. Hopefully, the decision on the Missouri Breaks

will serve the needs of the population most affected by the development. One thing is clear, the solution to the out-migration and poverty will have to be far more complex and fundamental than the construction of one more dam on the Missouri River. The giant main stem dams have failed to alter the basic development problems in the northern Great Plains. In the case of the Middle Missouri, the large dam response was probably outdated as a regional development tool before the completion of the dams.

Recommendations

Advocacy resource development and the methodology to evaluate the human impact of water projects needs considerable research. This study raises many questions and illustrates unresearched problems. A few problems illustrated by this study are:

1. What is the local impact of water developments?
What indications of development are valid, how can they be measured and predicted?
2. What is the geographic distribution of benefits and costs not only in the construction phase but throughout the useful life of a project?
3. How can cultural differences and variations in social values be accounted for in the development process? The opportunity for public hearings falls far short and does not cope with this problem.

4. What are some ways to implement or institutionalize the advocacy process into resource development?
Humanization is needed in resource development but how can existing decision making be altered?
5. Research is needed in the un-development of large water projects. The most opportune rates of draw-down and phase out of reservoirs is entirely unknown. Physical and biological problems of un-development and re-development possibilities have not been explored. Yet some large projects may not be justified when a more precise measure of social costs and benefits are available.

APPENDIX

APPENDIX

Notes on Census Sources

Listed below are the sources of the data listed in the tables.

All census data are from U.S. Bureau of the Census, U.S. Department of Commerce.

Agriculture data:

Census of Agriculture, 1969, Vol. 1, Area Reports, U.S.G.P.O. 1972.

Montana--pt. 38, Sect. 2.

North Dakota--pt. 18, Sect. 2.

South Dakota--pt. 19 Sect. 2.

Number of farms, Table 1.

Average farm size, Table 1.

Average value land & buildings, Table 1.

Average value farm products sold, Table 4.

Vol. IV, Irrigation, U.S.G.P.O. 1973.

Number of irrigated farms, Table 11.

Average area irrigated per farm, Table 11.

Census of Agriculture, 1940, Vol. 1, West North Central Division, Pt. 2.

U.S.G.P.O. 1942, includes North and South Dakota.

Number of farms, State Table 1 and County Table 1.

Average farm size, State Table 1 and County Table 1.

Average value land & buildings, State Table 2 and
County Table 1.

Vol. II, The Western States, pt. 3, U.S.G.P.O. 1942.

Average value farm products sold, State Table 19
and County Table 17.

Vol. IV, Irrigation of Agriculture Lands, U.S.G.P.O. 1942.

Number of irrigated farms, State Table 1 and
County Table 1.

Average area irrigated per farm, State Table 1 and
County Table 1.

(Listed as "total area irrigated" which is divided
by number of irrigated farms to determine average per
farm.)

Census of Agriculture, 1930, Vol. III, The Western States,
pt. 3, U.S.G.P.O. 1932.

Number of farms, State Table 1 and County Table 1.

Average farm size, State Table 1 and County Table 1.

Average value land & buildings, State Table 2 and
County Table 2.

Average value farm products sold, State Table 3 and
County Table 3.

Number of irrigated farms, State Table 1 and County
Table 1.

Average area irrigated per farm, State Table 1 and
County Table 1.

Demographic DataCounty and City Data Book, 1972, U.S.G.P.O. 1972.

Median age, Table 1A & 2, Col. 15.

Percent of the pop. 65 yrs. or older, Table 1A & 2, Col. 14.

Percent of the pop. with 4 yrs. of high school, Table 1A & 2, Col. 26.

Percent of the pop. with 4 yrs. of college, Table 1A & 2, Col. 27.

Median school yrs. completed, Table 1A & 2, Col. 24.

Percent of the pop. rural non-farm, Table 1A & 2, col. 168.

Percent of the pop. rural farm, Table 1A & 2, Col. 169.

(Both rural non-farm and rural farm are derived by expressing columns 168 and 169 as a percent of column 3 total population.)

Percent of the pop. urban, Table 1A & 2, Col. 8.

Birth rate per 1,000 (1968), Table 1A & 2, Col. 21.

Death rate per 1,000 (1969), Table 1Z & 2, Col. 22.

Population, Table 1A & 2, Col. 3.

Census of Population, 1970, Vol. 1, Characteristics of the population.

U.S.G.P.O., 1972.

U.S. Summary--pt. 1.

Montana--pt. 28.

North Dakota--pt. 36.

South Dakota--pt. 43.

Percent pop. 14 yrs. or less, Table 19, 50, and 136.
Census of Population, 1940, Vol. II, Characteristics of the
 population, U.S.G.P.O. 1942.

Pt. 4, Montana.

Pt. 5, North Dakota.

Pt. 6, South Dakota.

Median age population, County Table 22.

Percent of pop. 14 yrs. or less, County Table 22.

Percent of pop. 65 yrs. or more, County Table 22.

