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Dams across the wide Missouri: Water transportation, the Corps of Engineers, and environmental change along the Missouri Valley, 1803-1993

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I want to dedicate this history to a number of people, all of whom have contributed to my understanding of water and rivers: to David Wieling, for introducing me to fly-fishing and a more intimate relationship to streams; to my brother, Tom Schneiders, for the moments at Wolf Creek and that huge rainbow that got away; to my mom and dad, Mary Jean (Lang) and Robert Joseph Schneiders, for allowing me to go to the river as a boy nearly everyday in the summertime and for teaching me to respect the river's power; to James Weyer and William Meier, for the shared imagination that inspired the "WeyMeiSchnei" expeditions along the Big Sioux; to Gail Evans, for teaching me to see the river as ever-changing and forever wild; and to my wife, Elizabeth Ann Wieling, for the 105-degree-day at Big Bend, the ten-foot-high elephant grass at Hudson, and the wonderful times at Niobrara.

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CHAPTER 1: INTRODUCTION

The Missouri River, and its valley, has been transformed in the past 190 years through human action. Once a wide, shallow, silt-laden stream with islands, sandbars, side channels, and oxbow lakes, the modern Missouri, over much of the reach above Yankton, South Dakota, is a series of clear, cold, deep lakes behind massive earthen dams. The river below Yankton also possesses few of its original characteristics, having been narrowed and straightened by the Corps of Engineers. This is the story of how the Missouri changed from a broad, meandering river to a partially regulated stream consisting of dams, reservoirs, and thousands of channelization structures.

The modern Missouri resulted from the cooperative efforts of local, grassroots organizations and federal entities. Numerous individuals and organizations worked together to develop the river. These human actors did not operate within a political vacuum. Rather, the Missouri had a tremendous influence on the human formulation and implementation of development plans. The Corps of Engineers altered the Missouri River for a number of reasons, but the establishment of a navigation channel in the river to aid agriculture and the rural population of the Midwest and northern Great Plains served as the primary justification for the construction projects. Yet, completion of a series of dams, reservoirs, and channelization structures from Montana to the river's mouth produced mixed results for the agricultural sector. Development plans had been initiated by the Corps without sufficient information about the river environment. Inadequate information, and hasty construction, caused disastrous and costly environmental repercussions.

This history focuses on events in the lower river valley (the area downstream and south of Sioux City, Iowa) because it served as the center of efforts to alter the Missouri. Furthermore, environmental changes along the lower river valley caused lower valley residents to seek the construction of dams across the upper Missouri.

Much has been written about the Missouri River. Writings can be categorized into four periods. During the first period, from approximately 1804 to 1880, explorers, adventurers, and European travelers kept notes of their impressions of the river and valley and then published the accounts. The most noteworthy are the journals of the Lewis and Clark Expedition (1804-1806), which contain extensive records of the flora and fauna they saw on their trek. The explorers also wrote detailed descriptions of Indian tribes, especially those living above the mouth of the Big Sioux River, including the Mandan, Hidatsa, Arikara, and Blackfeet. Unfortunately, Lewis, who was to supervise publication of the journals, died soon after the expedition and the complete report was not published until late in the nineteenth century. Elliot Coues' three volume edition, *History of the Expedition Under the Command of Lewis and Clark* (1893), and Gary Moulton's *The Journals of the Lewis and Clark Expedition* (1983-) are two of the most historically accurate editions.[1]

Other writers followed Lewis and Clark up the Missouri and quickly published their descriptions of the region. In 1811, Henry M. Brackenridge accepted Manuel Lisa's invitation to accompany a fur trading party to the Mandan villages (near present-day Bismarck, North Dakota) and in 1814 published his journal, which described Indians, the river's unpredictable nature, and the animals living in the valley.[2] British botanist John Bradbury traveled on a keelboat to the upper Missouri in 1811 and published a report of his trip in 1817 as *Travels in the Interior of America in the Years 1809, 1810, and 1811*.[3] The

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[1]Meriwether Lewis and William Clark, The History of the Expedition Under the Command of Lewis and Clark, 1, 2, & 3, ed. Elliot Coues, (New York: Francis P. Parker, 1893; reprint, New York: Dover Publications, Inc., no date of reprint). Gary E. Moulton, The Journals of the Lewis and Clark Expedition, 1, (Lincoln: University of Nebraska Press, 1983).

[2]Henry M. Brackenridge, Views of Louisiana; Together with a Journal of a Voyage up the Missouri River, in 1811, (Pittsburgh: Cramer, Spear, and Eichbaum, 1814; reprint, Ann Arbor: University Microfilms, Inc., March of America Facsimile Series, Number 60, 1966), 200.

journals of the Stephen Long expedition to the present-day Omaha, Nebraska area in 1819-20 appeared in 1823 as an *Account of an Expedition from Pittsburgh to the Rocky Mountains.*[4]

Tourism to the American West and upper Missouri became fashionable in the 1830s and 1840s among European and eastern United States intellectuals, aristocrats, and artists. George Catlin (1832), Prince Maximillian of Wied and Karl Bodmer (1833), and ornithologist John J. Audubon (1844) provided Americans and Europeans with a glimpse of the Missouri Valley's natural wonders and indigenous peoples. Their published paintings, drawings, and writings spurred further interest in the upper Missouri. Thaddeus Culbertson followed the lead of the earlier adventurers and artists and floated on a steamboat to the upper river in 1850.[5] The reports of Lewis and Clark, Brackenridge, Bradbury, Long, Prince Maximillian, Audubon, and Culbertson, plus the illustrations of Catlin and Bodmer, provide a wealth of information on the environment of the Missouri River Valley prior to the settlement of large numbers of Americans.

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[3]John Bradbury, Travels in the Interior of America, in the Years 1809, 1810, and 1811; Including a Description of Upper Louisiana, Together with the States of Ohio, Kentucky, Indiana, and Tennessee, with the Illinois and Western Territories, and Containing Remarks and Observations Useful to Persons Emigrating to Those Countries, (London: Sherwood, Neely, and Jones, 1817; reprint Ann Arbor: University Microfilms, Inc., March of America Facsimile Series, Number 59, 1966).

[4]Edwin James, ed., Account of an Expedition from Pittsburgh to the Rocky Mountains, Performed in the Years 1819 and '20, by Order of the Hon. J.C. Calhoun, Sec'y of War: Under the Command of Major Stephen H. Long, from the Notes of Major Long, Mr. T. Say, and Other Gentlemen of the Exploring Party, (Philadelphia: H.C. Cary and I. Lea, Chesnut Street, 1823; reprint Ann Arbor: University Microfilms, Inc., March of America Facsimile Series, Number 65, 1966).

[5]Thaddeus A. Culbertson, Journal of an Expedition to the Mauvaises Terres and the Upper Missouri in 1850, John Francis McDermott ed., Smithsonian Institution, Bureau of American Ethnology, Bulletin 147, (Washington DC: GPO, 1952; reprint Lincoln: J & L Print Company, Reprints in Anthropology, 22, 1981).

Historians and anthropologists wrote during the second period, which lasted from roughly 1890 to 1920. Historians focused on the history of European-American settlement in the Missouri River region, especially the exploits of early pioneers as they confronted the free-flowing river and the unsettled land. Anthropologists examined what many considered a vanishing Indian presence in the river valley.

Hiram Chittenden's two volume account, *History of Early Steamboat Navigation on the Missouri River* (1903), is an extensive history of the role the steamboat played in the settlement of the Missouri Valley. The two volumes also explain the Missouri River's seasonal character and flow rates, along with difficulties of navigating the stream by keelboat and steamboat.[6] In 1909, John G. Neihardt, a Nebraska native, poet, and college professor, wrote *The River and I*, which chronicles his journey down the Missouri from Great Falls, Montana, to Sioux City, Iowa, in a small motorized boat. Neihardt describes the river along this route, explains the history of several significant points in the valley, and concludes by predicting the eventual development of the river for hydroelectric generation.[7]

Anthropologists traveled to the upper Missouri region in increasing numbers in the early 1900s to record the histories, culture, and agricultural techniques of the area's indigenous inhabitants. Believing Indian peoples and their cultures faced extinction soon, these anthropologists sought to record, for posterity's sake, the traditional cultural characteristics of various tribes. George F. Will's *Corn Among the Indians* (1917), examines Mandan and Hidatsa agricultural practices, Gilbert Wilson's *Agriculture of the Hidatsa Indians* (1917), is

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[6]Hiram Martin Chittenden, History of Early Steamboat Navigation on the Missouri River: Life and Adventures of Joseph La Barge, Pioneer Navigator and Indian Trader for Fifty Years Identified with the Commerce of the Missouri Valley, 1 & 2, (New York: Francis P. Harper, 1903).

[7]John G. Neihardt, The River and I, (New York: The Macmillan Company, 1927).

a superb account of his relationship to a traditional Hidatsa agriculturist and details the agricultural information he learned from his teacher. Melvin R. Gilmore's *Uses of Plants by Indians of the Missouri River Region*, published in 1919, presents an ethnobotanical account of past Indian uses of plants for medicinal, religious, and dietary purposes.[8]

The third period of historical writing about the Missouri River occurred between 1944 and 1960. During these years, authors promoted the building of dams and channelization structures along the river. Books in this category include Stanley Vestal's *The Missouri* (1945), Bruce Nelson's *Land of the Dacotahs* (1946), LeRoy W. Schaffner's *Economic Aspects of the Missouri River Project with Special Reference to Iowa* (1946), Rufus Terral's *The Missouri Valley: Land of Drouth, Flood, and Promise* (1947), Otto G. Hoiberg's *Missouri River Basin Development Program: A Study Guide* (1950), and Richard Baumhoff's *The Dammed Missouri Valley: One Sixth of Our Nation* (1951). The books portray the Missouri in its natural state as an enemy of civilization and economic progress. Furthermore, the authors viewed development and control of the river's water as crucial to the stability and future prosperity of the agricultural economy of the Midwest and northern Great Plains. Stabilization of the economy could only be achieved through the construction of large dams, which would curtail the high flows that had previously disrupted the production of crops in the valley and provide irrigation water for growing produce during drought periods.

The final period of historical writing on the Missouri River began in 1970 and continues to this day. It is characterized by a plethora of scientific studies on the river and valley environments. Government agencies, including the Corps of Engineers, the Department of the Interior's Fish and Wildlife Service, and the Iowa Geological Survey have sponsored the majority of these studies. They examine such diverse environmental topics as water quality,

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[8]Melvin R. Gilmore, Uses of Plants by the Indians of the Missouri River Region, (Lincoln: University of Nebraska Press, 1977).

streambed degradation, aquatic habitat, and the migration patterns of fish in the altered river system. A few titles illustrate the general theme of this period: William Persons' *The Use of Open and Closed Backwater Ponds of the Missouri River, Iowa as Spawning and Nursery Areas for Fish* (1979), George R. Hallberg's *Changes in the Channel Area of the Missouri River in Iowa, 1879-1976* (1979), the Corps of Engineers' *Final Report and Final Environmental Impact Statement for Fish and Wildlife Mitigation for the Missouri River Bank Stabilization and Navigation Project* (1981), and Forrest Holly's *Computer-Based Prognosis of Missouri River Bed Degradation: Refinement of Computational Procedures* (1984).

Three political histories have been written during this last period. Michael Lawson's *The Dammed Indians: The Pick-Sloan Plan and the Missouri River Sioux, 1944-1980* (1982), examines the Pick-Sloan Plan's affects on the Indians of North and South Dakota. The Pick-Sloan Plan authorized the construction of five dams across the main stem of the Missouri River. The Corps of Engineers built these five earthen behemoths between 1946 and 1966. The book focuses on the social, economic, and political consequences of dam construction for those Indians who lived in the valley, and places special emphasis on the issue of monetary compensation to the tribes for the inundation of their lands. Lawson's book is not a history of environmental change.[9] John E. Thorson's *River of Promise, River of Peril: The Politics of Managing the Missouri River* (1994), briefly examines how the Missouri River has been managed since the 1940s. Thorson addresses current water management issues confronting the Corps of Engineers and recommends institutional changes in order to more effectively allocate the river's water. In particular, Thorson believes a new, non-partisan

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[9]Michael L. Lawson, Dammed Indians: The Pick-Sloan Plan and the Missouri River Sioux, 1944-1980, (Norman: University of Oklahoma Press, 1982).

institution should be established to manage the Missouri River.[10] Thorson's book is timely because of the current political controversy between the upper basin states and lower basin states over the methods utilized by the Corps of Engineers to apportion Missouri River water. Upstream states are pushing the Corps to adopt a new management plan to replace the one that has favored downstream interests for the past fifty years. The third recent book on the Missouri River is John Ferrell's *Big Dam Era: A Legislative and Institutional History of the Pick-Sloan Missouri Basin Program* (1993). This book examines the legislative origins of the Pick-Sloan Plan and discusses current management problems confronting the Corps of Engineers, including the difficulty of meeting the water demands of many interest groups during drought periods.[11] Histories that describe both the political origins of Missouri River development and the environmental changes induced by that development are absent from the literature.

The recent Missouri River histories fit into the larger historiography of water development in the United States, which has four identifiable characteristics. First, the majority of the histories examine topics related to river development in the American West during the twentieth century, particularly after 1930. Second, the literature focuses on the role of local, state, and federal organizations in implementing development schemes and managing completed projects. Third, authors either indict the developers or absolve them of any wrong doing for changing the West's rivers. Fourth, these histories do not emphasize the actual environmental change that resulted from the construction of dams, diversion canals, and

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[10]John E. Thorson, River of Promise, River of Peril: The Politics of Managing the Missouri River, (Lawrence: University Press of Kansas, 1994).

[11]John R. Ferrell, Big Dam Era: A Legislative and Institutional History of the Pick-Sloan Missouri Basin Program, (Omaha: Missouri River Division, US Army Corps of Engineers, 1993).

channelization works. Instead, they emphasize the politics of river development, especially the role of interest groups in pushing for the construction of projects.

The recent historiography of water resources development in the United States has been greatly influenced by environmental historian Donald Worster and his book, *Rivers of Empire* (1985). In *Rivers of Empire*, Worster argues that the modern American West (the region extending from the Mississippi River west to the Pacific Ocean) is organized into a hydraulic society. This society is characterized by the concentration of wealth and power in the hands of a few individuals and organizations, who are referred to by the author as the water, or power, elites.

Worster defines the water elites as large agribusiness firms and the federal government, represented by the Bureau of Reclamation and the Corps of Engineers. These water elites sit at the top of the West's social, political, and economic hierarchy. The water elites achieved this status by possessing the capital, expertise, and technology to dominate nature, especially rivers. Their ability to control, and manipulate rivers, has enabled the elites to establish an undemocratic regime across the region.[12] Because Worster argues that water is the source of wealth and power in the West, those individuals and organizations that monopolize this resource also control the masses who live in the region.

Worster contends that the water elites in the federal government and in agribusiness implemented water development schemes in an undemocratic fashion. During the twentieth century, the elites forced great engineering projects on the people of the West. He contends that decisions concerning development of Western rivers were made by the elites alone, without the participation of the masses (those persons without large reserves of capital, technology, or expertise). Worster condemns the capitalist economic system, stating that

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[12]Donald Worster, Rivers of Empire: Water, Aridity, and the Growth of the American West, (New York: Oxford University Press, 1992).

capitalism, besides creating the water elites, is also responsible for the destruction of a multitude of riverine ecosystems. Yet, Worster fails to discuss the details of environmental degradation. He does not explain how river ecosystems have been altered through development.

Since the publication of the first edition of *Rivers of Empire* in 1985, historians of water resources development have repeatedly addressed the issues raised by Worster - in particular the issue of whether elites have controlled water development in the West. Historians have lined up on two sides of his thesis. Worster's supporters argue that river/water development has been undemocratic, exploitative, and dominated by repressive state and federal governments and large corporate farms. Historians in opposition to Worster, including John Opie, Norris Hundley, and James Sherow, have argued that water development in the West has been based on democratic principles. The initiative for development projects came not from the federal government but from grassroots farmers, town residents, and local businessmen.

John Opie's *Ogallala: Water for a Dry Land* (1993), states that democratic-pluralism has determined the history of water development in the Great Plains region. According to Opie, the people of the Great Plains are not controlled by a water elite. No state, federal, or local organizations dominate the region's political, economic, and social systems. The region is characterized by the dispersal of power among many individuals and groups. Access to the region's primary source of water, the Ogallala Aquifer (a vast body of fresh water underlying the Great Plains from North Dakota to Texas), has been open to everyone. No one organization ever controlled the aquifer's water supply. Open access to the aquifer's water led to the establishment of democratic institutions to manage that water supply. The clearest example of this democratic system of water management is the existence of irrigation districts managed by the farmers and ranchers themselves; these districts are self-regulating, establishing water withdrawal rates for their members.

Unlike Worster, Opie does not blame the capitalist economic system for environmental destruction in the Great Plains region. Instead, Opie believes the operation of the capitalist system and democratic water management practices has resulted in the transformation of a desert into the breadbasket of the world. Although the capitalist economic system and democratic institutions have worked miracles on the plains in the past thirty years, both need to be modified in order to avert the complete depletion of the Ogallala Aquifer. Opie is confident that farmers and ranchers can modify their organizations to insure that the aquifer's water is not entirely gone within the next thirty years.[13] Opie's book does examine environmental change on the Great Plains. In particular, he focuses on how this arid territory has been transformed into a wheat, corn, and cattle producing region.

Norris Hundley does not agree with Donald Worster's conclusions either. In his book, *The Great Thirst: Californians and Water, 1770s-1990s*, Hundley states that democratic principles have guided water management decisions in California since the mid-nineteenth century. According to Hundley, a water elite does not exist in California or the West. To illustrate this point, he describes how state and city officials based in northern California are frequently in conflict in the state legislature with representatives from southern California over the use and development of the state's water resources. Furthermore, farmers, ranchers, city dwellers, and industrial users all fight for the state's limited water supply, with no one political or economic entity dominating water policy and dictating use to the others. Hundley does not criticize, as does Worster, the capitalist system for "destroying" the environment. Instead, he argues that this system has created an incredibly sophisticated system of dams and diversion canals that have helped make California one of the world's economic powerhouses. Hundley concludes that California should develop a new water management system that can

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[13]John Opie, Ogallala: Water for a Dryland. A Historical Study in the Possibilities for American Sustainable Agriculture. (Lincoln: University of Nebraska Press, 1993).

deal with the ever-shrinking water supply in relation to rising demands.[14] *The Great Thirst* does not address the environmental impacts of California's water delivery system.

James Sherow's book, *Watering the Valley: Development Along the High Plains Arkansas River, 1870-1950*, argues that Donald Worster in *Rivers of Empire* is wrong about the western water elite but correct for blaming the capitalist economic and political system for ecological degradation. Sherow argues that no one interest group in eastern Colorado and western Kansas came to dominate the Arkansas River's water supply or dictate its development and use. Instead, these groups competed for the river's water within the capitalist economy and this competition led to the over exploitation of the Arkansas. So much water was eventually drawn out of the Arkansas that it dried up along certain reaches. Sherow does address environmental changes that resulted from the construction of the John Martin Dam and the unrelenting consumption of the river's water. However, he only provides cursory coverage of the environmental consequences of over development.

Sherow concludes that the competitive capitalistic approach to river development and water allocation along the Arkansas River Valley must be replaced with a water allocation system based on socialist principles. The long-term economic viability of the entire western Kansas and eastern Colorado region depends on regulating the further development of the river so that the people of the region as a whole benefit from the river's water rather than one economic interest group. Only long-term planning and a supra-government agency can sustain balanced and ecologically sensitive development in the valley.[15]

Dams Across the Wide Missouri differs from previous writings on the Missouri River and water resources development in the American West. Past accounts of the Missouri describe

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[14]Norris Hundley, Jr., The Great Thirst: Californians and Water, 1770s-1990s, (Berkeley: University of California Press, 1992).

[15]James Sherow, Watering the Valley: Development Along the High Plains Arkansas River, 1870-1950, (Lawrence: University Press of Kansas, 1990).

the river and valley environments in time, during a particular year, or decade. This history chronicles the river and valley environments through time, explaining how these environments have changed since the early nineteenth century. *Dams Across the Wide Missouri*, like previous political histories related to the Missouri River, examines the political origins of Missouri River development plans. But rather than describe only the actions of the human players in the political arena, this history argues that the Missouri River was an active entity that had a tremendous and often unpredictable affect on the human formulation and implementation of development plans. For example, the Great Flood of 1952 influenced the political decision-making process to alter the Missouri River environment. This flood led to the construction of two additional dams on the river, two dams for which federal funds had been eliminated or substantially reduced because they were deemed unnecessary for the control of the stream. *Dams Across the Wide Missouri* details the environmental changes that resulted from the construction of the navigation channel below Sioux City, and to a lesser degree the effects of the dams and reservoirs north of Yankton. The only previous data on the environmental consequences of construction projects has been presented in scientific journals and reports. Unlike these scientific studies, this history describes the environmental changes in the Missouri River in narrative form with attention to how the changes related to other events and actions.

In addition, neither a water elite nor grassroots organizations dictated the direction of Missouri River development. Instead, the elites (as defined by Worster), and the democratic organizations (as defined by Opie, Hundley, and Sherow) cooperated with each other to accomplish their respective goals. Missouri River development was designed to benefit the agricultural sector of the American economy, especially through the establishment of a navigation channel along the river. Proponents of channelization believed that deep-draft barge traffic on the Missouri would result in a lowering of commodity shipment costs for farmers. Development progressed without sufficient information about the river environment. Even though the federal engineers continually learned about the Missouri and adapted their engineering techniques and technologies, they could not prevent negative, and costly, environmental repercussions. Finally, development produced mixed results. People paid a tremendous price for the benefits derived from damming and channelizing the river. For example, upstream dams decreased the flood threat south of Sioux City but required the inundation of several hundred thousands acres of the most fertile agricultural land in Montana, North Dakota, and South Dakota.

This history is organized chronologically, except for Chapter 2, which describes the Missouri River as it exists today. Chapter 3 sketches the views of early nineteenth century travelers who experienced the Missouri River before the beginning of large-scale American agricultural settlement in the river valley. Chapter 4 explains how the Missouri River and valley environments encouraged agricultural settlement in the lower valley. Chapter 5 examines the first efforts of lower valley residents, the Missouri River Commission, and the Corps of Engineers to improve the Missouri River for navigation purposes. Chapter 6 chronicles the rejuvenation of development plans following the flood of 1903 and records the political origins of the 1912 legislation authorizing the six-foot channel to Kansas City. This chapter also addresses the 1927 congressional authorization to extend the six-foot channel to Sioux City.

Chapter 7 depicts Missouri River development during the drought and depression years of the late 1920s and 1930s, emphasizing the expansion of the federal presence along the river with construction of the Fort Peck Dam and reservoir. Individuals and interests based in the upper Missouri Valley, particularly in South Dakota, sought to build dams across the Missouri River in the 1910s, 1920s, and 1930s. Chapter 8 describes South Dakota's attempts to control the Missouri River and explains why those attempts failed to receive federal government support. Chapter 9 chronicles Missouri River history during the 1940s, focusing on the individuals, organizations, and events that led to congressional authorization of the

Pick-Sloan Plan in 1944. Chapter 10 describes the Great Flood of 1952, including the flood's influence on public support for the construction of dams in the Dakotas. In addition, Chapter 10 details the highly-advanced construction techniques utilized to confine the Missouri River to its navigation channel. Chapter 11 compares the benefits of Missouri River development to the costs. Chapter 12 concludes this history by summarizing the previous eleven chapters and suggesting what lessons might be learned from the development of the Missouri River.

CHAPTER 2: THE MODERN MISSOURI

The modern Missouri River serves people, millions of people. The river provides irrigation water to farmers in Montana, hydroelectricity to city folk in Great Falls, Sioux City, and Omaha, walleye for sport fishers in the Dakotas, drinking water for the thirsty cattle of ranchers in Nebraska, and a navigable water route for barge companies based in St. Louis. Only within the past 100 years has the river been engineered and managed to provide these benefits; the intensive utilization of the Missouri River is a twentieth century phenomenon. The waterscape of the modern Missouri River reflects the multiple individuals and interest groups it serves each and every day.[1]

The Missouri is a long river, longer than even the Mississippi. It flows approximately 2,466 miles from its headwaters in the foothills of the Rocky Mountains to its confluence with the Mississippi, roughly twenty miles north of the city of St. Louis, Missouri. The Missouri, its source streams, and tributaries drain 529,000 square miles, or one sixth the land area of the continental United States.[2] The source streams of the Missouri form in, or around, Yellowstone National Park and the Bitterroot Mountain Range of northwestern Wyoming and southwestern Montana. Here, in the land of geysers, hot springs, pinnacles of sandstone, and deep canyons, rivulets and streams begin their descent to rivers that feed the Missouri. In the Bitterroot Range, to the west of Yellowstone National Park, the Ruby, Beaverhead, and Big Hole rivers converge to form the Jefferson, named by American explorers Lewis and Clark for the third president of the United States and the primary supporter of their expedition to the western sea (Figure 2.1).

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[1] Waterscape refers to the natural and human-made features present in a river system.

[2] Missouri Basin Inter-Agency Committee and the Missouri River States Committee, The Missouri River Basin Development Program, (Washington DC: GPO, 1952), 3-5.

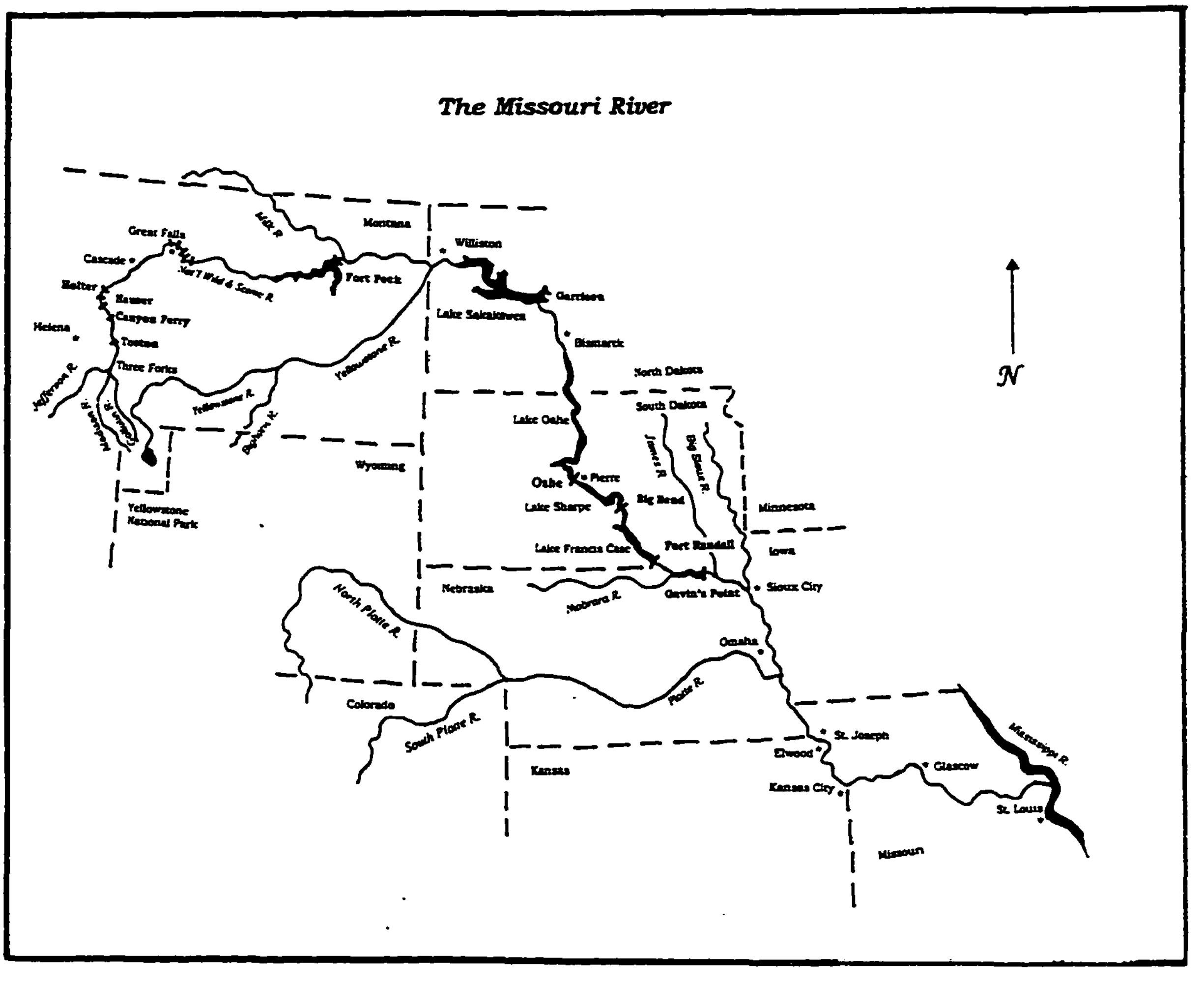

Figure 2.1. The Missouri River. The Missouri flows approximately 2,466 miles from Three Forks, Montana, to its confluence with the Mississippi River just north of St. Louis, Missouri. The modern Missouri River is dammed at sixteen different locations in Montana, North Dakota, and South Dakota. Below Sioux City, Iowa, the river is confined within a system of stone revetments and wing dams. The river valley south of Sioux City served as the foci of river development efforts from the late nineteenth century into the 1950s. Map by author.

The Madison River is created from the waters spewing forth from hot springs, and snowmelt, and from quick, violent summer thunderstorms that frequent the mountains; it exits the west end of Yellowstone National Park and veers to the north, its current moving rapidly over stone and gravel. Northwest of Quake Lake exists a stretch of water known in local parlance as the "Fifty Mile Riffle," because the Madison is continuously choppy from shallow water moving over stones.

The Gallatin River also rises in the park, only a few miles from the source streams of the Madison. From its starting point, the Gallatin travels nearly due north through a narrow valley, abutted by high cliffs on each side. The Missouri's largest tributary, the Yellowstone, begins at Yellowstone Lake in the center of the park. This stream, the only undammed major river remaining in the continental United States, has a spectacular beginning exiting the lake and cascading over a 109-foot fall and then another, more incredible 308-foot fall, before regaining its valley floor and traveling north through a yellow and red walled canyon.[3]

As the Missouri's source streams, the Jefferson, Madison, and Gallatin, course through the rugged land surrounding the park, their channel areas are straight, stable, and possess rapid currents. However, each river is transformed as it descends to the foothills of the Rockies. Here, in the gently rolling landscape near Bozeman, Montana, the rivers' currents slow down, the streams meander, and their silt content increases. By the time the Jefferson, Madison, and Gallatin meet at Three Forks, Montana, they meander so much that it is difficult to discern which rivers are actually converging to form the Missouri. Three Forks is a low, alluvial plain interspersed with a confusing array of oxbow lakes and river channels. The Jefferson, Madison, and Gallatin do not join in a torrent of water to create the Missouri. Rather, the Madison first joins the Jefferson and then the Jefferson and Gallatin meet under a steep, white bluff, giving birth to the Missouri River.

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[3]Montana, Official Highway Map 1995-1996, (Helena: Montana Promotion Division, 1995).

North from Three Forks, the clear, blue river glides past a land of wheat fields extending westward and the Big Belt and Little Belt mountain ranges rising to its east. Only twenty miles north of Three Forks, the river current is blocked by a dam at Toston, Montana. This low dam was built in the early 1900s to provide irrigation water to local farmers and ranchers. Another twenty miles north, northwest of Toston Dam, the Missouri River enters the headwaters of the Canyon Ferry Reservoir, the largest reservoir on the river above Fort Peck Reservoir, storing two million acre feet of water.[4] Canyon Ferry Dam was built in the 1950s by the Bureau of Reclamation as part of the Pick-Sloan Plan for Missouri River Development and its primary purpose is the generation of hydroelectricity.[5] Just below this dam, the river enters the reservoir impounded by Hauser Dam.

Canyon Ferry Lake and Hauser Lake are located only fifteen miles to the east of the Montana state capital of Helena, which is situated above the two reservoirs on a sloping plain. Helena residents rely on the reservoirs not only for drinking and sanitation water but also for recreation. Summer weekends witness large numbers of Helena residents along the reservoirs' shores either fishing, camping, or boating.

Another dam only four miles below Hauser Dam created Upper Holter Lake. This lake sits on the upstream end of a deep gorge of the Missouri known since 1804 as the Gates of the Rocky Mountains. The river is squeezed through the Gates of the Rocky Mountains by high black and white cliffs that rise hundreds of feet directly above the river. The channel itself is confined to a width of a mere 100 to 150 yards. Lewis and Clark described this spectacular section of the river in late July 1805:

> Nothing can be imagined more tremendous than the frowning darkness of these rocks, which project over the river and menace us with destruction. The river, of 150 yards in width, seems to have forced

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[4]Henry Hart, The Dark Missouri, (Madison: University of Wisconsin Press, 1957), 155. One acre foot equals one acre of land covered by one foot of water.

[5]Ibid., 158.

> its channel down this solid mass; but so reluctantly has the rock given way that, during the whole distance, the water is very deep even at the edges, and for the first three miles there is not a spot, except one of a few yards, in which a man could stand between the water and the towering perpendicular of the mountain.[6]

After the Missouri passes through the Gates of the Mountains its waters are stilled by yet another reservoir, this one behind Holter Dam. The water exiting from Holter Dam's powerhouse is cold, cold enough to support one of the best trout fisheries in the United States along the river from the dam to the town of Cascade, Montana. This section abounds with large rainbow and brown trout that feed on the river's rich aquatic insect life. During the summer months, and early fall, the river here is crowded with fly-fishers who gain access to the river from the Missouri River Recreational Road.

At and just below the town of Great Falls, Montana, (named after the Great Falls of the Missouri that are located here), the Missouri River has five dams across its path. These dams capture the river's hydroelectric capacity as it descends. In one section alone, the river drops an estimated 350 feet in a mere two and a three-quarter-mile stretch.[7] A hydroelectric dam now stands directly on top of the Great Falls of the Missouri, destroying what had once been considered the most beautiful falls west of Niagara (Figure 2.2).

As the Missouri travels through the valley from Fort Benton, Montana to the Charles M. Russell Wildlife Refuge - a section designated by Congress as a National Wild and Scenic River - it enters the longest stretch of the entire river system that has not been either dammed or channelized. Fantastic rock formations, known locally as the Stone Walls, stand above the river. In 1833, German artist Karl Bodmer remarked that the sandstone formations here

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[6]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, 1, ed., Elliot Coues, (New York: Francis P. Harper, 1893; reprint, New York: Dover Publications, Inc., no date of reprint), 426,427 (page references are to reprint edition).

[7]Ibid., volume 2, 385.

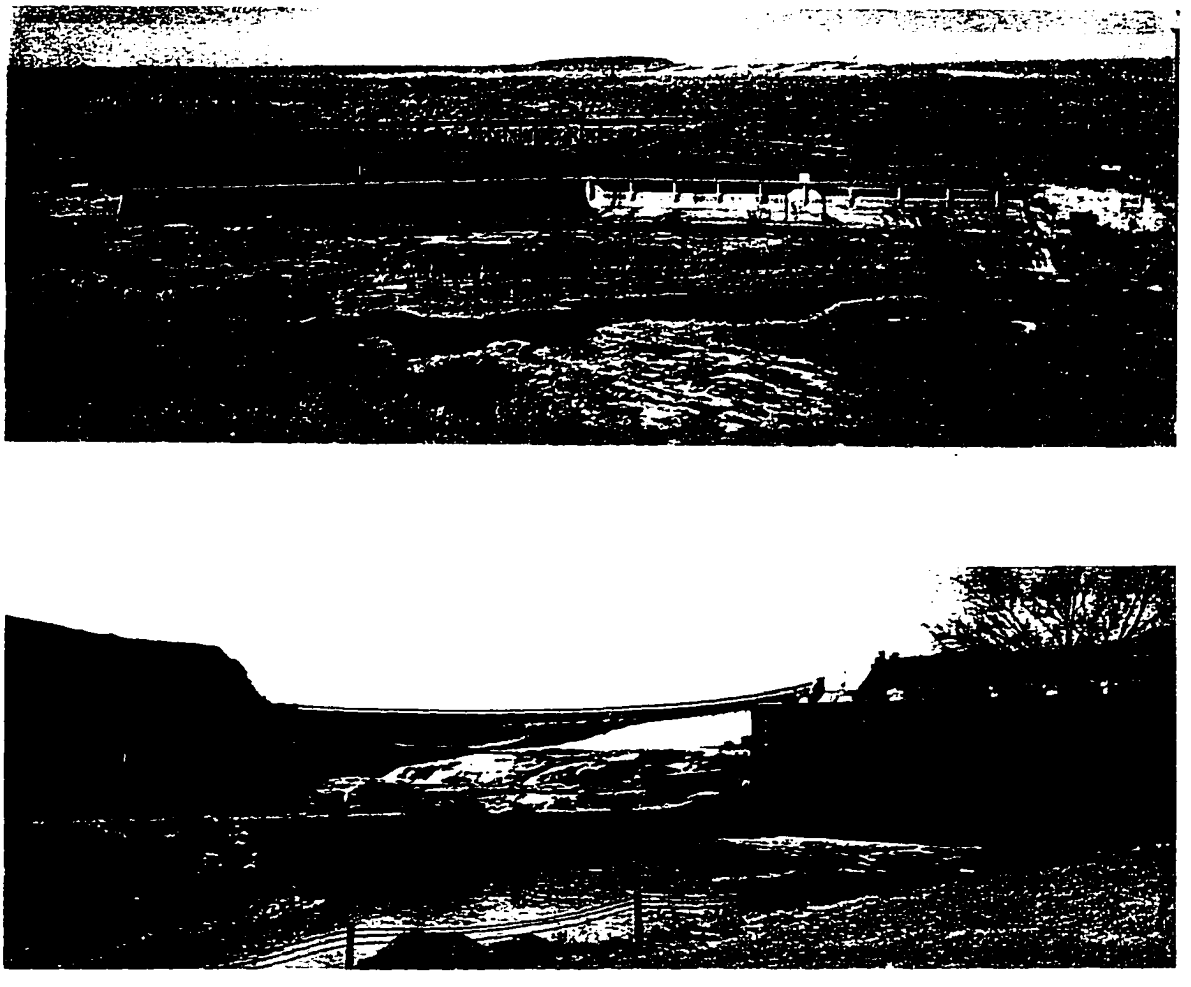

Figure 2.2. The dams at Rainbow Falls and Great Falls, Montana. On 14 June 1805, Captain Meriwether Lewis observed the Rainbow Falls (top photograph) for the first time. The explorer considered the falls "one of the most beautiful objects in nature." The grandeur of the Great Falls (bottom photograph) also deeply impressed Lewis and Captain William Clark. In the early 1900s, hydroelectric enthusiasts built dams on top of both falls, destroying what many considered the most magnificent falls west of Niagara. Photographs by author, 1996.

resembled ancient European fortresses and castles.[8] One formation is known as Citadel Rock, which is a sliver of stone that juts straight up from the water line.[9]

Downstream from the Stone Walls, the river's current again slows as its waters enter the reservoir behind Fort Peck Dam. This reservoir extends 134 miles to the face of the dam. Fort Peck was the first, and largest, earthen dam built on the main stem of the Missouri. The dirt plug across the valley is four miles long and 220 feet high. The reservoir has a storage capacity of 18.7 million acre feet, enough to store nearly three times the average annual flow of the Missouri River past this point.[10]

Just below Fort Peck, the Milk River enters the Missouri from the north. The Milk River received its name because of the color of its water, which once appeared milky white due to sediments that leached into the stream from the surrounding countryside. In the past, the Milk River's sediment load spilled into the Missouri River. These sediments slowed the Missouri's current, increased its channel sinuosity, and contributed to the formation of sandbars and islands. The changes in the character of the Missouri River accelerated as the undammed waters of the Yellowstone, the Missouri's largest tributary (and some claim the Missouri's true parent) poured into the river just a few miles southwest of Williston, North Dakota. But today, the sediment of the Yellowstone and Missouri rivers is not allowed to flow as it did years ago. Rather, the mouth of the Yellowstone has become an immense, sandy delta. As the silt-laden waters of the Yellowstone run into the calmer water of the Missouri, its silt is dropped on top of the Missouri's streambed. Since the mid-1950s, the

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[8]Josyln Art Museum and University of Nebraska Press, Karl Bodmer's America, (Omaha: Josyln Art Museum, 1984), 229.

[9]Ibid., 232.

[10]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Master Water Control Manual: Review and Update Study, Draft Environmental Impact Statement, (Omaha: U.S. Army Corps of Engineers, Missouri River Division, 1994), 3-5, 3-7.

Missouri's carrying capacity (the amount of water the river's channel area can normally hold without flooding) at the mouth of the Yellowstone has decreased fifty percent because of these silt deposits. Furthermore, the build-up of silt has led to a higher water table, increased lowland flooding, and required the protection of Williston from ever-rising waters. The cause of these problems is Lake Sakakawea.[11]

Lake Sakakawea is a wind-swept monster of a lake, created in the 1950s with the downstream closure of Garrison Dam. Lake Sakakawea's storage capacity is 23.8 million acre feet, making it the largest reservoir on the river.[12] To create a lake of this size, all of the Missouri Valley bottomlands on the Fort Berthold Reservation, home to the Three Affiliated Tribes of the Mandan, Hidatsa, and Arikara, were flooded. Beneath the reservoir's waters lie the remains of nine Indian towns, with names like Old Sanish, Shell Creek, Charging Eagle, Elbowoods, and Nishu.[13] Garrison Dam stands 180 feet high and 11,300 feet long.[14]

Below Garrison Dam, the Missouri again runs as a river, rather than a reservoir. In an eighty-seven mile stretch from the dam to the headwaters of the next reservoir, the river somewhat resembles its former self, before the massive, twentieth century civil engineering projects completely remade it and its valley.[15] Here the river flows around sandbars, cuts away its banks, and glides past islands and timbered bottomlands. But this free-flowing river of today is not the river of yesterday. The Missouri's waters are clear and cold, not warm and

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[11]Ibid., 3-17, 3-18.

[12]Ibid., 3-5.

[13]Sioux City Journal, *Indians Lose in Taming of Missouri,* 7 September 1991

[14]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Master Water Control Manual, 3-5.

[15]The word "headwaters" refers to the upstream end of a reservoir. The headwaters section of a reservoir is where flowing water slows as it enters the reservoir proper.

silt-laden. The water flowing in this reach originates from the dark, sunlight-deprived depths of Lake Sakakawea. As this sediment-free water exits the dam, it erodes the riverbed. Over the years, the riverbed south of Garrison has dropped from four to five feet.[16]

Lake Oahe, formed by Oahe Dam, begins only a few miles south of Bismarck, the capital city of North Dakota. This reservoir sustains one of the best sport fisheries in the United States. Chinook salmon, channel catfish, northern pike, white bass, sauger, trout, crappie, and walleye flourish in Oahe. The superb walleye fishing on Oahe has earned the lake the title of "Walleye Capital of the World." The fishing is good for two reasons. First, the South Dakota Game, Fish, and Parks Departments annually stocks fingerlings in the lake. Second, the size of Oahe provides a wide array of suitable habitat. Oahe's reservoir storage capacity is 23.1 million acre feet, which creates a shoreline of 2,250 miles. But the sheer size of the lake increases the dangers for fishers and recreational boaters. At the Little Bend of the Missouri, located thirty miles north of Pierre, the distance from bank to bank is twenty miles. Here, three to five-foot-high waves are common on the lake. During strong winds, the waves breaking on the shoreline can reach heights above ten feet.[17]

Oahe Dam towers 200 feet above Pierre and Fort Pierre, South Dakota. Below the dam, the river runs again, but only for about six miles, before it enters Lake Sharpe, named for Merrill Q. Sharpe, the South Dakota Governor who gave unflagging support for large dam projects in South Dakota. Lake Sharpe lies in central South Dakota, country as wide-open, imposing, and as beautiful as any on the Great Plains.

Forty-five miles south, southeast of Pierre, the river makes a dramatic turn to the north, northwest and then loops around again toward the south, southeast. The Big Bend of the

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[16]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Master Water Control Manual, 3-18.

[17]American News, *Reservoirs Termed More Treacherous Than Ocean,* 10 June 1966.

Missouri is twenty-six miles around, which distinguishes it as one of the longest natural river bends in the world. The neck of the bend is a mere one and a half miles across. On the southeast corner of the bend, at the edge of the neck, sits a small town called Lower Brule, the government seat for the Lower Brule Sioux Reservation. This is a relatively new town, built in the early 1960s to replace the original community of Lower Brule, which was inundated in 1963-64 by the rising waters behind Big Bend Dam.[18]

Approximately seven miles east-southeast of Lower Brule is another dam, named for the bend in the river and not the bend in the dam itself. In the 1960s, engineers considered Big Bend Dam to be an engineering marvel because of the construction techniques utilized by the Corps to create the structure. The Corps built the dam in an unique "S" shape to utilize the favorable foundation conditions located on both sides of the Missouri Valley. In 1967, the American Society of Civil Engineers nominated the dam for the Outstanding Civil Engineering Achievement Award.[19]

The Missouri does not become a free-flowing river again below Big Bend Dam. Instead, the headwaters of the next Missouri river reservoir begin at the bottom of the dam wall. Lake Francis Case, named after the Senator from South Dakota who was instrumental in promoting, and procuring funding for, the construction of dams and reservoirs on the Missouri in the 1940s, 50s, and 60s, extends 140 miles downstream to Fort Randall Dam. Lake Francis Case may be the most unsightly Missouri River reservoir; from Big Bend Dam to Chamberlain, South Dakota, the protruding white stumps and branches of trees drowned in the 1950s outline the serpentine former river channel. The dead trees resemble the bleached bones of some giant, slithering beast, now lying silent in the river, serving as a reminder of a once vibrant valley ecosystem that has been stilled.

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[18]Sioux Falls Argus Leader, *Big Bend Popular Spot,* 17 May 1964.

[19]Rapid City Journal, *Big Bend Dam Nominated for Engineering Award,* 4 January 1967.

All along the edge of Lake Francis Case there is evidence of a phenomenon known as shoreline slumping. Officials at the Missouri River Division of the Corps of Engineers, which overseas the operation and maintenance of the main-stem dams and reservoirs, wrote,

> Because these shorelines consist of highly erodible soils, wave and ice action leads to accelerated erosion in the form of slumping cut-banks.... The cut-banks are continually slumping into the reservoirs at rates as high as 20 feet per year. At such rates, there is not sufficient opportunity for protective vegetation to take root and protect the cut-banks from further erosion.[20]

Besides decreasing the reservoir's storage capacity, slumping contributes to vast stretches of mud shoreline. These drab mud flats become visible during low water periods.

Fort Randall Dam is not as big as Garrison or Oahe; its height is 160 feet and its length is approximately two miles.[21] Fort Randall Dam was the first of the Pick-Sloan Plan dams to stem the Missouri's flow. At the foot of the dam sits the remains of Fort Randall, a U.S. Army post established in 1856 to keep an eye on the nomadic Sioux and aid in the European-American settlement of the valley. The dilapidated Christ Church is the only structural evidence of the post's presence. About half a mile due west of the post, on the slope of a grassy bluff overlooking the dam and the church is a nineteenth century cemetery which bears testament to the American frontier experience. Simple, white headstones have inscriptions that read: Eugene Trask, killed by Indians, Sept. 3, 1863; John Thompson, found frozen, Jan. 16, 1870; H.B.E. Heiner, chronic diarrhea, Sept. 5, 1876; and John H. Bezent, struck by lightening, Aug. 20, 1874.[22]

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[20] U.S. Army Corps of Engineers, Missouri River Division, Missouri River Master Water Control Manual, 3-16.

[21] U.S. Army Corps of Engineers, The Federal Engineer, Damsites to Missile Sites: A History of the Omaha District, U.S. Army Corps of Engineers, (Washington DC: GPO, 1985), 107.

[22] Sioux Falls Argus Leader, series titled, *Down by the River: Life along the Missouri,* 21-25 July 1991.

South of Fort Randall Dam the river flows again, flows past hills that recede into the western horizon. The river and valley, extending for thirty-nine miles southeast of the dam, have been designated a National Recreational River under the National Wild and Scenic Rivers System. This area is managed by the National Park Service which hopes to preserve its wildlife habitat and develop its tourism potential. Forty-four miles below Fort Randall, the Missouri meets the Niobrara, emptying its waters from the west. The Niobrara River moves with such force into the Missouri that the Missouri, for a moment, is pushed aside to let this tributary enter. At the mouth of the Niobrara, a mass of silt has built-up over the years to create a marshy delta. The silt has caused problems for the residents of the town of Niobrara, Nebraska, located on the south bank of the Niobrara River. In the 1950s, the town had been spared initial inundation from the waters behind Gavin's Point Dam. But, by the 1960s, the silt pouring into the headwaters of Lewis and Clark Lake (behind the dam) raised the water table enough to cause frequent flooding of basements in the town. To avoid future flooding, residents agreed to relocate to higher ground. In July 1977, they dedicated a new town site on the bluffs above the river valley.[23]

Gavin's Point Dam is the smallest of the five earthen structures built on the Missouri between 1946 and 1966. The dam stands seventy-two feet high and 8,700 feet across.[24] Lewis and Clark Lake is roughly forty miles long. The lake is a major tourist attraction, drawing visitors from three metropolitan areas, including Omaha, Sioux City, and Sioux Falls. The number of visitors to the lake has steadily increased since the 1950s, with a major boom in the mid- and late 1980s. In one ten-day period in the summer of 1991, over 100,000

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[23]U.S. Army Corps of Engineers, The Federal Engineer, 168.

[24]Ibid., 147.

people visited the Lewis and Clark Recreation Area, a series of parks adjacent to the lake.[25] The scenery, fishing, boating, and sailing opportunities are the reasons for the high number of visitors. The calumet bluffs on the Nebraska side of the lake change color with the position of the sun, turning a brilliant gold at sunset on cloudless evenings. Furthermore, the lake's water level fluctuates the least of the reservoirs on the Missouri and this contributes to good fishing. Stable water levels have also allowed attractive shoreline vegetation to take root and grow.

From Gavin's Point Dam to Nebraska's Ponca State Park, a distance of fifty-seven river miles, the Missouri appears largely as it did in the nineteenth century, possessing sandbars, islands, side channels, and shifting, deadly currents.[26] A mile below the steep bluffs that front the river at Ponca State Park, the Missouri River passes around the first stone wing dam built by the Corps of Engineers to prevent bank erosion and provide a navigation channel for barges. The wing dams just below Ponca are designed to keep the Missouri River from shifting its channel away from Sioux City, Iowa, the supposed head of barge navigation on the river. From Sioux City to the river's confluence with the Mississippi thousands of wing dams and hundreds of miles of quarried limestone line the river bank, forcing the river into a uniform, monotonous channel. There are no sandbars, only a handful of islands, and a couple of side channels along this 740-mile stretch. The river maintains a near-constant 300-foot-wide, nine-foot-deep channel. Above the river's stone banks, an observer can easily see where the former river once meandered through its valley in western Iowa. The old shorelines are visible in the otherwise laser-leveled valley, they appear as gentle dips in the

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[25]Sioux Falls Argus Leader, series titled, *Down By The River: Life along the Missouri,* article titled, *Crowd Control, State Officials Consider Plans for Lewis and Clark Lake,* 24 July 1991."

[26]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Master Water Control Manual, 3-37.

terrain, and after a good rain, former channel areas fill up with water, marking the river that once flowed through the area.

The Missouri glides past the skyscrapers of Omaha, Nebraska. In this city resides the Headquarters office, Missouri River Division, U.S. Army Corps of Engineers; here work the people entrusted with the day-to-day oversight of the Missouri's dams, reservoirs, and navigation channel. The Missouri River Division headquarters building houses what is referred to as the Missouri River Reservoir Control Center. This is the nerve center for regulating the flow of the river. In this room, with its maps of the basin, computers, and large-screen monitors displaying data on flow rates, Corps officials determine the water release sequence for the main stem dams.[27] If the land surrounding Pierre, South Dakota, received a drenching, six-inch rainfall, the previous night, officials calculate how much of that water will enter the reservoirs behind Oahe and Big Bend dams, when it will arrive, and how much and when to draw down the reservoirs in order to create storage space for the eventual runoff. The Reservoir Control Center can sharply curtail the flow of the river or dramatically increase the flow.[28]

On down the river, past the mouth of the Platte River and into the states of Missouri and Kansas, the river moves on, rather quickly within its rock-lined, 300-foot-wide, Corps-designed channel. Just across from St. Joseph, Missouri, the historic jumping-off point for Pony Express riders crossing the Great Plains, stand the remains of Elwood, Kansas, a town devastated during the Great Flood of 1993. Before sunrise on 25 July 1993, water from the Missouri rushed through the streets of Elwood, pulling down entire houses, digging deep channels, and moving mobile homes in a helter-skelter fashion. Fewer than twelve of the

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[27] Omaha World Herald, *New Center Here Achieves World's Best Water Control,* 24 May 1956.

[28] Sioux City Journal, *Corps Stuck in Middle of River Muddle,* 18 September 1991.

town's 500 houses were not damaged by the high water; an estimated 100 houses in Elwood were totally destroyed.[29] On the outskirts of the ravaged town lie gigantic cottonwood trees, uprooted by the flood waters and deposited in the valley, signposts of where the torrents had passed.

The signs of the Great Flood of 1993 persist south of Elwood, down to Kansas City, and especially through central Missouri, which witnessed some of the worst flooding of that memorable summer. The river moved with such force through central Missouri that one town after another was inundated and bridges spanning the river were severely damaged. One span of a railroad bridge at Glasgow, Missouri, collapsed into the river.[30] Even after the Great Flood, the U.S. Army Corps of Engineers kept a close eye on the river, especially along its final reach. During the flood, the river began flowing through an ancient channel that emptied into the Mississippi eight miles north of its present mouth. However, the high waters of the Mississippi overpowered the floodwaters of the Missouri and prevented the Missouri from permanently occupying this prehistoric route to the Mississippi. If the Missouri had been able to shift its entire flow to this older river bed, it would have wreaked havoc on the new $850 million Melvin Price Lock and Dam on the Mississippi, which sits a couple of miles above the present mouth of the Missouri. If the Missouri's water is able to enter the Mississippi above the Melvin Price Lock and Dam, rather than below it, the effective life of the structure will be dramatically lowered by the silt that will accumulate behind it. To safeguard the lock and dam, the Corps of Engineers built a massive stone barrier to keep the Missouri out of its ancient channel during the next flood. The Corps is

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[29]Des Moines Register, *Clobbered by Raging River,* 25 October 1993.

[30]U.S. Army Corps of Engineers, North Central Division, The Great Flood of 1993, Post-Flood Report, Upper Mississippi River and Lower Missouri River Basins, Main Report, (St. Paul (?): U.S. Army Corps of Engineers, North Central Division, 1994), 60.

determined to keep the river flowing along its current path. Claude Strauser, Corps of Engineers, Mississippi River Division, St. Louis, Missouri, emphatically stated,

> As long as we have a viable government and people realize the consequences [of the river meandering] we won't let it happen. The Corps will find some way to keep enough rock in front of the Missouri to keep it from establishing a major new channel across the low-lying peninsula. In the next 50 or 100 years we'll probably be able to keep things the way they are, but in the long run the Missouri will have its way. Over geologic time, nature will do what it wants to.[31]

The waterscape of the modern Missouri River is the result of changes that have largely occurred within the past century. In that relatively short span of time, the Missouri went from a river lightly touched by the human presence to a river completely transformed to serve people. This transformation began with American agricultural settlement. Thus, an examination of the Missouri River and valley environments prior to that settlement is necessary to understand later events.

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[31] Des Moines Register, *River Resists Path Charted for It by Man,* 24 October 1993.

CHAPTER 3: THE MISSOURI RIVER YESTERDAY

During the nineteenth and early twentieth centuries, Americans gave the Missouri River a number of nicknames designed to describe, very succinctly, the environmental character of the stream. People referred to the river as Big Muddy, the Mighty Mo, the Wide Missouri, and Old Misery. Big Muddy denoted the river's water; the Mighty Mo acknowledged the Missouri's incredible power, especially during floods; the Wide Missouri described the great width of the river as it flowed through the Dakotas, western Iowa, and Missouri; Old Misery expressed the sufferings of the thousands of individuals who had lost loved ones or property to the stream. A number of popular sayings also characterized the Missouri River. Valley residents said the Missouri behaved like a transient, because it spent every night in a different bed; others asserted that farmers with crops in the bottomlands never knew whether they would harvest corn in the fall or a stringer full of catfish. Missouri Valley inhabitants declared the river's water too thick to drink and too thin to plow. All of these names and statements aptly applied to the Missouri River and valley environments in the early and middle nineteenth century, before large-scale American agricultural settlement in the valley.[1]

In the early 1800s, the Missouri River, below its confluence with the Yellowstone River, was much longer, from one hundred and fifty to two hundred miles longer than it is today.[2]

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[1]Lewis R. Freeman, *Trailing History Down the Big Muddy,* National Geographic, LIV, no. 1, (Washington DC: National Geographic Society, July 1928), 73. Frederick Simpich, *Taming the Outlaw Missouri River*, National Geographic, LXXXVIII, no. 5, (Washington DC: National Geographic Society, November 1945), 569. Time Magazine, *Land of the Big Muddy*, 1 September 1952.

[2]George R. Hallberg, Jayne M. Harbaugh, and Patricia M. Witinok, Changes in the Channel Area of the Missouri River in Iowa, 1879-1976, (Iowa City: Iowa Geological Survey, 1979), 17, Appendix (river maps). Gary Moulton, ed., The Journals of the Lewis and Clark Expedition, 1, Atlas of the Lewis and Clark Expedition, (Lincoln: University of Nebraska Press, 1983), 14, Clark-Maximillian Sheet 3, route about August 3-8, 1804, 15, Sheet 4, route about August 8-13, 1804, 16, Sheet 5, route about August 13-21, 1804. Hiram Chittenden,

The river was longer because it meandered great distances within its valley. Two factors contributed to the river's sinuosity: valley width and the climatic cycle. Through the Dakotas, the width of the Missouri Valley is from one to three miles.[3] As a result, the river meandered, but the valley walls limited its sinuosity by blocking its curvaceous path. From present-day Yankton, South Dakota, south to the Platte River confluence, the Missouri Valley widens. Here the distance from valley wall to valley wall is from five to eighteen miles, with the widest section in northern Monona County, Iowa.[4] Because of the wide alluvial valley below Yankton, the Missouri wandered far and wide. Along this reach, the Missouri created dramatic loops, or bends (Figure 3.1). On 29 July 1804, Lewis and Clark penned, "The Missouri is much more crooked since we passed the Platte, though generally speaking not so rapid."[5] The explorers also measured a bend in the river in present-day Monona County that extended eighteen and three quarters of a mile around and only nine hundred and seventy-four yards across at its neck.[6] When John James Audubon traveled up the Missouri in 1843,

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History of Early Steamboat Navigation on the Missouri River: Life and Adventures of Joseph La Barge, Pioneer Navigator and Indian Trader for Fifty Years Identified with the Commerce of the Missouri Valley, 1, (New York: Francis P. Harper, 1903), 154, 155, map titled, *Changes of the Channel of the Missouri River Through Monona County, Iowa,* map drawn by Paul Burgoldl, compiled by Mitchell Vincent, Onawa, Iowa. B. Shimek, Iowa Geological Survey Annual Report, 20, *Geology of Harrison and Monona Counties*, (Des Moines: Emory H. English, 1910), 293.

[3]U.S. Army Corps of Engineers, Missouri River Division, Comprehensive Report on Missouri River Development, Appendix VIII, Plan of Improvement, Section A: Introduction, (Unpublished, 1944), 11.

[4]B. Shimek, *Geology of Harrison and Monona Counties*, 287.

[5]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 62, 63.

[6]Ibid., 73. Gary E. Moulton, ed., The Journals of the Lewis and Clark Expedition, 1, Atlas of the Lewis and Clark Expedition, 15, Clark-Maximillian Sheet 4, route about August 8-13, 1804.

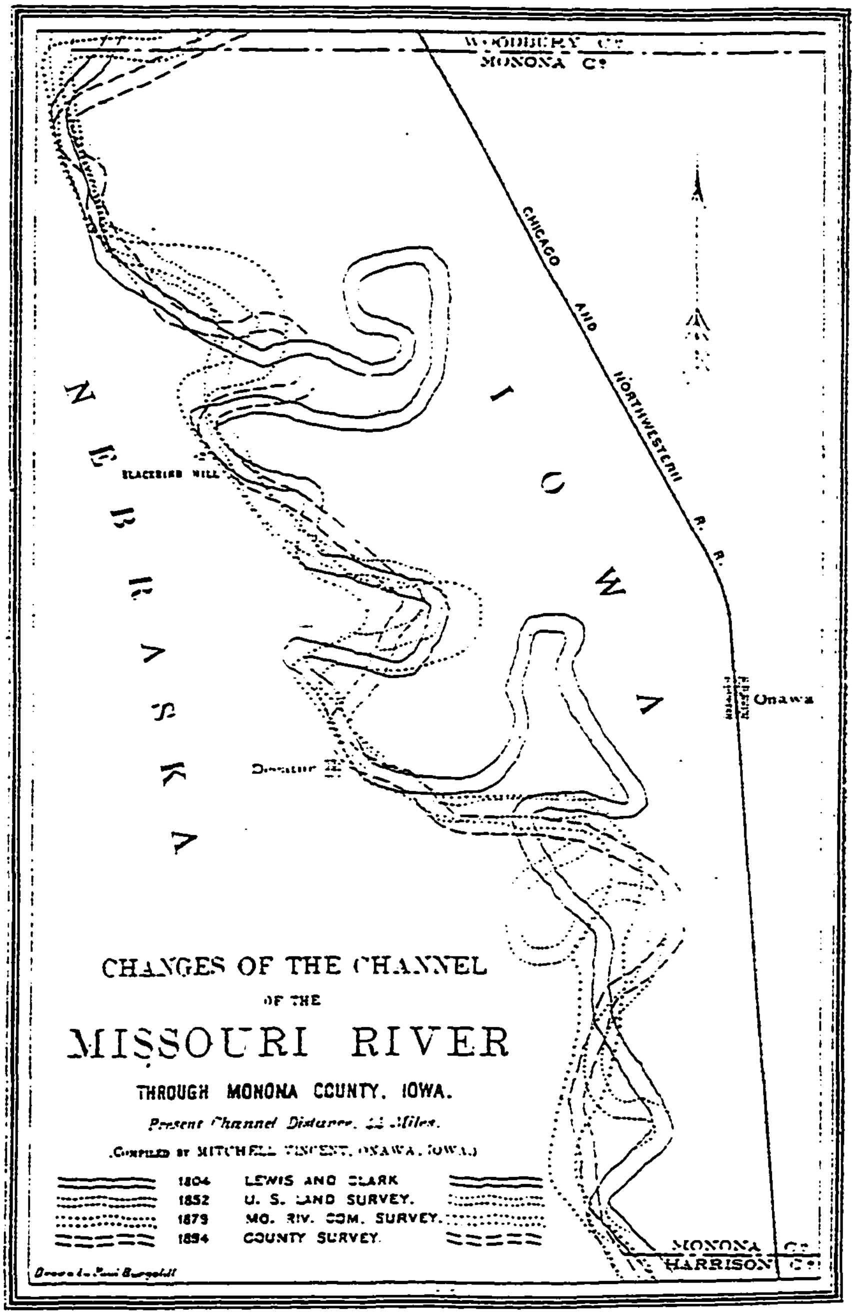

Figure 3.1. Changes in the channel of the Missouri River in Monona County, Iowa. The Missouri River constantly eroded its banks and changed the direction of its channel. In the nineteenth century, the Missouri naturally straightened its channel area by cutting off long bends. Those changes are visible in this illustration of the river channel adjacent to Monona County, Iowa. Map from Hiram Chittenden's *History of Early Steamboat Navigation on the Missouri River*.

he observed the change in the river above present-day Council Bluffs, Iowa. "We have now come to a portion of the river more crooked than any we have passed; the shores on both sides are evidently lower, the hills that curtain the distance are further from the shores, and the intervening space is mostly prairie, more or less overflowed.[7]"

Climate also influenced the river's sinuosity. In the early 1800s, a dry climatic cycle descended upon the Missouri Basin. Low annual precipitation amounts contributed to the river's sinuosity. The Missouri did not have the water volume or current velocity to move more directly south, so it moved from side to side. Beginning in the early 1840s, and continuing into the twentieth century, precipitation patterns shifted; annual rainfall amounts increased and the valley became wetter. The river compensated for the increase in its water volume and current velocity by straightening itself, widening its channel area, and cutting off bends. From the 1840s to the 1920s, the river naturally changed from a meandering stream to a semi-braided stream (a river with a straighter channel area that contains more side channels, sandbars, and dunes than a meandering river).[8]

These changes in the river (from a meandering to a semi-braided stream) began soon after Audubon visited the Missouri Valley. In 1844, the lower reaches of the Missouri (south of the Platte River confluence) inundated its valley in the greatest flood up to that time, and cut off a number of bends.[9] The straightening process accelerated in the early and middle 1850s.[10] During the winter of 1856-57, the upper Midwest experienced heavy snows and

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[7]Maria R. Audubon, *The Missouri River Journals, 1843*, in Audubon and His Journals, I & II, edited by Elliot Coues, (New York: Charles Scribner's Sons, 1897, reprint, New York: Dover Publications, Inc., 1960), 483.

[8]Hallberg, Harbaugh, and Witinok, Changes in the Channel Area of the Missouri River, 17.

[9]Chittenden, History of Early Steamboat Navigation on the Missouri River, 154, 155.

[10]Sioux City Journal, *Stabilizing Missouri River Will Affect Brown's Lake*, 30 September 1954.

bitter cold. According to Landon Taylor, an early settler in western Iowa, a snowstorm that struck in the first week of December 1856 lasted for three straight days and dumped upwards of four feet of snow in the valley near Sioux City.[11] When the snows melted and the rains fell in the spring of 1857, the Missouri in western Iowa cut off more of its meander channels. The process continued with the huge floods of 1881, 1903, 1908, and 1915. Thus, in the early 1800s, the Missouri River possessed a greater length than it does today. The river was first shortened by changes in the climatic cycle and only later through human action.

In present-day western Iowa, and Missouri, the river channel area (the area of the flood plain that contained the main channel of the river, secondary channels, and chutes as well as sandbars, islands, and cut off channels) had a width of 1,000 to 10,000 feet during normal flow periods.[12] During flood periods, the river's width expanded to 25,000 feet or upwards of 40,000 feet.[13] Every year, the river experienced an annual spring and summer rise. These rises usually occurred in April and June respectively. The spring rise resulted from the break-up of the river's ice, the melting of the snow cover on the plains, and the advent of thunderstorms. The spring rise struck quickly and violently, remained localized, and lasted maybe a week or two. The summer rise resulted from the melting of the mountain snowpack combined with prolonged precipitation in the lower valley, and it lasted longer and covered a

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[11]Willard Robbins, Recollections of Monona County Pioneers, (Published by the author, no date of publication), listed on page two under the title, *The Story of a Pioneer*.

[12]U.S. Army Corps of Engineers, The Federal Engineer, Damsites to Missile Sites: A History of the Omaha District, U.S. Army Corps of Engineers, (Washington DC: GPO, 1985), 45. Hallberg, Harbaugh, and Witinok, Changes in the Channel Area of the Missouri River, 7.

[13]Sioux City Journal, *Sea of Water Extends from South Sioux City to Jackson*, 10 April 1943.

larger area.[14] These rises occurred every year, like clockwork, and their height and duration depended upon the amount of runoff entering the river.

Audubon witnessed the start of the summer rise when he visited Fort Union at the mouth of the Yellowstone on his 1843 voyage. He recorded how the swollen Yellowstone (which drains the short-grass plains and mountainous regions to the southwest) entered the Missouri, causing it to actually stop flowing, back-up, and flood low-lying areas.[15] Henry Brackenridge, who went up the Missouri by keelboat in 1811 out of "idle curiosity," wrote about the summer rise near the Whitestone River (the Vermillion River in present-day southeast South Dakota).

> A delightful day, the water has risen to its utmost height, and presents a vast expanse, the current uniformly rapid, in some places rolling with the most furious and terrific violence...[the water in] the middle of the river appeared several feet higher than the sides. He continued, The high waters enable us to cut off points, which is no small saving of the distance... great quantities of drift wood descend [the stream] and thirty or forty drowned buffaloes pass by every day.[16]

The river's elevation in relation to the adjacent valley floor exacerbated the flooding that occurred along the Missouri. Over the ages, the deposition of the Missouri's silt-load raised the Missouri's immediate bankline above the surrounding bottomlands. Iowa Geologist, B. Shimek noted that the valley floor in western Iowa sloped downward from five to six feet from the banks of the river to the Loess Hills on the eastern edge of the valley. This phenomenon also existed along the Missouri's course through Kansas and Missouri. Thus, once the Missouri overtopped its banks, its waters went cascading through the lowlands.[17]

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[14]Chittenden, History of Early Steamboat Navigation on the Missouri River, 83.

[15]Maria Audubon, *The Missouri River Journals,* volume II, 53.

[16]Henry Marie Brackenridge, Views of Louisiana: Together with a Journal of a Voyage up the Missouri River, in 1811, (Pittsburgh: Cramer, Spear, and Eichbaum, 1814, reprint, Ann Arbor: University Microfilms, Inc., 1966), 232.

[17]B. Shimek, *Geology of Harrison and Monona Counties*, 287. Kansas City Star, 7 May 1911.

The Missouri River experienced extreme fluctuations in water volume, and corresponding depth, during any given year or even during a particular week. The river rose several inches or even feet in a few hours following a severe thunderstorm and it dropped just as quickly once the skies cleared. The higher reaches of the river had more stable water levels than the lower reaches because above the mouth of the Yellowstone most of the runoff entering the Missouri came from snowmelt, which slowly percolated into the river. Furthermore, the upper river has a smaller drainage area, along with a stone and gravel bed; two factors that kept the river level from fluctuating wildly up and down. Along the Missouri's upper reaches, the ordinary variation in water level during the average year was 7.3 feet, and during a year with a major flood, the difference in level reached as high as nineteen feet. Further downstream, in the reach through western Iowa, the ordinary fluctuation was 10.4 feet and the highest fluctuation was approximately twenty-five feet. The reach extending through central Missouri experienced oscillations as high as thirty-eight feet in a year. In other words, the river stage at Hermann, Missouri, might jump from as low as three feet to as high as forty-one feet in the same year.[18]

In addition to floods and extreme fluctuations in volume, the river experienced a phenomenon known as "ice-out." This usually occurred in March, when the frozen river awoke from its winter slumber. Ice-out began with the popping and cracking and occasional booming of the ice as it thawed. Then the ice broke into pieces and the whole mass started to move. As the jumbled, cold mixture hurried downstream, the blocks of ice rammed into each another, as if jockeying for position, and the larger ice cakes pulverized the smaller ones into slush or forced them skyward accompanied by a low groan.

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[18]U.S. Army Corps of Engineers, Annual Report of the Chief of Engineers (ARCE) 1939, part 1, volume 2, (Washington DC: GPO, 1939), 1273, 1308.

Ice-out always coincided with localized flooding, as ice jams formed and the river backed-up into the surrounding lowlands.[19] The worst flooding from ice jams occurred on the river in the spring of 1881. That year, the Missouri's tributaries poured a large volume of meltwater into the still frozen river. Instead of the usual, gradual breaking-up of the river's ice, the in-flow quickly dislodged the ice, resulting in the formation of massive ice cakes.[20] One cake, witnessed near Yankton, South Dakota, measured approximately ten acres across and four feet thick.[21] These cakes flowed downstream and jammed around logs, sharp bends in the channel, or on top of sandbars and islands. Once an obstacle blocked the flow of ice, ice piled up behind the obstruction until the river became dammed. It was common for the water to rise three, four, five feet or more in a matter of hours behind ice jams.[22] After sufficient water pressure built up behind the structure, the ice jam gave way.

A succession of ice jams above and below Old Vermillion, Dakota Territory, demolished that town in 1881. The river's ice and water shattered a total of one hundred and thirty-two buildings. In one day alone, the Missouri carried downstream fifty-six buildings, eventually smashing them up against an ice jam south of town.[23] When the waters receded, Old Vermillion resembled a junk yard. Ice cakes covered with greasy black mud lay strewn all

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[19]Yankton Herald, The Great Flood, (Yankton: Herald Press, 1881), 3.

[20]A.H. Lathrop, Life in Vermillion Before the 1881 Flood and Shortly After, (Vermillion: Clay County Historical Society, 1970), 38.

[21]Sioux City Journal, *Damaging Missouri River Flood of 1881 Recalled on 60th Anniversary of Outstanding Event in the History of This Area*, 30 March 1941.

[22]Sioux City Journal, *Enraged Missouri River Carries Vermillion Away: It's April 6, 1881*, 5 July 1953.

[23]A.H. Lathrop, Life in Vermillion, 37.

over the streets, and a large section of the town had been wiped clean, its buildings gone with the river.

The depth of the river's main channel, or thalweg, varied with the season of the year. In the spring and early summer, the thalweg attained its greatest depth, peaking in late June. Beginning in early July, the river dropped, retreating to its lowest level in the months of December and January.[24] Although highly variable, the depth of the thalweg, below the mouth of the Yellowstone confluence, averaged between three and four feet. But on the outside edge of abrupt bends (where the water tore against the bank) or off the end of gravel bars, the thalweg achieved depths approaching ten feet or even twenty feet and there were holes in the Missouri that exceeded forty feet in depth.[25]

The Missouri also contained rapids, cascades, and riffles. The river above the Yellowstone had the majority of rapids and falls. Two famous rapids, named during the steamboat era, were Bird's and Daulphin's rapids.[26] Even the lower river, with its predominantly sand, gravel, and clay bed, possessed rapids and riffles.[27] In 1811, Brackenridge reported that on 24 April, his party attempted to pass over a sand and gravel

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[24]U.S. Army Corps of Engineers, Annual Report of the Chief of Engineers, United States Army, to the Secretary of War, for the Year 1891. (Washington DC: GPO, 1891), graph titled, *Mean Daily Gauge Height and Discharge in Cubic Feet Per Second for a Period of Twelve Years. 1879-90. Missouri River, Sioux City. To accompany annual report for 1891 of A.H. Blaisdell, Asst. Eng'r.*

[25]U.S. Army Corps of Engineers, The Federal Engineer, 7. William E. Lass, A History of Steamboating on the Upper Missouri River, (Lincoln: University of Nebraska Press, 1962), 110.

[26]Elias J. Marsh, *Account of a Steamboat Trip on the Missouri River, May-August, 1859,* in South Dakota Historical Review, I, no. 2, January 1936, 110.

[27]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 8.

riffle where the water flowed with considerable force.[28] Lewis and Clark documented large boulders in the middle of the river near the Big Bend region.[29] Massive, water-worn, round stones blanked the Missouri River channel near the mouth of the Cannonball River, the presence of these stones gave the Cannonball its name.

Contrary to popular belief, the Missouri River was not muddy. Prairie topsoil did not saturate its water. As a result, the Missouri never appeared black or dark brown. Rather, the stream took on a milky, light brown coloration or a shade of gray.[30] Nineteenth century explorers and adventurers appreciated the beauty of this seemingly dirty water, especially when the sun's light struck the river at a particular angle. Hiram Chittenden, a Corps of Engineers officer assigned to the Missouri River in the late nineteenth century, claimed that the Missouri's water took on a "crimson hue or silver glimmer" in the mornings and before sunset (Figure 3.2).[31] The river acquired its color from the sands, clays, gravels, and limestone that washed into the stream off the great short-grass plains that extend to the Rocky Mountains. These materials formed a concoction known as silt, which was constantly in motion in the river's current. Silt was picked up, dropped down, moved from side to side, and rolled along the river bed. When it settled down, silt formed sandbars, which littered the river from bank to bank, especially during low flow periods. At times, the bars became so

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[28]Brackenridge, Views of Louisiana, 215.

[29]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 127.

[30]Thaddeus A. Culbertson, *Journal of an Expedition to the Mauvaises Terres and the Upper Missouri in 1850*, in Smithsonian Institution Fifth Annual Report, 1850, (Washington DC: GPO, 1851, reprint, edited by John Francis McDermott, Washington DC: GPO, 1952), (page references from reprint edition), 17.

[31]Chittenden, History of Early Steamboat Navigation on the Missouri River, 83.

Figure 3.2. The Missouri River near the Platte River confluence. The Missouri River's water color appeared light yellow or at times an ashen gray. The clearer water of the Platte (to the right of the painting) did not immediately mix with the silt-laden Missouri. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

numerous that early river navigators had difficulty discerning the location of the thalweg. Sandbars made the lives of keelboatmen and steamboat pilots hellish. Lewis and Clark, traveling upstream via keelboat, described their predicament on 12 September 1804,

> We with great difficulty were enabled to struggle through the sand-bars, the water being very rapid and shallow, so that we were several hours in making a mile. Several times the boat wheeled on a bar, when the men were obliged to jump out and prevent her from upsetting; at others, after making a way up one channel, the shoalness of the water forced us back to seek the deep channel. We advanced only four miles in the whole day and camped on the south.[32]

Audubon, traveling by steamboat nearly forty years later wrote about a similar experience near Fort Pierre. His entry for 31 May 1843 stated that his boat had been moored the previous night only nine miles southeast of Fort Pierre and that the boat departed for the fort at 3:30 a.m. in the morning, but only reached the fort at 4:00 p.m. in the afternoon. It took twelve and a half hours to travel nine miles because the boat kept getting hung-up on sandbars. No doubt, Audubon would have been better off to have walked to Fort Pierre that day.[33]

Islands formed in the Missouri River when the thalweg changed course and separated a piece of land from the main shore, or when the river's water no longer inundated a sandbar, which allowed for the growth of vegetation. The Missouri did not possess as many islands as sandbars because the river's erosive action prevented the formation of stable landforms within the channel area. However, the islands that did form in the river supported stands of trees, which in-turn anchored the island, and prevented its destruction. Two of the largest islands in the Missouri existed in present-day southeast South Dakota, Bon Homme Island (west of

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[32]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 62, 63.

[33]Maria Audubon, *The Missouri River Journals,* volume I, 525.

modern-day Yankton, South Dakota) and Cedar Island (approximately forty-two miles upstream from Fort Randall Dam).[34]

Sand flats existed on the perimeter of the channel area, especially on the inside edge of bends, or at the foot of the bank line. The river frequently scoured or inundated the flats, and rendered the establishment of vegetation impossible (Figure 3.3). Sand dunes formed near the river as the wind blew across the sand flats, picked up dry, fine silt, and dropped it in front of an obstacle, such as a log or tree. Dunes located near Bon Homme Island so impressed Lewis and Clark with their height, that the explorers mistook the formation for an ancient fortress.[35] In western Iowa, dunes around trees reached twenty feet in height.[36] The extensive sand flats, dunes, and sandbars in the channel area contributed to vicious sandstorms that tore through the valley.

The Missouri eroded its banks endlessly, shifting its channel and frequently cutting off bends to form oxbow lakes. Thaddeus Culbertson, who traveled up the Missouri Valley to Fort Pierre in 1850 wrote the following: "I have noticed several lakes within the last two days, all of a peculiar shape, that of a half moon and having wood on the inner side. I am told these lakes are filled with fish which are left there from the high waters of the Missouri."[37] Oxbow lakes formed during high flow periods, when the river's greater volume and increased current velocity contributed to channel straightening. The river also created oxbow lakes

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[34]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 103, 113. Maria Audubon, *The Missouri River Journals*, volume I, 508.

[35]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 103, 104.

[36]B. Shimek, *Geology of Harrison and Monona Counties*, 411, 412.

[37]Thaddeus A. Culbertson, *Journal of an Expedition to the Mauvaises Terres and the Upper Missouri in 1850,* 36.

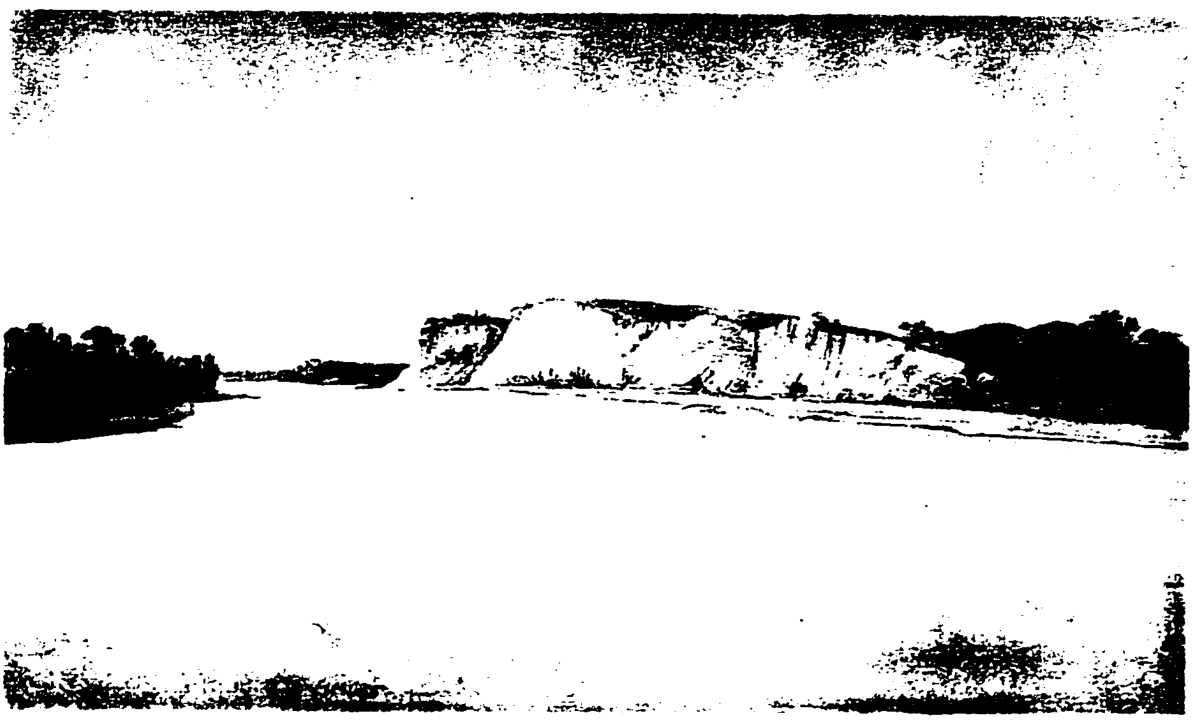

Figure 3.3. Sand flats below the mouth of the Big Sioux River. The Missouri River channel area in the nineteenth century was wide and divided by numerous sandbars. Extensive sand flats existed along the river's edge, formed during high flows through deposition of silt and the scouring action of the river's current. In this illustration, sand flats are visible at the foot of the Loess Hills. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

through prolonged erosion of a bend's neck, regardless of increased water volumes descending the channel.

