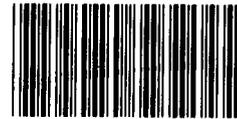


January 1992

WATER RESOURCES

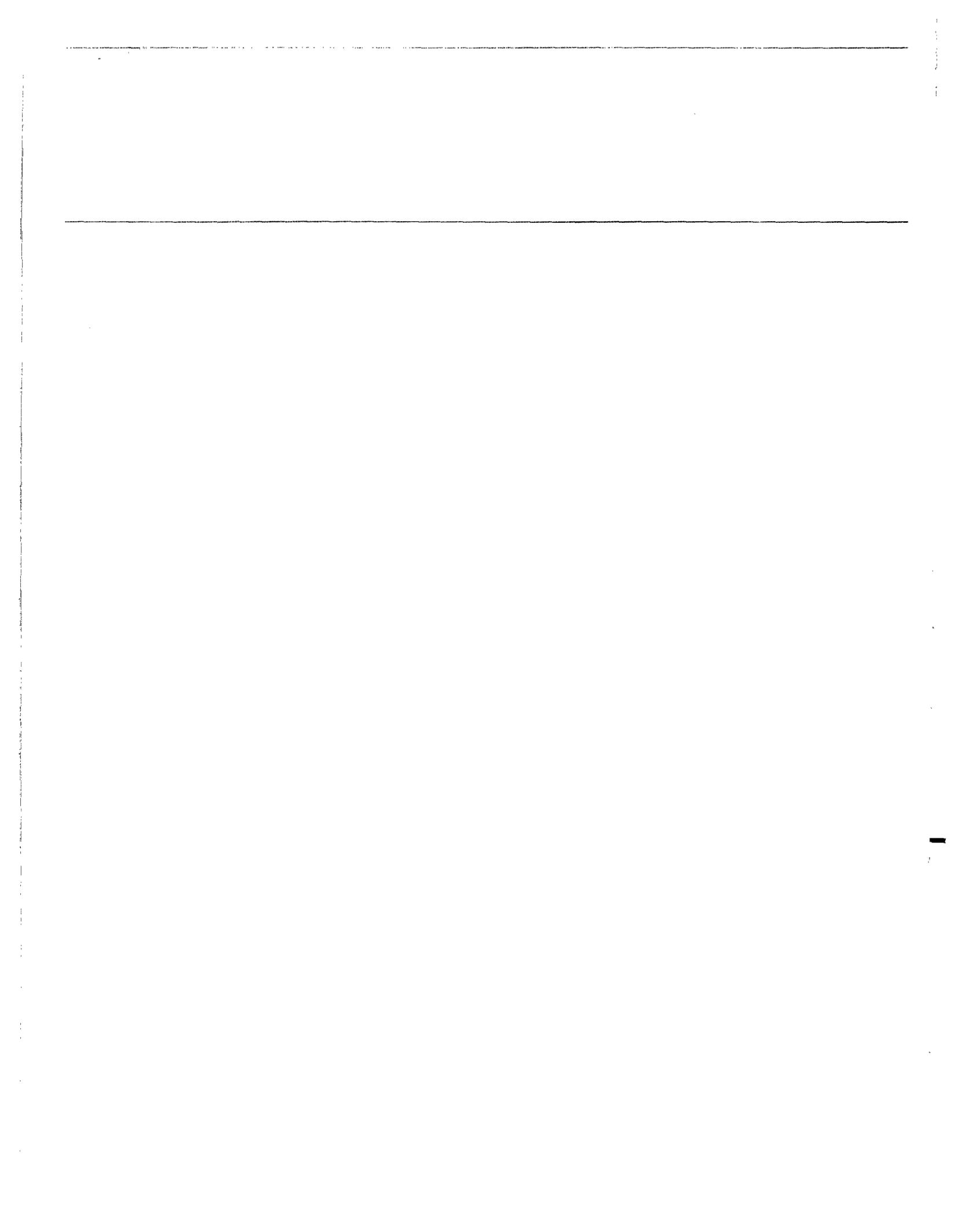
Corps' Management of Ongoing Drought in the Missouri River Basin



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**United States
General Accounting Office
Washington, D.C. 20548**

**Resources, Community, and
Economic Development Division**

B-241794

January 27, 1992

The Honorable Kent Conrad
Vice Chairman, Subcommittee on Water
and Power
Committee on Energy and Natural Resources
United States Senate

The Honorable Byron L. Dorgan
House of Representatives

As you requested, we reviewed the U.S. Army Corps of Engineers' management of the Missouri River reservoir system under drought conditions in 1988, 1989, and 1990. Specifically, the report examines whether the Corps followed a drought contingency plan and identifies how the Corps set operating priorities for this plan.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 15 days from the date of this letter. At that time, we will send copies to interested parties and make copies available to others upon request.

This report was prepared under the direction of James Duffus III, Director, Natural Resources Management Issues, who may be reached on (202) 275-7756. Other major contributors are listed in appendix I.



J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

The Missouri River basin, encompassing all of Nebraska and parts of nine other North Central states, is experiencing its most severe drought since the 1930s. Below-normal rain and snowfall have left the water at three U.S. Army Corps of Engineers reservoirs on the upper Missouri River at levels significantly below normal. Concerned about the drought's impacts on the recreation industries supported by the reservoirs in Montana and the Dakotas, state officials questioned whether the Corps had a drought contingency plan to conserve water in the reservoirs and equitably distribute the negative economic impacts of the drought.

The Vice Chairman, Subcommittee on Water and Power, Senate Committee on Energy and Natural Resources, and Representative Byron L. Dorgan asked GAO to (1) review whether in 1988, 1989, and 1990 the Corps followed a drought contingency plan and whether the plan reduced the amount of water released, and (2) identify how the Corps set operating priorities for this plan.

Background

The Corps operates six dams on the Missouri River—located above Sioux City, Iowa—as an integrated system. Water in the reservoirs makes possible commercial navigation between Sioux City and St. Louis, Missouri; generates hydroelectric power; provides municipal and industrial water supplies; and supports recreation industries in Montana, North Dakota, and South Dakota. The Corps manages the system according to its Master Manual and operating priorities established in 1952. The Corps can fulfill all purposes of the Missouri River reservoir system under normal operating conditions. However, since 1988, the drought has prevented the Corps from meeting all users' demands for water. Competition for the available water supply has increased, particularly between recreation interests in the upper basin and navigation interests in the lower basin below the reservoirs.

Results in Brief

The Corps followed a drought contingency plan in 1988, 1989, and 1990 in releasing water from the reservoir system. Acting consistently with the plan, the Corps reduced winter release rates, shortened navigation seasons on the Missouri River, and reduced water levels in the navigation channel. As a result, 17 percent less water was released during the 3-year period than would have been released under normal operating conditions. The drought and the Corps' response to it adversely impacted all of the purposes served by the reservoirs except flood control.

The Corps' drought contingency plan, however, is based on assumptions about the amount of water needed for navigation and irrigation made in 1944 that are no longer valid, and the plan does not reflect the current economic conditions in the Missouri River basin. The Corps' ongoing comprehensive study of its operation of the reservoir system is expected to address these issues. Notwithstanding the results of its study, the Corps maintains on the basis of its interpretation of the authorizing legislation that unless it obtains congressional approval to change existing operating priorities, it must continue to give recreation a lower operating priority than other authorized purposes even if this lower priority results in decreased system benefits. GAO sees no appropriate basis for the Corps' view. A lawsuit filed in federal court by three upper-basin states questions the legality of the Corps' position on recreation.

Principal Findings

Corps Followed a Drought Contingency Plan in 1988, 1989, and 1990

Declining water reserves in the Missouri River system triggered the Corps' drought contingency plan in July 1988. Following the plan, the Corps maintained normal water releases during a shortened 1988 navigation season to offset the lower-than-normal runoff into the river downstream of the reservoirs. The Corps then reduced water releases during the 1988-89 and 1989-90 winters, shortened the 1989 and 1990 navigation seasons, and reduced the 1989 and 1990 navigation streamflows.

GAO estimated that if the Corps had not reduced its service to navigation and hydroelectric power for the 1988-1990 drought period, it would have released about 61.2 million acre-feet of water. Corps records show that the volume released was about 50.8 million acre-feet, or 17 percent less than under normal operations. As of December 31, 1990, drought operations had used about 42 percent of the water normally held in reserve for use during a drought. The Chief of the Corps' Reservoir Control Center in Omaha, Nebraska, estimated that as of September 1991, the reservoirs needed 4 to 6 years of normal runoff to return to normal operating levels.

Drought Has Impacted All Purposes Except Flood Control

Data obtained from the Corps, state officials, industry representatives, and private individuals indicated various drought impacts. Municipal, industrial, and rural water supplies above and below Sioux City experienced pumping and other problems because of the level of their

intakes. Below Sioux City, commodity shipments on the river declined. Above Sioux City, hydroelectric power generation declined, private irrigators lost their water supplies, and receding shorelines left boating facilities at the upper three reservoirs on dry land and reduced the habitat for fish.

Some Corps' Assumptions About Demand for Water Are No Longer Valid

According to the Corps, the Congress approved the Missouri River reservoir system in 1944 to improve the basin's economic climate. At that time, the system's planners believed that they could achieve this by providing flood control, river transport for the lower basin's products, and irrigation for the upper basin's arid farmlands and by generating power for inhabitants throughout the basin.

