

*Missouri National
Recreational River
Nebraska and South Dakota
General Design
Memorandum MRR-1*

**Gavins Point Dam, South Dakota,
to Ponca State Park, Nebraska**



**OMAHA DISTRICT CORPS OF ENGINEERS
DEPARTMENT OF THE ARMY
JULY 1980**



DEPARTMENT OF THE ARMY
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS
P. O. BOX 103, DOWNTOWN STATION
OMAHA, NEBRASKA 68101

MRDPD

07 APR 1980

SUBJECT: Implementation of National Recreation River, Gavins Point Dam
to Ponca, Nebraska, Missouri River

District Engineer, Omaha

1. The signed cooperative agreement between the Departments of Interior and Army for implementation of Section 707, PL 95-625, provides specific procedures for implementation of the recreation river. In general, the agreement delegates to the Corps planning and design responsibilities, as well as all fiscal budgeting, tempered with some joint efforts with Interior to achieve these ends. In order to permit initial budget requests to be formulated for FY 82, the following guidance is furnished.
2. The District Engineer will proceed immediately to prepare a General Design Memorandum (GDM) for this project; submittal of this GDM to the Division Engineer should be scheduled prior to 1 August 1980 to permit review and approval before a 1 August filing date for the FEIS. This GDM will not be comparable to normal GDM's prepared by the Corps. Rather, it should be considered as an extension and detailing of the Missouri National Recreation River Management Plan, prepared by HCRS, recently approved by the Secretary of Interior and soon to be printed in the Federal Register and submitted to Congress.
3. The GDM should accept the basic plan from the Division Engineer's pre-authorization report and focus on review of various features in order to address the key issues of land acquisition, costs, and time schedule for implementation. As a minimum, the GDM will include a critical path schedule of all planning and construction activities together with estimated unconstrained budget requirements. In addition, based on criteria to be furnished by Interior, items 1(A)(B) and (C) of the MOA, general land acquisition requirements will be set forth, together with an assessment by the District Engineer as to whether such acquisition can be achieved. The monetary authorization for this project has a "built-in" lid. Accordingly, the GDM should present an updated cost estimate (as part of the above outlined schedule) and the need for legislative relief with respect to project cost.
4. The Division Engineer will be the approving authority for the GDM. However, since the Chief of Engineers was a signatory party to the MOA,

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07 APR 1980

a field review should be scheduled with OCE and MRD when a draft GDM is available. In this way, higher authority can take exception to any items in the GDM before the final version is published.

5. We have been advised by OCE that your request of 8 February 1980 for exemption under Section 404(r) and use of State water quality certification has been granted. In order to meet all requirements for FY 82 budget formulation an FEIS should be filed by 1 August (which will follow approval of the GDM by one week). It is our understanding that the District is now preparing the FEIS for a 1 August 1980 filing.
6. Provided the procedural requirements outlined above are met, the District will be in a positive posture for initiating construction in FY 81, if the capability expressed by the Division Engineer should be included in the FY 81 budget by the Congress. The FY 81 capability amount should be in consonance with the schedule of activities presented in the GDM, which in a sense would include built-in priorities of project elements ready for construction.
7. At a meeting between our respective staffs on 13 March 1980, a number of issues surfaced which are repeated here as further amplification of GDM requirements as set forth above. A major task is to document with some confidence that the outstandingly remarkable values which the designated river reach possesses can be preserved and protected for the public benefit, given the constraints imposed by Section 707 of PL 95-625. This will require a greater detailing of those values than is provided in the HCRS management plan, particularly with respect to their specific identity and their location within the designated reach. It will also involve assessment of the existing recreational river corridor landowners' willingness to sell, donate, or otherwise assign sufficient interest in their lands to preserve both the outstandingly remarkable river values and the integrity of the designated river reach. To this end you should seek early delineation of the criteria established by Interior in accordance with the terms of the MOA. Another major task is to establish a procedure for assuming Federal maintenance of bank protection structures for which Section 221 contracts or other local assurances exist.
8. Request that I be furnished a summary of all study activities and scopes thereof that you propose to undertake. Also, request your assessment of the adequacy of the appropriated \$500,000 for accomplishing all planning. This information should be submitted by mid-April. Additional funding requirements for planning purposes should be identified in the GDM. There is no question that studies outlined in the MOA will be conducted by the Corps, but a very careful evaluation of scoping will be required to keep everything in proper perspective. From previous meetings and correspondence we note you also propose to undertake certain technical studies not identified in the MOA. These, too, should be carefully evaluated as to need for implementation

07 APR 1963

MRDPD

SUBJECT: Implementation of National Recreation River, Gavins Point Dam
to Ponca, Nebraska, Missouri River

of this project. For example, the MRD technical staff sees no need whatsoever for potamology studies. The only river engineering data needed now for planning purposes are a good set of aerial photographs to document pre-project conditions in the river and the adjacent valley and an update of the bank erosion rates and actively eroding areas presented in the Umbrella Study. Future river engineering activities should include the establishment of additional record river ranges and periodic hydrographic surveys, water surface profile measurements, bed sampling, and aerial photographs to document the changing river regimen.

