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Report to Congressional Requesters

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WATER RESOURCES

Corps' 1988 Missouri River Water Releases Met Guidelines

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Resources, Community, and
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The Honorable Max Baucus
The Honorable Quentin N. Burdick
The Honorable Kent Conrad
The Honorable Thomas A. Daschle
United States Senate

In response to your May 24, 1990, request, this letter provides information on the U.S. Army Corps of Engineers' operation of its Missouri River system of dams and reservoirs during 1988. In particular, you asked us to determine (1) whether the Corps released Missouri River water during 1988 specifically to aid navigation on the Mississippi River and (2) the Corps' legal authority to take such action.

Results in Brief

The Corps did not increase water releases from the Missouri River system of dams and reservoirs it controls specifically to aid navigation on the Mississippi River in 1988. Corps water release and river flow data showed that during the Missouri River navigation season, water released from the system provided river flows that generally met or fell below navigation flow targets. The Corps did not increase target levels because of deteriorating river conditions on the Mississippi. Corps records further showed that water releases made during the remainder of the year (winter seasons) were in accordance with its Master Manual, which provides guidance on appropriate water releases. Thus, the Corps operated the Missouri system to benefit Missouri River interests and water reaching the Mississippi during 1988 was incidental to that purpose.

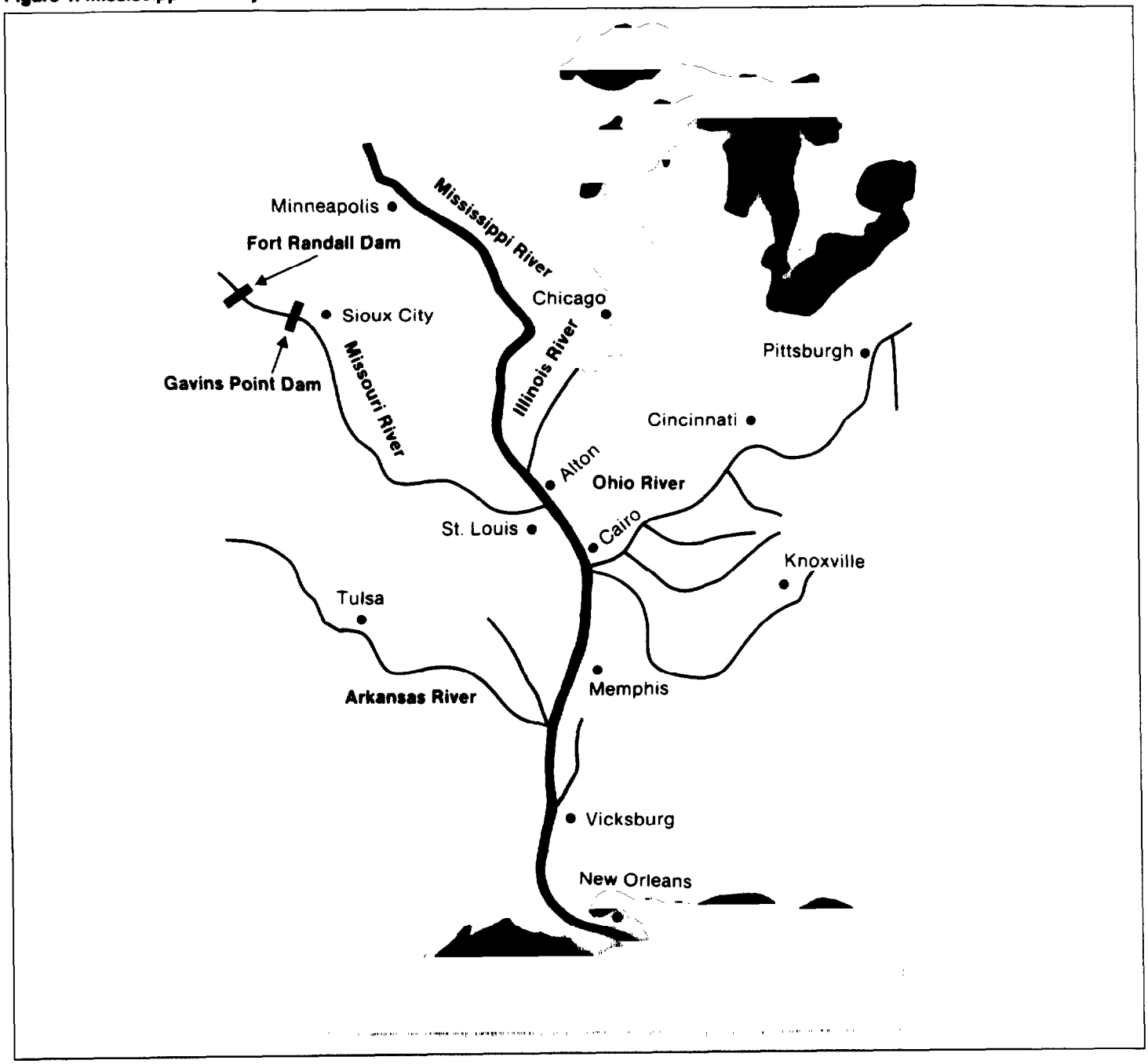
The Corps does not have the legal authority to operate the Missouri River system solely to benefit interests on the Mississippi River. Congressional authority would be needed for the Corps to operate the system in this manner.