When the Missouri River eroded its banks, it undermined trees and brush. During floods, when the river's erosive powers were greatest, the river channel filled with downed trees, which eventually settled to the river bottom, becoming snags. Over time, rushing water stripped all the bark, leaves and small branches from the snags. These white, barkless snags extended above the murky water, and during foggy mornings appeared like ghosts seeking to rise from their watery graves (Figure 3.4).[38] Floating trees and brush, which collected behind embedded snags, became what pioneers referred to as an embarras. A French trader wrote: "The first [snags deposited in the river] serve as a stay for the others, which serve in turn for those which follow, and all being entwined and gathered together become a solid mass and form an immovable bridge, all bristling with branches and stumps, which extends far out into the water."[39] Occasionally, embarrases reached stupendous sizes, covering hundreds of square feet, and extending all the way across the river channel. In order for keelboats and steamboats to pass beyond a massive embarras, a path had to be literally sawed through the jumbled mess. During this procedure, there was the constant risk that men wielding axes and saws would be pulled under the obstruction by the current (Figure 3.5).

The Missouri possessed, or was possessed by, whirlpools. Hiram Chittenden told the story of the steamboat *Miner*, which narrowly escaped being sunk in a whirlpool just south of Sioux City in 1867. Witnesses claimed the center of the whirlpool descended twelve feet below its outside edge. As the *Miner* tried to pass safely by the swirling mass of water, it

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[38]Josyln Art Museum, Karl Bodmer's America, (Omaha: Josyln Art Museum, 1984), 150, painting listed as 152. *Snags on the Missouri*, watercolor and pencil on paper, 8 3/8 X 10 3/4.

[39]Annie Heloise Abel, ed., Tabeau's Narrative of Loisel's Expedition to the Upper Missouri, translated from the French by Rose Abel Wright, (Norman: University of Oklahoma Press, 1939), 61.

Figure 3.4. Snags in the Missouri River. The erosive Missouri River frequently undermined its banks, toppling trees into its channel. Over time, the root structures of the trees became anchored in the riverbed; and the river's ice and powerful currents stripped away the bark and smaller branches. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

Figure 3.5. An embarras on the Missouri River. The embarras was a collection of floating debris that gathered on the upstream side of a snag or obstruction. Occasionally, an embarras reached huge dimensions, blocking the entire river channel. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

became caught in the spiraling current, two men slipped off the deck and drowned in the turbulent water. Fortunately, the whirlpool tossed the *Miner* into calmer water, where it mustered enough steam to proceed onward.[40] A whirlpool near Vermillion menaced that town and its residents from 1875 to 1881. The whirlpool undermined the railroad tracks south of town, threatened the lives of boaters, and in the Great Flood of 1881, this whirlpool became the depository of many of the town's buildings.[41]

Although the river often shifted course, cut away its banks, and carried trees, brush, and buffalo downstream, it actually accreted more land than it eroded. The wide alluvial valley floor in western Iowa had been aggregating since the last glaciation. And when the Missouri eroded one side of its channel area, it rebuilt the other side. One area's loss was always another area's gain. The Missouri redistributed soils, working in concert with geological and climatic forces to move soils off the plains and prairies, deposit sediments along its entire length, and dump a portion of its silt load into the Mississippi.

The silt deposited by the river along the valley was very fertile and contributed to the growth of thick underbrush, tall prairie grasses, and forests. Lewis and Clark, while camped near present-day Homer, Nebraska, noted the underbrush and the difficulties of travel along the valley floor. "The walk [to a nearby Indian village] was very fatiguing, as they [the men] were forced to break their way through grass, sunflowers, and thistles, all above ten feet high and interspersed with wild pea."[42] The forests lining the river were truly impressive. Lewis noted that [the Missouri] "nourishes the willow-islands, the scattered cottonwood, elm, sycamore, linden, and ash, and the groves are interspersed with hickory, walnut, coffee-nut,

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[40]Chittenden, History of Early Steamboat Navigation on the Missouri River, 122.

[41]A.H. Lathrop, Life in Vermillion, 13, 14.

[42]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 75.

and oak."[43] Cottonwoods along the river grew to astounding sizes, fed constantly by the river's water. Brackenridge, in 1811, claimed to have measured a river edge cottonwood thirty-six feet in diameter at its base.[44] John Bradbury, who also traveled up the Missouri in 1811, measured cottonwoods seven feet in diameter, which maintained that thickness eighty or ninety feet above the ground (Figure 3.6).[45]

At the start of the nineteenth century, the Missouri River Valley remained lightly touched by the human presence. The river, (with its whirlpools, shifting currents, deep holes, side channels, sandbars, rapids, and silt-laden water), and valley (with its marshy bogs, oxbow lakes, tangled underbrush, and overflowed lowlands) had been shaped and changed almost exclusively by geological and climatic forces. Indian peoples did divert water from the river to irrigate small plots of maize or beans. They also burned the valley's prairie grass in the spring to encourage plant growth. They even extracted timber from the valley forestlands for furnishings and fuel. But the Indians only minimally affected the environmental character of the river and valley because their numbers remained low and their population groupings lived in widely-separated locations. As a result, the small number of people, spread out over great distances, limited the human affect on the river and valley environments.

But beginning in the early 1800s and continuing through the 1870s, large numbers of American settlers entered the Missouri River Valley. These settlers flocked to the valley

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[43]Ibid., 63.

[44]Brackenridge, Views of Louisiana, 204.

[45]John Bradbury, Travels in the Interior of America, in the years 1809, 1810, and 1811; Including a Description of Upper Louisiana, Together with the States of Ohio, Kentucky, Indiana, and Tennessee, with the Illinois and Western Territories, and Containing Remarks and Observations Useful to Persons Emigrating to Those Countries, (London: Sherwood, Neely, and Jones, 1817; reprint Ann Arbor: University Microfilms, Inc., March of America Facsimile Series, Number 59, 1966). 15.

Figure 3.6. Underbrush along the Missouri Valley. The fertility of the river valley's soil contributed to the growth of expansive forests, thick underbrush, and tall prairie grasses. Swiss artist, Karl Bodmer, painted this scene along the river bank below the grave of Blackbird, former chief of the Mahas. The grave is located in present-day east-central Nebraska. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

because its environment possessed many of the raw materials necessary for the maintenance of life in a rudimentary agricultural society, including game animals, fish, fresh water, wood, and fertile soil. The river provided settlers with a transportation route between peripheral settlements and eastern U.S. and European markets. Thus, in its undammed and unchannelized state, the Missouri River served a crucial role in the successful American agricultural settlement of the lower Missouri Valley and the adjacent uplands.

CHAPTER 4: THE MISSOURI VALLEY ENVIRONMENT AND AMERICAN SETTLEMENT, 1803-1880

From 1803 to 1880, American military personnel, fur traders, and agriculturists settled in the Missouri Valley. The valley's timber, easily accessible drinking water, wild game animals, flat land surface, and lush prairie grasses furnished these pioneers with the resources they needed to survive in a frontier region. The pioneers also relied upon the Missouri River transportation route to: maintain a communications link with the outside world, supply them with manufactured goods, and carry their agricultural commodities downstream. Thus, for the early settlers, the establishment of homes, farms, and towns in the bottomlands made economic sense. They needed to be close to the resources and transportation artery that allowed them to live there in the first place.

Public reliance on the river as a transportation and communications link led directly to efforts to improve the stream for navigation purposes through a program of snag removal. When the railroad arrived in the valley, residents abandoned the river route. By the 1880s, the railroads firmly established a monopoly over the transportation system of the upper Midwest. Missouri Valley inhabitants perceived this monopoly as exploitative and sought to revive commerce on the Missouri. But rather than advocate snag removal and the reestablishment of steamboat traffic, the public wanted nothing less than the complete remaking of the stream to facilitate barge traffic.

American agricultural settlers advanced up the Missouri Valley after 1803, spurred on by favorable environmental conditions. In 1804, Lewis and Clark recorded that the furthest white settlement up the valley sat at the mouth the Osage Woman River, approximately forty-four river miles above the confluence of the Missouri and Mississippi rivers. West of this village lived a handful of French trappers, a few American farmers, and several nomadic

Indian tribes.[1] On their descent of the river in 1806, the two explorers saw farmers, accompanied by their cattle and hogs, living in the valley as far west as the Gasconade River, ninety miles above the Missouri's mouth. The line of settlement moved fifty miles in only two years.[2] In 1811, Henry Brackenridge witnessed plantations and sizable towns along the banks of the Missouri 200 miles from the river's mouth. Five years later, the federal census estimated the presence of 500 whites along the bottomlands in central Missouri. By 1820, the number of whites living in the valley and nearby uplands increased to 17,629.[3] The town of Franklin became central Missouri's commercial hub. A decade later, in 1830, a string of communities lined the Missouri Valley through central and western Missouri, including Osage, Jefferson City, Rocheport, Boonville, Arrow Rock, Glascow, and Independence.

Settlers continued to concentrate in the lower valley in the 1840s and 1850s. An editorial written in the *St. Louis Post-Dispatch* in 1843 argued that less than a quarter section of land remained unclaimed in the Missouri Valley from the river's mouth to the Missouri-Iowa border. The U.S. census of 1850 confirmed that 225,000 Americans lived in, or immediately adjacent to, the Missouri Valley in the state of Missouri. By that same year, the town of St. Joseph, located along the river in northwest Missouri, had become a well-established community, serving as an outfitting center for prospectors headed to the California gold mines. Agricultural settlers occupied the bottomlands in west-central Iowa as early as 1855; and a group of Council Bluffs-based investors founded Sioux City in 1856. By the spring and summer of 1859, over 1,000 people waited in the Sioux City area for federal authorization to colonize the former Indian lands of southeast Dakota Territory. When that

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[1]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 7,8,9.

[2]Ibid., 1211,1212.

[3]Brackenridge, Views of Louisiana, 211.

authorization came in July 1859, Americans hurriedly occupied the river valley northwest of Sioux City.[4] During the 1860s and 1870s, the line of settlement moved north, northwest along the river through Dakota Territory.

Settlement in the Missouri Valley occurred prior to the arrival of the railroad and before the occupation of all the lands to the east of the river. The river and valley environments served as magnates to American entrepreneurs and settlers (Figure 4.1).

The Missouri Valley environment contained fresh, easily accessible drinking water for military men, traders, and agricultural settlers and their stock animals. Pioneers considered the Missouri's silt-laden water to be excellent for drinking because of its coolness and taste. When thirsty, the men of the Lewis and Clark Expedition dipped their cups into the river, making sure to take only the water near the surface, because the water lower down contained the silt. Fur traders in posts up and down the Missouri went to the stream with buckets to secure their water needs, as did the passengers on steamboats. Farmers drew water from the

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[4]Herbert S. Schell, History of South Dakota, (Lincoln: University of Nebraska Press, 1961), 71, 72, 73. James Sterling Pope, *A History of Steamboating on the Lower Missouri: 1838-1849, St. Louis to Council Bluffs, Iowa Territory*, (Ph.D. Dissertation, St. Louis University, St. Louis, Missouri, 1984), 97. James R. Shortridge, *The Expansion of the Settlement Frontier in Missouri*, Missouri Historical Review, 75, (October 1980), 68, 73, 77. Raymond D. Thomas, *Missouri Valley Settlement-St. Louis to Independence*, Missouri Historical Review, 21 (October 1926), 19-37. Sam T. Bratton, *Inefficiency of Water Transportation in Missouri-A Geographical Factor in the Development of Railroads*, Missouri Historical Review, 14 (October 1919): 82-88. Edward J. White, *A Century of Transportation in Missouri*, Missouri Historical Review, 15 (October 1920): 126-162. Jonas Viles, *Old Franklin: A Frontier Town of the Twenties*, The Mississippi Valley Historical Review, IX, no. 4, (March 1923), 270. Hattie M. Anderson, *Missouri, 1804-1828: Peopling a Frontier State*, Missouri Historical Review, 31 (January 1937): 150-180. Stuart F. Voss, *Town Growth in Central Missouri, Part III*, Missouri Historical Review, 64 (April 1970): 322-350. Stuart F. Voss, *Town Growth in Central Missouri, 1815-1880, An Urban Chaparral, Part I*, Missouri Historical Review, 64, (October 1969): 64-80. Thaddeus Culbertson, *Journal of an Expedition to the Mauvaises Terres and the Upper Missouri in 1850: by Thaddeus A. Culbertson*, in Smithsonian Institution Fifth Annual Report, 1850, (Washington DC: GPO, 1851). Reprint, edited by John Francis McDermott, (Washington DC: GPO, 1952), 21-25. References to reprint edition.

Figure 4.1. The Loess Hills and the Missouri Valley. Wind-borne silt formed the Loess Hills during the last glaciation episode between 31,000 and 12,500 years ago. The Missouri Valley bottomland, because of its proximity to water, flat surface, soil fertility, and abundance of timber, made a significant contribution to the success of American settlement. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

river for a number of uses. Stock animals waded into the river to cool off during hot summer days and to quench their thirst all year long.[5] Persons living in the Missouri Valley did not have to dig deep water wells. The elevation of the river in relation to the valley floor kept the water table close to the surface.

In the 1800s, extensive timber tracts existed along the valley in the state of Missouri and western Iowa. Pioneers utilized bottomland timber to build dug-out canoes, rafts, and mackinaws (a large, flat-bottomed boat). Crewmen used wood to repair damaged keelboats and steamboats. They replaced a broken mast or a punctured hull with bottomland timber.[6] In addition, wood fueled the engines of the steamboats. Steamboats stopped twice or three times daily to load wood, with the crew spending as much as three hours per day gathering the material, either by scouring the countryside or purchasing it at a wood yard.[7] The furnaces of the boats burned an average of twenty to twenty-five cords in a twenty-four hour period (Figure 4.2). On every trip, crewmen became obsessed with obtaining kindling. When steamboat crews found any structure along the river's banks not clearly occupied or in use, they tore it down and carted it off. Cabins, deserted military forts, barns, and fences eventually found their way into the furnaces of the steamers.[8] Besides fueling the steamers,

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[5]Maria Audubon, *The Missouri River Journals,* volume II, 14. Joyce Estes, member of the Lower Brule Sioux Tribe, interview by author, tape recording, Lower Brule, South Dakota, 12 March 1992. Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 82, 83.

[6]Brackenridge, Views of Louisiana, 203.

[7]Elias J. Marsh, *Account of a Steamboat Trip on the Missouri River, May-August, 1859,* 86, 95. Maria Audubon, *The Missouri River Journals,* volume I, 502.

[8]Maria Audubon, *The Missouri River Journals,* volume II, 15. Chittenden, History of Early Steamboat Navigation on the Missouri River, 117, 118.

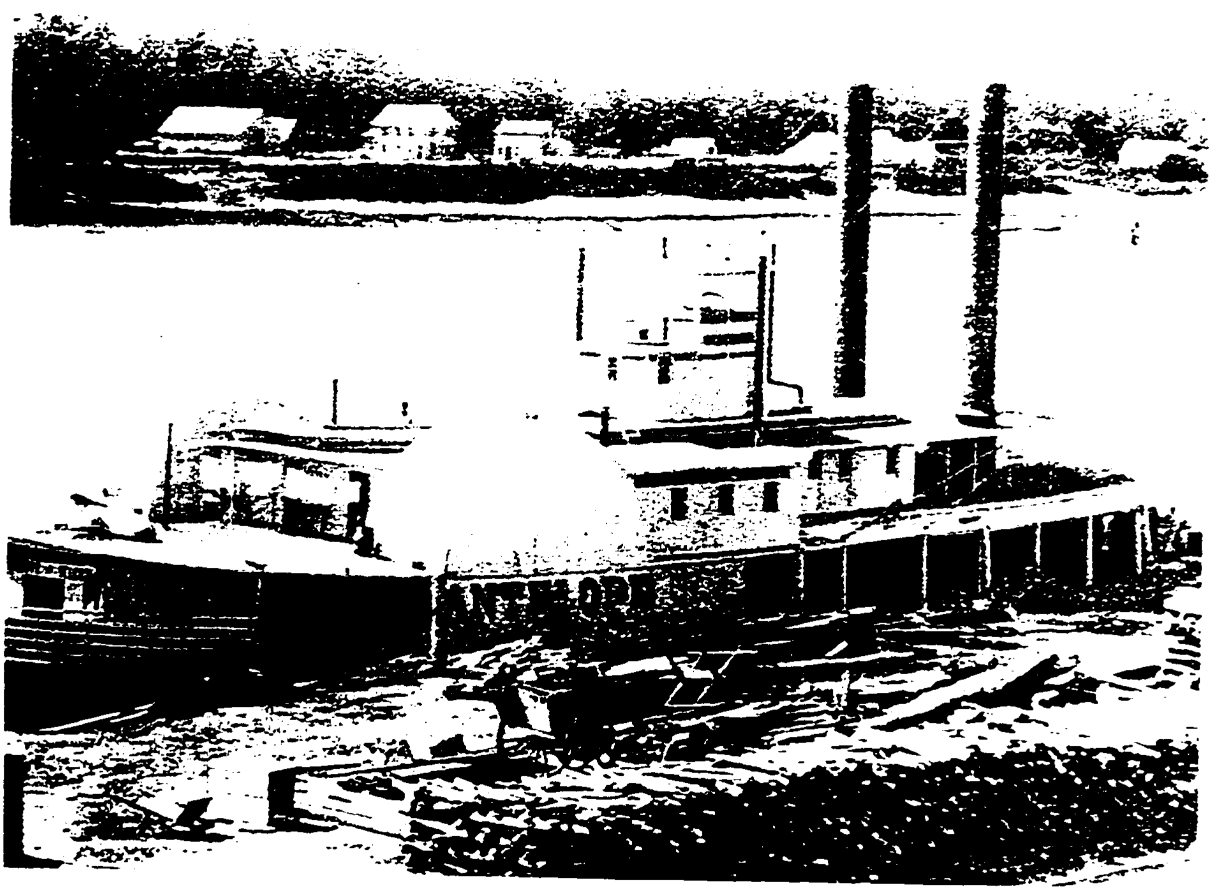

Figure 4.2. The steamer *Antelope* and a fuel wood supply at Sioux City, circa 1868. Steamboats consumed tremendous amounts of wood in their furnaces. The boats stopped two or three times daily to load wood, with crews spending as much as three hours per day gathering the material. The average boat burned between twenty and twenty-five cords in a twenty-four hour period. In the photograph, a stack of wood equaling twenty cords (a single day's supply) is visible in the foreground. The wood to fuel the steamboats came exclusively from the valley bottomlands. Courtesy of the Sioux City Public Museum.

settlers cut wood for the construction of tools, dwellings, storage containers, and furniture.[9] Wood served as the primary fuel to heat cabins and homes and to cook food. Valley forestland provided shelter for stock animals during inclimate weather. Settlers guided their cattle into the trees before approaching storms.[10] In the nineteenth century, wood's multiple uses made it the wonder material, the historical equivalent of today's plastic. Without the bottomland timber, human life in the Missouri Valley could not have been sustained.

The river valley from the Yellowstone confluence south provided habitat for a host of game animals, including deer, elk, buffalo, black bears, coyotes, wolves, and beaver. Explorers, traders, and settlers hunted and trapped all of these animals for food, furs, and oils. The men of the Lewis and Clark Expedition ate a variety of meats during their journey, the three primary staples of the expedition included buffalo, deer, and elk, with beaver tail as a delicious appetizer. Hiram Chittenden, author of a *History of Early Steamboat Navigation on the Missouri River*, (1903) wrote that once a steamboat went beyond the last civilian settlement, the crew and passengers relied on hunting to procure meat. Each steamboat had men on board hired specifically to hunt during the journey. These hunters often left the boat at midnight to pursue their prey in the valley bottomlands. After killing an animal, its carcass was hung in a highly visible spot next to the bank, so the boat could pick it up as it moved upstream.[11] Other steamboat travelers remarked that buffalo were shot from steamboats while they swam the river, men then hauled their carcasses on board, skinned and roasted

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[9]John Perlin, A Forest Journey: The Role of Wood in the Development of Civilization, (Cambridge: Harvard University Press, 1991).

[10]Willard Robbins, Recollections of Monona County Pioneers, story titled, *The Story of a Pioneer*, 3.

[11]Chittenden, History of Early Steamboat Navigation on the Missouri River, 125, 126.

each creature, and then feasted on everything from the entrails to the tongue (Figure 4.3).[12] Wild turkeys, prairie chickens, and waterfowl of various sorts (abundant in the woods and grasslands of the valley) afforded an additional source of food. Settlers in western Iowa in the 1850s ate these birds on a regular basis.[13]

Military personnel, fur-traders, adventurers, and settlers caught and ate fish from the Missouri River. The river and its feeder streams teemed with fish. Lewis and Clark wrote of fishing in a small stream referred to as Maha Creek, near present-day Homer, Nebraska. Several expedition members built a crude net, then dragged it through the creek. The two explorers recounted that, "The first company [of men] brought 318 fish, the second upward of 800, consisting of pike, bass, fish resembling salmon-trout, redhorse, buffalo-fish, rock-fish, one flat-back, perch, catfish, a small species of perch called on the Ohio silver-fish, [and] a shrimp of the same size."[14] In 1843, Audubon recalled that, "We caught seven catfish at the river near the fort [Fort Union at the mouth of the Yellowstone River], and most excellent eating they are, though quite small compared with the monsters of this species on the Missouri below."[15] Audubon acknowledged that the lower Missouri River (below the Big Sioux River) contained the largest catfish; here, the river's deeper thalweg and abundance of side channel's and oxbow lakes provided riverine habitat conducive to the growth of bigger fish. Channel, blue, and flathead catfish were either the most abundant fish species in the

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[12]Maria Audubon, *The Missouri River Journals,* volume II, 21.

[13]James J. Dinsmore, A Country So Full of Game: The story of Wildlife in Iowa, (Iowa City, University of Iowa Press, 1994), 116. Willard Robbins, Recollections of Monona County Pioneers, story titled, *Wild Life in 1855*. Brackenridge, Views of Louisiana, 214. Thaddeus Culbertson, *Journal of an Expedition to the Mauvaises Terres,* 31.

[14]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 76.

[15]Maria Audubon, *The Missouri River Journals,* volume II, 56.

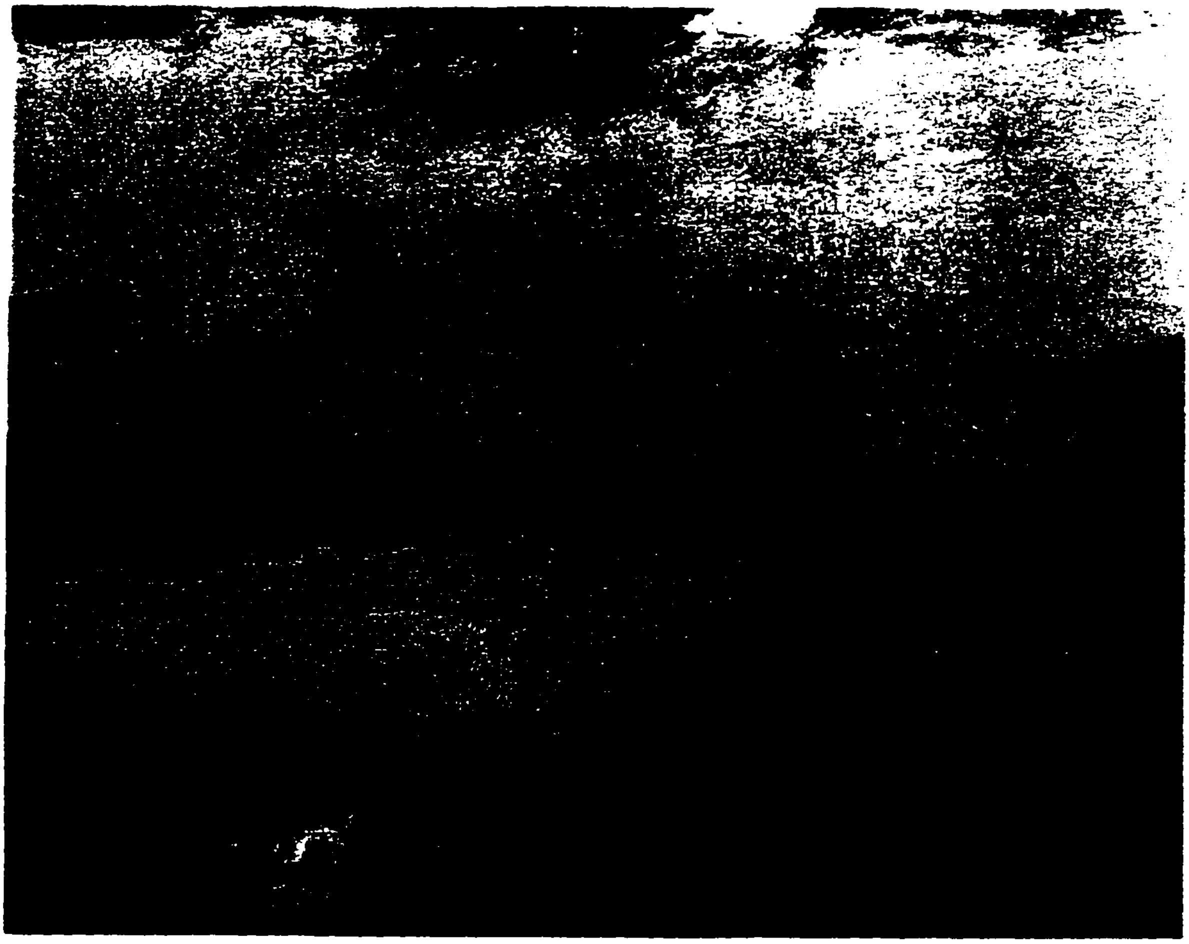

Figure 4.3. Buffalo along the upper Missouri Valley. The Missouri Valley environment, because of its habitat diversity, served as the home to a wide array of animal species. Above the mouth of the Yellowstone River, early nineteenth century explorers and adventurers observed astronomical numbers of buffalo. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

river in the early nineteenth century or they appeared to be because they received all the attention of journal writers. Nonetheless, catfish numbers must have been stupendous, catching them took little effort and even less skill or knowledge. Lewis and Clark repeatedly mention men catching catfish. The size of some of these creatures bewildered the men of the expedition. On 25 August 1804, as the expedition approached the mouth of the Whitestone River (the present-day Vermillion River in southeast South Dakota), Sergeant Patrick Gass wrote: "Two of our men last night caught nine catfish, that would together weigh three hundred pounds. The large catfish are caught in the Missouri with hook and line."[16]

The river valley environment also provided Americans with fruits and vegetables that added variety to their diet. Wild grapes, strawberries, currants, gooseberries, and plums grew in the brush adjacent to the river, as did mouse beans, wild peas, and tubers of various sorts.[17] American accounts detailed how delicious and refreshing the wild fruit tasted, especially after a grueling day of travel in the valley. Saw grass that grew near the water reached heights of five to ten feet. According to Orville Rowland of Turin, Iowa, one of the first settlers to arrive in the Monona County area in the middle nineteenth century, farmers utilized the bottomlands principally for the production of hay. Homesteaders cut the saw grass, which Rowland called "ripgut" or "slough grass," to feed to their cattle during the winter and early spring.[18] In addition to cutting the saw grass, stockman led their cattle to

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[16]Patrick Gass, A Journal of the Voyages and Travels of a Corps of Discovery, Under the Command of Capt. Lewis and Capt. Clarke of the Army of the United States, from the Mouth of the River Missouri through the Interior Parts of North America to the Pacific Ocean, During the Years, 1804, 1805, and 1806, (Minneapolis: Ross and Haines, Inc., 1958), 35.

[17]Willard Robbins, Recollections of Monona County Pioneers, story titled, *Early Day Farming Methods*, 1. Bradbury, Travels in the Interior of America, in the years 1809, 1810, and 1811, 14.

[18]Sioux City Journal, *Tame Fertile Bottom Land*, 25 July 1954.

the ripgut before the advent of a winter storm. Mary Fischer, another early settler from Turin, Iowa, said farmers kept cattle in the ripgut near the marshes until late in the winter. Henry V. Bingham, who traveled to the Missouri Valley in 1818, asserted, "...when the winter sets in they [farmers] drive their cattle into the bottoms where in a number of places is a quantity of cane...."[19]

The valley's topography eased American exploration, trade and settlement. The flat alluvial plain facilitated the establishment of farmsteads. Farmers and their draft animals expended less energy planting, cultivating, and harvesting crops along the valley floor than those who farmed the hilly uplands. Furthermore, the valley's soil, which had been nourished with nutrients by the Missouri's annual floods, produced more corn per acre than the uplands. According to Henry V. Bingham, farmers in the valley produced upwards of 80 to 100 bushels of corn per acre. When the bottomlands dried-out in the late summer, the flat surface expedited overland transportation. Wagons and horses moved faster across the valley floor than through the hill country. As a result, farmers saved time and money when marketing their agricultural produce.[20]

Keelboat and steamboat navigation contributed to the concentration of people along the Missouri Valley and an ever-increasing population facilitated the expansion of river navigation. Before hard-surfaced roads and railroads, the Missouri River served as the only viable route to the lands west and northwest of St. Louis, and the only means for valley settlers to ship their surplus production downstream to eastern U.S. and European markets.[21]

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[19]Willard Robbins, Recollections of Monona County Pioneers, story titled, *The Prairies*, 2. Marie George Windell, editor, *The Road West in 1818, the Diary of Henry Vest Bingham, Part II*, Missouri Historical Review, 40 (January 1946), 188.

[20]Marie George Windell, editor, *The Road West in 1818*, 188.

[21] Gary E. Moulton, ed., The Journals of the Lewis and Clark Expedition, 1, Atlas of the Lewis and Clark Expedition, 3.

Keelboats plied the Missouri River from 1803 into the 1830s. The majority of Missouri River keelboats were built in the eastern United States, either at Pittsburgh, Pennsylvania, or Louisville, Kentucky. Their builders designed the boats specifically for navigating on the Missouri. The average keelboat had a length of fifty-five to seventy feet, a width of eight to twelve feet, and a depth of hold between five and six feet.[22] The hull had a flat bottom to accommodate the shallow water of the Missouri. When fully loaded, the majority of keelboats drew a mere thirty-six inches of water. On its bow stood a forecastle, and its stern held a cabin, averaging ten feet long, four feet high above the deck, and eight feet wide. The hold was approximately thirty to forty feet long. A mast rose skyward from the deck and held a large square sail. On each side of the boat ran a narrow plankway, called the *passe avant*, roughly fifteen inches wide. Crews occasionally placed a brass swivel cannon, or blunderbuss, on the bow of each boat for use against Indians.[23]

The keelboat possessed four primary means of motive power. It moved forward either under sail, by a method known as cordelling, through oaring, or with the crew poling. The only method that did not require strenuous human effort entailed the use of the sail. Keelboatmen unfurled the sail when the winds were favorable, which was not very often on the crooked Missouri. One instant, the thalweg would be flowing directly out of the north and the boat would be under sail from a strong south wind; around the next bend the thalweg would be flowing from the south to the north and the boat would be facing directly into the

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[22]Depth of hold refers to the depth of the keelboat's hull.

[23]Stephen Ambrose, Undaunted Courage, 107, 128. Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 4. Blair Chicoine, curator of the Sergeant Floyd Museum, Sioux City, Iowa, interview by author, 14 June 1996. Chittenden, History of Early Steamboat Navigation on the Missouri River, 102.

wind. Occasionally, the river and the winds might cooperate with the keelboatmen, in which case a boat made from twenty to twenty-five river miles distance in a day.[24]

Keelboatmen tied the cordell (a hemp rope, two to three inches in diameter that had a length of from 500 to 1,000 feet) to the top of the sailing mast, it then ran from the top of the mast through a looped piece of rope attached to the bow and from there to the bank, where a crew of from twenty to forty men waited to tug on the rope. Each member of the cordelling crew grabbed a section of the rope, and under the supervision of a foreman they were ordered forward. While pulling the rope, the men moved through almost impenetrable vines and brush along the river bank, stepped into concealed holes, tumbled down stream banks, disentangled the rope from tree branches, forded small streams and rivers, fell into the Missouri as the river bank caved-in under their feet, thrashed through ten-foot high elephant grass, tried to keep the blowing sand out of their eyes, nose, and ears, and worst of all they fought-off the incessant attacks of the hordes of mosquitoes that descended upon their ravaged bodies, all the while sweating profusely under the summer sun. A cordeller had a tough job.

When the winds died down and the keelboat sat too far from the shore to be cordelled, the crew took out the poles. The poles were a solid piece of hardwood, usually ash, and were manufactured with a round knob on the top and a sort of shoe on the bottom. Roughly ten men lined up on each side of the front of the boat along the narrow *passe avant*. The crew lowered the poles in unison into the river and placed the round knob under their armpits. Once the poles struck the river bottom, the foreman ordered the men to push. The men then walked in marching step toward the back of the boat. Once the poling crew reached the rear of the boat, the foreman commanded the men to raise the poles, return to the front, and repeat

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[24]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 73.

the procedure.[25] Poling, like cordelling, did not win too many enthusiasts, the process required great physical exertion from the men, especially when the boat became lodged on a sandbar and the only way off the bar was to pole. Keelboatmen lowered the oars into the river as the need arose, usually as a last resort, when sailing, cordelling, or poling failed.

Not suprisingly, with all of the difficulties of navigating the Missouri River by keelboat, the boats did not make good time moving up the river. For example, the Lewis and Clark Expedition departed St. Charles (twenty-one miles above the mouth of the Missouri) on 21 May 1804 and reached the Big Sioux River on 21 August. The expedition traveled approximately 900 miles, averaging a little more than nine and a half miles per day. Both Henry Brackenridge and John Bradbury traveled up the Missouri seven years later on separate keelboats. Brackenridge's party left St. Charles on 2 April, and arrived at the mouth of the Big Sioux River forty-nine days later, averaging eighteen miles a day. Bradbury's group left St. Charles on 14 March and arrived sixty-three days later at the mouth of the Big Sioux, averaging fourteen miles per day.[26] Considering that the average adult can walk four miles per hour over open terrain, keelboats traveled upstream at a snail's pace. On the trip downstream, keelboats made better time, traveling at the speed of the current or faster, anywhere from two to six miles per hour or more. Traveling down river, boats could cover from 60 to 100 miles a day.

Keelboats supplied fur-trading posts, military forts, and settlements with gunpowder, coffee, blankets, and tools. Keelboats also carried immigrants up the Missouri to recently opened lands and hauled their produce to markets at St. Charles and St. Louis. Keelboats

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[25]Chittenden, History of Early Steamboat Navigation on the Missouri River, 105.

[26]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 6, 80. Brackenridge, Views of Louisiana, 200, 231. Bradbury, Travels in the Interior of America, in the years 1809, 1810, and 1811, 12, 69.

shipped tons of agricultural produce downstream in the 1820s, especially tobacco and hemp from the Boonslick country of central Missouri. Although cumbersome, slow, and difficult to cordell, keelboats represented the most efficient means of transporting cargo up and down the Missouri River Valley at the time.

But, the difficulties of keelboat travel led directly to the rapid adoption of the steamboat for use on the Missouri River.[27] In the 1820s, the lower river between St. Louis and Westport Landing (a few miles east of Kansas City, Missouri) experienced the increasing use of steamboats. These steamboats, initially built for the deeper rivers of the eastern United States, also navigated the lower Missouri because of its increased water volume, especially during the spring and summer rises. Regular steamboat navigation on the upper Missouri, waited until 1831.

That year, the American Fur Company had the steamer *Yellowstone* constructed in Louisville, Kentucky. The boat was a side-wheeler, 130 feet long, nineteen feet wide, and had a six-foot deep hull. Although the *Yellowstone* possessed a hull deeper than advisable for the Missouri, two company officials, Kenneth McKenzie and Pierre Chouteau, Jr., believed the boat would be able to ride upstream during the annual rises. These two men also believed the steamboat would be faster than the keelboat, carry more freight, and thereby cut costs, and increase company profits. The boat ascended the Missouri in late April, its crew hoping to reach the company's post at Fort Union, before the river began falling in July and August. Unfortunately, the *Yellowstone* only reached Fort Tecumseh (near present-day Pierre, South Dakota) on its maiden voyage. McKenzie and Chouteau did not give up their attempt to reach Fort Union. In 1832, the *Yellowstone* set off nearly a month earlier, and

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[27] Jonas Viles, *Old Franklin: A Frontier Town of the Twenties*, The Mississippi Valley Historical Review, IX, no. 4, (March 1923), 274, 275.

reached Fort Union on 17 June. This venture demonstrated that two thousand miles of the Missouri River could be navigated by steamboat at least once (Figure 4.4).

The number of steamboats on the Missouri increased in the 1830s, 1840s, and 1850s, and their uses expanded in proportion to their numbers. Steamboats contributed to settlement by carrying farm products downstream to St. Louis and beyond. In June 1843, two steamers, the *Mary Tompkins* and the *John Aull* docked at St. Louis with freight hauled from the Missouri Valley settlements. A partial list of the cargo of these two boats illustrates the contribution of steamboats to agricultural settlement. The *Mary Tompkins* carried 311 hogsheads of tobacco, 24 bales of hemp, 14 casks of bacon, 11 kegs of lard, 49 barrels of wheat, 45 barrels of flour, 1 keg of butter, 1 pack of peltries, 1 sack of feathers, and a number of miscellaneous items. The *John Aull* carried 234 hogsheads of tobacco, 647 bales of hemp, 38 casks of bacon, 653 sacks of wheat, 6 barrels of beef and lard, beeswax, tallow, as well as furs.[28] In addition to shipping commodities, the boats carried annuities and Indians to reservations in Dakota Territory, hauled troops into battle and weapons and ammunition to military forts in Montana Territory, transported immigrants and personal items to new settlements, and moved prospectors to jumping-off points for the California and Montana gold mines. An impressive increase in steamboat numbers and use occurred during the same period, with the decade of the 1850s being the height of steamboat travel on the Missouri River south of Sioux City. Only one steamer plied the Missouri River above the mouth of the Platte in 1832. By 1857, the port of Sioux City had twenty-eight steamboat arrivals (Figure 4.5).[29] In 1858, fifty-nine steamboats operated on the river below the Platte, while twenty-three boats serviced the river north of Sioux City. In that same year, the port of Leavenworth logged 306 steamboat arrivals during the eight-month long navigation season and in 1859, Omaha recorded 174

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[28] James Sterling Pope, *A History of Steamboating on the Lower Missouri,* 92.

[29] Omaha World Herald, *Steamboats' Banner Year Was 1859*, 9 May 1954.

Figure 4.4. The steamer *Assiniboine* on the upper Missouri River. In 1833, Karl Bodmer and Prince Maximilian of Wied traveled to the upper Missouri River region on board the steamer *Yellowstone*. In this painting, another early river steamer, the *Assiniboine*, steams past colorful hills located in present-day central South Dakota. By the 1850s, large numbers of steamers plied the waters of the Missouri. Karl Bodmer watercolor, 1833. Courtesy of the Joslyn Art Museum.

Figure 4.5. The port of Sioux City, circa 1868. A string of towns and cities arose along the Missouri's banks after 1803. From the late 1820s to the 1880s, steamboats supplied these communities with goods and services, carrying finished products to frontier areas and hauling agricultural commodities to eastern United States markets. Prior to the arrival of the railroad in the Missouri Valley, Sioux City, founded in 1856 at the juncture of the Big Sioux and Missouri rivers, served as a jumping off point for settlers headed to the Dakota and Montana territories. Courtesy of the Sioux City Public Museum.

arrivals.[30] These statistics reveal that the bulk of the steamboat traffic moved on the Missouri River from Omaha to the south (Figure 4.6).

As the demand for the transportation services provided by steamboats increased, the packet companies invested money in designing and building boats adapted to the Missouri River. Better boats meant more reliable delivery, which often resulted in a further increase in demand. In 1859, Pierre Chouteau Jr. (son of the Pierre Chouteau of the *Yellowstone* venture) of the Pierre Chouteau Jr. and Company received a government contract to deliver Indian annuities to Fort Union, Fort Sarpy, and Fort Benton on the upper Missouri. Company officials also signed a contract to move a military reconnaissance party to the region. In order to fulfill this contract, Chouteau had a special boat built, known as a "mountain boat."

The *Chippewa* had a length of 165 feet, a width of 30 feet, and a cargo capacity of 350 tons; it drew only thirty-one inches when loaded at over half capacity.[31] Other features included a stern paddle wheel, new high-pressure steam engine, the use of light woods in the construction of the hull and deck, and a low overall profile. The wider hull of the boat meant the *Chippewa* could be loaded heavier without drawing as much water as a narrower, v-bottom craft. The stern paddle wheel provided the boat's pilot with greater maneuverability through the Missouri's winding, thin thalweg. On the Missouri, side wheelers experienced more groundings and more damage than stern wheelers. The high pressure engine gave the boat greater horsepower to push through the river's chutes and the accompanying strong currents. The use of lighter woods and building materials lessened the draft of the boat, while the lower profile of the *Chippewa* aided in steering under windy conditions. The

[30] William E. Lass, A History of Steamboating on the Upper Missouri, 42. Chittenden, History of Early Steamboat Navigation on the Missouri River, 217.

[31] William E. Lass, *Missouri River Steamboating*, North Dakota History, Journal of the Northern Plains, 56, no. 3, Summer 1989, 13.

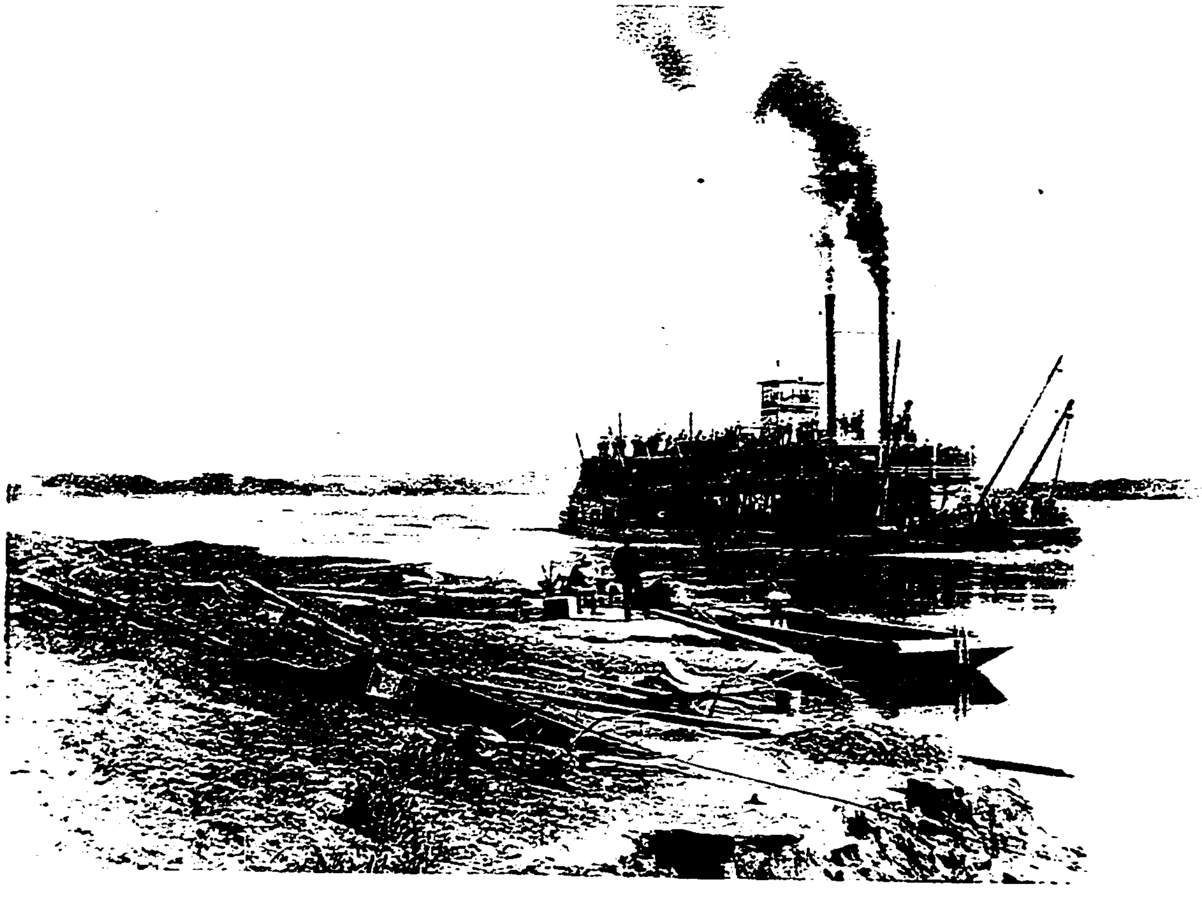

Figure 4.6. The sternwheeler steamboat *Josephine* plies the waters of the Missouri River. Sternwheeler steamboats were better adapted to navigation on the upper Missouri because they drew only a few feet of water and pilots could steer the boats through the river's narrow chutes and side channels. Courtesy of the Sioux City Public Museum.

strong winds that constantly swept across the Missouri Valley tossed high profile steamers against sandbars and snags.[32] The *Chippewa* represented the best in steamboat technology, materials and construction, but it still failed to reach Fort Benton in 1859, it had to stop twelve miles below the fort and unload its cargo. The river had been too low to support the mountain boat.

Although steamboat technology advanced to new heights in the 1860s and 1870s, and the packet companies learned to time their scheduled trips during the river's annual rises, steamboat navigation of the Missouri River remained fraught with danger and delays. The dangers existed in the form of snags, ice, rocks, and boiler explosions. Snags formed in the Missouri after the river eroded its bankline. Once a tree had been undermined by the river, it fell into the channel and its root structure and trunk, because of their heavier weight, sunk to the bottom and became securely fastened to the riverbed with the accumulation of sand and gravel around its edges. As the river's current tore away the snag's bark, leaves, and smaller branches, only the trunk and largest branches remained grounded in the river and these pointed downstream, directly at the hulls of steamboats traveling up the river. When the river's level rose and covered the snags with water, steamboat pilots had difficulty discerning their location. Often, the only indication to a steamboat pilot that a snag lurked in the depths was the small break in the surface of the water as water bubbled up after striking the snag. Thus, pilots referred to underwater snags as "breaks."[33] But, when the wind ruffled the water, the rain blanketed the thalweg's surface, or fog or darkness descended upon the Missouri and reduced visibility, even the most astute pilot had difficulty avoiding striking one of the breaks. As a result, steamboats sank with alarming regularity on the Missouri River in the nineteenth century.

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[32]William E. Lass, A History of Steamboating on the Upper Missouri, 15, 16, 17, 18.

[33]Chittenden, History of Early Steamboat Navigation on the Missouri River, 80, 81.

A partial list of the boats that hit snags and went down in the river in western Iowa and southeast South Dakota included: *Helena No. 1, Katy P. Kountz, Mollie Dozier, Nora, Carrie,* and *Damsell.*[34] Other boats sunk, including the *Alabama, of the North*, which was a stern wheeler, 160 feet long, and 32 feet wide. The boat was owned and operated by the Northwestern Transportation Company of Sioux City. On 27 October 1870, the *Alabama* struck a snag near the mouth of the Vermillion River. The boat, and its consignment of whiskey and flour, valued at $12,000, was a total loss. To make matters worse for the boat's owners, the *Alabama* and its cargo were not insured.[35] The *Miner*, which in 1867 had narrowly escaped being sucked into a whirlpool south of Sioux City, ran out of luck in 1874. The boat hit a snag at the mouth of the Niobrara River. Fortunately, the pilot and crew steered the boat to shore and removed its freight (Figure 4.7).[36]

Interests in St. Louis, including the editors of the *St. Louis Post-Dispatch*, petitioned the federal government to lower the risk to steamboats through a program of snag and tree removal along the river and its banks. Congress recognized as early as 1832 that the Missouri needed improvement for navigation purposes, the same year Chouteau traveled on the *Yellowstone* to Fort Union. Congress did not deem snag removal necessary on the river during the keelboat era. Keelboats rarely risked destruction by striking snags. A keelboat did not travel fast, maybe two miles per hour, hardly enough to impale itself on an underwater

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[34]Hiram M. Chittenden, *Report on Steamboat Wrecks on Missouri River*, Nebraska History Magazine, VIII, no. 1, January-March 1925, 21, 22.

[35]Ralph E. Nichol, Steamboat Navigation on the Missouri River with Special Reference to Yankton and Vicinity, 13.

[36]Ibid., 13.

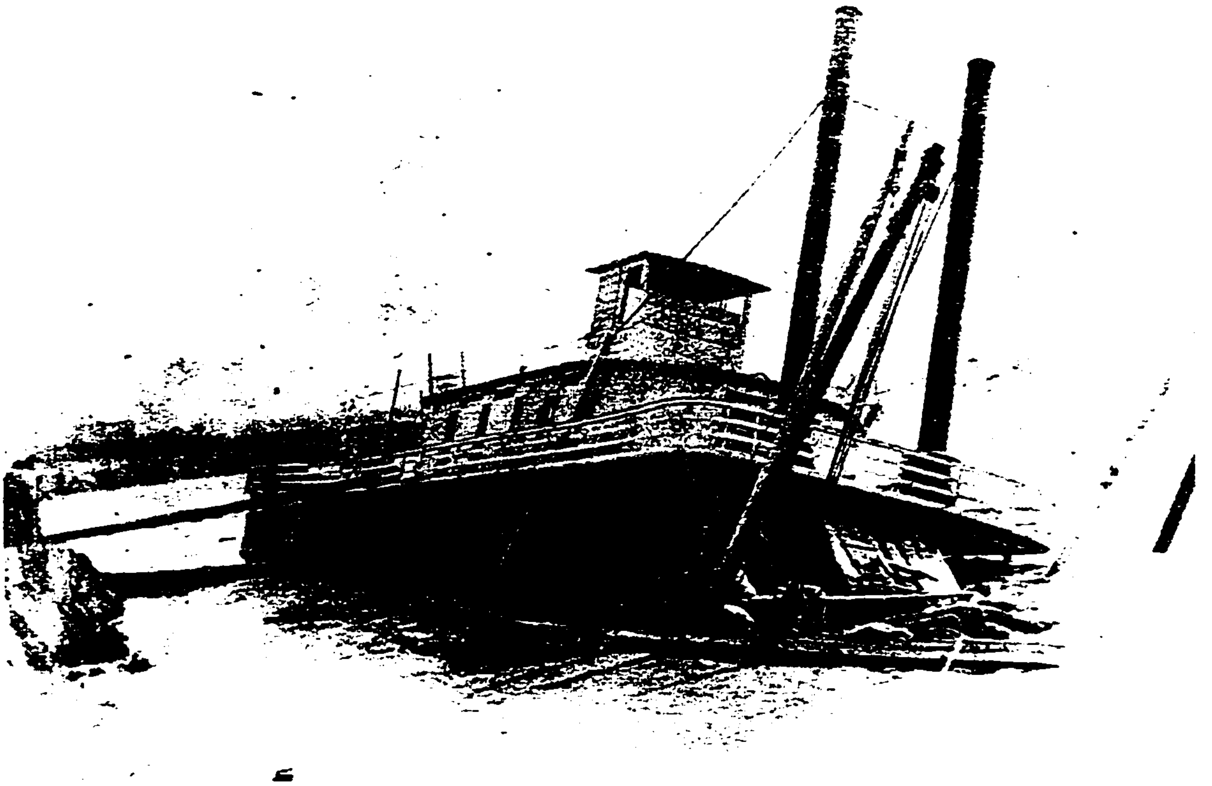

Figure 4.7. A steamer sinks in the Missouri River. In the nineteenth century, the Missouri claimed nearly 300 steamboats. The majority of boats sunk after striking submerged snags, which river pilots referred to as "breaks" because of the barely discernible break they made on the surface of the water. Courtesy of the Sioux City Public Museum.

snag.[37] Steamboats on the otherhand, traveled twice or three times as fast as keelboats. This increase in speed made the boats more vulnerable to snags.

From 1838 until the late 1870s, the federal government's primary role on the Missouri River involved the removal of snags, trees, and other obstructions to navigation. The U.S. Army Corps of Engineers cleared the channel of impediments to steamboat navigation. In 1838, two government snagboats began operation on the Missouri. The *Heliopolis* and *Archimedes* traveled up the river over three hundred miles above the mouth and removed 2,245 snags and cut 1,710 overhanging trees that appeared on the verge of dropping into the river. Snagboat crews also engaged in the destruction of the embarrases that cluttered the stream.[38] Over the years, the Corps pulled an astronomical number of snags out of the Missouri; in one thirteen year period, snagboat crews removed a total of 17,676 threatening snags. The Corps took the majority of these snags from the lower river, between Kansas City and the Missouri's mouth. The Corps focused its efforts on this section of the river because it carried the heaviest steamboat traffic.[39]

The Corps' snagboats varied in their technological sophistication. The more sophisticated ones were modified steamboats with a split pontoon bow and a machine operated pulley system of cables and chain. The less sophisticated snaggers were two flat-bottomed mackinaws attached side-to-side with a block and tackle mounted on the front.[40] Regardless

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[37]Meriwether Lewis and William Clark, The History of the Lewis and Clark Expedition, ed., Elliot Coues, 6, 80. Brackenridge, Views of Louisiana, 200, 231. Bradbury, Travels in the Interior of America, in the years 1809, 1810, and 1811, 12, 69.

[38]Chittenden, History of Early Steamboat Navigation on the Missouri River, 417, 421.

[39]ARCE 1902, 203.

[40]Robert L. Branyan, Taming the Mighty Missouri: A History of the Kansas City District, Corps of Engineers, 1907-1971, (Kansas City: U.S. Army Corps of Engineers, Kansas City District, 1974), 4.

of the boat, the procedure for removing a snag was the same. The snagboat approached the obstruction from the downstream side, in order to utilized the force of the current to aid in extraction. After anchoring below the snag, the cables or rope were run out from the pulley and wrapped around the trunk. The boat's crew then utilized the pulley system to drag the snag out of the water. If the snag was deeply embedded, crewmen wrapped the cable around the trunk a second time, but at a lower point, and used the pulley again.

Snagboats, channel clearing operations, and bankline tree removal only marginally decreased the threat that snags posed to steamboats. Two factors mitigated against the success of these procedures. First, the river continually replenished the supply of snags through bank erosion, especially during the high flows of spring and early summer. Second, snagboats operated after the end of the annual rises, when the river level was lower and snag removal safer. Thus, snag removal occurred after the end of the high traffic season on the river, when boats took advantage of the high flows. As a result, just at the time steamboat traffic reached its height, and the river filling with snags, the snagboats sat in port, this fact contributed to sinkings (Figure 4.8).[41]

Hiram Chittenden, a Corps of Engineers officer in the nineteenth century, calculated that 273 steamboats sank in the river between 1830 and 1902.[42] According to another estimate, the number of boats lost equaled three of every seven boats that navigated the Missouri during this period.[43] Along the river reach in western Iowa, a total of thirty-nine steamboats

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[41] ARCE 1884, 1532. ARCE 1885, 1635. ARCE 1886, 1394. ARCE 1891, 3726.

[42] Chittenden, *Report on Steamboat Wrecks on Missouri River*, Nebraska History Magazine, VIII, no. 1, January-March 1925, 24.

[43] Omaha World Herald, *Steamboat's Banner Year Was 1859*, 9 May 1954.

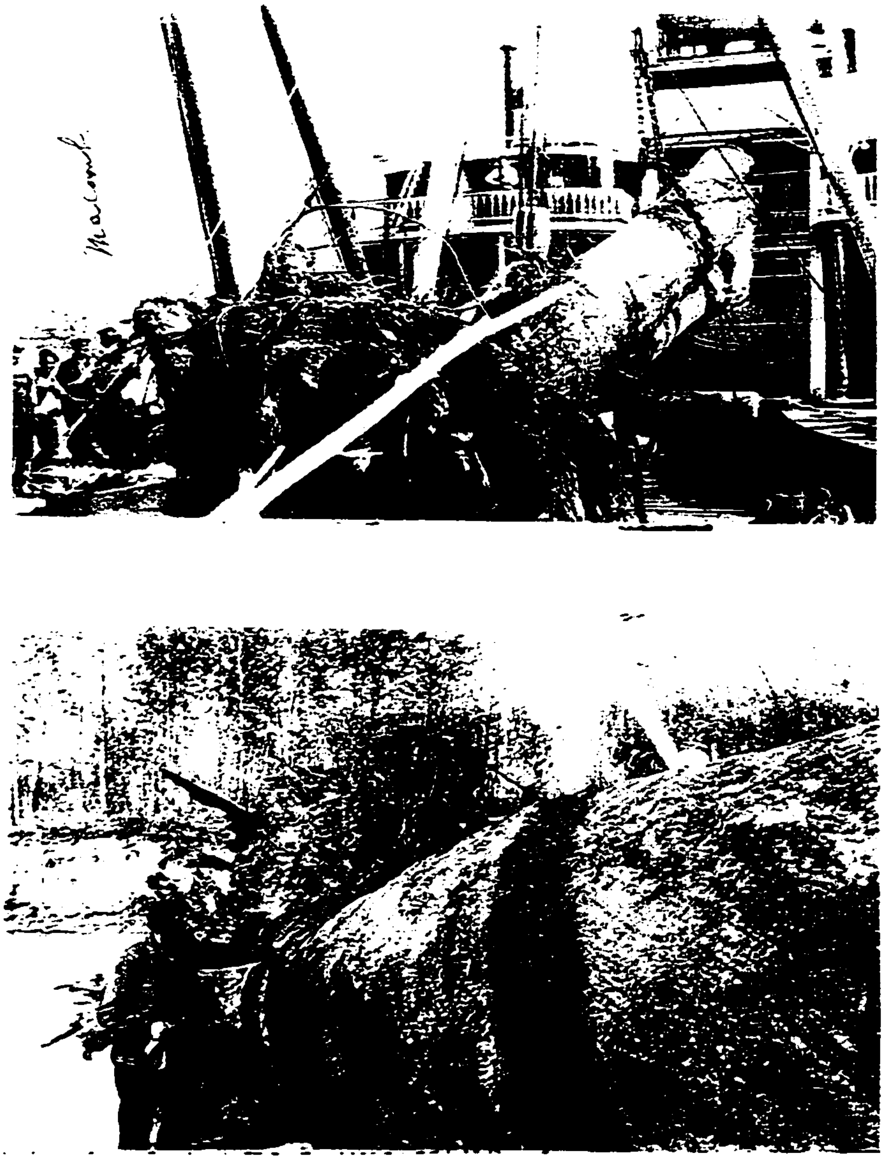

Figure 4.8. Giant snags pulled from the Missouri. The Corps of Engineers extracted snags from the Missouri River to facilitate steamboat navigation. But the erosive Missouri continually refilled its channel with trees, making it necessary for the federal government to expend thousands of dollars per year for snag removal operations. In the top photograph, a government snagboat and its African-American crew pull a gigantic snag from the channel. In the bottom photograph, a man is dwarfed by a colossal snag, likely a mature cottonwood that had toppled into the stream. Courtesy of the Sioux City Public Museum.

sank or sustained severe damage during the steamboat era.[44] In one short stretch of river a few miles west of the town of Onawa, Iowa, the Missouri claimed nine boats.[45] Chittenden estimated that snags caused seventy percent of the wrecks, while ice, sandbars, rocks, fire, and boiler explosions accounted for the remaining thirty percent.[46] Because of the high probability of a boat's destruction in the river, steamboat companies had to pay exorbitant rates for insurance. According to William Lass, author of *A History of Steamboating on the Upper Missouri River*, boat and cargo insurance cost from six to ten percent of the value of the product.[47] The high costs of insurance translated into high passenger fares and expensive cargo rates.

In addition to the dangers, steamboat passengers endured constant delays. The most common delay occurred when the boat became stuck on a sandbar. Crews worked anywhere from a few minutes to several hours or even days to lift the boats off the sandbars. More delays occurred when the boat had to be "wooded." As if the dangers and delays of Missouri River steamboat travel were not enough, the boats made deafening noises, smelt of urine, rotten carrion, and filthy passengers, and were often overloaded with deck passengers and cargo.[48]

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[44]Hiram M. Chittenden, *Report on Steamboat Wrecks on Missouri River*, Nebraska History Magazine, VIII, no. 1, January-March 1925, 20, 21, 22, 24. The Transportation Commission of the State of Iowa, Transportation Map, Iowa.

[45]Chittenden, *Report on Steamboat Wrecks on Missouri River*, map between pages 20 and 21.

[46]Chittenden, History of Early Steamboat Navigation on the Missouri River, 81.

[47]William E. Lass, *Missouri River Steamboating*, North Dakota History, Journal of the Northern Plains, 56, no. 3, Summer 1989, 13.

[48]Elias J. Marsh, *Account of a Steamboat Trip on the Missouri River, May-August, 1859,* 85, 89.

Not suprisingly, residents of the Missouri Valley welcomed the arrival of the railroad. The railroad offered cheaper passenger fares, lower cargo rates, greater efficiency and reliability, and far more comfort than the steamboats. Most importantly, the railroad provided farmers with more direct access to markets in the eastern United States and Europe.

As soon as the railroad reached the river, profitable steamboat operations were significantly curtailed below that point. Railroad companies extended tracks to the river beginning in 1859, when a line reached St. Joseph, Missouri. The trend continued when tracks reached Council Bluffs (1867), Sioux City (1868), Bismarck, Dakota Territory (1872), Yankton, Dakota Territory (1873), Pierre, Dakota Territory (1880), and Chamberlain, Dakota Territory (1881).[49] The railroad dissected the Missouri River transportation route, cutting the river into smaller and smaller stretches available to steamboat operators (Figure 4.9).

Missouri River steamboats, with all of their drawbacks, gave way to railroads. By 1880, steamboat operations closed down below Yankton, Dakota Territory. Yankton and Bismarck remained the two largest ports on the river. In 1887, when the Great Northern Railroad reached Helena, Montana Territory, profitable steamboat navigation on the Missouri came to an end.[50] Only small packets operated between river towns not serviced by the railroad. The end of steamboat navigation meant that the Missouri's primary role in the settlement of the Missouri Valley also came to an end. Missouri Valley residents no longer needed the river to bring people and supplies to the settlements. The river was no longer the only connection Americans in the valley had with the outside world.

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[49]Chittenden, History of Early Steamboat Navigation on the Missouri River, 417, 418, 419. Herbert S. Schell, *The Dakota Southern, A Frontier Railway Venture of Dakota Territory*, South Dakota Historical Review, 2, no. 2 (1937), 99. William E. Lass. A History of Steamboating on the Upper Missouri, 137.

[50]Chittenden, History of Early Steamboat Navigation on the Missouri River, 417.

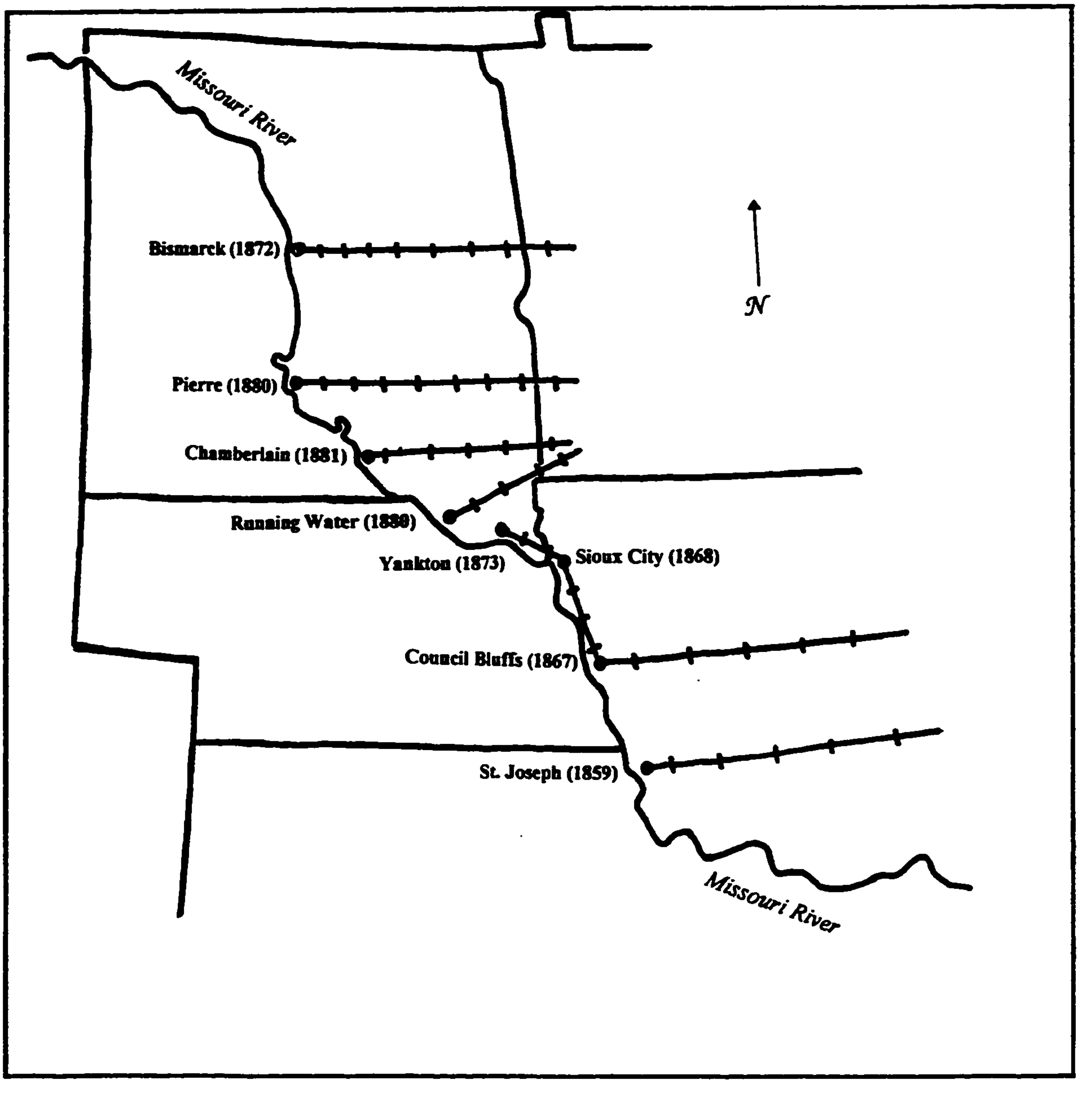

Figure 4.9. The railroad reaches the Missouri Valley. The railroad eliminated the Missouri River as a transportation route and sharply curtailed its role as a supplier of food, timber, and supplies to valley residents. As public dependence on the railroad increased in the 1870s and 1880s, the perception of the Missouri River changed. People began to consider the Missouri as destructive to human purposes, a threat to agriculture, and a wasted natural resource. This new perception of the river, along with the belief that railroad companies charged unfair rates, led to efforts by valley residents to redesign the Missouri to carry barge traffic. Map by author.

In addition to eliminating the river as a transportation route, the railroad also eliminated the river as a supplier of food, timber, and supplies. The railroad provided everything imaginable. Prefabricated houses built in Chicago, farm implements, cut timber from the forests of Minnesota, furniture, toys, canned foods, and the U.S. Mail went over the rails. American dependence on the river and valley environments was quickly replaced with a dependence on the railroad.

As dependence on the railroad increased, the perception of the river changed. Valley residents began to consider the Missouri as a threat to agriculture and a wasted natural resource in need of improvement. This new perception of the river, along with the belief that the once-welcomed railroad companies charged usurious rates, led directly to efforts by valley residents to redesign the Missouri to carry barge traffic.

CHAPTER 5: THE MISSOURI RIVER ABANDONED

Competition from railroad companies led to a sharp decline in the number of steamboats operating on the Missouri River. By the early 1880s, only a few boats worked the river in Montana and Dakota, and most of these steamers hauled freight between Bismarck and Fort Benton.[1] As the steamboat era came to an end, Missouri Valley residents organized associations to lobby Congress for funding to improve the Missouri River. These lobbyists did not seek the reestablishment of steamboat commerce. Instead, they wanted the federal government to channelize the Missouri to inaugurate deep-draft barge traffic. Only deep-draft barges, with their large cargo carrying capacities, could conceivably compete against the railroad companies.

From the late 1870s to the mid-1890s, persons from Sioux City, Council Bluffs, Omaha, Nebraska City, St. Joseph, Leavenworth, and Kansas City sought appropriations from Congress to channelize the Missouri. Citizens from Kansas City, Missouri, represented by the Kansas City Commercial Club, led this organizational movement. These local proponents of river development confronted a reluctant federal government. Congressional members did not readily finance Missouri River channelization. Rather, Congress needed to be convinced that construction of a Missouri River barge channel represented a justifiable investment of federal dollars. Had it not been for the lobbying efforts of Missouri Valley residents, Congress would not have financed channelization. Even after the start of construction on the barge channel, Congress did not remain loyal to the project. In 1896, federal officials slashed funding for work on the Missouri; and in 1902, Congress abolished the organization charged with construction of the navigation channel. Federal reluctance to

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[1] William Lass, A History of Steamboating on the Upper Missouri River, (Lincoln: University of Nebraska Press, 1962), 141, 142.

finance Missouri River channelization, and eventual abandonment of the work altogether, indicates that federal authorities did not force river development on the residents of the Missouri Valley. Rather, valley inhabitants pushed Congress to develop the Missouri.

On 18 December 1875, Congressman John B. Clark, Jr. from Fayette, Missouri, introduced a bill in the U.S. House of Representative (H.R. 267) that sought "to appropriate $1,000,000 to be expended in deepening and permanently locating the channel of the Missouri River with a view of securing a navigable depth of five feet during low water from Sioux City to the mouth...."[2] Introduction of this bill signaled the beginning of efforts to develop the Missouri River for deep-draft barge navigation. Passage of the bill would have benefited the congressman's constituents living athwart the Missouri River in central Missouri. But Clark's bill went down to defeat in the House. Instead, Congress appropriated a much smaller amount in the general Rivers and Harbors Act for bank stabilization work at St. Joseph and Nebraska City.[3]

A little over a year later, in January 1877, Congressman Clark Buckner, from St. Charles, Missouri, introduced a bill in the House "to appropriate money to improve the Missouri River between the city of St. Charles and its mouth...."[4] Buckner wanted to make St. Charles accessible to deep draft boats that plied the Mississippi River. Buckner also failed in his efforts to channelize the Missouri.

Four years later, in February 1881, the Secretary of War submitted a report to Congress written by Corps of Engineers Major Charles Suter of the St. Louis office, which supervised Corps operations on the Missouri. Suter examined the feasibility of improving the Missouri

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[2]*Congressional Record.* Washington D.C., 1873-. 15 December 1875, 228, 229.

[3]ARCE 1885, 2990.

[4]*Congressional Record.* Washington D.C., 1873-. 8 January 1877, 488.

River for barge traffic. Suter viewed the Missouri in relation to the Mississippi and a larger system of inland waterways. The major stated,

> The subject of its [the Missouri River] improvement, therefore, is not only of local interest, but is of the greatest general importance now that the improvement of the Mississippi is receiving serious consideration.... The cost of this improvement, which if carried out on a large scale and with liberal appropriations, will not probably exceed $10,000 per mile. This would put the cost for the whole 800 miles under consideration [from the mouth to Sioux City] at $8,000,000, and from Kansas City to the mouth of the river at $3,750,000.[5]

Suter, who relied on only two years of continuous, daily stream flow data for the Missouri, calculated that the river south of Sioux City could be deepened to a reliable twelve-foot depth at low water. The major asserted, "The benefits attendant on such an improvement can hardly be overestimated. With a guarantee that at lowest navigable stages, a safe and permanent channel, having nowhere a less depth than 12 feet, will be available, boats and barges as large as any now used on the Lower Mississippi could be built and safely navigated."[6] Suter's engineering report provided Congress with a blueprint for future action.

The same year that Suter presented his findings to Congress, a group of individuals interested in Missouri River navigation held a Missouri River Improvement Convention in St. Joseph. Convention delegates discussed methods to generate public support for channelization of the river. Before adjourning, delegates elected a committee to petition Congress for appropriations. In early 1882, this committee sent a letter to Congress; it stated, "Could we successfully employ barges on the Missouri [r]iver, between Kansas City and St. Louis alone, so as to realize this saving in the cost of marketing our crops, it would make a

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[5]U.S. Congress. House. *Appointment of a Missouri River Commission, Report to Accompany H.R. 6330,* 18 May 1884, 2.

[6]Ibid., 3. Missouri River Improvement Convention, *Official Report of the Proceedings of the Missouri River Convention, Held in Kansas City, Mo., December 29 and 30, 1885*, (Kansas City: Lawton and Havens, Printers, Binders, and Stationers, 1885), 6. ARCE 1890-91, 3821, 3822, 3831.

vast difference to the people of the Missouri Valley."[7] The petition also informed Congress that the shipment of agricultural commodities by barge rather than rail would save farmers in the upper Midwest over $14 million dollars per year in transportation costs, this amount equaled nearly twice the estimated expense of improving the river between Sioux City and the mouth.[8] Advocates of a Missouri River barge channel believed it would benefit agriculture and the region's rural population.

Congress responded to the lobbying efforts of the Missouri River Improvement Convention on 2 August 1882 when it passed the Act for the General Improvement of the Missouri River. Along with the act, Congress appropriated $850,000 for channelization of the stream. The act and appropriation represented a dramatic shift in the federal role on the Missouri. Never before had the federal government allocated such a large sum of money for work on the river. Previously, Congress made only small, yearly appropriations for the Missouri in the Annual Rivers and Harbors Bill. For example, in the five-year period ending in 1881, Congress financed Missouri River work amounting to $861,000. The appropriation of 1882 nearly equaled all of the money spent on the Missouri in the preceding five years.[9]

Furthermore, in 1882, Congress endorsed a new type of construction work along the stream. Prior to this date, Congress ordered the Corps of Engineers to remove snags from the channel area and stabilize the river bank in the vicinity of towns. The Corps built revetments (structures designed to prevent bank erosion) adjacent to thirteen towns in the Missouri Valley between 1876 and 1881.[10] St. Charles, Lexington, Glascow, Kansas City, Fort

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[7]Missouri River Improvement Convention, *Official Report of the Proceedings of the Missouri River Convention, Held in Kansas City, Mo., December 29 and 30, 1885*, 4, 5.

[8]Ibid., 4, 5.

[9]ARCE 1885, 2991.

[10]Ibid., 2990.

Leavenworth, St. Joseph, Nebraska City, Omaha, and Sioux City received Corps revetments. But in 1882, Congress embarked on a new path, abandoning piecemeal work for systematic, continuous improvement of an 800-mile reach of river.[11] This shift in priorities resulted from the widespread public support garnered at the 1881 Missouri River Improvement Convention.

Major Charles Suter received responsibility to oversee Corps of Engineers operations on the Missouri. The major used the $850,000 appropriation to purchase the physical plant needed to build channelization structures. Suter purchased and outfitted a fleet of 188 boats, including mattress boats, barges, snag boats, hydraulic graders, hydraulic pile drivers, quarter boats, yawls, skiffs, and a floating machine shop.[12] But Suter and his engineers did not actually build anything in 1882 or 1883. Instead, the new fleet sat in port, waiting for another appropriation before starting work on the Missouri.

Suter's hope for further federal money, and the hopes of Missouri Valley improvement advocates, soared in 1884 when Congress reinforced its commitment to systematic improvement with the establishment of the Missouri River Commission. Federal authorities created the commission because they believed it would be less politicized, less likely to bend to the will of a local constituency seeking bank protection work, and more committed to the expenditure of federal funds for the channelization of continuous stretches of the stream. Congress appointed Major Charles Suter as president of the commission. Along with the act

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[11]Ibid., 2990, 2991.

[12]U.S. Army Corps of Engineers, The Federal Engineer, Damsites to Missile Sites: A History of the Omaha District, U.S. Army Corps of Engineers, (Omaha: U.S. Army Corps of Engineers, Omaha District, 1984), 7.

creating the commission, Congress appropriated $500,000 for channelization work below Sioux City.[13]

Congressmen approved the creation of the commission, and the accompanying appropriation, because they firmly believed establishment of a barge channel along the Missouri would benefit agriculture. In its report to the House recommending adoption of the Missouri River Commission, the Committee on Commerce argued, "It [the Missouri River] is located where it is most needed and where it can perform the greatest service in the shape of transportation. With the great natural advantages possessed by this waterway it should be the main dependence for the bulky freights of an agricultural valley."[14]

Suter planned on first channelizing the river at Kansas City, Missouri, and then progressing downstream toward the mouth. According to the Annual Report of the Chief of Engineers, "Engineering necessities require that the work should progress downstream. The initial point must, therefore, be at some distance above the mouth. The commission [Missouri River Commission] have selected Kansas City, 386 miles above the mouth, because it is the first important commercial center to be met with in proceeding upstream."[15] Suter and his colleagues determined that constructing channelization structures from the mouth to Kansas City would be more costly because completed structures would face the full onslaught of the unchannelized Missouri River just upstream. The unchannelized Missouri would continue to shift the direction of its channel and outflank sections of river already channelized. By building from Kansas City to the mouth, Suter hoped to avoid this

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[13]ARCE 1885, 2989, 2990. U.S. Congress. House. *Appointment of a Missouri River Commission, Report to Accompany H.R. 6330,* 18 May 1884, 1.

[14]Ibid., 2.

[15]ARCE 1885, 2992.

possibility, since the river immediately above sections under construction would have already been stabilized.

Suter and his engineers had to wait to implement their construction plans. In 1885, Congress overrode the authority it had earlier given to Suter and the commission and ordered Suter to spend the federal appropriation on bank protection work at Kansas City and St. Joseph, where the river threatened to destroy hundreds of thousands of dollars of previous revetment work. Later that same year, Congress failed to appropriate any money for channelization of the Missouri.[16]

Although stymied, advocates of Missouri River improvement continued to organize and publicize their cause. In September 1885, the City of St. Paul hosted a River and Harbor Convention to discuss strategies for developing the Mississippi River for navigation. Approximately fifty river improvement enthusiasts from the Missouri Valley attended. An executive committee was created and "charged with the prosecution of all matters looking to the improvement of the Missouri [r]iver." Two Kansas City men sat on the executive committee, T.B. Bullene and H.M. Kirkpatrick. Other notable members of the committee included John H. King of Chamberlain, Dakota Territory, and Thomas C. Power of Helena, Montana Territory. King served as an executive officer of the Missouri River Transportation Company, which ran steamboats in Dakota. Power oversaw the operation of the Benton Transportation Company, another steamboat company with operations on the river above Bismarck, Dakota Territory. Isaac P. Baker of the Benton Transportation Company joined the movement a few months later. These three steamboat company executives sought river improvement as a means of lessening their business risks, lowering their insurance costs for

[16]ARCE 1886, 2167.

freight and company boats, and increasing their competitiveness in relation to the railroads.[17] They also hoped that government construction contracts to improve the stream would provide their flagging businesses with sorely needed capital. Their steamboats, dry docks, and machinery could be employed in the channelization work. Finally, these executives believed federal government construction contracts would replace the losses in revenue that resulted from the diminishing military supply contracts. The end of Army campaigns on the Northern Great Plains reduced the profits of the steamboat companies.[18]

On 18 November 1885, Power, King, and the other members of the hurriedly established executive committee sent invitations to Missouri Basin governors, senators, congressional representatives, and other "distinguished citizens" to attend a convention on Missouri River navigation. Although participants only received notification of the event one month in advance, and the convention occurred during the holiday season, 200 prominent men attended the meeting in Kansas City, Missouri, on 29 and 30 December 1885. Such a high number of participants indicated the level of interest in river improvement that existed throughout the Missouri basin. Kansas City men constituted the largest single delegation in attendance. Citizens from the state of Missouri represented the largest state contingent. Dakota Territory, Iowa, Montana Territory, and Minnesota sent small delegations, only two or three individuals from each state. The participants in the convention came exclusively from the professional classes, with a number of business executives, judges, lawyers, and local government officials present. Few, if any, farmers or laborers attended the convention. A list of names and professions gives an indication of the type of men who led the early movement to

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[17]William Lass, A History of Steamboating on the Upper Missouri River, 124, 149. *Official Report of the Proceedings of the Missouri River Convention, Held in Kansas City, Mo., December 29 and 30, 1885*, 7.

[18]William Lass, A History of Steamboating on the Upper Missouri River, 130.

channelize the Missouri River: General W.H. Beadle [retired], Judge William T. Woods, Winslow Judson, St. Joseph Board of Trade, and Joseph S. Nanson, St. Louis Merchants Exchange.[19]

For two days, these men discussed the federal government's responsibility for developing the nation's inland waterways and improving the Missouri River for barge traffic. A sampling of what transpired in December 1885 suggests how these men viewed Missouri River improvement and what they sought from the federal government. The mayor of Sioux City, D. A. Magee asserted, "We [members of the convention] earnestly recommend and urge the present and permanent improvement of the navigation of the Missouri River upon a general and systematic plan to prepare if for commerce by steamers and barges, and we urge the policy of large and continuous appropriations by Congress therefor[e]."[20] E.H. Allen of the Kansas City Board of Trade stated, "We are making a plain business proposition. It is our purpose to improve the Missouri [r]iver from its source to its mouth, to make it thoroughly available for navigation. This, if accomplished, would be an exceedingly valuable thing to the commercial, manufacturing, and agricultural interests of this section of the country."[21] James Craig of St. Joseph told the assembled delegates that if the Senate and House did not provide the necessary money to finance the river's improvement, then the government officials should be removed from office. Craig insisted, "Whenever you unite, you will make the earth quake underneath your Congressmen and Senators. Their commissions will not be very safe unless they help you with all their might. If they don't do their duty, I would do the

[19]*Official Report of the Proceedings of the Missouri River Convention, Held in Kansas City, Mo., December 29 and 30, 1885*, 16-18.