Percent of pop. with 4 yrs. high school, County
 Table 21.

Percent of pop. with 4 yrs. of college, County
 Table 21.

Median school years completed, County Table 21.

Percent of pop. rural non-farm, County Table 21.

Percent of pop. rural farm, County Table 21.

Population, County Table 21.

County Data Book, 1947, U.S.G.P.O. 1947.

Percent of population urban, Table 1, Col. 10.

Vital Statistic Rates in the U.S., 1900-1940, 16th Census
 of the U.S.

U.S.G.P.O. 1943.

Birth rate per 1,000, Table 53.

Death Rate per 1,000, Table 53.

(Includes 1940 U.S., State and County data.)

Statistical Abstract of the U.S., 1943, U.S.G.P.O. 1944.

(U.S. and State 1940 data.)

Median age population, Table No. 12.

Percent pop. 14 yrs. or less, Table No. 24.

Percent pop. 65 yrs. or more, Table No. 24.

Percent pop. with 4 yrs. high school, Table No. 221.

Percent pop. with 4 yrs. college, Table No. 222.

Median school yrs. completed, Table No. 222.

Percent pop. rural non-farm, Table No. 12.

Percent pop. urban, Table No. 12.

Population, Table No. 6.

Birth, Stillbirth and Infant Mortality Statistics, 1930,

U.S.G.P.O. 1934.

Birth rate per 1,000, State Table 1, County Table 1.

Death Rate per 1,000, State Table 1, County Table 1.

Census of the United States, 1930, Population Vol. III,

Pt. 2.

Montana-Wyoming.

Median age population, Table 14.

Percent population 14 yrs. or less, Table 14.

Percent population 65 yrs. or more, Table 14.

Percent population rural non-farm, Table 13.

Percent population rural farm, Table 13.

Percent population urban, Table 13.

Population, Table 2.

Human Resource Development Data

Census of Governments, 1967, Vol. VII, U.S.G.P.O. 1970.

No. 3, U.S. summary.

No. 26, Montana.

No. 34, North Dakota.

No. 41, South Dakota.

Total local taxes U.S. Table 1, State Table 18,
County Table 34.

Per capita county taxes, U.S. Table 1, State
Table 18, County Table 34.

Total property taxes, U.S. Table 1, State Table 18,
County Table 34.

Total county expenditures, U.S. Table 5, State
Table 18, County Table 34.

Expenditures for police protection, U.S. Table 6,
State Table 18, County Table 34.

Expenditures for public welfare, U.S. Table 6,
State Table 18, County Table 34.

Expenditures for health & hospitals, U.S. Table 6,
State Table 18, County Table 34.

Expenditures for education, U.S. Table 16, State
Table 18, County Table 34.

Statistical Abstract of the United States, 1943, U.S.G.P.O.
1944.

U.S. and State Human Resource Development Data,
County expenditures and taxes are found in Table
No. 309.

County Finances, 1942, U.S.G.P.O. 1945. North Dakota and South Dakota. County Human Resource Development Data, County expenditures and taxes.

Statistical Abstract of the United States, 1935, U.S.G.P.O. 1935.

U.S. and Montana Human Resource Development Data, county expenditures and taxes are found in Table No. 213, 214, and 222.

Financial Statistics for States and Local Governments, 1932.

Montana County Human Resource Development Data, County expenditures and taxes are located in Table 1.

Economic Data

County and City Data Book, 1972, U.S.G.P.O. 1972.

Median family income, Table 1A and 2, Col. 58.

Percent of families with income less \$3,000 per year. Table 1A and 2, Col. 52.

Percent of families with income \$3,000-4,999 per year, Table 1A and 2, Col. 53.

Percent of families with income \$5,000-6,999 per year, Table 1A and 2, Col. 54.

Percent of families with income \$10,000-14,999 per year, Table 1A and 2, Col. 55.

Percent of families with income \$15,000-24,999 per year, Table 1A and 2, Col. 56.

Percent of families with income \$25,000 or more per year, Table 1A and 2, Col. 57.

Dependency ratio expressed as a percentage of those 14 years and less and those 65 years and more compared to those 14-64 years old.

Number employed in Montana, Table 1A and 2, Col. 39.

Census of the Population, 1950, Vol. 11, Characteristics of the Population, Pt. 1, U.S. Summary, Pt. 26, Montana.

Pt. 34, North Dakota.

Pt. 41, South Dakota.

Income data--U.S. Table 57.

Income data--State Table 32.

Income data--County Table 45.

County Data Book, 1947, U.S.G.P.O. 1947.

Number employed in manufacturing (1940), Table 1, Col. 25.

Number employed in agriculture (1940), Table 1, Col. 22.

Census of United States, 1930, Population, Vol. III.

Pt. 2, Montana-Wyoming.

Number employed in manufacturing (1930), Table 20.

Number employed in agriculture (1930), Table 20.

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