9. Because of tight schedules, your staff should work closely with my staff in resolving potential problems that may arise. This can be accomplished on an informal basis, but any major problems or issues in need of resolution should be elevated as they become known.



C. A. SELLECK, JR.
Colonel, Corps of Engineers
Division Engineer

MROPD-A (7 Apr 80) 1st Ind

SUBJECT: Implementation of National Recreational River, Gavins Point
Dam to Ponca, Nebraska, Missouri River

DA, Omaha District, Corps of Engineers, Omaha, NE 68102

TO: Division Engineer, Missouri River

1. I am submitting 15 copies of a working draft of the General Design Memorandum (GDM) and Final Environmental Impact Statement (FEIS) for the Missouri National Recreational River project for your review and comments. The GDM is an extension of Department of Interior's Management Plan and provides only the basis for implementation of the plan. Implementation of the total plan depends upon the success of plan implementation as outlined in this GDM and legislative relief with respect to total project cost. The current preliminary estimated cost of the total plan is \$70 million; however the final estimated cost will not be available until completion of the remaining management plans later this year and in FY 1981.

2. Copies of the draft GDM and FEIS are being circulated concurrently to the National Park Service, the Heritage Conservation and Recreation Service, and the Fish and Wildlife Service. On 23 June we will meet in Denver with Regional Directors of these agencies to obtain their views and comments on the GDM. If they generally concur with our implementation strategy, we expect to have the capability to acquire the necessary interest in lands and initiate construction of bank stabilization at two sites in FY 1981.

3. We have asked all reviewing agencies to provide comments by 30 June 1980 to allow submittal of a final GDM by 15 July 1980. I would like to meet with your staff about 1 July, or earlier if you prefer, to discuss the draft GDM and FEIS.

Incls
as


V. D. STIPO
Colonel, Corps of Engineers
District Engineer

MRDPD-ER (7 Apr 80) 2nd Ind

SUBJECT: Implementation of National Recreational River, Gavins Point Dam to
Ponca, Nebraska, Missouri River

DA, Missouri River Division, Corps of Engineers, PO Box 103,
Downtown Station, Omaha, NE 68101 8 July 1980

TO: District Engineer, Omaha, ATTN: MROPD-A

1. The working drafts of the GDM and FEIS are returned. Division staff comments are inclosed.
2. The basic plan of development authorized by Section 707 was that shown in the Missouri River "Umbrella Study" Report. The GDM places too much emphasis on the full corridor recognized in the HCRS Management Plan, without providing for maximum initial public availability. Unless public access to emergent lands between high banks is emphasized, little new recreation opportunity will be realized from Section 707 authority.
3. The outstandingly remarkable values are recognizable from existing data. These values should be identified in the report along with the general areas within the designated river where they are found. These values should be identified even though detailed studies are not completed and we cannot be precise about specific river features that will require protection to preserve the values.
4. Accomplishment of requirements for recreation, preservation, and bank stabilization within selected sub-reaches must be handled simultaneously.
5. On the basis of evidence available, a clear statement should be presented in the Conclusions section of the GDM as to whether the expectations of Section 707 can be realized under the willing seller and monetary constraints.
6. Scenic and recreational easement conditions should be simplified and standardized as much as possible. "Negotiable" aspects should be very limited if recommended at all. It will be difficult enough to administer easements with standard conditions.
7. The FEIS should be based on the GDM. The only "alternative" possible at this time is "no action."

FOR THE DIVISION ENGINEER:

2 Incls
1. 5 cys w/d
Added
2. as

Joe Donald M. Sedrel
DONALD M. SEDREL
Acting Chief
Planning Division

MROPD-E (7 Apr 80) 3rd Ind

SUBJECT: Implementation of National Recreational River, Gavins Point Dam to Ponca, Nebraska, Missouri River