[20]Ibid., 13.

[21]Ibid., 20.

same with them as I would with a farm hand; find some one else to do the work."[22] One of the last speakers at the convention, Purd Wright of St. Joseph, spoke about the need for unity among all of the river interests. Towns and cities in the valley had to present a united front to Congress in order to secure money for improvement. Once the money had been secured, the Missouri River Commission and the Corps of Engineers should be allowed to spend the money as they deemed appropriate for the establishment of barge navigation. Wright also warned that localities must not go to Congress alone to seek money for their own pet projects, otherwise the improvement of the whole river would never be achieved. The convention ended with a resolution to hold another river convention in Omaha in 1886 and to send several men to Washington to lobby Congress.[23]

The efforts of the Missouri River Improvement Convention to secure federal financing in 1886 met with success. On 30 June 1886, Congress allocated $375,000 to the Missouri River and in 1888, appropriated a tremendous $1,000,000. But the Missouri River Commission, under pressure from local officials and congressional representatives from towns in the Missouri Valley, spent the federal money on bank protection structures adjacent to several river towns and not on the proposed barge channel.

Although Missouri Valley residents spoke of systematic improvement, they undermined efforts to channelize the river by seeking bank protection near their own localities. Widely dispersed bank protection work did nothing to foster barge navigation on the stream. The fact that localities received the federal appropriations, instead of the channelization project, indicates the level of local control over the direction of river development. Two federal agencies, the Missouri River Commission and the Corps of Engineers, responded to the orders of Congress, which, in-turn, reacted to the demands made by residents in towns

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[22]Ibid., 28.

[23]Ibid., 62, 63.

throughout the Missouri Valley, especially the citizens of Kansas City and St. Joseph. Local groups directed the development of the Missouri River, not the Corps of Engineers or the Missouri River Commission.

Consequently, continuous, systematic improvement of the Missouri still did not occur. Of the $2,015,000.00 appropriated to the Missouri River Commission between 1884 and 1890, $279,951 went toward revetment work at Kansas City and another $97,983 for work at St. Joseph. None of the two million dollars went to channelize the river below Kansas City.[24]

The decade of the 1890s witnessed greater unity among Missouri Valley towns, and the type of work performed on the river between 1891 and 1896 reflected this unity. On 19 September 1890 Congress appropriated $800,000 for the Missouri River Commission and ordered the Secretary of War to expend these funds for channelization work, not bank protection.[25] In 1891, using the money allocated in 1890, Suter and the engineers under his charge began channelizing the Missouri River along what they referred to as the First Reach. Suter divided the river from the mouth to Sioux City into six reaches and the First Reach extended 137 miles from the mouth to the Osage River confluence.[26] The commission reversed its earlier decision to build from Kansas City to the mouth. Instead, it now determined to extend the navigation channel from the mouth to the west and north, progressively opening more of the Missouri River Valley to the commerce of the Mississippi River and beyond (Figure 5.1).

Suter clarified the principle that would guide construction of the barge channel, "By utilizing the natural forces at work, we hope to avoid any direct conflict with the river, as in

[24]ARCE 1890-91, 3730, 3732.

[25]Ibid., 3723, 3726.

[26]Ibid., 3726.

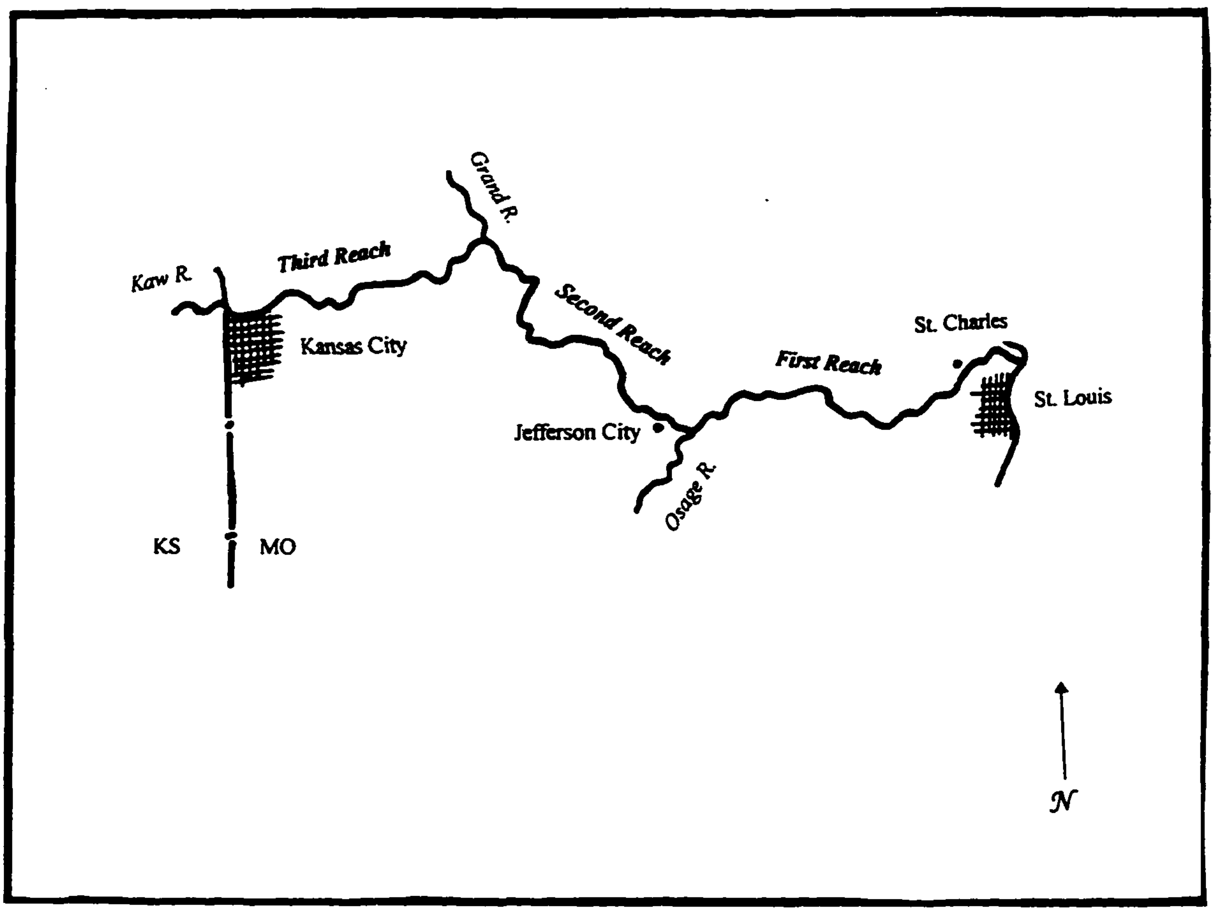

Figure 5.1. The Missouri River between Kansas City and the mouth. Major Charles Suter and the engineers under his command divided the Missouri River south of Sioux City into a series of reaches to facilitate construction of the Missouri River navigation channel. The First Reach extended from the mouth of the Missouri to the Osage River confluence, a distance of 137 river miles. Between 1891 and 1896, the Missouri River Commission and the Corps built forty-five miles of the barge channel along the First Reach. Map by author.

such a conflict we would in all probability be worsted.[27] Suter planned on using the river's heavy silt load to facilitate channelization. The Missouri River carried a large amount of silt to the Mississippi each year. The quantity varied depending upon flow volumes. Corps officials estimated the ratio between maximum monthly silt load and minimum monthly load at 166 to 1. Stated another way, the Missouri could carry 166 times more silt in a given month than the lowest load ever carried in a month. Even more astonishing, the river's highest daily silt discharge past Kansas City equaled 2,086 times the lowest daily discharge.[28] Another study carried out by the Corps of Engineers placed the average annual amount of silt moving past Kansas City at 397,700,000 tons. A lower estimate, put the average silt load past Omaha at 275,000 tons per day, or 100,375,000 tons per year, still enough sediment to fill 5,500 railroad cars (with fifty-ton capacities) every single day.[29] Suter sought to utilize the river's enormous silt load for channelization purposes. He hoped to accomplish channelization with the use of hydraulic pile drivers, piles, and pile dikes.

A hydraulic pile driver consisted of a small steamer or diesel-powered boat with a hydraulic jack attached to its bow (Figure 5.2). The piles used by the Corps were actually long poles of white oak or cypress, with head diameters of eight to ten inches and butt diameters of thirteen to nineteen and a half inches. Piles ranged from thirty to over fifty feet long, roughly the same size as a telephone pole.[30] The Corps' hydraulic pile drivers pounded piles into the river bed, through layers of sand and gravel, and into a layer of clay,

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[27]U.S. Army Corps of Engineers, The Federal Engineer, 7.

[28]U.S. Army Corps of Engineers, *Missouri River,* 73rd Congress, 2nd Session, House Document 238, (Washington DC: GPO, 1935), 272.

[29]Frederick Simpich, *Taming the Outlaw Missouri River,* in National Geographic, LXXXVIII, no. 5, November 1945, 589.

[30]ARCE 1894, 3134, 3148.

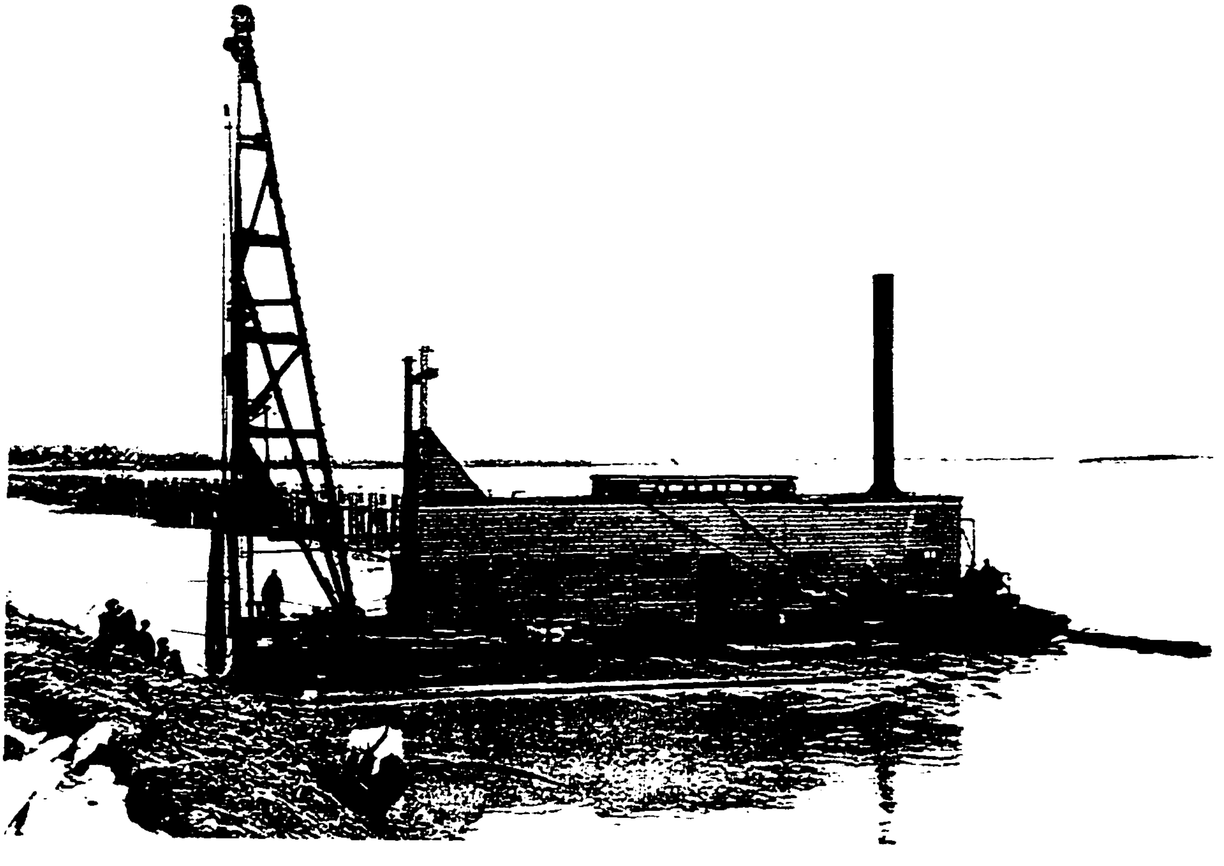

Figure 5.2. A hydraulic pile driver in operation on the Missouri River. A hydraulic pile driver consisted of a small steamer or diesel-powered boat with a hydraulic jack attached to its bow. Corps of Engineers' pile drivers pounded piles into the river bed, through layers of sand and gravel, and into a layer of clay. Occasionally, 600 to 700 blows of the jack were needed to drive one pile deep into the subsurface clay deposits. Courtesy of the Sioux City Public Museum.

which securely anchored the pile, and prevented it from being washed out by the river's current. The hydraulic pile drivers did not hammer the piles into the bedrock underlying the river. Clay served as an adequate foundation material. But pounding a pile through layers of sand and gravel, and then into the clay, required a great deal of time and energy. Occasionally, 600 to 700 blows of the jack were needed to drive one pile deep into the subsurface clay deposits. According to Corps officials, between two and half to thirty feet of the pile remained above the surface of the river bed.

Corps officials placed the piles at ten-foot intervals in a row extending out from the natural bank line into the stream. Ten feet on either side of the original row, another row of piles were driven, extending the same distance out into the river. At particular locations, the force of the Missouri's current required that a three- or four-row set of piles be driven. These piles served as the base for the pile dike. With the piles embedded deep in the clay, laborers bolted pine boards along the entire length and width of the pile dike. These boards served as braces, giving greater support to the structure. Finally, men placed a series of small willow saplings, trimmed of all their branches, along the length of the dike, running from the top of the structure down into the sand and gravel of the riverbed. The placement of the willows formed a "willow curtain," which served the purpose of further slowing the river's current. As the current slowed on the downstream side of the willow curtain, the water no longer had the power to carry its silt load, so it dropped the silt on the downstream side of the pile dike.[31] Overtime, the deposited silt accumulated behind the entire length of the dike and the thalweg flowed beyond the downstream end of the structure (Figure 5.3).

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[31] Ibid., Plate II titled, *Missouri River Commission, Osage Division, First Reach. Method of bracing dikes adopted for works constructed during fiscal year 1894,* 3134. Chittenden, History of Early Steamboat Navigation on the Missouri River, illustration titled, *Improving the Missouri River,* 424. ARCE 1891, illustration titled, *Missouri River Commission, Omaha Division, Sketch and Cross-Section showing Waling and Willow Curtains Constructed May and June 1891 on Dykes at Sioux City, IA,* insert at page 3833.

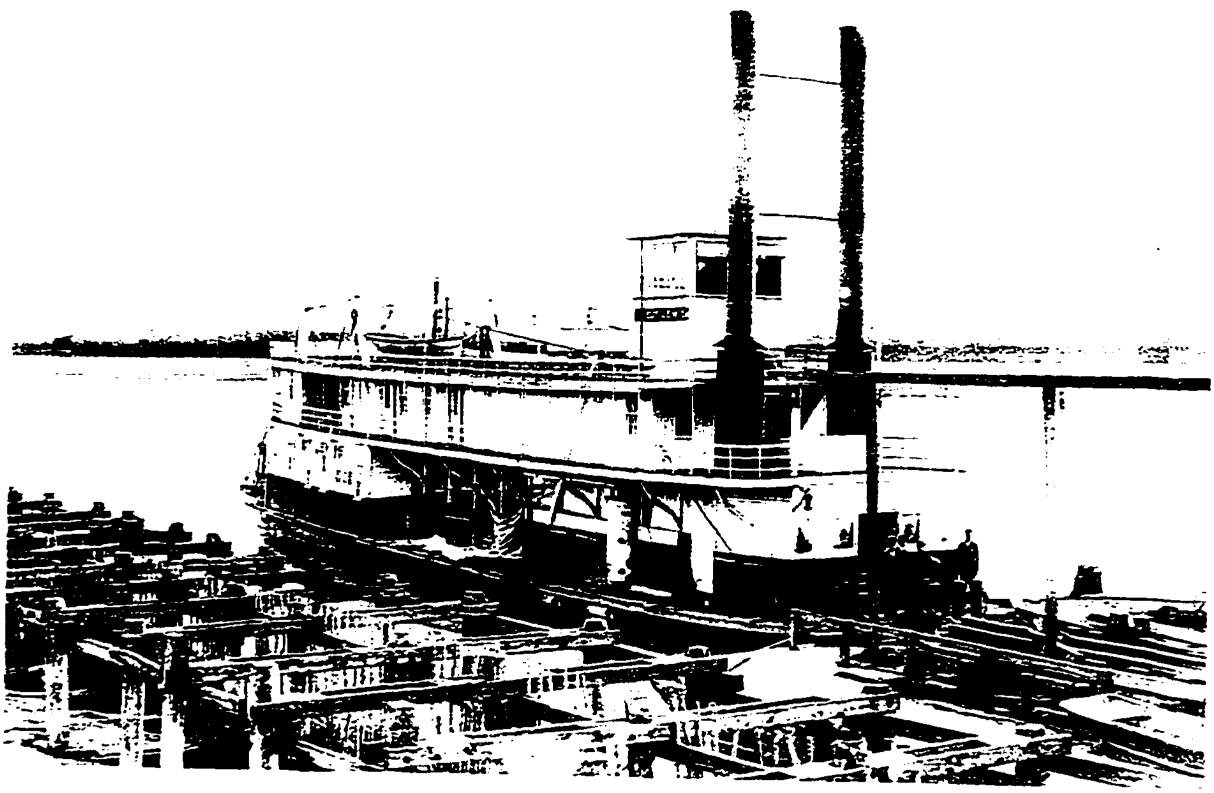

Figure 5.3. A pile dike along the Missouri River, circa 1895. The pile dike in the foreground of the photograph possesses a willow curtain running down the center of the structure. The pile dike and willow curtain slowed the river's current, forcing the deposition of silt on the downstream side of the structure. These silt deposits redirected the flow of the river, narrowed the river's channel area, deepened and stabilized the thalweg, and improved the river's navigability. The pile dike served as the standard method of channelizing the Missouri River up until the mid-twentieth century. Courtesy of the Sioux City Public Museum.

By using two-, three-, or four-row pile dikes, spaced at intervals of several hundred feet, engineers created a new bank line, redirected the flow of the river, narrowed the river's channel area, deepened and stabilized the thalweg, and improved the stream's navigability. Thus, the engineers worked within the existing river environment to channelize the Missouri.[32]

The commission and its construction engineers considered a number of factors while building pile dikes. First, each pile dike had to extend above the natural bank line a sufficient distance to prevent the river from flanking the structure during high flows. Second, the dike had to reach far enough beyond the river's low water line to remain effective during low flows. Third, the piles and willow curtain had to be driven into the riverbed the proper depth. If the piles and willows went too deep, the river at flood stage could over-top the structure, reducing its effectiveness. If driven to high, the river would flow past the structure without depositing the requisite silt. A fourth consideration of the engineers was that pile dikes could not be too long. If the dikes narrowed the Missouri's channel too much, the river's current velocity would increase proportionately, thereby making upstream navigation by barges and steamers difficult, or even impossible. Furthermore, excessive narrowing of the channel would induce greater downstream scouring and erosion, which would threaten downstream pile dikes. A final design feature related to the thickness of the piles. Piles had to be thick enough to withstand the full force of the river's current and resist destruction from floating debris and ice. Thin wooden piles could be smashed to splinters by ice flows. But thick piles cost more to purchase, transport, and place. The engineers strained to discover the proper balance between pile diameter, strength, and cost.

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[32] ARCE 1894, 3076, 3077. John Ferrell, Soundings: One Hundred Years of the Navigation Project, (Washington DC: GPO, 1996), 13, 14, 15. Hiram Chittenden, History of Early Steamboat Navigation on the Missouri River, (New York: Francis P. Harper, 1903), 424.

The commission and the Corps also utilized revetments in their work along the First Reach. A revetment is a structure placed along the bank to prevent the bank's recession by caving or erosion. Federal engineers usually built revetments on the outside edge of bends, where the river's current caused the greatest erosion.[33] During this early period, engineers relied almost exclusively on the woven willow mattress and stone revetment. The construction of this revetment involved the following procedures. First, engineers waited until the river dropped to low water stage and the bank line needing improvement became exposed, this meant construction of revetments most often occurred in the fall or winter.[34] Laborers then graded, or smoothed out, the original bank line, giving the bank a ninety degree angle. Corps engineers then supervised the cutting of thousands of small willow trees which grew on sandbars and sand flats near the water's edge. The Corps of Engineers utilized these willows to weave a mattress. Men wove the mattress by hand, monotonously intersecting the willows over and under each, eventually forming a continuous mat. Constructing a willow mattress required plenty of time and human energy. Men built the mattresses either at the location of the bank needing improvement or at the location of the willows, where the completed mattress was loaded on a mattress boat and carried to the graded bank. Whatever the case, once completed, the men laid the mattress on top of the graded bank, with a portion of the mattress extending several feet above the river's high water-line and several feet below the low water-line. Mattresses extended beyond these two water-lines to prevent them from being undermined by persistent low flows or from being eroded from above by excessive

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[33]C.P. Lindner, *Channel Improvement and Stabilization Measures*, in State of Knowledge of Channel Stabilization in Major Alluvial Rivers, edited by G.B. Fenwick, Committee on Channel Stabilization, Corps of Engineers, U.S. Army, Technical Report No. 7, (Vicksburg: U.S. Army Corps of Engineers, 1969), VIII-7.

[34]Sioux City Journal, *Harnessed: Revetment Job Near Salix Illustrates How Uncle Sam is Preparing Missouri River for Opening of Navigation*, 3 March 1940. U.S. Army Corps of Engineers, The Federal Engineer, 9.

high flows. Water either seeping under the mattress or behind it could destroy the revetment in a few hours. Because the difference between the annual high water-line and low water-line could be over thirty feet below Kansas City, the commission and Corps built immense mattresses. After laying the mattress on the bank, men placed stones on the mattress. Stone kept the mat in place and protected the bank-line.[35]

The commission and Corps built a modified revetment just below the mouth of the Osage River (Figure 5.1). Here the river had long been the bane of steamboat pilots, with its braided channel, sandbars, and fast currents. In order to narrow the channel and deepen the thalweg, the engineers had to close off side channels and concentrate the river's flow. One notorious side channel, known as the Osage Chute, needed to be sealed from the barge channel. Forty-five percent of the river's flow moved through the chute and away from the proposed navigation channel. The Corps had a sophisticated and costly willow mattress and stone revetment build across the upstream end of this chute. Laborers placed willow and stone in seven consecutive layers over the entrance, laying the lowest mattress and stone on the riverbed itself. The structure stretched 1,525 feet across the head of the chute and possessed an average height of fourteen and a half feet. This unique revetment cost a total of $25,329. After the revetment's completion, the volume of the water through the chute dwindled to five percent of the total, the remainder moved through the barge channel.[36]

Suter and his engineers did not know how narrow or deep they could build the barge channel. In the early 1880s, Suter estimated that the Missouri contained enough water to sustain a twelve-foot deep channel from Sioux City south, even during low flow periods. In

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[35]U.S. Army Corps of Engineers, The Federal Engineer, 8, 9. Thomas Bruegger, personal photograph collection, Missouri River willow mattress construction in the 1930s in western Iowa.

[36]ARCE 1894, 3142, 3143, illustration titled, *Missouri River Commission, Osage Division, First Reach. Osage Chute Dam, Plate IV.*

1891, Samuel Yonge, (who supervised channelization work along the First Reach), relied on only twelve years of daily stream flow data to calculate that the Missouri at its lowest stage possessed enough water to maintain an eight-foot depth downstream from Kansas City. Yonge told a crowd of river boosters in Kansas City,

> From an extended series of measurements made in the Missouri River at Kansas City and at other points, it has been ascertained that the probable volume of water at Kansas City will seldom be less at any time than 20,000 cubic feet per second.... It is, therefore self-evident that if the volume of water given above flows at the velocity stated in a channel 850 feet wide, the average depth of the channel must be about eight feet.[37]

The commission and the Corps' work on the Missouri River did not have any precedent, but would be experimental, trial and error. Pile thickness, dike length and height, distance between dikes, and the proper channel width would have to be determined as the project progressed. The commission and Suter became experimenters, testing new techniques and technologies on the Missouri. The engineers did not have the fail-proof channelization structure, instead they built structures and modified them until they found the ones suited for the stream and its local characteristics. But the basic willow mattress and stone revetment, along with the pile dike, remained the standard construction technique for channelizing the Missouri River up until the mid-twentieth century.[38]

Although channelization work began along the First Reach in 1891, the project's future remained uncertain. Congress would not automatically finance the continuance of construction on the barge channel. Instead, Missouri Valley residents had to lobby for congressional support of Missouri River channelization. To insure continued federal endorsement, a group of Kansas City men organized another Missouri River Improvement Convention.

37Missouri River Improvement Association, *Proceedings of the Missouri River Improvement Convention, Held at Kansas City, Mo., December 15th and 16th, 1891.* (Kansas City: Missouri River Improvement Association, 1891), 23.

38ARCE 1894, 3077.

At a meeting of the Kansas City Commercial Club on 21 October 1891, the club's president, G.F. Putnam, and its members expressed their fear that Congress would cut funding for Missouri River improvement unless Missouri Valley interests organized and lobbied for additional appropriations.[39] Ohio and Mississippi valley residents had already taken the initiative to push Congress for appropriations for their respective streams. The people of the Missouri Valley needed to organize now or face the possibility of no future appropriations. To prevent that scenario, Putnam invited the Boards of Trade of Kansas City, Kansas, Leavenworth, Kansas, Atchison, Kansas, and St. Joseph, Missouri, to attend a meeting on 27 October 1891 to discuss means of organizing the people of the valley into a unified river improvement movement. At the meeting on the twenty-seventh, the attendees created an executive committee to lead the movement to gain congressional funding. Kansas City, Missouri, men dominated the membership of this committee, holding fifteen of its thirty-one seats. Other locales, including St. Louis, Omaha, St. Joseph, and Sioux City, were also represented. As with the 1885 convention, the men leading the movement came from the commercial and professional classes. This committee exclusively represented lower valley interests, no one from the Dakotas or Montana retained membership in the executive committee. The committee, in turn, extended invitations to individuals and commercial clubs throughout the valley for a convention to be held 15 and 16 December 1891 in Kansas City, Missouri.[40]

Over four hundred individuals from throughout the Missouri Valley and beyond attended the convention. Men from Memphis, Tennessee, New Orleans, Louisiana, Rosedale,

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[39]Missouri River Improvement Association, *Proceedings of the Missouri River Improvement Convention, Held at Kansas City, Mo., December 15th and 16th, 1891*. (Kansas City: Missouri River Improvement Association, 1891), 6.

[40]Ibid., 32.

Mississippi, Denver, Colorado, as well as Ohio, North Dakota, South Dakota, and Iowa participated in the conference. The large number of participants and their geographical origins indicated the groundswell of public support that existed for Missouri River improvement across the United States.[41]

Putnam opened the convention with an address that focused on the reasons he and his colleagues wanted the Missouri River improved for barge traffic. Putnam stated, "The Commercial Club does not claim to be above the inspiration of selfish motives, neither do the people of Kansas City claim to be too magnanimous to be mindful of their own interests. They expect to be benefited, and largely benefited, by the improvement of the Missouri River...."[42] Putnam continued, "The business of the Commercial Club is to promote whatever it believes to be for the best interests of the people of Kansas City and the country tributary to it."[43] Putnam believed establishment of a barge channel along the Missouri River would substantially lower the cost of shipping agricultural commodities, raw materials, and manufactured goods into and out of the Missouri Valley. As a result, valley farmers and Kansas City businessmen would save millions each year that would otherwise go to the railroads. Any transportation savings could then be reinvested in the region, spurring further economic development.[44] Putnam also asserted, "Deepen the channel of the Missouri River and you confine its water to much narrower limits, excepting in times of great overflows-and consequently render more valuable every acre of land now subject to tillage in the valley,

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[41]Ibid., 79-85.

[42]Ibid., 36.

[43]Ibid., 42.

[44]Ibid., 42.

besides adding to the tillable area of our country...."[45] In other words, channelization would: allow valley farmers to reclaim thousands of acres of bottomland formerly occupied by the river channel, enable them to drain swampland into the deeper river, and increase property values by reducing the threat of erosion. All of these changes would foster economic development. The new acres put under the plow would contribute to increases in agricultural productivity and larger farm incomes, which would result in more business orders for Kansas City firms.[46] A rise in property values would increase the tax base of the river counties while at the same time permitting farmers to borrow more money for capital improvements on their farms.

But Colonel G.C. Broadhead of the Corps of Engineers explained to the assembled crowd that the federal government would not improve the Missouri River to increase the value of farmland in the valley. Broadhead said, "The law says, primary object to protect commerce and navigation, but nothing is said about protection of private property from washing." The channelization project was to establish barge traffic on the Missouri, not protect the river's banks, and adjacent agricultural land, from erosion.[47]

The convention ended with the passage of a series of resolutions and plans for future action. The delegates resolved to name their permanent organization the Missouri River Improvement Association. Its primary purpose was to seek congressional funding for the channelization of the entire Missouri River and the Mississippi River below the Missouri's mouth for the purpose of stimulating barge traffic. According to one of the resolutions, the association's total membership consisted of anyone from the states of Montana, North

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[45]Ibid., 41.

[46]Ibid., 35-43.

[47]Ibid., 151.

Dakota, South Dakota, Minnesota, Nebraska, Iowa, Kansas, Colorado, Missouri, Illinois, Kentucky, Tennessee, Arkansas, Mississippi, and Louisiana willing to work for the promotion of its agenda.[48] Convention delegates wanted their association to be a broad-based, democratic body rather than an elitist, exclusive organization.

The Missouri River Improvement Association did not have a hard time selling its program to residents of the basin. In 1891, no one in the Missouri Valley or surrounding states objected to river channelization. At the time, people believed that everyone but the railroad companies would benefit from the construction of a barge channel. Farmers, businessmen, industrialists, realtors, bankers, and shippers believed they would all profit from the project.[49]

With so much public support for channelization, Congress made large appropriations for work on the Missouri between the years 1890 and 1895. But by late 1895 and early 1896, the commission and the Corps finished only forty-five miles of the barge channel between Kansas City and the mouth at a cost of approximately $2.6 million, or roughly $58,000 per river mile. The cost per river mile was over five times greater than the original estimate made by Suter in the 1880s. Furthermore, the engineers merely achieved a low-water depth of six-feet in the barge channel, not Suter's twelve feet, or even Yonge's eight feet. The Missouri River just did not have the water to support those greater depths.[50]

Considering the huge costs of improving such a small stretch of river, the continued absence of barge traffic on the Missouri, the slow progress of construction, the fact that the river continually undermined completed structures, and the disintegration of the Missouri

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[48]Ibid., 155, 156.

[49]Ibid., 155.

[50]ARCE 1902, 176, 177.

River Improvement Association, it came as no surprise to anyone when Congress curtailed appropriations for channelization in 1896. The navigation project had become too costly and its results too uncertain. Furthermore, the Panic of 1893 had passed, the national economy improved, and the need for federal expenditures for public works did not appear as necessary in 1896 as during the previous years.[51]

Between 1896 and 1902, work on the Missouri River diminished to little more than snag removal operations and small-scale bank protection projects.[52] In 1902, there still remained 324 miles of the Missouri River between Kansas City and the mouth that needed to be channelized to facilitate barge traffic. That same year, Congress passed an act abolishing the Missouri River Commission.[53] As 1902 came to a close, federal appropriations for the Missouri River were at levels barely enough to maintain snagging operations. Congress, state and local entities, and the general public abandoned the Missouri River.

From the late 1870s to the mid-1890s, Missouri Valley residents sought appropriations from Congress to channelize the Missouri River. Kansas City interests led the movement to secure federal support. The advocates of Missouri River channelization confronted a hesitant federal government. Congress had to be persuaded that a Missouri River barge channel represented a legitimate investment of federal dollars. Although Congress provided money for channelization work between 1890 and 1895, the results of this work disappointed federal officials. As a result, in 1896, Congress cut funding for work on the Missouri. In 1902, Congress abolished the Missouri River Commission. Federal reluctance to finance Missouri

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[51]Ibid., 186.

[52]ARCE 1902, 184-188. Bradley, *Government Ice Harbors,* North Dakota History, Summer 1993, 28-37. Ralph Nichol, *Steamboat Navigation on the Missouri River with Special Reference to Yankton and Vicinity*, (Master's thesis, University of South Dakota, Vermillion, South Dakota, 1936), 14.

[53]ARCE 1913, 930.

River channelization, and eventual abandonment of the work altogether, indicates that federal authorities did not force river development on the residents of the Missouri Valley.

CHAPTER 6: THE MISSOURI RIVER REDISCOVERED

Not long after federal funding for Missouri River channelization had dropped to its lowest level, a series of events caused a resurgence of interest in developing the Missouri River. The first of these events, the hundred-year flood of 1903, rekindled interest in Missouri River improvement only one year after the dissolution of the Missouri River Commission.[1] Thus, the Missouri River had a direct affect on the formulation and implementation of development plans.

The Great Flood of 1903 resulted from the convergence of two natural forces. First, heavy rains fell in May 1903 in the Kaw River Basin west of Kansas City and in an area to the north of the city, encompassing southeastern Nebraska, southwestern Iowa, northeastern Kansas, and northwestern Missouri. From five to fifteen inches of rain fell over this region during the month, most of the rain came in an eleven-day period from 21 May to 31 May.[2] Much of this rainfall drained into the Kaw River, filling its banks to the second-highest level recorded by European-Americans.[3] As the high water descended the Kaw, it ran directly into an engorged Missouri River, experiencing its annual June rise. Because the high waters of the Missouri blocked the flow of the Kaw, the Kaw had nowhere else to go but onto the streets of Kansas City. Of seventeen bridges across the Kaw in the Kansas City area, sixteen washed downstream. The flooding rendered 22,000 people homeless and covered the city's business

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[1] A hundred-year flood is a measurement of water discharge and is considered the highest water level possible during a one hundred year period. The odds of a hundred-year flood are one in a hundred each year.

[2] U.S. Army Corps of Engineers, *Missouri River,* 73rd Congress, 2nd Session, House Document 238, (Washington DC: GPO, 1935), 80.

[3] Ibid., 751.

district with several feet of water.[4] At the height of the flood on 1 June 1903, the Missouri's flow measured 548,000 cubic feet per second at Kansas City, the equivalent of nearly three and a half times the mean monthly flow of the river at that point for the month of June.[5]

Once the Missouri's flood waters passed the Kansas City metropolitan area, they spread across the entire width of the valley, inundating hundreds of thousands of acres of the best agricultural land in the state of Missouri. Although the Great Flood of 1903 remained confined to the Kansas City district and areas to the east, it cost more in monetary terms than any other Missouri River flood up to that date; population numbers and property values in the valley had skyrocketed since the last great flood in 1844.[6] The 650,000 acres inundated cost valley farmers a total of $9,780,000 in lost earnings and property. Damage to the Kansas City metropolitan area equaled $1,000,000.

The flood rekindled interest in Missouri River improvement for the purpose of flood control. Both engineers and valley residents believed the sinuous channel of the Missouri had slowed the movement of flood waters past Kansas City, thus pushing the Kaw's waters into the city's business district. A completed navigation channel, the engineers argued, would deepen the Missouri's channel, straighten it, and increase its current velocity - changes that would allow future floods to move more quickly past the city and through the state of Missouri.

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[4]Robert L. Branyan, Taming the Mighty Missouri, A History of the Kansas City District, Corps of Engineers, 1907-1971, (Kansas City District: U.S. Army Corps of Engineers, Kansas City District, 1974), 43.

[5]U.S. Army Corps of Engineers, *Missouri River,* 73rd Congress, 2nd Session, House Document 238, (Washington DC: GPO, 1935), 91. ARCE 1891, 3826.

[6]U.S. Army Corps of Engineers, *Missouri River,* 73rd Congress, 2nd Session, House Document 238, (Washington DC: GPO, 1935), 80, 386.

In mid June 1903, only days after the Great Flood had subsided, Captain Hiram Chittenden of the Corps of Engineers wrote a letter to the mayor, recommending that Kansas City officials ask Congress to restore the Missouri River Commission. According to Chittenden, the reconstituted commission would not improve the Missouri River for the purposes of establishing barge traffic. Instead, Chittenden suggested that the new commission improve the river to protect private property and lower the risk of future floods.[7]

Kansas City's mayor followed Chittenden's advice. He, along with members of the Kansas City Commercial Club, organized a River Congress in early October 1903. The event's sponsors hoped to accomplish two goals: to bring together officials from towns along the Missouri and Kaw valleys to discuss means of preventing a repeat of the disastrous flood of 1903, and to form an organization to lobby Congress to fund flood control projects.

Over 200 individuals attended the congress, including Senator J. Ralph Burton of Kansas, Senator Francis Cockrell of Missouri, and Congressmen W.S. Cowherd, W.W. Rucker, and John Dougherty of Missouri. The delegates concluded that adequate flood protection for Kansas City would be provided with the construction of a system of dams and reservoirs along the upper Kaw River (in the vicinity of Topeka, Kansas), the building of a string of levees adjacent to the Missouri and Kaw rivers, and the straightening of both streams.[8] Prior to the close of the congress, the delegates formed a permanent river commission made up almost entirely of Kansas City, Missouri, men. This river commission worked to secure federal financing for the construction of its proposed flood control projects on the Kaw and Missouri rivers. Unfortunately, for Kansas City interests, the Senate Committee on Rivers and Harbors rejected any proposals for flood control, claiming such action was outside the

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[7]Sioux City Journal, *Ignore Navigation*, 11 June 1903.

[8]Kansas City Star(?), *The River Congress Opens*, 9 October 1903. Kansas City Times, *Appeals to Congress*, 9 October 1903.

jurisdiction of the federal government. Thus, the Kansas City River Congress and its river commission failed in their purposes.[9]

High water again descended the Missouri River in 1904, and 1905 and again influenced the formulation of development plans. These floods further focused the attention of valley residents on the river. But without any possibility that the federal government would initiate flood control projects for the Missouri, Kansas City interests sought to secure congressional support for the Missouri River barge channel, the construction of which would supposedly lower the risk of floods. In the summer of 1906, Lawrence M. Jones of the Kansas City Commercial Club and a group of roughly forty Kansas City businessmen, established the Missouri Valley River Improvement Association.

Jones, and his colleagues in the Commercial Club, sought Missouri River improvement for a number of reasons, including flood control, land reclamation along the valley, and the establishment of barge traffic on the stream. Creation of a barge channel along the river was the primary reason these men wanted the river channelization. The Kansas City metropolitan area had been experiencing an economic boom since roughly 1900. The settlement of the Great Plains to the west, along with the rise of the city's meat packing industry, fostered an increase in population and wealth in the city. By the end of the decade, the city's population increased fifty-one percent over the previous decade.[10] Members of the Commercial Club hoped Missouri River improvement would sustain the economic boom by lowering transportation costs, increasing the value of real estate, and create new avenues of commerce.[11]

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[9]Kansas City Star, 24 June 1932.

[10]Branyan, Taming the Mighty Missouri, III.

[11]Kansas City Journal, *To Use the River, Business Men Hold Meeting to Further the Movement*, July 1906. Kansas City Star, 24 June 1932.

The Missouri Valley River Improvement Association had multiple purposes, including: proving the Missouri navigable, convincing Congress of the river's navigability (and thus garner federal financing for channelization) and establishing routine barge traffic. Considering the failures of the past twenty-five years to establish barge traffic on the river, Jones and his colleagues set high goals for themselves.[12]

To prove the river was navigable, Lawrence Jones and A.G. Ellet of the Commercial Club's river committee, in July and August 1906, chartered the steamboats *Lora* and *Thomas H. Benton* and the barges *Louise* and *America* at St. Louis, and loaded each with freight for Kansas City. When the boats and barges arrived at Kansas City on 23 September 1906, a crowd estimated at between 10,000 and 15,000 celebrated the supposed reopening of Missouri River navigation. That winter, Congress, impressed with the movement of cargo on the river, made an appropriation for the removal of snags from the Missouri.[13]

In the spring of 1907, Lawrence Jones traveled to Washington to lobby Congress on behalf of Missouri River channelization. Later in the year, he, along with sixty delegates from Kansas City, attended the Lakes to the Gulf Deep Waterway Association meeting in Memphis, Tennessee. President Theodore Roosevelt came to this meeting, giving his support to the development of the nation's inland waterways. Jones presented a speech at Memphis, promoting the Missouri River as a key element in any future national system of inland waterways. According to Jones, he put the Missouri River, "on the map," making federal

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[12]Kansas City Star(?), July 1906. Kansas City Star, 24 June 1932.

[13]Missouri Valley River Improvement Association, *The Way to Navigate is to Navigate, The Missouri, A Deep Waterway, A 12-Foot Channel Would Save Its Cost Every Year, Work of Missouri Valley River Improvement Association for the Development of River Navigation*, (Kansas City: Missouri Valley River Improvement Association, 1907), 7. Kansas City Star, 24 June 1932.

officials aware of the river's importance to the future prosperity of commercial and agricultural interests in the valley.[14]

The hundreds of individuals present at the Memphis meeting of the Lakes to the Gulf Waterway Association, including President Roosevelt, illustrated the level of private and federal interest in internal waterways development that emerged during the decade of the 1900s as part of the progressive conservation movement. The progressive conservationists, who included Roosevelt and Gifford Pinchot, head of the Forest Service, believed the federal government should use its authority to conserve the nation's natural resources for sustained yield production. Initially, the progressives focused on the conservation, and "wise use" of the nation's timber, oil, and mineral reserves. But by the end of the decade of the 1900s, the progressives believed the nation's rivers needed to be developed to the fullest extent possible, for hydroelectric generation, irrigation, or navigation.[15] To progressives like Roosevelt, failure to develop the rivers of the United States constituted the waste of a valuable resource.

Progressives viewed the Missouri River as only one component of a much larger transportation system that included the Great Lakes, Mississippi River, Ohio River, and the soon-to-be-completed Panama Canal. These various waterways would be linked together, thus providing the United States with the means to ship bulk agricultural commodities directly from the Midwest to virtually any port in the world without breaking bulk. Such an integrated waterways system would accomplish two major goals for the progressives. It

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[14]Kansas City Star, 24 June 1932.

[15]Roderick Nash, Wilderness and the American Mind, 3rd Edition, (New Haven: Yale University Press, 1982), 162, 163. John F. Reiger, American Sportsmen and the Origins of Conservation, (Norman: University of Oklahoma Press, 1986), 148-151. Theodore Roosevelt, *Publicizing Conservation at the White House*, in Roderick Nash, editor, American Environmentalism: Readings in Conservation History, Third Edition, (New York: McGraw-Hill Publishing Company, 1990), 84-89. George R. Call, The Missouri River Improvement Program As I Have Known It, unpublished manuscript, 1967, Sioux City Public Library, 2, 3.

would increase the international competitiveness of the United States and decrease the economic and political power of the railroad companies. As a first step toward the "wise use" of the nation's rivers and the establishment of a national system of waterways, President Roosevelt, in 1907, established the Inland Waterways Commission; its mission, to take an inventory of the nation's water resources and establish methods for their development.[16]

After the Memphis meeting of the Lakes to the Gulf Waterway Association, members of Roosevelt's Inland Waterways Commission, at the invitation of Lawrence Jones and Edgar C. Ellis (a congressional representative from Kansas City), traveled to Kansas City aboard the Commercial Club's luxurious private train. Once in Kansas City, the Commercial Club held a series of meetings with their federal guests, including prominent conservationists Gifford Pinchot, Senator Francis P. Newlands (author of the Reclamation Act of 1902), and F.H. Newell (chief of the recently created Bureau of Reclamation). After being treated to a sumptuous breakfast, the Commercial Club gave the federal entourage a motor tour of the city and then hosted a lunch in their honor. At the luncheon, Lawrence Jones spoke of the necessity for Missouri River channelization, emphasizing the need for improvement between Kansas City and the mouth. Jones excluded the river north of Kansas City from future improvement.

Following the luncheon, the guests boarded the Corps of Engineers' snagboat *Suter* for a tour of the Missouri River. Once on the water, Colonel Shulz of the Corps explained the techniques and technologies that would channelize the river for deep-draft barges, while other Kansas City men described how the resumption of river traffic would save the Kansas City region million of dollars in reduced shipping costs each year. After lengthy conversations

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[16]Kansas City Post, 3 November 1907. Theodore Roosevelt, *Publicizing Conservation at the White House*, in Roderick Nash, editor, American Environmentalism, 84-89. J. Leonard Bates, *Conservation as Democracy*, in Roderick Nash, editor, American Environmentalism, 98-101. Samuel P. Hays, *Conservation as Efficiency*, in Roderick Nash, editor, American Environmentalism, 102-104.

with members of the Inland Waterways Commission, Jones, Ellis, and the other Kansas City men spoke with confidence that federal officials, including the president, Pinchot, and members of Congress, would support Missouri River improvement.[17] The Kansas City Commercial Club had effectively tied their movement for river channelization to the larger national crusade for internal waterways development advocated by the progressive conservationists.

As a further sign of federal support for improvement of the Missouri, the Corps of Engineers, in 1907, established the Kansas City District office to oversee work on the river. Previously, the Missouri had been under the jurisdiction of the division office in St. Louis. Creation of a separate office for the Missouri River illustrated the increased importance placed on the stream by the federal bureaucracy. The founding of the Kansas City District gave further impetus to the river improvement efforts of the Missouri Valley River Improvement Association. Members of the Kansas City Commercial Club would now be able to articulate their demands for river work directly to the Corps of Engineers. They could also cooperate more fully with Corps officials to secure funding from the Congress. Kansas City men would no longer need to travel to St. Louis to speak with Corps officials. Instead, the river improvement proponents would only need to travel across town.

Establishment of the Kansas City District also meant the careers of the Corps' military officers and civilian engineers became intertwined with Missouri River improvement. In St. Louis, Corps officials did not possess any great loyalty to the development of a particular stream. They did not have to have such loyalties, because the office supervised numerous projects. But now, the institutional survival of the Kansas City District, and the careers of Corps personnel assigned to it, depended solely on the improvement of the Missouri River. Thus, the Missouri Valley River Improvement Association gained a major ally in its fight to

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[17]Kansas City Post, 3 November 1907.

acquire federal financing for Missouri River channelization - the Kansas City District of the Corps of Engineers.[18]

Also in 1907, the Missouri Valley River Improvement Association, with Lawrence Jones as its president, published a pamphlet to garner public and congressional support for Missouri River channelization. This pamphlet, titled, *The Missouri: A Deep Waterway*, expressed the association's reasons for seeking a twelve-, or even fourteen-, foot channel from Kansas City to the mouth. These reasons included: 1) relief of the transportation bottleneck caused by insufficient railroad trackage, 2) water-borne freight rates for bulk agricultural commodities were one-sixth the railroad rates, 3) river transportation would break the railroad monopoly over the nation's transportation system, 4) Missouri River channelization would aid the development of the Great Plains region to the west and south of Kansas City, 5) Missouri River navigation would aid in the United States' competition with other world powers, especially grain producers like Argentina and Australia, 6) full utilization of the Panama Canal would result with the development of the nation's waterways, including the Missouri, 7) a twelve- or fourteen-foot channel would avoid any break-in-bulk between the Missouri River ports and ports along the Mississippi, Ohio, or proposed Lakes-to-Gulf Waterway.[19]

The renewed interest in the channelization of the Missouri River spread northward from Kansas City to other Missouri Valley towns, spurred on by the promotional efforts of the Kansas City men. In November 1907, the Real Estate Association of Sioux City met and decided to host a Missouri River improvement convention in that city. George C. Call, A.B. Beall, and J.L. Kennedy organized the event. On 22 and 23 January 1908, 600 Missouri

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[18]Missouri Valley River Improvement Association, *The Way to Navigate is to Navigate, The Missouri, A Deep Waterway, A 12-Foot Channel Would Save Its Cost Every Year, Work of Missouri Valley River Improvement Association for the Development of River Navigation*, VII.

[19]Ibid., 5-31.

River improvement advocates from throughout the Missouri Basin and the United States gathered in Sioux City, Iowa, for the First Annual Convention of the Missouri River Navigation Congress. This congress represented the largest single meeting ever held for the purposes of Missouri River improvement. The number of dignitaries alone gave the meeting an air of importance. Governor Coe I. Crawford of South Dakota, Joseph Ransdell, president of the National Rivers and Harbors Congress, Mayor Henry M. Beardsley of Kansas City, Missouri, Governor John Burke of North Dakota, Governor George L. Sheldon of Nebraska, and Governor A.B. Cummins of Iowa, all attended the congress and spoke in favor of federal improvement of the stream.

Both Lawrence Jones and Edgar Ellis of Kansas City gave presentations in Sioux City. Jones spoke of the benefits to agriculture from channelization of the Missouri River. He predicted a substantial reduction in shipment costs for agricultural commodities as farmers placed their produce on barges rather than in rail cars. Jones also spoke of the likely increase in the value of valley farmland as the Corps stabilized the river's banks. Ellis talked of the difficulties inherent in convincing Congress to finance river channelization. He said, "...to induce the national government to take hold of this great project, to approve it, and to provide the money for it, is incomparably the greatest legislative undertaking that any community or section of our country has ever attempted. That is the point I am trying to make. The favor we seek is not going to be conferred as a compliment."[20] The federal government would not readily commit to improving the Missouri River. Other river associations vied for the same federal dollars for improvement of their respective streams. Only the people of the Missouri Valley could put the political pressure on the Congress to make channelization possible. Ellis continued,

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[20]Ibid., 25.

> The first work, you will readily perceive, will be to shape public sentiment right here at home. In doing this there will be work for commercial organizations in all our towns and cities, there will be work for our press, for our city press, and our country press. The public will have to be educated to true conceptions and to sufficient conceptions of what is proposed, what it will be worth, and how it is to be brought about. ...It must be demonstrated that benefits are to be general; that advantages are to [e]nure to all classes and to all communities. We must have a public sentiment that will prompt the people to support with some constancy and consistency their representatives in Congress who must front this fight.[21]

At the close of the Missouri River Navigation Congress, the delegates elected Edgar C. Ellis as the president of the organization, and Lawrence Jones received the position of vice-president.

The Missouri River Navigation Congress represented a significant moment in the history of efforts to channelize the Missouri River. Never before had so many gathered in support of the cause. Although the active supporters of river improvement came from the business and professional classes of society, the navigation congress stands as an example of democracy-in-action, of private citizens taking the initiative to develop a major natural resource.

Later in 1908, the Missouri Valley River Improvement Association published another pamphlet to educate the public and Congress. This pamphlet, titled, *The Deep Water Project for the Missouri River*, stated that a twelve-foot channel between Sioux City and the mouth would cost $50,000 per mile, or $42,500,000 for the entire reach, according to Colonel E.H. Schulz of the Corps of Engineers. The association claimed that a fourteen-foot navigation channel could possibly be constructed along the river if there was adequate runoff during the year. The pamphlet mentioned that channelization of the stream would result in the reclamation of 210,365 acres of bottomland between Sioux City and the mouth. According to the Missouri Valley River Improvement Association, the value of this reclaimed land alone would pay the total cost of channelization.[22]

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[21] Missouri River Navigation Congress, *Proceedings of the First Annual Convention of the Missouri River Navigation Congress, Sioux City, Iowa, Wednesday and Thursday, Jan. 22-23, 1908*, (Sioux City, Iowa(?): Missouri River Navigation Congress, 1908), 27, 28.

[22] Missouri Valley River Improvement Association, *The Way to Navigate is to Navigate, The Deep Water Project for the Missouri River, A 12-Foot Channel Would Save Its Cost Every*

At the same time that the association published promotional materials, its members chartered steamboats and barges to carry goods between St. Louis and Kansas City, to prove the Missouri navigable. The financial backers of these endeavors cared less about the profitability of barge and steamer service, and more about their propaganda value. Hauling freight on the river, even if at a loss, served two important purposes. First, the Missouri Valley River Improvement Association could claim to both Congress and the public that the Missouri River could be navigated and thus deserved federal dollars for improvement. And second, association members could argue that carriers would use the river even more if the Congress would just channelize the stream. In other words, barge and steamer service had been revived on the stream, and the volume of traffic would increase substantially once the federal government deepened the Missouri River. For these reasons, barges and steamers traveled up and down the river between Kansas City and its mouth in 1906, 1907, and 1908.[23]

In the spring of 1908, another major flood descended the Missouri River. Only two previous floods exceeded the magnitude of the high flows of 1908 - the floods of 1903 and 1844. For farmers in the valley, the deluge of 1908 may have been the worst ever; the water remained high longer than any previous summer rise. This prevented valley farmers from even planting a marginal crop that season.[24] As a result, the promotion of Missouri River channelization took on an added urgency. Although no one affiliated with the Missouri

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Year. Report of the Missouri Valley River Improvement Association, (Kansas City: Missouri Valley River Improvement Association, 1908), 14.

[23]ARCE 1913, 936. Missouri Valley River Improvement Association, *The Way to Navigate is to Navigate, The Deep Water Project for the Missouri River, A 12-Foot Channel Would Save Its Cost Every Year*, 5, 8. Kansas City Times, *Kansas City Must Be Its Own Seaport*, 10 April 1909

[24]Kansas City Star, 5 July 1908.

Valley River Improvement Association dared publicly speak of channelization for flood control and property protection because Congress would not fund channelization for those purposes, river development advocates silently agreed that channelization would reduce the flood threat.[25]

After his election to the presidency of the Missouri River Navigation Congress, Representative Edgar Ellis took the initiative to organize the people of the valley to push Congress for appropriations. The more people actively supporting channelization, the more likely Congress would provide funds for the work. On 23 July 1908, Ellis wrote a letter to Louis Benecke of Brunswick, Missouri, a lawyer and long-time advocate of Missouri River improvement. He wrote,

> Permit me to suggest, ...that you form a local organization at Br[i]nswick, even if you can get no more than a dozen or a score of members...Such a local group would be a nucleus for cooperative effort. I could then furnish you with bulletins showing progress, plans, and prospects, and the help you could afford would be very substantial and gratifying. It has been my plan to invite just this sort of cooperation in every town between here [Kansas City] and St. Louis.[26]

Benecke responded quickly to Ellis's request for a local organization of the Missouri River Navigation Congress. In early September 1908, Benecke reported to Ellis that he had organized a "Local Group" with twelve members. The resolution forming the Brunswick branch of the Navigation Congress stated, "...it will be the object of the local group to secure much needed river work at points near Brunswick."[27] And so Ellis, with the assistance of

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[25]Ibid. Kansas City Star, *How a Canal Would Reduce the Height of the Missouri at Kansas City*, 13 June 1908.

[26]Benecke Family Papers, Louis Benecke, Collection Number 3825, Box 50, Folder 2044, *Edgar C. Ellis to Louis Benecke, 23 July 1908*, Western Historical Manuscript Collection, Columbia, Missouri.

[27]Benecke Family Papers, Louis Benecke, Collection Number 3825, Box 50, Folder 2045, *Louis Benecke to Edgar C. Ellis, 8 September 1908*, Western Historical Manuscript Collection, Columbia, Missouri. Benecke Family Papers, Louis Benecke, Collection Number 3825, Box 50, Folder 2045, *Resolution to form a local office of the Missouri River Navigation Congress*, Western Historical Manuscript Collection, Columbia, Missouri.

men like Benecke, organized the valley towns between Kansas City and St. Louis. Support for river improvement easily surfaced in the river towns, especially with the flood of 1908 still fresh in everyone's mind.[28]

With the river towns through central Missouri squarely in support of the efforts of the Missouri Valley River Improvement Association and the Navigation Congress, Ellis presented a decisive argument to U.S. Congressional colleagues for appropriations for Missouri River channelization. In January 1909, Congress appropriated $655,000 for the resumption of channelization work along the Missouri River. According to the *Kansas City Times*, "...much credit is due to Representative Ellis for the appropriation for the Missouri River. Mr. Ellis has worked long, continuously, industriously, and effectively for this provision [appropriation]."[29] After passage of this bill, representative Ellis confidently claimed that the U.S. Congress would approve a channelization project for the Missouri River sometime in 1910.

Of the $655,000 approved in 1909 for the Missouri River, the U.S. Congress earmarked $450,000 for river work between Kansas City and the mouth. Such a large appropriation for this reach of the river illustrated the political influence of Ellis, the Kansas City Commercial Club, and the river towns through central Missouri. A further indication of the political power of these interests became apparent in the spring of 1909 when the Corps of Engineers,

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[28] Benecke Family Papers, Louis Benecke, Collection Number 3825, Box 50, Folder 2045, *Resolution to form a local office of the Missouri River Navigation Congress*, Western Historical Manuscript Collection, Columbia, Missouri. Benecke Family Papers, Louis Benecke, Collection Number 3825, Box 50, Folder 2045, *Edgar C. Ellis to Louis Benecke, 9 September 1908*, Western Historical Manuscript Collection, Columbia, Missouri. Benecke Family Papers, Louis Benecke, Collection Number 3825, Box 50, Folder 2045, *Edgar C. Ellis to Louis Benecke, 18 September 1908*, Western Historical Manuscript Collection, Columbia, Missouri.

[29] Kansas City Times, *Missouri River Work Insured*, 3 January 1909.

rather than arbitrarily deciding where to spend the $455,000, held a series of public meetings in towns between Kansas City and the mouth to determine the "best" location for immediate river improvement.

Ellis continued to work for larger federal appropriations for the channelization of the Missouri. He suggested to several Kansas City businessmen that they form a barge line and establish routine freight service between Kansas City and St. Louis. The infrequently chartered barge and steamer trips between 1906 and 1908 no longer had any propaganda value. According to Ellis, a legitimate barge company, regularly moving freight on the Missouri, would convince congressional skeptics that people in the valley wanted to use the river. A company would also send a signal to Congress that commerce could flourish on the stream, if only the Corps deepened the channel. The Kansas City Commercial Club followed Ellis's advice. In the fall of 1909, club members organized the Kansas City Missouri River Navigation Company and named Walter S. Dickey of Kansas City as its president. Dickey then sold stock in the new company to members of the Missouri River Navigation Congress, the Missouri Valley River Improvement Association, and the Commercial Club. In a letter to members of the Navigation Congress, Dickey asserted, "When you join this movement to start freight cargoes up and down the Missouri, you will be making an investment that will prove profitable to yourself, your property, and your county." Dickey received enough financial support to incorporate the company in late 1909. This widespread public endorsement of Missouri River barge navigation did impress Congress and the chair of the U.S. House of Representatives Rivers and Harbors Committee, Theodore Burton. Burton remarked, "Those who have to do with river and harbor improvements [in Congress] are watching the situation here [in the Missouri Valley] very closely, with the thought that provision should be made for the traffic that is being developed along the Missouri River."[30]

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[30]Benecke Family Papers, Louis Benecke, Collection Number 3825, Box 50, Folder 2048, *Kansas City Star*, *"Build the Boats-Burton, Rivers and Harbors Chairman Says He's*

In February 1910, Burton and the Rivers and Harbors Committee conducted a hearing to consider whether or not the Missouri River channelization project should receive continued federal financial support. Numerous members of the Kansas City Commercial Club traveled to Washington to attend the hearing, including W.T. Bland, E.M. Clendening, J.C. Swift, H.G. Wilson, and Walter S. Dickey. Dickey, of the Kansas City Missouri River Navigation Company, told the congressional representatives present that Missouri River channelization would benefit the rapidly growing population of the Missouri Valley and upper Midwest through an eventual lowering of freight rates. W.T. Bland informed the committee members that farmers and industrialists along the valley would save five cents per ton on their freight costs. This amount would equal a total savings of five million per year once the barge channel was completed by the Corps of Engineers. The committee members wanted to know whether or not the Kansas City men would use the Missouri River as a transportation route. Dickey responded that they would use the river regardless of any federal channelization project. As proof of that fact, Dickey argued that valley residents had already formed a navigation company for the purpose of moving cargoes on the unchannelized river. Dickey and his colleagues made such a favorable impression on the Rivers and Harbors Committee that its members recommended to the full House that the Missouri River channelization project receive a one million dollar appropriation that year. The House and Senate concurred with the recommendation and the channelization project received its largest allocation to date. In the same Rivers and Harbors Bill, Congress appropriated money for the construction of a six-foot channel along the Mississippi from St. Louis north to St. Paul and a nine-foot channel below St. Louis. Large-scale construction of a national waterways system had begun

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Watching the Situation," 29 September 1909, Western Historical Manuscript Collection, Columbia, Missouri.

in earnest.[31] Congress hoped this system would benefit agriculture and the rural population of the upper Midwest and South through the creation of competitive carrier rates.

Although the lobbying efforts of Missouri Valley towns and their respective commercial interests played a vital role in securing the federal appropriation in 1910, both the sympathies of the progressive conservation movement and the widespread public enthusiasm for development of the nation's rivers for navigation made federal officials receptive to the promotional efforts of Ellis, Dickey, the Commercial Club, and the Missouri Valley River Improvement Association.[32]

In 1912, Congress authorized the construction of a six-foot deep channel between Kansas City and the mouth. A six-foot channel would be significantly more shallow than the original fourteen- and eight-foot channels recommended by Major Suter and Samuel Yonge. However, by 1912, Corps studies of river flow volumes indicated that only a six-foot channel would be attainable below Kansas City. The river did not have the water to sustain greater depths.[33]

The authorizing legislation of 1912 represented a further congressional endorsement of the channelization of the Missouri. And before World War I, the federal government willingly provided the money on a regular basis to channelize the stream. In July 1912, Congress allocated $800,000 to the project. One month later, the project received an additional

[31] Kansas City Star, 5 February 1910. Kansas City Times, 9 December 1910. Kansas City Times, 24 December 1910.

[32] ARCE 1885, 2992. C.P. Lindner, *Channel Improvement and Stabilization Measures,* in State of Knowledge of Channel Stabilization in Major Alluvial Rivers, ed., G.B. Fenwick, VIII-6.

[33] John Ferrell, Soundings: One Hundred Years of the Navigation Project, (Washington: GPO, 1996), 35.

$600,000. Then in March 1913, Congress allocated another $2,000,000.[34] The Corps estimated that it needed approximately $2 million per year to complete the project in ten years. Congress, although not supplying that much money per year, did provide the Corps with enough money to construct long stretches of the barge channel. The technologies and techniques utilized in river channelization after 1910 resembled those first used by Major Charles Suter during the 1890s. The willow mattress and stone revetment, along with the pile dike, remained the two predominant methods of channelization.[35]

Ironically, just as Missouri River channelization received its greatest appropriations and congressional endorsement, it came under its sharpest attack. In March 1915, Congress ordered an examination of the cost-effectiveness of a number of river projects, including the Missouri River barge channel. This review occurred after $6,250,000 had been spent on additional construction below Kansas City in the previous five years.[36] Kansas City District engineer Lieutenant Colonel Herbert Deakyne supervised the study, which he submitted to the Board of Engineers in August 1915.[37] The conclusions made by Deaknye in his report shocked not only his superiors, but also Missouri Valley residents, including the Kansas City contingent that had worked so many years to win appropriations for channelization. Deaknye concluded that Missouri River barge traffic would never reach levels necessary to justify the expense of constructing the navigation channel. Furthermore, railroad rates could be lowered

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[34]ARCE 1913, 933.

[35]Kansas City Times, 27 April 1914.

[36]Kansas City Times, 6 August 1915.

[37]The Board of Engineers consisted of seven high-ranking Army engineers who reviewed the economic and engineering feasibility of river and harbor projects. A project receiving board approval went to the Rivers and Harbors Committee for further review and legislative action. If the Rivers and Harbors Committee accepted the board's endorsement, it recommended inclusion of the project in the Annual Rivers and Harbors Bill.

through the enactment of regulatory laws rather than the expenditure of twenty million dollars on a dubious barge channel. Valley residents did not need a six-foot channel to ship their agricultural commodities downstream. Instead, they could continue to use the rail lines that paralleled both banks of the river between Kansas City and St. Louis. He ended his report by proposing that the federal government abandon Missouri River channelization altogether, and that future river work be restricted to snagging operations.[38] Deakyne stated, "I recommend that the present project be modified so as to provide for snagging alone at an estimate[d] cost of $40,000 per year, and that all other work be stopped."[39]

Missouri Valley residents responded quickly to Deakyne's report. Upon learning of the submission of the study to the Board of Engineers on 5 August 1915, Kansas City Commercial Club president C.S. Keith blurted, "We will get busy at once to prepare to make an appeal [to the board]. No stone will be left unturned. I will call a meeting of the board of directors of the Commercial Club the very first thing tomorrow morning."[40] Keith and his colleagues decided to organize the people of the Missouri and Mississippi valleys against Deakyne and his supporters in Congress and the Corps. Members of the Commercial Club sent telegrams to senators, representatives, state and local officials, farm organizations, and commercial clubs from Sioux City to St. Louis and from St. Paul to Memphis, urging them to contact the Board of Engineers and express their support for Missouri River channelization. The public response to the Commercial Club's call for action was overwhelming. A group of fifty-six farmers from Norborne, Missouri, signed a petition that read, "We the undersigned

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[38]Kansas City Times, 6 August 1915. Kansas City Star, 9 August 1915. Kansas City Times, 10 August 1915. Kansas City Times, 16 October 1915. Kansas City Star, 11 November 1915.

[39]Kansas City Times, 10 August 1915.

[40]Kansas City Times, 6 August 1915.

farmers, residing in the Missouri River Valley... hereby petition the federal government to continue appropriations that the river service may be continued." The Glascow, Missouri, Commercial Club wrote to their Kansas City colleagues, "The business men of Glasgow are for river improvement and deplore the adverse recommendation made by Colonel Deakyne." The people of Chamois, Missouri, angrily declared, "Our Commercial League and citizens of this community are unanimous in opposing the abandonment of the improvement of the Missouri River." Up and down the valley, the response was the same, valley residents adamantly rejected Deakyne's recommendations. Residents of St. Charles, Hermann, Jefferson City, Hardin, Boonville, Brunswick, Washington, Bonnots Mill, Carrolltown, and New Haven, Missouri, pledged to support the Kansas City Commercial Club in its efforts to influence the Board of Engineers and defeat Deakyne's proposals.[41] Under pressure from Missouri Valley residents and their congressional representatives, the Board of Engineers convened a hearing on the Missouri River channelization project in October 1915 in Kansas City, Missouri. The purpose of the hearing was to determine whether Congress should continue to finance the work. For two days, businessmen, and potential shippers, from throughout the valley urged federal completion of the barge channel. O.V. Wilson of the Commercial Club made the assertion that the savings in the price farmers paid to ship their grain on the barge channel would be so great that the project from Kansas City to the mouth would pay for itself in one year.[42] Because of the public support for channelization, the Board of Engineers rejected Deakyne's conclusions. In April 1916, Colonel W.M. Black submitted a report to the board that unequivocally endorsed the future channelization of the Missouri and urged Congress to continue financing the project. Also, Deakyne's superiors

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41 Kansas City Times, 10 August 1915.

42 Kansas City Times, 21 October 1915.

ordered his transfer from the Kansas City District office. The Kansas City Commercial Club could not work with a man who advocated the abandonment of their pet project.[43]

During the Deakyne affair, private interests overrode the authority and recommendations of the Corps of Engineers and determined the direction of Missouri River development. The Deakyne affair illustrated the power of local groups in the promotion, planning, and implementation of channelization work. The events surrounding the submission of Deakyne's report also indicated the level of cooperation needed between local organizations and federal entities to affect development.[44]

The success of Missouri Valley residents in defeating Deakyne recommendations enraged Senator Theodore Burton of Ohio and Congressman James Frear of Wisconsin. Burton believed the Missouri River project represented a "pure, bald, unmitigated waste" of federal dollars.[45] Of course, Burton's constituents wanted to improve the Ohio River with the same federal funds expended along the Missouri. Frear, whose district bordered the Upper Mississippi River, another river being channelized by the Corps at that very moment, called for the House of Representatives Judiciary Committee to investigate the "river lobby," especially the "Missouri River lobby." Frear stated to his congressional colleagues, "That such committee [judiciary] shall further investigate the activities of the Missouri River lobby that is alleged to have active interest in securing appropriations for the reclaiming at government expense of ½ million acres of private land along the Missouri River valued, according to official reports, at 60 million dollars."[46] Frear argued that the navigation

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[43]Kansas City Star, 7 April 1916.

[44]Kansas City Times, 10 March 1916.

[45]Kansas City Times, 10 March 1916.

[46]Kansas City Times, *The Frear Attack*, 11 January 1916.

project was a sham, that the real purpose of the project had been, and continued to be, the stabilization of the Missouri's banks so that bottomland farmers could acquire the land that either accreted behind the pile dikes or remained free from inundation as the channel deepened itself. Representative W.P. Borland from Kansas City responded to Frear with a challenge, "I invite you here and now to Kansas City to show what that city is doing toward navigating the river. I want you to come there, and I invite you to come to convince you that many of the statements you make here today are untrue."[47] The Kansas Cityan argued that the purpose of the channelization project had always been to establish barge traffic on the river. Bank stabilization remained an incidental benefit of the project, not its sole purpose. Frear then yelled across the House floor, "Pork, Pork" and said, "...these statistics [on the amount of freight carried by water] invite the services of a lunacy commission in order to determine where the responsibility rests for such unmitigated waste put over Congress by waterways lobbies and army engineers."[48] Nothing came of Frear's threat. Congress continued to authorize the Missouri River channelization project.

World War I forced reductions in expenditures for federal waterways projects. Thus, after 1916, work on the Missouri River navigation channel slowed to a standstill. A further indication of the poor state of the project along the river occurred in 1918 when the Kansas City Missouri River Navigation Company, first established in 1909, sold its last remaining boats to the federal government, which, in turn, transferred the boats to the Mississippi River for service during the war.

After World War I, work on the river did not resume. Between 1916 and 1922, the Corps spent just a little more than $1 million on the project, not even enough money to maintain the integrity of the existing channelization structures, which deteriorated under the constant

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[47]Ibid.

[48]Ibid.

assault of the river's ice flows, floating debris, and annual floods. By 1922, only 35 percent of the river reach from the mouth to Kansas City had been channelized by the Corps. The cost of channelizing a mere 135 miles of river equaled $7.4 million dollars, or roughly $55,000 per river mile.[49] Not surprisingly, with the channel incomplete, deep draft steamers and barges remained confined to the Mississippi River. The Kansas City Missouri River Navigation Company never returned its boats to the Missouri. By late 1922, the sound of barges and steamers remained absent from the valley; the only sound that could be heard was that of flowing water moving against the bank, over rocks, and around the aging pile dikes of the Corps.[50]

The inactivity along the river concerned members of the Kansas City Commercial Club.[51] By 1923, the men had become desperate in their attempts to establish barge traffic on the river. At a meeting in November of that year, the Chamber of Commerce's Executive Secretary, E.M. Clendening, argued that proponents of Missouri River barge navigation had to go it alone, and assume the federal government would not finance the completion of the channelization project. As a result, Clendening stated that new methods had to be discovered by which barge traffic could be established on the river even without the completion of the federal channelization project.[52] But no one came up with a miracle plan to establish barge traffic on the shallow Missouri.

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[49]John Ferrell, Soundings: One Hundred Years of the Navigation Project, 51.

[50]Kansas City Star, *What of New River Plan?, Navigation Company Officials Asked How to Proceed*, 15 November 1923.

[51]Kansas City Star, 1 September 1918. Kansas City Times, 16 July 1919.

[52]Kansas City Star, *What of New River Plan?, Navigation Company Officials Asked How to Proceed*, 15 November 1923.

J.C. Nichols, another member of the Kansas City Commercial Club, knew that the only hope for navigation of the Missouri River rested with channelization of the stream under federal auspices. He believed something had to be done to get the government back into the business of improving the Missouri River. Toward that end, Nichols attended a meeting of the Mississippi Valley Association sometime in 1923 or 1924. The Mississippi Valley Association, established in 1919, consisted of river development advocates from twenty states within the Mississippi Basin. New Orleans, St. Louis, St. Paul, Cincinnati, and Pittsburgh businessmen represented the bulk of its membership. These men organized the association to coordinate the efforts of river associations throughout the basin, to insure that river boosters did not work at cross purposes, and to lobby Congress for funding of river improvement projects.[53]

When Nichols attended the conference of the Mississippi Valley Association, he expressed amazement that the Missouri River did not come up in any of the presentations. Instead, discussions centered on the development of the Mississippi and Ohio rivers. At the close of the conference, Nichols decided to create an organization to lobby Congress on behalf of the Missouri River. In the fall of 1924 and spring of 1925, Nichols, working in concert with long-time river developer, Lawrence Jones, met with members of the commercial clubs of Omaha, St. Joseph, and Sioux City to discuss means of organizing the entire valley.[54] Out of these meetings, and subsequent correspondence, Nichols concluded that interest in Missouri River improvement had not diminished since the war; and with

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[53]George R. Call, *The Missouri River Improvement Program As I Have Known It*, (unpublished manuscript, Sioux City Public Library, Sioux City, Iowa, 1967), Chapter II, 6.

[54]Kansas City Star(?), *Arrival of "Mark Twain," "Gen. Ashburn," and Towboats Marks Opening of River for Barge Lines*, 26 June 1932. Missouri River Navigation Association, *What the Missouri River Navigation Association Has Accomplished*, (Kansas City: Missouri River Navigation Association, 1927), 3.

proper organization, the federal government could be induced to finance the completion of the project below Kansas City. To perfect an organization, Nichols, Jones, and the Kansas City Chamber of Commerce invited businessmen, industrialists, agriculturists, and educators from states in the Midwest to a conference on Missouri River navigation to be held 19 and 20 October 1925 at Kansas City.[55]

The response to the invitation surprised the Kansas City men. Approximately 750 individuals attended the conference. These numbers surpassed attendance at any previous Missouri River navigation meeting, even the one at Sioux City in 1908, which had 600 delegates. Herbert Hoover, Secretary of Commerce, gave the keynote address to the assembled masses. Hoover advocated the completion of a system of internal waterways that embraced the Great Lakes, the Mississippi and Ohio rivers and the Missouri River from its mouth to Kansas City. This system would become the nation's "Cross of Commerce," and would include a deep channel running from Chicago south to New Orleans along the Illinois and Mississippi rivers and another channel running from Pittsburgh down the Ohio to its mouth and from the confluence of the Mississippi and Missouri rivers west to Kansas City. Hoover believed that this vast waterways system would serve American agriculture by reducing the cost of transporting bulk commodities. The Secretary of Commerce said, "Water-borne traffic and its cheaper cost is peculiarly adapted to primary agriculture products."[56] He also claimed that, "Modern forms of development have made water carriage the cheapest of all transportation for many types of goods. Broadly, 1,000 bushels of wheat

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[55]Missouri River Navigation Association, *What the Missouri River Navigation Association Has Accomplished*, (Kansas City: Missouri River Navigation Association, 1927), 3. Kansas City Star(?), *Missouri River Project*, 16 October 1925.

[56]Herbert Hoover, *The Need of Inland Waterway Transportation for Agriculture and Industry, an address delivered before the Missouri River Navigation Conference, October 19th, 1925*, (Kansas City: Missouri River Navigation Association, 1925), 9.

can be transported 1,000 miles... by our modern equipped Mississippi barge serve for $60 to $70, and by railroads for $150 to $200. These estimates are based not on hypothetical calculation, but on the actual going freight rates."[57]

Hoover countered the arguments of those who believed waterways development to be a waste of federal dollars. He argued that commerce had not developed on the nation's rivers because river improvement had been piecemeal. The nation's major rivers had to be linked together in order for the people to reap any benefits. He compared the contemporary waterways system of the United States to a railroad that remained incomplete. No railroad could possibly turn a profit if its trains had to stop every few miles because of obstacles.[58]

Before closing his speech, Hoover committed himself, and the Department of Commerce, to the development of a connected, national, waterways system, that embraced the Missouri River.

> We know what we should do. We know its [river development's] vast benefits; we know it [development] can be accomplished by a comparatively trivial cost compared to these benefits. We should go to it and have it [the Cross of Commerce] completed within the next decade. And it is my hope that we shall see not only the steady completion of the Ohio River section, but also of the Chicago and Kansas City lines.[59]

Hoover's speech gave the cause of Missouri River channelization an incredible boost.

Capitalizing on the support shown by Hoover, the delegates of the conference resolved to form the Missouri River Navigation Association. The new association had two primary goals; the first, to induce Congress to complete the navigation channel between Kansas City and the mouth, the second, to convince Congress to authorize the extension of the navigation channel north of Kansas City, to a point yet to be specified. Membership in the association

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[57]Ibid., 6.

[58]Ibid., 7.

[59]Ibid., 11.

remained open to anyone, but it consisted mostly of bankers, lawyers, businessmen, heads of farm organizations, presidents of commercial clubs, and state and local government officials. The governors of the ten states of the Missouri Basin served as board members, and individuals affiliated with various professional organizations held the bulk of administration positions. The conference attendees elected A.J. Weaver of Falls City, Nebraska, (a banker) as president and J.C. Nichols (a realtor) of Kansas City, Missouri, as vice president.[60] A list of other officials in the association included, Stewart Gilman, mayor of Sioux City, Iowa, Ballard Dunn, editor of the *Omaha Bee*, Dr. C.M. Pugsley, president of the South Dakota State College of Agriculture, Brookings, South Dakota, P.F. Walker, dean of the College of Engineering, University of Kansas, Lawrence, Kansas, and Harry L. Keefe, president of the Nebraska State Farm Bureau Federation, Walthill, Nebraska. A few farmers served as officers, including Dr. Frederick Roost, Sioux City, Iowa, W.C. Children, Council Bluffs, Iowa, and R.W. Brown, Carrollton, Missouri.[61]

Weaver, Nichols, and other members of the Missouri River Navigation Association wasted no time in working toward their two goals. According to a statement made by Weaver, the association effectively lobbied Congress in December 1925 to increase the appropriation for rivers and harbors from $40 million to $50 million dollars, with the additional $10 million dollars slated for the Mississippi River system. Weaver and Nichols understood that money for the Mississippi or its tributaries would contribute to the accomplishment of their own goals. In particular, deepening of the Mississippi had to be accomplished before the Missouri could be utilized for barge traffic.

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[60]Missouri River Navigation Association, *What the Missouri River Navigation Association Has Accomplished*, (Kansas City: Missouri River Navigation Association, 1927), 3, 4.

[61]Missouri River Navigation Association, *The Missouri River Navigation Association, Organized At Kansas City, Missouri, October 19th - 20th, 1925*, (Kansas City: Missouri River Navigation Association, 1925), 3, 4.

Also during the month of December 1925, the Missouri River Navigation Association formed the Upper River Committee whose purpose was to determine the economic feasibility of channelizing the Missouri as far north as Sioux City. In early 1926, the Upper River Committee concluded that future annual barge tonnage between Kansas City and Sioux City would justify the expenditures necessary to construct the navigation channel along this reach. The long-term savings in transportation costs to valley residents would surpass the costs of any future project. The committee then submitted a detailed report on the topic to the Kansas City District of the Corps of Engineers. At the time of the report's submission, engineers at the Kansas City District disapproved of the construction of the navigation channel to Sioux City, because they believed any extension of the channel should wait until the river below Kansas City had been opened to barge traffic. But the Upper River Committee's report, along with public support for the extension in the region north of Kansas City, convinced the district engineer's office to abandon its opposition and endorse the immediate improvement of the stream to Sioux City.[62] Yet, the chief of engineers continued to oppose the extension, and he refused to recommend the project to Congress. The chief of engineers wanted to wait and see whether the Kansas City-to-mouth reach would carry enough barge traffic to justify a further investment.[63]

The association kept active on other fronts. In January 1926, Weaver and Nichols contacted Major General Harry Taylor, chief of engineers, to determine whether the federal government would purchase the assets of the inactive Kansas City Missouri River Navigation Company in order to start a federal barge line on the Missouri River. Weaver and Nichols believed that federal sponsorship of a barge line would further commit the government to the improvement of the stream, and its profitability would induce private investors to start their

[62]Ibid., 5.

[63]Ibid., 5.

own companies.[64] The chief of engineers remained non-committal, responding to Weaver and Nichols that the matter needed further study.

A.J. Weaver and J.C. Nichols held meetings in towns all along the river in early 1926 to keep the residents of the Missouri Valley organized and interested in the cause of channelization. In Yankton, in late February, the men conferred with South Dakota Governor Carl Gunderson, who reiterated his support for the six-foot channel extension north of Kansas City. In Sioux City, before members of the Chamber of Commerce, A.J. Weaver said, "This river project needs the united action of farmers, industrial organizations and consumers. It is a common cause imperative to the welfare of our section and our nation."[65] Weaver and Nichols worked diligently to garner mass public support for the proposed navigation channel.

The lobbying and organizational work of the Missouri River Navigation Association between October 1925 and April 1926 bore fruit when Congress, in late April 1926, appropriated $2 million for channelization work below Kansas City, out of the total $50 million rivers and harbors appropriation for that fiscal year. Unfortunately for river boosters along the upper river, Congress did not allocate money for channelization of that reach.

Although only $2 million had been directed toward the lower river project, this appropriation had symbolic importance; for many river boosters it marked a turning point in the efforts for channelization of the river. Members of the Kansas City Chamber of Commerce, along with officials of the Missouri River Navigation Association, now spoke with confidence that the reach below Kansas City would receive the requisite federal

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[64]Kansas City Star, 22 January 1926.