Conditions supporting these assumptions have changed over time. In 1944, the Corps estimated the demand for river transport of goods at 12 million tons annually. At commercial navigation's peak in 1977, 3.3 million tons of goods were shipped on the Missouri, or 72 percent less than the Corps' estimate. As of 1988, the tonnage shipped on the river had declined further, to 2.2 million tons. In addition, the federal government never constructed the massive irrigation projects anticipated in 1944 that would have used the reservoirs' water to irrigate 2.2 million acres of farmland. Conversely, the extent to which the reservoirs have generated recreation industries that provide significant economic benefits to their host states was not envisioned by the system's planners.

The Corps is reviewing its operation of the Missouri River reservoir system because information in the Master Manual is outdated and because users of the system have questioned the Corps' management of it. The Corps will analyze the national economic development benefits that can be derived from the reservoir system under various operating alternatives and plans to complete its review in early 1993.

Current Lawsuit Questions the Corps' Operating Priorities

On the basis of its interpretation of section 9 of the Flood Control Act of 1944, which authorized construction of the Missouri River system, the Corps believes that each authorized purpose is either primary or secondary. The Corps also believes that secondary purposes, which it says includes recreation, must be relegated to a lower operating priority than primary purposes. As a result, according to the Corps, recreational use of the reservoirs was not a factor in the Corps' major water release decisions during the drought. Corps officials said they would not give priority to

recreation over other purposes even if their analysis showed that the change in priority could increase total system benefits because of the Corps' position on primary and secondary purposes. They said that congressional approval would be needed to change existing operating priorities.

In February 1991, three upper basin states—Montana, North Dakota, and South Dakota—filed a lawsuit in federal court challenging the Corps' policy of categorizing a project's authorized purposes as primary and secondary. The outcome of this court case could have far-reaching implications because the Corps' policy is applicable agencywide. In essence, the states argue that because recreation is an authorized purpose of the Missouri River system, it is not a secondary purpose that receives only water that is left over after other uses are satisfied.

Because its review did not reveal a statutory scheme for regarding authorized purposes as primary or secondary, GAO sees no appropriate basis for the Corps' view. The lawsuit may ultimately settle the legal question. However, in the absence of a court decision adverse to the Corps' position, the Corps will continue to relegate recreation to a low priority, even if the lower priority results in decreased system benefits, unless it is directed by the Congress to establish operating priorities for all authorized purposes on the basis of economic and other benefits to be derived from all authorized purposes.

Matter for Congressional Consideration

To ensure that the Corps maximizes the economic and other benefits of all authorized purposes of the Missouri River reservoir system and other Corps water projects, the Congress should consider enacting legislation to require the Corps to establish operating priorities for its reservoir projects on the basis of the economic, environmental, social, and other benefits to be derived from all authorized project purposes.

Agency Comments

GAO discussed the information in this report with officials at the Corps' headquarters and Missouri River Division. In general, the officials agreed that the information was accurate, and GAO incorporated suggested changes where appropriate. However, these officials disagreed with GAO's view that the Corps can change the operating priority for recreation without congressional approval. GAO is suggesting that the Congress consider enacting legislation to **clarify this matter**. As requested, GAO did not obtain written agency comments on a draft of this report.

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Abbreviations

cfs	cubic feet per second
GAO	General Accounting Office
maf	million acre-feet
M&I	municipal and industrial
WAPA	Western Area Power Administration

Introduction

Since May 1987, the Missouri River basin has suffered its worst drought since the 1930s.¹ The amount of water running off the land into six U.S. Army Corps of Engineers reservoirs on the upper Missouri River was one-third below normal during the 4-year period 1987-90. Without sufficient runoff to replenish the reservoirs, the Corps was unable to fully support all authorized water uses in 1988, 1989, and 1990. The drought continues today.

The drought raises difficult questions about whether to store water for in-reservoir benefits or to release water for downstream benefits. By the end of 1988, the drought and water released for navigation downstream and hydroelectric power generation left the three most northern reservoirs as much as 18.4 feet below normal operating levels. Officials in Montana, North Dakota, and South Dakota raised questions about whether the Corps had a drought contingency plan that conserved the reservoir's water and equitably distributed the negative impacts of the drought among all users of the water, particularly between the upper basin's recreation industries and the lower basin's navigation industry.

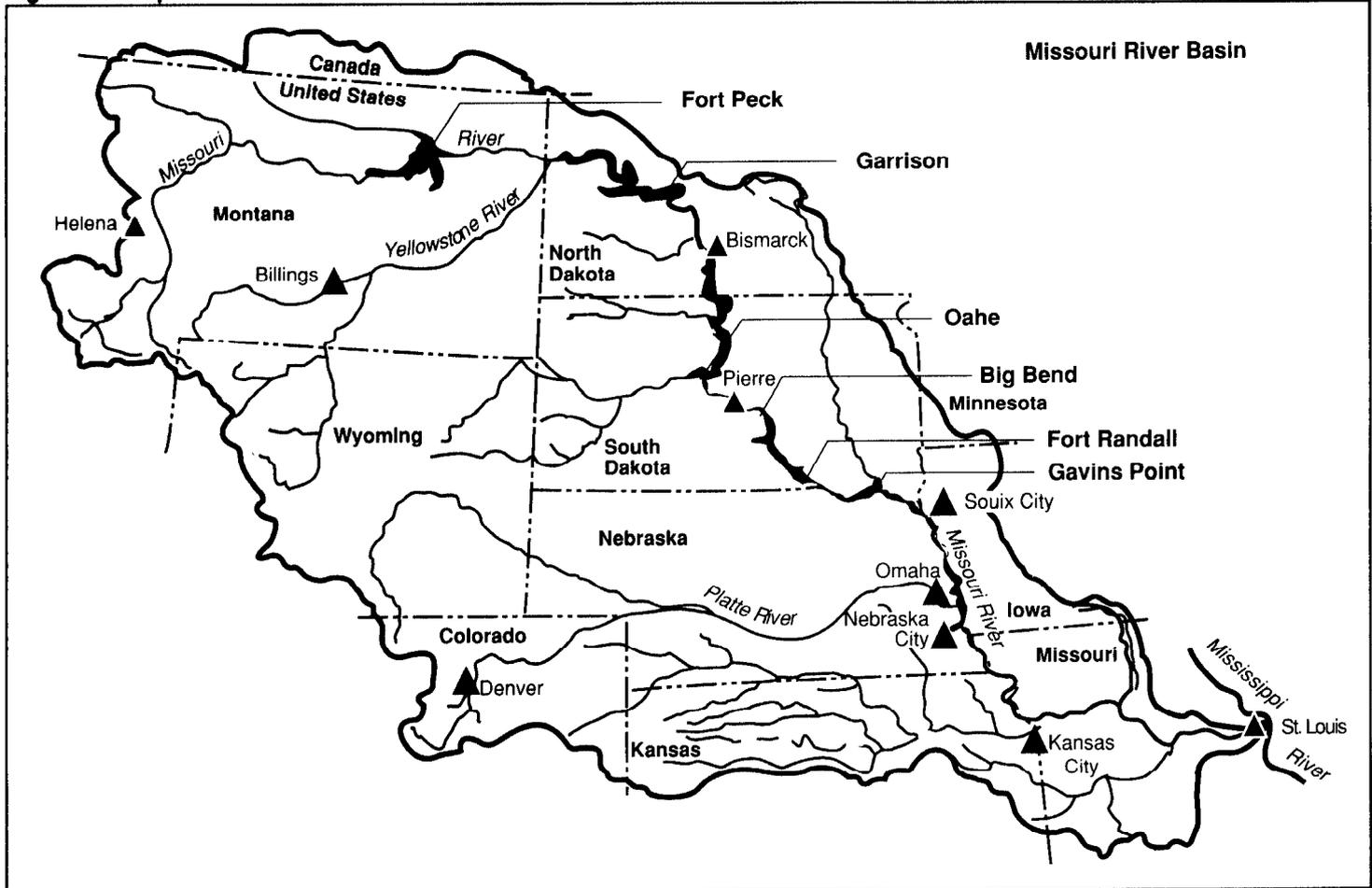
The Missouri River Reservoir System Serves Multiple Purposes

Between 1933 and 1964, the Corps built six dams and reservoirs on the Missouri River above Sioux City, Iowa, to serve the water resource needs of the inhabitants of the Missouri River basin. The six reservoirs form a chain of lakes stretching about 1,075 miles between Fort Peck in Montana, east and southward, to Gavins Point on the South Dakota-Nebraska border. Water stored in the reservoirs makes possible commercial navigation on the Missouri River between Sioux City and St. Louis, Missouri, where the Missouri River meets the Mississippi. It also generates hydroelectric power, provides municipal and industrial (M&I) water supplies, and supports recreation industries in Montana, North Dakota, and South Dakota. The Corps operates the reservoirs as a single integrated system to achieve these purposes.

The six reservoirs are Fort Peck in Montana; Garrison in North Dakota; Oahe, which begins in North Dakota and extends into South Dakota; Big Bend and Fort Randall in South Dakota; and Gavins Point. Figure 1.1 shows the Missouri River basin and the location of the reservoirs, and figure 1.2 shows a cross section of the reservoir system.