Background

The Mississippi River Basin includes seven subbasins: Upper and Lower Mississippi, Missouri, Ohio, Arkansas-White, Red, and Ouachita. Figure 1 shows the four major rivers—the Illinois, Missouri, Ohio, and Arkansas—that contribute to flows on the middle and lower Mississippi. The Missouri River, which enters the Mississippi near St. Louis, Missouri, contributes mostly to flows in the middle Mississippi.[1]

[1]The upper Mississippi extends from the river's headwaters to Lock & Dam No. 26 near Alton, Illinois (north of the point where the Illinois River enters the Mississippi). The middle Mississippi extends to Cairo, Illinois (north of the point where the Ohio River enters the Mississippi). The lower Mississippi extends to the river's mouth at New Orleans.

Figure 1: Mississippi River System



The 1988 drought in the Mississippi River Basin was a landmark event. Below normal rainfall during the first 6 months of the year caused record low river depths at many locations. Unlike previous low-water events, the drought extended for months on the lower Mississippi during 1988 and lasted for more than 1-1/2 years on the middle Mississippi.

The prolonged drought and resulting low water levels placed unprecedented stress on navigation on the lower Mississippi River in 1988. In June and July 1988, the Mississippi experienced record low water levels below Cairo, Illinois. The combination of deteriorating channel conditions and large towboats pushing from 35 to 42 barges each caused groundings and blockages during these 2 months. At some points along the river, nearly 2,000 barges remained idle as dredges worked to clear sandbars forming below the water's surface.

Normally, flows from the upper Mississippi River and from the Missouri River contribute about 55 percent and 45 percent, respectively, of the Mississippi River's flow at St. Louis. As declining rainfall in the Upper Mississippi subbasin reduced the volume of water entering the Mississippi, the Missouri River's flow became even more important in maintaining streamflow on the Mississippi.

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 Center releases water from the system at Gavins Point, the system's southernmost dam, during the navigation season (usually March 23 through November 22) to support navigation for the 730 miles between Sioux City, Iowa, and St. Louis, Missouri.

The Reservoir Control Center's Master Manual provides guidance for the appropriate service level to support navigation on the Missouri River during the navigation season. The choice of service level is based on the total volume of water contained in the system's reservoirs (storage) on March 15 and July 1 of each year. Depending on the volume of water stored, navigation service levels range from "full service," which generally provides a 9-foot channel, to "minimum service," when navigation on the Missouri is severely affected. The service levels are expressed in streamflow rates of cubic feet per second (cfs) at four monitoring points—Sioux City, Iowa; Omaha and Nebraska City, Nebraska; and Kansas City, Missouri. The Center refers to these streamflow rates as navigation flow targets.