[65]Sioux City Journal, *River Meetings at Sioux City and Yankton: Governor Gunderson, J.C. Nichols and A.J. Weaver among Speakers at Meetings in Upper Missouri River Cities*, 28(?) February 1926.

financing that would enable the Corps of Engineers to actually complete the six-foot navigation channel. O.V. Wilson of the Chamber of Commerce predicted, "We have been working many years for river navigation, and it begins to appear as if we actually will have it in a few years." T.J. Brodnax, another member of the Chamber of Commerce, proclaimed, "If everything proceeds as it should, I believe it will be possible for boats [barges] to be in operation on the Missouri River in about three years."[66] Believing that they had almost achieved their first goal (that of completing the channel below Kansas City), the association's leadership shifted their focus to the north, to secure congressional authorization for the extension of the six-foot channel to Sioux City.

In late April 1926, a delegation of river boosters from Omaha met with members of the Missouri River Navigation Association in Kansas City to discuss how to win congressional approval for the extension of the six-foot channel. At this meeting, the attendees agreed that they should immediately push Congress for authorization of the project. The climate in Washington appeared to be favorable for approval of river projects, however dubious those projects might be. Also, considering the support for Missouri River channelization shown by Congress in the past few months, the river boosters believed they had the momentum to push the project through Congress.

The association kicked-off its congressional lobbying campaign by sending a large delegation to Washington to meet with congressional representatives from the Missouri Valley states. After laying out a legislative strategy, the Missouri Valley contingent agreed that an amendment to the Annual Rivers and Harbors Bill would be introduced on the floor of the House. This amendment would contain an authorization for the extension of the six-foot

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[66] Kansas City Star(?), 30 April 1926.

deep barge channel to Sioux City. The House passed the Rivers and Harbors Bill, with the amendment, by a whopping two to one margin.[67]

After clearing the House, the Rivers and Harbors Bill went to the Senate Commerce Committee for review. In June 1926, the Commerce Committee held hearings on what had become known as the Upper River Project (Figure 6.1). Again, the Missouri River Navigation Association sent a large delegation to Washington to participate in the hearings and try to convince the Senate of the project's importance.

One of the first association members to testify before the Senate Commerce Committee, C.E. Childe of the Omaha Chamber of Commerce, argued that the river valley north of Kansas City needed water transportation to provide rate relief to farmers and business interests. According to Childe, the region north of Kansas City sat on the periphery of numerous markets; thus, its residents had to import and export commodities and finished products over great distances, which in-turn lowered the region's competitiveness compared to other regions of the United States.

To add to the economic hardships of the area, Childe stated that railroads had arbitrarily raised their rates 60 to 100 percent since the end of the First World War. The railroads could dictate freight rates because no other form of transportation existed in the area. The increase in railroad rates, in combination with the region's disadvantageous market location, had worsened the agricultural depression that had gripped the Midwest since the early 1920s. Childe claimed that barge traffic on the Missouri River would allow the region to compete more effectively on national and world markets. He concluded his analysis by insisting, "All the people of the Missouri Valley are united in demanding this improvement and they want action. ...Our people are not radical, but they want relief, and they are voicing their demand

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[67]Sioux City Journal, *Dr. Roost Explains Upper Missouri Project*, October 1926.

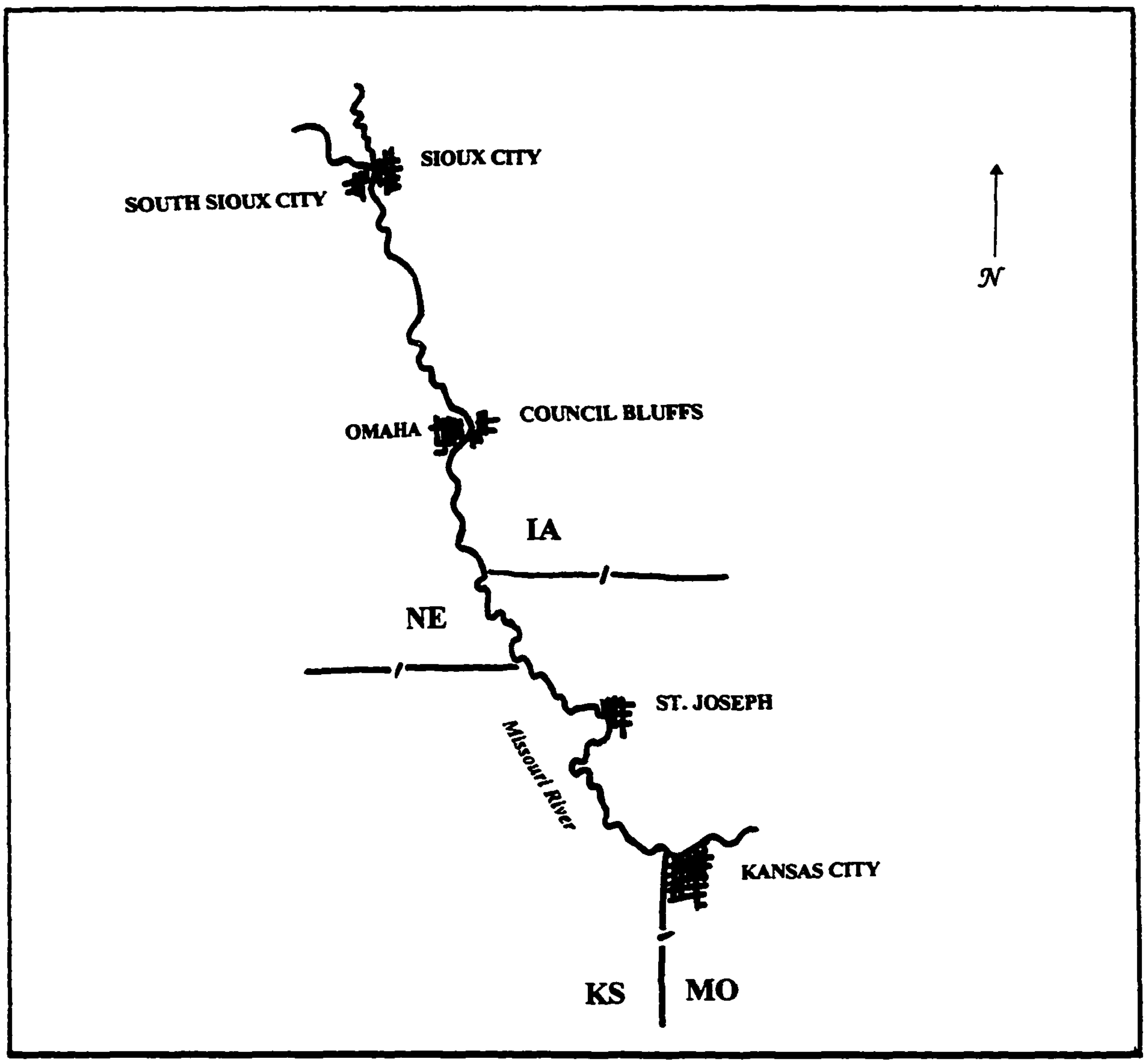

Figure 6.1. The Upper River Project. In the mid-1920s, members of the Missouri River Navigation Association lobbied Congress to extend the six-foot barge channel from Kansas City to Sioux City (a distance of approximately 385 river miles), even though the channel below Kansas City remained closed to barge traffic. Proponents of the channel extension believed the region north of Kansas City needed freight rate relief. Map by author.

that something be done."[68] Mayor Stewart Gilman of Sioux City, told the committee, "both businessmen and farmers looked to improvement of the upper river as the only means of lowering freight rates from that section." He continued, "About all the river is good for now is for a despondent farmer to commit suicide in." In response to this point, a committee member said, "And you have lots of despondent farmers?" Gilman followed, "Too many of them, and they are expecting the government to devote some attention to their condition."[69] But the Commerce Committee did not report favorably on the Upper River Project to the full Senate. The project appeared headed for defeat.

The action of the Senate Commerce Committee dismayed Weaver, Nichols, Gilman, and other members of the Missouri River Navigation Association, but they still did not give up hope that the Senate would authorize their project. On 9 November 1926, the association met again in Omaha to discuss how to reintroduce the Upper River Project into the Senate Rivers and Harbors Bill. At the close of this meeting, the men agreed to send a resolution to the full Senate, urging it to authorize channelization north of Kansas City. They also planned to send another large lobbying delegation to Washington in the middle of December, when the Rivers and Harbors Bill went before the Senate for a final time. Lastly, Weaver and his colleagues decided to have Missouri Basin senators reintroduce the Upper River Project on the floor of the Senate, as an amendment to the original Rivers and Harbors Bill, in the same fashion that the earlier House amendment had been introduced that past spring.

During the final push for authorization of the Upper River Project in the Senate, Sioux City men, rather than the Kansas Cityans, played the pivotal role. Two native Sioux Cityans, Mayor Stewart Gilman and Iowa's U.S. Senator David W. Stewart, organized a Missouri Valley bloc in the Senate. This bloc aligned with senators from the northeastern United

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[68] Kansas City Star, 15 June 1926.

[69] Ibid.

States (who wanted a canal constructed across Cape Cod) to secure passage of the Upper River Project as an amendment to the Rivers and Harbors Bill. According to George R. Call, another river booster from Sioux City, Senator Stewart displayed incredible political astuteness by garnering enough votes for acceptance of the amendment.[70] The Upper River Project became law on 21 January 1927 with President Coolidge's signature.[71] After this tremendous legislative victory, A.J. Weaver, president of the Missouri River Navigation Association said, "Men who have been identified with the river navigation movement for many years and have watched the long struggle made for approval of various projects say that the approval of the Upper River, [the project to Sioux City] without the recommendation of the Chief of Engineers and in such a short time, was a very unusual victory."[72]

In that same Rivers and Harbors Bill, Congress authorized the Corps of Engineers to conduct a survey of the river below Kansas City to determine the feasibility of constructing a nine-foot navigation channel. Missouri River navigation interests recognized that the six-foot channel would become obsolete the instant the Mississippi River had been deepened to nine feet below St. Louis. Barges that drew seven or eight feet of water would not enter the shallower channel of the Missouri. As a result, these barges would be forced to break bulk at St. Louis before traveling on to Kansas City. Any break in bulk would substantially increase the cost of transporting cargo via the Missouri River and consequently lower its usefulness. The channel had to be the same depth of the Mississippi's navigation channel, or risk being forever neglected by barge operators.

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[70]George R. Call, *The Missouri River Improvement Program As I Have Known It*, Chapter V, 5.

[71]ARCE 1934, 833.

[72]Missouri River Navigation Association, *What the Missouri River Navigation Association Has Accomplished*, (Kansas City: Missouri River Navigation Association, 1927), 6.

Between 1903 and 1927, private interests based in the Missouri Valley, especially in Kansas City, worked to gain federal support for the channelization of the Missouri River. By early 1927, these interests, in cooperation with federal officials, had achieved tremendous results. Congress had not only authorized and financed the construction of a six-foot navigation channel below Kansas City, it had also agreed to the extension of the navigation channel as far north as Sioux City, Iowa. The Missouri Valley interests repeatedly found federal officials willing to cooperate with them to push appropriations and legislation through Congress. In the decade of the 1900s, the members of the Missouri Valley River Improvement Association effectively attached their movement to the larger, national waterways crusade sponsored by the progressive conservationists. The ability of the Missouri Valley men to blend their own purposes with the larger goals of federal officials resulted in the 1910 appropriation and the 1912 authorization of the six-foot channel below Kansas City. The same joining of local and federal interests occurred in the 1920s, when the Missouri River Navigation Association secured a federal commitment to complete the channel below Kansas City and extend the six-foot channel to Sioux City.

CHAPTER 7: DEVELOPMENT DURING THE DRY YEARS, 1927-1942

After the congressional authorization of the Upper River Project in January 1927, members of the Missouri River Navigation Association and businessmen, politicians, and farmers living in the area north of Kansas City lobbied Congress, the War Department, and the president for the money needed to start construction on the channel extension to Sioux City. Advocates of the Upper River Project believed that it would benefit the agricultural economy and the rural population through a reduction in freight rates. But the lobbying efforts of these Missouri Valley navigation enthusiasts did not initially meet with success. Federal officials did not cooperate with local groups to channelize this reach. For six years, federal authorities rejected local appeals to start large-scale construction on the Upper River Project.

The Roosevelt Administration adopted a very different approach toward Missouri River development. By late 1933, federal officials committed themselves to the extension of the six-foot channel to Sioux City, the construction of the world's largest earthen dam at Fort Peck, and the eventual deepening of the navigation channel to nine feet. The shift in policy evident during the Roosevelt Administration occurred for a number of reasons, including political, social, and economic concerns. But the river itself also affected the formulation and implementation of development plans during the 1930s. More specifically, the low river levels that lasted from 1929 into the late 1930s forced local and federal officials to expand the navigation project to include the construction of storage reservoirs.

Between 1927 and 1942, the Missouri River environment underwent huge changes. By 1932, the Corps had confined the river below Kansas City into a single, deep channel. In the eight years between 1932 to 1940, the Corps channelized most of the 385 miles of river between Kansas City and Sioux City. At the same time that the channelization project progressed along the lower river, federal engineers built Fort Peck Dam. By the late 1930s, the reservoir behind the massive Fort Peck Dam began to fill with water, eventually creating a man-made lake 180 miles long. Thus, by 1942, 750 miles of the lower river and 180 miles of the upper river barely resembled its former character.

In the spring of 1927, Congress only appropriated $45,000 for work on the Upper River Project; this money did not even allow the Corps to conduct studies necessary for future construction. On the other hand, the project from Kansas City to the mouth received approximately two million dollars that year.[1] Again, in 1928, Congress provided money for channelization below Kansas City, but completely neglected the Kansas City-to-Sioux City reach. A Nebraska senator, whose constituents would benefit from the Upper River Project, expressed his frustration with the lack of congressional support,

> No section has suffered more in an economic way than the West. If we are to reduce the river funds even more, what are we of the West to hope for? If I did what my inclination prompts me to do I would offer an amendment [to the annual Rivers and Harbors bill] increasing the appropriation 12 million for the upper Missouri alone. But I know it would only delay matters [passage of the bill] and would not be approved at this time.[2]

In November 1928, when Herbert Hoover became President of the United States, advocates of the Upper River Project believed they had a major ally in the White House. Three years earlier, at the Missouri River Navigation Conference, Hoover had committed himself to the development of the nation's inland waterways. During his Kansas City address, Hoover outlined a plan to create a north-south barge channel from Chicago to New Orleans and an east-west route from Pittsburgh to Kansas City and possibly beyond. This inland waterways system, known as the Cross of Commerce, would embrace the Illinois, Mississippi, Ohio, and Missouri rivers. With his election, members of the Missouri River Navigation Association hoped Hoover would submit budget requests to Congress that

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[1] Kansas City Times, 17 March 1927.

[2] Kansas City Times, 28 February 1928.

included large appropriations for the completion of the Cross of Commerce, the six-foot channel to Kansas City, and the Upper River Project.

Hoover and his new Secretary of War, James W. Good, did not fully endorse the Upper River Project. In March 1929, only days after being sworn into office, Good, who possessed discretionary power over the dispersal of congressional funds allocated to the Missouri River, ordered the expenditure of six million dollars for work on the Kansas City-to-mouth reach. As a concession to upper valley interests, Good directed that the remaining one million dollars of the appropriation be spent on work between Kansas City and St. Joseph (St. Joseph is located approximately 100 river miles above Kansas City). Good's action represented the first allocation of money for construction purposes to the Upper River Project. However, one million dollars would only cover the cost of channelizing about twenty miles of stream, an insignificant length considering that 385 miles of river flowed between Kansas City and Sioux City (Figure 7.1).[3]

Rather than placate local interests, Good's allocation of funds angered residents of eastern Nebraska and western Iowa who wanted channelization work started in their locales. In mid-May 1929, a delegation of congressional representatives from this area met with the Secretary of War to persuade him to direct more money to their section of the Missouri. This delegation wanted the original seven million dollar appropriation dispersed evenly along the entire river from its mouth to Sioux City instead of spent almost exclusively in Missouri. The delegation also argued that the federal government should open the upper river to barge traffic at the same time it opened the channel to Kansas City. The upper valley did not want to wait for its six-foot channel. Good listened to the delegation's arguments, then he responded that work needed to be concentrated along the Kansas City-to-mouth reach so as to open that section to barge traffic as soon as possible. By keeping all of the Corps'

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[3]Kansas City Times, 7 March 1929.

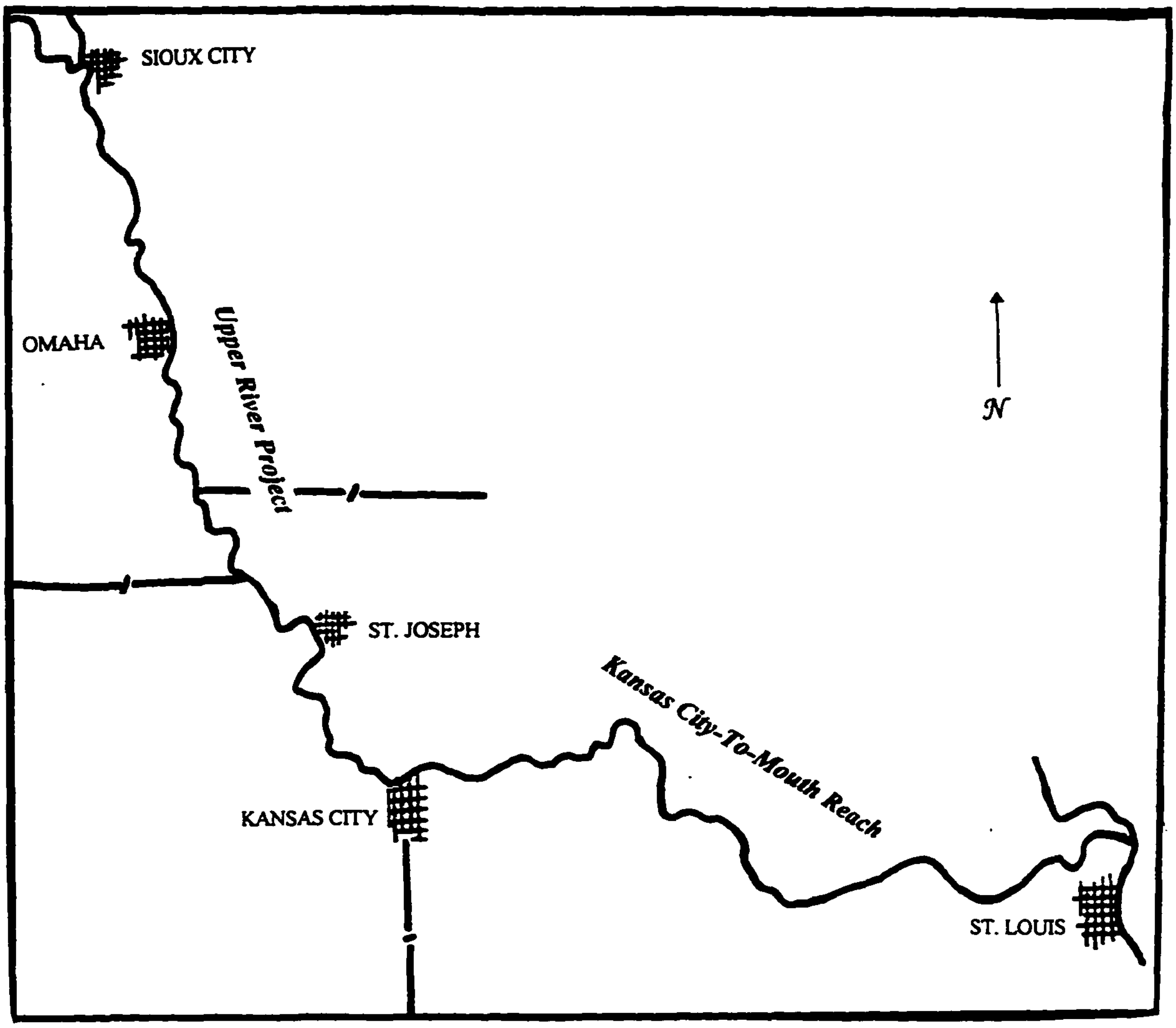

Figure 7.1. The Upper River Project and the Kansas City-to-Mouth Reach. Congress authorized the construction of a six-foot navigation channel from the mouth of the Missouri River to Kansas City in 1912. Not until the Hoover Administration (1929-1933) did the Corps of Engineers receive sufficient funds to channelize the reach below Kansas City. The Upper River Project received large federal appropriations during the Roosevelt Administration. Map by author.

equipment, construction material, and manpower along the lowest reach, the government decreased that barge channel's overall cost. To spread out the Corps' work along the river below Sioux City would substantially increase costs by requiring more time to move men and material into position, boosting the price of transporting piles and rock to isolated sites, and guaranteeing higher maintenance expenses for disconnected pile dikes and revetments destroyed by the river. Good believed that the sooner the navigation channel below Kansas City carried barges the sooner the federal government would receive a return on its investment. Good and the War Department wanted to save federal dollars, upper river interests just wanted those dollars, irrespective of issues of efficiency and cost-effectiveness.[4]

In response to the demands of congressional representatives from the Missouri Valley, Good, later in 1929, directed an additional one and a half million dollars to the Upper River Project. The Corps spent this entire allocation just north of Kansas City. The Secretary of War also procured another seven million dollars for work between Kansas City and the mouth, for a total of nearly thirteen million dollars for the year.[5] Never before had the federal government provided so much money in a single year for Missouri River improvement. The allocations for the Missouri River alone equaled twenty-five percent of the federal government's rivers and harbors budget for 1929.[6]

Good ordered such massive expenditures for the Missouri River navigation project because he hoped to quickly link the Missouri into the larger inland waterways system then nearing completion. By 1929, the Corps had already deepened the Mississippi River to nine-feet from St. Louis to New Orleans. Another nine-foot channel existed from Cairo, Illinois,

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[4]Kansas City Times, 7 March 1929. Kansas City Star, 16 May 1929.

[5]Kansas City Star, 6 October 1929.

[6]Kansas City Star, 16 May 1929.

to Pittsburgh along the Ohio River. At the same time, work steadily progressed on the six-foot channel along the Upper Mississippi River from St. Louis to St. Paul. Rapid completion of the six-foot channel to Kansas City would be a substantial step toward the realization of Hoover's Cross of Commerce.[7]

Hoover spoke about his Cross of Commerce in late October 1929 during a visit to Louisville, Kentucky, to commemorate the addition of the Ohio River to the inland waterways system. During a rousing speech, the president reiterated his commitment to the establishment of barge navigation on the nation's rivers, "As a general and broad policy, I favor modernizing of every part of our waterways which will show economic justification in aid of our farmers and industries. Now is river navigation's day of renaissance. Upon deep and regular channels unromantic diesel tugs now tow long trains of steel barges. What the river has lost in romance it has gained in tonnage...."[8] He then argued for the construction of a waterways system in which all of the rivers possessed a single, standard depth of nine-feet. Such standardization would eliminate the costly and inefficient process of breaking bulk. Barge operators "broke bulk" when they transferred cargo to deeper or shallower draft barges for transshipment. A standard nine-foot depth would also enable operators to increase their barge carrying-capacities, decrease their shipment costs, and through these savings contribute to general economic development.[9] The president asserted, "While it is desirable that some of the tributaries be made accessible to traffic at six or seven feet, yet we should, in

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[7]Kansas City Journal-Post, 8 October 1929. Kansas City Times, *Our Turn Comes Next, With Ohio River Job Done, the Missouri River Needs a 9-Foot Channel*, 26 October 1929.

[8]Kansas City Times, *High Points in the President's Waterways Address*, 24 October 1929.

[9]Kansas City Journal-Post, 8 October 1929. Kansas City Times, *River Days Back, Hoover Visions Great Era*, 24 October 1929.

the long view, look forward to increasing this latter depth [nine feet] as fast as traffic justifies."[10]

Hoover's Louisville speech thrilled members of the Missouri River Navigation Association. Not only did the president commit to the completion of the Cross of Commerce, he also supported the deepening of rivers to nine feet. J.C. Nichols, the organization's vice president, proclaimed, "The President's favorable attitude toward a 9-foot channel wherever justified fits in well with the demand of the Missouri River states for such a channel. We believe that with a 9-foot channel the Missouri River would become a trunk line waterway, earning all those benefits to agriculture and industry the President foresees accruing to the territory of the Ohio River."[11] That same month, the executive committee of the Missouri River Navigation Association held a hearing in Kansas City to determine the economic feasibility of deepening the Missouri River channel to nine feet below Kansas City. The association invited Kansas City District Engineer Major Gordon R. Young to the hearing along with hundreds of businessmen from the surrounding area. Over the course of four days, Major Young heard repeated arguments in favor of deepening the channel.[12] Walter S. Dickey of the defunct Kansas City Missouri River Navigation Company told Major Young that a "deeper channel would attract such a quantity of freight as to crowd the river with traffic...." Other speakers claimed that a nine-foot channel would eliminate the need for operators to break bulk at St. Louis. As a result, more companies would use a nine-foot

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[10]Kansas City Times, *River Days Back, Hoover Visions Great Era*, 24 October 1929.

[11]Kansas City Star, *Sees Great River Hope, J.C. Nichols Enthusiastic Over Hoover's Speech*, 24 October 1929.

[12]Kansas City Journal-Post, 11 October 1929. Kansas City Times, *9-Foot Plea Today, Major Young Will Hear Case for the War Department, To Meet At C. of C.*, October 1929. Kansas City Star, *A Long River Link*, 10 October 1929. Kansas City Star, *Oil in River Plea*, 15 October 1929. Kansas City Times, *Channel Plea Is In*, 16 October 1929.

channel than a six-foot channel. Specific Kansas City area companies pursuing completion of a nine-foot channel included the Sonken-Galamba Corporation (scrap metal dealers), Burnham, Munger, & Root Dry Goods Company (wholesalers), National Cast Iron Pipe Company, Thompson-Hayward Chemical Company, and the Independent Oil & Gas Company. In all, 400 Kansas City businesses presented Major Young with proclamations of how they would utilize a nine-foot channel. J.C. Nichols, who presided over the hearing, closed the meeting with a plea to Major Young, the War Department, and Congress. Nichols declared, "Agriculture is at a low ebb in the territory.... The deeper river is needed to revive them [the farmers]." Nichols then urged Young to recommend the nine-foot channel to his superiors at the Upper Mississippi River Division in St. Louis; Nichols also pressed Young to get the nine-foot channel included in the next rivers and harbors bill, slated for consideration that December.[13]

Major Young responded to the demands of the Missouri River Navigation Association. During December 1929 and January 1930, Young wrote a report on the proposed nine-foot channel. In this report, the district engineer recommended the project for inclusion in the upcoming rivers and harbors bill. Young believed the amount of future barge traffic that would use the deeper channel, and the comparatively low cost of deepening the six-foot channel to nine feet, justified the project.[14]

Young's endorsement of the nine-foot channel represented a significant coup for Kansas City interests, but it did not guarantee legislative passage for the project. Young's findings had to be accepted by the Board of Engineers of the House Rivers and Harbors Committee. The Board screened all project proposals before recommending them to Congress for

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[13] Kansas City Star, *A Long River Link*, 10 October 1929. Kansas City Times, *Channel Plea Is In*, 16 October 1929.

[14] Kansas City Star, *For Big Barges*, 19 January 1929.

inclusion in the rivers and harbors bill. Brigadier General Herbert Deakyne (who had been caught in a firestorm fifteen years earlier when he rejected the Missouri River navigation project) now served as Chairman of the Board of Engineers. When Young's preliminary report favorable to the nine-foot channel went across Deakyne's desk, he rejected it. Deakyne argued that the nine-foot channel needed further investigation. The general believed the Corps should learn more about the river's water discharge rates, and how it would behave once its channel had been further narrowed and deepened before recommending the entire project to Congress. Deakyne seriously questioned whether or not the Missouri could ever be engineered to a nine-foot depth.[15]

Deakyne sent the report back to Young in Kansas City. Young, who still wanted to get the project included in the river's and harbors bill that year, hurriedly wrote a report on the engineering feasibility of the project. Young claimed that the Missouri could be deepened below Kansas City for an additional investment of twenty-seven million dollars above the cost of completing the present six-foot channel. Moreover, Young believed the deepening of the channel could be accomplished using the same channelization techniques employed during construction of the six-foot channel. According to Young, the already existing channel only needed to be further narrowed to achieve the greater depth. The major sent his engineering report to Lieutenant Colonel George R. Spalding, the Division Engineer at St. Louis. Spalding headed the Upper Mississippi River Division, which supervised the operations of Young's Kansas City District. Spalding disagreed with Young's conclusions and attached an addendum to the report that recommended the nine-foot channel not be undertaken at this time. Instead, Spalding wanted the Corps to first conduct experimental

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[15]Kansas City Star, *A 9-Foot Channel Delay, Lower Missouri Project May Be Held Over*, 23 January 1929.

work along the river to determine whether the Missouri could, in-fact, be deepened to nine-feet. Spalding advocated a wait-and-see approach.[16]

When Young's engineering report and Spalding's addendum reached Deakyne and the Board of Engineers, the Board concurred with Spalding's assessment. Deakyne argued that Young's report did not adequately address the engineering feasibility of the nine-foot channel. Deakyne, for the second time in his long career, dealt a blow to the advocates of Missouri River channelization.[17]

By rejecting the nine-foot channel, the Board of Engineers adhered to the fiscally conservative policies of Congress and President Hoover. As political appointees, the Board of Engineers, chief of engineers, and the secretary of war followed the advice and recommendations of President Hoover with regard to river projects. Hoover only advocated the construction of river projects that possessed favorable cost-to-benefit ratios. He also believed river improvement projects should provide tangible benefits to the American people. In other words, the president wanted projects to either indirectly or directly return money to the U.S. Treasury. Projects of questionable value, or of a pork-barrel nature, did not receive administration support. Thus, the Upper River Project and the nine-foot channel below Kansas City did not receive the financial-backing of the administration or the War Department. On the other hand, the administration deemed the six-foot channel to Kansas City a worthy project and a key component of the inland waterways system. As a result, the

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[16]Kansas City Star, *Speed In River Hearing, Engineers' Board to Hurry Channel Report to Congress*, 23 February 1930.

[17]Kansas City Star, *Delay Deep River, The Army Engineers Announce They Will Not Recommend 9-Foot Channel This Year*, 13 March 1930.

six-foot channel from Kansas City to the mouth received tremendous appropriations during the years of the Hoover Administration.[18]

When Patrick Hurley succeeded James Good as Secretary of War in early 1930, he clarified the administration's policy toward river improvement. Hurley stated that the administration would resist pressure from local interests to fund their pet projects and instead focus its efforts on the completion of an integrated system of waterways. According to Hurley, piecemeal appropriations for disconnected river projects would end. This meant that money for the Upper River Project would not be forthcoming until at least after completion of the reach below Kansas City.[19] In September 1930, Hurley reiterated the administration's stance on river improvement, "We [in the administration] have departed from the idea that this is a local matter. The inland waterways are national in scope and national in benefits which they will bestow. There will be no dipping into the pork barrel in connection with appropriation and spending of waterway funds."[20] The Hoover Administration had no intention of using the Missouri River navigation project to provide unemployment relief.[21]

Even with the unemployment situation worsening in the United States in 1930, Hoover and the War Department refused to initiate large-scale work on the Upper River Project.[22] In December 1930, Chief of Engineers Lytle Brown requested a mere $800,000 from Congress

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[18]Kansas City Star(?), *River Development Makes Great Strides, Congress Gives More to Missouri than to Any Other Inland Project*, December 1930.

[19]Kansas City Star, *Concern On Rivers Bill*, 20 March 1930. Kansas City Star, *A Threat To River Work, Failure of Congress to Grant Funds May Cause a Halt*, 22 March 1930.

[20]Kansas City Star, *A Great Water-Highway*, 16 September 1930.

[21]Kansas City Star, *1000 River Jobs, Appropriation Saturday Means More Work in the Kansas City District This Winter*, 22 December 1930.

[22]Kansas City Times, *$25,000,000 Will Be Spent Immediately*, 17 November 1930.

for work above Kansas City for the following fiscal year. Upon learning of the small request for funds, Representative Edward Campbell of the Eleventh Iowa District (the district included Sioux City) commented,

> The time to make public improvements is in the days of depression. The time to put men to work is in the days when men want work. No American wants to waste our public funds but surely constructive building of needed public improvements is not a form of waste. The flow of money through the wages paid will enliven every avenue of trade, and it looks as if every sensible American citizen should take this view.[23]

But Hoover and the War Department continued to hold tight to the federal purse strings.

In order to get a substantial allocation for the Upper River Project, Arthur Weaver requested, and received, an audience with President Hoover on 8 December 1930. J.C. Nichols of Kansas City, George C. Call, John Kelly, and George F. Silknitter of Sioux City, Rufus E. Lee and C.E. Child of Omaha, Charles E. Wattles of St. Joseph, W.C. Lusk of Yankton, and Representative Edward Campbell of the Eleventh Iowa District accompanied Weaver to the White House. In all, twenty-five Missouri Valley men met with Hoover in the Oval Office. Weaver served as the group's spokesperson. He told the president that the interests above Kansas City wanted a ten million dollar appropriation for the fiscal year beginning July 1931. Weaver argued that this huge appropriation for the Upper River Project would contribute to unemployment relief and hasten the recovery of the agricultural sector in Nebraska, Missouri, Iowa, South Dakota, and North Dakota.[24] Hoover listened to Weaver and the others and expressed sympathy for their aims, but the president did not commit to the expenditure of more money along the river reach north of Kansas City.[25]

23Sioux City Journal, *Midwest Asks River Project Aid, Campbell*, 26 November 1930.

24Sioux City Journal, *To Fight For River Money*, 3 December 1930.

25Sioux City Tribune, *Men Named To River Meeting*, 3 December 1930. Sioux City Journal, *To Fight For River Money*, 3 December 1930. Omaha World Herald, *Hoover Pledges Support to Work on Upper River, Call Improvement an Aid to Farmers*, 9 December 1930.

Through their lobbying efforts, the advocates of the Upper River Project did secure more than the original $800,000 appropriation for the fiscal year 1931. By the end of 1931, the Corps spent $2,565,619 on the Upper River Project. But all of this money went for work in the vicinity of Kansas City. The region above St. Joseph still did not receive any significant sums.[26]

Disappointed that the War Department neglected their region, members of the Missouri River Navigation Association from Nebraska and Iowa traveled to Washington in the fall of 1931 to urge Secretary of War Hurley to begin channelization work near St. Joseph, Omaha, and Sioux City. The group wanted federal money in order to provide work for large numbers of unemployed men in those cities. But War Department officials rejected the pleas of the delegation. Instead, the War Department only requested $1,400,000 for work on the Upper River Project during the fiscal year beginning July 1932, this amounted to less than the sum spent in 1931. Outraged at this apparent lack of concern for their needs, another delegation of Missouri Valley residents traveled to Washington in December 1931 to confer with President Hoover. This group consisted of thirty men from all over the Missouri Valley. Arthur J. Weaver again served as the spokesman for the delegation. The cities of Sioux City, Omaha, and St. Joseph had numerous representatives present at the White House. Weaver asked the president to seek an eight-million dollar appropriation from Congress for the fiscal year 1932 for the Upper River Project, rather than the small $1.4 million dollar appropriation.[27] Hoover told the Missouri Valley men that he would consider their request. But Hoover did not pursue the larger appropriation for the river reach north of Kansas City.

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[26]ARCE 1934, 838.

[27]Kansas City Times, *For Upper River Haste*, 9 December 1931.

Instead, that section only received $1.1 million in 1932. Sioux City, Omaha, Council Bluffs, and St. Joseph still had to do without large-scale federal waterways funds.[28]

In contrast to the paltry amount of money granted to the Upper River Project between 1927 and 1932, the Corps of Engineers received colossal sums of money for the reach below Kansas City during this same period. The largest appropriations for this section of the river came during the Hoover administration. For example, the engineers expended $12,825,000 in 1929, $14,041,498 in 1930, $10,916,775 in 1931, and $9,499,153 in 1932 on river work between Kansas City and the mouth.[29] This money went to pay the wages of thousands of laborers, purchase fuel for boats and machinery, repair worn-out pieces of equipment, transport men and materials to construction sites, quarry stone, and buy cypress and pine piles. All of this money resulted in the transformation of the Missouri River below Kansas City in just a few short years.

Congress and the Hoover Administration supported appropriations for the Kansas City-to-mouth reach because federal officials wanted to quickly link this section of the stream to the national waterways system. Federal officials believed the barge channel would foster a general economic recovery. In other words, the project symbolized Hoover's approach toward the Great Depression. Instead of supporting pork barrel projects designed to provide unemployment relief, the president favored the prudent expenditure of federal funds on projects possessing favorable cost-to-benefit ratios.

Between 1927 and 1932, the Corps utilized the pile dike and the willow mattress and stone revetment to channelize the Missouri. The willow mattress and stone revetment remained essentially unchanged since its introduction on the stream in the nineteenth century. But the pile dike used in the late 1920s and early 1930s represented a modification of the

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[28]ARCE 1934, 838.

[29]ARCE 1934, 831.

original pile dike. The engineers had learned that placement of the piles in clusters insured against the rapid destruction of the dike. As a result, pile drivers hammered two or three piles within inches of each other. Crewmen then wrapped wire around this cluster to keep it together. Next, the pile driver pounded another cluster approximately ten feet away. The engineers placed a series of pile clusters at intervals extending in a straight row from the natural bankline. After completion of one row, the pile driver placed one or two more rows of clustered piles adjacent to the original row. Finally, crews lay piles in-between the rows, tying them to the vertical piles, to give the dike added strength. The Corps no longer employed the willow curtain. The engineers had learned that the pile clusters alone forced the river to deposit its silt load downstream of the dike (Figure 7.2).

The scale and intensity of construction activity during this period dwarfed all previous levels. Never before in the history of Missouri River improvement had so many men, machines, and materials been wielded for channelization of the stream. From 1929 to 1932, the Corps of Engineers and private contractors annually employed between 10,000 and 13,000 men on the reach below Kansas City. In 1929, the first year of large-scale work, a total of 12,000 men labored along the river's banks, in the willow groves adjacent to the stream, and on floating barges tied to pile dikes.[30] In May 1930, the number of men working on the river approached 13,000.[31] By December of that year, the number of workers dropped to as few as 2,000.[32] The advent of spring witnessed the hiring of men again. In early March 1931, approximately 3,500 men struggled to reshape the Missouri River.[33] These

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[30] Kansas City Star, 6 October 1929.

[31] Kansas City Star, *Upper River Plea Is In*, 13 May 1930.

[32] Kansas City Star, *1000 River Jobs, Appropriation Saturday Means More Work in the Kansas City District This Winter*, 22 December 1930.

[33] Kansas City Star, 3 March 1931.

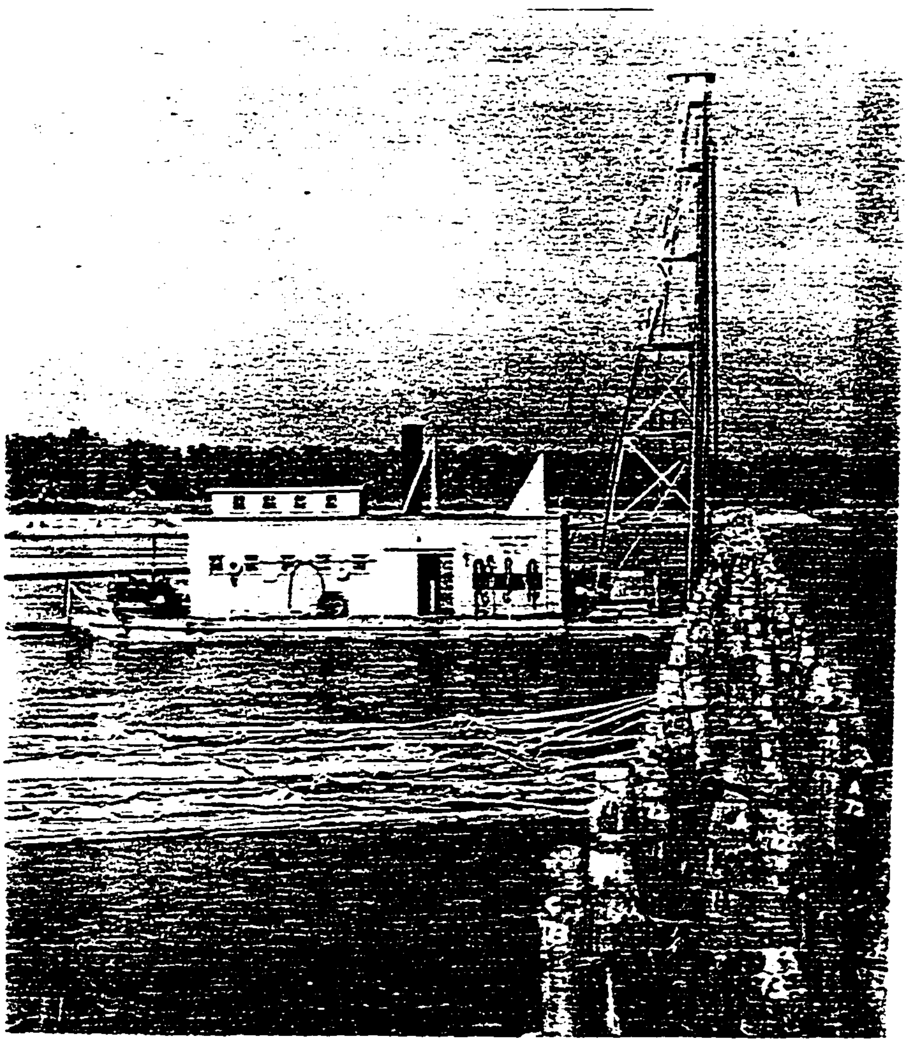

Figure 7.2. A pile driver in operation on the Missouri River, circa 1935. By the 1930s, the Corps of Engineers had modified the pile dike, discontinuing the use of the willow curtain. Instead, the engineers drove pile clusters into the river bed in rows extending from the natural bank line. These clusters slowed the river's current and forced the deposition of silt on the downstream side of the dike. Courtesy of the Corps of Engineers.

numbers rose to approximately 10,000 by that fall only to drop off again during the winter months. In 1932, 10,000 men found employment with either the Corps or one of its private contractors.[34]

The majority of men working on the river came from farms, towns, and cities located along the valley in central Missouri. A large percentage of men also came from the Kansas City metropolitan area. Many of the private construction firms under contract with Corps had home offices in Kansas City and thus hired Kansas City men.[35] Common laborers were usually local men seeking temporary employment. These men required almost no training. Anyone could learn to cut willows, lay rock, quarry stone, or weave willow mattresses. The Corps usually hired laborers on a temporary basis, laying the men off during the winter months. Skilled laborers, trained engineers, and machine operators often came from outside of the valley, or from one of its major cities. These men were less likely to be laid-off during the winter months and often remained on the permanent payroll of the Corps of Engineers.[36]

The level of channelization work occasionally reached a fever pitch. In 1929, a total of fifty-six pile drivers operated on the river. The pile drivers incessantly hammered the cypress and pine piles into the river bed, non-stop, twenty-four hours a day, seven days a week, month after month. Crews only shut-down a pile driver when it needed oiling or when its parts wore out.[37] That same year, the Corps placed massive electric lights at thirty-four

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[34]ARCE 1934, 831. Kansas City Star, 6 October 1929. Kansas City Star, *Upper River Plea Is In*, 13 May 1930.

[35]Ferrell, Soundings: One Hundred Years of the Navigation Project, 59. Kansas City Star, *Great Days on Missouri River In Life of "Steamboat Bill"*, 12 February 1950. Kansas City Star, *A Threat to River Work*, 22 March 1930. Kansas City Star, *Hopeful of River Bill*, 21 May 1930. Kansas City Times, *Government Action To Assist Jobless*, 17 November 1930.

[36]Kansas City Star, 3 March 1931.

[37]Kansas City Star, 6 October 1929.

points along the river to illuminate men while they laid mattresses and built stone revetments during the night hours. In 1930, the federal engineers increased the number of pile drivers working below Kansas City to seventy-two and continued to deploy electric lights all along the river bank.[38] During peak construction periods, men worked long hours and took few breaks. Thousands of men slept on government quarter-boats that lined the river bank near each construction site. Since channelization work required the frequent movement of the labor force, quarter-boats served the vital purpose of keeping the men close to the construction sites.[39]

Corps channelization work during these years adhered to a seasonal regime, dictated by the Missouri's water discharge rates. By following the river's natural ebb and flow cycles, the engineers saved time, money, and effort. For example, during the months of March, April, and May, the engineers pushed the construction of pile dikes, with the goal of having the dikes in place before the start of the June rise.[40] As the June rise descended the valley, its waters carried stupendous amounts of suspended sediment. More silt rode downstream during the month of June than at any other time of the year. This silt fell behind the completed pile dikes and quickly realigned the river's thalweg. According to Corps officials, "...enough silt can be deposited during a single rise in the river to completely cover the dikes with sand, thus narrowing the channel to a desired width. This seems especially remarkable in view of the fact that the piles are 6 to 8 feet high [above the surface of the river bed]."[41]

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[38]Kansas City Star, 16 May 1930.

[39]Ferrell, Soundings: One Hundred Years of the Navigation Project, 61.

[40]Kansas City Star, 16 May 1930.

[41]Kansas City Star(?), 1931, untitled article.

Along sections of river where pile dikes and revetments had been in place for years, the high water levels, moving at from five to six miles per hour past the end of the dikes, scoured the sands and gravels from the river bottom and deepened the thalweg to the requisite six-foot depth. Finally, high, fast water kept the new navigation channel free of snags and debris by preventing their deposition in the river bed. Corps officials referred to the June rise as "Santa Claus" because of the gifts it bestowed on their navigation channel.[42]

After the river's water level dropped in mid-July, the engineers shifted gears, focusing their efforts on the construction of willow mattresses and stone revetments. Mattress and revetment work progressed rapidly during low flow periods when the banks protruded far above the water-line. By waiting until late summer to build mattresses and stone revetments, the Corps of Engineers saved time, money, and materials; high flows made mattress placement difficult, time-consuming, and hazardous for the crews.[43]

Each year, during the months of November, December, January, and February, the pace of channelization work slowed down. Colder temperatures, ice flows, and the frozen ground led to higher construction costs, frequent delays, and greater wear-and-tear on equipment and men. As a result, the Corps kept the level of work during these months to a minimum, usually repairing damaged pile dikes or revetments or reinforcing structures along strategic points in the river.[44]

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42 Kansas City Star, 16 May 1930.

43 Sioux City Journal, *Harnessed: Revetment Job Near Salix Illustrates How Uncle Sam Is Preparing Missouri River For Opening of Navigation*, 3 March 1940.

44 Kansas City Star, 9 August 1929. Kansas City Star, 6 October 1929. Kansas City Star, *Setback To River, Failure of June Rise Is a Blow to Missouri Navigation Plans, Hope for a Fall Flood*, 10 July 1930. Kansas City Star, 3 March 1931. Kansas City Journal-Post, *Hurley's Party Glad to Battle Strong Current*, 22 June 1932.

Work moved rapidly forward after 1929. In 1927, the Corps had channelized approximately 40 percent of the Kansas City-to-mouth reach. By 1929, the reach was almost 70 percent complete; and in 1930, 80 percent of the barge channel had been finished by the engineers. In 1932, only a few miles of the river remained unchannelized and the Corps claimed that the barge channel stood 95 percent complete. Near the end of the Hoover Administration, a total of 370 miles of the river had been narrowed and deepened with channelization structures. The river became noticeably different in just a few years. The previously wide, shallow, unstable, meandering channel maintained a uniform width and depth. Sandbars, side channels, islands, and snags disappeared from the river.

In June 1932, Secretary of War Hurley, accompanied by Major General T. Q. Ashburn, Chairman of the Inland Waterways Corporation (a government subsidized barge line), Colonel George R. Spalding, Division Engineer of the Upper Mississippi River Division, and Captain Theodore Wyman, Jr., District Engineer of the Kansas City District, traveled on board a small flotilla of government towboats from the mouth of the Missouri to Kansas City to inspect the nearly completed six-foot navigation channel. Hurley wanted to see firsthand what the government had accomplished along the Missouri. The secretary also wanted to campaign for President Hoover, seeking reelection that fall.

Just before Hurley's departure from St. Louis on 21 June, the secretary told an assembled crowd, "I am here to redeem a campaign pledge made four years ago by a candidate for president. Much has been said about making the Missouri River navigable. That job has been completed, as far as Kansas City."[45] Speaking about the administration's policy toward river improvement Hurley proclaimed,

> A few days ago we [in the administration] were asked if we could spend 539 million dollars next year on river improvement. The Corps of Engineers estimated that with this money it could add 34,000 men to the 30,000 now employed. There are about 8 million men unemployed in the country. To employ

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[45]Kansas City Times, *Tie At St. Charles*, 22 June 1932.

> 34,000 of them, we would unbalance the budget, throw the country into confusion and employ only a drop in the bucket.[46]

Even with the number of unemployed still rising in 1932, the Hoover administration balked at spending liberal sums of money on river projects.

When Hurley's inspection boats entered the Missouri, they ran squarely into the highest water level to descend the river in three years. Corps officials estimated that the channel depth in the Missouri averaged twenty feet. Along with the high water came a fast current, up to five miles per hour.[47] Although the government boats struggled to move upstream, the high water convinced Hurley that the river could now carry barge traffic. Hurley boasted, "The Missouri River between Kansas City and St. Louis has been conquered by the engineers."[48]

Hurley's entourage stopped at a number of towns along the river, including St. Charles, Hermann, Jefferson City, Boonville, Waverly, and Lexington. At each town, Hurley gave speeches commending President Hoover for his efforts in developing the Missouri and the other major rivers of the United States.[49] On Monday, 27 June, the government boats approached within a few miles of Kansas City.[50] A crowd estimated at over 10,000 cheered as the boats docked at the Kansas City wharf. Once on land, Hurley shook hands with Arthur Weaver, J.C. Nichols, and George Miller of the Missouri River Navigation Association. A

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46 Kansas City Times, *Tie At St. Charles*, 22 June 1932.

47 Kansas City Journal-Post, *Hurley's Party Glad to Battle Strong Current*, 22 June 1932. Kansas City Times, *Revive the River*, 23 June 1932.

48 Kansas City Star, *Recalls a Hoover Vision*, 25 June 1932.

49 Kansas City Times, *Tie At St. Charles*, 22 June 1932. Kansas City Star, 24 June 1932. Kansas City Times, *Revive the River*, 23 June 1932.

50 Kansas City Times, *Eyes Up the River Now*, 28 June 1932. Kansas City Journal-Post, *Important Dates in Missouri River History*, 26 June 1932. Kansas City Star, 24 June 1932.

band belted out patriotic music and 75 mm howitzers blasted a salute. Weaver claimed that the completion of the river channel below Kansas City represented the greatest single achievement in the Missouri Valley in the last twenty-five years. He announced, "Transportation is vital. We rejoice with Kansas City in the demonstration of the feasibility of the channel. I feel the opening of the Missouri will bring a rejuvenation to our entire valley."[51]

The rejuvenation of the valley would occur once regular barge traffic moved on the river. Such traffic would create competitive carrier rates, lower transportation costs for farmers and industrialists, and bring prosperity to valley residents. But the rejuvenation of the valley's economy did not occur in 1932. Even though Hurley and his flotilla made it upstream, the six-foot channel remained incomplete. Hurley's trip was a fluke, the government boats had been lucky to avoid grounding on shoals. Barges still could not use the river. Too many shallow points remained between Kansas City and the mouth. The era of prosperity did not arrive. Instead the economic depression deepened and the numbers of unemployed soared in late summer and early fall of 1932.

In a September 1932 article in *Fortune* magazine, the author calculated that the number of unemployed in the United States had risen to ten million. Another one million would be out of a job by winter. Taking into consideration the number of persons relying on these eleven million for their livelihood, the magazine estimated that upwards of 27,500,000 Americans had already lost, or would soon lose, their only source of income. Nearly one-fourth the population of the United States would need relief in the approaching months.[52] The

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[51]Kansas City Times, *Eyes Up the River Now*, 28 June 1932.

[52]John M. Blum, ed., The National Experience: Part II, A History of the United States Since 1865, Eighth Edition, (Fort Worth: Harcourt Brace Jovanovich, 1993), 688.

economic crisis reached dangerous proportions. Hungry, bored, and hopeless people often turned to violence to meet their needs.

In the presidential election of 1932, the American people turned to the Democratic Party and Franklin D. Roosevelt to solve the worsening economic situation. During the campaign, Roosevelt promised the public that his administration would reverse the failed policies of the Hoover years and would offer the American people a "new deal." Just what Roosevelt's new deal would entail, no one really knew. Most voters just wanted a change and a president who might be able to reverse the deepening depression. Hoover's policies, like much of the country, were bankrupt. As a result, Roosevelt became president by a wide margin, taking 57 percent of the popular vote. The Democrats also captured significant majorities in both the House and the Senate.[53] Roosevelt would have an opportunity to initiate his new deal. But during the months before his inauguration, the unemployment rate continued to spiral out of control. By early 1933, an estimated twelve million former workers did not hold jobs.[54]

Prior to Roosevelt's inauguration, members of the Missouri River Navigation Association tried to determine the president-elect's policy toward the navigation project. Doubt arose among valley residents whether the new president would fund their project or abandon it. Hopes rose for the Missouri Valley in early February 1933 when Roosevelt, during one of his first "fire-side chats" at Warm Springs, Georgia, disclosed his plans for the Tennessee Valley. Roosevelt planned to employ 200,000 men in the Tennessee Basin working on dams, cutting trees and brush, and reseeding eroded areas. The president-elect declared, "If it [the

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[53]Ibid., 692.

[54]Kansas City Star, *Gigantic Job Plan, President-Elect Roosevelt Has Scheme Designed to Solve Unemployment*, 2 February 1933.

Tennessee Valley project] is successful, and I am confident it will be, I think this development will be the forerunner of similar projects in other sections...."[55]

While Roosevelt prepared to take office and valley residents wondered what the President's plans would be for the Missouri River, the Corps of Engineers Kansas City District made plans of its own for the river. Two events spurred the Corps to consider further development of the Missouri River. The first event was the opening of the nine-foot channel along the Mississippi below St. Louis and the nine-foot channel on the Ohio. Deeper depths on these two rivers made the Missouri River six-foot channel obsolete before it was even finished. Corps officials understood that barge operators would shy away from the Missouri because its shallower depth would require a break-in-bulk at St. Louis. In order to make the Missouri a viable component of the inland waterways system, the river needed to be deepened. Otherwise, the sixty million dollar investment would be wasted for navigation purposes.[56]

The second event that led the Corps to plan further development along the Missouri River was the drought that gripped the northern Great Plains and upper Midwest from 1929 through 1932. The drought dropped the Missouri to unprecedented levels and raised the serious question of whether or not the navigation channel would ever be utilized to carry barges. In the 1920s, the Corps calculated that the Missouri River needed to possess a volume of approximately 20,000 cubic feet per second below Sioux City in order to maintain the depth needed for a six-foot navigation channel. But during the navigation seasons of 1929, 1930, and 1931, the river below Sioux City did not meet this minimum depth requirement a total of 413 days. Each navigation season lasted 240 days, from 15 March to 15 November. Thus, for 57 percent of the time during the previous three navigation seasons, the river remained

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[55]Ibid.

[56]ARCE 1934, 827, 831.

too shallow for a six-foot channel. The Corps had designed the six-foot channel below Kansas City to hold approximately 23,000 cubic feet per second.[57] But during the severest drought periods, the river did not provide that amount of water. In 1931 alone, the river below Kansas City did not have enough water for a six-foot depth for a total of seventy-two days during the navigation season. On 19 September 1931, the river shattered all previous low flow records when its level dipped to 10,700 cfs at Kansas City. This was half the amount recorded during the previous record low flow and half the volume needed to sustain the six-foot channel.[58] As a result, the channel's reliability and usefulness was in serious doubt. If barge companies faced a similar drought in the future and could not navigate the Missouri below Kansas City for over two months during the season, barge navigation would die on the river. No company could survive on the stream if its equipment, labor force, and barges had to lie idle for months on end.

The Corps quickly concluded that the only solution to the obsolete six-foot navigation channel was the construction of upstream storage reservoirs on either the Missouri main stem or one of its larger tributaries. Corps officials ruled out any modification of the existing channel to obtain either the six-foot depth with lower volumes of water. Officials concluded that it would be impossible to further narrow the river channel to achieve greater depths with less water. Such a narrowing would result in dangerously high current velocities during high flow periods. Moreover, the narrowing would not guarantee greater depths, because a future drought could still reduce the river to a trickle. Thus, the only option to combat the drought and establish a deeper channel on the river appeared to be the construction of storage reservoirs. Reservoir water would augment flows in the low river. But the question was where to build the dam, or dams.

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[57]U.S. Army Corps of Engineers, *Missouri River*, House Document 238, 194, 195, 518.

[58]Ibid., 194-200.

Engineers at the Kansas City District conducted a survey in the early 1930s to determine the best sites for storage reservoirs. By late 1932, the district had narrowed its choice of dams sites to two. The Corps considered building a large dam across the Kaw River near Topeka, Kansas, and a dam at Fort Peck, Montana, across the Missouri (Figure 7.3). Each of these dams had numerous advantages as well as disadvantages. The Topeka Dam would sharply curtail floods along the Kaw River in the vicinity of Kansas City, provide enough water downstream to maintain a nine-foot channel from Kansas City to the mouth, and provide irrigation water to farms in central Kansas. However, a dam at Topeka would require the relocation of a significant Kaw Valley population, estimated at 5,000 persons. Moreover, a dam there would not contribute any water to the six-foot channel that might eventually be built from Kansas City to Sioux City. Any navigation channel north of Kansas City would remain vulnerable to drought periods. Finally, a Topeka reservoir would shrink during drought periods since its primary source of water would be rainfall. Rainfall that would diminish with any drought. A Topeka dam would reduce the threat that droughts posed to the navigation channel below Kansas City, but not entirely remove it.

A large Fort Peck Dam would provide numerous benefits to the navigation channel. First and foremost, the dam's water supply would be more reliable than the dam at Topeka. Above the mouth of the Yellowstone the Missouri maintained a fairly consistent water volume, because the river received the majority of its runoff from snowmelt. Snowfall amounts in the Rockies did not vary as much as rainfall amounts across the Great Plains or in central Kansas. Downstream from the Yellowstone, the river volume fluctuated greatly each year and over a period of years. The oscillations in water level resulted from the highly variable weather patterns over the northern Great Plains. Corps officials ruled against dams in the Dakotas because they believed reservoir water levels there would be severely affected during drought periods. Thus, Dakota reservoirs would be unable to supply water for the navigation channel downstream. Stable water volumes above the Yellowstone would insure

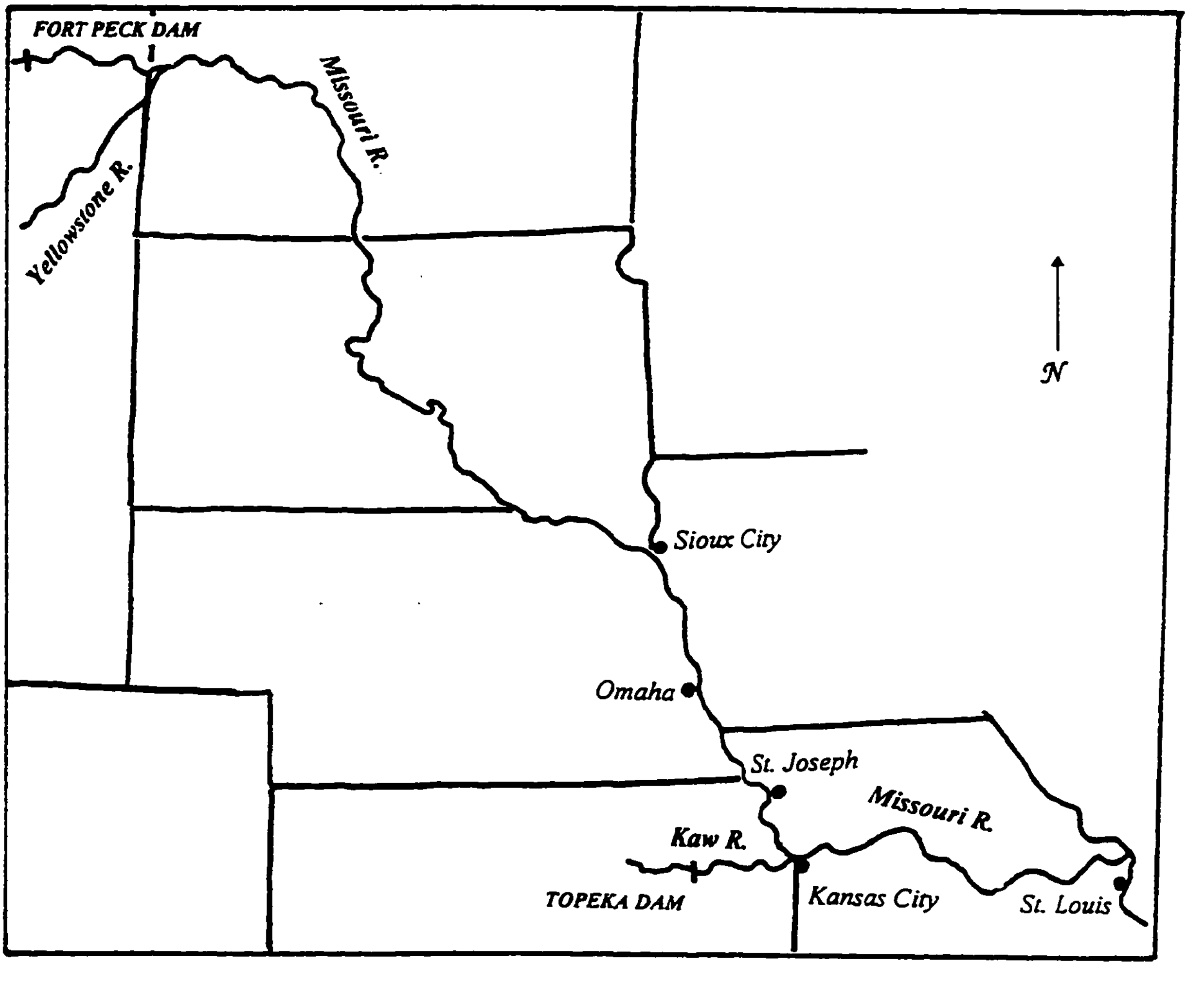

Figure 7.3. The Topeka and Fort Peck dams and the navigation channel. In the early 1930s, the Kansas City District of the Corps of Engineers examined two dam sites for the purpose of storing water to augment flows in the navigation channel. A dam at Topeka, Kansas, would have provided the water necessary to maintain a nine-foot depth in the Missouri River below Kansas City but would have left the channel north of Kansas City vulnerable to low flows. The dam at Fort Peck was designed to provide water to maintain a nine-foot depth in the river from Sioux City to the mouth. Map by author.

that the proposed Fort Peck Dam would still be able to supply water to the lower river, even if the Great Plains and middle Missouri endured a severe drought.[59]

Second, Fort Peck Dam would provide the water needed to maintain depths of eight to nine feet in any future barge channel constructed from Sioux City to Kansas City. On the other hand, the Topeka Dam would only furnish the water for a channel below Kansas City. Third, the reservoir behind Peck would inundate a sparsely settled area with much lower land values than those around Topeka. Fewer people would be forced to relocate and the price of purchasing land would lower the overall cost of the Fort Peck Dam. Furthermore, a dam at Fort Peck would not receive as much silt as a dam on the Kaw. As a result, Fort Peck reservoir would take much longer to fill with silt. But Fort Peck Dam possessed disadvantages. The dam would sit so high up on the Missouri that its contribution to flood control in the lower valley would be negligible. All of the Missouri's largest plains tributaries would still be able to pour their water into the stream. The dam site's remoteness increased its cost. Large pieces of machinery, boats, materials, and men would have to travel great distances to get to any future construction site.

Captain Theodore Wyman in Kansas City considered four development options in relation to either the Topeka or Fort Peck dams. In the first option, he could reject any reservoir projects designed to augment flows in the navigation channel. The navigation channel would be allowed to remain susceptible to dry cycles. The second option was to build a low dam at Fort Peck, Montana, along with another dam at Topeka. The low Fort Peck Dam would have a reservoir storage capacity of four million acre feet (MAF). This would be enough storage to provide for a six-foot channel below Sioux City. The Topeka Dam would supplement flows from Fort Peck and provide enough water to maintain a nine foot navigation channel from Kansas City to the mouth. In other words, Wyman and the Kansas City District

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[59]U.S. Army Corps of Engineers, Missouri River, House Document 238, 527.

considered the establishment of a future navigation channel of nine feet from the mouth to Kansas City and a shallower channel from Kansas City to Sioux City.

The third option under consideration was to build a higher dam at Fort Peck with a storage capacity of six MAF. This storage capacity would still maintain the six-foot channel between Sioux City and Kansas City and also provide a little additional water in case of extremely severe drought conditions. The Topeka Dam would also be built to maintain the nine-foot channel below Kansas City. The fourth option considered by the Corps included the construction of a huge Fort Peck Dam with a storage capacity of 17 MAF. This dam would provide for a regulated flow of 30,000 cfs past Yankton during the navigation season and would provide the water necessary to maintain a nine-foot channel from Sioux City to the mouth. The Topeka Dam would not be built under this plan.[60]

District Engineer Theodore Wyman and his colleagues in the Corps of Engineers were still studying their Missouri River options when Franklin D. Roosevelt finally took office in March 1933. Roosevelt did not immediately reveal his position on Missouri River development. The president's unwillingness to specifically endorse either the Upper River Project or the six-foot channel below Kansas City concerned residents of the Missouri Valley.

Anxiety among the advocates of Missouri River navigation rose in late March 1933 when Roosevelt ordered the War Department to halt all new work along the nation's rivers, including the Missouri. Administration officials wanted to review existing river projects to ascertain those worthy of continued federal financing. More specifically, the White House planned to initiate a massive unemployment relief program across the United States in the coming months; the review would help officials decide which river projects to include in the relief program. In response to the suspension of work along the Missouri River, a

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[60]U.S. Army Corps of Engineers, *Missouri River,* <u>House Document 238</u>, 199, 518, 519, 526, 527, 852, 855, 857. <u>ARCE 1934</u>, 842.

correspondent for the *Kansas City Star* wrote, "President Roosevelt's policy towards inland waterways continued today to be as much a puzzle as it was before his inauguration March 4."[61]

Arthur Weaver and George Miller spent ten days in Washington in late March consulting with administration officials and members of the War Department in order to discover the administration's position on the Missouri River. During the trip, Weaver learned about the Corps' studies on the Topeka and Fort Peck dams. Jubilant at the possibility of securing a reliable volume of water for the navigation channel, Weaver postulated, "Navigators could be assured of an 8 or 9-foot channel from the Dakotas to the mouth of the Missouri if the excess water were impounded in Montana."[62] Weaver made it clear that he favored Fort Peck Dam over the Topeka Dam. But Weaver and Miller did not get a firm response from anyone in the administration regarding Roosevelt's attitude toward Missouri River development. The two men left the capital still unsure of whether the Missouri would be included in Roosevelt's economic recovery plans.[63]

In May 1933, the Annual Rivers and Harbors Bill went before the House of Representatives. For the first time in a decade, the bill did not contain any provision for the Missouri River. Without a congressional appropriation, the only hope for continued financing of Missouri River channelization rested with the administration and its future relief program. But Missouri Valley interests still did not know Roosevelt's stance on the Upper River Project, the six-foot channel below Kansas City, or the tentative storage reservoirs at Topeka and Fort Peck. All attempts by members of the Missouri River Navigation

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61 Kansas City Star, *A Halt On River Work*, 28 March 1933. Kansas City Star, *No Open River Policy*, 29 March 1933.

62 Kansas City Star, *Plan to Harness River*, 30 March 1933.

63 Ibid.

Association to learn the president's position met with non-committal replies from administration officials. To try and get a solid answer and to lobby on behalf of Missouri River development, George Miller and Arthur Weaver trekked back to D.C. in early May, taking J.C. Nichols with them. Nichols, Miller, and Weaver, in their discussions with administration officials, asserted that continued channelization work would employ significant numbers of men. Miller reasoned, "There isn't a project in the country which would put men to work more quickly than the authorization to proceed on the river. Eighty percent of the cost goes for wages."[64] Although no one in the administration agreed to push for appropriations for the Missouri, the three men traveled back to Kansas City confident that the White House held a favorable attitude toward Missouri River channelization.[65]

In June 1933, Congress passed the National Industrial Recovery Act (NIRA). The NIRA allocated 3.3 billion dollars to a public works fund and established the Public Works Administration to disburse the money. Through the NIRA, Congress placed the Public Works Administration (PWA) under the authority of the president and granted the organization the power to initiate federal construction projects without the approval of Congress. In essence, Roosevelt possessed discretionary power over the 3.3 billion dollar fund. Congress hoped such singular control over funding decisions would result in rapid implementation of construction projects for the purpose of industrial recovery. In order to receive PWA money for its river projects, the War Department would be required to submit its funding requests to a Public Works Board which would then advance the request to the

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[64] Kansas City Times, *The Missouri Left Out*, 2 May 1933.

[65] Ibid.

head of the PWA. Roosevelt named Secretary of the Interior Harold Ickes as chief of the PWA.[66]

Only three days after the adoption of the National Industrial Recovery Act, the Corps of Engineers held hearings in Washington to ascertain whether the War Department should seek continued funding for the Missouri River from the PWA.[67] At the time of the hearings, the War Department considered two distinct proposals for the future development of the Missouri River. One report had been written by Captain Wyman at Kansas City and the other by Division Engineer Spalding at St. Louis. Wyman recommended to his superiors the continued construction of the six-foot channel from the mouth to Kansas City and the immediate commencement of large-scale operations on the Upper River Project. He also believed work on the Fort Peck Dam should begin as soon as possible. Spalding, on the other hand, argued that work on the six-foot channel should end at or near St. Joseph and that the government should not build either the Fort Peck or Topeka dams. Instead, federal officials should wait and see whether a significant amount of barge traffic emerged on the river below St. Joseph. If boats began to use the river in justifiable numbers, then the river could be developed further north and its flows augmented with upstream reservoirs. Spalding also advocated a "go slow" approach because he had concerns about the rising costs of maintaining the channelization structures already in place. If the Corps moved too quickly upriver with their pile dikes and revetments, the cost of maintaining the structures against the ravages of the river might possibly negate the benefits derived from an increase in barge traffic.[68]

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[66]William E. Leuchtenburg, Franklin D. Roosevelt and the New Deal, (New York: Harper and Row, 1963), 70.

[67]Kansas City Star, *River Advocates Plead for Work as Valley's Need*, 19 June 1933.

[68]Ferrell, Soundings: One Hundred Years of the Navigation Project, 75.

A large Missouri Valley contingent traveled to Washington to insure that the Army engineers and War Department rejected Spalding's recommendations and adopted Wyman's proposals for a major expansion of the navigation project. C.E. Childe of the Omaha Chamber of Commerce told the Army engineers that the Missouri River channelization project offered, "far more in public benefits and economic potentialities than any other public works under consideration." He then begged federal officials to, "Give us an outlet to the sea and our population will increase, our industries will expand, our agriculture [will] become profitable."[69] Weaver pleaded with the engineers, "We helped pay for the Panama Canal, seaports, and other waterways. Now we have the right to demand development of our waterway."[70]

Ten days after the hearing, the War Department submitted a request to the Public Works Board for over 17 million dollars for Missouri River channelization. The War Department decided against a "go slow" policy for the Missouri River. Out of the 17 million dollar request, the Corps planned on spending 3.5 million dollars on the river below Kansas City and another $14.1 million for construction work on the Upper River Project.[71] The Public Works Board did not immediately decide to fund Missouri River channelization. Instead, one of its members, Secretary of War George Dern, traveled to the Missouri Valley to learn about the region's needs. On 7 August, Dern arrived in Omaha and met with Weaver and thirty other river boosters from the region. Businessmen and political officials from Sioux City, Council Bluffs, Omaha, Nebraska City, Lincoln, Blair, and Plattsmouth urged the secretary to push for the start of work on the Upper River Project. Dern assured the group that he

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69 Kansas City Star, *River Advocates Plead for Work as Valley's Need*, 19 June 1933.

70 Ibid.

71 Kansas City Star, *Asks River Funds*, 29 June 1933.

understood their problems. The secretary said he would go back to the capital and press his colleagues on the board for an allocation for the Upper River Project.

After his Omaha meeting, the secretary of war boarded a plane and flew south above the river to Kansas City, where he met another thirty-five Kansas City businessmen and members of the Missouri River Navigation Association in the Muehlebach Hotel. These men informed the secretary about the importance of the channelization work to their region and its unemployed. Dern told the group that, "There was an acute farm problem before other industries had difficulties. For that reason I'm sympathetic to waterways development."[72]

Ten days after Dern's visit to the valley, PWA chief Harold Ickes ordered Chief of Engineers Lytle Brown and Deputy PWA Administrator H.M. Waite to study the six-foot channel to Sioux City to determine whether the project should receive PWA funds. A few days later, Brown and Waite reported favorably on the project to Ickes. This endorsement, along with Dern's advocacy, and the widespread public support for the project along the Missouri Valley, convinced Ickes to approve funding for the Upper River Project. On 24 August 1933, Ickes released $14.1 million for immediate expenditure on the river between Kansas City and Sioux City. But Ickes did not release any money for construction along the river below Kansas City or for Fort Peck Dam.[73]

The allocation of funds for the Upper River Project represented a significant shift in federal policy toward the river. From 1927 to 1933, the Corps of Engineers had resisted the rapid extension of the navigation project north of Kansas City. Concerns about cost-effectiveness, engineering feasibility, and a desire to finish the reach below Kansas City kept work on the Upper River Project to a minimum. But the $14.1 million PWA allocation surpassed all previous allocations for the Kansas City-Sioux City reach. The Roosevelt

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[72]Kansas City Star, *Pledge to River*, 8 August 1933.

[73]Kansas City Times, *8000 River Jobs, Work Early Next Month*, 25 August 1933.

Administration and the War Department reversed previous policy for a number of reasons. Possibly the single greatest reason for the allocation was that the work along this reach could start quickly. The Kansas City District had already drawn-up design plans for the Upper River Project, the physical plant used on the nearly complete channel below Kansas City could be rapidly transferred to the north, and a trained cadre of Corps employees existed to supervise the mass of workers who could be hired. Thus, federal money would put men to work within a matter of weeks. Time factored strongly into Ickes' reasoning, men needed work immediately, before further hardship and the onset of winter.[74]

A second reason the Upper River Project received such a large appropriation was that channelization work entailed the execution of labor-intensive tasks. As George Miller had earlier claimed to federal officials, "eighty percent of the cost goes for wages."[75] Thousands of men could be employed, carrying stone, cutting trees, laying willow mattresses. The project was ideal for employing high numbers of men. A third factor was that work on the river below Kansas City was winding down. The channel there neared completion. To not fund the Upper River Project would have idled an extensive construction fleet. The operation of this fleet contributed to the health of other industries, including oil, timber, and machine tools. A fourth factor involved the high number of unemployed in the Missouri Valley. Furthermore, the project would contribute to soil conservation, a key component of Roosevelt's plans for other river basins. The stabilization of banks would prevent erosion, and increase the value of valley farms. Finally, administration officials hoped the work would facilitate completion of a navigation project that would contribute to an economic recovery through the reduction of freight rates.

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[74]Ibid.

[75]Kansas City Times, *The Missouri Left Out*, 2 May 1933.

Speed was of the essence in the expenditure of funds. PWA administrators wanted men employed without delay. In September 1933, the Kansas City District rushed ahead with the letting of construction contracts for work on the Upper River Project. District Engineer Wyman said, "Every effort will be made to employ the maximum number of men immediately so that the greatest amount of work possible may be accomplished and wages paid before winter." Wyman then remarked, "Men will be put to work first in the vicinity of St. Joseph and Nodaway. But the work will be spread out over the whole length of the [upper river] project rapidly." Assistant Secretary of War Harry Woodring proclaimed, "Everything that can be done by hand will be done by hand. We intend to give employment to the greatest number of men possible and to make them once more paying consumers for the products of the country's industry."[76]

In all, Wyman intended on having 8,000 men on the river before the cold set in. He planned on spending the money near the towns of St. Joseph, Nodaway, White Cloud, Rulo, Tarkio, Corning, Nebraska City, Plattsmouth, Omaha, Council Bluffs, Florence, Brownville, Dakota City, and Sioux City. The former policy of concentrating funds along particular reaches of the river had been abandoned in favor of the less efficient and more costly technique of spreading the work out over a number of different locations.[77]

George Miller of the navigation association concluded that the allocation for the Upper River Project could only mean one thing, the Roosevelt Administration was leaning toward the adoption of the Fort Peck Dam. Otherwise, according to Miller, it did not make economic or engineering sense for the administration to finance the Upper River Project when future flow volumes on the river could not be assured.[78] Miller claimed, "It [the work

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[76]Kansas City Times, *Woodring a River Ally*, 31 August 1933.

[77]Kansas City Times, *8000 River Jobs, Work Early Next Month*, 25 August 1933.

[78]Ibid.

on the Upper River Project] certainly means that the government is going to finish the job to some such strategic[al] point as Omaha. And it is my opinion that having done that, it will not stop short of the Fort Peck reservoir and the 9-foot channel."[79] The Assistant Secretary of War, Harry H. Woodring, agreed with Miller's assessment of the situation. Only days later he stated that "We will have first a 6-foot channel. I believe the 6-foot channel must lead inevitably to a 9-foot channel with the development of the reservoir system."[80]

But the administration kept quiet about its position with regard to Fort Peck. Throughout the month of September, members of the Missouri River Navigation Association and residents throughout the valley wondered whether the project would receive administration approval. Meanwhile, the president and Ickes waited for a final Corps study on the feasibility of the dam.[81] On 29 September 1933, Chief of Engineers Lytle Brown reported to Acting Secretary of War Harry Woodring that the Corps of Engineers had completed its feasibility study on Fort Peck Dam and that it endorsed the construction of the dam using PWA funds. The chief of engineers advocated building the largest possible dam, one with a storage capacity of between 17 MAF and 19.5 MAF. This reservoir would supply the river channel below Sioux City with an eight- to nine-foot depth. Brown also recommended the rapid completion of the six-foot channel to Sioux City under PWA auspices. The Corps estimated the total cost of the two projects would be $145 million dollars.[82] Woodring then submitted the Corps study, and a $145 million request, to the Public Works Board for review.

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[79] Kansas City Times, *U.S. Out to "Finish Job," Allotment Indicates and Eventual 9-Foot Channel, Miller Says*, 25 August 1933.

[80] Kansas City Times, *Woodring a River Ally*, 31 August 1933.

[81] Kansas City Star, *For a Nine-Foot Channel*, 6 October 1933. Kansas City Star, *Ask Speed on Dam*, 30 September 1933.

[82] Kansas City Times, *Ickes May Oppose River*, 4 October 1933.

When informed of the War Department's request, Harold Ickes indicated that he might oppose any additional allocation for the Missouri. The PWA head blurted, "It's a lot of money. We've already allotted 14 million dollars out there."[83] To avoid a clash with Ickes, members of the Missouri River Navigation Association and congressional representatives from the Missouri basin states decided to go straight to the president for the money to build Fort Peck. On 5 October 1933, Roosevelt met with Weaver, J.C. Nichols, George Miller, Senator Bennett C. Clark of Missouri, Senator Burton Wheeler of Montana, and Senator Lynn Frazier of North Dakota. A number of other senators accompanied the group to the White House.[84] During this meeting, Roosevelt told the group that he favored the completion of the six-foot channel to Sioux City and the construction of Fort Peck Dam.[85] The Topeka Dam would not be built because of local opposition to the project. The president also told Senator Clark to see Ickes about getting money for the channelization project below Kansas City. He and Ickes would discuss funding for Fort Peck later.[86]

Bennett Clark met with Ickes on 7 October 1933 and received assurances from the Secretary of Interior that he would provide $3.5 million dollars for the river below Kansas City. Clark claimed that with this money, "the channel to Kansas City could be completed by spring, ready for opening of navigation, and employment would be provided immediately to

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83Ibid.

84Kansas City Star, *For a Nine-Foot Channel*, 6 October 1933. Kansas City Times, *Ask Speed on Dam*, 30 September 1933. Kansas City Times, *Ready for a River Plea*, 5 October 1933.

85Ibid.

86Kansas City Star, *River Men Alert, Immediate Action on 104 ½ Million Allotment for Missouri and Ft. Peck Planned, The President an Aid, Kiro Dam Has Hit A Snag*, 8 October 1933. Kansas City Star, *A River and Jobs, Fort Peck Dam Also Up*, 10 October 1933.

several thousand men."[87] Three days later, Ickes released the money for the lower river project.[88]

Concerned about the status of the Fort Peck project, Senator Burton again met with the president on 13 October to urge a release of funds to begin construction on the dam. Roosevelt assured the Missouri senator that he would get as much money for the dam as could be efficiently spent in the upcoming year. The next day Ickes released $15.5 million dollars for the start of construction on Fort Peck Dam.[89]

The administration supported the construction of Fort Peck Dam for many of the same reasons it funded the Upper River Project, including: work at the dam site could be initiated without delay; construction tasks would be labor-intensive and require the employment of large numbers of men; the dam would be built in the economically depressed region of eastern Montana, thereby aiding that region's recovery; heavy industrial equipment, machine tools, and extensive amounts of raw materials would be utilized by the Corps of Engineers during construction; the dam would fit into the president's overall policy of conserving natural resources; and finally, the dam would support downstream navigation, soil conservation, and flood prevention.[90]

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[87]Ibid.

[88]Kansas City Star, *A River and Jobs*, 10 October 1933.