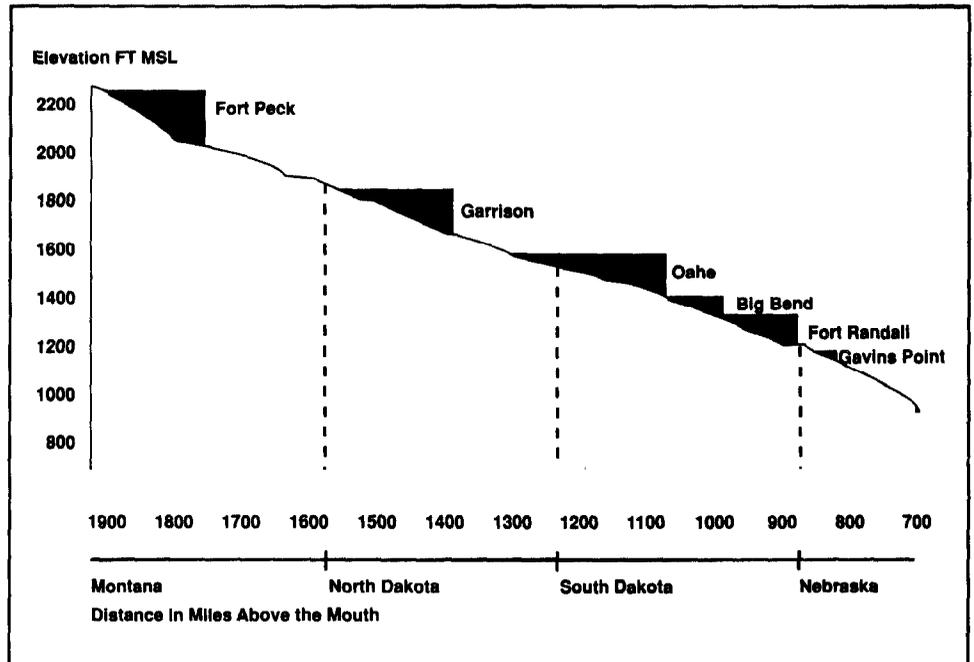
¹The Missouri River basin encompasses all of Nebraska and parts of Colorado, the Dakotas, Iowa, Kansas, Minnesota, Missouri, Montana, and Wyoming.

Figure 1.1: Map of the Missouri River Basin and Location of Missouri River Reservoirs



Source: U.S. Army Corps of Engineers.

Figure 1.2: Cross Section of the Missouri River Reservoir System



Source: U.S. Army Corps of Engineers.

Various laws authorize the operation of the reservoir system for flood control, navigation, federal irrigation projects, hydroelectric power generation, the use of surplus water for M&I supplies, maintenance of water quality, recreation, and fish and wildlife conservation. In 1952, the Corps established the following operating priorities for the Missouri River system:

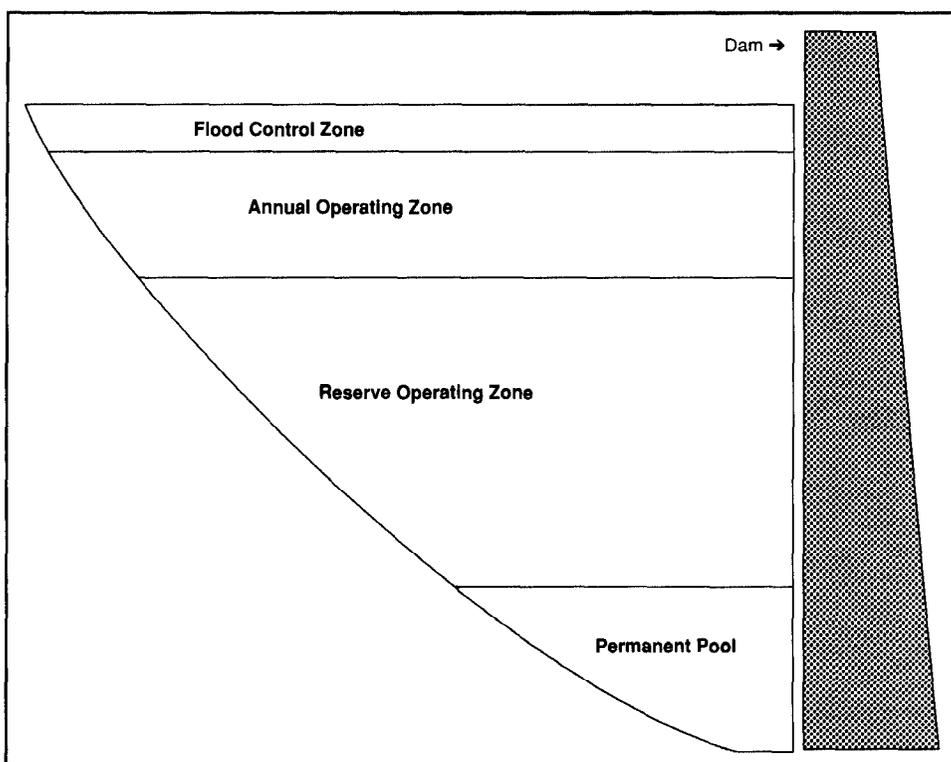
- flood control,
- irrigation diversion projects,
- M&I water supply and maintenance of water quality below the system's exit point at Gavins Point dam,
- navigation,
- hydroelectric power generation, and
- recreation and fish and wildlife conservation.

In addition, authorizing legislation subordinates uses of water from the five lower reservoirs for navigation purposes to consumptive uses in the westernmost states, including Montana, North Dakota, South Dakota, Nebraska, and Kansas. Consumptive uses are those in which part of the water withdrawn is not returned to the system, such as municipal water supply and irrigation.

After the enactment of the Endangered Species Act of 1973, the Corps gave priority to fish and wildlife protection for threatened and endangered species over all authorized purposes except flood control. According to the Corps, other M&I water supply, and private irrigation uses of water within the reservoir system are authorized only if surplus reservoir water is available.

The Corps divides the storage capacity of each reservoir into either three or four operating zones. Figure 1.3 profiles these zones.

Figure 1.3: Storage Zones of a Missouri River Reservoir



Source: U.S. Army Corps of Engineers.

A flood control zone captures extreme or unexpected flood waters. The Corps evacuates water from this zone as rapidly as feasible.

The annual operating zone captures the current year's water supply. Normally, the Corps uses this water to support navigation and hydroelectric power. This zone ranges from 2 to 15 feet in depth at the six reservoirs.

A reserve operating zone stores water from year to year to support navigation and hydroelectric power when water in the annual operating zone is exhausted during prolonged periods of drought. This zone ranges from 30 to 74 feet in depth at the Fort Peck, Garrison, Oahe, and Fort Randall reservoirs.

The permanent pool provides water for minimum power requirements and protected consumptive water uses. Corps guidance provides that normally the water level will not drop below the top of this zone.

The reservoirs at Fort Peck, Garrison, and Oahe have significant roles in supporting navigation because they contain 88 percent of the system's total water storage capacity. The massive reserve operating zones within these reservoirs store exceptionally large amounts of water for use during a drought. Thus, as the system continues to support navigation during a prolonged drought, water levels can drop 75 feet, 77 feet, and 86 feet from the tops of the annual operating zones at Garrison, Oahe, and Fort Peck. Conversely, the water levels at Big Bend and Gavins Point remain relatively unaffected during a drought because these reservoirs do not have reserve operating zones.

Corps' Master Manual Provides Operating Guidance

The Corps' Missouri River Division operates the Reservoir Control Center in Omaha, Nebraska, to regulate the Missouri River system of six dams and reservoirs. The Reservoir Control Center's Master Manual, which includes a drought contingency plan, was first published in 1960, and provides broad guidance for operating the Missouri River reservoir system based on operating priorities established in 1952. In addition, each August the Corps prepares an annual operating plan presenting how it expects to operate the system during the upcoming year.

Operating the reservoir system follows an annual cycle. Each year, the reservoirs accumulate an average of about 23.3 million acre-feet (maf) from melting snow and rainfall. During the spring, summer, and fall, the Corps releases water to generate hydroelectric power and support navigation on the 732 miles between Sioux City, Iowa, and St. Louis, Missouri.

Releases for navigation usually begin in late March and continue through November, gradually increasing during the summer and fall to compensate for decreasing natural inflows into the navigation channel from the river's tributaries. During the navigation season, the Corps releases water from the Oahe reservoir at a relatively high rate. This generates hydroelectric

power and replaces the water released from the reservoirs at Big Bend, Fort Randall, and Gavins Point, where the water supply is smaller. Conversely, releases from the Fort Peck and Garrison reservoirs are relatively low during the navigation season.