The amount of water released from Gavins Point Dam is based on three factors: the navigation flow target, the streamflow at the monitoring point experiencing the lowest streamflow in relation to its target, and inflows into the Missouri River from its tributaries below the reservoir system. Releases from Gavins Point Dam during the 1988 navigation season ranged from 20,000 cfs to 36,700 cfs.

The Master Manual also provides criteria for non-navigation (winter) releases from Gavins Point Dam. The winter releases are composed of (1) the releases from Fort Randall Dam, the dam above Gavins Point, which are based on the amount of system storage on September 1, and (2) the incremental flows from tributaries between the Fort Randall and Gavins Point dams. Winter release rates are normally one-third to one-half the navigation season rates.

Missouri River 1988 Releases Were Not Increased Specifically to Aid Mississippi River Navigation

The Corps did not increase water releases from the Missouri River's system of dams and reservoirs specifically to aid navigation on the Mississippi River in 1988. Corps records showed that for the 7-1/2 month navigation season, water released to support navigation on the Missouri River generally met or fell below navigation flow targets. Corps records also showed that during the winter seasons, water was released in accordance with its Master Manual. In addition, the Corps followed its Master Manual in setting service levels for both the navigation and non-navigation seasons.

Water Releases Generally Met or Were Below Flow Targets for the Navigation Season

Water releases at Gavins Point Dam during the navigation season (March 23 through November 7, 1988) provided streamflows that met or were below the Missouri River navigation flow targets for 179 days (79 percent) of the 230-day navigation season.[2] Flows exceeding the targets occurred on 51 days. As table 1 shows, 35 of these days occurred before June 1988, when navigation problems on the Mississippi first began. For the remaining 16 days on which excess flows occurred, these flows were small amounts and of short duration.

[2]Missouri River Division policy is not to adjust releases when river flows are within 500 cfs of target. It considers such variance as meeting target flows.

Table 1: Missouri River Flows Exceeding 1988 Navigation Season Targets

Month	Days in season	Days with excess flows	Peak day flow over target (cfs)
March	9	8	3,310
April	30	2	820
May	31	25	2,460
June	30	10	1,120
July	31	1	970
August	31	0	0
September	30	4	1,260
October	31	0	0
November	7	1	750
Total	**230**	**51**	

We asked Center officials why Missouri River flows in March and May showed the largest percentage of days in excess of navigation targets. They told us that for the 1-week period of March 24 through 30, they released additional water to aid two tows grounded near St. Joseph and Booneville, Missouri, in order to maintain an open channel. They said that they increased releases in May to prevent least terns, an endangered species of bird, from nesting at low levels on the river. If they had not done so, the birds' nests would likely have been destroyed later in the summer when release rates are usually increased.

Excluding the March and May flows, the maximum excess flow of 1,260 cfs occurred on September 17, 1988. This excess flow equates to 1.9 percent of the Mississippi River's flow at St. Louis and provided the Mississippi about 1.5 inches to 2 inches of additional depth. According to the Center's Chief, Reservoir Regulation Section, these excess flows were the result of an unanticipated volume of water flowing into the Missouri from its tributaries, and not a response to the deteriorating navigation conditions on the Mississippi River.

Corps Followed Its Master Manual in Setting Navigation Season Service Levels

Corps records showed that the Center set navigation service levels for the first half of the 1988 navigation season (March 23 through June 30) at the full service level. The Master Manual recommends this level when the system's storage can support full service to navigation.

By July 1, storage in the system had dropped to a level at which the Master Manual recommended reducing Missouri River flows to between full and minimum service levels—a range of 6,000 cfs—during the second half of the navigation season (July 1 through November 22). To

conserve water during critical periods, the manual also allows for a shorter navigation season at the full service level, on the basis that the higher flows decrease costly dredging and permit heavier barge loadings.