[89]Kansas City Times, *Push Fort Peck Fight*, 12 October 1933. Kansas City Star, *A Ft. Peck Fund, Public Works Administration Allots 15 ½ Million for First Year's Work on Project*, 14 October 1933. Kansas City Star, *River To Its Own, Fort Peck Allotment Means the Missouri Will Be a Vital Waterways Factor, Roosevelt Is A Big Aid*, 15 October 1933.

[90]Ferrell, Soundings: One Hundred Years of the Navigation Project, 76, 77. John Ferrell, Big Dam Era, (Omaha: Missouri River Division, U.S. Army Corps of Engineers, 1993), 5, 7, 8. Kansas City Times, *A Vast Fort Peck Plan*, 17 October 1933. Kansas City Star, *Job Hunters To Fort Peck*, 29 October 1933. Kansas City Times, *Where 287 Miles of Power Line Will Be Built As Part Of The Ft. Peck Dam Project*, 16 April 1934. Kansas City Times, *To Speed River Work*, 9 June 1934.

By approving the construction of Fort Peck Dam, Roosevelt, Ickes, and the War Department tacitly committed the federal government to the completion of not only the six-foot channel to Sioux City, but also the future deepening of the channel to nine-feet. The navigation channel south of Sioux City would be useless without the dam and the dam would be useless without the navigation channel, especially a nine-foot channel. Approval of Fort Peck Dam tied the federal government to a larger development program for the Missouri River. J.C. Nichols of the navigation association said the same in October 1933, "The building of the Fort Peck reservoir is of immense importance to the whole middle West, both from the standpoint of industry and agriculture. It assures a dependable channel for navigation and removes this [channelization] project from a position of doubt."[91]

Within days after the PWA allocation of funds for Fort Peck, District Engineer Wyman swung into action; he first established a Corps office in Glascow, Montana (just seventeen miles north of the dam site) to oversee the project. Only nine days after Ickes released the money, Wyman had seventy local men clearing brush at the dam site.[92] Brush and timber clearing operations continued until the middle of December. On 10 January 1934, the crews began construction of dredge boats. These boats would suck clay from the river bed and deposit the material on the dam embankment to form the impervious earthen plug. By early February 1934, the Corps employed over 1,000 men at the dam site. The majority of the common laborers came from Valley County, Montana which bordered the Missouri on the north.[93] The only employees likely to come from outside the immediate area consisted of heavy-machine operators and Corps personnel. PWA policy required that as many men as

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[91] Kansas City Star, *River To Its Own*, 15 October 1933.

[92] Kansas City Times, *A Year's Work On Peck Dam*, 19 October 1934. ARCE 1934, 842.

[93] Kansas City Star, *Job Hunters To Fort Peck*, 29 October 1933.

possible should be hired locally. On 28 February 1934, the engineers began construction of a combination railroad-highway bridge across the Missouri just downstream from the future dam. In May 1934, crews initiated construction on a 287-mile long power line from the Rainbow Falls Dam near Great Falls, Montana, to the Fort Peck Dam site. Electricity from this upstream dam would power lights, machines, and the employee housing facilities then being built. The Missouri River would be turned against itself, its hydroelectric generating capacity contributing to the further damming of the stream.

Work during the first year involved building the infrastructure necessary to support construction of the dam itself. By June 1934, the Corps began burrowing four twenty-eight feet diameter tunnels that would eventually carry the Missouri around the earthen dam, through the bluffs, and safely downstream.[94] In July 1934, Ickes ordered another twenty-five million from the PWA fund spent on Fort Peck. The Secretary of Interior wanted the work on the project accelerated to relieve the continued economic hardship evident in Montana that summer as the region suffered from another year of severe drought.[95] This significant allocation meant the dam would be completed. With so much invested in the project, there would be no turning back. In early August, Roosevelt visited the dam site, where he proudly witnessed the employment of 7,000 men struggling to harness the Missouri.[96]

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94 ARCE 1934, 842. Kansas City Star, *Work Begins On a 72-Million-Dollar Flood Control Project for the Missouri Valley*, 27 February 1934. Kansas City Star, Work Goes Ahead on the Huge Missouri River Project at Fort Peck, Montana, 4 March 1934. Kansas City Times, *Where 287 Miles of Power Line Will Be Built As Part Of The Ft. Peck Dam Project*, 16 April 1934

95 Kansas City Times, *25 Millions to Ft. Peck, Work On Dam Thus Is Financed For Second Year*, 13 July 1934.

96 Kansas City Star, *On to the Fort Peck Dam, Inspection Tour Takes Roosevelt to Glascow,* Montana, 6 August 1934.

While men labored to block the flow of the Missouri at Fort Peck, thousands more toiled along the river south of Sioux City attempting to confine the Missouri within a wooden straight-jacket. Only a couple of months after Wyman received PWA money for the Upper River Project, the engineer bragged that he had 4,000 men working on the river between St. Joseph and Sioux City.[97] Significant numbers of these men were farmers who needed additional income to supplement their meager earnings from crop and livestock sales. Apparently Corps officials had received instructions from the PWA to not only hire local labor but to insure that farmers received a better-than-fair consideration for the available construction jobs.[98] With so much money at his disposal, Wyman and his colleagues nearly completed the six-foot channel to St. Joseph by early June 1934. Work above that point had been spread-out among numerous towns. Thus, a continuous navigation channel did not exist north of St. Joseph. The $3.6 million PWA allocation for the river reach below Kansas City enabled the Corps to claim that reach's six-foot channel complete in the fall of 1934.

By early 1935, the first PWA allocation had been nearly exhausted. As a result, members of the Missouri River Navigation Association again traveled to Washington to lobby the administration for more money. On 1 February 1935, Weaver and several individuals from Sioux City and Omaha met with Roosevelt. The men asked the president for thirty-five million dollars for the Upper River Project so that the engineers could complete the channel all the way to Sioux City within the next couple of years. Weaver reminded the president that the counties bordering the river in western Iowa and eastern Nebraska had severe unemployment. An estimated 31,362 families were on relief rolls during the fall and winter

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97 Kansas City Times, *Gay Start to Tame River*, 13 October 1933.

98 Kansas City Star, *400 Men and the River*, 21 December 1933.

months of 1934-35. The president listened to Weaver's arguments, but did not make a definite commitment to provide money to the project.[99]

By May 1935, no decision had yet been made by the administration regarding the Upper River Project. Again, concerns rose about its future financial status. Weaver traveled to Washington to meet once again with Roosevelt. On 6 May, Weaver and Nebraska Senator Edward Burke asked the president for $40 million dollars for the Upper River Project. Weaver wanted the money so the Corps could rush the construction of pile dikes in time to capture the heavy silt-load of the approaching June rise.[100] On 17 May, Ickes released $10 million dollars. Although this amount was significantly lower than the $40 million requested, it would be enough for the Corps to nearly complete the channel to Omaha.

Dissatisfied with the small allocation, Weaver urged members of the navigation association to write or send telegrams to the president requesting more money for the Upper River Project. A major reason for Weaver's urgency was his belief that the completed Fort Peck Dam would forever end, or dramatically reduce, the Missouri's annual June rise. Deprived of its high flows and heavy silt content, the Missouri River below Sioux City would be unable to quickly confine itself within the system of pile dikes.[101] Weaver's letter-writing campaign failed to gain more money for the Upper River Project.

Although PWA and WPA funds for channelization work decreased after 1935, the Missouri River Navigation Association still secured enough funding from Congress and the president to push work onto Omaha and then Sioux City. In 1936, work began on a major scale along the reach through western Iowa. By that fall, the engineers predicted that

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[99]Kansas City Star, *An Upper River Plea In*, 2 February 1935. Kansas City Star, *To Roosevelt On River*, 2 February 1935.

[100]Kansas City Star, *Ask Early River Money*, 6 May 1935.

[101]Kansas City Times, *New River Work Boost*, 14 September 1935.

channelization work to Omaha would be "virtually completed" by June 1937.[102] In January 1937, Chief of Engineers Edward Markham requested a $19.3 million dollar congressional appropriation for Missouri River channelization. This sum would allow for a rapid progression of the work toward Sioux City. Colonel Richard C. Moore, Division Engineer at the recently established Missouri River Division in Omaha, did not believe such a large appropriation would be approved by Congress. The division still had $12 million dollars in its coffers for expenditure on the Upper River Project. This sum would guarantee large-scale construction operations on the river for at least another year. Furthermore, Moore did not believe the $19.3 million appropriation would necessarily hurry the completion of the channel. The river had remained low since 1929 and the colonel acknowledged that "Low water has prevented the river from conforming to work already completed."[103] The House included Markham's $19.3 million dollar request in its annual rivers and harbors bill. A member of the House appropriations committee stated after the inclusion of this sum in the bill that it "might be well to bring to a close the Missouri River project from Kansas City to Sioux City, to the extent practicably consistent with sound engineering practice and work already accomplished."[104] But the Senate reduced the appropriation for the Upper River Project. As a result, Secretary of War Harry Woodring only released seven million dollars in the summer of 1937 for continuance of work on the river in western Iowa. That same summer, the Corps closed the dam at Fort Peck. On 24 June, the Corps forced the river through the diversion tunnels (Figure 7.4).[105]

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[102]Kansas City Star, *End of River Job*, 10 October 1936.

[103]Kansas City Times, *Big River Request*, 5 January 1937.

[104]Kansas City Star, *A Big River Fund*, 11 June 1937.

[105]Kansas City Times, 30 July 1937. ARCE 1937, 1023, 1024.

Figure 7.4. Fort Peck Dam. President Roosevelt and Harold Ickes supported construction of Fort Peck Dam for a number of reasons. The dam fit into the president's overall policy of conserving the nation's natural resources by contributing to downstream navigation, soil conservation, and flood prevention. Furthermore, the president and head of the PWA believed the utilization of heavy industrial equipment, machine tools, and raw materials in the construction of the dam would aid economic recovery. Also, the dam would provide work relief to thousands of men in the depressed counties of eastern Montana. Courtesy of the Corps of Engineers.

From the fall of 1937 to the summer of 1938, Corps officials curtailed work along the Omaha-Sioux City reach, claiming that, "Work in this section is being withheld in order that sufficient funds will be available for the completion of the portion below Omaha."[106] The Corps wanted to enable barges to reach Omaha as soon as possible. The first barge arrived in Omaha in May 1939, traveling up-river on top of spring flood waters.[107] During 1939 and 1940, the Corps concentrated its resources along the Omaha-Sioux City reach.

Corps officials believed the Omaha-Sioux City reach of the river to be the most unstable section of the entire river system.[108] Along this reach, the valley floor and the river's bed consisted of highly erosive alluvium which facilitated frequent changes in the direction of the channel. Furthermore, the distance between valley walls is greater along this section than anywhere else. Thus, the river had a wide path to move through on its way south. As a result, the channel not only spread out south of Sioux City, it also formed long bends. The average channel area (the area of the river with free flowing water) below Sioux City was 1000 feet to 10,000 feet wide.[109] A river nearly two miles wide with large loops would require extensive alteration in order to develop a navigation channel six feet deep with a 200-foot wide thalweg. The other major physical challenge confronting the Corps above Omaha was the climate. Wet cycles affected the river here more than to the south or north.. High flows exacerbated the inherent instability of the river in western Iowa. In other words, during floods the Missouri jumped all over the place. High flows would make the task of maintaining a stable navigation channel very difficult because the river could outflank the

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[106]ARCE 1938, 1177.

[107]ARCE 1939, 1301.

[108]Kansas City Times, *Upper River Work Soon*, 11 May 1931.

[109]Hallberg, Harbaugh, and Witinok, Changes in the Channel Area of the Missouri River, 7.

Corps' pile dikes and revetments. The annual flooding posed the most serious risk to the construction and maintenance of the six-foot channel in western Iowa. But in the 1930s, the Corps did not possess the congressional or local support to construct flood control reservoirs across the Missouri.

In the actual construction of the channel along western Iowa, the Corps relied on the two-clump and three-clump pile dike and willow and stone revetment. The only distinction between the methods used along this reach and those employed to the south was the length of the pile dikes, they were longer here to compensate for the greater width of the river.[110] The Corps also used the excruciating "one rock, one man" method for building revetments because it insured employment for thousands of men (Figure 7.5 and Figure 7.6). Although bulldozers and draglines could have laid the rock at a lower cost, those methods did not meet political, social, and economic goals.[111] Men still cut willows near the bank and wove the mattresses by hand (Figure 7.7). By the mid-thirties the engineers began to construct wooden mattresses, built with 1X4 pieces of lumber, replacing the traditional willow mattress.[112]

New techniques employed in the 1930s to channelize the river included hydraulic hoses for bank-leveling, asphalt revetments, and gigantic dredges. The hydraulic hoses were used

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[110] C.P. Lindner, *Channel Improvement and Stabilization Measures,* in State of Knowledge of Channel Stabilization in Major Alluvial Rivers, G.B. Fenwick, editor, (Vicksburg: U.S. Army Corps of Engineers, Committee on Channel Stabilization, 1969), VIII-25, VIII-26. Branyan, Taming the Mighty Missouri, 22. Sioux City Journal, *They're Fixing the Missouri,* 22 July 1938. Sioux City Journal, *Army Engineers Harnessing Missouri River Here to Confine Channel,* 27 March 1940.

[111] Sioux City Journal, *Harnessed: Revetment Job Near Salix Illustrates How Uncle Sam is Preparing Missouri River for Opening of Navigation,* 3 March 1940. Sioux City Journal, *Army Engineers Harnessing Missouri River Here to Confine Channel,* 27 March 1940.

[112] Branyan, Taming the Mighty Missouri, 24.

Figure 7.5. A stone revetment under construction along the Missouri River, circa 1935. In the 1930s, the Corps of Engineers, rather than utilize steam shovels and bulldozers, hired thousands of men to construct stone revetments. In the photograph, men place one stone at a time on top of a willow mattress. The "one rock, one man" technique kept men employed during the Great Depression. Courtesy of the Corps of Engineers.

Figure 7.6. The "one rock, one man" technique of building revetments. Placing large stones along the bank line was back-breaking work for the construction crew. Courtesy of the Corps of Engineers.

Figure 7.7. Men weaving a willow mattress along the Missouri River in western Iowa, circa 1935. Willow mattress construction was a labor-intensive task that insured employment for thousands of men during the depression years of the 1930s. Courtesy of the Corps of Engineers.

in place of grading the bank with hand-held shovels, bulldozers, and draglines. The hoses sat on a floating platform, placed adjacent to the bank needing leveling, and then water was pumped directly from the river, through the hose and onto the bank. This method was quick and effective. Asphalt revetments were considered a replacement for the standard willow mattress and stone revetment. But their performance was dismal on the Missouri, where the majority were undermined in short order.[113]

Dredges became a standard feature of channelization work during the 1930s, especially along the western Iowa reach. Dredges possessed the capacity to suck tons of sand and gravel from the river bed in just a matter of minutes. By the summer of 1939, the Corps had nine dredges working continuously between Kansas City and Sioux City.[114] Corps officials named two of the largest dredge boats after the explorers Meriwether Lewis and William Clark. The *Lewis* and *Clark* each had a length of 260 feet, width of fifty feet, and a draft of four feet. The boats weighed close to 250 tons and had the power to pull 3,000 cubic yards of material from the river every hour. Another dredge named the *William S. Mitchell* could cut a path through alluvium eighty feet wide, 1,300 feet long, and approximately twenty-five feet deep in a single day.[115] The Corps employed the behemoths to remove sandbars obstructing the thalweg, deepen shallow channel crossings, and cut off long bends. To form a cut-off, the engineers placed a dredge on the downstream end of a bend. From that point, the dredge proceeded to excavate a narrow channel across the bend's neck. Once the dredge neared the natural river channel on the upstream side of the neck, it "punched through" the remaining

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[113]U.S. Army Corps of Engineers, The Federal Engineer, 49. Lindner, *Channel Improvement and Stabilization Measures,* in State of Knowledge of Channel Stabilization in Major Alluvial Rivers, VIII-10.

[114]ARCE 1939, 1300.

[115]Ferrell, Soundings: One Hundred Years of the Navigation Channel, 85, 87.

alluvium and forced the river south along the cut-off. Once a bend had been cut off from the new navigation channel it filled in with silt, dried-up, and became overgrown with vegetation.[116]

The engineers conducted extensive snag-removal and timber-clearing operations along the river in western Iowa. The Corps undertook snag removal not for its contribution to commercial navigation but for the safety of the Corps construction fleet moving up and downstream. The number of snags pulled from the river equaled or surpassed the number taken from the stream during a given year in the nineteenth century, proof that the erosive Missouri continued to refill it channel with trees. For example, in 1936-37, snagboats extracted 790 snags from the riverbed. Tree-clearing operations reached stupendous proportions. Between 1934 and 1937, men cut down a total of 9,097 trees deemed threats to navigation along the Kansas City-Sioux City reach.[117] The majority of these trees were large, mature cottonwoods growing close to the river bank. The extent of federal timber-clearing operations along the river valley exceeded all previous levels.

Through the utilization of dredges, pile drivers, and thousands of men, officials at the Missouri River Division could assert in 1940 that the river between Omaha and Sioux City, "is very much improved and is practically completed, except for six or seven troublesome bends where major corrective action is now in progress."[118] With the navigation channel to Sioux City almost in place, a towboat named *Kansas City Socony* and two barges owned by a subsidiary of Mobil Oil Corporation ventured toward that city in June 1940. The two barges held 400,000 gallons of gasoline and drew a mere four and a half feet, half of their potential

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[116]U.S. Army Corps of Engineers, The Federal Engineer, 47.

[117]ARCE 1935, 1002. ARCE 1936, 998. ARCE 1937, 1006.

[118]ARCE 1940, 1312.

capacity. As the tow and its barges neared Sioux City on 27 June 1940, a crowd estimated at several thousand waited at the riverfront for its arrival. George R. Call and Lachlan Macleay of the Mississippi Valley Association stood proudly on the bank, recognizing the fulfillment of a long-held dream, the arrival of barges at this inland port.[119] Personnel from two radio stations, KSCJ and KTRI Radio, performed the novel task of broadcasting live from the Sioux City dock.[120] As the tow and barges floated toward the dock and in sight of the crowd, the vessel got stuck on a sandbar. Two government boats had to dislodge the *Kansas City Socony* from the bar, and the boat proceeded to land at Sioux City, heralding in what the *Sioux City Journal* proclaimed was the "advent of a new era in Sioux City transportation."[121] The opening of Sioux City to regular barge traffic appeared to be within sight.

But even with the completion of Fort Peck Dam and the channel to Sioux City, barge traffic remained absent from the river. Only two private companies operated on the river above Kansas City by 1940 and each of these barge lines possessed only one towboat and a couple of shallow-draft barges. The pathetic showing by barge operators along this reach was graphically illustrated in the fall of 1940 when the Sioux City-New Orleans Barge Line built the towboat *Sioux City*. The *Sioux City* only possessed a 110 horsepower engine, barely enough power to push one deep-draft barge designed for service on the Mississippi. Moreover, the *Sioux City* sat so low in the water that the pilot could not see the river in front

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119 Sioux City Journal, *Two Boosters for Missouri River Transportation*, 27 June 1940.

120 Sioux City Journal, *KSCJ Announcer Paints Picture of Possibilities of River Navigation*, 27 June 1940.

121 ARCE 1940, 1312. Sioux City Journal, *Big Crowd Cheers Tow-Barge Arrival At Sioux City Port*, 27 June 1940.

of the barge.[122] On its maiden voyage, a crew member standing at the head of the barge relayed steering directions to the pilot house. The *Sioux City* carried only 200 tons of freight, this equaled one-fourth the carrying capacity of the deep-draft barge. The barge had to be loaded light otherwise it would have struck bottom. Moreover, the towboat did not have the power to push a heavier load. A Corps launch assisted the *Sioux City* on its voyage upstream, taking soundings all along the journey to prevent a grounding.

The Corps also sent launches out to assist every towboat carrying cargo on the lower river. Even though the Corps had certified the river reach below Kansas City open to barge traffic in 1934, private operators did not use the stream. Not until 1937 did a private company commence operations on the Missouri River. And the government-owned Inland Waterways Corporation only sent barges to Kansas City on an irregular schedule, staying completely clear of the river north of Kansas City.

Environmental, economic, and political factors combined to keep barges away from the Missouri River. During the 1930s, the river below Sioux City repeatedly dipped to record low levels. Low flows hindered the movement of barges, making groundings all too frequent, requiring a break-in-bulk at St. Louis, and eliminating the profitability of moving goods by water. Second, even when the river contained enough water to float deep-draft barges, the current running down the navigation channel impeded upstream navigation. In 1937 the Corps admitted, "During the periods of high water which usually occur in April and June drafts of 8 feet or more are possible, but the increased velocity of the current during these periods renders impracticable depths in excess of 5 feet for the type of equipment

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[122]U.S. House of Representatives, Eighty-Second Session, *Missouri River Channel Stabilization and Navigation Project,* Hearings Before The Subcommittee of the Committee on Appropriations, 30 June 1952, (Washington DC: GPO, 1952), 18. Sioux City Journal, *KSCJ Announcer Paints Picture of Possibilities in River Navigation*, 27 June 1940. Sioux City Journal, *Sioux City Owned Barge On Maiden Voyage*, 3 August 1940. Sioux City Journal, *Sioux City Towboat On Way Home*, 20 August 1940.

normally used for navigation."[123] Deep-draft barges could not fight the current. In addition to these environmental variables, the Great Depression reduced available investment capital and increased the financial risks of starting barge operations along an unreliable river channel. To further reduce the economic incentives to operators and shippers alike, by the mid-1930s a highway bordered the river from Kansas City to St. Louis. Thus, trucking firms could haul goods between the cities in just eight hours, while a towboat and barges took anywhere from five days to a week to travel the same distance.[124] The other major impediment to the emergence of barge traffic on the Missouri River was the approach of war in Europe and Asia. By 1940-41, federal appropriations for the Missouri River channelization work were decreasing, funds were being spent for defense purposes, and the channel began to deteriorate from lack of maintenance. By 1942, the Corps barely had enough money to keep-up with the maintenance of existing structures. The advent of a wet climatic cycle over the northern Great Plains and upper Midwest further threatened the integrity of channelization structures south of Sioux City.

During the decade of the Great Depression, the Missouri River had been radically reshaped in the interests of navigation. By 1932, the channelization project from Kansas City to the mouth transformed that reach of the river into a single, uniform channel without any sandbars, islands, or side-channels. While work progressed rapidly below Kansas City during the Hoover Administration, the river north of that city remained largely untouched by the Corps of Engineers. To the chagrin of interests based in northwest Missouri, Nebraska, Iowa, and South Dakota, the Hoover Administration, the War Department, and the Corps ruled against immediate large-scale construction on the Upper River Project. The federal government wanted to concentrate its resources in order to quickly finish reach below Kansas

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[123]ARCE 1937, 994.

[124]New York Times, 14 April 1935.

City. Furthermore, federal officials still questioned the economic and engineering feasibility of extending the six-foot channel to Sioux City. Thus, even though the Missouri River Navigation Association and state and local officials from the Missouri Valley continually lobbied federal officials to start work on the Upper River Project, the federal government refused to cooperate with them.

The worsening economic depression contributed to the election of Franklin D. Roosevelt in the fall of 1932. Missouri Valley residents did not know Roosevelt's policy toward the Missouri River until the summer of 1933, when Roosevelt and Harold Ickes reversed Hoover's policy and initiated large-scale construction on the Upper River Project. But Roosevelt and Ickes did not fund the Upper River Project as an automatic response to the depression. Rather, the lobbying efforts of the Missouri River Navigation Association and congressional representatives from the Missouri Basin played an important role in securing the PWA funds. The president and Ickes had hundreds of other projects they could have financed that summer, but Weaver, Nichols, and Miller pushed their project and won federal support.

Once the Upper River Project received federal backing, federal acceptance of the proposed dam at Fort Peck became almost certain. The Upper River Project and Fort Peck Dam were closely linked; neither would fulfill its purpose without the other. The channel to Sioux City required a reliable source of water which Fort Peck would supply, while the dam needed a confined channel to provide with water. Yet, the dam's fate hung in the balance until the middle of October 1933. Only after Missouri Valley residents met directly with the president, and bypassed Ickes, did the dam gain PWA funding. Once again, Weaver, Nichols, Miller, and their Missouri Valley colleagues played a crucial role in securing financing for further Missouri River development. By the end of 1933, the Roosevelt's policy toward the Missouri River had largely been established for the remainder of the decade. Although Missouri Valley interests still had to lobby for financing for the project.

By the late 1930s, the Corps began work on the channel north of Omaha (Figure 7.1). Along this reach, the engineers confronted new and difficult environmental conditions. But through the use of new channelization techniques (especially large dredges) and older methods, the engineers proceeded to create a navigation channel to Sioux City by 1940-41. Yet, with the six-foot channel from the mouth to Sioux City almost in place, barge traffic failed to develop on the river. World War II resulted in a cut in federal financing for channelization work and when high flows returned in the early 1940s, the channelization works began to deteriorate at a rapid rate. Thus, the prospects for the establishment of barge traffic on the stream after the war did not appear bright.

The tremendous accomplishments of Missouri Valley residents, especially the Kansas Cityans, in gaining federal cooperation for river development stood in sharp contrast to the failures of South Dakotans who had sought Missouri River development since the 1910s. The inability of South Dakota interests to develop the Missouri resulted largely from the successes of the lower river interests.

South Dakota became the center of river development activities along the Missouri Valley above Sioux City. Just as Kansas City led the river movement to the south, individuals from Pierre, Chamberlain, and Yankton led the movement in the north. The projects proposed by these South Dakota residents between 1910 and 1942 had tremendous economic and environmental consequences for the interests based in the lower river. Furthermore, the inability of South Dakota residents to gain Corps of Engineers cooperation for their development schemes illustrates the nature of Corps political power. In particular, the Corps' influence along the Missouri River originated with Congress and ultimately depended upon the people of the lower valley. For these reasons, the story of South Dakota's river development schemes is important to the overall history of Missouri River development.

CHAPTER 8: SOUTH DAKOTA ATTEMPTS TO DEVELOP THE MISSOURI RIVER

After 1910, South Dakota became the center of a movement to construct dams across the main stem of the Missouri River. Although Montana and North Dakota interests sought river improvement, their level of organizational activity and the scale of their proposed projects did not compare with the grandiose schemes of the South Dakotans. In Montana, the Montana Power Company had built a number of hydroelectric dams across the Missouri in the vicinity of Helena and Great Falls during the 1900s and 1910s. Dams rose above the river at the Gates of the Mountains, Black Eagle Falls, Crooked Falls, the Great Falls, and Wolf Creek (Holter Dam). These projects provided only local benefits and had minimal influence on the river's flow rates or environmental character outside their immediate vicinity. Near Williston, North Dakota, farmers had sought and received federal sponsorship of the construction of a small-scale water diversion project along the Missouri River in the decade of the 1910s. But this project, like the Montana dams, had little influence on the overall environmental character of the Missouri River.[1]

The projects proposed by South Dakotans between 1910 and 1942 had tremendous consequences for navigation proponents based in the lower valley. As a result, residents from Iowa, Nebraska, Kansas, and Missouri, working in conjunction with the Corps of Engineers, repeatedly blocked South Dakota's efforts to build dams across the Missouri River. In large part, South Dakota residents failed in their dam-building plans because lower valley navigation interests had already succeeded with their own development schemes. Finally, the inability of South Dakota residents to gain Corps of Engineers cooperation for their

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[1] Louis N. Hafermehl, *To Make the Desert Bloom: The Politics and Promotion of Early Irrigation Schemes in North Dakota,* North Dakota History, Journal of the Northern Plains, 59, no. 3, Summer 1992, 13-27.

development proposals illustrates the nature of Corps political authority. The Corps did not wield arbitrary power over the inhabitants of the upper and lower valley. Rather, the Corps' influence along the Missouri River ultimately depended upon the more numerous residents of the lower valley and their greater influence with Congress and the chief executive's office.

South Dakotans had been involved in river improvement efforts since the 1880s. Individuals from various South Dakota communities participated in the river congresses and conventions held in Kansas City, St. Joseph, and Sioux City between 1881 and 1908. John King from Chamberlain, W.H. Beadle from Yankton, and Coe J. Crawford from Pierre were just a few of the notable South Dakotans to attend lower river conventions and advocate channelization to facilitate barge navigation. But during this early period, South Dakotans participated in the organizations and improvement plans of lower valley inhabitants, they did not assume leadership in these movements. However, in 1910, South Dakotans began to hold their own river improvement meetings and make their own plans to serve their purposes.[2]

On 30 March 1910, Pierre river boosters hosted a waterways convention. Delegates discussed the possibility of building dams across the Missouri River in South Dakota to facilitate barge navigation, store water for irrigation purposes, and generate electricity.[3] One

[2]Missouri River Improvement Association, Proceedings of the Missouri River Improvement Convention held at Kansas City, Mo., December 15th and 16th, 1891, (Kansas City: Missouri River Improvement Association, 1891), iii. Missouri River Improvement Convention, Official Report of the Proceedings of the Missouri River Convention, Held in Kansas City, Mo. December 29 and 30, 1885, (Kansas City: Lawton & Hayens Printers, 1885), 3. Missouri River Navigation Congress, Proceedings of the First Annual Convention of the Missouri River Navigation Congress at Sioux City, Iowa , Wednesday and Thursday, Jan. 22-23, 1908, (Sioux City(?): Missouri River Navigation Congress, 1908), 93.

[3]National Archives, Kansas City, Missouri, Record Group 77, Correspondence of the Kansas City District, U.S. Army Corps of Engineers, 1907-1930, *Charles E. DeLand, Chairman of the Publicity Committee of the Pierre Waterways Convention to Kansas City District Engineer Edward H. Shulz*, 17 March 1910. William G. Robinson, *The Development of the Missouri Valley,* in South Dakota Historical Collections, XXII, (Madison: Madison Daily Leader, 1946), 452.

year later, Doane Robinson, head of the South Dakota State Historical Society in Pierre, contacted the commissioners of Sully, Stanley, and Hughes counties, located adjacent to the Little Bend of the Missouri (Figure 8.1). Robinson believed that the Little Bend (an 18. 5 mile loop in the river approximately thirty miles above Pierre) could be profitably developed into a hydroelectric site by building a thirty-foot high dam across the Missouri River and excavating a canal or tunnel across the neck of the bend. Missouri River water would be diverted from the reservoir through the power canal to a generating plant on the downstream end of the bend. Forty-eight feet of head would be captured by the powerhouse. (Head refers to potential hydroelectric energy generated from stored water as it descends. A high head will generate more electricity than a low head).[4] The three county commissioners responded favorably to Robinson's proposal and hired the engineering firm of Westinghouse, Church, Kerr & Company of Chicago, Illinois, to conduct a study of the site's economic feasibility. Unfortunately for Robinson and the commissioners, the firm did not recommend development of the Little Bend. The amount of earth requiring excavation for the power canal and the Kansas City District's insistence that the proposed Little Bend Dam possess navigation locks meant the cost of the project would exceed its long-term benefits. According to engineers who examined the site, the Corps' insistence that navigation locks be installed on the dam ultimately resulted in the project possessing an unfavorable cost-to-benefit ratio.[5]

This incident represented the first time the Corps of Engineers wielded its authority over navigable waterways to kill a South Dakota development proposal. By rejecting the Little

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[4]Donald L. Miller, *The History of the Movement for Hydro-Electric Development on the Missouri River in South Dakota,* (Master's thesis, University of South Dakota, 1930), 11, 11a.

[5]Ibid., 15. The cost-to-benefit ratio refers to the cost of the project in comparison to its long-term financial benefits.

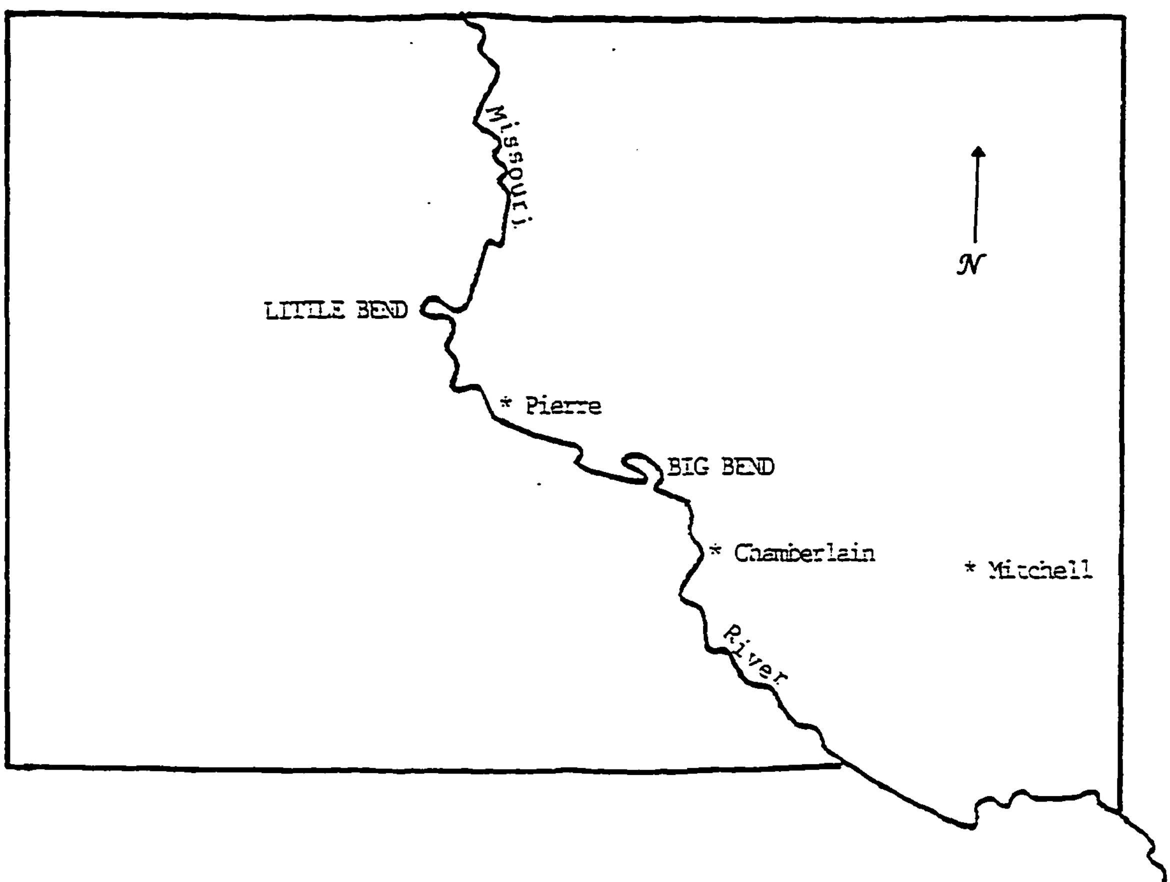

Figure 8.1. The Little Bend and the Big Bend of the Missouri. During the 1910s and 1920s, various individuals and interest groups from South Dakota sought to develop the Little Bend and the Big Bend for the generation of hydroelectricity. Note each bend's location in relation to Pierre, South Dakota. Map by author.

Bend Dam, the Corps safeguarded the Missouri River's flow for its lower valley constituency. The engineers kept Missouri River water out of the hands of South Dakota interests and insured its availability for the navigation channel then being built below Kansas City.[6] The Kansas City District also prevented a local governmental entity from making an inroad on an otherwise federal domain.

In 1916, as war between the United States and Germany appeared likely, the Wilson administration considered building hydroelectric facilities for munitions production. River boosters from South Dakota, including *Pierre Capital Journal* editor J.M. Hipple and Doane Robinson, hoped to persuade federal officials that South Dakota possessed the best sites for federal hydroelectric plants. Promotional efforts centered on the development of either the Little Bend or Big Bend of the Missouri. Big Bend is a twenty-six mile loop in the river approximately sixty-five miles southeast of Pierre and thirty-five miles northwest of Chamberlain. Pierre residents favored federal development of the Little Bend site because its location thirty miles north of town meant that town would provide the only reasonable market for its hydroelectricity. Individuals from Chamberlain, Mitchell, and Sioux City wanted the Wilson administration to develop the Big Bend site because their towns would likely receive power from a facility there or at least secure government construction contracts once work commenced on the project (Figure 8.1).[7]

The negative conclusion of Westinghouse, Church, and Kerr regarding the Little Bend site in 1911 turned Robinson into an ardent supporter of the development of Big Bend. To convince federal officials, Robinson and two partners formed the *Missouri Power Company*

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[6]National Archives, Kansas City, Missouri, Record Group 77, Correspondence of the Kansas City District, U.S. Army Corps of Engineers, 1907-1930, *Major General M. Taylor to Executive Secretary, Federal Power Commission, 15 March 1926.*

[7]Sioux City Journal, *Engineer Says Missouri Big Bend is Best Power Site*, 16 June 1916 or 1917. Miller, *The History of the Movement for Hydro-Electric Development*, 17.

in 1916, and then went to Washington to discuss Big Bend with officials of the Wilson Administration and the War Department.[8] The War Department had the responsibility of choosing sites for federal hydroelectric development, and Robinson quickly learned that the War Department favored sites outside of South Dakota with more favorable cost-to-benefit ratios. Eventually, the War Department decided to build a facility across the Tennessee River at Muscle Shoals where a greater output of power would be available for the production of nitrates.[9]

Stymied by federal officials twice (first in 1911 and then again in 1916), South Dakota's river boosters turned to the state government for support. In 1918, the State of South Dakota financed the first comprehensive survey of the Missouri River in South Dakota to determine the most cost-effective locations for building state-financed dams. Governor Peter Norbeck appointed Doane Robins to supervise the survey.[10] The state government published the results of Robinson's survey in a pamphlet titled, *Dam Sites on the Missouri River in South Dakota*. Governor Norbeck and Robinson hoped the pamphlet would inform the citizens of South Dakota of the great natural resource that flowed through their state, educate those citizens about hydroelectricity's potentialities, and foster public support for a state-financed dam construction program.

In *Dams Sites on the Missouri River in South Dakota*, Robinson proposed seven possible locations for hydroelectric facilities along the Missouri River in the state. The report concluded that favorable conditions existed for the construction of either dams or hydroelectric plants at the following sites: 1) Mulehead (just north of present-day

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[8]Miller, *The History of the Movement for Hydro-Electric Development*, 19.

[9]Ibid., 23.

[10]Doane Robinson, Dam Sites on the Missouri River in South Dakota, (Pierre: South Dakota Department of Immigration, 1918), 3.

Pickstown, South Dakota), 2) Chamberlain (two miles north of Chamberlain, South Dakota), 3) Big Bend, 4) Reynold's Creek, 5) Medicine Butte (six miles north of Pierre, South Dakota), 6) Little Bend, 7) Bad Hair (Figure 8.2). Robinson recommended building dams at all of the sites but the Big Bend. Here no dam would be necessary for power production because of the site's excessively high natural head. This head could be captured by digging a power canal across the bend's neck. The dams proposed for the other locations would be low (approximately forty feet in height) and impound small reservoirs. These structures would be used almost exclusively for power production.[11] Any flood control benefits would be only an incidental consequence of construction. Commercial navigation could never reemerge on the Missouri in South Dakota; locks would not be built into the structures. Robinson concluded that Big Bend possessed the most favorable cost-to-benefit ratio of all seven sites.

To justify the costs of his elaborate hydroelectric system for South Dakota, Robinson argued that the dams and hydroelectric facility at Big Bend would provide cheap electricity for municipalities, farms, railroads, and industries throughout the state and to mining companies located in the Black Hills. Hydroelectricity would even permit the mining of aluminum ore lying beneath the bluffs only a few miles upstream from the Big Bend.[12] Robinson admitted however that much of the market for this power did not yet exist in 1918. Yet, Robinson proclaimed, "New uses for current [hydroelectricity] will be developed; the agricultural field is sure to be an extensive one.... The farms of South Dakota will afford an outlet for a tremendous amount of current as rapidly as it can be transmitted to them.... That the market for the current will develop as rapidly as the power plants can be constructed seems certain."[13]

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[11]Ibid., 19.

[12]Ibid., 23.

[13]Ibid., 23.

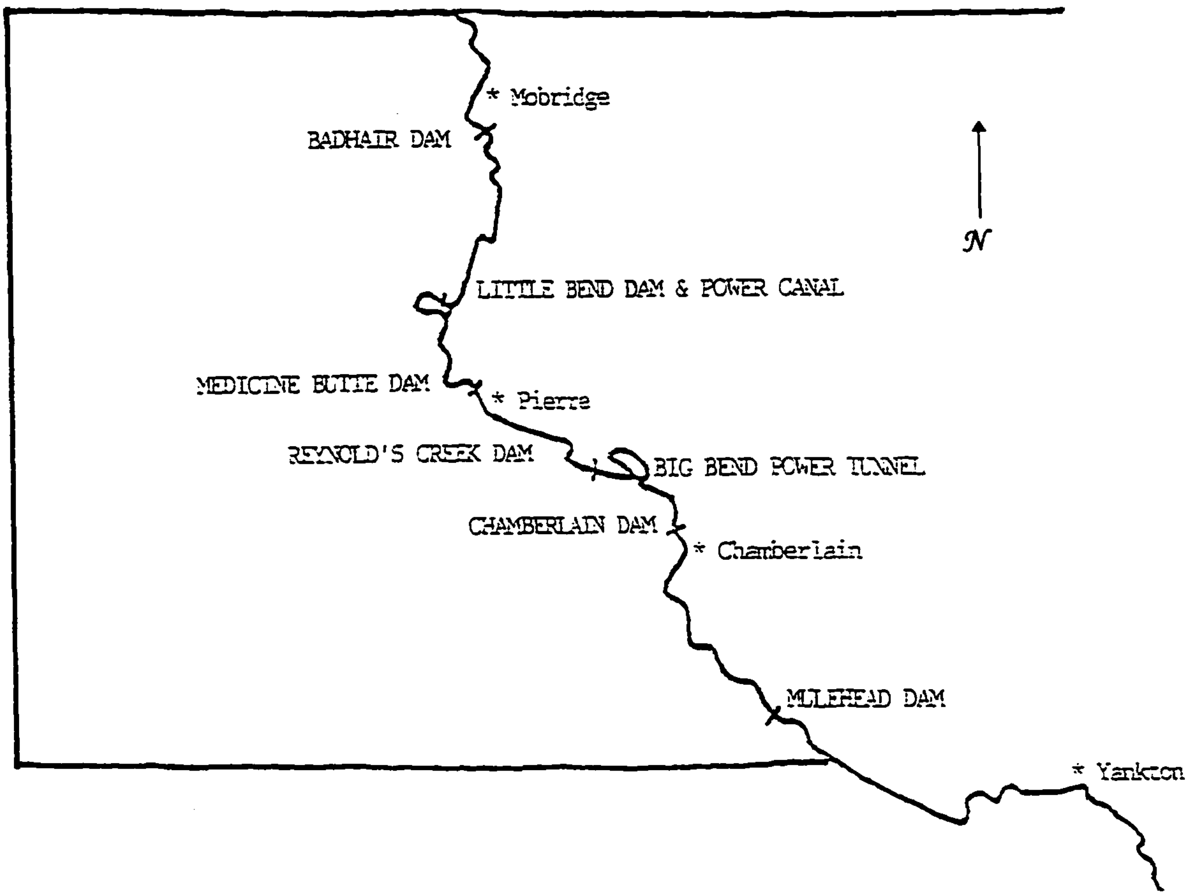

Figure 8.2. Doane Robinson's dam sites along the Missouri River main stem in South Dakota. In 1918, Doane Robinson, head of the South Dakota State Historical Society, proposed the construction of seven hydroelectric facilities across the Missouri River in South Dakota. Robinson, an amateur hydrologist and engineer, believed a power plant at Big Bend would produce more electricity than any of the other sites under consideration. Map by author.

One year after the publication of *Dams Sites on the Missouri River in South Dakota*, the South Dakota legislature created the Hydro-Electric Commission to promote, study, and eventually oversee the construction of hydroelectric facilities on the Missouri River. Doane Robinson was its executive secretary. As its first order of business, the commission financed a thorough engineering survey of dam sites along the Missouri River. Robinson, a historian, did not have the engineering background to determine the cost effectiveness of dams or power plants and the state government needed accurate cost estimates before moving forward with any development scheme. In 1919 and 1920, engineers working for the firm of Mead & Seastone of Madison, Wisconsin, roamed up and down the Missouri Valley, making borings, measuring elevations, and examining the mineral composition of the valley wall. The engineers studied the seven sites Robinson had proposed in 1918 and an additional site located four miles north of Mobridge, South Dakota.[14]

Mead & Seastone used five variables to judge cost-to-benefit ratios: 1) length of transmission lines to be constructed from dam site to existing or potential market, 2) foundation conditions at the site, 3) power potential of the water stored behind the dam, 4) market value of the lands to be flooded, 5) proximity of the dam site to available transportation facilities.[15]

Mead & Seastone concluded that the Big Bend facility did not have a favorable cost-to-benefit ratio because of the expense of digging the power canal across the neck of the bend. Instead, the site north of Mobridge had the best cost-to-benefit ratio of the eight locations examined under the survey. The Mobridge location had superior foundation conditions,

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[14]Daniel W. Mead and Charles V. Seastone, Report on the Feasibility of the Development of Hydro Electric Power from the Missouri River in the State of South Dakota, (Pierre: Hydro-Electric Commission of the State of South Dakota, 1920; reprint, Pierre: Lawrence K. Fox, 1929), 21, (page references are to reprint edition).

[15]Ibid., 23-25.

access to a railroad only one mile away, and the existence of a profitable market for its power in the nearby town of Mobridge.[16]

Two years after the submission of the Mead & Seastone report, the citizens of South Dakota held a referendum on whether to issue bonds to finance dam construction on the Missouri River. The Mobridge Dam would be the first structure built. Of course, the residents of Mobridge favored the construction of a dam just north of their town since they would be the dam's main beneficiaries. Residents living in the counties due west of Mobridge also wanted the dam because a highway would be built on top it, linking the rural West River country with urban centers in eastern South Dakota.[17]

In early November 1922, state residents voted 106,409 to 55,563 against financing the Mobridge Dam.[18] The vote was sectional, with the southern tier of counties in the state in opposition and the northern tier of counties adjacent to Mobridge in support of the dam.[19] The referendum went down to defeat for several reasons. First, residents in the southern counties did not want to finance the development of the northern counties and the town of Mobridge. Second, rural residents did not want to support a hydroelectric project that would largely benefit urban residents. The high cost of transmission lines to remote areas precluded any possibility that rural residents would receive electricity from the project. Third, the agricultural depression of the early 1920s contracted the money supply. Farmers already

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[16]Ibid., 56.

[17]Mobridge Tribune, *Cheap Electric Power For Home, Farm, and Factory,* (Mobridge: Mobridge Tribune, 1922). Miller, *The History of the Movement for Hydro-Electric Development on the Missouri River,* 62.

[18]Sioux Falls Argus Leader, 11 November 1957.

[19]Miller, *The History of the Movement for Hydro-Electric Development on the Missouri River,* 71a.

strapped for cash did not want to pay higher taxes to finance the project. Finally, the lobbying efforts of the opposition, especially the South Dakota Taxpayers League and its pamphlet *Hydro Phobia,* persuaded the majority of South Dakota voters that development of the river might cost more money than would ever be returned to the state treasury through electricity sales.[20] The defeat of the Mobridge Dam referendum did not signal public opposition to Missouri River development or the construction of dams. Rather, the vote indicated opposition to a particular dam which would only benefit a small proportion of the state's total population. Defeat of the referendum also indicated the level of public support needed to implement any future Missouri River development scheme.

Efforts to develop hydroelectric sites on the Missouri River in South Dakota suffered a severe setback with the public rejection of the Mobridge Dam. But this reversal did not stop river boosters from seeking the construction of hydroelectric projects along the river.[21] In 1924, city leaders from Mitchell advocated the construction of a hydroelectric plant at the Big Bend. They hoped to persuade South Dakota residents to finance the project. The Mitchell proposal called for diverting a significant portion of the Missouri's flow through a power canal constructed across the bend's neck. This was the same plan put forward earlier by Robinson and rejected by Mead & Seastone. Mitchell's river boosters noted that Big Bend's position in central South Dakota increased its attractiveness; a large number of towns could conceivably receive electricity from a plant there, including Pierre, Winner, Chamberlain, White River, Mitchell, Huron, Redfield, and Murdo. The Mitchell group believed Big Bend's wider potential market would appeal to a larger percentage of South Dakota's electorate than the Mobridge Dam and thereby make state financing for the project more likely. But state financing for Mitchell's Big Bend project never became a reality (Figure 8.3).

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[20]Ibid., 71.

[21]Sioux Falls Argus Leader, 23 May 1954.

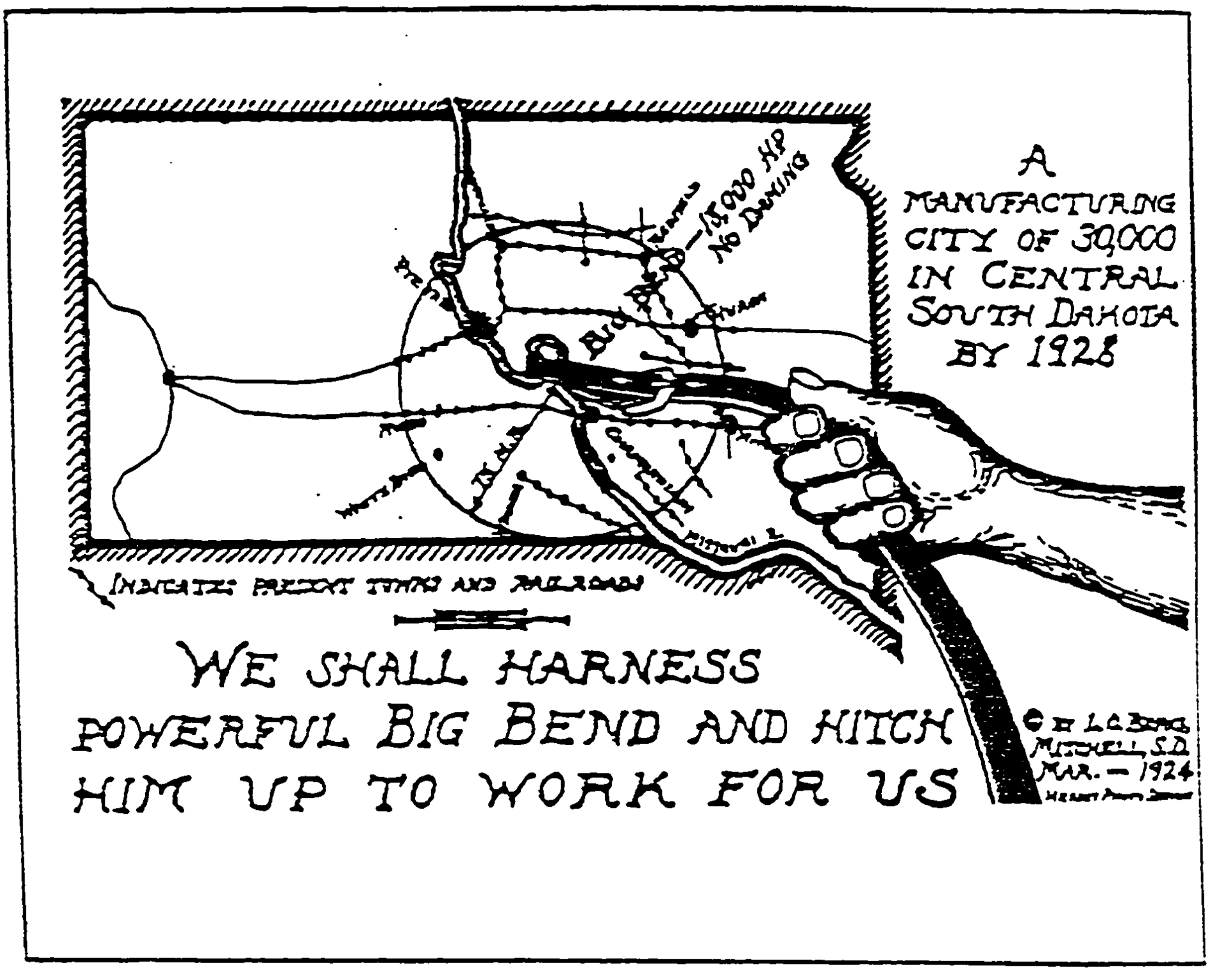

Figure 8.3. Mitchell boosters promote the Big Bend. Mitchell hydroelectric enthusiasts published this promotional flyer in 1924. The flyer emphasized Big Bend's wider potential market versus the Mobridge site. The boosters hoped that a larger percentage of South Dakota's rural population would vote in favor of constructing a power plant there. Unfortunately for the Mitchell group, their efforts to develop Big Bend failed to attract enough public support. Map by L.O. Berg, Mitchell, South Dakota, 1924.

By the early thirties, South Dakota river boosters understood that river development depended solely upon federal government support. The inability of South Dakota's residents and interest groups to agree on a suitable location for development, in combination with the twin disasters of drought and depression, made it impossible for the state government to generate the revenue necessary for the construction of Missouri River hydroelectric facilities. Only the federal government had the resources at its disposal to build the mammoth river projects.

In order to obtain federal assistance during the 1930s, South Dakotans began to earnestly promote the extension of barge navigation into the Dakotas. Project proposals advocating the construction of a navigation channel through South Dakota were more likely to gain Corps backing than projects designed almost exclusively for hydroelectric generation. A Dakota navigation project could conceivably be coupled to the six-foot channel being built south of Sioux City. South Dakota river boosters also wanted the Missouri developed for irrigation. They believed irrigation would mitigate the negative economic effects of the Great Depression and drought, keep farmers on the land, and foster a general agricultural and industrial recovery throughout South Dakota.

On 18 February 1931, the Pierre Commercial Club sponsored a meeting to discuss the development of the Missouri for hydroelectric generation and navigation. Arthur J. Weaver of the Missouri River Navigation Association, Mayor J.M. Hipple of Pierre, and State Historian Doane Robinson were three notable attendees at the conference. The Kansas City District sent a representative to Pierre, and Governor Warren Green of South Dakota wired a statement to the participants expressing support for their efforts to arouse public sentiment in favor of Missouri River development.[22]

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[22]William G. Robinson, *The Development of the Missouri Valley,* 455.

During the conference, and over the course of the following months, the Pierre Commercial Club formulated a development plan that called for the construction of a series of low dams (approximately forty feet in height) from Gavin's Point, South Dakota (approximately ten miles northwest of Yankton) to the mouth of the Yellowstone River, a distance of approximately 650 miles. The Commercial Club proposed that seventeen dams be built at intervals of approximately forty miles.[23] Club members believed that these dams, with the addition of locks, would allow for slack-water navigation through the Dakotas, which would allow for the use of impounded water to float deep-draft barges. (Open channel navigation, in contrast, refers to the use of flowing water to carry barge traffic). The club's recommendation for the Missouri River closely resembled the system of locks and dams then being proposed for the Upper Mississippi River. The South Dakotans speculated that slack-water navigation, like open-channel navigation below Sioux City, would create competitive carrier rates between barge lines and railroad companies. This competition would spur economic development by lowering the transportation costs of Dakota and Montana farmers. A further purpose of the seventeen dams would be the generation of hydroelectricity for industrial, mining, and municipal purposes.[24]

Later in 1931, the club received financing from the State of South Dakota to publish 30,000 pamphlets explaining to the public the purposes of their plan. Doane Robinson authored the pamphlet. Robinson explained that the series of dams would serve the multiple purposes of navigation, hydroelectricity, irrigation, recreation, flood control, and improved overland transportation between eastern and western South Dakota (with the addition of

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[23]Pierre Commercial Club, *Navigation of the Missouri River Through the Dakotas*, (Pierre: Hipple Printing Company, 1931), 1.

[24]Ibid., 2.

roadways over the dams).[25] That same year, commercial club members sought in vain for a congressional appropriation for an engineering survey of their scheme.

The commercial club found a supporter for their plan at the Corps' Kansas City District headquarters. District Engineer Theodore Wyman championed the construction of the series of main stem dams, but he did not convince his superiors at division headquarters in St. Louis of the project's economic or engineering feasibility.[26] The top echelons of the Corps opposed such an extensive dam construction program for a number of reasons. The drought of the thirties lowered the level of the Missouri to unprecedented levels and Corps officials worried that dams in the Dakotas (especially dams built for irrigation purposes) might impinge upon the water supply needed to maintain the six-foot channel south of Sioux City. Furthermore, Corps officials doubted whether the Missouri held enough water during drought periods to fill all seventeen reservoirs. In addition, the cost of seventeen low dams with accompanying locks would have been exorbitant. Government engineers also believed that the future volume of barge traffic on the river through the Dakotas would probably never reach levels high enough to justify the costs of the project. Finally, Corps officials did not sanction any major dam-building scheme for the Missouri River because proposals for comprehensive, multiple-purpose, river basin development were gaining popularity in Congress and the executive branch of the federal government. If a big dam construction program for the Missouri River went before Congress at this time, Corps officials feared that their jurisdiction over the Missouri would be challenged by a public corporation based on the soon-to-be-enacted Tennessee Valley Authority legislation.[27]

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[25]Ibid., 1-3.

[26]William G. Robinson, *The Development of the Missouri Valley*, 456, 458.

[27]Ibid., 460, 461.

In the spring of 1933, South Dakotans renewed their struggle to procure federal aid for the development of the Missouri River to reverse the negative effects of the severe drought and depression that gripped their state. On 4 April 1933, a group of individuals held a meeting in the small town of Kennebec, South Dakota, to discuss issues related to the Missouri. Kennebec lawyer Merrill Q. Sharpe, Doane Robinson, and William Robinson (Doane's son) attended the meeting.[28] Other river boosters from Murdo, Presho, Chamberlain, and Mitchell participated in the discussions.[29] The attendees resolved to form the Upper Missouri Valley Development Association (UMVDA) and they elected William Robinson as president. Like their predecessors in the Pierre Commercial Club, the UMVDA membership sought federal funds for the construction of a series of low dams through the Dakotas (Figure 8.4).[30] By the fall of 1933, the UMVDA lobbied the PWA for a portion of the funds earmarked for Fort Peck Dam.[31] They wanted the money for their own dam-building program. By 1934, the UMVDA's promotional campaign fizzled out, because it did not acquire any funds from the Fort Peck appropriation. As a result, the UMVDA's proposal for a series of low dams remained nothing but a dream.

But South Dakota river development enthusiasts did not accept defeat. They persisted throughout the 1930s to seek federal construction of Missouri River dams. In the mid-1930s, the Chamberlain Commercial Club advocated the construction of a hydroelectric facility at

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[28]Mrs. Sam Weller, Daughter-in-law of the late Charles Weller (who owned land at the Big Bend of the Missouri), interview by author, phone conversation, Mitchell, South Dakota, 12 June 1993.

[29]William G. Robinson, *The Development of the Missouri Valley* 463.

[30]Ibid., 464.

[31]Ibid., 463.

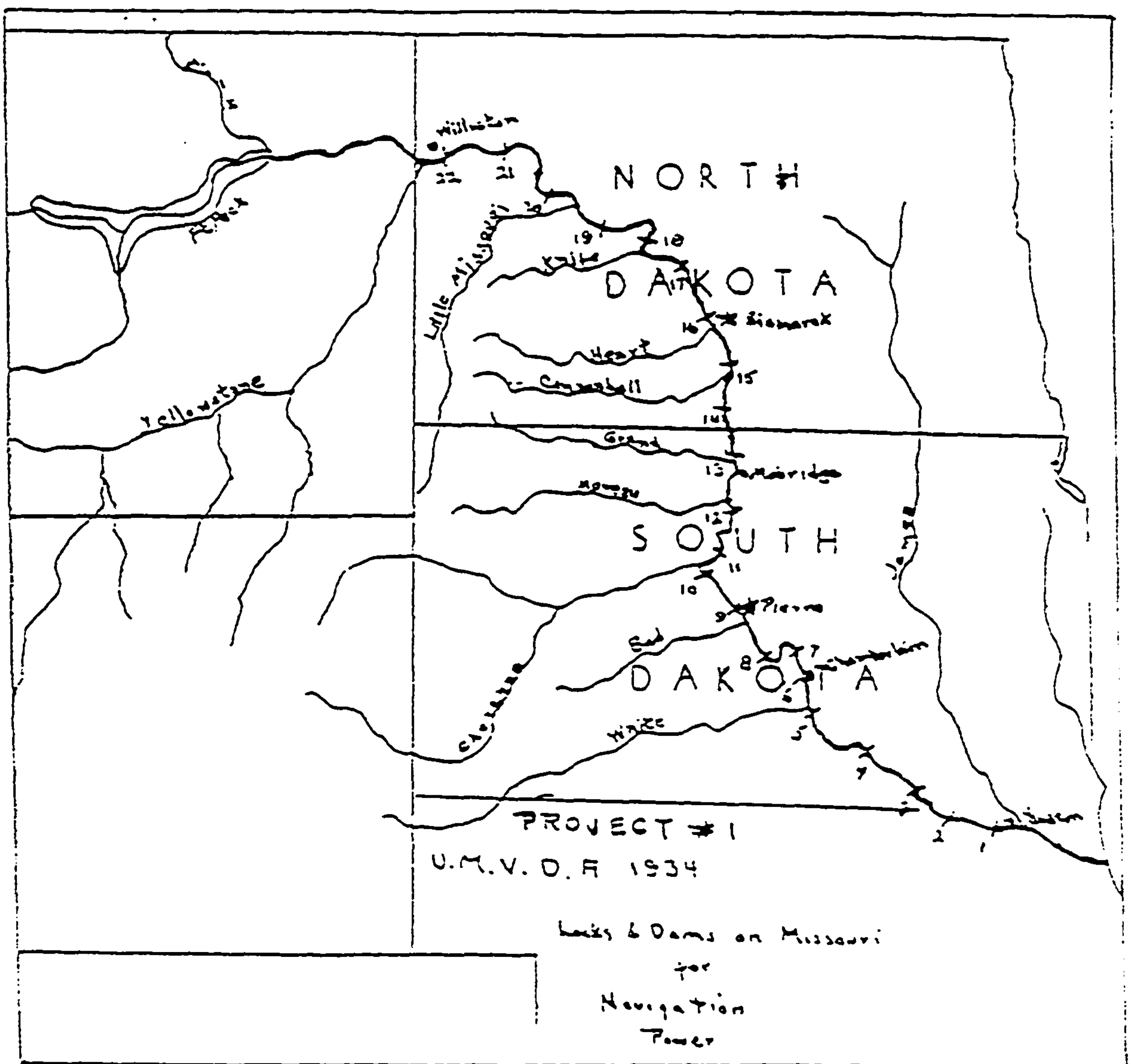

Figure 8.4. The Upper Missouri Valley Development Association's proposed system of Missouri River main stem dams, 1934. The UMVDA sought federal construction of a series of twenty-two dams from Yankton, South Dakota to the Montana-North Dakota border. The UMVDA received support from the Kansas City District of the Corps of Engineers for its development scheme, but the higher echelons of the Corps opposed the extensive system of dams. Map by the Upper Missouri Valley Development Association, 1934. Courtesy of the South Dakota State Historical Society, Pierre, South Dakota.

Big Bend because a dam there would stimulate the economy of the river town. But the club, like all the other organizations before it, failed in its purpose.[32]

In May 1937, the Lower Brule Tribal Council and its Chairman Reuben Estes sought Bureau of Indian Affairs and congressional support for tribal development of Big Bend for the production of hydroelectricity.[33] The Big Bend sat astride the Lower Brule and Crow Creek Indian reservations. Estes and the tribe had known of the efforts of Chamberlain and Mitchell promoters who had hoped to build a power canal at Big Bend. He and the tribe wanted to preempt those efforts and develop a water resource located partially on tribal and individual Indian land.[34] Such a project would bring sorely needed capital into the tribal economy during the midst of the Great Depression.

On 16 May 1937, Chairman Estes wrote South Dakota Representative Francis Case and requested advice on how to proceed with the development of the Big Bend region.[35] Case reacted favorably to Estes' proposal for Indian sponsorship of a construction project at the bend because all previous South Dakota ventures had floundered. Since the State of South Dakota, the Corps of Engineers, and the Public Works Administration had been either unwilling or unable to finance any dams or hydroelectric facilities along the river, Case believed the Bureau of Indian Affairs and its parent organization, the Department of the Interior, deserved consideration as possible sources of financing.[36]

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[32]Chamberlain Commercial Club, *Big Bend Hydro-Electric Project.*

[33]Francis Case Papers, Special Collections, *File Folder 157, Reuben Estes to Francis Case, 16 May 1937*, Dakota Wesleyan College, Mitchell, South Dakota.

[34]Francis Case Papers, *Estes to Case*, 16 May 1937. Mrs. Sam Weller, interview by author.

[35]Francis Case Papers, *Case to Arnold Sukrow*, 2 July 1937.

[36]Francis Case Papers, *Case to Estes*, 1 June 1937.

Case advised Estes to inform the Bureau of Indian Affairs office in Washington of the Lower Brule Tribe's desire to build a hydroelectric plant at Big Bend. The South Dakota congressional representative closed his letter to Estes with the following words, "Now this whole idea may be impractical, but it is worthy of investigation.... It may be that this thing [the proposed power project] will be too big for us to handle so I do not want you to feel that it must be handled by your organization alone but it [the power site] is right there in your reservation and certainly you are entitled to first consideration, if some such program can be worked out."[37]

On 12 June 1937, the Lower Brule Tribal Council followed Case's earlier advice and passed a resolution that stated their wish to develop the site at Big Bend for the benefit of the Lower Brule Indians.[38] The tribe reminded Bureau of Indian Affairs (BIA) officials that it's recent acceptance of the provisions of the Indian Reorganization Act made it eligible for federal loan funds. Tribal members then sent this resolution to BIA headquarters in Washington. After the submission of this resolution, the success of the Lower Brule development proposal depended upon the approval of two federal bureaucracies, the Department of the Interior and the Corps of Engineers.[39] The Department of Interior would actually approve the funding request while the Corps of Engineers would determine whether the project possessed a favorable cost-to-benefit ratio. The Corps also would examine the project to insure that it did not impede navigation on a federal waterway.

Between 1937 and 1940, the Lower Brule tribe labored to gain support from the Department of Interior and the Corps for their Big Bend project. To further their cause, the

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[37]Ibid.

[38]Francis Case Papers, *Case to John Herrick*, 12 July 1940.

[39]Francis Case Papers, *Frederick L. Kirgis to Secretary of the Interior Harold Ickes*, 10 July 1940.

Indians solicited aid from eleven county governments and numerous commercial clubs located in central South Dakota.[40] But by 1940 neither the Interior Department or the Corps had provided the Indians with a definitive response to their overture. Then in the early summer of 1940, Secretary of Interior Harold Ickes told South Dakota Representative Case that he endorsed Lower Brule development of Big Bend under the auspices of the Bureau of Indian Affairs.[41] BIA sponsorship of the project would not only contribute to Indian self-sufficiency, it would also enable the Department of Interior to expand its influence into a region and main stem river system long dominated by its rival bureaucracy, the Corps of Engineers.

But Ickes' endorsement actually carried little weight because the Corps of Engineers had the final decision on the proposal based on its authority over the nation's navigable rivers. In October 1940, Corps officials finally furnished representative Case and the tribe with a definite response, there would be no development at Big Bend by the Lower Brule or the Bureau of Indian Affairs. According to Corps officials who met with Case, the site had been designated a lower priority for federal development than the Mobridge and Mulehead locations.[42]

The Corps of Engineers rejected the Indian Big Bend project for additional reasons besides its poorer cost-to-benefit ratio in relation to the Mobridge and Mulehead sites. Indian development of Big Bend would have allowed the Department of Interior to control Missouri River water by diverting it through the power canal. Such control would have threatened the Corps' authority over the river and given the Department of Interior a significant inroad into a

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[40]Francis Case Papers, *J.W. Jackson to Case*, 17 January 1940.

[41]Francis Case Papers, *Case to John Herrick*, 12 July 1940.

[42]Francis Case Papers, *Case to J.W. Jackson*, 11 October 1940.

region and river system long-dominated by the Corps. Furthermore, water impounded by an Indian dam or diverted through an Indian power canal could have diminished the flow needed to maintain the six-foot channel below Sioux City. For example, in order for the proposed dam and power plant at Big Bend to generate hydroelectricity, a high head of water would have to be stored behind the dam. Storage of water would diminish downstream flow volumes. This potential scenario could not be permitted by the Corps. Too much money had already been invested in the six-foot channel and Fort Peck Dam to allow an Indian dam to threaten the barge channel's future viability. And so another South Dakota development proposal went down to defeat.

At the same time that the Lower Brule Tribe petitioned the Corps of Engineers for approval of their power project at Big Bend, a group of individuals from South Dakota, northeast Nebraska, and northwest Iowa formed the Upper Missouri Valley Association. This association consisted of businessmen, lawyers, local and state government officials, and other professionals. Thus, its membership composition was similar to all the other organizations that had pushed for river improvement since the 1880s. Mayor Ernest A. Crockett of Yankton served as the group's president. The Upper Missouri Valley Association adopted a broad platform which embraced river development for the sake of soil and water conservation, irrigation, bank stabilization, navigation, flood control, and hydroelectric generation. Federal construction of a dam at Gavin's Point was the group's immediate goal. By endorsing multiple-purpose development of the Missouri River, Crockett and the Upper Missouri Valley Association hoped to gain the cooperation of the Corps of Engineers and lower river interest groups and their congressional representatives. But that hoped for cooperation never materialized. And to Crockett's utter amazement, he learned that the Omaha District of the Corps of Engineers (which after 1933 supervised work on the river north of Rulo, Nebraska) did not want to build dams along the Missouri River in South Dakota.[43]

The failures of the 1930s still did not stop the residents of South Dakota and the upper Missouri Valley from seeking development schemes to alleviate the effects of drought and depression. One week after the bombing of Pearl Harbor and America's entry into World War II, businessmen and government representatives from the states of South Dakota, North Dakota, Wyoming, Montana, and Nebraska met with officials from the Bureau of Reclamation and Corps of Engineers in Bismarck, North Dakota, to discuss and coordinate their plans for Missouri River development.[44] Out of this initial conference and additional gatherings and correspondence in early 1942, upper river interests established the Missouri River States Committee (MRSC) and named Governor Merrill Q. Sharpe of South Dakota as its head.[45] Sharpe first became involved with Missouri River issues back in 1933 when he joined the Upper Missouri Valley Development Association. Sharpe asserted that he and his colleagues,

> organized the Missouri River States Committee for the express purpose of securing power development, irrigation, flood control, navigation, and related improvements through a valley-wide development of the entire Missouri River system.... The general purpose of the committee is to secure unified state action toward accomplishment of this plan of development. It means that the Missouri

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[43]George R. Call, *The Missouri River Improvement Program As I Have Known It*, Chapter VIII, 3, 4, 5. Letter from House representative Vincent F. Harrington to George R. Call, 29 January 1937 in *The Missouri River Improvement Program As I Have Known It*. Program for the Upper Missouri Valley Association meeting in the Elks Hall, Huron, South Dakota, 8 February 1937 in *The Missouri River Improvement Program As I Have Known It*.

[44]John Ferrell, Big Dam Era, (Omaha: Missouri River Division, U.S. Army Corps of Engineers, 1993), 4.

[45]Merrill Q. Sharpe, *History of the Missouri River States Committee* in South Dakota Historical Collections, XXII, (Madison: Madison Daily Leader, 1946), 400.

> River states are going to act from a cooperative standpoint instead of going it alone and trying to get individual state projects constructed along the river valley.[46]

In other words, the states of the basin would work together to secure federal financing for a multiple-purpose project similar to those initiated in the Colorado, Tennessee, and Columbia basins during the New Deal. The MRSC would not push for the adoption of single projects beneficial to only one locale, or state. Instead, its membership committed themselves to a broad program that would link proposed water projects together into a mutually supportive system. This commitment to an overarching, interconnected, basin-wide project sharply distinguished the MRSC from all previous organizations involved in Missouri River improvement, especially those associations organized in the lower valley for the construction of the barge channel.

In July 1942, the MRSC held its first official meeting in Billings, Montana.[47] At Billings, the members of the committee agreed to seek the participation of the states of Iowa, Kansas, and Missouri. The inclusion in the MRSC of the three most populous states of the basin would provide a major boost to the organization's federal legislative influence. While Sharpe and the MRSC worked to obtain the collaboration of the three remaining states, the Missouri River spilled out of its banks and inundated the lower valley in one of its worst floods in a century. Unlike any previous event, the Great Flood of 1943 compelled the lower river interests and the Corps of Engineers to finally join with the South Dakotans to seek the construction of dams across the Missouri River.

46Merrill Q. Sharpe, *Missouri River States Committee: Its Origin and Work*, in The Future Development of the Missouri River Valley, A Report on the Program and Activities of the Missouri River States Committee, (Chicago: The Council of State Governments, 1944), 8.

47Sharpe, *History of the Missouri River States Committee*, 404.

CHAPTER 9: DEVELOPMENT DURING THE WET YEARS, 1943-1951

The Great Flood of 1943 began in late March and early April after a sudden warm-up in temperatures caused the rapid melting of the winter snowpack lying across the northern plains and eastern sections of the Dakotas. Rather than soak into the soil or evaporate, the meltwater saturated the ground and then proceeded to drain into the tributaries of the Missouri. Dakota residents prepared for the worst, while downstream in Iowa and Nebraska, individuals anxiously watched events in the upper valley, trying to determine whether the river would flood in their vicinity.

By the first week of April, the Missouri began to inundate its valley in North and South Dakota. On Sunday, 4 April 1943, the river level at Pierre measured three and a half feet above flood stage. Police closed the Highway 14 bridge connecting Pierre with its sister city, Fort Pierre, as Missouri River water raced over the west approach. In Fort Pierre, numerous homes began to disappear beneath the icy, brown water. To the dismay of those living near the advancing waters, meteorologists predicted another two-foot rise in the river as the crest passed the two cities.[1]

The flooding intensified lower down the valley, especially between Yankton and Omaha; the reason, two of the Missouri's largest tributaries (the James and the Big Sioux) dumped unprecedented amounts of water into the already swollen river. Only a few miles southeast of Yankton, the James River, whose watershed encompasses much of eastern South Dakota, joins the Missouri. This river discharged so much water into the Missouri that the big river almost topped its record 1881 flood stage just below Yankton. Along the border between Iowa and South Dakota flows the Big Sioux River; it drains an area comprising far eastern South Dakota, southwest Minnesota, and northwestern Iowa. The Big Sioux gushed into the

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[1] Sioux City Journal, *Serious Overflows at Yankton, Stevens Seen,* 5 April 1943.

Missouri a few miles above Sioux City, but the larger river could not absorb the additional water. The Big Sioux then backed-up and broke through a nine-foot-high dike built to protect Riverside, Iowa. Millions of gallons of water poured into Riverside's residential section, inundating most of the town and driving hundreds of frustrated people from their homes.[2]

As the waters of the James, Missouri, and Big Sioux co-mingled near Sioux City, the Missouri River widened out across its valley and took on the appearance of a vast, wave-tossed sea. Forty square miles of the best agricultural land in the world vanished beneath the surging tide. Basements in South Sioux City, Nebraska filled with infectious refuse from overflowing sewers. Police barred motorists from crossing U.S Highway 20 between the Iowa border and Jackson, Nebraska, after water began lapping over the pavement. An estimated 250 farm families found themselves surrounded by raging currents, the water moving too fast to risk a passage to safety.[3] Reporter Neil Miller of the *Sioux City Journal* described the scene to the west of Sioux City as follows: "Lakes and the old river shoreline appear to be wiped out as the swollen yellow river spreads over lowlands in all directions."[4]

On 9 April, the South Sioux City Police Department deployed thirty flat-bottomed Johnboats to evacuate persons in the path of the river. This rescue operation prevented the loss of life in the area. But persons affected by the flood still lost personal property and suffered psychological damage. Charles Brown lived with his dog, Tuffie, in a tiny one room shack next to the river at Sioux City. Brown reluctantly abandoned his simple home and meager belongings as floodwaters neared his doorstep. Mike Virusa of South Sioux City,

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[2] Sioux City Journal, *Dike Breaks, Large Area Inundated*, 11 April 1943.

[3] Sioux City Journal, *Sea of Water Extends from South Sioux City to Jackson*, 10 April 1943.

[4] Sioux City Journal, *Nearby Lakes 'Lost' in General Flood Airview*, 10 April 1943.

Nebraska just spent $65.00 for seed for a three-acre "Victory Garden," when the river carried off his seed and fledging garden and filled his home with muddy water. Looking across a half mile of former cropland toward his waterlogged house, Virusa said, "I lost everything."[5]

Joe McGinty, who lived with his wife and three children on a 187-acre farm one mile west of South Sioux City spent two days and two nights (from 8 April to 10 April) working frantically to save his home and property from the Missouri. But the river rose too fast and too high, and McGinty watched helplessly as the river swept away his stock animals and feed grain. In a matter of minutes, McGinty lost five cows, four calves, six horses, two colts, 150 hens, 1,000 bushels of corn, and 500 bushels of barley, along with his recently planted crops. The stock animals alone were worth $5,000. Trying to keep at least his home, McGinty and his son worked tirelessly to build a makeshift dike around the structure. But the river topped it and filled his living quarters with water. Leaving his flooded farm on Saturday, 10 April, the defeated McGinty went into South Sioux City where he went berserk. The police arrested him, put him in the city jail, and waited until he calmed down before releasing him to the custody of his family.[6] McGinty's neighbor, Al Austin, watched his own house collapse after water rushed under the foundation. The Missouri River made no friends during the flood of 1943.

If valley residents surrounding Sioux City did not lose their homes or stock animals, hundreds of them had to clean putrid mud from their walls, floorboards, and contaminated wells. Removing mud and floodwater from a home was unpleasant at best and sickening at worst. The smell, grime, and potential for disease required that homes be cleansed as soon as possible. After removal of the muck, health officials recommended that chloride of lime be sprinkled on the flooded areas, left for an hour, and then scrubbed clean with a water and

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[5]Sioux City Journal, *Find the Victory Garden,* 11 April 1943.

[6]Sioux City Journal, *Hospitalized After Futile Fight to Save His Farm,* 11 April 1943.

chloride solution, this was time-consuming work. The fetid water in contaminated wells had to be pumped out and a solution of chloride poured in and allowed to sit for twenty-four hours. After waiting the requisite amount of time, the water had to be pumped out again. When this was all done, the well-water still had to be taken to a health facility for analysis. The cleanup after a flood required patience and fortitude.[7]

The flood crest passed Sioux City late in the night on 10 April 1943. Gauges there read 18.7 feet, still below the flood stage of 19.0 feet, and far below the record stage of 22.5 feet set in 1881. Sioux City did not suffer serious damage because the river north of town had not yet been channelized by the Corps of Engineers. As a result, the Missouri was able to spread across the valley floor before reaching the city and thereby lower the height of its crest.

As the crest moved south along the western Iowa border, its waters covered thousands of acres of farmland but skirted the majority of small towns. When a twelve-foot-high dike gave way in Monona County, Iowa, 1,000 acres of productive agricultural land disappeared under the deluge and a number of unsuspecting chickens met their deaths.[8] Residents in Onawa, Iowa, became concerned as the river, which normally flowed seven miles west of town, approached within one mile. But the town stood on a small ridge-line, too high to be affected by the flood. Further south at Blencoe, basements filled with water; and at the town of Missouri Valley, the marauding river forced the Iowa State Patrol to close Highway 30.[9]

North of Omaha, Corps pile dikes and revetments funneled the flood waters downstream toward that city, keeping the river confined and preventing it from naturally reducing its crest. The channelization structures so compressed the river that when the crest reached

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[7]Sioux City Journal, *Act to Thwart Flood Disease: Health Authorities Take Steps to Avoid Outbreaks,* 11 April 1943.

[8]Sioux City Journal, *Flood Waters Creep Higher Near Onawa,* 8 April 1943.

[9]Sioux City Journal, *Not Venice; It's Blencoe, Ia.,* 13 April 1943.

Omaha it nearly surpassed the record stage of 1881! Omaha sustained heavy damage. Emergency personnel ordered the evacuation of large sections of the downtown area. Government officials redirected civilian and military flights away from the municipal airport when water covered the runway. At the flood's height, the airport sat under seven feet of water.[10] The crest dissipated after it passed south of St. Joseph. Here, the river had remained low, so it absorbed the flood waters. By the time the crest reached Kansas City, the river did not top flood stage.[11] All told, in the valley between Bismarck and the vicinity of St. Joseph, the Missouri River inundated 700,000 acres and caused damages estimated at $8 million.[12] The Corps kept silent about the possible effects of the channelization structures on flood levels. Instead, Corps officials claimed that the flood would have been much worse had it not been for the presence of Fort Peck Dam. Colonel Lewis Pick of the Missouri River Division asserted,

> ...we might have had a new record in this part of the river, if we had not been storing water during that entire time in the Fort Peck reservoir. It has been estimated that if the water from the upper Missouri captured by Fort Peck had been free to come down to join with that from the Yellowstone and the other tributaries, the gauge at Omaha would have read two feet, three inches higher than it did. Not only would Omaha have been inundated but, in my opinion, it probably would have been impossible to keep the flood waters out of Council Bluffs and Sioux City.[13]

Yet, Fort Peck Dam could not halt the continuation of record-setting flooding along the Missouri River during the month of May. Between 6 May and 20 May, the channelized river below Kansas City went out of its banks after heavy rains fell in the Grand, Gasconade, and

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[10]Sioux City Journal, *Flood Waters Recede at Omaha Airport,* 16 April 1943.

[11]Lewis A. Pick, *A Valley-Wide Program of Development*, in The Future Development of the Missouri River Valley. A Report on the Program and Activities of the Missouri River States Committee, (Chicago: The Council of State Governments, 1944), 12.

[12]U.S. Army Corps of Engineers, The Federal Engineer, 75.

[13]Lewis A. Pick, *A Valley-Wide Program of Development*, in The Future Development of the Missouri River Valley, 12.