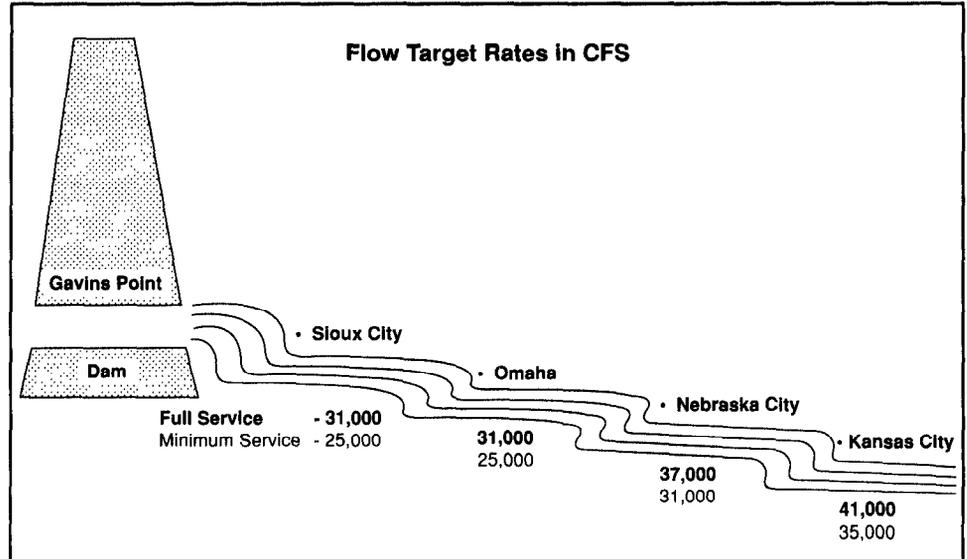
The beginning and ending dates of a normal 245-day navigation season vary from place to place on the river because of the time it takes water to travel from one point to the next. Thus, the navigation season normally runs from March 23 through November 22 at Sioux City, Iowa; from March 25 through November 24 at Omaha; from March 28 through November 27 at Kansas City, and from April 1 through December 1 at St. Louis, Missouri.

Between navigation seasons (usually December to late March), the Corps reduces the releases from Gavins Point, Fort Randall, Big Bend, and to a lesser extent, from Oahe and continues to generate hydroelectric power by increasing the releases from Fort Peck and Garrison. These “winter releases” replenish the reservoir at Oahe and prepare the reservoirs at Fort Peck and Garrison to receive spring floods by evacuating their annual operating zones.

Much of the Master Manual’s guidance is presented in terms of the streamflows, measured in cubic feet per second (cfs), required to support navigation because the volume of water released for navigation normally exceeds the volume required by other downstream purposes. The Master Manual also provides guidance for the appropriate service level for navigation on the Missouri River. The service level is determined based on the total volume of water stored in the system on March 15 and July 1 of each year. Depending on the volume of storage, releases for navigation range from “full-service,” which generally provide a channel that is 9 feet deep, to “minimum-service,” which generally provide a channel that is 8 feet deep. Providing minimum service requires releasing 6,000 cfs less than the rate needed to provide full service.

The Corps expresses its service levels in the number of cfs at which water flows past four monitoring points—Sioux City, Iowa; Omaha and Nebraska City, Nebraska; and Kansas City, Missouri. It refers to these streamflow rates as navigation flow targets. Figure 1.4 shows full and minimum flow targets for these four monitoring points.

Figure 1.4: Full and Minimum Flow Target Rates for Navigation on the Missouri River



Source: U.S. Army Corps of Engineers.

When system storage falls enough to activate the drought contingency plan but remains above 41.0 maf, the Master Manual permits the Corps to shorten the navigation season as an alternative to reducing streamflows because higher flows decrease the amount of costly dredging and permit heavier barge loadings. A reduction in Missouri River flows forces shippers to use additional barges to ship the same volume of goods.

The specific rate at which the Corps releases water from Gavins Point for navigation is based on three factors: the navigation streamflow targets, the streamflow at the monitoring point experiencing the lowest streamflow in relation to its target, and the inflows from tributaries below the reservoir system. The Corps releases water to compensate for the difference between the streamflow provided by tributaries and the target flow for that monitoring point. Therefore, release rates from Gavins Point can vary daily in response to the current conditions of the river; and the volume of water released during the navigation season varies each year depending on the volume of natural inflows below Gavins Point.

The Master Manual also provides criteria for winter releases from Gavins Point. The Corps sets an average winter release rate from Fort Randall, the dam above Gavins Point, based on the amount of system storage on September 1. The average winter release rate from Gavins Point is determined by adding the average release rate from Fort Randall and the

estimated incremental inflows from tributaries between Fort Randall and Gavins Point.

Authorization to Study Operating Priorities

Section 216 of the Flood Control Act of 1970 authorizes the Secretary of the Army acting through the Chief of Engineers to review and recommend modifications to the operation of completed federal projects when significant physical or economic changes make performing a review advisable. The Corps' regulations require managers to follow principles and guidelines prepared by the Water Resources Council when performing this review.² These guidelines state that "the Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment."

The guidelines provide for four analyses of the impacts from alternative operations. These analyses assess impacts on national economic development, environmental quality, regional economic development, and other social factors. National economic development benefits are determined by changes in the economic value of the national output of goods and services. The environmental quality analysis considers nonmonetary effects on ecological, cultural, and aesthetic resources. Regional economic development benefits are represented by changes in regional economic activity. Relevant social changes not considered by the other three analyses are assessed separately.

The guidelines require that the review of a project's operations include an operating alternative maximizing national economic development benefits while protecting the environment. Alternatives that reduce net national economic development benefits in order to address other federal, state, and local concerns are also to be analyzed, but the guidance directs that managers recommend the alternative that maximizes national economic development benefits unless an exception is justified and granted by the Assistant Secretary of the Army (Civil Works).

Objectives, Scope, and Methodology

The Vice Chairman of the Subcommittee on Water and Power, Senate Committee on Energy and Natural Resources, and Representative Byron L. Dorgan requested that we review the Corps' management of Garrison Dam during 1988 and 1989. After discussions with their staffs, we agreed to (1)

²The Water Resources Council, now inactive, consisted of the Secretaries for Agriculture, the Army, Commerce, Energy, Housing and Urban Development, the Interior, and Transportation; and the Administrator of the Environmental Protection Agency.

determine whether in 1988, 1989, and 1990, the Corps followed a drought contingency plan in operating the Missouri River reservoir system and whether the plan reduced water releases, and (2) identify how the Corps set operating priorities for its plan.

To determine whether the Corps followed its drought plan, we compared service levels set in 1988, 1989, and 1990 to the Corps' internal guidance. To determine whether the Corps reduced releases from the reservoir system, we analyzed releases from Gavins Point, the system's exit reservoir, for the period 1968-90 and compared release rates in 1988, 1989, and 1990 with a range of average release rates for the 10-year period 1978-87. The range was determined by one standard deviation to either side of the 10-year average. We chose this measure of "normal" because releases were relatively constant and less erratic during 1978-87 than during the early years of this reservoir system's operation. Our analysis relied on computer-processed data contained in the Corps' Missouri River Automated Data System. We conducted sufficient tests of the data to assess its reliability. On the basis of these tests, we concluded the data were sufficiently reliable to be used for our objectives. We also estimated the volume of water that the Corps would have released without reduced service to the system's users.

To obtain information on the drought's impacts on the system's purposes, we interviewed officials from Montana, North and South Dakota, Iowa, Kansas, and Missouri and observed the water levels and related problems on Lake Sakakawea (the lake behind Garrison Dam) and Lake Oahe. Officials for Nebraska's Department of Water Resources declined our request for an interview on the advice of counsel for the state of Nebraska because of the pending legal proceedings. We also interviewed officials from the Western Area Power Administration in Billings, Montana, concerning the economic effects of the drought on hydroelectric power. In addition, we spoke with various individuals with interests in the recreation and navigation industries. We could not identify any studies on the overall impact of the drought on the Missouri River basin, nor did we conduct such a study.

To identify the basis of the operating priorities in the Corps' drought contingency plan, we reviewed the Corps' Digest of Water Resources Policies and Authorities, its Management of Water Control Systems Manual, the Missouri River Division's Master Manual, and other relevant documents. We interviewed officials at the Reservoir Control Center in Omaha, Nebraska, and the Water Control and Quality Section, Engineering

Division, at Corps headquarters in Washington, D.C. We also interviewed officials and obtained a written opinion from the Corps' Office of Chief Counsel concerning the Corps' authority to operate the Missouri River reservoir system. In addition, we researched the system's legislative basis. We also quantified the service provided recreation and hydropower in 1988 and 1989 as a result of the Corps' operating priorities.

We conducted our review from December 1989 through September 1991 in accordance with generally accepted government auditing standards. As requested, we did not obtain written agency comments on a draft of this report. However, we discussed the factual information in this report with officials of the Corps at its headquarters in Washington, D.C., and its Missouri River Division in Omaha. In general, the officials agreed that the information was accurate; in a few instances, they suggested revisions to information that they believed to be technically inaccurate. We made changes where appropriate. However, these officials disagreed with our view that the Corps can change the operating priority for recreation without congressional approval. We discuss this matter in chapter 3.

Corps Followed a Drought Contingency Plan

During 1988, 1989, and 1990, the Reservoir Control Center released water from the Missouri River reservoir system according to guidance in the Master Manual's drought contingency plan. However, as of December 31, 1990, the combination of evaporation, water releases, and below average precipitation had caused the reservoir system to lose about two-fifths of its water reserves. All of the system's purposes except flood control were affected.

Corps Followed the Master Manual in Setting Service Levels and Release Rates

Corps records showed that in 1988, 1989, and 1990, the Center either selected the service levels recommended by the Master Manual or cut the length of the navigation season in exchange for a higher service level. Records also showed that the Corps released about 50.8 maf of water during the 3-year period. We estimated that without the cuts in service, the Corps would have released about 61.2 maf. Thus, the Corps saved 10.5 maf, or 17 percent of the water required for full-service operations.

The Master Manual's drought contingency plan initiates water conservation on the basis of the amount of water stored in the system on three measurement dates—March 15, July 1, and September 1. Table 2.1 shows the service levels recommended by the drought contingency plan based on system storage, the actual amount of storage, and the service levels selected by the Corps.