At the request of Missouri River shippers and navigators, the Center retained the full service level and conserved water by shortening the navigation season by 2-1/2 weeks, ending it on November 7 rather than November 22. This decision increased water flowing into the Mississippi River by about 2,000 to 2,500 cfs per day from July 1 through November 7 over the amount recommended by the Master Manual. Conversely, during the 2-1/2 weeks when the Center began operating under the winter season guidelines, on November 8 rather than on November 22, the Mississippi River received about 22,000 cfs per day lower flow than recommended in the Master Manual.

According to Corps officials at the Center and the Lower Mississippi Valley Division, Missouri River shippers preferred that the Corps shorten the navigation season rather than reduce flows. A reduction in Missouri River flows forces shippers to lighten loads on their barges, requiring additional barges to make shipments. Conversely, they said that Mississippi River shippers prefer a full navigation season on the Missouri with lower flows because a reduction in Missouri River flows of the magnitude of 2,000 to 3,000 cfs per day is too small to have a measurable effect on Mississippi navigation. The officials also mentioned that the greatest effect on navigation on the Mississippi between St. Louis and Cairo, Illinois, occurs when the Center begins the much lower winter release rates at the end of the Missouri River navigation season.

Corps Followed Its Master Manual for Winter Releases

On September 1, 1987, the Missouri reservoir system had sufficient storage, according to the Master Manual, to provide the daily winter release rate of 15,000 cfs from Fort Randall Dam plus incremental tributary flows. Corps records showed that from December 1, 1987, through March 15, 1988, incremental tributary flows averaged about 3,000 cfs daily. Accordingly, the Center made winter releases from Gavins Point Dam from January 1 through March 22, 1988, at a rate of about 18,000 cfs per day.

On September 1, 1988, storage in the system was not sufficient to continue the releases at that rate. Therefore, in accordance with the Master

Manual, the Center reduced winter releases to 12,500 cfs in November and December 1988.

Corps records also showed that winter releases for the period were below the average winter release rates for the Missouri river during the previous 21 years.

Corps Officials Did Not Request Increased Releases

According to the Chief of the Water Control Branch, Lower Mississippi Valley Division, and the Chief of the Missouri River Division's Reservoir Control Center, no water was released from Missouri River reservoirs specifically to aid navigation on the Mississippi during 1988. The Chief of the Water Control Branch analyzed planned releases and historical data on low flows from the Illinois, Missouri, Ohio, and Arkansas Rivers. He said his analysis showed that even if the systems of federal dams and reservoirs in the Mississippi's subbasins were operated independently, according to standard operating procedures, there would have been a relatively dependable minimum streamflow for navigation on the Mississippi no matter how little rain fell in 1988. He said he did not ask the Missouri River Division to increase releases of reservoir water because he was reasonably confident that the navigation channel could be kept open by using towing restrictions and by dredging.

Lower Mississippi Valley Division records on Mississippi River depths contained no evidence that the Corps was supplementing Mississippi River flows with additional releases from Gavins Point Dam. Moreover, except for brief periods in September and October, Mississippi River depths at St. Louis were below the historical average low levels between April 25 and November 7. The Division's monthly bulletins showed that increases in river depths during September and October were due to rainfall within the Mississippi River Basin.

The Corps Does Not Have Authority to Release Missouri River Reservoir Water Specifically to Aid Mississippi Navigation

The Missouri River system of dams and reservoirs was authorized to serve the Missouri River Basin with the expectation that its operation would also provide important incidental benefits for flood control and navigation on the Mississippi River.