Osage watersheds. These three tributaries dumped so much water into the Missouri that it surpassed the level of the 1844 superflood along its lower 140 miles. This second flood submerged an additional 540,000 acres of agricultural land across the central portion of the state of Missouri.

If the second Missouri River flood of 1943 did not push the endurance of valley residents to the limit, the third flood did. This flood resulted from the convergence of two natural phenomenon. In June, a considerable snowpack above five thousand feet elevation melted and drained into the Missouri's largest tributary, the undammed Yellowstone River. High water from this stream entered the Missouri below Fort Peck Dam, resulting in the formation of a moderate-sized June rise. At the same time that the June rise passed Omaha, a series of heavy thunderstorms struck Kansas and Missouri. One storm dropped seven inches of rain across the Kaw River Basin in a few hours. In a striking similarity to the flood of 1903, a torrent descended the Kaw only to converge with an already overflowing Missouri. The resulting deluge covered an estimated 960,000 acres of farmland between St. Joseph and the mouth. During that wet spring and summer, the Missouri inundated a total of 1.8 million acres of agricultural land at least one time. Hundreds of thousands of acres were submerged two or three times. Civil and military authorities estimated that the damages to roads, bridges, farms, and factories equaled $47,300,000.[14]

In addition to the destruction of private property and infrastructure, the floods battered the Corps' piles dikes and revetments. After the waters had receded, engineers from the Kansas City and Omaha district offices traveled up and down the navigation channel, inspecting the status of their work. They discovered a sobering truth; the control structures had failed to

[14]Paul L. Harley, *The Gestation Period of the Pick-Sloan Missouri Basin Plan,* in Pick-Sloan Missouri Basin Plan, proceedings of a conference held in Des Moines, Iowa 10-11 August 1983, by the Missouri Basin States Association, 1983, 7. Branyan, Taming the Mighty Missouri, 45.

keep the river in place. Officials concluded, "Subsequent high waters have accelerated the destructive erosion of unprotected concave banks, flanked and destroyed many existing installations, and have resulted in complete loss of alignment control in some sites with progressive loss of alignment threatened at additional sites through natural actions of an uncontrolled river reverting to a wild state."[15] The engineers were losing the river.

The floods of 1943 also disrupted rail and river traffic along the Missouri and Mississippi rivers during the emergency wartime situation. Successive periods of high water prevented the planting of crops in the valley which in-turn lowered agricultural production needed to supply American troops in the field in Europe and Asia. Flood waters damaged military installations, delayed the training of troops, and required the diversion of supplies and equipment slated for the war front to the flood zone. Eleven people lost their lives to the floods and untold numbers of hogs, cattle, and chickens drowned in the turbid stream.[16]

The floods of 1943 had significant consequences for the future of Missouri River development. The repeated freshets convinced the residents of the lower basin states of Iowa, Missouri, and Kansas to finally join with their frustrated neighbors to the north to push for a dam-building program for the Missouri River. During the drought years of the 1930s, lower valley residents, and their state and federal representatives, opposed Dakota dams for fear that the structures would reduce the already depleted flow of the river and deprive the six-foot navigation channel of the water needed to support barge traffic. But after the floods of 1943, lower valley interests realized that the only means of protecting their cities, farms, and $185 million dollar navigation channel from recurring high flows would be through the

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[15] ARCE 1944, 1022.

[16] Lewis A. Pick, *A Valley-Wide Program of Development*, in The Future Development of the Missouri River Valley, 13.

construction of dams upstream.[17] And the only place where Corps flood control dams and reservoirs could be built was across the main stem of the Missouri in North and South Dakota.

In order to secure flood protection, the governors of the lower basin states of Iowa, Missouri, and Kansas joined the Missouri River States Committee (MRSC) on 21 May 1943.[18] This was only days after the second flood had passed through central Missouri. Representatives from Iowa, Missouri, and Kansas joined the MRSC to advance their own agenda, not to support upper basin development plans.[19] Environmental circumstances forced this reluctant alliance. The lower river states needed South Dakota's assistance in order to advance their plans. South Dakota's geographical position along the main stem of the Missouri made it the key state in any future flood control program. Cost-effective dams could not be built below Yankton and reservoirs confined to North Dakota and Montana would not capture enough tributary run-off to significantly lower flood levels at Omaha, St. Joseph, and Kansas City. The inability of Fort Peck Dam to prevent the floods of 1943 clearly demonstrated the danger of building dams too far up on the main stem. Dams in South Dakota would capture the run-off from eleven sizable tributaries, the same tributaries that had caused so much damage in April, May, and June 1943. Therefore, local, state, and federal officials from Iowa, Missouri, and Kansas worked to gain the support of the people of South Dakota and their government representatives for their own dam-building program.[20]

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[17]ARCE 1944, 944, 1022.

[18]Sharpe, *History of the Missouri River States Committee,* 405.

[19]Marian E. Ridgeway, The Missouri Basin's Pick-Sloan Plan: A Case Study in Congressional Policy Determination, (Urbana: The University of Illinois Press, 1955), 173.

[20]Ibid., 212, 213.

Lower valley residents also petitioned Congress to direct the Corps of Engineers to study the feasibility of constructing flood control dams across the Missouri main stem.[21] In May 1943, Congress ordered the Chief of Engineers to proceed with such a study.[22] At the time of the 1943 flood, Colonel Lewis Pick served as the head of the Missouri River Division located in Omaha, Nebraska. Pick oversaw the two Corps districts that worked on the river, the Kansas City District and Omaha District. He was also in charge of managing the navigation channel.[23] The Chief of Engineers commanded Pick to conduct the survey and provide recommendations on methods to control flooding in the lower valley.

While Pick prepared his survey and recommendations in the summer of 1943, the MRSC recognized the importance of South Dakota to any future dam-building program by appointing Governor Merrill Q. Sharpe of South Dakota as the committee's chairman.[24] Under Sharpe's direction, the MRSC conducted a massive promotional campaign throughout the valley to gain public support for dams in the Dakotas, further channelization work, and the construction of a levee system adjacent to the river from Sioux City to the mouth. The MRSC sponsored meetings in cities all along the river during 1943. Bismarck, Pierre, Sioux City, Nebraska City, and St. Joseph hosted conferences.[25]

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21 Charles B. Hoeven, member of the U.S. House of Representatives from Iowa, *What Congressmen Say*, in The Future Development of the Missouri River Valley, 29. Bennett C. Clark, member of the U.S. Senate from Missouri, *What Congressmen Say*, in The Future Development of the Missouri River Valley, 33, 34.

22 Hart, The Dark Missouri, 120.

23 "Pick-Sloan Missouri Basin Plan," Proceedings of a Conference, x. U.S. Congress, House of Representatives, Statement of M.Q. Sharpe, Governor of South Dakota: Hearing before the Committee on Flood Control, 78th Cong., 2nd sess., 16-17 February 1944, 3.

24 Sharpe, *History of the Missouri River States Committee,* 405.

25 Robert Hipple, former member of the Missouri Basin Interagency Committee, interview by author, tape recording, Pierre, South Dakota, 20 May 1992.

At the MRSC-sponsored meetings, Army engineers and Bureau of Reclamation field agents explained the technicalities of river development, or how the river would actually be engineered to meet society's demands for water, hydroelectricity, flood control, and navigation. Members of the local chamber of commerce and state political representatives then stepped forward and explained the economic benefits of harnessing the water of the river. At Sioux City's Martin Hotel in August, nearly 200 prominent citizens and government officials listened to Pick and Sharpe espouse their vision for the Missouri Valley. Colonel Pick proclaimed that the Army engineers could build dams that would provide, "a source of power to pump water for irrigation, keep the proposed [nine-foot] navigation channel open even in low water seasons and operate industrial and electrical plants." The colonel asked the assembled crowd to lobby Congress for the funds necessary to start the construction of upstream dams following the close of World War II. Pick pleaded, "This great project will cost millions of dollars and of course we cannot expect to do very much, if anything, in the way of building until the war is over. But I do not see any reason why this improvement cannot be incorporated in any postwar program which may be inaugurated by the federal government."[26] The colonel recognized that Corps influence on the Missouri River ultimately rested with the people living in the valley, especially the lower valley. The colonel ended his presentation with the following words of caution, "The Missouri River Valley is the last great valley in the United States whose water potentialities have not been developed. ...If the river is not properly under control the results will be disastrous." When Sharpe took the podium he said, "Now is the time for action. The prospects for success are excellent. They may never be any better."[27] The public relations strategy of the MRSC

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[26]Sioux City Journal, *Flood Control More than a Dream*, 24 August 1943.

[27]Ibid.

resulted in widespread public acceptance of the idea of building dams and reservoirs along the upper river. There was little, or no, organized opposition within the basin to further damming of the Missouri River and using its waters to stabilize and promote the basin's economy.[28]

Congressman Max Schwabe, whose district encompassed several counties along the river in central Missouri, provided members of the MRSC with a clear example of the overwhelming public support that existed in the valley for additional river development. Schwabe noted that "612 people registered and attended a recent flood conference" in Boonville, Missouri. This group of individuals concluded that "flood control is a federal problem and a federal responsibility." With that in mind, the group recommended that "the operation of dams in the Missouri River Valley should be governed in such a manner as to eliminate as far as possible the flooding and damaging of agricultural lands...." The river boosters also agreed to "petition our Senators and our Representatives to sponsor and to support all legislation found to be necessary or required to accomplish the purposes set forth in these resolutions." Grassroots organizations once again sought federal cooperation for development of the Missouri.[29]

Any opposition to a basin-wide approach to controlling the Missouri River arose over the design specifications of the dams, not the dams themselves. Different economic and political interests wanted different aspects of the dam-building plan stressed over others.[30] Senator

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[28]Hipple interview 1992.

[29]Max Schwabe, member of the U.S. House of Representatives from Missouri, *What Congressmen Say*, in The Future Development of the Missouri River Valley, 35, 36.

[30]Sharpe, *History of the Missouri River States Committee,* 407. Max Schwabe, member of the U.S. House of Representatives from Missouri, *What Congressmen Say*, in The Future Development of the Missouri River Valley, 35.

Gerald P. Nye of North Dakota succinctly stated the issue, "In the south end of the valley you have one problem and in the north end we have another. Some want control of these waters, some want access to these waters."[31] Farmers, business people, and politicians from the upper basin (Montana, North Dakota, South Dakota, and Wyoming) represented by the National Reclamation Association, South Dakota Reclamation Association, Montana Stockgrowers Association and a number of chamber of commerces wanted dams that met their needs for irrigation and hydroelectric power.[32] Whereas, lower basin residents from Kansas, Missouri, Iowa, and Nebraska, led by the Kansas City Chamber of Commerce, Mississippi Valley Association, and the National Rivers and Harbors Congress, wanted a plan that protected their urban centers from devastating floods, opened their cities to deep-draft barge traffic, and provided them with cheap power.[33] The goals of the upper and lower valley did not coincide. If the upper basin irrigationists received the water they wanted for their crops, commercial interests along the lower river believed they would have to abandon their navigation channel. Both upper basin and lower basin residents understood that water required to sustain a six-foot or possibly nine-foot navigation channel for eight months each year would lower the proposed upstream reservoirs and siphon off water required for irrigation. No one in the MRSC had an immediate solution to this conflict of interest.

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[31]Gerald P. Nye, member of the U.S. Senate from North Dakota, *What Congressmen Say*, in The Future Development of the Missouri River Valley, 38.

[32]Arthur Svendby, president of the South Dakota Reclamation Association, *The Opinions of Organizations in the Valley*, in The Future Development of the Missouri River Valley, 60.

[33]U.S. Congress, House of Representatives, Statement of M.Q. Sharpe, Governor of South Dakota: Hearing before the Committee on Flood Control, 78th Cong., 2nd sess., 16-17 February 1944, 9. Ridgeway, The Missouri Basin's Pick-Sloan Plan, 212, 213.

Pick completed his flood control survey and recommendations and submitted the report to Congress on 10 August 1943, less than three months after being given the assignment.[34] The plan devised by Pick sought to accomplish three interrelated objectives. First, the colonel sought to provide flood protection to urban centers, infrastructure, and farms in the valley below Yankton. Second, he hoped to protect the $185 million dollar navigation channel from eventual destruction. And third, he wanted to supply consistent flow volumes to the navigation channel to encourage barge traffic.

To achieve these objectives, Pick recommended the construction of four of the world's largest earthen-fill dams along the main stem of the Missouri River in North and South Dakota. These dams would capture the Missouri's annual spring and summer rise and release the stored water at a uniform rate to maintain a nine-foot navigation channel below Sioux City. Pick's dams would be built to provide water for a nine-foot navigation channel that did not yet exist.

Under the Pick Plan, the Corps proposed building dams at Garrison in North Dakota and Oahe (Pierre), Fort Randall (Lake Andes), and Gavin's Point (Yankton) in South Dakota.[35] The dams at these four locations would fulfill lower basin demands for flood control and navigation and provide only incidental irrigation and hydroelectric power benefits.[36] The *Comprehensive Report on Missouri River Development*, which was an Army Corps policy paper, stated that, “Exclusive power storage would not be provided but power would be

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[34]U.S. Army Corps of Engineers, The Federal Engineer, 75.

[35]Ibid., 76.

[36]Hipple interview 1992. Hart, The Dark Missouri, 121-125.

generated with water released for navigation and sanitation purposes."[37] The Corps made it clear that upper basin demands for irrigation water and hydroelectricity would be secondary to lower basin demands for navigation. Not suprisingly, lower valley interest groups, such as the Kansas City Chamber of Commerce and the Mississippi Valley Association, fully endorsed the Pick Plan.

The Pick Plan also called for the construction of low, re-regulating dams below the bigger dams. Re-regulating dams would eliminate destructive water surges when the big dams released large amounts of water. Re-regulation would be necessary to prevent high water from eroding river banks, disrupting downstream navigation, and disturbing municipal water supplies. The Corps' *Comprehensive Report on Missouri River Development* stated that re-regulating dams needed to "be constructed a short distance downstream of each major dam, sufficiently high to create poundage to permit releases from the lower dam at a uniform rate."[38] Under this scheme, re-regulating dams would be built below the dams at Garrison, Oahe, and Fort Randall. The site for the re-regulating dam below Fort Randall had already been chosen at Gavin's Point near Yankton. A dam in the vicinity of the Big Bend of the Missouri would serve as Oahe's re-regulating dam. The Army Corps had not chosen a definite site for a re-regulating dam below Garrison (Figure 9.1).

Late in 1943, the Corps submitted the Pick Plan to Congress for authorization. The submission of the Pick Plan to Congress split the Missouri River States Committee along regional lines. Prior to the plan's submission, the Corps and its rival bureaucracy within the federal government, the Bureau of Reclamation, (which wanted access to the Missouri's

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[37]Department of the Army, U.S. Army Corps of Engineers, Omaha District, Comprehensive Report on Missouri River Development, Appendix VIII, Plan of Improvement, (Omaha: U.S. Army Corps of Engineers, 1944), 4.

[38]Ibid., 20.

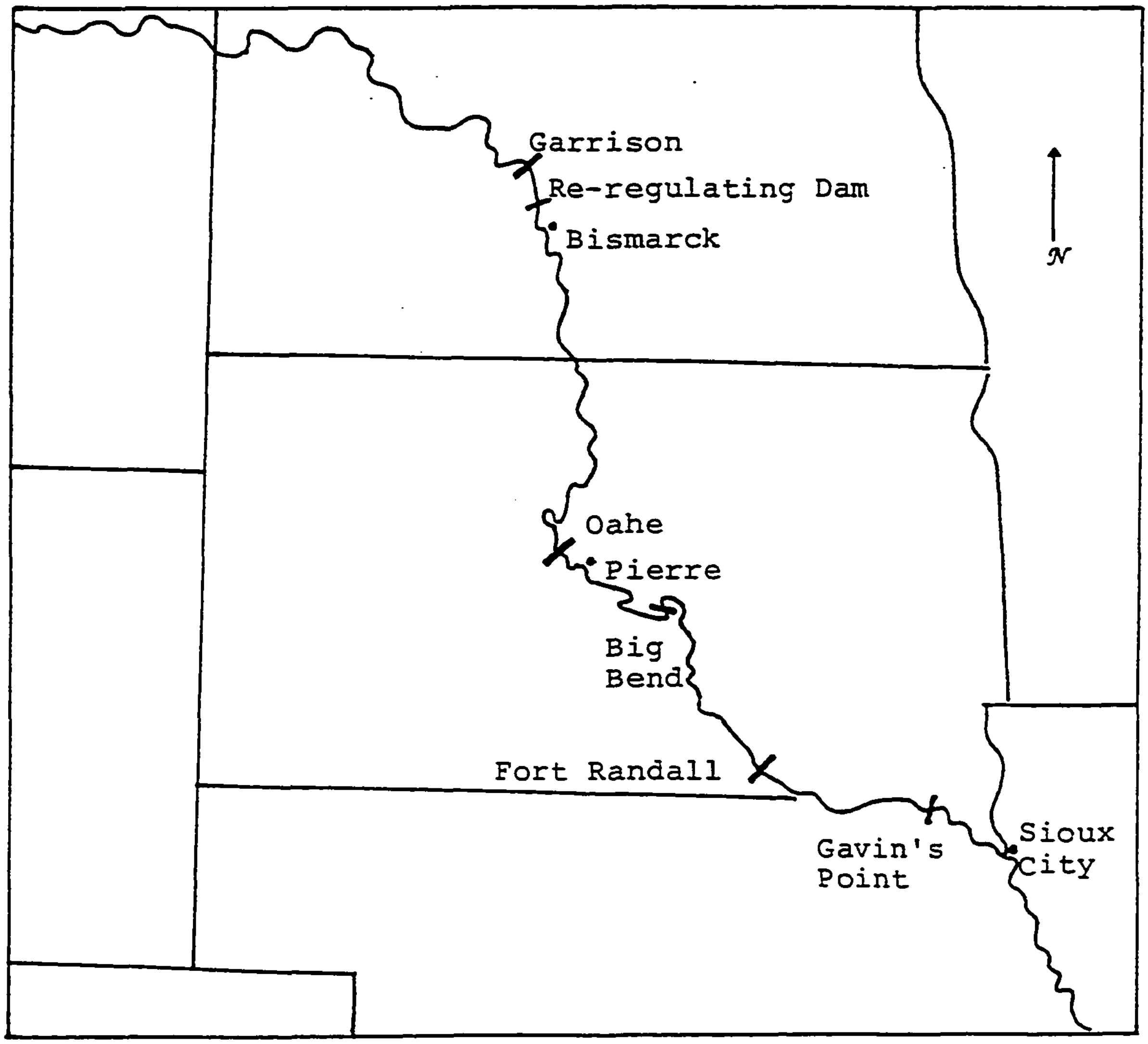

Figure 9.1. The Pick Plan dams. Colonel Lewis Pick of the Missouri River Division, Corps of Engineers, responded to lower basin demands for flood protection and a dependable water supply for a nine-foot navigation channel by proposing the construction of Gavin's Point, Fort Randall, Oahe, and Garrison dams. In addition, the colonel believed re-regulation dams would need to be located below the high dams at Garrison and Oahe. Map by author.

water to expand its regional influence) maintained a functional working relationship within the MRSC. The public disclosure of the Pick Plan in February 1944 destroyed that alliance and pitted the Bureau of Reclamation and its upper basin constituency against the Corps and its lower basin supporters.

MRSC Chairman Merrill Q. Sharpe favored the Pick Plan because it was the first development program ever submitted to Congress that proposed construction of dams in South Dakota.[39] Although the plan favored navigation interests over irrigation, Sharpe considered it the best and only plan available. Governor Sharpe also supported the plan because he realized that South Dakota would benefit substantially from its implementation. Four of Pick's dams (Oahe, re-regulation dam at Big Bend, Fort Randall, and Gavin's Point) would be built in Sharpe's state.

With Sharpe and the South Dakota representatives, including influential newspaper publisher Bob Hipple of Pierre, siding with the lower basin and the Corps of Engineers, lower river interests scored a major political victory in their efforts to develop the river for their particular purposes. South Dakota's defection to the lower basin placed the remaining upper basin states within the MRSC at a distinct disadvantage in the negotiations and discussions concerning the specifications of the proposed dam-building program. But representatives from North Dakota, Montana, and Wyoming, along with officials of the Bureau of Reclamation, could still create federal legislative problems for the proponents of the Pick Plan by delaying or attempting to kill any future river development projects.[40]

Sharpe sought to gain the support of the other upper basin states by convincing them of the Pick Plan's benefits. During congressional hearings held on the Pick Plan in February 1944, Sharpe urged cooperation between the various basin interests. He presented an

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[39]Hipple interview 1992. Congress, Statement of M.Q. Sharpe, 3.

[40]Hipple interview 1992.

insightful analysis of the problems and potentials of river development. The South Dakota governor noted that the conflict between the irrigation and navigation interests was predicated on a perceived shortage of water. He believed this conflict could be resolved through the construction of dams that had enough reservoir water storage capacity for both lower basin and upper basin needs.[41] Sharpe added, "I think a complete answer for many years to come is found in the single word, storage."[42] Sharpe concluded his analysis by warning everyone that if the proper amount of reservoir water storage did not mend the split in the MRSC and between upper and lower basin state and federal officials, then the entire dam-building scheme would be threatened. He admonished his listeners, "It seems to me that such a result [increasing reservoir water storage capacity] should be reached rather than letting any conflict of interests bring the matter to an impasse which will deprive the Missouri Valley and the nation of the multiple benefits to labor, agriculture, business, postwar adjustment, and other national objectives which require that the project get started now. . . ."[43]

Assurances of goodwill by the Corps and Sharpe to build more storage into their Pick Plan were not enough to convince the Bureau of Reclamation and upper basin irrigationists that their interests would be satisfied by that plan. In May 1944, the Bureau of Reclamation responded with its own dam-building plan for the Missouri, which emphasized irrigation and hydroelectric power.[44] This plan became known as the "Sloan Plan," named after its author, William G. Sloan, a Bureau of Reclamation field agent stationed in Billings, Montana. Sloan's Plan called for the construction of dams on the main stem of the Missouri River at

[41]Congress, Statement of M.Q. Sharpe, 9.

[42]Ibid., 11.

[43]Ibid., 11.

[44]Hart, The Dark Missouri, 127.

Oahe (Pierre), Big Bend (thirty miles north of Chamberlain), and Fort Randall (Lake Andes) (Figure 9.2). Like the Corps, the Bureau of Reclamation recognized South Dakota's geographical importance to the construction of main stem dams. The dams at Oahe and Fort Randall would provide the necessary water storage to irrigate land in both North and South Dakota, while Big Bend would be used almost exclusively for the generation of electricity. The bulk of the land Sloan hoped to irrigate was located in eastern South Dakota in the James River Valley. Sloan proposed that his three dams each produce hydroelectricity to pump water from their reservoirs to the irrigation fields and any surplus hydroelectricity would be sold to either public or private utilities to help offset the costs of the projects.[45] Sloan's plan departed quite significantly from the Pick Plan. Sloan did not include Garrison or Gavin's Point dams in his proposal. Sloan did not deem it necessary to build Gavin's Point Dam because he did not intend on re-regulating large water discharges for the purpose of downstream navigation. Under Sloan's plan, Missouri River water would be diverted eastward toward the James Valley, not sent downstream to support barge traffic.

The submission of the Sloan Plan led Sharpe on a frantic effort to mend the split between the upper and lower basin states and between the Bureau of Reclamation and the Corps. Sharpe desperately tried to save any plan to build dams in his home state with federal financing. On 5 August 1944, Sharpe convened a meeting of the MRSC in Omaha, Nebraska. At this gathering, the upper and lower basin interests recognized the folly of attempting to develop the Missouri River without each other's cooperation. If the upper basin and lower basin went their own separate ways, the future dam-building plans would be jeopardized by the political and legal infighting that would result. Congress would not authorize the construction of two programs for the Missouri River that were in direct conflict. With this realization in mind, the upper basin states and the Bureau of Reclamation joined

[45]Ibid., 125.

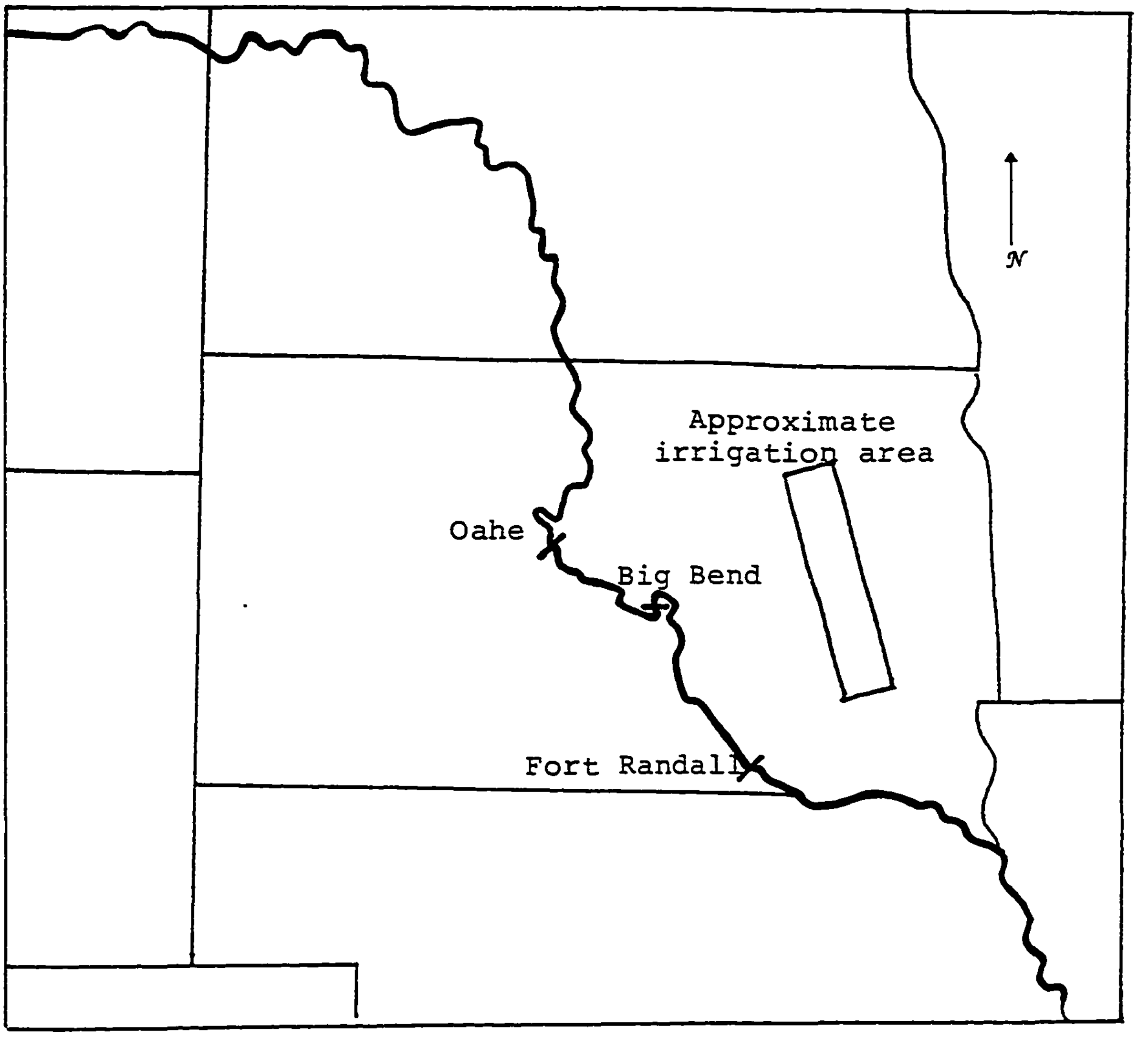

Figure 9.2. The Sloan Plan dams. Field agent William G. Sloan of the Bureau of Reclamation proposed the construction of three main stem dams in South Dakota. These structures would provide irrigation water for farmers in the James River Valley. Oahe and Fort Randall reservoirs would supply much of the water for irrigation and Big Bend Dam would be designed primarily for the production of hydroelectricity. Map by author.

with the lower basin states and the Corps of Engineers to create a revised dam-building plan that supposedly would meet the needs of all interested groups.[46]

At the Omaha meeting in August 1944, the MRSC passed a resolution and then distributed it throughout the federal government's executive and congressional branches. This resolution was crucial to the creation of the Pick-Sloan compromise. Point five of the resolution declared, "We ask the President and the Congress of the United States to authorize and direct the United States Army Engineers and the United States Bureau of Reclamation to bring before Congress a coordinated plan...."[47]

The success of the compromise between the Corps of Engineers and the Bureau of Reclamation and between the upper and lower basin states was contingent upon the successful site selection and design of multiple-purpose dams. The dams proposed by the Bureau of Reclamation in the Sloan Plan and by the Army Corps in the Pick Plan were designed almost exclusively for their particular constituencies. If the compromise was going to work and the interest groups of the entire basin were to avoid legal haggling over the river's water, the original Pick Plan and Sloan Plan had to be altered, new dam sites considered, each previously proposed dam redesigned, and reservoir water storage capacities increased. Only by making these alterations would it be possible to insure continued congressional and upper basin support for the damming of the Missouri River.[48]

There were a number of hurdles that had to be overcome in order for the multiple-purpose dam concept to be successful in the Missouri Valley. First, proper sites had to be chosen for the construction of the dams. Second, the dams and reservoirs had to be designed in minute

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[46]"Pick-Sloan Missouri Basin Plan," Proceedings of a Conference, 12.

[47]Ibid., 13.

[48]Congress, Statement of M.Q. Sharpe, 11.

detail to insure that all basin interests were met. And third, the weather had to cooperate by producing enough rainfall to fill the reservoirs. The first two hurdles could be overcome with the proper application of technology and money. The third hurdle was beyond the control of anyone, and this worried everyone. If the rains did not fall on the Great Plains, and the completed reservoirs remained below storage capacity, the states of the basin would likely fight over the limited water supply.

In order to insure the success of the multiple-purpose dams, the Corps, MRSC, and the Bureau of Reclamation, had to agree on the proper sites.[49] Site selection was dependent upon geology, cost-effectiveness, demographics, and political considerations.

Geological factors weighed heavily in selecting the final dam sites for the Pick-Sloan Plan. The geological character of the Missouri Valley limited the area of possible sites to the upper basin. From Fort Peck Dam in Montana to Yankton, South Dakota, the Missouri Valley had a width of from one to five miles. Below Yankton, the valley width varied from five to seventeen miles. A narrow valley was more conducive to dam construction for two simple reasons: cost and safety. Dams in the lower reaches of the river would cost exorbitant amounts of money because of the earth fill required to block the flow of water through the wide valley. Also, long dams in the lower valley would be more likely to fail because sub-surface mineral deposits are less stable over long stretches. With that in mind, the engineers and politicians focused their attention on the Missouri Valley in North and South Dakota where the valley was narrower and more stable subsurface minerals existed.[50]

The sub-surface mineral deposits in the Dakotas further restricted the available choice of sites. The Missouri Valley in South Dakota is underlain with deposits of Pierre shale and Niobrara chalk. Both of these subsurface minerals were deemed suitable for the placement of

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[49]Ridgeway, The Missouri Basin's Pick-Sloan Plan, 173.

[50]Corps of Engineers, Plan of Improvement, 16.

large earth-fill dams. The depth of these minerals affected the cost of the dams. Since the dams had to be attached to the chalk or shale, it would cost more to dig deep and attach the dams to these materials.[51] As a result, a factor in choosing a damsite was the proximity of these materials to the surface.

Another geological consideration was the relation of the sites to tributaries of the Missouri River. The engineers wanted to insure that the dams captured all, or most, of the water entering the valley from its tributaries. If a major tributary's water was not captured by a dam on the Missouri, its flood waters would be able to flow downstream and wreak havoc on urban centers and agricultural lands as well as disrupt navigation.[52]

Other factors besides foundation conditions and valley width affected the cost-effectiveness of the dam sites chosen for the Pick-Sloan Plan. Engineers had to consider the location of the sites in relation to available transportation facilities in the Dakotas. Large pieces of machinery and equipment would have to be brought to the site by railroad and highway. If a site was located far from a railhead or highway, the cost of constructing roads to the site would lower its attractiveness.[53] The proximity of the dams to towns, hospitals, housing, and recreational facilities were also considered. The construction personnel had to be provided with medical care, food, clothing, and shelter. If the Corps had to construct these facilities at the site, the cost of the project would quickly become exorbitant. Therefore, sites near cities or towns that had established facilities were preferable.[54]

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[51]Department of the Army, U.S. Army Corps of Engineers, U.S. Army Engineer District, Omaha, Missouri River, Big Bend Reservoir, South Dakota, Design Memorandum Number MB-1, Site Selection, (Omaha: U.S. Army Corps of Engineers, 1957), 4-7.

[52]Corps of Engineers, Plan of Improvement, 15.

[53]Corps of Engineers, Design Memorandum Number MB-1, 4-8.

[54]Ibid., 4-5.

The engineers also considered the difficulty and cost of acquiring the lands needed for the reservoirs and the cost of relocating valley residents. Prime lands or expensive urban real estate in the proposed reservoir area would increase the overall cost of the dam; therefore, underutilized or cheap low quality land was preferable.[55] Furthermore, moving a large urban population would cost far more than moving widely dispersed rural residents. A related consideration was the cost of relocating facilities. Railroad bridges, sewer facilities, buildings, and other property would have to be moved out of the reservoir areas. An additional factor in the cost-effectiveness of the multiple-purpose dam sites was the distance transmission lines had to be built to carry the hydroelectric power from the site to the available market.

Thus, the biggest influence on the site selection process for the proposed Pick-Sloan Plan dams was the relation of the dams and reservoirs to urban centers in the Dakotas. Each dam and its resultant reservoir had to spare the large urban centers along the Missouri River while still providing the reservoir storage capacity to meet the water demands of basin interest groups. The importance of the population centers to the site selection process was explicitly stated in the 1944-1945 *Comprehensive Report on Missouri River Development*,

> In determining the location of the multiple-purpose reservoirs, consideration must be given to the existence of cities which might be wholly or partially inundated by these reservoirs, and the railroads and highways crossing the river in the reservoir areas. Larger cities in this category are Chamberlain, Pierre, and Mobridge in South Dakota, and Bismarck and Williston in North Dakota. Accordingly, the sites described in this report have been selected at such distances downstream from these cities that sufficient storage [in the reservoirs] will be provided without undue flooding of expensive real estate.... Thus the height to which Fort Randall Dam can be built is limited by Chamberlain and the railroad and highway crossings in that vicinity, while the proximity of the city of Pierre, S. Dakota, to the upper reaches of the Fort Randall Reservoir precludes any further consideration for dams below Pierre.[56]

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[55] Corps of Engineers, Plan of Improvement, 17.

[56] Ibid., 17.

The report continued, "One of the reasons for selecting the Garrison site was that it is above Bismarck. The storage limit for Garrison reservoir was dictated by damages imposed at and in the vicinity of Williston, near the Montana border."[57]

By late 1944, the Corps, Bureau of Reclamation, and the MRSC had come to an agreement on the selection of dam sites on the Missouri River. There would be five dams across the Missouri main stem. Four dams, Oahe, Big Bend, Fort Randall, and Gavin's Point, were to be located in South Dakota and the fifth dam would be built at Garrison in North Dakota (Figure 9.3). These five dam sites were chosen because of their favorable cost-to-benefit ratios and topographical attributes. Most importantly, the five dams and their respective reservoirs would minimize damage to major urban centers in the Dakotas while still providing the reservoir storage capacity to satisfy lower basin demands for navigation and flood control. The storage space would also be utilized to generate hydroelectricity and furnish some irrigation.

The MRSC did not have any Indian representation. Only off-reservation interests participated in the MRSC's hearings, organizational activities, congressional lobbying efforts, and deliberations surrounding the selection of dam sites and reservoirs. As a result of this exclusion from the political process, Indian lands and towns located along the Missouri River in the Dakotas did not receive the same degree of consideration as off-reservation cities received during the site selection and design phase of the Pick-Sloan dams.[58] The Corps, Bureau of Reclamation, and MRSC did not change the sites of any dams or reduce their reservoir storage capacities to spare Indian bottomlands or towns from inundation. The reason was simple. Any decrease in reservoir storage capacity to take into account Indian interests would have diminished the benefits received by off-reservation interests. For

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[57]Ibid., 17.

[58]Hipple interview 1992.

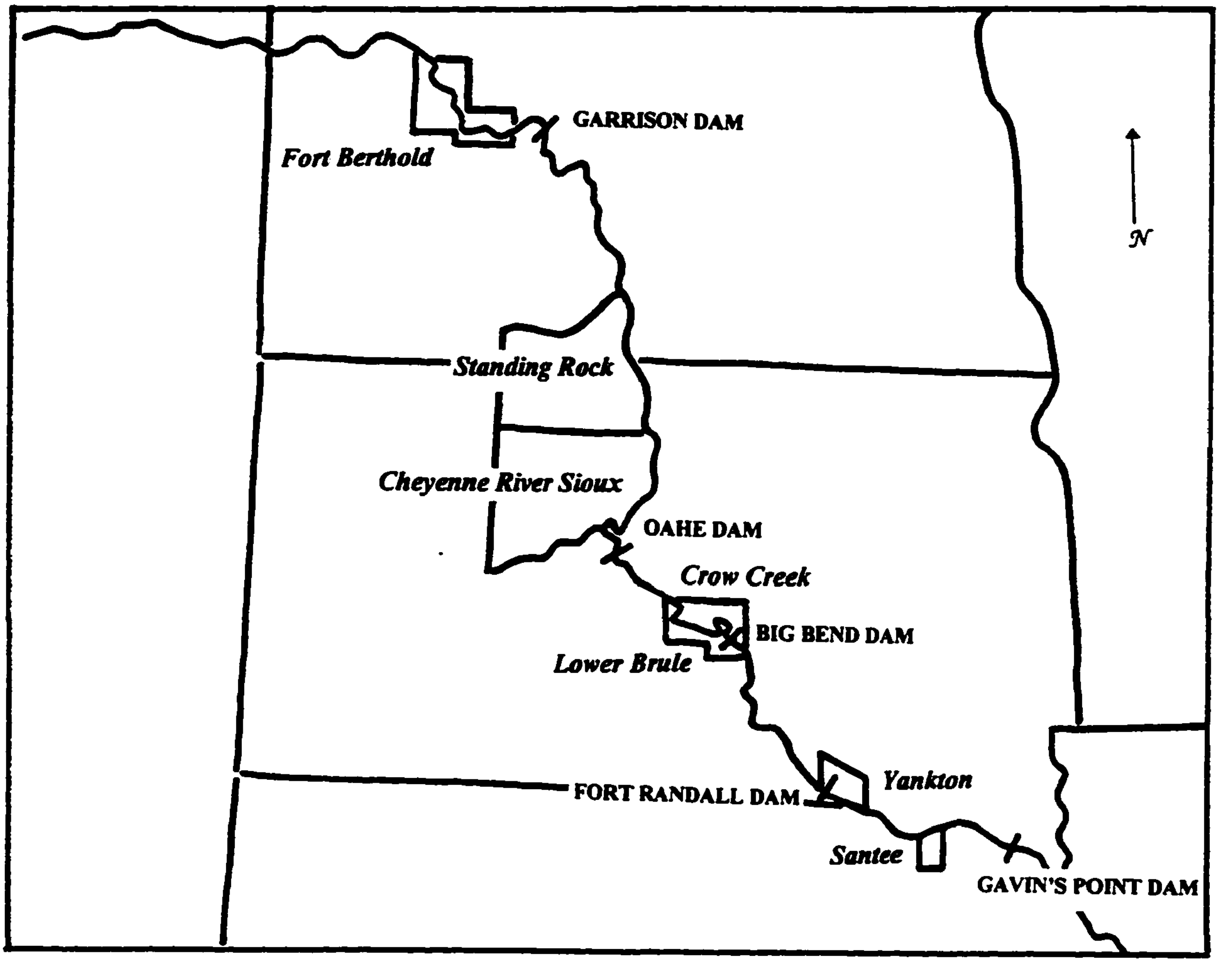

Figure 9.3. The Pick-Sloan Plan dams and Missouri River Indian reservations. The Corps of Engineers, in cooperation with the Missouri River States Committee and the Bureau of Reclamation, designed and built dams across the Missouri River main stem to provide multiple benefits to the off-reservation population of the northern Great Plains and upper Midwest. Those benefits depended on the construction of high dams with large storage capacities. The large reservoirs inundated hundreds of thousands of acres of Indian land in North and South Dakota. Map by author.

example, smaller reservoirs would have spared some Indian land while also reducing the amount of water available for navigation and irrigation purposes. A reduction in benefits to off-reservation interests may have lead to their withdrawal of political support for the Pick-Sloan compromise and prevented the passage of future appropriations bills. Therefore, Indian interests in preserving their lands and old communities were ignored in order to make the Pick-Sloan Plan a reality.

In December 1944, Congress authorized the construction of the five Pick-Sloan Plan dams. Roosevelt signed the authorization into law on 22 December 1944. The power of lower valley interests to direct development became apparent when Congress gave the Corps of Engineers jurisdiction over the main stem dams. The dams would be operated to serve primarily navigation and flood control purposes. Just a few months later, in March 1945, Congress (again responding to the political influence of the Mississippi Valley Association, National Rivers and Harbors Congress, and the Kansas City Chamber of Commerce) authorized the construction of a nine-foot deep navigation channel from the mouth to Sioux City. This law meant that the future Pick-Sloan Plan dams would supply water for the new, deeper channel instead of irrigating the James River Valley or the parched fields of North Dakota.[59]

Immediately following the close of the Second World War, the Corps began construction on two of the five Pick-Sloan dams. In 1946, work commenced on Fort Randall Dam in southeast South Dakota and Garrison Dam in north-central North Dakota.[60] Fort Randall Dam's location far down along the Missouri main stem, along with its tremendous size, made it the key structure of the Pick-Sloan Plan. Situated thirty-five miles above the mouth of the Niobrara River and just a few hundred feet from the site of the old military post bearing its

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[59]Ferrell, Soundings: One Hundred Years of the Navigation Project, 97.

[60]Sioux City Journal, 1 August 1946.

name, the Fort Randall Dam would be able to impound water entering the Missouri from nearly all of its plains tributaries, including the Milk, Yellowstone, Little Missouri, Knife, Heart, Cannonball, Grand, Moreau, Cheyenne, Bad, and White rivers. Although Garrison Dam would eventually capture the waters of the Milk, Yellowstone, and Little Missouri, Fort Randall Dam could have conceivably stood alone across the main stem and still provided significant flood control benefits for the lower valley.[61] Engineers claimed that Fort Randall, when closed, would take a minimum of four feet off the crest of any future superflood south of Sioux City. The dam would guarantee substantially lower flood levels along the Missouri Valley in western Iowa, but would not stop floods. Uncontrolled tributaries, such as the James and Big Sioux, would still flow into the Missouri below the dam.[62]

In addition to its role in flood control, Fort Randall Dam would be vitally important to the success of the navigation channel. The dam's location meant it would be the primary supplier of water for the nine-foot channel. Engineers planned to use one-third of Fort Randall's reservoir storage capacity to hold flood waters. Another one-third, or more, would generate electricity and maintain flows through the navigation channel. The remaining one-third of the reservoir would serve as a permanent pool. According to the Corps, "The permanent pool provides minimal water level necessary to allow the hydropower plants to

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[61]Des Moines Register, *160-Ft. Fort Randall Dam to Control Flood Waters,* 14 September 1947. U.S. Army Corps of Engineers, Missouri River Division, Missouri River Master Water Control Manual, Review and Update Study, Draft Environmental Impact Statement, Description of Existing Environment, 3.0, (Omaha: U.S. Army Corps of Engineers, Missouri River Division, 1994), 3-5.

[62]Omaha World Herald, *Fort Randall Dam Is Ready to Guard River,* 26 October 1952.

operate and provide reserved space for sediment storage."[63] None of Fort Randall's water would be available for use in irrigation.[64]

Because of Fort Randall's import for future flood prevention and navigation, the Corps requested congressional funding for this structure before any of the other dams. Once Congress allocated the money, the Corps began construction. On 1 August 1946, a crowd of 6,000 restless spectators gathered along the hills overlooking the future site of Fort Randall Dam. People sat in the grass, walked aimlessly along the bluff-line, or just stood silent under the beaming sun, waiting for the start of the ceremony. On a grandstand in front of the assembled audience stood General Pick, Governor Sharpe, Governor Dwight B. Griswold of Nebraska and Mayor Forrest M. Olson of Sioux City. In the background, the American flag flew prominently above the men, snapping as a brisk south wind whipped it back and forth. Sharpe was one of the first to speak. He told his listeners about the multiple benefits the great dam would provide to residents of the Missouri Valley and beyond. Pick also reiterated the importance of the dam to the stabilization of the area's economy. After all the dignitaries had spoken, Pick walked over to an electrical plunger, pushed down the handle, and set-off a charge of dynamite that blew away the side of a bluff where the future spillway of the dam would be built. Construction of Fort Randall Dam had begun.[65]

The first order of business for the Corps of Engineers was to organize a logistics system to insure that men, equipment, and supplies could reach the dam site. Engineers built a railroad

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[63]U.S Army Corps of Engineers, Missouri River Division, *Current and Alternative Water Control Plans*, in Draft Environmental Impact Statement, Missouri River Master Water Control Manual Review and Update, (Omaha: Missouri River Division, 1994), 2-4.

[64]Des Moines Register, *160-Ft. Fort Randall Dam to Control Flood Waters,* 14 September 1947.

[65]Sioux City Journal, *Journal Photographer Helps Fort Randall Celebrate,* 1 August 1946.

spur from the Chicago, Milwaukee, St. Paul, and Pacific line that ran through Lake Andes eight miles to the northeast of the dam site. The railroad would be a key piece of technology used by the Corps to construct the earthen plug at Fort Randall. Over the rails traveled heavy earth-moving equipment, building materials, and eventually the huge turbines that would be installed in the dam's powerhouse. A little less than seventy years earlier, the railroad rendered the Missouri River transportation route obsolete and contributed to the human perception that the Missouri River and valley environment were wasted natural resources. Now, in the middle of the twentieth century, the railroad would be the main instrument in transforming the river valley environment.

In addition to building a railroad spur, the Corps supervised the construction of a highway from Lake Andes to the bluffs above the dam site.[66] Government engineers erected a whole new town on a series of bluffs just east of the dam site and named it Pickstown, in honor of the man who tirelessly promoted dams and channelization works along the Missouri River, General Lewis Pick.

By the spring of 1948, the Corps completed the necessary logistical base. Work on the dam itself could now begin in earnest. To start that work, the Corps hired thousands of men to drive trucks, operate bulldozers, lay concrete, and perform administrative tasks. A horde of workers, and their families, descended on the dam site.[67] At the peak of construction activity, upwards of 5,000 men worked on Fort Randall Dam.[68] The huge number of people temporarily overwhelmed the government housing at Pickstown. Some families actually lived in converted nineteenth-century streetcars that had been purchased in Sioux City and

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[66]U.S. Army Corps of Engineers, The Federal Engineer, 107.

[67]Des Moines Register, *6,000 to Live Here While Dam Is Built,* 14 September 1947.

[68]U.S. Army Corps of Engineers, The Federal Engineer, 108.

carried to Pickstown to meet the housing emergency. One family even had to take-up residence in a sheep shed and another hearty individual decided to save on the astronomical cost of rent by living in a filthy coal bin near the railroad tracks.[69] Over the course of the next six years, these men toiled to place a mound of dirt in the path of the Missouri River.

Three of the largest tasks involved in the construction of Fort Randall Dam included raising the embankment, digging the outlet tunnels, and excavating the approach channel from the river to the tunnels. The embankment would stop the flow of the river and impound its waters. The outlet tunnels would allow water to pass around the embankment and downstream. The approach channel would route the river away from its former channel, keep it from abutting against the embankment's upstream side, and direct it to the openings in the outlet tunnels. To accomplish these three tasks, the engineers adhered to the following construction sequence. First, the earthen embankment would be raised on one side of the river to its final height and on the other side of the stream to a height sufficient to avoid being topped by high flows. Second, the outlet tunnels would be completed and the approach channel dug from the river to the tunnel openings. An earthen plug would remain in place at the upstream end of the approach channel to prevent the Missouri from flowing through the tunnels prematurely. While this work progressed, the Missouri River would be allowed to flow through a 1,000-foot-wide gap between the two sections of the embankment. Once these three tasks had been accomplished, the Corps would close the remaining gap and route the river through the outlet tunnels. This construction sequence remained essentially the same for all the dams built on the main stem of the Missouri under the Pick-Sloan Plan.[70]

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[69] Des Moines Register, *Fort Randall Dam Sets Off Dakota Boom,* 18 July 1948.

[70] Sioux City Journal-Tribune, *'Muddy Mo' Meets Master As Dredge Outsilts Silt,* 21 July 1952. Des Moines Register, *Mighty Missouri Rolls Quietly Under Shackles,* 8 August 1952.

The earth for the embankment came from the bluffs adjacent to the river valley.[71] Massive Marion 191-M draglines tore eleven cubic-yard strips of dirt from the bluffs and dropped the earth into the back ends of gigantic Mack trucks.[72] Five scoops from the dragline filled each truck with material.[73] The loaded trucks then rumbled down the bluffs to the section of the embankment being raised. There, the trucks dumped their loads. A bulldozer then spread the earth in an even layer, approximately six-inches thick. Afterward, a sprinkler truck passed over the thin layer and applied just the proper amount of water to moisten it, but not melt it into a muddy mess. Watering the soil insured a tighter compaction. Finally, a sheepsfoot roller drove over the layer, breaking up any clods, making its texture consistent, and compacting the material. Crews drove trucks back and forth between the borrow pits and the embankment on a round-the-clock basis. At the height of the embankment work, the private contractor installed a lighting system to allow for night work. During this peak period, trucks placed an average of 60,000 cubic-yards of earth per day on top of the rising barrier.[74] During the winter months from November to March, the contractor halted work on the embankment. Frozen dirt made compaction difficult and if placed inside the dam, its embedded ice would later melt and weaken the dam structure.[75]

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[71] Des Moines Register, *Missouri River Dam Is Growing,* 18 July 1948.

[72] U.S. Army Corps of Engineers, The Federal Engineer, 108.

[73] Des Moines Register, *Missouri River Moves in Tunnels as Spillway Work Goes On*, 3 August 1952.

[74] U.S. Army Corps of Engineers, The Federal Engineer, 108. Des Moines Register, *Missouri River Dam Is Growing,* 18 July 1948. Des Moines Register, *Missouri River Moves in Tunnels as Spillway Work Goes On*, 3 August 1952.

[75] Sioux City Journal, *Man-Made Walls Curb Wild River,* 23 November 1952. Martha Sutherland Coon, Oahe Dam: Master of the Missouri, (New York: Harvey House, Inc., 1969), 35.

Building the embankment required more time and effort than any other portion of the dam. Embankment work started in 1948. By the spring of 1952, the completed section on the east bank rose nearly185 feet above the river bed, stretched approximately 8,000 feet , and had a base 1,600 feet wide. Private contractors had dumped upwards of 30 million cubic yards of dirt to form this mound.[76] Yet, there still remained closure of the remaining 1000-foot gap, the raising of that portion of the embankment to the requisite 185-foot height, and completion of work on the west bank.

While the trucks piled up dirt for the embankment, men and machines dug outlet tunnels. Engineers decided to bore the tunnels through Niobrara chalk located deep within the bluffs on the far east end of the dam site. Chalk formations are less prone than other mineral deposits to shift or crack from excessive water pressure or vibration. Furthermore, chalk is an impervious material. Thus, in the unlikely event that the reinforced concrete lining the tunnel walls fractured, the chalk would prevent, or slow, a widening of the fissure and thus forestall the failure of the dam.

Tunnel work began in 1949. During construction, rather than utilize men to drill the tunnel as had been done at Fort Peck, the private contracting company, Silas Mason, employed a novel tunnel-boring technology, the first of its kind in the world. Engineers with Silas Mason mounted a coal saw (similar to a buzz saw) on a notched steel ring that had the same diameter as the future tunnel. The saw and ring sat on a contraption known as a jumbo. The jumbo rolled along on railroad tracks. During boring operations, the coal saw rotated on the ring while it cut through the chalk. After cutting a two or three-foot deep perfectly circular outline through the chalk, men armed with jackhammers came up front and reduced the outlined piece to rubble. By using the saw and jumbo, the engineers removed as much

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[76]Des Moines Register, *Missouri River Dam Is Growing,* 18 July 1948. Des Moines Register, *Mighty Missouri Rolls Quietly Under Shackles,* 3 August 1952.

chalk in 1.5 hours as it had taken sixteen men to remove in 3 hours at Fort Peck Dam. The speed and precision of this machine enabled Silas Mason to complete the outlet tunnels by late 1951.[77] The company drilled twelve tunnels (four with diameters of 22 feet and eight with diameters of 28 feet) through 875 feet of chalk.[78]

By the early spring of 1952, only two major jobs needed to be finished before Fort Randall Dam would stem the flow of the Missouri River. The Corps still needed to dig the approach channel from the river to the outlet tunnels and plug the last remaining gap in the embankment. Closure of the dam would dramatically affect the frequency and height of main stem floods south of Sioux City. Government engineers planned to fill the gap in the embankment sometime during the late summer of 1952. But just before the engineers attained closure, the Missouri River experienced its greatest flood.

During the spring and summer of 1943, a series of floods caused extensive damage along the river valley from Bismarck, North Dakota to the river's mouth. The floods claimed eleven human lives, drowned countless numbers of livestock and poultry, inundated cropland, forced reductions in industrial production, destroyed pile dikes and revetments, and delayed military preparations in support of the war effort. The extent of the flood devastation convinced Missouri Valley residents and their state representatives to seek the federal construction of dams in the Dakotas. After decades of blocking efforts by South Dakotans to build dams across the Missouri River, lower basin interests finally joined their neighbors to the north to urge the federal government to adopt a dam-building program. Widespread public support for the construction of upstream dams, the defection of South Dakota to the lower basin political coalition, and the promise of the Corps to build large reservoirs resulted in legislative passage of the Pick-Sloan Plan in December 1944.

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[77]U.S. Army Corps of Engineers, The Federal Engineer 110.

[78]Ibid., 109.

Pick-Sloan authorized the construction of five earthen dams across the main stem of the Missouri River. Fort Randall Dam in southeast South Dakota was the pivotal structure in this entire main stem system. Fort Randall's location and size would create a reservoir with the storage capacity to provide significant flood control benefits to the area below Sioux City. The reservoir would also provide the water necessary to sustain the depth of the recently authorized nine-foot channel. Because of the dam's importance to downstream interests, the Corps started construction on the dam before the other four Pick-Sloan dams. By early 1952, the Corps prepared to close Fort Randall Dam.

CHAPTER 10: THE MIGHTY MISSOURI AND THE FINAL QUEST FOR CONTROL, 1952-1970

December 1951 witnessed the beginning of the wettest, coldest, and deadliest winter on the northern Great Plains since Euro-American agricultural settlement of the area nearly eighty years before. The state of South Dakota received an inordinate share of the harsh weather. Tripp County, in south-central South Dakota experienced a blizzard in early December that closed transportation routes and left farmers and ranchers stranded for days on end. Cold northwest winds blew so persistently after this storm that the county supervisor's office radioed and phoned rural residents to let them know when plows would clear particular sections of highway. After the plow passed their homes, residents jumped in their automobiles, roared down the highway to the nearest town for supplies, and then hurried back before the road closed again from drifting snow.[1] Individuals living in Pierre, and the area surrounding the city, endured a series of snowstorms that began on 6 December 1951 and lasted for fifteen consecutive days, bringing the central portion of the state to a standstill. By 21 December 1951, twenty-six inches of snow stood on the ground at Pierre. High winds and the accompanying drifting snow repeatedly forced the closure of roads into and out of the capital. Such dangerous white-out conditions prevailed in rural areas that the South Dakota State Highway Office forbid anyone from leaving Pierre for at least ten days during December.[2]

In January 1952 more blizzards pounded the Dakotas. These additional storms prompted President Harry S. Truman to extend federal emergency relief to the state of South Dakota so that its highway department could clear state highways and county roads. Relief came in the

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[1]Des Moines Register, 14 December 1951.

[2]Des Moines Register, 21 December 1951.

form of snow removal machinery dispatched to the area. Yet, even with the proper equipment, the wind continued to make snow removal futile; snow often covered roads within hours after the plows had passed over them.

Weather conditions in Montana and along the east-slope of the Rocky Mountains paralleled circumstances in the Dakotas. In January 1952, officials working for the Corps of Engineers, clad in snowshoes and heavy coats, hiked into the mountains to conduct a snowpack survey. The surveyors discovered a sobering fact. The mountain snowpack in areas drained by the Missouri and its tributaries surpassed all previous recorded levels. To make matters even worse, the deep snow contained a high moisture content. The Missouri River Division office in Omaha ominously noted that snow amounts across the mountains and northern Great Plains equaled or exceeded the levels present prior to the deluge of 1943. This conclusion caused grave concern among Missouri Valley residents from Montana to the mouth.[3]

Meteorologist Ivory P. Rennels of the U.S. Geological Survey office in Sioux City expressed fear that severe flooding would follow the melting of the heavy snow cover. In March 1952, Rennels confirmed that the northern plains had received 155 percent of the normal amount of precipitation since 1 December 1951. The area surrounding Pierre received an incredible 460 percent of normal precipitation during the same period.[4] Rennels understood that the Missouri and its tributaries could not possibly absorb the meltwater from this snowfall without some flooding.[5]

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[3]Sioux City Journal, 13 February 1952.

[4]Sioux City Journal, 5 March 1952.

[5]Sioux City Journal, 6 March 1952.

Corps officials and valley residents kept an anxious eye on the sky and the river in March 1952. Temperature patterns and precipitation amounts during March often determined whether the Missouri flooded or remained in its banks during the upcoming spring. If warm temperatures and heavy rains arrived suddenly across the Great Plains, the consequent snowmelt would quickly saturate the soil and pour into the Missouri, causing unprecedented flooding. On the other hand, a slow warming trend accompanied by progressively warmer days and cool, or freezing nights would mean a gradual melting of the heavy snows, giving the Missouri River time to safely drain away the meltwater streaming off the plains. Everyone's greatest fear envisioned swiftly rising temperatures and an abrupt melting of the snowpack.

Valley residents also worried about another, even more important, factor that influenced the extent and duration of any Missouri River flood. If warm temperatures descended upon the upper basin before the lower basin, the entire valley from the Dakotas to the mouth might sustain catastrophic flooding. The reason, the upper river's high flows would descend the valley first and then converge with the runoff just entering the stream from the lower basin. A simultaneous warming trend in the upper and lower basin would have nearly the same effect, upper river meltwater would be unable to drain off to the south. Ideally, warm temperatures would slowly spread from the lower basin northward. This scenario would give the lower river time to carry away the meltwater from Iowa, Nebraska, Kansas, and Missouri before the water from South Dakota, North Dakota, and Montana came down the valley.

Across the northern Great Plains, March 1952 was cold, windy, and exceedingly wet. Heavy snows fell throughout the Dakotas during the second and third week of the month.[6] As April approached and the snow piled-up, the possibility of a gradual melting grew dimmer and dimmer. April carried the real possibility of warm days and warm nights. On 28 March

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[6]Sioux City Journal, 24 March 1952.

1952, Ivory Rennels at the U.S. Geological Survey announced that severe flooding along the main stem of the Missouri River appeared imminent. "The risk of rapid thawing, along with the ice breakup, has increased. The weather the next two weeks to a large extent will determine the intensity of flooding." The meteorologist believed the Missouri River would flood, but the duration and extent of the flooding remained to be seen.[7]

Four days later, on 1 April, Rennels predicted massive flooding within the Missouri basin. According to the meteorologist, the snows in the region were melting rapidly, the ground remained largely frozen, and a high percentage of the meltwater went directly into the Missouri's tributaries. During the first days of April, the Big Sioux, James, Niobrara, White, Bad, Cheyenne, Cannonball, Moreau, Knife, Little Missouri, and Milk rivers became raging torrents, spilling out across their valleys, hurdling debris down their channels, and racing toward the main stem of the Missouri (Figure 10.1).

The Milk River, flowing through northeastern Montana, washed over its banks in a flash flood on 1 April that caught humans and animals by complete surprise. Upwards of 3,000 people hurriedly fled from the advancing water. When the river gushed across the valley, stock animals galloped toward high ground to escape death. Numerous animals became disoriented, fell in the rapidly rising water, and floated downstream. Many of the animals spared from immediate death took refuge on top of a series of small knolls spread across the valley floor. But with unrelenting determination, the water surrounded the hillocks and prepared to carry away the creatures. Rather than allow their cattle and horses to slowly drown in the icy water, ranchers rented planes and hired sharpshooters to fly above the stranded animals and kill them with high-powered rifles.[8] Milk Valley farmers and ranchers sustained heavy losses from this flash flood.

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[7]Sioux City Journal, 28 March 1952.

[8]Omaha World Herald, 6 April 1952. Des Moines Register, 8 April 1952.

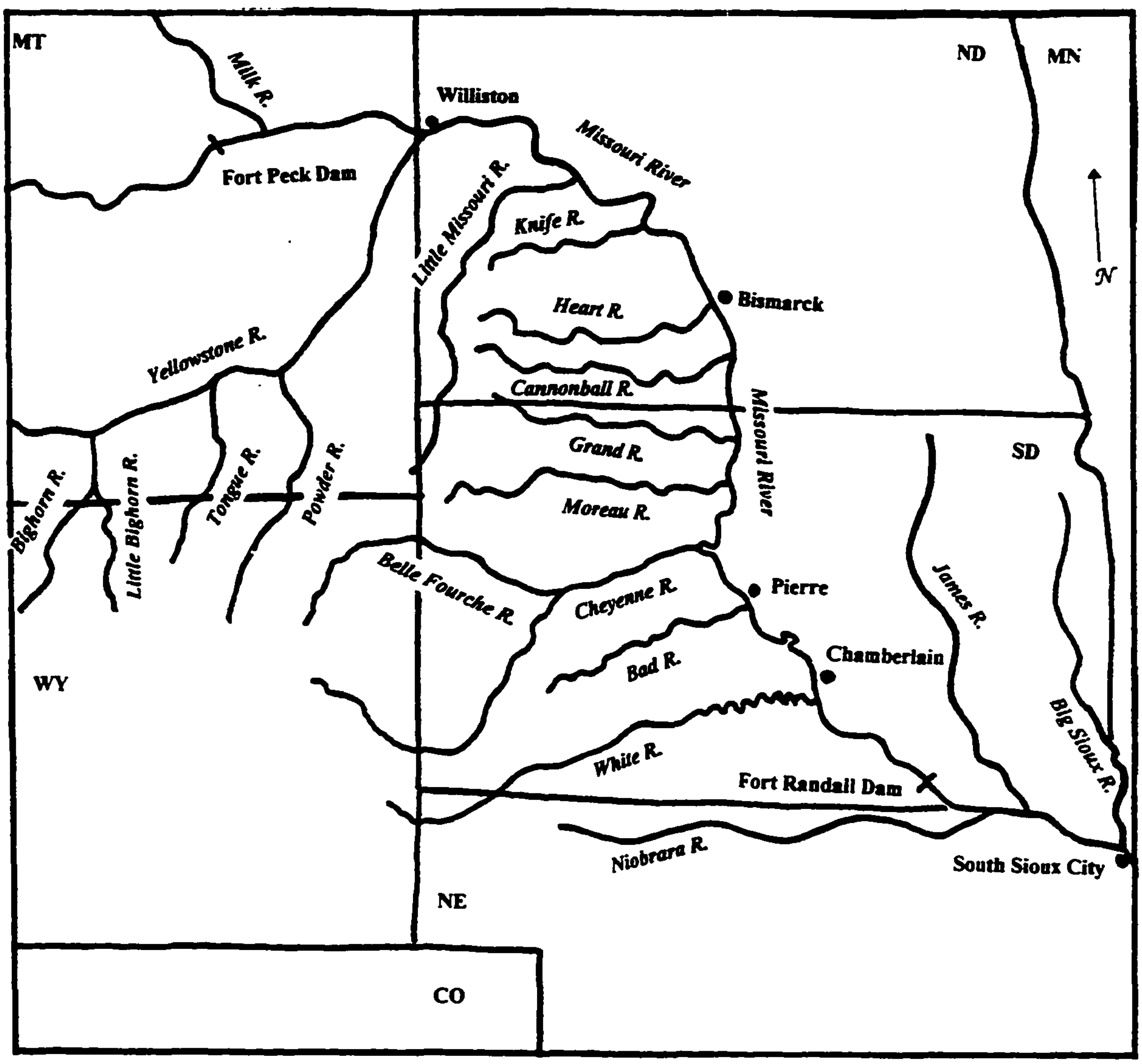

Figure 10.1. Major prairie-plains tributaries of the Missouri River. The Great Flood of 1952 began across the northern Great Plains and prairie regions of the eastern Dakotas in late March and early April when the meltwater from the heavy snowpack drained into the Missouri's tributaries. Map by author.

At the same time that the Milk River flooded, the Little Missouri River, which flows through western North Dakota, reached 23.1 feet at Marmarth where flood stage stood at 18 feet. Flood waters inundated approximately 200 homes in the town. Beaver Creek, a tributary of the Missouri located sixty-five miles southeast of Bismarck, overflowed its banks and covered parts of the town of Linton, North Dakota with three feet of water.[9] As the tributaries dumped their water into the Missouri, its level reached unprecedented heights, flooding towns along its banks from North Dakota south to the state of Missouri.

The worst flood in forty-two years hit Bismarck, covering the railroad tracks of the Northern Pacific Railroad and swamping homes near the riverbank. Pierre and Fort Pierre sustained the most extensive flood damage since their founding in the nineteenth century. Fort Pierre, located at the juncture of the Bad and Missouri rivers, nearly disappeared under the ocean of water. All of the town's 633 residents evacuated their homes when water lapped over streets, sidewalks, and yards. Portions of Fort Pierre remained submerged for over a week, with water reaching to the rooftops of countless buildings.[10] On 9 April, the Missouri River stood eight feet above flood stage at Pierre and the water kept rising, expected to reach ten feet over flood stage the next day. The river forced 1,600 people to abandon their homes and thirty blocks of the city sat under water.

Seventy-five miles southeast of Pierre, the Missouri submerged the lower sections of the Indian reservation town of Fort Thompson. Further south at Chamberlain, the fast river current and huge water volume, in combination with gigantic ice chunks, hammered away at the Milwaukee railroad bridge that spanned the river there. The Missouri undermined a 150-foot-long section of the bridge, causing the span to first slump and then fall into the river, thereby cutting off a major east-west rail link in South Dakota. Fearing for the remainder of

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[9] Sioux City Journal, 2 April 1952, and 8 April 1952.

[10] Sioux City Journal, 9 April 1952.

the bridge, railroad officials loaded boxcars with tons of material and pushed the cars unto the bridge, hoping the added weight would keep the bridge in place. The ploy succeeded and the bridge stood against the fury.[11]

The river poured south, moving past the Fort Randall Dam site without causing damage to the rising earth structure. At Yankton, the river's enormous water volume became compressed between chalkstone bluffs as it passed through what locals referred to as the "Yankton Narrows." Engineers measured the current velocity within the narrows at fourteen miles per hour, about six times the average speed.[12] Just below the narrows, the river burst forth into the wide alluvial valley that stretches from Yankton south to the Iowa-Missouri border.

The next sizable towns in the path of the Big Muddy included Sioux City and South Sioux City. Sioux City faced less of a flood threat than South Sioux City because the majority of its homes and businesses rested on bluffs and a high plateau above the river valley. South Sioux City, on the other hand, lay on top of a slight rise in the valley floor. South Sioux City relied on a levee for protection against the river. In the first days of April, South Sioux residents became increasingly concerned about their safety as the Missouri River paraded past the town the evidence of its powerful surge through the Dakotas. The *Sioux City Journal* declared on 8 April 1952, "From the Combination Bridge (the bridge linking Sioux City with South Sioux City), evidence of great destruction to the north could be seen in the seething mid-channel of the Missouri. Parts of houses, telephone poles, huge uprooted trees and other debris swirled downstream...."[13] The river's display of power convinced South Sioux City

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[11] Sioux City Journal, 10 April 1952.

[12] Sioux City Journal, *River Volume Here 15 Times as Great as Its Normal Flow,* 14 April 1952.

[13] Sioux City Journal, 8 April 1952.

residents that the dike to the north and west of town required constant surveillance to detect any breaks. The dike had been designed to withstand a flood stage of 19.4 feet, but meteorologists predicted a flood crest at South Sioux City of twenty-four feet.[14] As a result, residents of the town put almost no faith in their chances of remaining dry. Nonetheless, they made every effort to maintain the viability of their dike. But vigilance, hope, and willpower could not stop the Missouri. In the early morning hours of 11 April 1952, the river breached the South Sioux City levee and ran straight through low-lying neighborhoods (Figure 10.2).

The worst of the flooding, however, was yet to come. On Easter Sunday, 13 April 1952, Mayor Wilbur Allen of South Sioux City ordered a complete evacuation of the community of 5,557 residents as the river's crest approached and threatened a total inundation. Later that night and early the next morning, the Missouri's crest passed South Sioux City at a height of twenty-five feet. River water almost completely covered the dark deserted town.[15] During the flood, one South Sioux City resident spent five days clinging to rafters in his attic, hoping to be rescued before the water rose any further and drowned him. Sixty-nine year old, Tom Cooper, was either unable or unwilling to leave his property when the river broke through the levee on the 11th of April. He hurried to his attic where he prayed the water would not rise any higher. Cooper survived for five days on three cans of cold beans and two quarts of milk. On 16 April his son Harold Cooper and a friend took a motor boat across the river from Sioux City to the home and pried the elder Cooper from the rafters.[16]

As the sixty-mile-long crest moved beyond the Sioux City metropolitan area, small town residents and farmers in the valley watched and waited (Figure 10.3). Corps officials

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[14]Sioux City Journal, 9 April 1952.

[15]Sioux City Journal, *Peak Is Even Higher Than Was Feared*, 14 April 1952.

[16]Sioux City Journal, *Man 69, Rescued After 5 Days in South Sioux Attic*, 16 April 1952.

Figure 10.2. The Great Flood of 1952 near the confluence of the Missouri and Big Sioux rivers. The mouth of the Big Sioux River is in the upper right-hand corner of the photograph. The vast amount of water entering the Missouri River from the James and Big Sioux rivers caused extensive damage to agricultural lands between Yankton, South Dakota, and the Iowa-Missouri border. Numerous communities along this reach also sustained water damage. Inundated buildings in South Sioux City, Nebraska, are visible in the left-center of the photograph. Photograph by Robert J. Schneiders.

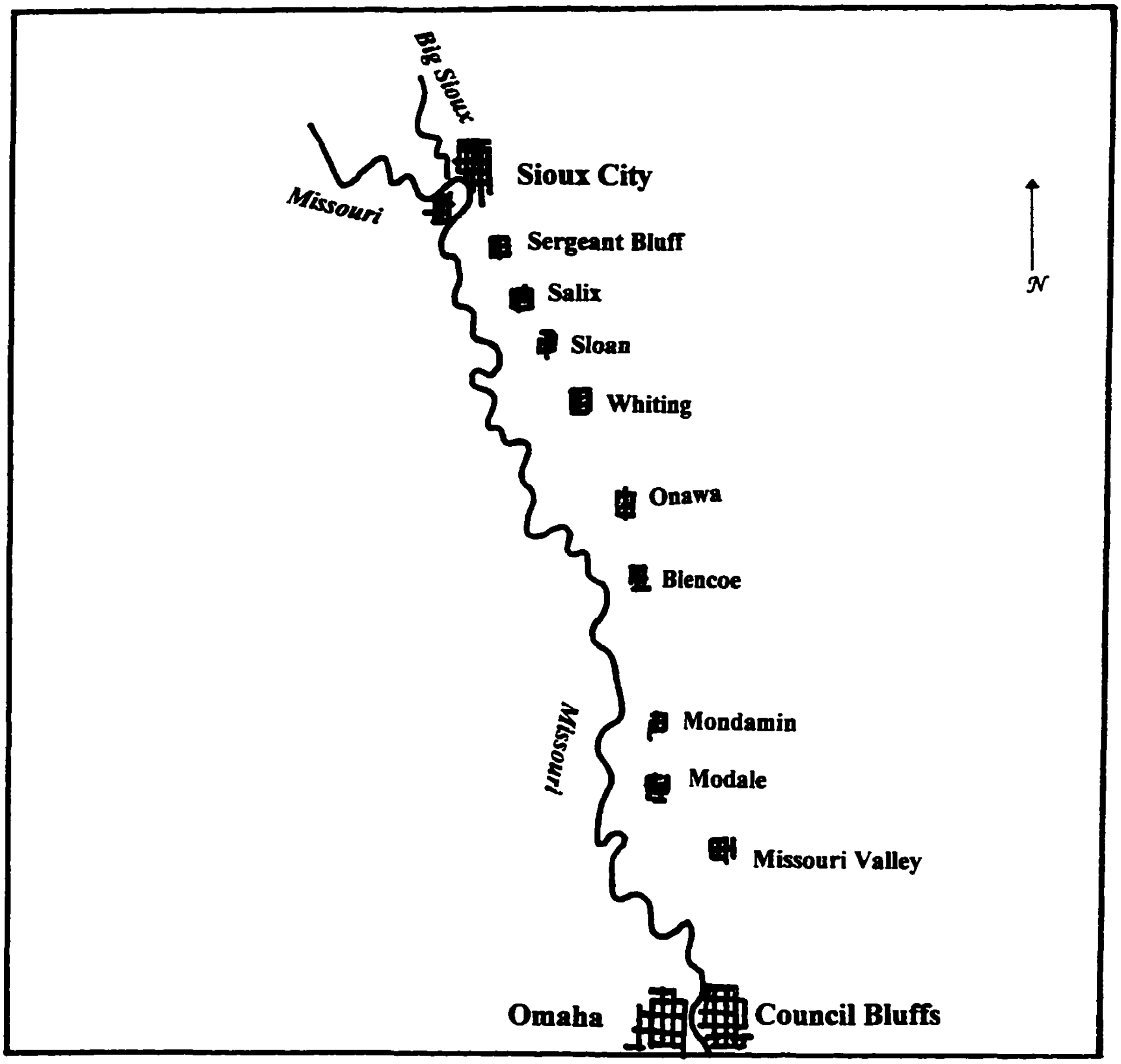

Figure 10.3. Western Iowa communities located in the Missouri Valley. The Missouri River flowed so erratically during the Great Flood of 1952 that no one really knew which towns would be inundated by the river and which towns would be spared by the flood. Sergeant Bluff, Salix, Sloan, Whiting, Onawa, and Missouri Valley stayed dry during the flood, while Sioux City, Blencoe, Mondamin, Modale, and Council Bluffs sustained water damage. Map by author.

predicted that the river would flood Sergeant Bluff, Salix, and Sloan, three towns immediately below Sioux City on the Iowa side of the river. To save their community, residents of Sergeant Bluff used bulldozers to hastily erect a nine-foot-high, 1,000-foot-long dike. This dike not only spared the town but also prevented river water from overrunning the Sioux City airbase. Corps officials informed Mayor R.J. Downing of Salix that he could expect from five to seven feet of muddy water to cover his town.[17] After receiving this news, the Salix town council decided that a dike tall enough to stem such an overflow could not be built in time. Instead, the council focused its energies on insuring the orderly evacuation of Salix and the surrounding area. Residents left the community believing that they would return to homes filled with silt and debris. Miraculously, the river skirted Salix. About one mile to the west of town, a former river channel had created a four-foot-high ridge that diverted the river away from Salix. Sloan, six miles below Salix, was also supposed to receive five feet of water over its streets sometime during 14 and 15 April. In anticipation of this crest, Sloan residents built a five-foot-high levee around the town. But the river stayed far from Sloan and its levee. Sloan's residents became jubilant upon hearing that an elevated county road five miles west of the town blocked the river's floodwaters.[18] The Missouri flowed so erratically during those first weeks of April 1952 that valley residents played a guessing game as to which town would be inundated next by the river. No one really knew where the river would go or how it would behave. One town might be spared when the river's current suddenly changed direction, while another town would be unexpectedly flooded.

Amazingly, the river did not inundate the majority of valley towns in western Iowa. Sergeant Bluff, Salix, Sloan, Whiting, Onawa, and Missouri Valley stayed dry, while only a

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[17]<u>Sioux City Journal</u>, 15 April 1952.

[18]<u>Sioux City Journal</u>, 15 April 1952.

portion of Blencoe, Mondamin, and Modale suffered flood damage.[19] Although the Missouri kept away from western Iowa towns, it caused extensive damage to farmsteads and agricultural land. The river from Sioux City to the Iowa-Missouri border widened to an average distance of twelve miles and covered roughly 308,000 acres of farmland. Farmers in Monona and Harrison counties saw more acres inundated than any of the other counties in western Iowa. The overflowing Missouri also forced an estimated 40,000 persons, or 18,496 families (mostly farm families), to evacuate their homes.[20] Floodwaters utterly destroyed some farmsteads. George Goodwin and his family lived in an area known as Flower's Island in Monona County, Iowa. High water lifted Goodwin's two-story house from its moorings and carried it downstream completely intact, only to drop it into a massive thirty-foot hole formed by an eddy.[21] Goodwin was not alone in his despair, hundreds of other farmers endured similar tragedies.

The total dollar amount of damages in western Iowa alone amounted to $43 million, with the agricultural sector sustaining a 17.6 million dollar loss, mostly from a reduction in potential agricultural earnings and damage to farms and machinery. The flood caused $4,052,000 worth of damage to western Iowa's transportation grid, washing out roads, undermining bridges, and carrying away long sections of railroad. Urban centers sustained approximately $11.5 million in damages. The cost of fighting the flood in addition to the destruction of communications facilities, utility systems, and levees equaled $10.1 million.[22]

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[19] Sioux City Journal, 17 April 1952.

[20] Sioux City Journal, *Peak Is Even Higher Than Was Feared*, 14 April 1952. Sioux City Journal, 13 July 1952.

[21] Sioux City Journal, *Hectic Flowers Island Survives Another Crisis*, 13 July 1952. Omaha World Herald, *Record Flood Damage Listed*, 13 July 1952.

[22] Sioux City Journal, 13 July 1952.

As the river crest descended toward Omaha-Council Bluffs, the attention of everyone in the nation, including President Truman, centered on whether the Omaha levee would hold back the approaching tide. At Omaha-Council Bluffs, the twelve-mile-wide river funneled into a 1200-foot-wide channel confined on both sides by levees protecting the twin cities. The Corps of Engineers built the Omaha levee after the flood of 1943. The levee possessed an effective height of twenty-six feet and an actual height of 31.5 feet. Effective height meant that the levee could withstand a crest of twenty-six feet without being undermined by the tremendous water pressure bearing down on the bottom and side of the levee. The likelihood of a levee failure increased if the water level rose beyond twenty-six feet. If the river topped 31.5 feet, the levee would suffer a massive failure. The U.S. Geological Survey's Meteorological Bureau predicted a crest of between thirty and thirty-one feet at Omaha, perilously close to the actual elevation of the levee. A crest of this height left little room for insurance. A strong wind could create waves high enough to top the levee. In order to prevent a topping of the levee, the Corps utilized National Guard troops to raise the levee's height with sandbags and a wooden fence. Between 14 April and 17 April, soldiers elevated the Omaha levee from 31.5 to 34 feet. But even this action provided no guarantee of security. The potential water pressure pressing against the dike created the likelihood of boils forming on the dry-side of the structure. A boil is created when the ground becomes so saturated that water actually begins to boil-up from under the levee. A boil can get out of control, totally break-down the soil, and undermine the levee. Fortunately for Omaha residents, their efforts to strengthen their levee resulted in success. On the night of 17 April, a thirty-foot-high crest passed the city, the levee held, and the city did not sustain heavy damage. The Corps calculated that the Omaha and Council Bluffs levee system prevented approximately $62.5 million in damages.[23]

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[23] Sioux City Journal, *2 Cities Watch River Tensely, Fear Disaster*, 18 April 1952. Sioux City Journal, *Omaha Waging Winning Fight Against Flood*, 18 April 1952.

Although the river crest moved past Omaha-Council Bluffs without major loss, the state of Missouri sustained $53.8 million in damages. The total damage estimate throughout the Missouri Valley reached $179 million, with agriculture losing $72.8 million. Astonishingly, the Great Flood of 1952 took no human lives. Two relatively new forms of mass media, the radio and the television, allowed disaster services personnel to forewarn Missouri Valley residents of the approaching water. However, an incalculable number of stock animals and wildlife drowned during the flood.[24]

The $179 million dollar total damage estimate did not include the losses inflicted upon control structures along the navigation channel south of Sioux City. Excessive high flows hastened the deterioration of pile dikes and revetments, eroding the banks behind revetments, undermining the riverbed beneath piles, and outflanking pile dikes. The flood of 1952 came after a decade of high flows and floods wreaked havoc on the navigation channel. In addition to the Great Flood of 1943, the Missouri overflowed its banks in 1947, 1949, 1950, 1951, and then 1952. A Corps official, referring to the dilapidated state of the navigation channel, admitted that, "The floods of July 1951 and April 1952 were particularly destructive."[25] Not even considering the losses incurred during the flood of 1943, the Corps lost a staggering number of pile dikes and revetments between 1944 and 1952 (Figure 10.4 and Figure 10.5).

On 30 June 1944, the Corps claimed that ninety percent of the six-foot navigation channel from the mouth to Kansas City stood intact. Eight years later, on 30 June 1952, the engineers estimated that seventy-eight percent of that same navigation channel remained in place.

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[24]Sioux City Journal, *Estimate Cost of April Flood at 179 Million,* 14 September 1952. Sioux City Journal, *Pick Sees Fight Just Beginning,* 21 April 1952.

[25]ARCE 1952, 1244.