Table 2.1: Comparison of Master Manual Criteria With Service Levels Selected by the Corps

Decision Date	Storage criteria for full (F) minimum (M) service (maf)	1988		1989		1990	
		Actual storage (maf)	Service selected	Actual storage (maf)	Service selected	Actual storage (maf)	Service selected
March 15	54.5F 46.0M	55.8	Full	46.0	Between full and minimum ^b	44.4 ^a	Minimum
July 1	59.0F 50.5M	54.3	Full ^b	47.8	Between full and minimum ^b	45.2	Minimum
Sept. 1	58.0F 43.0M	50.5	Between full and minimum	45.3	Between full and minimum	44.0	Between full and minimum

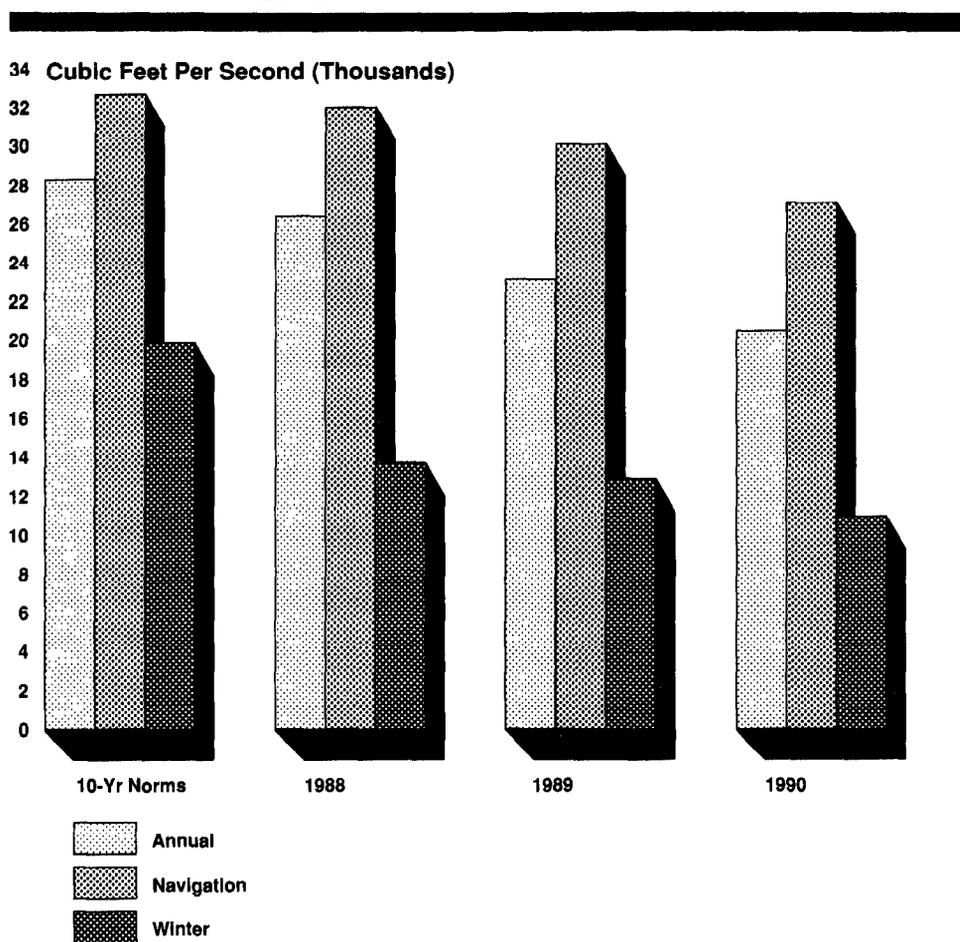
^aAs of March 31, 1990.

^bThe Corps reduced the navigation season in order to increase the service level that could be provided.

Source: GAO analysis at Corps of Engineers data.

Figure 2.1 shows average seasonal and annual release rates from Gavins Point for 1988, 1989, and 1990. The average release rate normally ranges from about 25,800 cfs to about 30,600 cfs. In 1988, the average annual release rate fell within this range at about 26,300 cfs. The average annual release rate for 1989 and 1990 fell below the range at about 23,100 cfs and 20,500 cfs, respectively.

Figure 2.1: Average Annual and Seasonal Release Rates for Gavins Point Dam, 1988-90



Source: U.S. Army Corps of Engineers.

The data in the following sections detail how the Corps conserved water in 1988, 1989, and 1990 during both the navigation and winter seasons.

Releases in 1988

Although the drought began in 1987, system storage exceeded the Corps' criteria for providing full service for navigation until July 1, 1988. Before this date, reservoir managers released water at normal rates to meet full service to navigation. By July 1, system storage had fallen to 54.3 maf well below 59.0 maf, the amount of storage necessary for continuing full service to navigation. The Master Manual recommended Missouri River flows of between full and minimum service levels during the second half of the navigation season. The Reservoir Control Center retained full service flow targets and conserved water by shortening the navigation season by 2 weeks, ending it at Sioux City on November 6 rather than on November 22.

The average release rate for the 1988 navigation season was about 32,000 cfs. To compare this release rate with historical averages, we used Corps records of average monthly releases for the 10-year period 1978-87. We calculated a "normal" release range of 28,900 to 36,200 cfs during the navigation season. The releases for the 1988 navigation season, therefore, were within this range.

Water releases during the 1988 navigation season provided streamflows that met or were below the Corps' navigation flow targets for 179 of 230 days. Officials at the Reservoir Control Center in Omaha said that streamflows slightly above the flow targets occurred in March, when they increased releases to help clear the navigation channel after the 1987-88 winter season; in May, when they increased releases to prevent endangered species from nesting on sandbars downstream at elevations that would preclude increased releases later in the season to meet navigation flow targets; and in September, when unanticipated volumes of water entered the Missouri River from its tributaries.

On September 1, 1988, system storage was about 50.5 maf, about 7.5 maf below the criteria for full service winter releases. The drought contingency plan provided for releases at Fort Randall to be between the full service rate of 15,000 cfs and the minimum service rate of 5,000 cfs. After adding the inflows from tributaries between the Fort Randall and Gavins Point dams, the Center set an average winter release rate of 12,500 cfs, the lowest rate ever set by the Center. In January 1989, ice on the river forced the Center to increase releases to an average of 15,000 cfs.

Releases averaged 13,600 cfs for the 1988-89 winter season. Again, we used 1978-87 Corps records to identify a "normal" range for winter releases of 16,400 to 23,100 cfs. Thus, releases during the 1988-89 winter season were below the range.

Releases in 1989

On March 15, 1989, system storage of 46.0 maf met the criteria for minimum service to navigation. As an alternative to reducing navigation flow targets by 6,000 cfs, the Center reduced them by 3,000 cfs and began the navigation season at Sioux City 1 week late on March 30, 1989.

On July 1, 1989, system storage of 47.8 maf met the criteria for continuing minimum service to navigation. The Center retained the service targets set the previous March and shortened the navigation season by an additional 4 weeks. The 1989 navigation season at Sioux City ended on October 23 rather than on November 22. Averaging releases over a full 8-month navigation season yields a 1989 average release rate of about 27,600 cfs, which falls below the normal release range of 28,900 to 36,200 cfs.

According to the Missouri River Division's 1989-90 annual operating plan, releases during the 1989 navigation season provided streamflows that generally met or were below navigation flow targets. Instances when streamflows were above the targets in June and July were due to unanticipated rainfall that occurred after the reservoirs' waters were released.

On September 1, 1989, system storage of 45.3 maf permitted releases between full- and minimum-service rates for the 1989-90 winter season. Releases from Gavins Point averaged 12,300 cfs from November 1989 through March 1990, well below the "normal" range of 16,400 to 23,100 cfs.

Releases in 1990

On March 15 and July 1, 1990, system storage of 44.4 and 45.2 maf, respectively, met the criteria for minimum service to navigation, and the Corps adopted minimum navigation flow targets for the 1990 navigation season. The Corps decided that the severity of the drought warranted water conservation measures in addition to those cited in the Master Manual. The Corps provided the same shortened navigation season that it provided in 1989; that is, the 1990 season was cut 5 weeks. These measures were taken to hasten the return to more normal storage levels. The average release rate for the 1990 navigation season was about 27,000 cfs, compared to the "normal" range of 28,900 to 36,200 cfs.

According to the Division's 1990-91 annual operating plan, releases during the 1990 navigation season generally provided streamflows that met navigation flow targets. Instances in which streamflows were above the targets in May and June were due to unanticipated rainfall below Gavins Point and the intentional release of additional water every third day. The

Corps refers to these releases as pulsing, which is intended to prevent endangered species from nesting at low elevations.

On September 1, 1990, system storage of 44.0 maf was below the criteria for full service winter releases and exceeded the criteria for minimum releases. Water release rates from Gavins Point averaged about 10,900 cfs through December 1990, which is well below the "normal" range of 16,400 to 23,100 cfs.

Storage and Lake Levels

Corps records show that the Missouri River reservoir system storage was reduced by about 18.4 maf through releases, evaporation, and irrigation and other depletions during the 3-year period 1988-90. The reservoir system received a total of about 44.1 maf of water, but released about 50.7 maf for a net decline of 6.6 maf; lost about 8.3 maf through evaporation; and lost about 3.5 maf through irrigation and other depletions. As of December 31, 1990, the drought had consumed about 42 percent of the system's drought contingency water supply; that is, 16.7 of the 39.3 maf of water normally held in the system's operating reserve zones.