The Corps and the Department of the Interior's Bureau of Reclamation had separate plans for development of the Missouri River Basin. Section 9 of the Flood Control Act of 1944 approved revised plans by the Corps and the Bureau. The Corps' plan as approved stated that in addition to the benefit to the Missouri River Basin

> . . . the proposed Missouri Basin reservoirs, operated in coordination with the authorized reservoirs in the Ohio, Arkansas, and other basins would become an important and beneficial part of the flood-control system of the lower Mississippi River. Use of the stored water for multiple purposes would also improve low-water flows in the Mississippi River thereby saving considerable dredging costs for the 9-foot navigation channel. Improvement of the low-water flow would assist in providing a 12-foot depth in the Mississippi River . . . [Emphasis added.]

As the act indicates, the dams and reservoir operations that benefit interests on the Mississippi are only incidental to the Corps' authority to operate the dams and reservoirs to benefit interests on the Missouri River. Therefore, according to the Corps' Chief Counsel, the Corps does not have authority to operate the Missouri system solely to benefit interests on the Mississippi River; to do so would require prior congressional authority.

We came to the same conclusion. Our review showed that the Corps was not authorized by section 9 of the Flood Control Act of 1944 to operate reservoirs on the Missouri River for the primary benefit of navigation on the Mississippi River. Rather, section 9 recognized that since the Missouri River flows into the Mississippi River, releases made for Missouri River Basin purposes would necessarily affect the Mississippi River.

Views of Agency Officials

As requested, we did not obtain official agency comments on a draft of this report. However, we discussed the information in this report with Corps officials at the Missouri River Division's Reservoir Control Center and at the Lower Mississippi Valley Division. They agreed that the information was accurate.

Scope and Methodology

To determine if the Corps released Missouri River water in 1988 for the purpose of specifically aiding navigation on the Mississippi River, we reviewed data maintained by the Corps' Missouri River Division on reservoir releases, reservoir storage, and Missouri River flows at Sioux City, Iowa; Omaha and Nebraska City, Nebraska; and Kansas City, Missouri. We also reviewed data maintained by the Lower Mississippi Valley Division on Mississippi River flows and depths at St. Louis, Missouri, and Cairo, Illinois, for 1988. We compared (1) the actual navigation flows with the flow targets for the period March 23 through November 7, 1988, and (2) the actual service levels with the navigation service levels recommended in the Missouri River Division's Master Manual based on March 15 and July 1, 1988, reservoir storage. We also reviewed winter water release rates from Gavins Point Dam for the

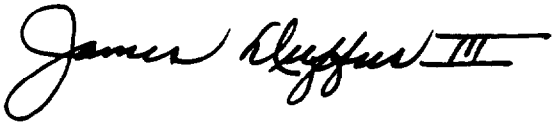
periods of January 1 through March 22 and November 8 through December 31, 1988. We did not independently verify the accuracy of the Divisions' data bases nor did we evaluate the adequacy of the Corps' guidance and procedures.

We interviewed officials at the Missouri River Division's Reservoir Control Center in Omaha, Nebraska, and at the Lower Mississippi Valley Division's Water Control Branch in Vicksburg, Mississippi. We interviewed officials at and obtained written opinions concerning the Corps' authority to operate the Missouri River system from the Corps' Office of the Chief Counsel at Corps headquarters and its Missouri River Division's Office of Counsel. We also reviewed the opinions and legislative basis for the Missouri River system.

Our review was conducted in July and August 1990 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the appropriate Senate and House Committees; interested Members of Congress; the Secretaries of Defense and the Army; the Director of the Office of Management and Budget; and the Chief, U.S. Army Corps of Engineers. We will make copies available to others upon request.

If you would like to discuss any of these matters further, please call me at (202) 275-7756. Major contributors to this report are listed in appendix I.



James Duffus III
Director, Natural Resources
Management Issues

Major Contributors to This Report

Resources, Community, and Economic Development Division, Washington, D.C.	Leo E. Ganster, Assistant Director John P. Murphy, Assignment Manager Phyllis Turner, Writer-Editor
Kansas City Regional Office	Patricia M. Crown, Evaluator-in-Charge
Office of the General Counsel	Stanley G. Feinstein, Senior Attorney