Figure 10.4. Destroyed pile dikes in Monona County, Iowa, circa 1955. Between the start of World War II and the middle of the 1950s, the Missouri River destroyed millions of dollars worth of dikes and revetments. The greatest damage to the navigation channel occurred along the reach between Omaha and Sioux City. Courtesy of the Corps of Engineers.

Figure 10.5. Flanked control structures at Blackbird Bend, Monona County, Iowa, circa 1955. Visible to the left-center of the photograph, the Missouri River has cut a pile dike into two pieces, placing one section in the middle of the river channel. Another pile dike to the right-center of the photograph has been flanked by a side channel. By the 1950s, Corps officials admitted that much of the river in western Iowa had reverted to a "wild state." Courtesy of the Corps of Engineers.

During this period, the Missouri rendered ineffective 46.3 river miles of pile dikes and revetments. The destruction along other reaches of the river exceeded the losses below Kansas City. In 1944, the engineers finished ninety-five percent, or 122.1 miles, of the navigation channel between Kansas City and Rulo, Nebraska. By 1952 only sixty-six percent (or 84.8 miles) of the channel remained viable. In 1944, the Rulo to Omaha reach had been ninety-nine percent complete. In 1952, that reach had degraded to only sixty-seven percent complete. The worst destruction occurred in western Iowa where the Corps finished seventy-eight percent of the six-foot channel between Omaha and Sioux City by 1944. In 1952, a mere thirty-six percent of this navigation channel continued to serve its design purpose. A total of 54.8 miles of river broke-out of its previous alignment north of Omaha. These statistics do not include the miles of structures destroyed and then replaced by the Corps during the eight-year-period.[26]

The monetary value of the demolished control structures reached shocking levels. The 175.9 miles of navigation channel destroyed and not replaced between 1944 and 1952 equaled $48.3 million in 1944 dollars. Then, during the eight-year-period, the Corps spent $75.8 million on maintenance and new work below Sioux City. But this massive additional investment still did not repair all of the damage to the navigation channel. In 1952 the Corps could only claim 511.4 miles of the navigation channel still in place, a distance far below the 687.3 miles of channel completed by 1944. Therefore, out of a total investment of $265.7 million in the six-foot channel up to 1952, the Missouri destroyed approximately $124.1 million in control structures.[27] President John Forsyth of the Upper Missouri Valley

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[26]ARCE 1944, 994, 995, 1021, 1022. ARCE 1952, 1244, 1245, 1304. *Missouri River Channel Stabilization and Navigation Project,* Hearing Before the Subcommittee on Appropriations, House of Representatives, Eighty-Second Congress, Second Session, 30 June 1952, Corps of Engineers maps titled, *Missouri River, Kansas City to Mouth,* and *Missouri River, Kansas City to Sioux City,* with indications of river miles.

[27]Ibid.

Association (an organization promoting the extension of the navigation channel to Niobrara, Nebraska) confirmed the extent of the devastation. In 1951, even before the erosive flood of 1952, Forsyth estimated that $30 million in improvements just between Kansas City and Sioux City had been lost to the river.[28] Forsyth made a conservative estimate, but his numbers indicated how much the river cost the Corps and the federal government. The losses along the navigation channel resulted directly from the rapid expansion of the navigation channel north to Sioux City in the 1930s prior assessing maintenance costs of the control structures and before checking the river's high flows. After the flood of 1952, referring to the situation north of Omaha, Corps officials confessed, "Loss of alignment and progressive destruction of control works continue in most parts of this section of the river.... Much of the river has reverted to its original wild state, and bank erosion is severe at many locations. The rate of the destruction has far exceeded the work accomplished with the limited funds available...."[29] The Missouri River had eluded the Corps' harness.

The widespread devastation caused by the river in the spring of 1952 led directly to an increase in public, congressional, and presidential support for the completion of all of the main stem dams proposed in the Pick-Sloan Plan. Again, the Missouri River affected the direction of development. Just prior to the flood, in March 1952, fiscal conservatives in Congress and the Government Accounting Office, seeking to balance the federal budget and redirect resources toward the war in Korea, succeeded in eliminating funding in the annual budget for the start of construction on Gavin's Point Dam. These same interests also substantially reduced the scheduled appropriation for Oahe Dam. The complete denial of funds for Gavin's Point and the reduction for Oahe created the real possibility that the two

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[28]U.S. Army Corps of Engineers, The Federal Engineer, 228.

[29]ARCE 1953, 1150. Sioux City Journal, 31 December 1952, 21 February 1954.

structures would not receive future appropriations. Congressional representatives found it much easier to eliminate a new project or one barely begun than a project already well underway that represented a large federal investment.[30]

General Lewis Pick, who had been promoted to Chief of Engineers, and Colonel Henry J. Hoeffer of the Omaha District, exploited the public outrage present after the flood to gain federal funding for Gavin's Point and Oahe. In April 1952, General Pick made the grandiose claim that the completion of the Pick-Sloan dams would forever end the flood threat in the Missouri Valley. The General boasted, "I fought the floods here in 1943. It was from Omaha that the plan for the comprehensive control of the Missouri River was launched and given impetus throughout the valley. It was my privilege at war's end to initiate the projects which will some day soon, I hope, [and] forever end the flood menace in this valley."[31] One month later the General reiterated, "There would have been no floods on the Missouri last month had the main stem dams, of which Gavin's Point is the last major project to get underway, been completed and operating."[32] In June 1952, Colonel Hoeffer told a group of individuals concerned with river development, "If our reservoir system (the five Pick-Sloan Plan reservoirs across the main stem) had been completed, the river would have been within [its] banks in this whole region and widespread suffering and losses would have been prevented."[33]

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[30]Omaha World Herald, *2 River Jobs on at Yankton,* 11 May 1952. Sioux City Journal, *House Trims River Funds 200 Million,* 28 March 1952.

[31]Sioux City Journal, *Pick Sees Fight Just Beginning,* 21 April 1952.

[32]Sioux City Journal, *10,000 Attend Historic Opening Work On Gavin's Dam,* 19 May 1952. Sioux City Journal, *Pick Sees Fight Just Beginning,* 21 April 1952.

[33]Sioux City Journal, *Says Reservoir Could Have Stopped Big Flood,* 25 June 1952.

Pick and Hoeffer did not have trouble selling their idea of additional dams across the Missouri River to anyone that spring. At a meeting between President Truman and the governors of the Missouri Valley, General Pick told the President and the other dignitaries assembled, "All the plans are made. We know what to do and how to do it." Pick claimed the Corps could end future flooding; the politicians just needed to provide the engineers with the money to do it. President Truman looked at Pick and with an air of frustration remarked, "It's time for action. We've fooled around long enough.... Two dams on the upper Missouri have almost been taken out of the budget. I hope that Congress will stick to the budget on flood control."[34]

Congress followed the President's lead. In July 1952, Congress appropriated $3 million for the continuance of work on Oahe Dam and $7.7 million for the start of construction on Gavin's Point Dam. Congressional representatives from the Missouri basin faced incredible pressure from their constituencies to finance the two projects. Rejecting the construction of more dams across the Missouri after one of the river's largest floods would have been tantamount to political suicide for congressional members during an election year. Thus, the Great Flood of 1952 enabled the proponents of main stem dams to defeat a serious congressional challenge to the completion of their development program.[35]

At the same time that the engineers procured funding for Gavin's Point and Oahe dams, they pushed the completion of Fort Randall Dam. By the summer of 1952, the embankment and tunnel work had progressed to the point where the engineers readied for closure of the dam across the natural channel. Closure promised to sharply curtail the river's propensity to flood below Sioux City. A decrease in flood levels assured protection for the navigation channel, urban centers, and agricultural land.

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[34]Sioux City Journal, *Truman Urges United Battle To Aid Valley,* 17 April 1952.

[35]Sioux City Journal, *Work On Huge Dams Assured,* 16 July 1952.

Closure of the dam and diversion of the Missouri began with the digging of the approach channel from the free-flowing river to the opening of the outlet tunnels. To excavate the approach channel, the Corps awarded a contract to the Western Contracting Corporation of Sioux City. Western then placed an order with the Tampa, Florida firm of Erickson Engineering for the world's largest, most powerful dredge boat. Officials with the Sioux City company named their huge dredge the *Western Chief.* The *Western Chief* possessed nine diesel engines that generated 10,950 horsepower. These engines gave the dredge the ability to suck rocks as large as eighteen inches in diameter from the river's floor and shoot them through hundreds of feet of pipe. The *Western Chief* weighed 1,500 tons, and its nose (the portion sunk into the riverbed) weighed 150 tons alone. The mechanical monster could pump material from forty-eight feet below the river's surface, deeper than any dredge then in operation on the Missouri. The size and velocity of material chewed up by the cutterhead required replacement of its blades every five days. The dredge was too large, and sat too deep in the water, to float up the Missouri, so engineers moved it in twenty-one separate sections to the dam site and assembled it there. Once in place, the *Western Chief* removed 4.5 million cubic yards of muck to complete the approach channel in the spring of 1952.[36]

By July 1952, the federal engineers sat poised to close the embankment and divert the river. Corps dam-builders scheduled the closure of Fort Randall Dam for July, when river levels dropped after passage of the spring and summer rises. A low water level reduced the amount of work necessary to fill the final gap in the embankment. Whereas, high water levels and strong currents would wash away the material used to close the gap, costing more money and time. Again, the Corps gave the Western Contracting Company the responsibility to effect closure. Company officials and Corps engineers decided that use of the *Western*

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[36]Omaha World Herald, *Dredge Helps Move River,* 27 July 1952. U.S. Army Corps of Engineers, The Federal Engineer, 109.

Chief offered the safest and cheapest method to achieve closure. Beginning on 14 July 1952, the dredge began sucking sand, gravel, chalk, rocks, and clay from the riverbed and depositing the slurry across the length of the 1,000-foot-gap at the rate of 1,600 cubic yards per minute, much faster than the river could wash it away. Just as the engineers had utilized the river's silt load below Sioux City to channelize the stream, they now used the silt to dam the Missouri. The *Sioux City Journal* proclaimed that, "The dredge just outsilted the mammoth stream which for many years has carried great amounts of silt down the river."[37] On 20 July 1952, after six days of non-stop dredging, the slurry pile rose above the river's water surface. At 1:10 p.m. that same day, the slurry sealed the natural river channel. Within minutes, the Missouri's water backed up, flowed through the approach channel, into the outlet tunnels, and on downstream.[38]

During the fall of 1952, the Corps quickly raised the embankment in the gap section to a height of eighty-five feet. The engineers hurried this work so that the dam could hold back possible high flows in the spring and summer of 1953. The Corps did not want a repeat of the 1952 flood.[39] As the dam rose above the riverbed, the Corps gradually reduced the flow of the Missouri River by lowering giant steel gates over the entrances to the outlet tunnels. In November 1952, the reservoir behind the dam began to fill, achieving a depth of thirty-five feet at the dam face by the spring of 1953 and stretching approximately twenty-three miles upstream. By September 1953, as the entire embankment rose to its maximum height, the reservoir constituted 45,000 square acres and its level climbed at the rate of six inches per

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[37] Sioux City Journal, *'Muddy Mo' Meets Master as Dredge Outsilts Silt*, 21 July 1952.

[38] Sioux City Journal-Tribune, *'Muddy Mo' Meets Master As Dredge Outsilts Silt*, 21July 1952. U.S. Army Corps of Engineers, The Federal Engineer, 110.

[39] Sioux City Journal, *Fort Randall Dam Closure Near Climax*, 17 July 1952.

day.[40] In October and November 1954, the reservoir reached beyond Chamberlain, ninety miles upstream. At this time, the impoundment held 2.7 million acre feet of water.[41]

Closure of Fort Randall Dam and the consequent capture of the river behind its embankment resulted in significant consequences for the navigation channel south of Sioux City. The dam diminished the Missouri's power to erode and wander through its valley; thus, the danger that unrestricted flows posed to channelization structures decreased in proportion. Recognizing the new environmental situation on the river below Sioux City, and still responding to the wishes of Missouri Valley residents and their congressional representatives, Congress began appropriating money for new work on the navigation channel in the middle 1950s. These appropriations came after a fourteen-year hiatus brought on by World War II and the repeated floods of the 1940s and 1950s. The renewal of funding for the navigation project launched the final push to control the Missouri River.[42]

The methods and technologies employed to narrow and deepen the Missouri River in the 1950s and 1960s differed radically from those utilized in the late 1920s and 1930s. These new engineering techniques and tools reflected the changing goals of the navigation project and the different environmental situation present along the river south of Sioux City. In the late 1920s and depression 30s, the project's primary objectives included work relief and the establishment of a barge channel. To fulfill these two goals, the Corps employed thousands of men performing labor-intensive tasks. But by the 1950s and 1960s, unemployment relief no longer served as a project goal. The improved economic situation in the United States and

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[40] Omaha World Herald, *Fort Randall Dam Is Ready to Guard River,* 26 October 1952. Omaha World Herald, *'Boat Dozer Helps Keep Out Trash From Ft. Randall Dam,* 30 August 1953.

[41] Omaha World Herald, *Randall Lake Grows Fast,* 17 October 1954.

[42] ARCE 1944, 1024. ARCE 1951, 1363. ARCE 1955, 775. ARCE 1956, 931.

Missouri Valley following the Second World War eliminated the necessity of using the project to employ thousands of men. As a result, the Corps utilized heavy equipment and technology to realign the river, not people. Furthermore, establishment of barge navigation on the stream remained a goal of the project. However, bank stabilization and concomitant protection of private property from the river's incursions became a goal on a par with navigation. Moreover, during this last phase of the navigation project, the Corps displayed an extreme concern for the costs of the channelization work. The budget-conscious Eisenhower Administration forced the engineers to devise means of cutting costs, while still achieving their goals. Finally, by the middle 1950s, the upstream dams had reduced the silt load of the Missouri River to a fraction of its pre-dam level.[43] Such a small amount of silt in the water meant the river could no longer narrow its own channel behind the Corps' traditional pile dikes. To compensate for the loss of the river's silt load, federal engineers devised new means of realigning the channel, including the use of the toe trench revetment, large quantities of stone, the pile dike revetment, and the pilot canal.[44]

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[43]Sioux City Journal-Tribune, *Muddy No Longer Fits the Missouri*, 17 April 1959. W.W. Sayre and J.F. Kennedy, *Degradation and Aggradation of the Missouri River*, proceedings of a workshop held in Omaha, Nebraska, 23-25 January 1978, Iowa Institute of Hydraulic Research Report No. 215, (Iowa City: University of Iowa, 1978), 8. Omaha World Herald, *'Wild' River Funds Urged*, 16 February 1954. Sioux City Journal-Tribune, *River Erosion Danger Imminent in This Area, Senator Case Declares*, 20 March 1954. Omaha World Herald, *Farmer Loses Again to Wandering Missouri*, 11 April 1954. Des Moines Register, *Missouri Speed-up Is Needed*, 30 March 1956. Sioux City Journal, *Sioux City Man Argues Against Slashing of River Work Funds*, 29 March 1956. Sioux City Journal, *Waltonians Boost for River Projects*, 8 April 1957. Sioux City Journal-Tribune, *Congress Urged to Okay Missouri Channel Funds*, 15 May 1957.

[44]Sioux City Journal-Tribune, *Engineers See Dam Progress*, 9 July 1952. Sioux City Journal-Tribune, *Nice Trip Anyway, Say Discouraged South Sioux Men*, 21 July 1953. Sioux City Journal, *Sioux City Man Argues Against Slashing of River Work Funds*, 29 March 1956. D.C. Bondurant, *Channel Stabilization on the Missouri River*, in Technical Report No. 1, Volume 1, Symposium on Channel Stabilization Problems, Committee on Channel Stabilization, Corps of Engineers, (Vicksburg: U.S. Army Corps of Engineers, 1963), 48, 50, 51. C.P. Lindner, *Channel Improvement and Stabilization Measures*, in Technical Report

The use of the toe trench revetment, in place of the willow mattress and stone revetment, indicated how the goals and technologies of the navigation project had changed by the 1950s (Figure 10.6). Construction of the toe trench revetment began with the placement of a dragline or bulldozer on the surface of a flat barge which carried the equipment to the construction site. Once in place, the dragline or bulldozer dug a seven-foot-deep and fourteen-foot-wide trench along the entire length of the proposed new bank-line. After the trench had been dug, a dragline dumped a blanket of quarried limestone, one or two feet thick, into the bottom of the trench and along its sloping outside edge. With the toe trench completed, engineers then diverted the river's flow into the deeper trench. Overtime, the Missouri scoured the earth on the riverward side of the trench, widened itself, and stayed within the confines imposed by the toe trench. The toe trench possessed a number of advantages over the older willow mattress and stone revetment; namely, its construction took less time, cost less money, required no willow mattress, could be built with few men, and most importantly, the structure "healed" itself. Whenever the river undermined a portion of the toe trench revetment, rocks fell into the gaps in the structure. As a result, the toe trench had little, or no, maintenance costs. Use of the toe trench enabled the Corps to achieve the multiple goals of realigning the river channel, lowering construction costs, securing a stable bankline, and contributing to the establishment of a barge channel along a river with a vastly reduced silt load.[45]

No. 7, State of Knowledge of Channel Stabilization in Major Alluvial Rivers, G.B. Fenwick, editor, Committee on Channel Stabilization, Corps of Engineers, (Vicksburg: U.S. Army Corps of Engineers, 1969), VIII-9, VIII-14, VIII-29.

[45]Photo of work at Decatur Bend, Monona County, Iowa provided by Tom Bruegger to author. Omaha World Herald, *Missouri River Will Be Led, Rather Than Pushed, Under Dry-Land Bridge,* 1 May 1955. John Manning, *River Control Structures,* in Technical Report No. 1, Volume 2, Symposium on Channel Stabilization Problems, Committee on Channel Stabilization, Corps of Engineers, (Vicksburg: U.S. Army Corps of Engineers, 1964), II-2.

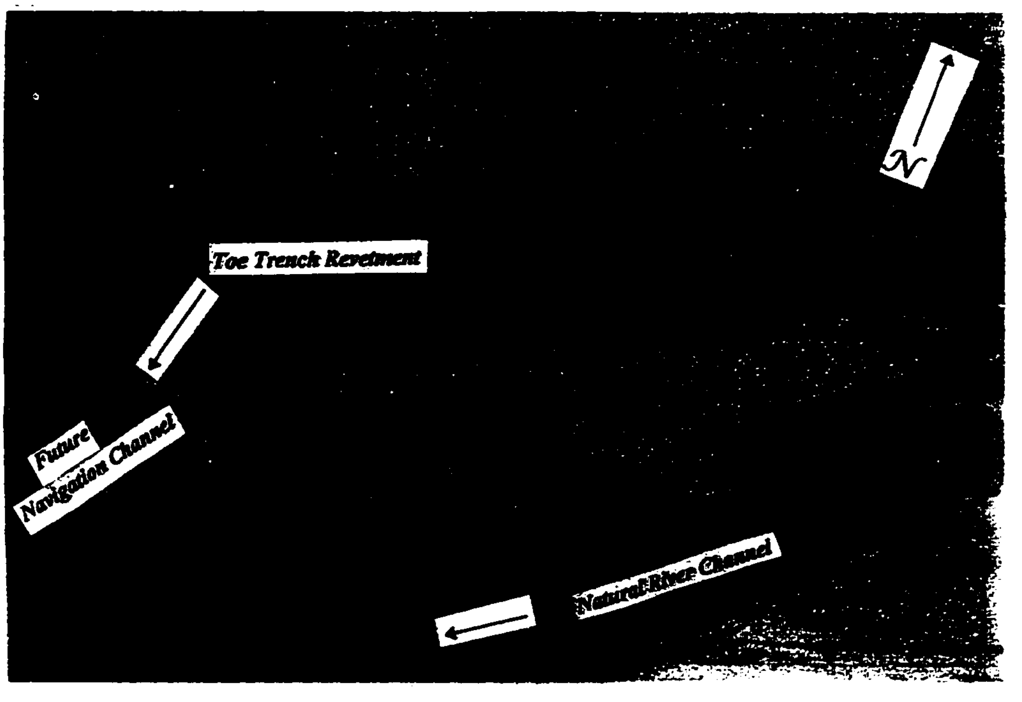

Figure 10.6. A toe-trench revetment along the river in western Iowa, circa 1955. To the left-center of the photograph, the Corps of Engineers has supervised the construction of a toe-trench revetment. The engineers diverted the river along the inside edge of this revetment. The Corps used the toe-trench revetment extensively after 1955. Courtesy of the Corps of Engineers.

In the 1950s, the engineers began utilizing the simple technique of dropping tons of stone into the river to realign the channel. When utilizing this method, the engineers did not engage in any preparatory work. They did not grade the bankline, lay a mattress, or drive piles into the clay bed. Instead, a dragline just emptied its load of rock into the natural channel to quickly shift the thalweg's direction. Near Sioux City in the mid-1950s, a Corps dragline deposited limestone into the river in a series of heaps running perpendicular to the natural bankline. The rock formed wing dams that forced the channel away from the natural bankline and into the new design channel.[46] Thus, in stark contrast to channelization work in the 1930s, the Corps accomplished realignment of the channel in a matter of hours and days instead of years. Again, use of this method lowered construction costs, provided fixed banks, and contributed to establishment of the barge channel.

In the 1950s and 1960s, the Corps continued to utilize pile drivers and wooden piles, but in a modified form. Rather than build traditional pile dikes to slow the current and facilitate the deposition of silt, the engineers built pile dike revetments. A pile dike revetment consisted of a three-clump, two-row pile dike surrounded by stone along its entire length (Figure 10.7). Essentially, the piles and stone reinforced one another, creating an exceptionally strong structure, resistant to powerful currents, high flows, and ice. Most often, the engineers placed pile dike revetments where the full-force of the current needed to be blocked and diverted downstream, such as across the upstream end of a natural river bend or adjacent to the opening in a pilot canal. The Corps of Engineers used pile dike revetments extensively in western Iowa after 1955. Although more expensive than merely dumping stone in the river, pile dike revetments facilitated realignment of the channel and the creation of nearly permanent, stone bank lines. In addition, the Corps strengthened old wooden pile

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[46]U.S. Army Corps of Engineers, The Federal Engineer, 232. Sioux City Journal, *Missouri Channel Entering Decisive Phase,* 20 August 1961.

Figure 10.7. A pile dike revetment in western Iowa. After 1955, the Corps of Engineers sought to rapidly realign the Missouri River channel. The engineers accomplished rapid realignment by dumping millions of tons of quarried stone into the river. Courtesy of the Corps of Engineers.

dikes with stone, placing rock around the piles with the use of draglines. This technique formed impermeable wing dams which were self-healing, required far less maintenance than the older permeable pile dike, and defied the destructive force of the river.[47]

The engineers relied heavily on the use of pilot canals. As in the 1930s, the pilot canal enabled the engineers to cut-off long bends deemed impediments to future barge navigation. Pilot canals also allowed the engineers to quickly move the channel. A few of the bends cut-off with the use of pilot canals along the western Iowa reach included DeSoto Bend, Decatur Bend, Tieville Bend, and Snyder Bend. The Corps built pilot canals with either bulldozers, draglines, or dredges, or a combination of all three. The engineers never dug a pilot canal the full-width of the proposed navigation channel. Instead, men and equipment excavated a canal between fifty and one hundred feet wide. Once engineers diverted the river through the canal, the rapidly moving water eroded the canal's banks the remaining 200 to 300 feet to the edge of a toe trench revetment (Figure 10.8 and Figure 10.9).[48]

The Decatur Bridge diversion operation represented the height of the Corps technological prowess along the Missouri River and illustrated how channelization work in the 1950s differed from the construction work carried out in the 1920s and 1930s. The engineers utilized pilot canals, toe trench revetments, pile dike revetments, and even upstream dams to redirect the Missouri River under the Decatur Bridge. Never before or since has the Corps of

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[47]Photos of work at channelization structures, Monona County, Iowa, circa 1955-1965, provided by Tom Bruegger to author. Sioux City Journal, *Harnessing the Missouri,* 16 June 1957. Sioux City Journal, *Missouri Channel Entering Decisive Phase,* 20 August 1961.

[48]Omaha World Herald, *Blast Sends Missouri River Into New Channel at St. Joseph,* 5 October 1952. Omaha World Herald, *New Bend in the River: Here's How Water Will Flow Under Decatur Bridge,* 24 July 1955. Sioux City Journal, *Missouri Diversion Creating Two Lakes Near Sioux City,* 16 October 1960. Sioux City Journal, *Plug Pulled; Missouri River Near Decatur Flows Straight,* 30 July 1961. Sioux City Journal, *Missouri Channel Entering Decisive Phase,* 20 August 1961.

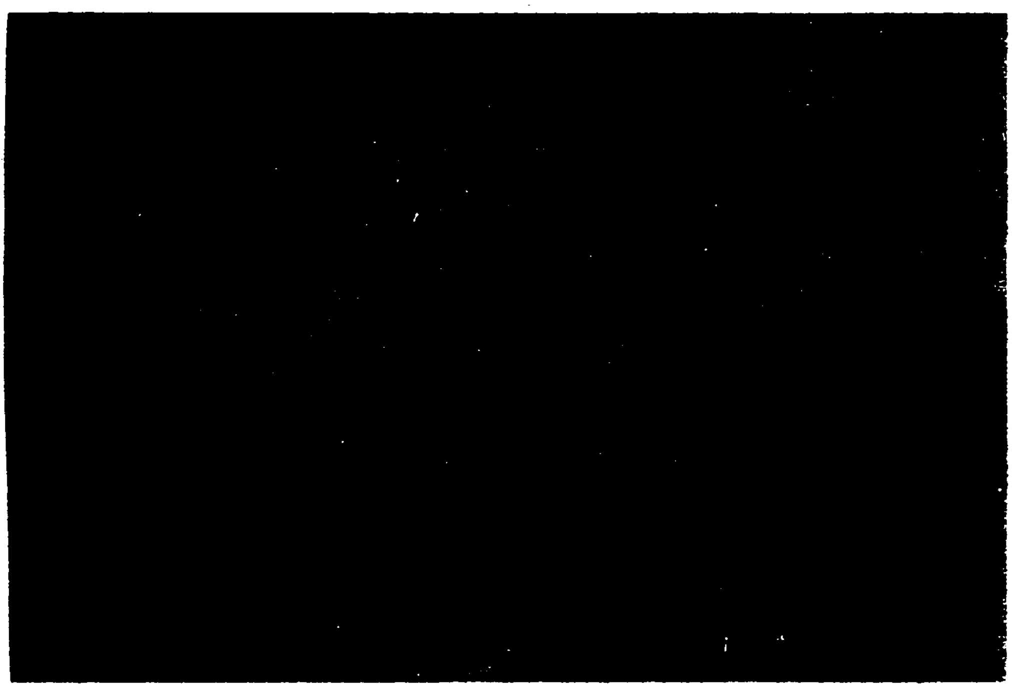

Figure 10.8. Pilot canal construction along the Missouri River. In the photograph, a pilot canal's upstream plug is removed with a dredge while a pile driver hammers piles into the riverbed in preparation for closing the old channel area from the future navigation channel. After 1955, the Corps used pilot canals to rapidly realign the Missouri River. Note the toe trench revetment on the right side of the pilot canal. Courtesy of the Corps of Engineers.

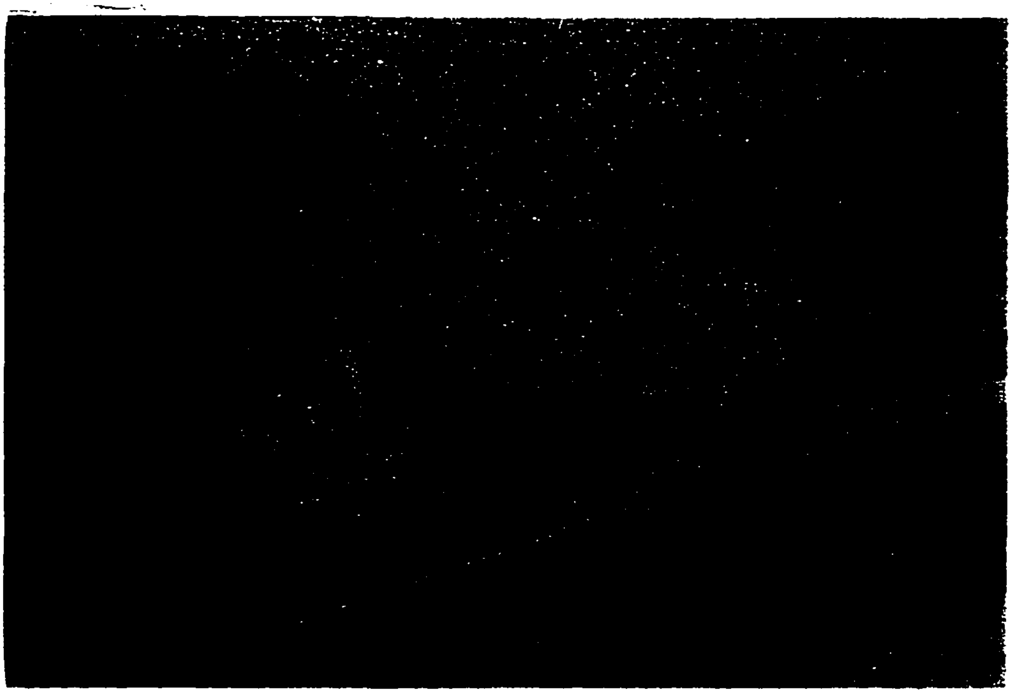

Figure 10.9. The natural channel area of the Missouri River is sealed from the navigation channel. In the photograph, the Corps has dropped quarried stone into the river along a row of piles, forming a pile dike revetment. This revetment cut the flow of water to the natural channel area and diverted the river down the pilot canal. The new navigation channel has widened itself to the bottom of the toe-trench revetment. Courtesy of the Corps of Engineers.

Engineers wielded such an awesome array of tools to manipulate the Missouri River. The Corps reached the pinnacle of its power along the Missouri in the summer of 1955.

The story of the Decatur Bridge diversion operation began in the fall of 1946. At that time, the Burt County Bridge Commission petitioned the Omaha District of the Corps of Engineers for the right to build a bridge across the Missouri River, linking Decatur, Nebraska with Onawa, Iowa. The Corps, with its vested authority over the nation's navigable waterways, examined the proposed bridge's design specifications to insure that it would not hinder the future construction of the navigation channel. With this in mind, Corps officials approved construction of the bridge, stipulating that the bridge span the proposed site of the navigation channel, not the unchannelized river then flowing 500 feet to the east. Following the Corps' directions, the county commission built the bridge over a bone dry expanse of valley bottomland covered with sand, thistle, small willows, and cottonwood trees. In 1951, the county commission finished the bridge, but the Corps did not have any money to divert the Missouri under the span. Thus, from 1951 to 1955, the Decatur Bridge sat idle, a bridge without a river. Only after persistent lobbying by members of the Burt County Bridge Commission and congressional representatives from western Iowa and eastern Nebraska (including Ben Jensen of Iowa) did Congress eventually appropriate the roughly $11 million to move the river under the $2 million dollar bridge.[49]

One and a half miles north, northeast of the Decatur Bridge, the Missouri River made a wide loop before traveling south past the east end of the span. This loop in the channel was

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[49]Sioux City Journal, *Missouri Bridge at Decatur, Neb., to Have Impact...*, 5 January 1947. Des Moines Register, *War May Change Plans to Move River Bridge*, February 1951. Sioux City Journal-Tribune, *Hope Nature Will Aid Bridge Without River at Decatur*, 2 February 1952. Sioux City Journal, *This is a Fine Bridge, But-It's Bone Dry*, Summer 1954. Des Moines Register, *Seek to Move River to Flow Under Bridge*, 2 February 1952. Sioux City Journal, *Agree on Funds for Dry Bridge*, 22 June 1954. Sioux City Journal, *Dry Bridge Work Slated*, 2 July 1954.

approximately three thousand feet wide, only a few feet deep, and covered with sandbars and islands. In order to move the river under the bridge, the Corps needed to construct a stable bankline to guide the river away from the loop and to the bridge.[50] The Corps planned to divert the river under the bridge in four stages.

The Corps and its private contractors completed the first stage in the early spring of 1955. The engineers built a stone revetment on the Nebraska-side of the river a mile above the bridge. This revetment insured that the river did not outflank the control structures built further downstream and kept the river directed toward the future navigation channel. Next, the Corps supervised the construction of a mile-and-a-half-long pile dike to deflect the river's flow away from the wide shallow loop. But the river still did not flow under the bridge. Instead, the Corps kept a 200-foot-long gap open along the south end of the pile dike revetment to allow the river to continue to run east of the bridge (Figure 10.10).[51]

The third stage of the diversion project involved the use of dredges. Dredges dug a pilot canal from south of the bridge, under the span, north to the point where the Missouri River flowed through the gap in the pile dike revetment. At the upper end of the pilot canal, the Corps maintained a coffer dam to keep the river out of the pilot canal until they finished dredging. The final stage of the scheme involved the most sophisticated application of technology. The engineers stationed at the Decatur site coordinated the diversion of the Missouri under the Decatur Bridge with the closure of Gavin's Point Dam at Yankton, South Dakota. On Friday, 29 July 1955, Fort Randall Dam pinched down the flow of the Missouri River to a mere trickle, 3,000 cubic feet per second, far beneath the normal flow volume of

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[50] Omaha World Herald, *Moving River Major Effort,* 4 July 1954. Omaha World Herald, *Missouri River Will Be Led, Rather Than Pushed, Under Dry-Lånd Bridge,* 1 May 1955.

[51] Omaha World Herald, *New Bend in the River: Here's How Water Will Flow Under Decatur Bridge,* 24 July 1955.

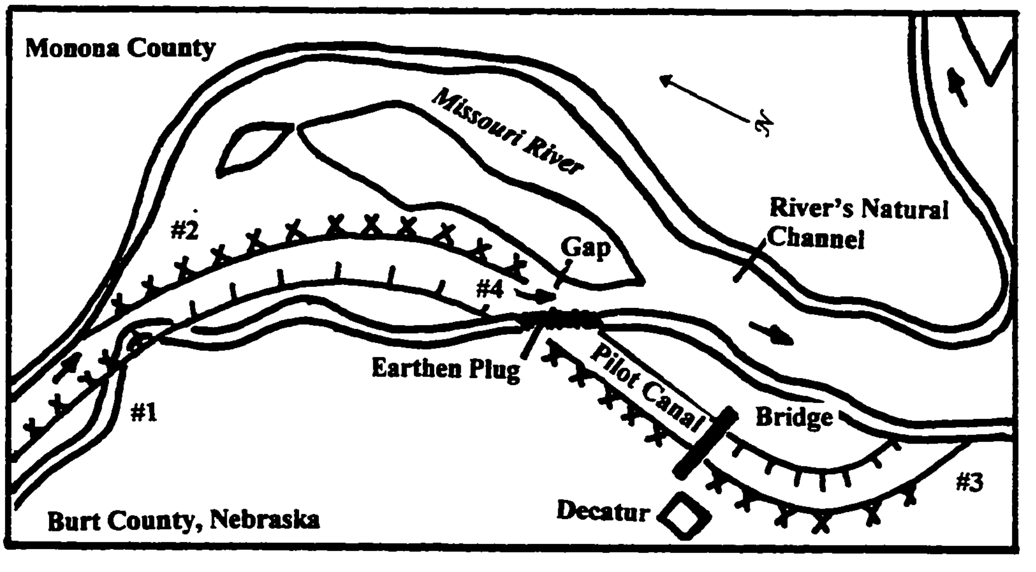

Figure 10.10. The Decatur Bridge diversion operation, summer 1955. The first step in the diversion of the Missouri River under the Decatur Bridge involved the construction of a stone revetment one mile north of the bridge on the Nebraska shore. The second stage of the project entailed construction of a one and a half-mile-long pile dike revetment to block the flow of the river through its natural channel. The engineers left a 200-foot-long opening in this revetment to allow the river to escape to the south. During stage three, the Corps dredged a pilot canal from the natural river channel north under the bridge to the edge of the 200-foot-long gap. In the final stage of the diversion sequence, the Corps, with the assistance of Fort Randall Dam, closed the 200-foot gap, removed the coffer dam at the upper end of the pilot canal, and forced the river under the bridge. Map by author.

28,000 cubic feet per second.[52] The Missouri had never been lower, probably not even since the glacial formation of the stream 30,000 years earlier. This low flow allowed the engineers to close Gavin's Point Dam on Sunday, 31 July 1955 without having to battle a strong current. As the low water level lazily drifted downstream, the *Sioux City Journal* proclaimed, "The lack of water proved that man had at last controlled the impetuous river."[53] At Sioux City, the low water exposed the river bottom to view, and out of the depths rose rusty old cars, discarded home appliances, and miscellaneous junk, testament to years of neglect.

The engineers at Decatur began the actual diversion when the low flow reached the construction site. Over the weekend of the 30 and 31 July, crews began dumping rock along the 200-foot-wide opening in the pile dike revetment northeast of the bridge. By the morning of Monday, 1 August 1955, only a few feet remained to be sealed in the dike before the river would be forced toward the pilot canal. To achieve total diversion, the engineers still needed to remove the coffer dam at the head of the pilot canal. The Corps initially planned on removing the plug with a simple dredge. However, representatives from the media wanted something more dramatic to mark the end of what had become nationally known as the "Decatur Dry Land Bridge." The Corps acquiesced in this request and placed a pickup truck full of dynamite on the coffer dam. Crews detonated the dynamite, but the resulting explosion only blew a small hole in the earthen plug and very little water flowed into the pilot canal and under the bridge. In an anti-climatic conclusion to the entire diversion sequence, a dredge moved into position and excavated the remainder of the plug. Cheers from the crowd went up as the Missouri's channel began to flow through the pilot canal and under the Decatur Bridge. The Decatur Dry Land Bridge was no more (Figure 10.11).[54] A

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[52]Sioux City Journal, *Missouri's Flow Cut for Closure,* 30 July 1955.

[53]Sioux City Journal, *Missouri River Choked to Trickle by Upstream Dams,* 7 August 1955.

[54]Des Moines Register, *Blast Sends Water Under 'Dry' Bridge,* 2 August 1955.

Figure 10.11. The Decatur Bridge, circa 1980. During the Decatur Bridge diversion operation, the Corps of Engineers employed the most sophisticated technologies ever utilized in the construction of the Missouri River navigation channel. The diversion operation represented the height of Corps technological prowess along the Missouri River. During the diversion, the *Sioux City Journal* even claimed that humanity "had at last controlled the impetuous river." Courtesy of the Corps of Engineers.

few days after the diversion, the engineers opened the gates at Fort Randall Dam to allow a higher water volume to flow downstream. This higher water volume quickly scoured the original 80-foot-wide pilot canal into an approximately 300-foot-wide channel, capable of holding the full volume of the Missouri.

The Corps continued to utilize many of the channelization methods and technologies employed during the Decatur Bridge diversion operation into the late 1950s and 1960s. These techniques, in combination with further congressional support, enabled the Corps to press forward with completion of the navigation channel south of Sioux City. By 1961, the Corps finished ninety-one percent of the nine-foot channel between Kansas City and the mouth. Corps officials admitted that,

> Since resumption of work in 1955, good progress has been made in stabilizing the channel and alleviating serious erosion. Although additional bank stabilization structures and the strengthening of existing structures are still required, control of the river has been regained in all but three short reaches totaling 22 miles. Work is underway in each of the three reaches but is not sufficiently advanced to provide a reliable navigation channel. Crossings are wide and very crooked and there is extensive shoaling.[55]

Four years later, in June 1965, the Corps announced that ninety-seven percent of the reach below Kansas City had been completed, but shallow crossings between bends still kept the channel's effective depth at seven and a half feet.[56] From Omaha to Sioux City, eighty-eight percent of the channel had been finished.[57] For all intents and purposes, the Corps completed the navigation channel from the mouth to Sioux City in 1970; although the engineers kept "fine-tuning" the river to deepen its channel.[58] At the same time, the Corps wrapped up construction on the series of dams and reservoirs first authorized in the Pick-

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[55]Ibid., 999.

[56]ARCE 1965, 783.

[57]Ibid., 821.

[58]ARCE 1976, 20.17, 21.15. ARCE 1970, 656.

Sloan Plan in 1944. Besides Fort Randall, Garrison and Gavin's Point, closed in 1952, 1953, and 1955 respectively, the engineers closed Oahe Dam in 1958, and Big Bend Dam in 1963. The closure of these dams resulted in the inundation of 650 miles of the 780 miles of river valley between Yankton, South Dakota and the mouth of the Yellowstone River.[59]

Yet, even though the Corps publicly claimed to have "tamed" the Missouri and made it work for humanity, the river eluded complete mastery. All of the dams, reservoirs, and channelization structures could not halt the occurrence of floods along the valley south of Sioux City, prevent the onset of a phenomenon known as stream bed degradation, curtail tributary stream-cutting, or lessen the effects of drought and flood on the navigation channel. In the 1960s and 1970s, a whole host of negative environmental repercussions surfaced as a result of the development projects of the preceding decades. These environmental problems, in combination with a rising public awareness about issues related to environmental quality, led to the first significant criticisms of the navigation project and its supporting system of dams and reservoirs. A period of public disillusionment with Missouri River development began in the 1970s and continued into the 1990s.

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[59]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Master Water Control Manual, Review and Update Study, Draft Environmental Impact Statement, Description of Existing Environment, (Omaha: U.S. Army Corps of Engineers, Missouri River Division, 1994), 3-1, 3-3, 3-5.

CHAPTER 11: THE UNTAMABLE MISSOURI

Although the Corps of Engineers had been channelizing the Missouri River since the 1890s, the river and valley environments maintained a semblance of their pre-settlement character up to the early 1950s because channelization structures and Fort Peck Dam failed to keep the river from meandering and eroding a new path. For example, in 1952, eighty-three of the 130.5 river miles between Sioux City and Omaha remained unchannelized and unencumbered by pile dikes or revetments. This free-flowing river hindered the advance of agriculture, industry, roads, and urban sprawl into the river corridor.[1]

The river corridor extended from one to four miles across the valley and consisted of four distinct subregions.[2] The subregions included: the water area, the channel area, the active erosion zone, and the meander belt (Figure 11.1).[3] The water area embraced the Missouri River itself, its thalweg, side channels, sloughs, and connected oxbow lakes, anywhere that water flowed. The Iowa Geological Survey estimated that the water area of the Missouri River in western Iowa prior to channelization covered approximately 24,637 surface acres.[4]

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[1]ARCE 1944, 1021. ARCE 1952, 1304.

[2]W.W. Sayre and J.F. Kennedy, *Degradation and Aggradation of the Missouri River,* proceedings of a workshop held in Omaha, Nebraska, 23-25 January 1978. Iowa Institute of Hydraulic Research Report No. 215, (Iowa City: University of Iowa, 1978), 5.

[3]George R. Hallberg, Jayne M. Harbaugh, and Patricia M. Witinok, Changes in the Channel Area of the Missouri River In Iowa, 1879-1976, (Iowa City: Iowa Geological Survey, 1979), 6, 7. U.S. Army Corps of Engineers, Missouri River Division, Missouri River Bank Stabilization and Navigation Project Final Feasibility Report and Final EIS for the Fish and Wildlife Mitigation Plan, (Omaha: U.S. Army Corps of Engineers, Missouri River Division, 1981), 3, 4.

[4]Hallberg, Harbaugh, and Witinok, Changes in the Channel Area of the Missouri River In Iowa, 1879-1976, 16.

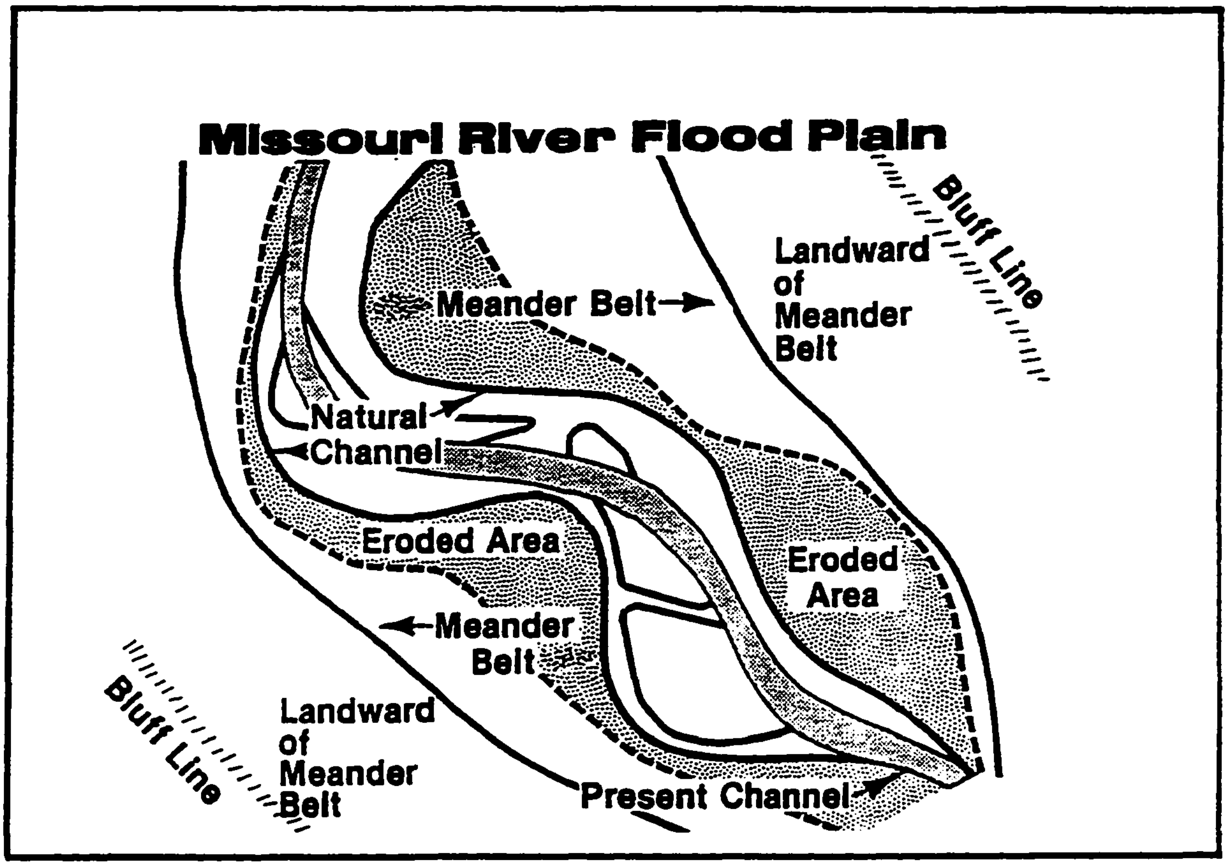

Figure 11.1. The four areas of the Missouri River corridor. The water area consisted of the thalweg, sloughs, connected oxbow lakes, and side channels. The channel area extended from the left bank to the right bank and encompassed the water area and all sandbars and islands. The active erosion zone (referred to in this illustration as the "eroded area") possessed a high probability of being scoured, eroded, or inundated during any given year. The meander belt existed the furthest from flowing water and as a result it comprised the most stable land forms and habitat types within the corridor. Courtesy of the Corps of Engineers.

The channel area stretched from the water line on the left bank to the water line on the right bank. The channel area comprised the water area as well as sandbars and islands. Along the Iowa border, this area embodied roughly 42,682 acres, or 66.6 square miles, before channelization.[5] The active erosion zone bordered the channel area on either side of the river. The active erosion zone could be inundated, scoured, or eroded each year. Physical features within this zone included: sandflats on the water's edge, willow groves along the bank, and timber tracts that stretched to the bluff line. From Sioux City to the mouth, a government estimate placed this area at 364,000 acres or 564 square miles.[6] In western Iowa there existed approximately 44,915 acres, or 70.1 square miles, inside the active erosion zone.[7] The meander belt sat the furthest from moving water. Here, the river was less likely to erode a new course, but the potential existed nonetheless. The meander belt possessed timber tracts, marshland, pasture, native grasses, and cropland. This area totaled 31,864 acres, or 49.7 square miles in Iowa. In sum, the river corridor in western Iowa contained approximately 186.4 square miles of various types of habitat for fish and wildlife (Figure 11.2).[8]

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[5]Ibid., 15, 16.

[6]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Bank Stabilization and Navigation Project Final Feasibility Report and Final EIS for the Fish and Wildlife Mitigation Plan, 3.

[7]Number of acres and square miles calculated by taking the 364,000 acres and dividing by total river miles between Sioux City and mouth (762.5 in 1952) which equals 447.37 acres per mile then multiply 447.37 by the number of river miles in western Iowa prior to the navigation projects in 1923 (200.8) and dividing by two for the half in Nebraska and half in Iowa.

[8]The figure of 186.4 square miles was derived by adding the 66.6 square miles of channel area, the 70.1 square miles of the active erosion zone, and the 49.7 square miles of the meander belt.

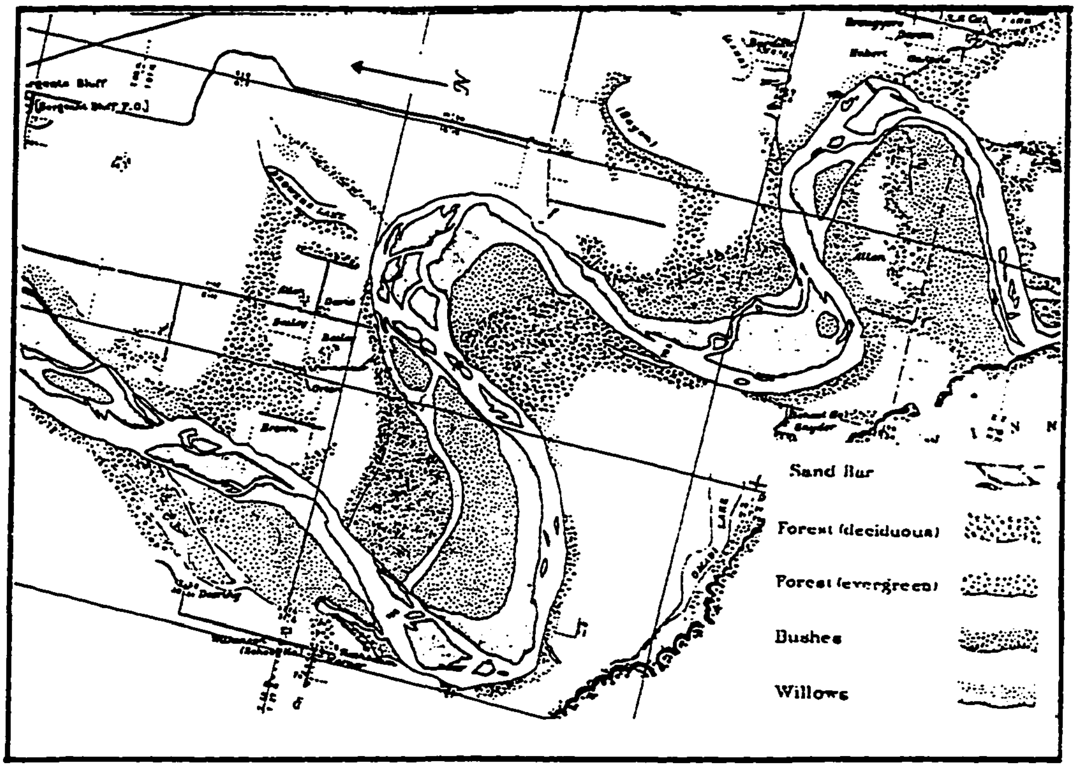

Figure 11.2. A portion of the Missouri River corridor in Woodbury County, Iowa, circa 1890. The unrestricted flow of the Missouri River fostered biodiversity by constantly creating and destroying species habitat. No single habitat type and its concomitant life forms could achieve dominance within the overall ecosystem as long as the river remained free to erode, meander, and flood. Closure of several Dakota dams in the 1950s and the resultant regulation of flow volumes, in concert with channelization work south of Sioux City, dealt a severe blow to biodiversity in the corridor. Courtesy of the Corps of Engineers.

The unchannelized and undammed Missouri River perpetually washed away sandbars and islands, undermined trees and brush along the shoreline, and overtopped its banks during the spring and summer months. As a result, the river prevented any one area in the corridor and its accompanying habitat from gaining supremacy within the overall ecosystem. Nothing in the river or adjacent valley remained standing against the power of moving water for very long. And at the same time that it destroyed one habitat, it created another. As the sandbars that served as nesting sites for shorebirds disappeared beneath the rising river, fish habitat increased proportionally; or when the river quit inundating a sand flat, willows and cottonwoods took root and provided cover and forage to birds and mammals. Through an endless process of formation and disintegration, the Missouri nurtured biological diversity.

In addition, the unrestricted flow of water contributed to the health of all life forms in the river and valley. When high water eroded a timber tract and sunk its trees to the bottom of the river, the deer, turkeys, coyotes, beavers, and skunks that had lived in the drowned forest moved to another grove. These displaced creatures competed for food and mates with wildlife already occupying the remaining woodlands. This competition strengthened the species.

Everything imaginable lived in this disparate habitat. Abundant numbers of blue, channel, and flathead catfish swam in the Missouri's warm, muddy, nutrient-rich water and its moderate to fast channel chutes. Among valley residents, the blue catfish gained notoriety because they grew to such large sizes. According to officials of the Missouri Department of Conservation, "Legendary blue catfish were caught frequently. Reports include one of 315 pounds, another of 242 pounds...."[9] The number and size of blue catfish decreased in the early and middle twentieth century because of commercial fishing and the elimination of

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[9]John L. Funk and John W. Robinson, *Changes in the Channel of the Lower Missouri River and Effects on Fish and Wildlife,* in Aquatic Series No. 11, Missouri Department of Conservation, (Jefferson City: Missouri Department of Conservation, 1974), 15.

habitat. But even in the 1950s, stories still circulated of huge blue catfish being caught by unsuspecting anglers.[10]

Paddlefish cruised the dark waters of the Missouri main stem. Paddlefish feed on plankton, using their long snout to grub for food on the river bottom. Consequently, these fish preferred to lie in the deeper sections of the river, in nine feet or more of water, only to leave the depths to migrate upstream to ancient spawning grounds and there, as the grayish-blue backs of the females protruded above the water surface, lay eggs over hundreds of feet of shallow gravel and sand riffles. Dispersal of the eggs guaranteed against destruction of the entire nesting population.[11] Paddlefish also reached admirable sizes. Fishers in the 1950s, using stout poles and large diameter treble hooks, frequently snagged paddlefish ranging from fifty to one hundred pounds. Legions of other fish lived in the shallow, calm side channels and connected oxbow lakes where a teeming mass of plankton, insects, larvae, crustaceans, and reptiles appeased the appetites of largemouth bass, smallmouth bass, white bass, black crappie, white crappie, blue sucker, goldeye, walleye, northern pike, shovelnose sturgeon, bigmouth buffalo, smallmouth buffalo, white sucker, pallid sturgeon, bluegill, and the ever-present and versatile carp.[12]

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[10] Sioux City Journal, *Missouri Yields a 93-Pound 'Cat.'* 23 June 1959.

[11] U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Missouri River Stabilization and Navigation Project, Sioux City, Iowa to Mouth, Detailed Fish and Wildlife Coordination Act Report, (North Kansas City: Kansas City Area Office, U.S. Fish and Wildlife Service, 1980), 42. Jack Merwin, *Research Gives Paddlefish a Chance,* South Dakota Conservation Digest, January 1974(?), 12. Donald Friberg, *Living Relics: Because of Little Natural Reproduction, Paddlefish May Be On the Decline in South Dakota,* South Dakota Conservation Digest, year published unknown, 28(?).

[12] U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, 42, 43. U.S. Fish and Wildlife Service, Missouri River Basin Studies, Distribution and Status of the Important Fish and Wildlife, Missouri River Basin, 1952, (Billings: U.S. Fish and Wildlife Service, 1953), 25, 26, 52, 53, 56,57, 67, 68.

The channel area and its sandbars, gravel bars, islands, and marshy sloughs afforded habitat to reptiles, shorebirds, geese, and ducks. Turtles, frogs, and snakes swam in the shallow water of sloughs or sunned themselves on the beaches and bars that blanketed the river. Shorebirds, such as the piping plover and least tern, with their long, thin legs, danced along the edge of bars, eating aquatic insects, snails, seeds, berries, and the occasional, unalert fish. Canadian geese, lesser snow geese, blue geese, and ducks of various sorts including the mallard, ring-necked duck, and ruddy duck all migrated and nested along the river corridor. Canadian geese depended heavily on the Missouri River flyway on their annual journeys north and south. The bars in the river furnished crucial resting sites for migrating birds needing protection from marauding predators. Bars also supplied waterfowl with nesting areas for the same reason, protection of the eggs and brood from weasels, badgers, raccoons, and skunks wandering the banks.[13]

Sandflats, sand dunes, willow groves, stands of cottonwood, tracts of elm, ash, and bur oaks as well as a tangled mass of poison ivy, wild grape vines, chokecherry bushes, and saw grass lay strewn across the active erosion zone. Wood ducks, woodpeckers, and eagles nested in tall, dead trees that towered above the river. Coyotes, red foxes, gray squirrels, fox squirrels, cottontail rabbits, raccoons, opossums, beavers, weasels, muskrats, skunks, badgers, bobcats, and mink scurried along the ground, either trying to avoid their neighbors or attempting to eat one of them. Bobwhite quail, hungarian partridge, ring-necked pheasants, and mourning doves fed on kernels of corn left in nearby fields in the fall, cowered

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[13]U.S. Fish and Wildlife Service, Missouri River Basin Studies, Distribution and Status of Waterfowl in the Missouri River Basin. (Billings: U.S. Fish and Wildlife Service, 1957), 50, 51, 54, 55, 56, 57, 60, 61, 100, 101, 114, 115.

in the brush during the snows of winter, and made a noisy racket as they sought mates during the spring.[14]

The meander belt possessed the most stable land forms and flora within the river corridor. Relative stability in habitat meant the presence of long-established oxbow lakes, mature forest tracts of bur oak, elm, and ash, pasture land occupied by cattle and hogs, and agricultural cropland. Many of the creatures that lived within the active erosion zone ventured into the meander belt for food and cover.

Beyond the active erosion zone and meander belt lived the valley's human inhabitants. For over one hundred years, the residents of the valley had kept their distance from the river for a simple reason: to avoid having their homes, crops, livestock, towns, and cities swept downstream. Along the margins of the valley, or on top of low ridgelines that ran along the bottomlands, sat towns, including Sergeant Bluff, Salix, Sloan, Holly Springs, Luton, Whiting, Turin, and Onawa in western Iowa. In Monona County, settlers platted their towns from four to ten miles away from the river or directly under the shadow of the Loess Hills. Railroads and highways (including Highway 75 and the Chicago and Northwestern Railroad) ran beside the bluff line or far from the river on top of natural inclines. Valley residents positioned grain elevators, warehouses, industrial sites, and farm houses away from the river. Common sense dictated that structures and people stay clear of the river corridor, or not even get close to it.[15]

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[14]U.S. Fish and Wildlife Service, Distribution and Status of the Important Fish and Wildlife, Missouri River Basin, 1952, 152, 155, 162, 166, 173, 176, 179, 182, 188, 197, 200, 204. Donald Frank Johnson, *Plant Succession on the Missouri River Floodplain Near Vermillion, South Dakota*, (unpublished master's thesis, University of South Dakota, 1950), 22-25.

[15]U.S. Geological Survey, Monona County, Iowa, 1:100,000-scale Topographic Map, (Denver: U.S. Geological Survey, 1987).

Closure of the Dakota dams and resumption of work on the navigation channel in the 1950s and 1960s set-off a series of physical and ecological changes in the river corridor from the Dakotas to the river's mouth. These changes occurred simultaneously and over a short period of time.

The closing of Fort Randall Dam in 1952, Garrison Dam in 1953, and Gavin's Point Dam in 1955 put an end to the Missouri's spring and summer rise. The regulated Missouri maintained a fairly even discharge rate during eight months out of the year, about 25,000 to 30,000 cubic feet per second at Sioux City. Regulation reduced the river's power to erode, meander, and flood.

Upstream dams and reservoirs substantially decreased the amount of silt and nutrients in the river below Yankton. The Corps of Engineers estimated that prior to the 1950s, the Missouri annually carried 142 million tons of silt past Sioux City. After closure of the dams, the river hauled a scant four million tons past the same location.[16] Another estimate claimed that the annual silt load before the dams equaled 138 million tons at Yankton. This amount decreased to 1.9 million tons.[17] Noting the decline in the river's silt content, Gerald Jauron, Missouri River Coordinator for the Iowa Conservation Commission exclaimed, "They closed the dam [Gavin's Point] last summer. For a couple of days the Mo practically stopped running, and you could almost spit across the river when they shut off the flowage. Then it began to flow over the spillway and the river began to rise again. When it did, I'd never seen the Missouri cleaner."[18] As a result of this change, residents in the valley boasted that the

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[16] Sioux City Journal Tribune, *'Muddy' No Longer Fits the Missouri,* 17 April 1959.

[17] W.W. Sayre and J.F. Kennedy, *Degradation and Aggradation of the Missouri River,* 8.

[18] Des Moines Register, *Newest Iowa Playground: The Missouri, Tamed River Offers Boating, Fishing,* 26 August 1956.

Missouri had become one of the cleanest rivers in the Midwest, and its nickname, "Big Muddy," was no longer applicable.[19]

The narrowing of the channel width below Sioux City from an average of 2363 feet to a mere 739 feet, in combination with the straightening of the river channel (the Corps shortened the river by seventy miles from Sioux City to the mouth), resulted in a threefold increase in the river's current velocity.[20] Before the navigation project, the river flowed between 1 and 2 miles per hour. After channelization, the Missouri rocketed downstream at 6 mph (Figure 11.3).[21]

Cleaner water, a straighter channel, and confinement of the water area within stone-lined banks led directly to streambed degradation or the lowering of the riverbed through erosion, which began immediately after the closure of the dams. Corps officials called the clear water exiting the dams "hungry water," which seeks sedimental material in order to slow its momentum. It did this by eating away the river bed of clay, gravel, and sand. Degradation occurred from Yankton to the Platte River confluence. Below the Platte, a number of factors mitigated against degradation, including the presence of bedrock near the surface. By 1980, the river had dug down 8.5 feet at Sioux City, and approximately 5.5 feet at Decatur (Figure 11.4).[22] No one knew how much lower the river would dig into its bed. Some officials

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[19] Sioux City Journal, *Missouri River No Longer 'Big Muddy,'* 18 April 1959.

[20] U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, 9.

[21] These bends included Omadi, Snyder, Winnebago, Blackbird, Tieville, Decatur, Louisville, and DeSoto.

[22] U.S. Army Corps of Engineers, Omaha District, Investigation of Channel Degradation, 1985 Update, Missouri River, Gavin's Point Dam to Platte River Confluence, (Omaha: U.S. Army Corps of Engineers, Omaha District, 1985), II-5.

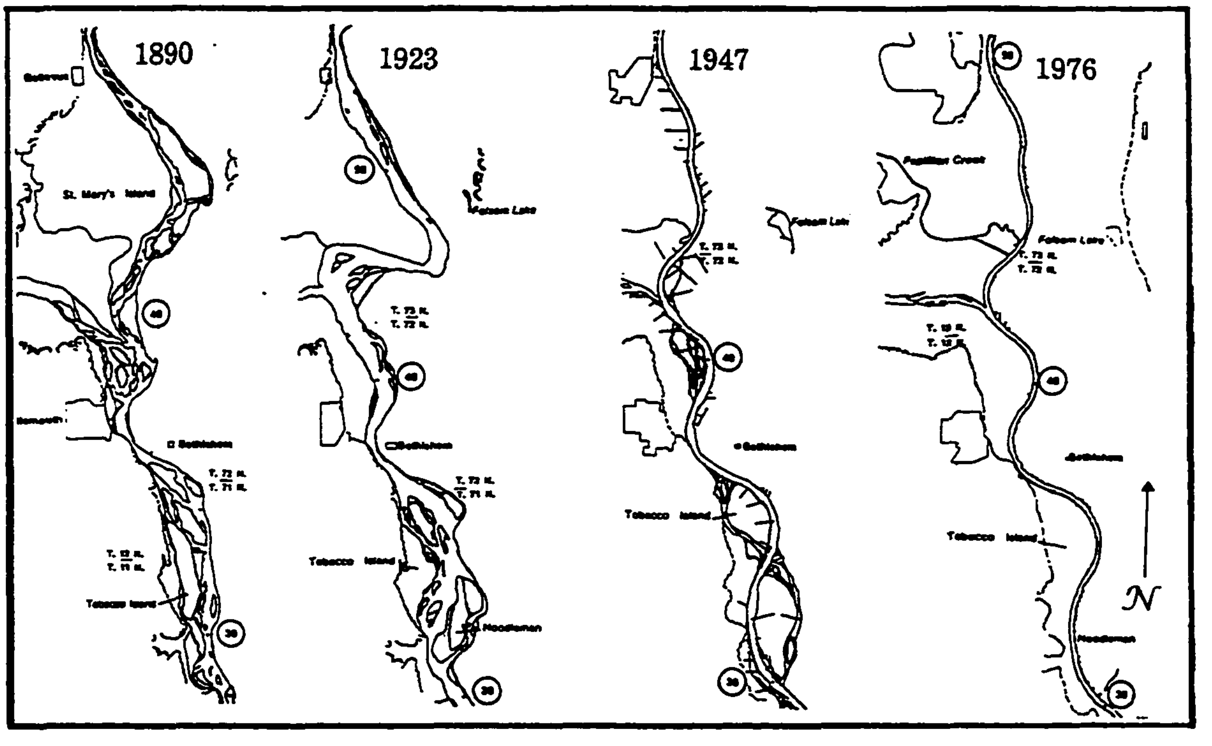

Figure 11.3. The transformation of the Missouri River, 1890-1976. This series of maps graphically illustrates the changes in the Missouri River that resulted from construction of the navigation project. Channelization structures reduced the Missouri's water area and channel area and eliminated all sandbars, islands, and side channels from the river. The work also straightened the river and increased its current velocity. Courtesy of the Iowa Geological Survey.

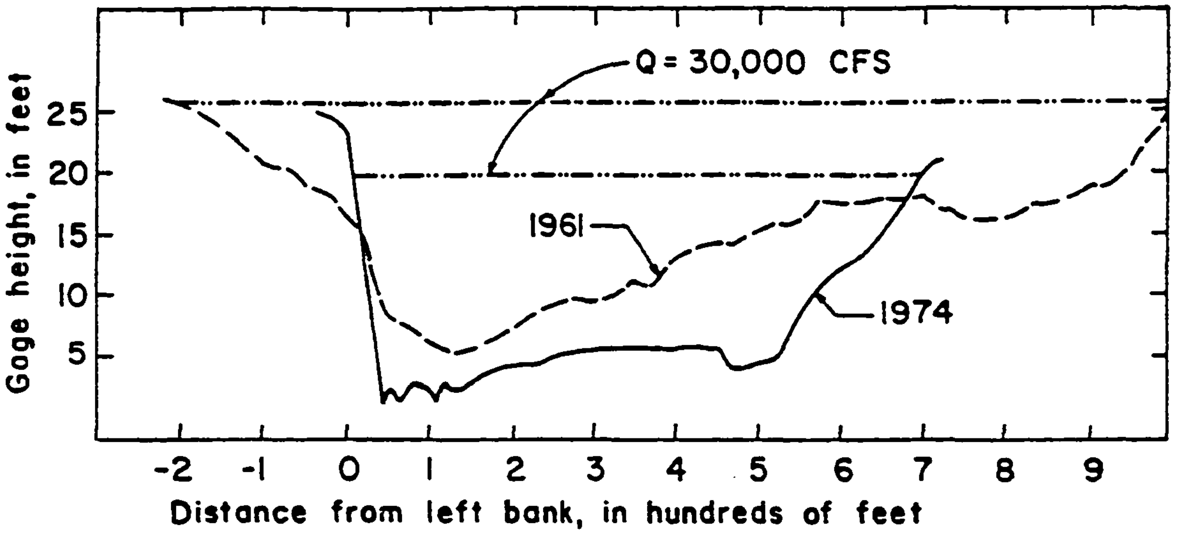

Figure 11.4. Streambed degradation at Sioux City, Iowa. Degradation of the Missouri's streambed began immediately after the closure of Fort Randall and Gavin's Point dams in the 1950s. The clear water exiting these dams tore away the river's original bed of clay, gravel and sand. Degradation occurred from Yankton to the Platte River confluence. By 1980, the river had dug down 8.5 feet at Sioux City. Illustration from Degradation and Aggradation of the Missouri River.

speculated that the river would degrade another 15 feet at Sioux City.[23] Corps officials predicted the river would lower itself only a few more feet because the hungry water flowed over increasingly coarser bed materials, including large stones and even boulders, that resisted erosion.

Regulation of flows, channelization, and degradation caused a marked reduction in the size of the river's water and channel areas. By 1980, the water area along the Iowa border dropped from an estimated 24,637 square acres to roughly 7,637 acres, a net loss of 26.5 square miles. The channel area, which included the water area, and all islands and sandbars, decreased from 42,682 acres to 7,682 acres in western Iowa. Essentially, the engineers succeeded in joining the water area with the channel area and in the process they eliminated all the river's islands and sandbars. Of the roughly 18,000 acres, or 28 square miles, of bars and islands that existed in western Iowa prior to the navigation project, not even 60 acres remained by the early 1970s.[24] The Iowa Geological Survey estimated that the channel area of the Missouri River from Sioux City to the mouth "had been decreased by more than 132,000 acres-over 206 square miles-about a -40% reduction from 1879. Even more striking is that over 103,000 acres-161 square miles-of water area have been lost, over -57% of the 1879 water area."[25] Similar changes occurred along the river reach in Kansas and Missouri.

The decrease in the size of the water area and channel area meant a corresponding increase in accreted land. The former islands, sandbars, side channels, and shallow sloughs became firmly attached to the new bank line. Accreted land represented a boon to valley farmers,

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[23]Sioux City Journal, *ICC staff told, 'time is running out for river,'* 20 October 1980.

[24]Hallberg, Harbaugh, and Witinok, Changes in the Channel Area of the Missouri River In Iowa, 1879-1976, 16.

[25]Ibid., 16. Kansas City Times, *Agency decries Missouri River, U.S. urged to alter policy to aid fish, wildlife,* 18 June 1980.

who quickly acquired the new terrain. With the river restricted inside rock wing dams and revetments, the dams holding back high flows, and the channel digging itself down into bedrock, valley farmers, for the first time in history, could plant crops to the water's edge.

Before crops could be sown within the river corridor, the accreted acres needed to be cleared of their original vegetation. In the 1950s, valley farmers often cleared their land during the winter months, after plant growth had ceased for the year and the cold brittle trees and shrubs could be easily knocked down. Farmers utilized a number of different technologies to clear the land, including chain-saws, bulldozers, triangular bulldozer blades, and a recent invention known as the Crossville Clearing Blade.

Farmers used chain saws to cut-down large diameter trees, while bulldozers plowed through the smaller willows and cottonwoods. Russell E. Long of Gray Ridge, Maine invented the Crossville Clearing Blade in the early 1950s and patented the device in September 1953. Within months, farmers employed this tool along the Missouri River corridor. The Crossville Clearing Blade was "V" shaped, razor sharp, and had a staggered edge. A bulldozer pushed the blade along only an inch above the surface of the ground where it cut through small to medium size trees up to thirty-six inches in diameter. D.M. Babbitt, who lived just below the mouth of the Platte, owned 600 acres of bottomland that had once been an island. Channelization work fixed the island to the bankline. Using the Crossville Clearing Blade, Babbitt and his sons removed an average of ten acres of trees and shrubs per day from the former island. In a month of irregular work, the men cleared ninety acres and intended on clearing the rest as soon as possible.[26] In western Iowa, owners of bulldozers hired themselves out to farmers to clear land in the river corridor. Working west of Sloan, a crew of three men cleared 200 acres of accreted land in just a couple of months in the winter of 1954. Another bulldozer operator claimed to have cleared 500 acres for several farmers

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[26]Omaha World Herald, *R.F.D.: River Work Opens New Frontier,* 7 February 1954.

near Onawa during the winter of 1955-56. Once the land had been stripped of foliage, farmers planted crops. Charles Scebold, who lived near Council Bluffs, plowed his furrows within feet of the Corps' old pile dikes. Farmers all along the river from Sioux City to the mouth repeated the actions of men like Scebold and Babbitt.

Studies conducted on clearing operations in Nebraska along the Missouri River between 1955 and 1971 concluded that 50 percent of the forest cover present in 1955 did not exist sixteen years later.[27] This compared with a rate of clearance of only five percent on lands adjacent to unchannelized streams or rivers, where most of the timber had been removed by the stream itself. More forestland may have been cleared in Nebraska because Nebraska law permitted valley farmers to acquire all the land accreted through channelization. In Iowa, accreted land within the former high water line of the river belonged to the State of Iowa. Thus, the state government held forestland in preserves that did not exist on the other side of the Missouri. Nonetheless, the amount of privately-owned forestland cleared in Iowa likely equaled the volume removed by farmers in Nebraska. The rate of clearing accelerated after 1971, spurred on by a jump in the value of agricultural land and rise in commodity prices as the Soviets purchased vast stores of American grain.[28] Approximately seventy to eighty

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[27]U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, 22.

[28]Omaha World Herald, *R.F.D.: River Work Opens New Frontier,* 7 February 1954. Omaha World Herald, *Land Cleared in Flood Plain, New Machinery Speeds Reclamation Job,* 7 February 1954. Sioux City Journal, *Clearing Accretion Land of Missouri Is Hardy Winter Job,* 24 January 1954. Sioux City Journal, *Land Clearing - 1955 Style,* 24 January 1955. Des Moines Register, *They've Harnessed the Missouri, But It's Still a Problem River,* 10 June 1956. Sioux City Journal, *Irrigating from Missouri River,* 2 July 1956. Sioux City Journal, *Decisions Crucial in fate of Missouri,* 29 December 1980. Sioux City Journal, *River research reveals habitat losses,* 28 January 1980. Des Moines Register, *Promises drown in muddy Mo,* from series titled, *The Once Mighty Missouri,* 1 October 1989. Des Moines Register, *The Mo gnaws deeper into its bed,* from series titled, *The Once Mighty Missouri,* October 1989. Des Moines Register, *Dry lakes, less wildlife - but a more navigable river,* from series titled, *The Once Mighty Missouri,* October 1989.

percent of privately-owned forestland in western Iowa had been destroyed by the 1980s.[29] Neil Heiser of the Woodbury County Conservation Board admitted that, "He did not know of a single 40-acre or more patch of native bottom timber left on private land anywhere along the Iowa side of the Missouri between Sioux City and Omaha."[30] The forests of bur oak, ash, elm, and cottonwood located in the erosion zone and meander belt had fallen in only thirty years.

Industry moved into the river corridor after 1955. Manufacturing facilities, coal-burning power plants, docks, and grain elevators sprung-up along the Missouri from Sioux City south. The Corps of Engineers encouraged this industrial expansion. In January 1955, General William Potter of the Missouri River Division proclaimed to the *Omaha World Herald* that the dams and channelization structures made industrial development possible in the valley. According to Potter, the cleaner river could supply the water to cool machine tools used in the manufacturing process and the navigation channel could provide a low-cost route for shipment of raw materials and finished products to and from the new industrial sites.[31] Later in 1955, General Potter told a group of Omaha business representatives that the federal government construction projects in the Missouri Valley laid the groundwork for industrial development along the river's banks, but valley residents had to take the initiative to exploit these opportunities.[32] Business interests in Sioux City, Omaha, Council Bluffs, and Kansas City did not need much encouragement to build facilities in the river corridor.

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[29]Thomas B. Bragg, and Annehara K. Tatschi, *Changes in Flood-Plain Vegetation and Land Use Along the Missouri River from 1826-1972,* Environmental Management, 1, no. 4, 1977, 346.

[30]Sioux City Journal, *River research reveals habitat losses,* 28 January 1980.

[31]Omaha World Herald(?), *'River Vital to Industry,' Potter Gives Views to Foundation,* 28 January 1955.

[32]Omaha World Herald, *River Project Must Be Used,* 17 November 1955.

In the middle 1950s, Sioux City businessmen established the Industrial Development Expansion Association. As its first order of business, the association acquired sixty-five acres of bottomland on the west side of Sioux City, just below the Loess Hills and slightly east of the mouth of the Big Sioux River. In 1958, the association employed bulldozers to remove trees and brush from the area, leveled the land, and filled ponds and marshland with sand and gravel dredged from the Missouri River. By the late 1970s and early 1980s, this former channel area contained a mammoth Zenith Electronics plant, a Holiday Inn hotel, numerous manufacturing facilities, retail stores, and restaurants. Sioux City developers named the complex the TriView Industrial Park (Figure 11.5).

In late 1959, the City of Sioux City, with the backing of the business community, annexed a 4.4 square mile section of river bottomland south of town. Within twenty years, this area housed gas stations, trucking firms, the Big Soo Barge Terminal, an extensive blue jeans manufacturing plant, and a Swift Packing Company hog processing plant. Also in 1959, the Iowa Public Service Company announced that it would build a large, twenty-five million dollar coal-burning power plant on the river west of Salix. This facility expanded over the years and became known as the Port Neal Industrial Area. In 1980 the Port Neal complex possessed four electrical generating plants, a massive Archer Daniel Midlands grain elevator, as well as the largest nitrate plant in the state of Iowa owned by Terra Chemical Incorporated.[33] All the way down the valley, the story repeated itself. Industries pushed into the river corridor.[34]

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[33]Sioux City Journal, *River Site Fill Slated*, 17 June 1958. Sioux City Journal, *Annexation Area*, 2 November 1959. Sioux City Journal-Tribune, *I.P.S. to Build 25-Million-Dollar Plant on Missouri West of Salix*, 10 December 1959. Rapid City Journal, *Municipal, utility projects tap river*, in series titled, *Missouri River Row*, 18 September 1991.

[34]Omaha World Herald, *Industry Site Needn't Spoil Good River View*, 30 January 1955. Omaha World Herald, *Tamed River Booms Industry Chance*, 15 January 1956.

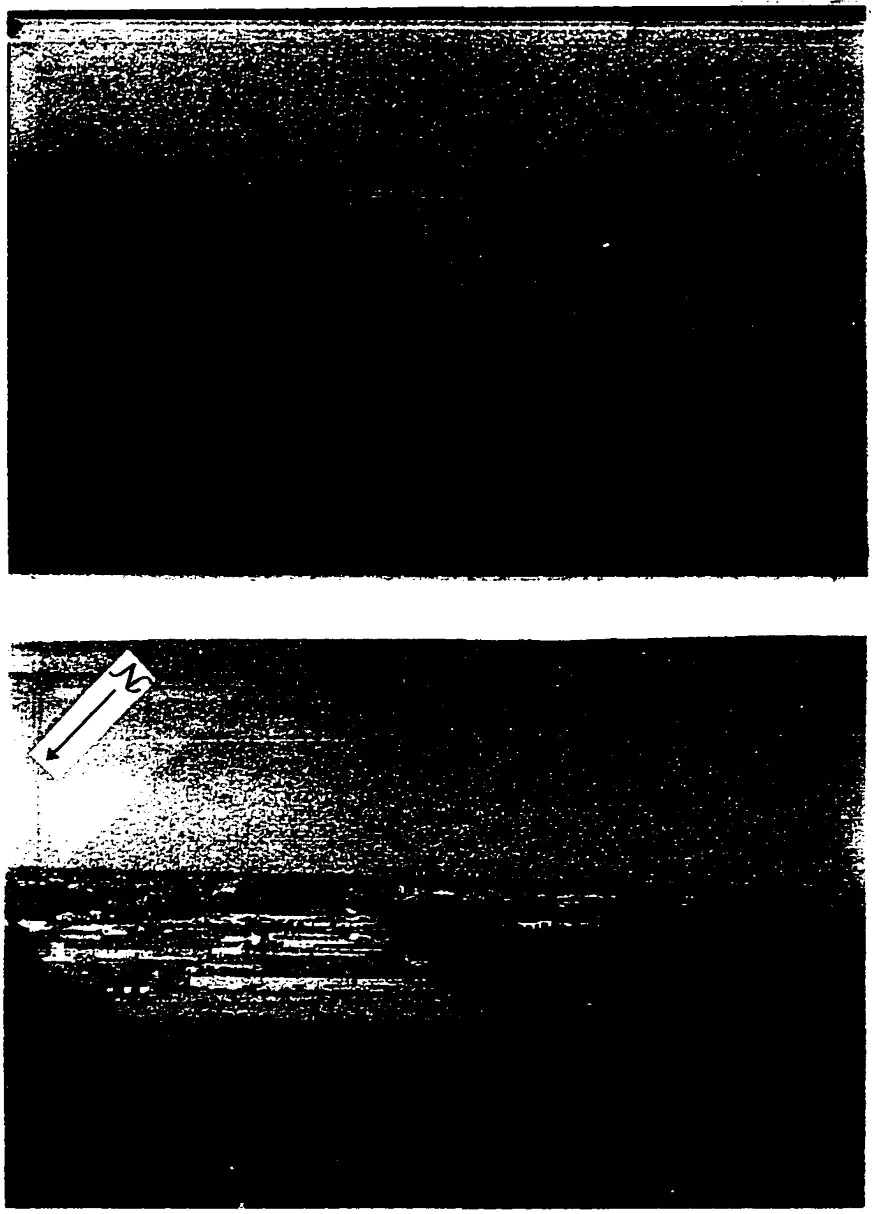

Figure 11.5. The site of the TriView Industrial Complex at Sioux City, Iowa. Prior to the construction of the Dakota dams, valley residents built industrial facilities, roads, and residential districts at a safe distance from the river or on top of natural inclines that ran along the valley floor. After closure of Fort Randall Dam, industry, roads, and urban sprawl were built in close proximity to the river. The top photograph, taken in 1939, shows the valley floor just east of the mouth of the Big Sioux River. The bottom photograph shows the same location over fifty years later. Top photograph by Robert J. Schneiders, bottom photograph by author.