During the 3-year drought period 1988-90, lake levels at Fort Peck, Garrison, and Oahe declined about 25 feet, 18 feet, and 22 feet, respectively. Depths of about 50 feet, 45 feet, and 42 feet above the permanent pools remained as of December 31, 1990. Fort Randall's reservoir showed no abnormal fluctuations from the drought. In September 1991, the Chief of the Corps' Reservoir Control Center in Omaha, Nebraska, estimated that 4 to 6 years of normal runoff are needed to return the reservoirs to normal operating levels.

The Drought and Reservoir Operations Adversely Affected All Purposes of the System Except Flood Control

Data obtained from the Corps, state officials, industry representatives, and private individuals indicated that the drought and the Corps' response to it adversely affected all purposes of the reservoir system, except flood control. Below Sioux City, Iowa, M&I users experienced pumping and other problems, and commodity shipments on the river declined. Above Sioux City, hydroelectric power generation declined, receding shorelines left boating facilities at Fort Peck, Garrison, and Oahe on dry land, municipal and rural water users incurred additional expenses to maintain their water supplies, and private irrigators lost their water supplies.

Downstream M&I Users Experienced Problems

The Missouri River provides water to 40 major M&I users below Sioux City, Iowa. Seventeen of the 40 are municipalities drawing water supplies for

about 3.2 million people, 21 are power plants with intakes for cooling water purposes, and 2 are chemical manufacturers. Over half of these users either experienced pumping problems during the drought or took action to avoid future problems, such as modifying intakes or operations or protecting existing intake structures from increased siltation caused by low streamflows. The Corps estimates that these users spent about \$4.5 million in 1989 and 1990 to allow them to cope with lower water surface elevations.

For example, two of the M&I users that experienced pumping or access problems during the drought were the Cooper Nuclear Power Plant in Brownville, Nebraska, and the Kansas City Pollution Control and Water Department of Kansas City, Missouri. The Cooper Nuclear Power Plant, which uses water from the river to cool its reactors, had difficulty pumping when siltation increased because of the lower volume of water in the river. The power plant installed a wall to guide silt past its intake. The Kansas City Pollution Control and Water Department had difficulty pumping water because of the elevation of its intakes. The water department is lowering its intakes and expanding its well field, which is the city's alternative water supply.

According to the chief of the Reservoir Control Center's Reservoir Regulation Section, reduced winter releases increase the possibility of ice formation. In February 1989, an ice jam below the Gavins Point dam restricted Missouri River streamflows and adversely affected several cities' water supplies. At St. Joseph, Missouri, industrial users ceased operations, school was canceled, hospital patients were moved, and some residents had to boil drinking water. According to the Corps, the city plans to eventually lower its water intakes to avoid future problems.

Commodity Shipments Decreased

Corps records showed that commercial navigation on the Missouri River fell 42 percent, from about 2.4 million tons shipped in 1987 to about 1.4 million tons in 1990. On the basis of the Corps' estimated benefit value of \$5 per ton, the decline represents a \$5 million decrease in annual benefits to individuals using the river to transport their goods.

According to a Corps analyst involved in valuing the system's benefits to its navigation users, the volume of tonnage shipped on the Missouri River decreased in 1988, 1989, and 1990 as a result of factors in addition to the Corps' reduced service to navigation. He said that changes in rail freight rates and export markets and the impact of the drought on the production

of agricultural commodities have all reduced the number of tons shipped on the Missouri River since 1977.

Reduced streamflows in 1989 and 1990 forced barge companies to operate less efficiently. Two of the three dry cargo barge companies operating on the Missouri River reported lost revenues of \$1.5 million in 1989 and \$5.1 million in 1990. According to these barge operators, lower streamflows forced them to reduce the tons loaded per barge and the number of barges per tow. The third barge company moved its operations from the Missouri River to the Mississippi in 1990.

Barge owners said that the Corps' service to navigation is necessary for them to retain their customers. If navigation is suspended during periods of drought, their customers will contract with other modes of transportation and may not return. They also said that operating the reservoir system below full-service level is jeopardizing the future of commercial navigation on the Missouri River.

Power Generation Was Reduced

Corps records showed that in 1988, 1989, and 1990, water releases from the Missouri River reservoirs generated about 87 percent, 81 percent, and 70 percent of the average amount of hydroelectric power generated annually by the reservoirs for the period 1978 through 1987. This reduction in the amount of power generated, in turn, delayed repayment of the portion of the reservoirs' construction debt allocated to hydroelectric power and ultimately resulted in increases in power rates.

The Western Area Power Administration, called WAPA, markets and transmits hydroelectric power for 13 federal power systems located throughout the central and western United States. The Missouri River reservoirs are part of the Pick-Sloan Missouri Basin Power System. Two divisions—the Eastern and Western—make up the Pick-Sloan power system. Although both divisions contribute revenue to repay expenses and capital investments, the divisions have different power generation resources, market allocations of power, and rate structures.

The Missouri River reservoir system joins with two of the Bureau of Reclamation projects to form the Eastern Division of the Pick-Sloan power system. WAPA estimates how much the Eastern Division's power resources can collectively produce on a reliable basis and negotiates long-term contracts with 275 customers—private power companies and public utilities—which specify the quantities of energy WAPA will provide and at

what cost. When conditions prevent the Eastern Division from collectively generating the contracted hydroelectric power, WAPA must purchase power from other sources at additional cost to fulfill its contractual commitments. WAPA uses the revenue from the sale of hydroelectric power to retire, over 50 years, that portion of each reservoir's construction debt allocated to hydroelectric power.

According to data provided by the Billings Area Office, the Eastern Division purchased about \$44 million of power from other sources during the 3-year period 1988-90 to meet its contractual commitments. Using the long-term average ratio of power generated by Missouri River reservoirs to total power generated by the Eastern Division, WAPA estimated that about \$40.5 million of the \$44 million resulted from insufficient power generation at the Missouri River reservoirs. However, not all of the \$40.5 million can be attributed to reduced power generation at Corps reservoirs. Even under full service conditions, the Eastern Division annually purchases power from other sources because the need for power during the winter exceeds the power generated by the Division's resources.

WAPA also estimated that reduced power generation decreased revenues from sale of surplus power by about \$42 million. Thus, WAPA estimated the total impact of the reduced power generation on revenue available to retire construction debt to be \$82.5 million. WAPA's 1989 power repayment study states that the loss of revenues delays the repayment of federal investment and increases its interest expense. According to the power repayment study, as of September 30, 1990, WAPA has repaid about \$740 million more than the amount required in the repayment schedule.

Reduced water releases in 1988, 1989, 1990 did not contribute to power rate increases for the Eastern Division's customers during those years. However, in fiscal year 1991, the Eastern Division increased its power rate to private power companies by 20 percent. According to the 1989 study, about 40 percent of the increase reflects the reduced annual revenues and increased costs to purchase power that resulted from the continued drought conditions throughout the areas served by both divisions of the Pick-Sloan power system.

Fewer People Visited Fort Peck, Garrison, and Oahe Reservoirs for Recreation in 1990

In 1988, 1989, and 1990, receding shorelines left many public and private boat ramps on the three most northern reservoirs inoperable. Despite the Corps' expenditure of \$1.9 million to extend and relocate public boat ramps, normal access to the reservoirs in 1988 was limited to only 23

percent, 36 percent, and 52 percent, and only 63 percent, 32 percent, and 22 percent in 1989 at the Fort Peck, Garrison, and Oahe reservoirs, respectively. Similarly, a June 1990 briefing document prepared for the Corps' Director of Civil Works by the Garrison Project Office reported that the Garrison reservoir had lost one-third of its surface.

According to Corps officials, the number of recreational visits do not decrease during the first years of a drought because declining water levels concentrate the fish population and improve fishing. As word of anglers' successes spreads, the number of recreational visits to the affected reservoirs increases. They also said that data that electronic counters gather on the number of visits become inflated because individuals drive in and out of recreation areas to check the water level and operation of boat ramps.

Corps records of visitation to the three upper basin reservoirs reflect the drought's delayed impact to recreation. In 1988, the number of visits to Garrison and Oahe increased about 12 percent and 22 percent, respectively, over the number in 1987; and the number of visits to Fort Peck remained relatively stable. In 1989, the number of visits to Fort Peck and Oahe increased about 2 percent and 3 percent, respectively, over the previous year, while the number of visits to Garrison declined about 7 percent. In 1990, the number of visits to Fort Peck, Garrison, and Oahe reservoirs declined about 11 percent, 6 percent, and 18 percent, respectively, from the previous year.

In a June 1990 briefing document, the Garrison Project Office reported that declining water levels in some areas caused recreational visitors to shift from using the upper portions of the three reservoirs to using lower portions, where the water remained accessible to boats. For example, visitation at Lewis and Clark State Park on the upper portion of Lake Sakakawea fell 40 percent, from 53,433 visitor days in 1987 to 32,181 visitor days in 1989. When we visited Lewis and Clark State Park in June 1990, we found it closed because the lake had totally receded from the marina. During this same time period, however, visitation at Indian Hills state recreation area on the lower portion of Lake Sakakawea, which remained accessible to boats, increased 111 percent from 25,855 to 54,648 visitor days.

As the Garrison reservoir became inaccessible to boats, businesses dependent on tourism, such as bait and tackle shops, marinas, park concessionaires, and fishing resorts, lost revenues. For example, as of

August 1989, 5 of 11 marinas on Lake Sakakawea had ceased operation. Similarly, the city auditor of Parshall City, North Dakota, located near the reservoir, estimated that declining visitation caused the city's business revenues to fall about 20 percent in 1989.

Conversely, visitors' spending in the six counties bordering Lake Oahe increased from about \$6.6 million in 1987 to about \$8.4 million in 1989. Only one county on the north end of Lake Oahe showed a significant decline in visitors' spending.

The lack of water in the reservoirs resulted in less habitat for all species of fish and decreased spawning. According to the briefing document prepared by the Garrison Project Office, in 1989, natural walleye production at Lake Sakakawea was the poorest on record. To maintain its population, this species requires a good spawn every 2 to 3 years. The last year when a good spawn occurred at Lake Sakakawea was 1986.

Similarly, in a May 1990 affidavit the Governor of South Dakota stated that declining water levels at Lake Oahe destroyed 100 percent of the 1990 northern pike spawn and hatch and 45 percent of the walleye spawn and hatch. He also stated that game fish, which feed on forage fish, suffered from malnutrition, and that low water levels destroyed from 35 to 45 percent of the 1990 forage fish spawn and hatch. Since much of the recreation on the reservoirs is based on sport fishing, poor spawning is likely to result in further loss of visitation.

Consumptive Uses Were Curtailed

In 1989, North Dakota's State Engineer surveyed 99 municipalities, businesses, farmers, and other private users of water from the Garrison reservoir. Twelve said they did not realize revenues because they lost their water supply; 8 of the 12 estimated their lost revenues, which together total \$254,100, and 4 provided no estimates of their losses. Another 37 said they maintained a water supply by extending their intakes. Twenty-nine of the 37 estimated their expenditures to do this. Together the estimates total \$344,800. The remaining eight provided no estimate of their expenditures. In addition, 19 of the 37 said they also lost revenues because they could not obtain an adequate water supply; 17 estimated that they lost revenues totaling about \$112,100, and 2 provided no estimate of their losses. The remaining 50 active water users said they maintained their water supply without difficulty.

Similarly, the Corps' Project Office at Oahe estimated that as of May 30, 1989, declining water levels had affected between 74 and 85 of 106 irrigators drawing water from Lake Oahe. South Dakota's Division of Conservation, Department of Agriculture, surveyed 14 of these irrigators in 1989 and found that 2 had lost access to water, 11 had extended their intakes, and 1 reported no problems accessing water. Using information provided by 10 irrigators and the state's lowest estimate of \$15 per foot to extend an intake, we estimate that 10 of the 11 irrigators who extended their intakes spent about \$206,700 for additional pumps, pipe, and electrical wiring. The remaining irrigator provided insufficient data for us to make an estimate. In addition, the state's Division of Water Rights estimated that the loss of water for irrigation prevented farmers from irrigating about 3,000 acres.

In 1989, the declining water level in Lake Sakakawea threatened to make the municipal intake for Parshall City, North Dakota, inoperable. The Corps granted Parshall emergency assistance of \$185,000, which was used to install a temporary pipeline to reach the receding water. Similarly, three rural water systems drawing water from Oahe and Fort Randall reservoirs spent about \$2.8 million to modify their intakes to retain water supplies for about 40,000 South Dakota residents.

Conclusions

The Corps managed the deteriorating conditions in the Missouri River basin by following its drought contingency plan in 1988, 1989, and 1990. It shortened the navigation seasons and reduced navigation streamflows and winter releases. The length and severity of the drought, however, adversely affected all the system's purposes except flood control. The impacts will most likely be felt for years to come. In September 1991, the Corps estimated that 4 to 6 years of normal runoff are needed to return the basin's reservoirs to normal water operating levels. ▲

The Corps' Operating Priorities Should Reflect Current Conditions

The drought contingency plan currently being followed by the Corps is based on economic assumptions about the uses of water for navigation and irrigation made in 1944 that never materialized and that do not reflect current economic conditions in the Missouri River basin. Moreover, on the basis of its interpretation of section 9 of the Flood Control Act of 1944, which authorized the construction of the Missouri River reservoir system, the Corps considers recreation to be secondary to other authorized purposes and, consequently, has relegated recreation to a lower operating priority. Although the Corps is in the process of updating the Missouri River Division's Master Manual, including the drought contingency plan, to meet the basin's current needs, the Corps maintains that unless it obtains congressional approval to change operating priorities, it must continue to give higher priority to what it considers to be the system's primary purposes over recreation, even if this results in decreased system benefits.

Three upper basin states have recently filed in federal court a lawsuit that challenges the Corps' policy of categorizing a project's authorized purposes as primary and secondary. The outcome of this court case could have far-reaching implications because the Corps' policy is applicable agencywide. Regardless of the lawsuit's result, it would be prudent to maximize the economic and other benefits of all authorized purposes, including recreation, of the Missouri River reservoir system as well as other reservoirs nationwide, and to develop operating priorities consistent with these benefits.

Corps' Assumptions About Demand for Water Are No Longer Valid

According to the Corps, federal planners in 1944 intended the Missouri River reservoir system to improve the economic climate within the Missouri River basin. They believed this goal could best be achieved by controlling flooding in the lower basin, providing river transport for the lower basin's products, providing irrigation for the upper basin's arid farmlands, and generating power for inhabitants throughout the basin. According to the Corps' Chief of Engineers, these assumptions are inherent in the Master Manual and the Corps' operation of the Missouri River reservoir system.

Some assumptions made in 1944 are no longer valid. For example, the Corps estimated that 12 million tons of goods would be commercially transported on the river annually. The commercial transportation of goods peaked in 1977 at only 28 percent of this amount, or about 3.3 million tons; and, as of 1988, had declined further to 2.2 million tons.

The Corps also estimated that the reservoirs would irrigate about 2.2 million acres of farmland through two of the Bureau of Reclamation's diversion projects at Garrison and Oahe. The Congress has since deauthorized the Oahe project and most of the Garrison project. It authorized and the Bureau built the Garrison Diversion Unit to irrigate only 130,940 acres; however, the Bureau has not placed the project in full operation. According to Corps' attorneys, U.S.-Canadian negotiations regarding compliance with the 1909 Boundary Waters Treaty has stalled operation of the Bureau's project. They told us that future operation of the project was uncertain.

In addition, other impacts were not anticipated, such as the impact of recreation on the reservoirs in terms of the revenues recreation industries could provide for North Dakota, South Dakota, and Montana. Added together, estimates from Montana State Park officials and two consultant studies commissioned by North and South Dakota show that the reservoirs supported spending of about \$65 million by visitors in 1988. This compares to estimated 1988 gross revenues for barge companies of about \$17 million.¹

Endangered species legislation enacted in 1973 has also affected the operation of the reservoirs. In recent years, the Corps has increased its water release rates in the early spring to control the nesting of endangered and threatened species of birds. Navigation normally requires higher water releases in the later part of the season, but endangered and threatened birds that nest on sandbars close to the river's edge can interfere with the Corps' ability to increase water releases from the reservoir system because this action would wash away the nests. Accordingly, the Corps has released water not required for navigation or other downstream purposes to raise the level of the river, thus forcing the birds to nest at higher elevations. While this protects the Corps' ability to provide the streamflows required for navigation later in the season without destroying the nests, it also reduces the volume of water available for other purposes.

¹We used a cost of \$7.76 per ton to estimate 1988 gross revenues for barge companies. This cost, which is based on an economic impact study commissioned by the Missouri-Arkansas River Basin Association, is probably high since it includes barge costs from Atchison, Kansas, to ports in Louisiana.

Recreation Is Considered Secondary to Other Authorized Purposes

Conditions have changed within the Missouri River basin since the Corps established operating priorities for the Missouri River reservoir system in 1952. However, the Corps believes that its discretion to significantly change its own operating priorities is limited by the priority given to what it considers primary purposes over what it considers secondary purposes. Under its interpretation of section 9 of the Flood Control Act of 1944, the Corps considers recreation to be secondary to other authorized purposes. Although elevating recreation to a higher operating priority may result in increased system benefits, the Corps believes that it is precluded from doing so without congressional approval.

Some of a reservoir's authorized purposes, such as flood control, irrigation, hydroelectric power generation, and navigation, may be identified in the legislation to construct or expand the reservoir or in subsequent legislation relating to that specific reservoir. Other purposes, such as recreation and water supply, also may be authorized under generic legislation applicable to all Corps reservoirs. For example, section 4 of the Flood Control Act of 1944, as amended, authorizes the Corps to build and maintain recreational facilities at its reservoirs. Additionally, section 4 of the Federal Water Project Recreation Act of 1965 authorizes recreation at previously constructed reservoirs whenever the act's provisions are implemented.

According to an August 1990 opinion of the Counsel, Missouri River Division which was approved by the Corps' Chief Counsel, a reservoir's authorized purposes must be categorized as either primary or secondary. The Corps considers primary purposes to be limited to those identified and allocated construction costs in authorizing legislation while secondary purposes are considered to be all other authorized purposes.