Industrial growth in the river corridor occurred simultaneously with, and was facilitated by, the construction of roads, especially Interstate 29 and a network of county highways. President Dwight D. Eisenhower's Interstate Highway Program authorized the construction of Interstate 29 from Kansas City north to the United States-Canada border, skirting the Missouri River as far as Sioux City. Work on the section in Iowa began in 1958 and progressed steadily until final completion in 1973. Interstate 29 did not wind through the Loess Hills or along the foothills as had highways constructed in the past. Instead, I-29 stretched along the lowlands, in close proximity to the Missouri. In numerous locations, I-29 approached the river to within half a mile and just south of Sioux City it comes within fifty feet of the water line. Before construction of Fort Randall Dam and the channelization project, constructing roads this close to the river would have been inconceivable.

Prior to the 1950s, the few roads that led to the river required the frequent expenditure of funds for maintenance because the Missouri habitually inundated the routes. If the river did not actually wash out a road, the high water table, poor drainage, and heavy spring and summer rains turned the lanes into muddy bogs. The Corps construction projects allowed county governments to construct hard-surface highways and gravel roads to the stream's banks.[35] The ever-expanding road network stimulated the construction of boat ramps up and down the Missouri. In the Sioux City area, government agencies constructed four boat ramps. The ramps and roads afforded unprecedented access to the river corridor to residents of the valley and beyond. The number of private sport boats on the Missouri increased in the 1950s, 1960s, and 1970s. As the river became narrower and deeper, "V" bottom sport boats with powerful inboard motors replaced the traditional Missouri River flat-bottom Johnboats

[35]Omaha World Herald, *Highway on River Bottom, Bluffs to Mondamin, Plan,* 8 February 1956. Sioux City Journal, *Supporters of Proposed Interstate Riverfront Highway Outline Benefits,* 22 September 1956. Sioux City Journal, *Here's Plan for New Cloverleaf Interchange at Gordon Drive,* 21 October 1956. Sioux City Journal, *Interstate Progresses,* 19 April 1959.

and their small outboard motors. Along with the boats arose a supporting system of harbors, gas stations, convenience stores, and restaurants.

Agricultural and industrial growth transformed the former active erosion zone and meander belt areas. Prior to the 1950s, the active erosion zone consisted of approximately 44,915 acres (70.1 square miles) from Sioux City to the Iowa-Missouri border. In 1980, the Corps of Engineers estimated that ninety percent of this area had been converted from fish and wildlife habitat to crops, industries, roads, or residential districts. Only 4,491 acres (7.1 square miles) of the zone remained undeveloped.[36]. Changes in the meander belt mirrored events in the active erosion zone. By 1980, nearly one hundred percent of the meander belt land area had been remade to serve human purposes. Thus, in western Iowa, this sector decreased by 31,864 acres (49.7 square miles). Federal officials calculated that since the navigation project's inception in the late nineteenth century, approximately 500,000 acres of the water area, channel area, and active erosion zone located below Sioux City had been either cropped, paved, or replaced with buildings. An additional 242,000 acres in the meander belt had been completely eliminated as habitat.[37] The amount of land affected by the navigation project reached astronomical proportions. One thousand one hundred and fifty square miles of the river valley had been altered as a result of the navigation project and its consequences.

Replacement of the richest continuous stretch of species habitat in the Midwest with an urban-industrial-agricultural complex benefited a significant number of valley residents. Secure roads, a more extensive highway network, new farm land, the decreased threat of

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[36]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Bank Stabilization and Navigation Project Final Feasibility Report and Final EIS for the Fish and Wildlife Mitigation Plan, 7.

[37]Ibid., 7.

floods, cheap land for industrial sites, water for cooling power plants and machine tools, and the presence of a barge channel financially advanced farmers and businessmen. Yet, the same environmental changes that profited some individuals and groups caused harm to others, including the fish and wildlife species that had lived in the former corridor.

By the 1980s, the only regions in the former corridor where fish and wildlife could find nesting and feeding sites existed in the water area and along narrow strips of accreted former channel not yet cleared for agricultural production or industrial use. According to data provided by the Corps of Engineers, U.S. Fish and Wildlife Service, and the Iowa Geological Survey, a mere thirty-seven square miles of the former corridor remained available as habitat in western Iowa. This amount represented a decrease of 150 square miles since 1950.[38] Even more significant, this thirty-seven square miles of habitat was not even remotely similar to what had existed before the navigation project and dams.

The channelized water area of the Missouri River no longer possessed the diversity of depths and current velocities of the previous water area. Members of the U.S. Fish and Wildlife Service claimed, "In place of wide range of aquatic niches, there now exists a swift-flowing channelized river containing hostile conditions for most organisms." The report continued, "This study indicated that no fish species prefers, or is even commonly found, in the main channel...."[39] The water flowed too fast and fish expended too much energy

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[38]Calculation based upon the following data: Water area in 1980 estimated at 7637 acres. Iowa Geological Survey estimated 35,000 acres of the channel area accreted to Iowa side of Missouri River through channelization. This 35,000 divided by the 33% of the land area the Corps estimated remained undeveloped in the former channel area of the entire Missouri south of Sioux City. Thus, 11,550 acres remained undeveloped in the land accreted on the Iowa side. Then take 11,550 acres plus the 4491 acres undeveloped in the active erosion zone (44,915 X.10, Corps estimated 10% of erosion zone undeveloped). Total acreage undeveloped, including navigation channel water area =23,678 acres or 37 square miles.

[39]U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, 18.

fighting the current. The new aquatic environment made life tough for most of the river's original fish species.

In addition, the loss of shallow, slow moving water, connected oxbow lakes, marshes, and sand and gravel bars eliminated the spawning sites utilized by the majority of fish. The only areas conducive to spawning existed behind the stone pile dikes, where the water slowed enough for fish to lay their eggs. But even here, few species could survive and spawn. In place of the dissimilar species that once thrived in the river, three species reigned supreme in the Missouri by 1980: the carp, buffalo fish, and the channel catfish. The remainder of the fish population consisted of declining numbers of shovelnose sturgeon, gar, pike, flathead catfish, paddlefish, blue catfish and the occasional freak exotic. Big blue catfish and paddlefish became relics of the past. An almost complete absence of snags meant blue catfish could not find nests and feeding lies.[40] Paddlefish numbers declined precipitously because of the elimination of sand and gravel bars and the closure of the dams, which kept the fish from visiting their prehistoric spawning grounds. State fisheries biologists maintained the paddlefish population through artificial propagation at hatcheries.[41] As the river changed, exotic fishes entered the new environment. People reported catching brown trout, rainbow trout, chinook salmon and even piranhas in the Missouri near Sioux City. These species could not have survived a day in the former silt-laden stream. Officials with the Missouri Department of Conservation confirmed, "These changes [in the fish population] have paralleled the physical changes in the river and, while proof of a cause and effect

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[40]John L. Funk and John W. Robinson, *Changes in the Channel of the Lower Missouri River and Effects on Fish and Wildlife,* Aquatic Series No. 11, Missouri Department of Conservation, (Jefferson City: Missouri Department of Conservation, 1974), 15, 27.

[41]Sioux Falls Argus Leader, *Paddlefish Must Depend On Man For Survival,* 11 July 1976. Larry W. Kallemeyn, *Paddlefish: Maybe a Future After All,* South Dakota Conservation Digest, (March/April 1975), 12-15.

relationship is lacking, the circumstantial evidence of a direct relationship between decreased diversity in the habitat and decreased diversity in the fish population is very strong."[42]

Reptiles such as snakes, frogs, and turtles suffered. Elimination of beaches, sandbars, and marshy bogs expelled creatures from the corridor. The variety of birds and their numbers dipped as the channel area accreted to the new bankline. Obliteration of sandbars kept geese and ducks from resting along the river during their migrations. A dispersed flyway consisting of artificial impoundments and managed refuges replaced the prehistoric Missouri River flyway. Migratory waterfowl flew in fragmentary patterns across the Great Plains and over the states of North Dakota, South Dakota, Nebraska, and Iowa. Additionally, geese and ducks became wholly dependent upon the system of refuges established in the upper Midwest by the U.S. Fish and Wildlife Service and state conservation departments. These refuges concentrated the birds and made the populations more susceptible to the spread of disease. The birds also became easier targets for hunters and predators while sojourning in refuges.[43]

Shore birds, such as the piping plover and least tern, lost habitat as regulated water releases from the upstream dams curtailed the scouring of bars and sandflats and allowed for plant growth that eliminated potential nesting locations. To add to the hardships confronted by the birds, the Corps of Engineers let large amounts of water out of the dams at the same time the birds usually nested in the spring. Increased human activity in the river corridor resulted in disturbance of the least tern and piping plover nests. People fished and sunbathed on the same beaches and bars the birds needed to survive.[44]

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[42]Ibid., 27.

[43]Omaha World Herald, *Missouri River's Duck, Goose Sport on Skids, Up to Hunters to Organize, Help Avert Repeat of Sour Sport in '55,* 27 November 1955. U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, 27.

[44]Sioux Falls Argus Leader, *For the birds, Efforts to save species set policies,* in series titled, *Down By The River: Life along the Missouri,* 25 July 1991. U.S. Fish and Wildlife Service,

The near total removal of timber, brush, and native grasses from the active erosion zone and meander belt precipitated a sharp decrease in a wide array of terrestrial species. Raccoon, weasel, deer, rabbit, skunk, beaver, squirrel, fox, coyote, mink, and bobcat populations all declined. Fox squirrel numbers plummeted with the destruction of the timber tracts. However, a few species actually benefited from the changes in the corridor. As corn and soybean replaced the original cover, the quantity of morning doves, common field mice, and Norway rats increased (Figure 11.6).[45]

Regulated flow volumes in concert with the channelization structures ended the previous succession process. The river no longer formed new plant communities or destroy older, stable communities. By 1980, all available terrestrial habitat approached the climax forest stage which favored only a few species.[46] Thus, even the land not converted to human purposes only rendered limited assistance to fish and wildlife species because its contribution to biodiversity decreased over time as it neared the mature forest stage.

Remaining habitat also endured extensive human interference. High powered motor boats tore through the water, their operators oblivious to the effects of the churning waves on fish. Power plants pumped water from the river and put it back much warmer and more deadly to creatures. Farmers, in huge tractors, plowed and planted to within feet of the Missouri.

Region 6, Draft Biological Opinion on the Preferred Alternative for the Draft Environmental Impact Statement on the Missouri River Master Water Control Manual Review and Study and Operations of the Missouri River Main Stem System, (Denver: U.S. Fish and Wildlife Service, 1994), 40-45.

[45]U.S. Army Corps of Engineers, Missouri River Division, Missouri River Bank Stabilization and Navigation Project Final Feasibility Report and Final EIS for the Fish and Wildlife Mitigation Plan, 10, 11. U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, 28.

[46]Donald F. Johnson, *Plant Succession on the Missouri River Floodplain Near Vermillion, South Dakota*, (master's thesis, University of South Dakota, 1949), 22-25.

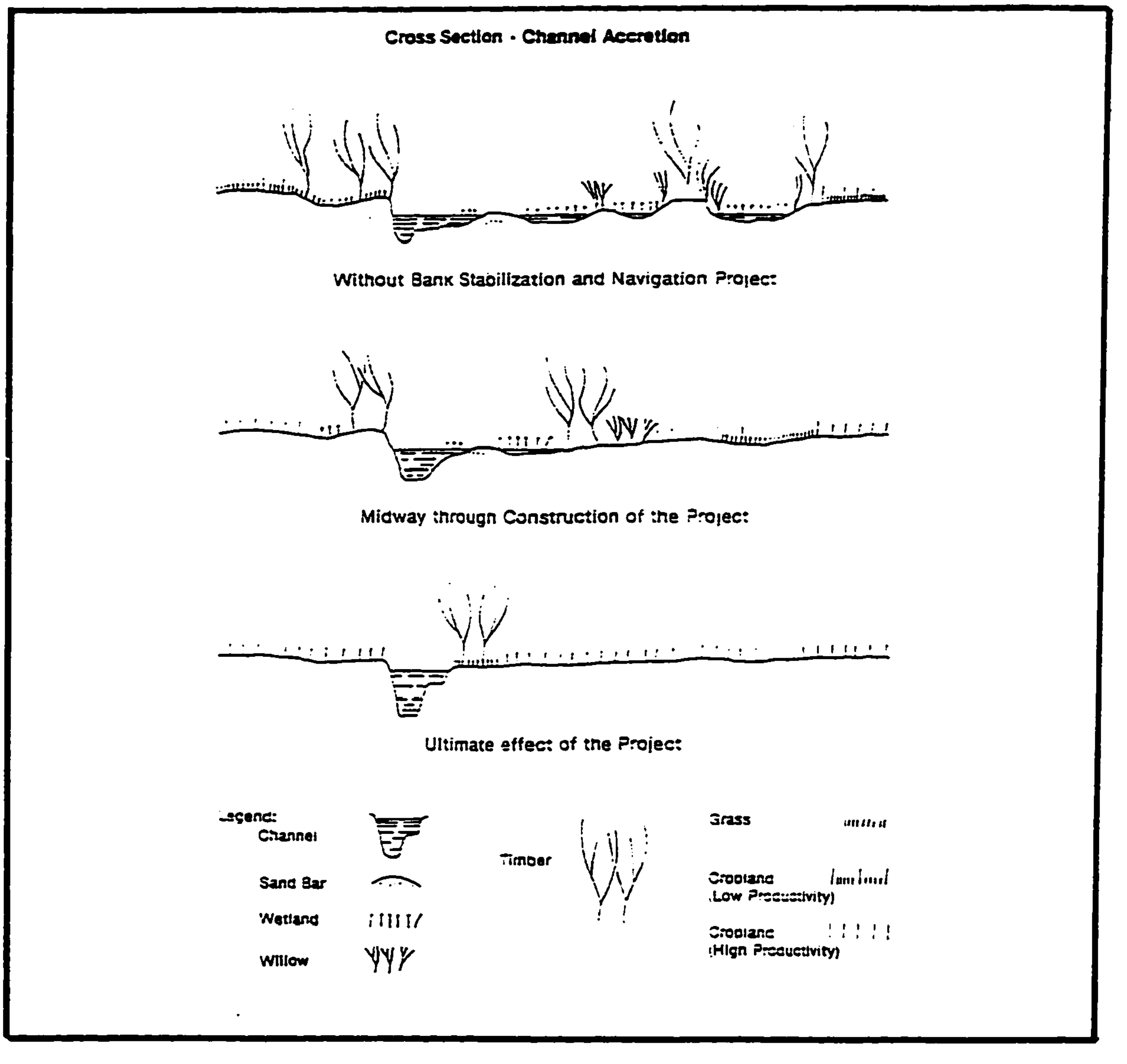

Figure 11.6. The effects of the Dakota dams and the navigation project on the Missouri River corridor. The dams and channelization structures facilitated the advance of agriculture, industry, roads, and urban sprawl into the river corridor. The human activity in the corridor after 1955 confronted species with so many challenges in such a short period of time that the majority of them perished from the onslaught. Courtesy of the Corps of Engineers.

People in cars came close to habitat and upset mating, nesting, or feeding species. The human advance into the river corridor after 1955 confronted species with so many challenges that the majority of them quickly perished in the face of the onslaught.

The loss of fish and wildlife species affected people, especially commercial fishers, sport fishers, and hunters. Commenting about the effect of the navigation project on the annual commercial harvest of fish from the river in the state of Missouri, John L. Funk and John W. Robinson of the Missouri Department of Conservation acknowledged,

> Since 1945 the trend of the annual commercial catch has been generally downward from 1,724,000 lb in 1947 to 342,000 lb in 1963, a decline of 80%. These are extremes, but they mark the trend of the catch. Many factors may effect the commercial catch in a body of water, but the one steady, consistent change in the Missouri River has been the reduction and deterioration of fish habitat resulting from the navigation and stabilization project.[47]

The two conservation department officials also admitted that the number of commercial fishers decreased from 771 in 1945 to 404 in 1970.[48]

A pitiful number of sport fishers used the channelized Missouri. Those that did fish often caught rough fish such as skipjack, carp, buffalo, and gar. Steve Jauron of the Iowa Department of Natural Resources remarked, "There's very few people fishing the Missouri River. It's not a very good fishery, It's just a canal.... The channel is for navigation. It's not for fish. It's not for ducks."[49] As early as 1954, the hunters along the Missouri in western Iowa noticed declines in the number of ducks and geese using the flyway. In 1955, Gerald Jauron of the Iowa Conservation Commission disparagingly noted, "The hunting on the Missouri River from Sioux City to Omaha has been the worst in years. And it'll get worse." Jauron continued, "There's not a reserve in this stretch; not a point where birds can

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47John L. Funk and John W. Robinson, *Changes in the Channel of the Lower Missouri River*, 26.

48Ibid., 21.

49Sioux City Journal, *Sioux City rediscovers its riverfront*, 19 September 1991.

congregate in breaking their flight. So what happens? The birds move straight through." [50] And the birds never returned. In the 1970s, scientists noted that an estimated 400,000 ducks and geese utilized the unchannelized river reach between Sioux City and Yankton as a food source or resting site, while none used the channelized river below Sioux City.[51] The navigation project ended the Missouri River's role as a hunting ground for ducks and geese in western Iowa and eastern Nebraska and reduced its usefulness as a commercial and sport fishery.

Since the nineteenth century, the oxbow lakes scattered across the river valley had served urban and rural residents as recreational sites. People went to the lakes to fish, swim, sunbathe, hunt, and boat.[52] The most popular lakes for recreational purposes in southeast South Dakota and western Iowa included McCook Lake in Union County, South Dakota, (ten miles northwest of Sioux City), Crystal Lake (situated near the city limits of South Sioux City), Brown's Lake (just ten miles south of Sioux City), Blue Lake (due west of Onawa), and Lake Manawa (a couple of miles south of Council Bluffs). These lakes had become popular because their proximity to urban centers afforded city dwellers the chance to easily access their waters. Lesser known, and more remote, oxbow lakes in western Iowa included Round, Badger, Modale Flats, Horseshoe, Folsom, Noble's, New, and Forney's.[53]

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[50] Omaha World Herald, *Missouri River's Duck, Goose Sport on Skids*, 27 November 1955.

[51] U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, 27.

[52] Hallberg, Harbaugh, and Witinok, Changes in the Channel Area of the Missouri River In Iowa, 1879-1976, 10.

[53] Sioux City Journal, *South Dakotans Seek Action to Restore McCook Lake Level,* 25 April 1955. Sioux City Journal, *McCook Lake Restoration Plea Taken to Congress,* 20 May 1955. Sioux City Journal, *Public Meeting Called to Discuss Improvement of Western Iowa Lakes,* 19 September 1955. Des Moines Register, *Future Is Dim for Missouri River Lakes,* 2 October 1955. Des Moines Register, *Oxbow Lakes No Longer Thrive,* 2 October 1955. Sioux City

Beginning in 1954 and 1955, water levels dropped in all of the oxbow lakes in the Missouri Valley in southeast South Dakota, western Iowa, and eastern Nebraska. The dip in lake levels generated a great deal of public concern. Sportsmen's clubs, conservation groups, lakeside property owners, and state game and parks departments wanted to prevent the loss of this natural resource.[54] But no one knew the reason for the low lake levels and thus nobody had a viable method for saving the oxbows. Erv Krogh of the Nebraska Izaak Walton League believed the lakes suffered from excessive evaporation rates. Residents of the resort community of McCook Lake believed the Great Flood of 1952 had filled their lake full of silt and clogged the underground springs that sustained water levels. Others thought that the lack of normal precipitation across the northern Great Plains and upper Midwest since 1953 influenced the water volume of the lakes.[55]

On 22 September 1955, more than 500 people packed the small Izaak Walton League clubhouse at Brown's Lake to discuss the oxbow lake situation. Representatives from the Iowa Conservation Commission, Corps of Engineers, Iowa Legislature, and the U.S. Congress attended the meeting. A.B. Kidd represented the Missouri River Division of the Corps of Engineers. Kidd stated that the upstream dams on the Missouri River might be the cause for the drop in lake levels. He said that prior to the dams, the Missouri flooded the valley on a regular basis, and these floods poured water into the lakes and raised their levels.

Journal, *Hope to Save Crystal Lake, Ikes Ask Bids for Second Pump to Retain Water,* 2 June 1955. Sioux City Journal, *Crystal Lake--Battle of Man Against Nature,* 11 August 1957.

[54]Sioux City Journal, *South Dakotans Seek Action to Restore McCook Lake Level,* 25 April 1955. Sioux City Journal, *McCook Lake Restoration Plea Taken to Congress,* 20 May 1955.

[55]Sioux City Journal, *Agree to Raise Level of Lake,* 23 March 1954. Sioux City Journal, *Hope to Save Crystal Lake, Ikes Ask Bids for Second Pump to Retain Water,* 2 June 1955. Sioux City Journal, *Crystal Lake--Battle of Man Against Nature,* 11 August 1957.

Now that floods had been curtailed, the lakes did not receive water to sustain their levels.[56] Later in 1955, staff writer George Mills of the *Des Moines Register* proposed another cause for the deterioration of the oxbow lakes. Mills claimed, "Stabilizing the channel... is likely to speed up the flow of water. That means the river bed will be lowered over the years by water action. As a result, instead of water seeping from the river into these lakes, the reverse will be true. The combination of no floods and loss through seepage is likely to shorten the lives of these lakes."[57] Mills correctly identified the culprit as degradation.

To prevent the total loss of the oxbow lakes, valley residents devised a number of ingenious, and expensive, methods to raise their water levels.[58] At McCook Lake, the South Dakota Game Fish and Parks Department and the Corps of Engineers dredged the oxbow at a total cost of $300,000.[59] But this dredging operation did not guarantee against future reductions in the lake's water volume. The Izaak Walton League spent $6,800.00 to dig a well and build a pump to supply water to Crystal Lake.[60] When the pump failed to save the dying lake, the league proposed to the Corps that it finance a one million dollar restoration project. The Corps balked at this request and the money never materialized.[61] The Iowa

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56 Sioux City Journal, *Area Lakes' Restoration Urged at Meet,* 23 September 1955.

57 Des Moines Register, *Future Is Dim for Missouri River Lakes,* 2 October 1955.

58 Sioux City Journal, *McCook Lake Restoration Plea Taken to Congress,* 20 May 1955.

59 Sioux City Journal, *Bill Introduced for Improvements at McCook Lake,* 29 May 1955. Sioux City Journal, *State Project at McCook Lake Begins in Fall,* 18 August 1955. Sioux City Journal, *McCook Lake Getting New $300,000 Look,* 10 June 1956.

60 Sioux City Journal, *Agree to Raise Level of Lake,* 23 March 1954.

61 Sioux City Journal, *Crystal Lake--Battle of Man Against Nature,* 11 August 1957. Sioux City Journal, *Back Crystal Lake Project,* 13 November 1958. Sioux City Journal, *Army Engineers Oppose Crystal Lake Dredging,* 12 April 1961.

Conservation Commission devised an innovative method to restore Lake Manawa. The commission allocated $270,000 to divert the water of nearby Mosquito Creek into the lake.[62] In the 1950s and 1960s, no one had the means or the money to restore water to Brown's and Blue lakes. In the 1970s, officials diverted cooling water from the Iowa Public Service power plant at Port Neal into Brown's Lake and pumped water into Blue Lake from a series of wells. Those oxbow lakes not receiving water through artificial means continued to deteriorate, or completely dried-up, as degradation progressed in the 1980s.[63] Thus, the construction of dams and channelization structures forced valley residents to sacrifice an important recreational resource. Yet, the formation of new oxbow lakes along the channelized river gave valley residents hope they could replace this loss.

As the Corps constructed the navigation channel in the 1950s and 1960s, it created channelized oxbow lakes. These channelized oxbows formed in much the same manner as the natural oxbow lakes, except that the Corps, rather than the river, created the cut-off. Members of state conservation commissions, state and local governments, county conservation boards, sporting clubs, and the Corps of Engineers believed these channelized oxbows would become playgrounds for residents of the Missouri Valley and the nation. Cartoonist and conservationist Ding Darling and Iowa Conservation Commission member Gerald Jauron believed the channelized oxbows of western Iowa could be developed into either a national park or one of the most valuable recreational assets in the Midwest. The two men reasoned that the series of new lakes would make-up for a major deficiency in parks and outdoor recreation facilities between the Appalachian Mountains and the Rocky

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62 Des Moines Register, *Future Is Dim For Missouri River Lakes,* 2 October 1955.

63 Sioux City Journal, *Area Lakes' Restoration Urged at Meet,* 23 September 1955.

Mountains.[64] Jauron proposed the construction of boat ramps, picnic areas, and beaches at twenty-one channelized oxbows in western Iowa, including Snyder Bend, Winnebago Bend, Tieville Bend, Middle Decatur Bend, Wilson Island, Nottleman Island, and State Line Island. Jauron predicted that Snyder Bend and Winnebago Bend (fifteen miles south of Sioux City) would achieve the status of true recreational meccas, drawing visitors from throughout the United States. Both oxbows possessed white sand beaches, high sand dune formations, deep blue water, and tall groves of trees.[65] But Darling's and Jauron's dream for the channelized oxbows never materialized. Instead, degradation drained the water from the oxbows. By the 1980s, weeds and trees grew where water once gleamed in the oxbow lakes.[66]

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[64] Des Moines Register, *Missouri River Oxbow Lakes,* 8 January 1961. Sioux City Journal, *River Channel Work Making 'Fun Spots,'* 4 July 1961. Sioux City Journal, *Ding's Idea For a Park On Missouri,* 6 August 1961. Sioux City Journal, *Engineers Plan New Lake Near Decatur,* 28 July 1961. Sioux City Journal, *New Siouxland Recreational Area-Snyder Bend Lake,* 29 May 1961. Sioux City Journal, *View Missouri Recreation Needs,* 20 June 1960. Omaha World Herald, *Iowan Will Seek Cash for Refuge on Missouri, DeSoto Bend Help Urged, Appropriations Bill Aid Sought By Jensen,* 3 January 1957. Omaha World Herald, *Engineers Poised to Make De Soto Recreational Outlets Come to Life,* 1 March 1959. Omaha World Herald, *Geese, Ducks, Not Workers, Fly South for Winter; Construction at DeSoto Bend Continues,* 9 December 1959. Gerald Jauron, interview by author, November 1992, Earling, Iowa, tape recording. Des Moines Register, *They've Harnessed the Missouri, But It's Still a Problem River,* 10 June 1956. Sioux City Journal, *Hoeven Sees River's Recreation Potential,* 12 August 1960.

[65] Omaha World Herald, *Iowa Recreation Project Will Benefit Nebraskans,* 2 April 1961. Omaha World Herald, *Refuge Chain on Missouri Boon to Fowl, Hunters,* 5 April 1961. Sioux City Journal, *New Siouxland Recreational Area - Snyder Bend Lake,* 29 May 1961. Des Moines Register, *View River's Play Areas,* 17 June 1960. Des Moines Register, *Decatur Bend O.K. Indicated,* 9 November 1967. Des Moines Register, *Decatur Bend Lake Approved,* 18 November 1961. Des Moines Register, *De Soto Bend Silt Work Set,* 6 April 1961. Sioux City Journal, *Missouri Diversion Creating Two Lakes Near Sioux City,* 16 October 1960. Gerald Jauron, interview by author, November 1992, Earling, Iowa, tape recording.

[66] Gerald Jauron, interview by author, November 1992, Earling, Iowa, tape recording.

Degradation contributed to other problems. Lowering of the streambed threatened the structural integrity of bridges that spanned the river at Yankton, Sioux City, Decatur, and Blair as the river tore away the bed material that had provided support to the spans.[67] Degradation caused tributary streams entering the Missouri River to experience "stream cutting," referring to a tributary stream's erosive action to lower its elevation to meet the Missouri River. Stream-cutting began at the mouth of tributary rivers and creeks and progressed backwards, or upstream. As the tributaries cut into their beds, their current velocities increased and they became even more erosive, widening their channel areas. The highly erodible alluvium present in the Missouri Valley exacerbated the effects of stream cutting. Moreover, the Loess Hills, which extend along the entire western Iowa border, consist of wind-borne silt up to seventy feet deep in some locations. As a result, tributary streams running through the hills eroded great distances before hitting bedrock. Stream-cutting worsened as farmers and government agencies straightened the Missouri's tributary rivers and feeder creeks after World War II.

The effects of stream cutting were evident throughout western Iowa. In Pottawattamie County stream banks descended only a few feet to the water's edge in the 1950s. By 1980, streams had eroded thirty-five to forty-foot-deep chasms. In other western Iowa counties, creek banks that fell six feet in the 1950s, descended twenty-five feet or more by the early 1980s. The Boyer River (a tributary of the Missouri) possessed a ten-foot-deep, thirty-eight-foot wide channel area in 1947. Thirty-five years later, the Boyer flowed through a twenty-two-foot-deep canyon with a 100-150-foot width.[68]

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[67]W.W. Sayre and J.F. Kennedy, *Degradation and Aggradation of the Missouri River*, 54.

[68]Des Moines Register, *West Iowa waterways get revenge. They cut deep, wide paths in the erodible soil that are 'not bottomless, but you can get a heck of a canyon.'* 22 August 1993.

A government study concluded that stream-cutting damaged, or threatened, 931 bridges in thirteen western Iowa counties. Residents of Woodbury County faced the most acute threat to the integrity of their bridges. An estimated one-third of that county's 597 bridges had been damaged by excessive erosion. The problem of stream-cutting went beyond western Iowa. Residents in southeast South Dakota and eastern Nebraska faced similar troubles with their infrastructure. Undoubtedly, the navigation project resulted in unforeseen financial and environmental repercussions for the residents of the Missouri Valley.[69]

Degradation led to a lowering of the water table. Wildlife biologist Robert Dolan of the Iowa Department of Natural Resources said that for every foot the Missouri lowered itself, the adjacent water table dropped a foot.[70] Beginning in the 1960s, degradation forced hundreds of farmers to deepen their wells. Degradation and a dip in the water table also weakened buildings placed in the valley. A high water table saturated the soil, sands, and gravels that supported structures. Once water drained from these sub-surface deposits, buildings slumped and shifted. In Elk Point, South Dakota, large fissures appeared in the high school and Catholic church as the buildings drooped.[71] Degradation even required the operators of power plants and industrial facilities to extend their inlet pipes to the receding water line.

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[69]U.S. Army Corps of Engineers, Omaha District, Investigation of Channel Degradation, 1991 Update, Missouri River, Gavin's Point Dam to Platte River Confluence, (Omaha: U.S. Army Corps of Engineers, Omaha District, 1991), 6, 10. Des Moines Register, *West Iowa waterways get revenge. They cut deep, wide paths in the erodible soil that are not bottomless, but you can get a heck of a canyon.* 22 August 1993.

[70]Des Moines Register, *Dry lakes, less wildlife-but a more navigable river,* in series titled, *The Once Mighty Missouri,* 1 October 1989.

[71]Des Moines Register, *S.D. Town Sags When Dams Dry Up Its Sand,* 8 October 1956.

The flooding along the Missouri River main stem did not end after completion of the five Pick-Sloan Plan dams, even though General Pick asserted in the 1950s that his engineers would end flooding in the valley forever. Flooding south of Sioux City, and especially below Kansas City, persisted for a number of reasons, including destruction of wetlands, possible changes in climate resulting from global warming, and the spread of paved areas within the river's watershed. A substantial reduction in the Missouri's carrying capacity and the existence of uncontrolled tributaries contributed more than anything else to the continuance of flooding along the main stem. Ironically, the navigation project's effect on the river's carrying capacity negated some of the flood protection provided by the Dakota dams. Confinement of the Missouri between pile dikes and revetments lowered the stream's ability to transport high flows. As a result, it took less water for the Missouri to overtop its banks. In the 1920s, before channelization work at Waverly, Missouri, the river carried 150,000 cubic feet per second without flooding. But after completion of the navigation project through central Missouri, the river flooded at Waverly in 1931, '35, '41, '42, '43, '44, '45, '47, '48, '49, '50, '51, and '52 at 150,000 cubic feet per second.[72] Dr. Charles B. Belt Jr. Of the Department of Earth and Atmospheric Sciences concluded, "This project [the navigation project]... has greatly reduced the channel area and given the river less space to spread out in times of high flow." Belt continued, "a water volume of 618,000 cubic feet per second raised the river at Hermann [Missouri] to a gauge height of 33.3 feet in July 1951 at the peak of flooding there... a volume of only about 500,000 cubic feet per second produced a higher gauge reading of 33.7 feet in an April 1973 flood."[73]

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[72]U.S. House of Representatives, *Missouri River Channel Stabilization and Navigation Project*, Hearings before the Subcommittee of the Committee on Appropriations, Eighty-Second Congress, Second Session, (Washington DC: GPO, 1952), 44.

[73]Kansas City Star, *Dams and Levees Built to Resist River*, 19 August 1980.

Tributary streams that still flowed unimpeded to the Missouri contributed to the perpetuation of flooding. Some of the larger uncontrolled tributaries included the James, Big Sioux, Little Sioux, Boyer, Nishnabotna, and Grand. Deep snow cover or heavy rains in the watersheds of these tributaries repeatedly forced the Missouri out of its banks after completion of the Dakota dams. Even worse, when the channelized Missouri overtopped its banks, the faster water wreaked severe damage on the increased number of roads and buildings present in the valley. Floods occurred along the main stem in 1960, 1971, 1973, 1984, and most recently in the superflood of 1993.[74]

By the 1980s, everyone in the valley (including the Corps of Engineers) admitted that the thousands of channelization structures and six earthen dams had failed to achieve their primary purpose, the establishment of barge traffic. Barges remained absent from the river. From 1935 (the first year of navigation below Kansas City) to 1951, over ninety percent of the traffic hauled on the Missouri consisted of sand, gravel, clay, stone, and building materials for the navigation channel itself.[75] In 1951, the Corps (providing tonnage estimates to Congress to justify the cost-effectiveness of the navigation project) predicted that the Missouri would carry an average annual commercial tonnage of 5 million tons by the 1980s. In 1960, operators hauled 1.4 million tons of cargo. In 1970, barge companies shipped 2.4 million tons. In 1979, the Missouri River carried a record 3.2 million tons of material, but this still fell short of the projected 5 million tons. In comparison, the

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[74]Kansas City Star, *Dams and Levees Built to Resist River*, 19 August 1980. Gordon Young, *That Dammed Missouri River*, National Geographic, vol. 140, no. 3, September 1971, 406. Des Moines Register, *Floods Knock Out Water in More Towns Minnesota to Missouri, Midwest River Rising*, 26 July 1993. U.S. Army Corps of Engineers, North Central Division, The Great Flood of 1993, Post-Flood Report, Upper Mississippi River and Lower Missouri River Basins, (St. Paul: U.S. Army Corps of Engineers, North Central Division, 1994), 22.

[75]U.S. House of Representatives, *Missouri River Channel Stabilization and Navigation Project*, Hearings before the Subcommittee of the Committee on Appropriations, Eighty-Second Congress, Second Session, (Washington DC: GPO, 1952), 22, 25.

Mississippi hauled an estimated 300 million tons of cargo per year by the late 1970s and early 1980s. The Missouri carried less than one percent of all the barge traffic moving in the United States. Even more astonishing, the river reach between Omaha and Sioux City hauled only fifteen percent of this already minuscule amount. A study completed by the Mid-America Regional Council concluded that ninety percent of the cargo to and from Kansas City and its surrounding region went over the rails. Most of the remaining ten percent went via semi-trailer truck.[76] The pitiful amount of traffic declined as a result of floods and drought in the 1980s. By 1985, only twelve people worked in Kansas City, Missouri, in positions directly related to Missouri River navigation.[77] The era of prosperity promised by river boosters since the 1890s never arrived for Kansas City or the upper Midwest.

The costs of development for residents of the Dakotas were also high. Over 500,000 acres of the most fertile land in North and South Dakota was inundated to provide storage space for the reservoirs. The loss of this land negated the gains in agricultural land south of Sioux City. Furthermore, South Dakota residents were able to irrigate only one percent of the land area originally planned for irrigation. The Missouri River just did not have enough water to maintain a navigation channel and supply water to parched regions.

In the 1970s and 1980s, as the problems affiliated with Missouri River development mounted, residents of the Missouri Valley reassessed past policies and projects. For the first time, valley residents turned against the Corps of Engineers, blaming it for the problems. Then, after the Great Flood of 1993, the shift in attitudes became apparent with the establishment of the Missouri River Coalition. This association sought to reverse the

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[76]Kansas City Star, *Missouri River's Impact Lags*, 22 February 1977. U.S. Fish and Wildlife Service, Field Office, Division of Ecological Services, Detailed Fish and Wildlife Coordination Act Report, Appendix, Economics, 2.

[77]Kansas City Star, *Some River Barge Firms Scraping Bottom*, 27 October 1985.

environmental effects of the navigation project and Dakota dams. A new era in Missouri River history had begun.

CHAPTER 12: CONCLUSION

In the early and mid-nineteenth century, the Missouri River and valley environment made a significant contribution to the success of European-American agricultural settlement of the Missouri Valley and adjacent uplands. American explorers, adventurers, fur-traders, miners, military personnel, and agricultural settlers depended upon the river and valley for nearly all the necessities of life, including drinking water, food, fuel, building materials, and furs. The Missouri River made its greatest contribution to American settlement as a transportation route. Between 1803 and 1880, keelboats, and later steamboats, carried passengers and manufactured products to the frontier regions and hauled agricultural commodities downstream to eastern United States markets.

Steamboat traffic on the Missouri River diminished with the arrival of the railroad in the valley. Railroad tracks reached St. Joseph in 1859, Council Bluffs in 1867, Sioux City in 1868, and Yankton in 1873. Steamboats, with their incessant delays, small cargo carrying capacities, high insurance rates, and uncomfortable passenger accommodations could not compete against the faster, more efficient, reliable, and comfortable railroads. As a result, by the early 1880s, steamboat operations on the Missouri River came to an end.

The demise of steamboat operations on the river, and the establishment of a railroad monopoly over transportation into and out of the Missouri Valley, contributed to a shift in perception among valley residents. Rather than consider the river and valley environment as contributing to their economic success, valley residents began to view the Missouri as a wasted natural resource, a threat to civilization, and a resource in need of improvement for navigation purposes.

Beginning in the late 1870s and early 1880s, individuals from a number of river towns began to lobby the United States Congress for funds to channelize the river. Steamboat company executives, lawyers, businessmen, and other professionals sought to create competitive carrier rates through the establishment of deep-draft barge traffic on the Missouri. These lobbyists confronted a reluctant Congress. Federal officials did not automatically approve of Missouri River channelization. Instead, local organizations, led by the members of the Kansas City Commercial Club, had to repeatedly convince federal authorities that the Missouri River deserved federal dollars and engineering expertise.

In 1890, Congress appropriated money for the first time for the channelization of the Missouri from the mouth to Kansas City. Congress ordered the Corps of Engineers and the Missouri River Commission to supervise construction of the barge channel. The engineers possessed only twelve years of continuous daily stream flow data for the river. As a result, they were unsure of how deep or wide they could design the navigation channel. But the federal engineers pushed ahead with construction anyway, hoping to learn the proper channel dimensions as work progressed. Engineers employed a system of permeable pile dikes and willow mattresses and stone revetments to concentrate the flow of water, realign the channel's direction, deepen the thalweg, and make the river navigable. After six years, the Corps of Engineers and the commission had improved a mere forty-five miles of river. Congress, disappointed with the results achieved on the Missouri, the rising cost of the channelization structures, the complete lack of any barge traffic on the stream, and the absence of valley-wide support for channelization, slashed funding for Missouri River channelization. By 1896, appropriations did not even cover the cost of maintaining the existing pile dikes and revetments. Then, in 1902, Congress disbanded the Missouri River Commission. Valley residents and the federal government abandoned the Missouri River.

During the decade of the 1900s, the Midwest and northern Great Plains experienced a series of wet years, which caused the Missouri to repeatedly flood. These floods refocused local and federal attention on the river. Thus, the Missouri contributed to the human formulation and implementation of development plans. But rather than improve the river for navigation, valley residents sought federal assistance to lessen the threat of floods. The public favored channelization as a means of hastening the movement of flood waters through the state of Missouri. But the federal government balked at funding flood control projects and the local lobbyists failed to garner federal cooperation.

In the decade of the 1900s, the progressive conservationists pushed for the development and sustained use of natural resources, including the nation's rivers. Missouri Valley residents, particularly the Kansas Cityans, effectively tied their own goals for the Missouri into the larger progressive conservation movement. As a result, Congress authorized the construction of a six-foot navigation channel from Kansas City to the mouth in 1912.

After 1916, work on the navigation channel slowed down, mainly because of erratic and inadequate appropriations from Congress. Then, in 1925, a group of Kansas Cityans formed the Missouri River Navigation Association. This local organization gained federal cooperation for the renewal of large-scale construction on the navigation channel. The navigation association also convinced Congress to authorize the extension of the barge channel to Sioux City, even though the channel below Kansas City had not yet been opened to traffic. Although Congress concurred with the expansion of the project, the War Department and the Coolidge and Hoover administrations did not support the construction of the Upper River Project. These federal authorities wanted to wait and determine whether barge traffic would emerge along the Kansas City-to-mouth reach before channelizing the stream to Sioux City.

Two events in the 1930s had a major effect on the development of the Missouri. In 1929, a dry precipitation cycle began across the plains states. The drought dropped the Missouri to unprecedented levels and convinced Corps officials that the six-foot channel was already obsolete. Again, the Missouri River influenced the formulation of development plans. In order to protect the federal investment in the completed channelization structures, and insure the future viability of the navigation channel, the Kansas City District office advocated the construction of Fort Peck Dam. President Roosevelt concurred with the Corps, and Fort Peck's construction began in 1933.

The Great Depression, and Roosevelt's efforts to restore the national economy, led to the reversal of federal policy toward the Upper River Project. Beginning in the summer of 1933, the Roosevelt Administration, through the Public Works Administration, directed large appropriations toward the construction of the six-foot channel from Kansas City to Sioux City. The techniques and technologies utilized by the Corps of Engineers at this time reflected the government's desire to employ men.

While the Corps built the navigation channel below Sioux City, South Dakotans organized to promote the construction of dams and hydroelectric facilities along the Missouri River. The South Dakotans failed in their efforts because the Corps of Engineers refused to cooperate with them. The Corps stymied the South Dakotans in order to protect the navigation channel and its lower valley constituency. The Corps did not wield arbitrary power over the South Dakotans. Rather, the Corps' actions reflected the wishes, and political power, of lower valley residents.

By the early 1940s, the six-foot channel from the mouth to Sioux City neared completion and Fort Peck Dam provided partial regulation of the river's flow volume. In 1940, the first barge arrived at Sioux City, docking at that city's small port facility. River boosters proclaimed the beginning of a new era in water transportation for the region. But the advent of World War II interfered with the completion of the barge channel. The federal government cut funding to all programs not deemed essential to the war effort, including the Missouri River navigation project.

In 1943, a series of floods struck the Missouri Valley. These floods convinced lower valley residents that storage reservoirs in the upper valley (particularly in South Dakota) offered the only means of protecting the navigation channel, and their urban centers and agricultural lands, from high flows. As a result, the lower basin states, for the first time, cooperated with the South Dakotans to push for a federal dam-building plan. In 1944, Congress and the President authorized the Pick-Sloan Plan for Missouri River Development. This plan called for the construction of five dams along the main stem of the Missouri.

In 1946, construction began on two of the main stem dams, Fort Randall Dam in southeast South Dakota and Garrison Dam in north-central North Dakota. The Corps did not plan on closing these dams until the early 1950s. In the meantime, the lower valley, and the Corps channelization structures, remained vulnerable to the destructive power of high flows. In the late forties and early fifties, a series of floods descended the valley. The floods carried away an estimated $124 million worth of channelization structures and made it apparent to everyone that the Corps had moved forward with construction of the navigation channel without a thorough knowledge of the river and its variable flow rates. By late 1952, Corps officials lamented about how the Missouri River had reverted to a wild, uncontrolled state over much of the reach south of Sioux City.

The closure of Fort Randall Dam in the summer of 1952, Garrison Dam in 1953, and Gavin's Point Dam in 1955, changed the environmental situation on the river. With the curtailment of high flows, the construction of the navigation channel proceeded without the threat of immediate destruction. In the 1950s and 1960s, Corps construction techniques and technologies differed radically from those employed during the depression thirties. The Corps utilized technologically-intensive methods, rather than labor-intensive procedures. The Decatur Bridge diversion operation symbolized the height of Corps technological prowess during the construction of the barge channel. Dredge boats, pile drivers, bulldozers, and even an upstream dam participated in the diversion operation. With so many tools at its disposal, the Corps completed the navigation channel to Sioux City in the 1970s. But effective regulation of the Missouri still eluded the federal engineers.

A number of environmental changes occurred in the Missouri River corridor after 1955. These changes had mixed results for the people living in the valley. Channelization in concert with the Dakota dams allowed farmers to clear land to the river's edge, but also contributed to degradation, tributary stream erosion, and a lower water table. Declines in habitat produced a corresponding decrease in the number of fish and wildlife species. Thus, the Corps' projects diminished the value of the Missouri River as a recreational resource for valley residents. The negative environmental repercussions, along with the continuance of flooding below Sioux City and the absence of substantial barge traffic on the stream, led to public disillusionment with Missouri River development. And after the Great Flood of 1993, valley residents organized to reverse the environmental effects of the channelization project.

The history of Missouri River development provides a number of lessons. First, the success of the Kansas Cityans in achieving their objectives, over all apparent odds, illustrates what local, grassroots organizations can accomplish within the institutional system now operating in the United States. A well-organized and highly motivated group of individuals did more than any other organization to develop the Missouri River. Admittedly, the Kansas City Commercial Club cooperated with the Corps and federal officials to channelize and dam the Missouri, but its also organized the people of the valley, publicized the cause of development, and effectively lobbied Congress and the various presidential administrations. The system of dams, reservoirs, and channelization structures that line the river today is largely the result of the Kansas City Commercial Club.

Second, a water elite did not, and does not, exist in the Missouri Valley. The Corps of Engineers and the federal government never arbitrarily directed Missouri River development. Furthermore, the Corps of Engineers is not the sole entity responsible for the environmental transformation of the lower valley. Granted, the engineers built the pile dikes, revetments, and dams; but the majority of farmers and businessmen living in the lower valley wanted the federal government to build those structures. And after the completion of the navigation channel and upstream dams, countless individuals and organizations cleared land in the river corridor for crop production, roads, industry, boat ramps, harbors, and homes. Thus, the

Corps of Engineers and their public supporters were responsible for the environmental transformation of the Missouri River and the problems resulting from that transformation.

Third, Missouri River development may have cost more in monetary and environmental terms than its benefits. Reservoirs in Montana and Dakota offer limited flood protection to the lower valley, while requiring the permanent inundation of the upper valley. Channelization structures provided lower valley farmers with more land, but contributed to a host of other problems, including degradation, habitat loss, and a channel that flows too fast for upstream barge traffic. Valley residents and the public at-large may have been better off to have left the Missouri River alone.

Finally, no one will ever know enough about the Missouri River to effectively regulate its flows; the river possesses too many characteristics, is influenced by innumerable external factors, and its waters behave in an unpredictable fashion. No amount of damming or channelizing of the stream will keep the river in check. The drought of the 1930s, the floods of the 1940s and 1950s, the drought of the late 1980s and early 1990s, and the Great Flood of 1993 proved that the Missouri River cannot be regulated for barge traffic, flood control, or irrigation. One might conclude that to continue to try to regulate the river to produce these supposed benefits is a waste of effort and money. As Claude Strauser of the Corps of Engineers admitted, "...in the long run the Missouri will have its way."

BIBLIOGRAPHY

I. MANUSCRIPT COLLECTIONS

Case, Francis. Francis Case Papers. Special Collections, Dakota Wesleyan College, Mitchell, South Dakota.

Benecke, Louis. Benecke Family Papers. Western Historical Manuscript Collection, Columbia, Missouri.

Trail, E.B. E.B. Trail Scrapbooks. Western Historical Manuscript Collection, Columbia, Missouri.

II. INTERVIEWS

Estes, Joyce. Member of the Lower Brule Tribe. Interview by author, tape recording, Lower Brule, South Dakota, 12 March 1992.

Hipple, Robert. Former member of the Missouri Basin Interagency Committee. Interview by author, tape recording, Pierre, South Dakota, 20 May 1992.

Jauron, Gerald. Former Missouri River Coordinator, Iowa Conservation Commission. Interview by author, tape recording, Earling, Iowa, 21 November 1992.

Weller, Sam, Mrs. Daughter-in-law of Charles Weller. Interview by author, phone conversation, Mitchell, South Dakota, 12 June 1993.

III. GOVERNMENT DOCUMENTS

Department of the Army, U.S. Army Corps of Engineers, Annual Report of the Chief of Engineers, U.S. Army, 1876-1979, Washington DC: GPO.

Department of the Army, U.S. Army Corps of Engineers, Omaha District. Comprehensive Report on Missouri River Development, Appendix VIII, Plan of Improvement. Omaha: U.S. Army Corps of Engineers, 1944(?).

Department of the Army, U.S. Army Corps of Engineers, Missouri River Division. Controlling the Missouri. Omaha: U.S. Army Corps of Engineers, Missouri River Division, 1951.

Department of the Army, U.S. Army Corps of Engineers, Office of the District Engineer, Omaha District. Missouri River, Oahe Reservoir, South Dakota, Design Memorandum No. MO- 27, Preliminary Study, Big Bend Dam and Reservoir. Omaha: U.S. Army Corps of Engineers, 1954.

Department of the Army, U.S. Army Corps of Engineers, Missouri River Division. Water Resources Development in South Dakota. Omaha: U.S. Army Corps of Engineers, 1955.

Department of the Army, U.S. Army Corps of Engineers, U.S. Army Engineer District, Omaha. Missouri River, Big Bend Reservoir, South Dakota, Design Memorandum No. MB-1, Site Selection. Omaha: U.S. Army Corps of Engineers, 1957.

Department of the Army, U.S. Army Corps of Engineers, U.S. Army Engineer Division, Missouri River. Water Resources Development in South Dakota. Omaha: U.S. Army Corps of Engineers, 1957.

Department of the Army, U.S. Army Corps of Engineers, Committee on Channel Stabilization. *Channel Stabilization on the Missouri River,* by D.C. Bondurant, in Symposium on Channel Stabilization Problems, Technical Report Number 1, Volume 1. Vicksburg: U.S. Army Corps of Engineers, 1963.

Department of the Army, U.S. Army Corps of Engineers, Committee on Channel Stabilization. *River Control Structures,* by John Manning, in Symposium on Channel Stabilization Problems, Technical Report Number 1, Volume 2. Vicksburg: U.S. Army Corps of Engineers, 1964.

Department of the Army, U.S. Army Corps of Engineers, Committee on Channel Stabilization. *Channel Improvement and Stabilization Measures,* by C.P. Lindner, in State of Knowledge of Channel Stabilization in Major Alluvial Rivers, Technical Report Number 7. Vicksburg: U.S. Army Corps of Engineers, 1969.

Department of the Army, U.S. Army Corps of Engineers. The Federal Engineer: Damsites to Missile Sites: A History of the Omaha District, U.S. Army Corps of Engineers. Omaha: U.S. Army Corps of Engineers, Omaha District Office, 1984.

Department of the Army, U.S. Army Corps of Engineers, Missouri River Division. 1991-1992 Missouri River Main Stem Reservoirs Annual Operating Plan and Summary of Actual 1990-1991 Operations. Omaha: U.S. Army Corps of Engineers, 1991.

Department of the Army, U.S. Army Corps of Engineers, Missouri River Division. Missouri River Master Water Control Manual, Review and Update Study, Environmental Studies, Reservoir Fisheries, Main Report, Appendix A-Description of Resource.

Appendix B-Reservoir Fish Reproduction Impact Methodology. Omaha: U.S. Army Corps of Engineers, Missouri River Division, 1994.

Department of the Army, U.S. Army Corps of Engineers, Missouri River Division. Missouri River Master Water Control Manual, Review and Update Study, Draft Environmental Impact Statement. Omaha: U.S. Army Corps of Engineers, Missouri River Division, 1994.

Department of the Interior, Fish and Wildlife Service, Missouri River Basin Studies. Distribution and Status of the Important Fish and Wildlife, Missouri River Basin, 1952. Billings: Fish and Wildlife Service, 1953.

Department of the Interior, Fish and Wildlife Service, Missouri River Basin Studies. Distribution and Status of Waterfowl in the Missouri River Basin. Billings: Fish and Wildlife Service, 1957.

Department of the Interior, Fish and Wildlife Service, Field Office, Division of Ecological Services. Missouri River Stabilization and Navigation Project, Sioux City, Iowa to Mouth, Detailed Fish and Wildlife Coordination Act Report. North Kansas City: Kansas City Area Office, Division of Ecological Services, 1980.

Department of the Interior, Fish and Wildlife Service. Fish and Wildlife Technical Report 8, Limnological and Fishery Studies on Lake Sharp, a Main-stem Missouri River Reservoir, 1964-1975. Washington DC: GPO, 1987.

Department of the Interior, Fish and Wildlife Service, Region 6. Draft Biological Opinion on the Preferred Alternative for the Draft Environmental Impact Statement on the Missouri River Master Water Control Manual Review and Study and Operations of the Missouri River Main Stem System. Denver: U.S. Fish and Wildlife Service, 1994.

Missouri Basin Inter-Agency Committee and the Missouri River States Committee. The Missouri River Basin Development Program. Washington DC: GPO, 1952.

Missouri Basin Inter-Agency Committee. The Missouri: A Great River Basin of the United States, Its Resources and How We Are Using Them. Washington DC: GPO, 1954(?).

Missouri River State Committee. The Future Development of the Missouri River: A Report on the Program and Activities of the Missouri River States Committee. Chicago: The Council of State Governments, 1944.

Robinson, Doane. Dam Sites on the Missouri River in South Dakota. Pierre: South Dakota Department of Immigration, 1918.

U.S. Congress, House, Committee on Flood Control. Statement of M.Q. Sharpe, Governor of South Dakota: Hearing before the Committee on Flood Control, 78th Cong., 2nd sess., 16-17 February 1944.

U.S. Congress, Senate. Missouri River Basin, 78th Cong., 2nd sess., 1944. Senate Document Number 247.

U.S. Congress, House of Representatives. Missouri River Channel Stabilization and Navigation Project: Hearing before the Subcommittee of the Committee on Appropriations, 82nd Cong., 2nd sess., 30 June 1952. Washington DC: GPO, 1952.

IV. PUBLISHED PROCEEDINGS

Aitken, Walter W. *Probable Effect of Reservoir Construction on Flora and Fauna of the Missouri River Region.* Presented at a meeting of the South Dakota Ornithologists Union in Sioux Falls, South Dakota, 15 January 1949. Photocopied.

Pick-Sloan Missouri Basin Plan. Proceedings of a conference held in Des Moines, Iowa, 10-11 August 1983, by the Missouri Basin States Association, 1983.

Review Report on the Missouri River in North Dakota, South Dakota and Nebraska, Supplement V, Volume III. Transcript of Proceedings at Public Hearing at Pierre, South Dakota on 15 March 1940, by Representative Francis Case.

V. NEWSPAPERS

Chamberlain Register, (Chamberlain, South Dakota), 1956-1958.

Des Moines Register, (Des Moines, Iowa), 1990-1995.

Huron Daily Plainsman, (Huron, South Dakota), 1966.

Kansas City Star, (Kansas City, Missouri), 1900-1975.

Kansas City Times, (Kansas City, Missouri), 1900-1975.

Mobridge Tribune, *Cheap Electric Power For Home, Farm, and Factory.* Mobridge: Mobridge Tribune, 1922.

Pierre Capital Journal, (Pierre, South Dakota), 1950-1965.

Sioux City Journal, (Sioux City, Iowa), 1930-1995.

Sioux Falls Argus Leader, (Sioux Falls, South Dakota). 1950-1995.

VI. PUBLISHED JOURNALS

Abel, Annie Heloise, ed. Tabeau's Narrative of Loisel's Expedition to the Upper Missouri. Norman: University of Oklahoma Press, 1939.

Account of a Steamboat Voyage on the Missouri River, St. Louis to Fort Benton, May-August, 1859, by Elias J. Marsh, M.D. South Dakota Historical Review 1, no. 2 (1936): 79-127.

Audubon, Maria R. *The Missouri River Journals, 1843.* In Audubon and His Journals, vol. 1, edited by Elliot Coues. New York: Charles Scribner's Sons, 1897. Reprint. New York: Dover Publications, Inc., 1960.

Bell, Gordon H. Down the Big Muddy. Sioux Falls: Published by author, 1958.

Brackenridge, Henry Marie. Views of Louisiana: Together with a Journal of a Voyage Up the Missouri River, in 1811. Pittsburgh: Cramer, Spear and Eichbaum, 1814. Reprint. Ann Arbor: University Microfilms, Inc., 1966.

Bradbury, John. Travels in the Interior of America, in the years 1809, 1810, and 1811; Including a Description of Upper Louisiana, Together with the States of Ohio, Kentucky, Indiana, and Tennessee, with the Illinois and Western Territories, and Containing Remarks and Observations Useful to Persons Emigrating to those Countries. Liverpool: Smith and Galway, 1817. Reprint. Ann Arbor: University Microfilms, Inc., 1966.

Bray, Edmund C. and Martha Coleman Bray, editors and translators. Joseph N. Nicollet on the Plains and Prairies: The Expeditions of 1838-39, With Journals, Letters, and Notes on the Dakota Indians. St. Paul: Minnesota Historical Society, 1976.

Coues, Elliot, ed. The History of the Lewis and Clark Expedition by Meriwether Lewis and William Clark. 3 vols. New York: Francis P. Harper, 1893. Reprint. New York: Dover Publications, Inc., (no date of reprint).

Culbertson, Thaddeus A. *Journal of an Expedition to the Mauvaises Terres and the Upper Missouri in 1850: by Thaddeus A. Culbertson.* In Smithsonian Institution Fifth Annual Report, 1850. Washington DC: U.S. Government Printing Office, 1851. Reprint. Edited by John Francis McDermott. Washington DC: U.S. Government Printing Office 1952.

Larpenteur, Charles. Forty Years a Fur Trader on the Upper Missouri: The Personal Narrative of Charles Larpenteur, 1833-1872. Chicago: R.R. Donnelley and Sons, Company, 1933. Reprint. Minneapolis: Ross and Haines, 1962.

Moulton, Gary E., ed. The Journals of the Lewis & Clark Expedition. 6 vols. to date. Lincoln: University of Nebraska Press, 1983-.

Nichols, Roger L., ed. The Missouri Expedition, 1818-1820: The Journal of Surgeon John Gale with Related Documents. Norman: University of Oklahoma Press, 1969.

Oehler, Gottlieb F. and David Z. Smith. Description of a Journey and Visit to the Pawnee Indians who live on the Platte River, a tributary to the Missouri, 70 miles from its mouth by Brn. Gottlieb F. Oehler and David Z. Smith, April 22-May 18, 1851, to which is added A Description of the Manners and Customs of the Pawnee Indians by Dr. D.Z. Smith. St. Louis(?): Moravian Church Miscellany of 1851-52. Reprint. New York: (publishing company unknown), 1914.

Reid, Russell, and Clell G. Gannon, eds. *Journal of the Atkinson-O'Fallon Expedition.* North Dakota Historical Quarterly 4 (October 1929): 5-56.

Riggs, Stephen Return. *Journal of a Tour From Lac-qui-Parle to the Missouri River.* South Dakota Historical Collections 13 (1926): 330-344.

Trudeau, Jean Baptiste. *Trudeau's Description of the Upper Missouri.* Mississippi Valley Historical Review 8 (1921): 149-179.

Warren, G[ouverneur] K[emble]. Explorer on the Northern Plains: Lieutenant Gouverneur K. Warren's Preliminary Report of Explorations in Nebraska and Dakota, in the Years 1855-'56-57. Introduction by Frank N. Schubert. Washington DC: Office of the Chief of Engineers, 1981.

VII. BOOKS

Athearn, Robert G. Forts of the Upper Missouri. Lincoln: University of Nebraska Press, 1967.

Ashton, Diane E., and Eileen M. Dowd. Fragile Legacy: Endangered, Threatened and Rare Animals of South Dakota. Pierre: Department of Game, Fish & Parks, 1991.

Baumhoff, Richard G. The Dammed Missouri Valley, One Sixth of Our Nation. New York: Alfred Knopf, 1951.

Branyan, Robert L. Taming the Mighty Missouri: A History of the Kansas City District, Corps of Engineers, 1907-1971. Kansas City: U.S. Army Corps of Engineers, Kansas City District, 1974.

Chittenden, Hiram. History of Early Steamboat Navigation on the Missouri River. 2 vols. New York: F.P. Harper, 1903.

Coon, Martha Sutherland. Oahe Dam: Master of the Missouri. New York: Harvey House, Inc., 1969.

Cronon, William. Nature's Metropolis: Chicago and the Great West. New York: W.W. Norton & Company, 1991.

Cutright, Paul Russell. Lewis and Clark: Pioneering Naturalists. Lincoln: University of Nebraska Press, 1969.

Dietrich, William. Northwest Passage: The Great Columbia River. New York: Simon and Schuster, 1995.

Dinsmore, James J. A Country So Full of Game: The Story of Wildlife in Iowa. Iowa City: University of Iowa Press, 1994.

Ewers, John C. Indian Life on the Upper Missouri. Norman: University of Oklahoma Press, 1968.

Ewers, John C., Marsha V. Gallagher, David C. Hunt, and Joseph C. Porter. Views of a Vanishing Frontier. Omaha: Center for Western Studies, Joslyn Art Museum, 1984.

Ferrell, John R. Heartland Engineers: A History of the Kansas City District, U.S. Army Corps of Engineers. Washington DC: GPO, 1992.

____________. Big Dam Era: A Legislative and Institutional History of the Pick-Sloan Missouri Basin Program. Omaha: Missouri River Division, U.S. Army Corps of Engineers, 1993.

____________. Soundings: One Hundred Years of the Navigation Project. Washington DC: GPO, 1996.

Gilmore, Melvin Randolph. Uses of Plants by the Indians of the Missouri River Region. Foreword by Hugh Cutler. Lincoln: University of Nebraska Press, 1919, 1977,1991.

Hallberg, George R., Jayne M. Harbaugh, and Patricia M. Witinok. Changes in the Channel Area of the Missouri River in Iowa, 1879-1976. Iowa City: Iowa Geological Survey, 1979.

Hanson, Joseph M. The Conquest of the Missouri: Being the Story of the Life and Exploits of Captain Grant Marsh. New York: A.C. McClurg & Company, 1909, 1937. Reprint. New York: Murray Hills Books, 1946.

Hart, Henry C. The Dark Missouri. Madison: The University of Wisconsin Press, 1957.

Holder, Preston. The Hoe and the Horse on the Plains: A Study of Cultural Development Among North American Indians. Lincoln: University of Nebraska Press, 1970.

Hoover, Herbert T. *The Missouri River*. In Rolling Rivers: An Encyclopedia of America's Rivers, edited by Richard A. Bartlett, 211-216. New York: McGraw-Hill Book Company, 1984.

____________. Karen P. Zimmerman and Christopher J. Hoover. South Dakota History: An Annotated Bibliography. Westport: Greenwood Press, 1993.

Hundley, Norris, Jr. The Great Thirst: Californians and Water, 1770s-1990s. Berkeley: University of California Press, 1992.

Iverson, Peter, ed. The Plains Indians of the Twentieth Century. Norman: University of Oklahoma Press, 1985.

Jackson, Donald. Voyages of the Steamboat Yellow Stone. New York: Ticknor & Fields, 1985.

Joslyn Art Museum and the University of Nebraska Press. Karl Bodmer's America. Omaha: Joslyn Art Museum, 1984.

Ladner, Mildred D. William de la Montagne Cary: Artist on the Missouri River. Norman: University of Oklahoma Press, 1984.

Lass, William E. A History of Steamboating on the Upper Missouri River. Lincoln: University of Nebraska Press, 1962.

Lathrop, A.H. Life in Vermillion Before the 1881 Flood and Shortly After. Vermillion: Clay County Historical Society, Inc., 1970.

Lawson, Michael L. Dammed Indians: The Pick-Sloan Plan and the Missouri River Sioux, 1944-1980. Norman: University of Oklahoma Press, 1982.

Lehmer, Donald J. Introduction to Middle Missouri Archeology. In Anthropological Papers no. 1, National Park Service, U.S. Department of the Interior. Washington DC: GPO, 1971.

Lowitt, Richard. The New Deal and the West. Norman: University of Oklahoma Press, 1984.

Malone, Michael P. and Richard W. Etulain. The American West: A Twentieth Century History. Lincoln: University of Nebraska Press, 1989.

Marcus, Alan I. and Howard P. Segal. Technology in America: A Brief History. New York: Harcourt Brace Jovanovich, 1989.

Mead, Daniel Webster and Charles V. Seastone. Report on the Feasibility of the Development of Hydro Electric Power from the Missouri River in the State of South Dakota. Pierre: Hydro-Electric Commission of the State of South Dakota, 1920. Reprint. Pierre: Lawrence K. Fox, 1929.

Mutel, Cornelia F. Fragile Giants: A Natural History of the Loess Hills. Iowa City: University of Iowa Press, 1989.

Nash, Roderick Frazier, editor. American Environmentalism: Readings in Conservation History. Third edition. New York: McGraw-Hill Publishing Company, 1990.

Neihardt, John G. The River and I. New York: G.P. Putnam's Sons, 1910. Reprint. Lincoln: University of Nebraska Press, 1938, 1968.

Nelson, Bruce. Land of the Dacotahs. Minneapolis: University of Minnesota Press, 1946.

Opie, John. Ogallala: Water for a Dry Land. Lincoln: University of Nebraska Press, 1993.

Pitzer, Paul C. Grand Coulee: Harnessing a Dream. Pullman: Washington State University Press, 1994.

Prior, Jean C. Landforms of Iowa. Iowa City: University of Iowa Press, 1991.

Ridgeway, Marian E. The Missouri Basin's Pick-Sloan Plan: A Case Study in Congressional Policy Determination. Urbana: The University of Illinois Press, 1955.

Schell, Herbert S. History of South Dakota. Lincoln: University of Nebraska Press, 1961.

Sherow, James. Watering the Valley: Development Along the High Plains Arkansas River, 1870-1950. Lawrence: University of Kansas, 1991.

Stewart, Rick, Joseph D. Ketner II, and Angela L. Miller. Carl Wimar: Chronicler of the Missouri River Frontier. Fort Worth: Amon Carter Museum, 1991.

Stine, Jeffrey K. Mixing the Waters: Environment, Politics, and the Building of the Tennessee-Tombigbee Waterway. Akron: University of Akron Press, 1993.

Terral, Rufus. The Missouri Valley: Land of Drouth, Flood, and Promise. New Haven: Yale University Press, 1947.

Todd, John. Early Settlement and Growth of Western Iowa or Reminiscences. Des Moines: The Historical Department of Iowa, 1906.

Thorson, John E. River of Promise, River of Peril: The Politics of Managing the Missouri River. Lawrence: University Press of Kansas, 1994.

Vestal, Stanley. The Missouri. New York: Farrar and Rinehard, Inc., 1945. Reprint. Lincoln: University of Nebraska Press, 1964.

Webb, Walter Prescott. The Great Plains. Boston: Ginn and Company, 1931. Reprint. Lincoln: University of Nebraska Press, 1981.

White, Richard. The Organic Machine: The Remaking of the Columbia River. New York: Hill and Wang, 1995.

Will, George F. and George E. Hyde. Corn Among the Indians of the Upper Missouri. St. Louis: The William Harvey Miner Company, Inc., 1917.

WNAX Radio, Yankton, South Dakota. Disaster 1952. Sioux City: Record Printing Company, 1952.

Works Progress Administration, Federal Writer's Project. Sodbusters: Tales of Southeastern South Dakota. Alexandria, South Dakota: The South Dakota Writer's League, 1938.

Worster, Donald. Rivers of Empire: Water, Aridity, and the Growth of the American West. New York: Pantheon Books, 1985. Reprint. New York: Oxford University Press, 1992.

Yankton Herald. The Great Flood. Yankton: Herald Press, 1881.

VIII. ARTICLES

Anderson, Hattie M. *Missouri, 1804-1828: Peopling a Frontier State*. Missouri Historical Review 31 (January 1937): 150-180.

Anderson, Hattie M. *The Evolution of a Frontier Society in Missouri, 1815-1828, Part I.* Missouri Historical Review 32 (April 1938): 298-326.

Armstrong, Moses Kimball. *History and Resources of Dakota, Montana and Idaho*. South Dakota Historical Collections 14 (1928): 9-70.

Bannon, John Francis, S.J. *Lewis and Clark Came Late*. South Dakota History 4, no. 2 (1974): 222-237.

Best, Louis B., Kenneth L. Varland, and Robert B. Dahlgren. *Effects of Stream Channelization on Land-Use Practices In Iowa*. Iowa State Journal of Research 52, no. 4 (May 1978): 411-423.

Bradley, L.E. *Government Ice Harbors on the Upper Missouri*. North Dakota History 60, no. 3 (1993): 28-37.

Bragg, Thomas B. and Annehara K. Tatschi. *Changes in Flood-Plain Vegetation and Land Use Along the Missouri River from 1826 to 1972*. Environmental Management 1, no. 4 (1977): 343-348.

Bratton, Sam T. *Inefficiency of Water Transportation in Missouri-A Geographical Factor in the Development of Railroads*. Missouri Historical Review 14 (October 1919): 82-88.

Briggs, Harold E. *The Settlement and Economic Development of the Territory of Dakota*. South Dakota Historical Review 2, no. 2 (1937): 151-166.

Brown, Richard Maxwell. *The Enduring Frontier: The Impact of Weather on South Dakota History and Literature*. South Dakota History 15, nos. 1 and 2 (1985): 27-65.

Campbell, David C. *The Pick-Sloan Program: A Case of Bureaucratic Economic Power*. Journal of Economic Issues XVIII, no. 2 (June 1984): 449-456.

Cass, Edward C. *Flood Control and the Corps of Engineers in the Missouri Valley, 1902-1973*. Nebraska History 63, no. 1 (Spring 1982): 108-121.

Chamberlain Commercial Club. *Big Bend Hydro-Electric Project*. Chamberlain: Register Printing Company, 1935(?).

Clow, Richmond L. *Tribal Populations in Transition: Sioux Reservations and Federal Policy, 1934-1965*. South Dakota History 19, no. 3 (Fall 1989): 362-391.

DeLand, Charles E. *Papers and Communications upon Internal Waterways and Navigation, Comprising a portion of the Part III of the author's book entitled "Thoughts Afield."* Pierre, South Dakota: Charles E. DeLand, 1911.

Ferrell, John. *Developing the Missouri: South Dakota and the Pick-Sloan Plan.* South Dakota History 19, no. 3 (Fall 1989): 306-341.

Fite, Gilbert C. *Agricultural Pioneering in Dakota: A Case Study.* Great Plains Quarterly 1, no. 3 (1981): 169-180.

Freedom, Gary S. *Moving Men and Supplies: Military Transportation on the Northern Great Plains, 1866-1891.* South Dakota History 14, no. 2 (1984): 114-133.

Freeman, Lewis R. *Trailing History Down the Big Muddy.* National Geographic LIV, no. 1, (July 1928): 73-120.

Funk, John L. and John W. Robinson. *Changes in the Channel of the Lower Missouri River and Effects on Fish and Wildlife.* Missouri Department of Conservation, Aquatic Series, Number 11, (November 1974).

Gerber, Max E. *The Steamboat and the Indians of the Upper Missouri.* South Dakota History 4, no. 2 (1974): 139-160.

Hafermehl, Louis N. *To Make the Desert Bloom: The Politics and Promotion of Early Irrigation Schemes in North Dakota.* North Dakota History, Journal of the Northern Plains 59, no. 3 (Summer 1992): 13-27.

Hamburg, James F. *Railroads and the Settlement of South Dakota During the Great Dakota Boom, 1878-1887.* South Dakota History 5, no. 2 (Spring 1975): 165-178.

Harvey, Mark W.T. *North Dakota's Water History: An Introduction.* North Dakota History, Journal of the Northern Plains. 59, no. 3 (Summer 1992): 2-4.

____________. *North Dakota, the Northern Plains, and the Missouri Valley Authority.* North Dakota History, Journal of the Northern Plains 59, no. 3 (Summer 1992): 28-39.

Hoover, Herbert. *The Need of Inland Waterways for Agriculture and Industry.* An address delivered before the delegates of the Missouri River Navigation Conference, Kansas City, Missouri, 19 October 1925. Published in pamphlet titled, Inland Waterways and Missouri River Navigation. Kansas City: Missouri River Navigation Association, 1925.

Hoover, Herbert T., John Rau, and Leonard Bruguier. *Gorging Ice and Flooding Rivers: Springtime Devastation in South Dakota.* South Dakota History 17, nos. 3 and 4 (1987): 181-201.

Hunt, William J. *Fort Floyd: An Enigmatic Nineteenth-Century Trading Post.* North Dakota History, Journal of the Northern Plains 61, no. 3 (Summer 1994): 7-20.

The Journal of Charles LeRaye. South Dakota Historical Collections 4 (1908): 149-180.

Land of the Big Muddy. Time (1 September 1952): 36,45.

Langevin, Thomas H. *Development of Multiple-Purpose Water Planning by the Federal Government in the Missouri Basin.* Nebraska History 34, no. 1 (1953): 1-19.

Lasch, Robert. *Harnessing the Missouri.* The Reporter (29 August 1950): 32-34.

Lass, William E. *Missouri River Steamboating.* North Dakota History, Journal of the Northern Plains 56, no. 3 (1989): 3-16.

____________. *The History and Significance of the Northwest Fur Company, 1865-1869.* North Dakota History, Journal of the Northern Plains 61, no. 3 (Summer 1994): 21-40.

Lawson, Michael L. *Federal Water Projects and Indian Lands: The Pick-Sloan Plan, A Case Study.* American Indian Culture and Research Journal 7, no. 1 (1983): 23-40.

Lehmer, Donald J. *Climate and Culture History in the Middle Missouri Valley.* In Pleistocene and Recent Environments of the Central Great Plains, edited by Wakefield Dort and J. Knox Jones, 117-130. Lawrence: University of Kansas Press, 1970.

Mattison, Ray H. *The Indian Frontier on the Upper Missouri to 1865.* Nebraska History 39, no. 3 (1958): 241-266.

Miller, George J. *Making the Missouri River Navigable: How it is Accomplished and What the Engineers Say.* Kansas City: Missouri River Navigation Association, November 1928.

Missouri River Improvement Association. *Proceedings of the Missouri River Improvement Convention, Held at Kansas City, Mo., December 15th and 16th, 1891.* Kansas City: Missouri River Improvement Association.

Missouri River Improvement Convention. *Official Report of the Proceedings of the Missouri River Convention, Held in Kansas City, Mo., December 29 and 30, 1885.* Kansas City: Lawton and Havens, Printers, Binders and Stationers, 1885.

Missouri River Navigation Association. *The Missouri River Navigation Association, Organized at Kansas City, Missouri, October 19th-20th 1925.* Kansas City: Missouri River Navigation Association, 1925.

Missouri River Navigation Association. *What the Missouri River Navigation Association Has Accomplished.* Kansas City: Missouri River Navigation Association, 1927.

Missouri River Navigation Association. *Railways and Waterways.* Kansas City: Missouri River Navigation Association, 1931.

Missouri River Navigation Congress. *Proceedings of the First Annual Convention of the Missouri River Navigation Congress at Sioux City, Iowa, Wednesday and Thursday, Jan. 22-23, 1908.* Sioux City(?): Missouri River Navigation Congress, 1908.

Missouri Valley River Improvement Association. *The Way to Navigate is to Navigate, The Missouri, A Deep Waterway, A 12-Foot Channel Would Save Its Cost Every Year. Work of Missouri Valley River Improvement Association for the Development of River Navigation.* Kansas City: Missouri Valley River Improvement Association, 1907.

Missouri Valley River Improvement Association. *The Way to Navigate is to Navigate, The Deep Water Project for the Missouri River, A 12-Foot Channel Would Save Its Cost Every Year. Report of the Missouri Valley River Improvement Association.* Kansas City: Missouri Valley River Improvement Association, 1908.

Nebraska History Magazine. *The Missouri River: Its Discovery, Its Region and Resources, Its Navigation, Its Future.* Lincoln: Nebraska State Historical Society, 1927.

Nichols, J.C. *The Missouri River, The Mississippi Waterways, and Their Relation to Agriculture and Industry.* An address delivered before the Mississippi Valley Association at its Tenth Annual Convention, St. Louis, Missouri, 27 November 1928. Published in a pamphlet titled, The Missouri River, The Mississippi Waterways, and Their Relation to Agriculture and Industry. Kansas City: Missouri River Navigation Association, 1928.

Nichols, Roger L. *Martin Cantonment and American Expansion in the Missouri Valley.* Missouri Historical Review 64 (October 1969): 1-17.

Pierre Commercial Club. *Navigation of the Missouri River Through the Dakotas*, Pierre: Hipple Printing Company, 1931.

Parker, Donald D. *Expeditions up the Missouri, 1818-1825.* South Dakota Historical Collections 33 (1966): 458-487.

Robinson, William G. *Big Bend of the Missouri.* Unpublished manuscript. Pierre: South Dakota State Historical Society, 1963. Photocopied.

____________. *The Development of the Missouri Valley.* South Dakota Historical Collections 22 (1946): 445-544.

Roy, Sydney J. *The Value of Missouri River Navigation to the Consumers and Producers of the Missouri River Valley.* An address delivered before the delegates of the "Farmers Week" Conference, Jessie Hall, University of Missouri, Columbia, Missouri, 21 January 1926. Published in pamphlet titled, Navigation and Agriculture. Kansas City: Missouri River Navigation Association, 1925.

Ruhe, R.V., T.E. Fenton, and L.L. Ledesma. *Missouri River History, Floodplain Construction, and Soil Formation in Southwestern Iowa.* Iowa Agriculture and Home Economics Experiment Station, Research Bulletin 580 (September 1975): 738-791.

Schell, Herbert S. *Early Manufacturing Activities in South Dakota, 1857-1875.* South Dakota Historical Review 2, no. 2 (1937): 73-95.

____________. *The Dakota Southern: A Frontier Railway Venture of Dakota Territory.* South Dakota Historical Review 2, no. 3 (1937): 99-125.

Sharpe, M.Q. *History of the Missouri River States Committee.* South Dakota Historical Collections 22 (1946): 400-409.

Shortridge, James R. *The Expansion of the Settlement Frontier in Missouri.* Missouri Historical Review 75 (October 1980): 64-90.

Simpich, Frederick. *Taming the Outlaw Missouri.* National Geographic, LXXXVIII, no. 5 (November 1945): 569-598.

Thomas, Raymond D. *Missouri Valley Settlement-St. Louis to Independence.* Missouri Historical Review 21 (October 1926): 24-40.

Viles, Jonas. *Old Franklin: A Frontier town of the Twenties.* The Mississippi Valley Historical Review 9, no. 4 (March 1923): 269-282.

Voss, Stuart F. *Town Growth in Central Missouri, Part I.* Missouri Historical Review 64 (October 1969): 64-80.

____________. *Town Growth in Central Missouri, Part II.* Missouri Historical Review 64 (January 1970): 197-217.

____________. *Town Growth in Central Missouri, Part III.* Missouri Historical Review 64 (April 1970): 322-350.

Welsh, Michael. *Western Historians, the U.S. Army Corps of Engineers, and the Rivers of Empire.* North Dakota History, Journal of the Northern Great Plains 59, no. 3 (Summer 1992): 5-12.

White, Edward J. *A Century of Transportation in Missouri.* Missouri Historical Review 15 (October 1920): 126-162.

Wilson, Frederick T. *Old Fort Pierre and Its Neighbors.* South Dakota Historical Collections 1 (1902): 257-379.

Windell, Marie George, editor. *The Road West in 1818, The Diary of Henry Vest Bingham, Part II.* Missouri Historical Review 40 (January 1946): 174-204.

Wood, Raymond W. *An Introduction to the History of the Fur Trade on the Northern Plains.* North Dakota History, Journal of the Northern Plains 61, no. 3 (Summer 1994): 2-6.

Young, Gordon. *That Dammed Missouri River.* National Geographic, 140, no. 3 (September 1971): 374-412.

IX. THESES

Call, George R. *The Missouri River Improvement Program As I Have Known It.* Unpublished manuscript, Sioux City Public Library, 1967.

Collins, Edward. *A History of Union County, South Dakota, to 1880.* Master's thesis, University of South Dakota, 1937.

Goetz, Anna M. *The History of Yankton County to 1886.* Master's thesis, University of South Dakota, 1927.

Johnson, Donald Frank. *Plant Succession on the Missouri River Floodplain Near Vermillion, South Dakota.* Master's thesis, University of South Dakota, 1950.

Koerselman, Jon D. *The Origins of Sioux City, Iowa, 1850-1870.* Master's thesis, University of South Dakota, 1975.

Miller, Donald L. *The History of the Movement for Hydro-Electric Development on the Missouri River in South Dakota.* Master's thesis, University of South Dakota, 1930.

Nichol, Ralph E. *Steamboat Navigation on the Missouri River with Special Reference to Yankton and Vicinity*. Master's thesis, University of South Dakota, 1936.

Pope, James Sterling. *A History of Steamboating on the Lower Missouri: 1838-1849, Saint Louis to Council Bluffs, Iowa Territory*. Ph.D. dissertation, St. Louis University, 1984.

Rees, Ida Mae. *Sioux City as a Steamboat Port, 1856-1873*. Master's thesis, University of South Dakota, 1967.

Rogge, Charles H. *Early History of Sully County*. Master's thesis, University of South Dakota, 1936.

Schneiders, Robert K. *To Dam the Missouri River: Big Bend Dam and the Lakota Indians*. Master's thesis, Iowa State University, 1993.

Wyman, Walker Demarquis. *The Missouri River Towns in the Westward Movement*. Ph.D. dissertation, University of Iowa, 1935.