According to the Corps' opinion, it is obligated to give operating priority to what it considers to be primary purposes over what it considers to be secondary purposes. This policy is reflected in both the Corps' Digest of Water Resources Policies and Authorities, applicable to all of the Corps' projects, and the Missouri River Division's Master Manual, applicable to the Missouri River reservoir system. The Digest states that, "Many projects, including those for which recreation facilities may have been included under general provisions of the Flood Control Act of 1944, as amended, do not have separable storage costs for recreation. In these circumstances recreation is an authorized project purpose but it is secondary, as far as storage operations is concerned, to project functions for which the storage was formulated. Any reallocation of reservoir

storage to provide more stable recreation levels that would have a significant effect on other authorized purposes, or that would involve major structural or operational change, requires Congressional authorization.”

Under the Corps' policy of identifying primary and secondary authorized purposes, flood control, irrigation, navigation, and hydroelectric power are considered by the Corps to be the primary authorized purposes of the Missouri River reservoir system, while recreation is considered to be a secondary authorized purpose. One result of this categorization was that, according to the Chief of the Reservoir Control Center, the demand for recreational access at the reservoirs was not a factor in the Corps' major water release decisions in 1988 and 1989.

The Corps' Interpretation of Section 9 Is Being Challenged

In February 1991, the states of Montana, North Dakota, and South Dakota filed suit against the Corps in the U.S. District Court for the District of Montana to prevent the Corps from administratively establishing operating priorities for the Missouri River reservoir system on the basis of “an archaic and erroneous interpretation of the Flood Control Act of 1944.”⁴ The states have also alleged that the Corps has given navigation priority over recreation on the basis of an outdated and false assumption about the demand for river freight navigation.

The states argue that section 9 adopts a comprehensive water resource development plan “for flood control and other purposes” in the Missouri River basin. According to the states, although section 9 does not specifically identify recreation as an authorized purpose, Senate and House documents underlying the law refer to recreation along with flood control, hydroelectric power generation, irrigation, and navigation as purposes that can be served by the system. In essence, the states argue that because recreation is an authorized purpose of the Missouri River system, it is not a secondary purpose that receives only water that is left over after other uses are satisfied.

Both the Corps and the states agree that recreation is an authorized purpose of Missouri River reservoirs. However, because recreation was not specifically identified and allocated construction costs in section 9 of the Flood Control Act of 1944, the Corps regards recreation as secondary to the purposes of flood control, irrigation, navigation, and hydroelectric power generation which were identified and allocated construction costs.

⁴South Dakota v. Needham, CV 91 26 BLG.

Our review did not reveal a statutory scheme for regarding project purposes authorized under various laws as primary or secondary. Thus, we see no appropriate basis for the Corps' view that it is statutorily precluded from considering the economic and other benefits of any authorized purpose in determining reservoir operating priorities. In our view, the fact that recreation was not specifically identified and allocated construction costs under section 9 of the Flood Control Act of 1944 is not determinative of the Corps' legal authority to change existing operating priorities for all the Missouri River reservoir system's authorized purposes, including recreation, on the basis of the economic and other benefits to be derived.

Operating Priorities Should Reflect the Results of Corps' Study

Acting in accordance with section 216 of the Flood Control Act of 1970 and the Corps' regulations and in response to concerns raised by residents of the three upper basin states, the Corps' Missouri River Division began the first comprehensive update of its Master Manual in November 1989. The study's objectives include identifying operating alternatives in addition to those currently in the manual; evaluating the economic, environmental, and social impacts of each; and reviewing the legal restraints on operating the system.

Preliminary results of the study reported by the Corps in May 1990 indicated that by increasing (1) the size of the permanent pools, (2) the storage level that triggers drought contingency operations, and (3) minimum release rates, the Corps could increase net national economic development benefits by about \$36.1 million annually. This increase would be accomplished by increasing the benefits derived from hydroelectric power generation, recreation on the system's reservoirs, and flood control in the Mississippi River basin while decreasing the benefits derived from recreation on the river, provision of water supply downstream, and navigation. The Corps plans to verify its preliminary data, acquire the additional data needed for more complex economic analyses, and complete the study by early 1993.

On the basis of the Corps' interpretation of section 9 of the Flood Control Act of 1944, the Corps, notwithstanding the results of its study, will continue to consider recreation as secondary to other authorized purposes, including during periods of prolonged drought. In the Corps' view, without congressional authorization, the Corps has no other alternative than to relegate recreation to a lower operating priority.

Conclusions

The Corps' current effort to update the Missouri River Division's Master Manual, including the drought contingency plan, to reflect current economic conditions in the Missouri River basin should increase net national economic development and other benefits derived from the Missouri River reservoir system. Notwithstanding the results of its review, which will consider the economic, environmental, social and other benefits of all authorized purposes, the Corps believes—on the basis of its interpretation of the authorizing legislation—that even though recreation is an authorized project purpose, it must continue to relegate recreation to a secondary, lower priority than other authorized purposes unless it obtains congressional approval to do otherwise. We see no appropriate basis for the Corps' view. A lawsuit filed in federal court by the three upper basin states challenges the legality of the Corps' position and could have far-reaching implications because the Corps' policy is applicable nationwide.

The lawsuit may ultimately settle the legal question. However, in the absence of a court decision adverse to the Corps' position, the Corps will continue to relegate recreation to a low priority, even if the lower priority results in decreased system benefits, unless it is directed by the Congress to establish operating priorities for all authorized purposes on the basis of economic and other benefits to be derived from all authorized purposes.

Matter for Congressional Consideration

To ensure that the Corps maximizes the economic and other benefits of all authorized purposes of the Missouri River reservoir system and other Corps water projects, the Congress should consider enacting legislation to require the Corps to establish operating priorities for its reservoir projects on the basis of the economic, environmental, social, and other benefits to be derived from all authorized project purposes.

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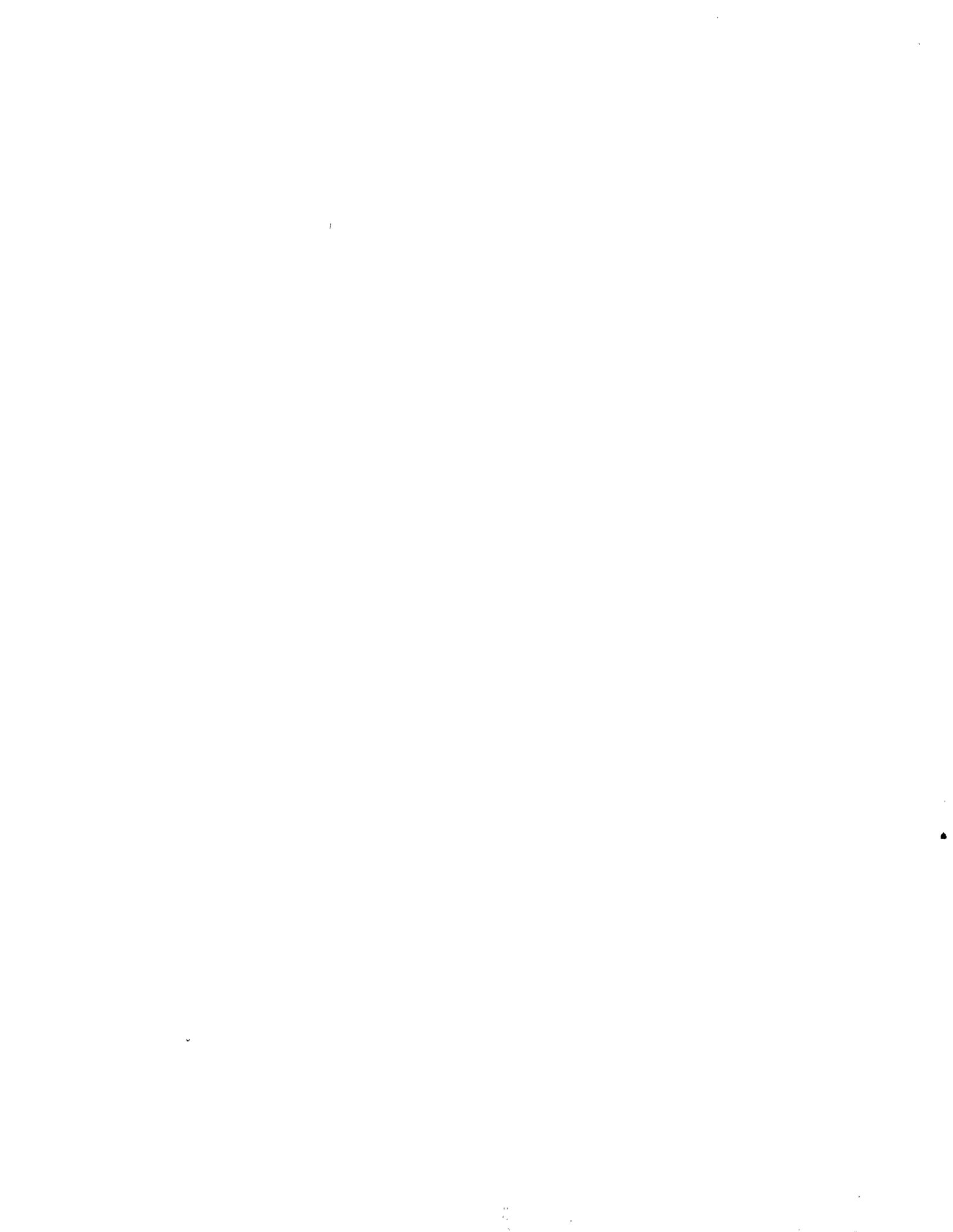
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