DA, Omaha District, Corps of Engineers, Omaha, NE 68102 1 6 JUL 1980

TO: Division Engineer, Missouri River

1. I am submitting 15 copies of the General Design Memorandum (GDM) and Final Environmental Impact Statement (FEIS) for approval as the initiating implementation document of the Missouri National Recreational River project. Both documents have been revised to the extent time permitted giving consideration to Missouri River Division comments provided with the 2nd Indorsement.
2. Section 3(b) of the Wild and Scenic Rivers Act charges the agency responsible for administering each component of the national wild and scenic rivers system with developing a document which establishes detailed boundaries for a designated river and gives development plans suitable to the classification of the river under the Act. Section 3(a)(22) as amended by Section 707 of the National Parks and Recreation Act of 1978 requires the Secretary of the Interior (SOI) to administer the subject project as a Recreational River, to enter into a written Cooperative Agreement with the Secretary of the Army for the construction and maintenance of bank preservation work and recreational development, and to coordinate the administration of the project with a Recreational River Citizens' Advisory Group (CAG). The SOI complied with Section 3(b) by publishing the Missouri National Recreational River Management Plan and complied partially with Section 3(a)(22) by signing the Cooperative Agreement; however, the Recreational River CAG has not yet been formed. The key element to implementing the subject project will be the coordination to be conducted with the Recreational River CAG. Up to this point, the Omaha District has been coordinating with an inter-agency planning team which consisted of representatives from State agencies, local agencies, Department of the Interior (DOI) agencies, interested private organizations, and the Omaha District. The planning team formulated the DOI Management Plan as explained in the GDM. This team agreed, in principle, to the implementation strategy for the initial implementation plan for a segment of the river, if Congress provides construction funds for FY 1981. This plan is explained in Section XI of the GDM. Subsequent detailed plans for remaining segments of the river will have to be presented to the Recreational River CAG for their concurrence prior to implementation.
3. The Regional Directors of the National Park Service, Fish and Wildlife Service, agreed to the implementation strategy presented in the draft GDM at the meeting conducted by the Omaha District on 23 June 1980 in Denver, Colorado.
4. As specified in the Cooperative Agreement, the Corps of Engineers is charged with developing detailed studies for the implementation of the subject project. Pending the completion of ongoing studies and subsequent development of written management plans, more definitive detail will be provided in response to Division

MROPD-E (7 Apr 80) 3rd Ind

1 6 JUL 1980

SUBJECT: Implementation of National Recreational River, Gavins Point Dam to
Ponca, Nebraska, Missouri River

comments. Section 3(a)(22) of the Wild and Scenic Rivers Act further specified that land or interests in land cannot be obtained without the consent of the owner. Definitive policies will have to be developed in coordination with the Recreational River CAG. Further insight into this matter will be provided by initial negotiations with landowners if construction funds are available during FY 1981.

5. The inclosed FEIS will require further processing by your office in accordance with paragraph 16(c) of ER 1105-2-507.

2 Incls
nc (15 cys)

Par *V. D. Stipo*
V. D. STIPO
Colonel, Corps of Engineers
District Engineer

MRDPD-ER (7 Apr 80) 4th Ind

SUBJECT: Implementation of National Recreational River, Gavins Point Dam to
Ponca, Nebraska, Missouri River

DA, Missouri River Division, Corps of Engineers, PO Box 103
Downtown Station, Omaha, NE 68101

18 AUG 1980

TO: District Engineer, Omaha

1. The designated National Recreational River plan of development presented in the General Design Memorandum MRR-1 is approved, subject to the following comments and modifications.

a. Page 2-1, Para 1.

The Missouri National Recreational River Management Plan published in the Federal Register and transmitted to Congress by the Department of the Interior satisfies the requirements of Section 5(b) of the Wild and Scenic Rivers Act. Therefore, specific boundaries and development plans to be presented in future design memoranda by the Omaha District will not require publication in the Federal Register and transmittal to Congress as inferred.

b. Page 2-3, Para 4.

The last sentence of paragraph 4 in the Real Estate Section is read to be applicable to individual segments of the designated reach of the river which will be delineated in separate development design memoranda.

c. Page 2-3, Para 6.

Tent camping as an allowable public use on scenic recreation and preservation easement lands is not approved. This overnight use activity would encourage building fires and cutting firewood which have implications of public safety and fire hazards to private property. Camping should be provided for on lands acquired in fee where development can minimize safety and fire hazards, and reduce potential for inadvertent trespass.

d. Page 4-7.

Material on this page is unnecessary and somewhat contradictory. Page 4-7 is hereby nullified to improve clarity.

e. Page 7-4, Para 3.3.

The reference to "corrective actions" in the last sentence is considered a reference to both the reconfiguration of old bank protection works and construction of new works in order to respond to evolving river conditions.

f. Page 7-8, Para 4.2.

The monitoring needs specified appear to be unnecessarily intensive. These data gathering procedures are to be undertaken only "as needed," and incrementally subject to approval by the Division Engineer, ATTN: MRDED.

1 8 AUG 1980

MRDPD-ER (7 Apr 80) 4th Ind

SUBJECT: Implementation of National Recreational River, Gavins Point Dam to
Ponca, Nebraska, Missouri River

g. Page 10-3, Para 5.12, Last sentence.

The Umbrella Study cost estimate for operation, maintenance, and replacement included not only the existing structures and the new structures proposed for the presently identified ten critical areas, but also other new structures that might be needed from time to time in response to shifting river conditions.

h. Page 11-1, Third paragraph.

This paragraph ascribes greater authority to the Recreational River Citizens' Advisory Group than is provided by law. Draft DDM's will be coordinated with the Advisory Group, but are not subject to approval by that body.

2. The Final Environmental Impact Statement was transmitted to EPA for filing on 7 August 1980. A copy of the transmittal was sent to you separately.

3. Proposed estates for easements discussed on page 2-3, Para 6, should be developed and submitted to this office as soon as possible. This will allow for early approval from OCE and preparation action on Real Estate portions of DM's can proceed accordingly.

4. An order of development priority for specific sub-reaches should be established. Proposed development and detailed real estate requirements should be incorporated in a separate DM for each reach. The Real Estate portion of the DM will, as a minimum, contain the same data required in any other Real Estate Design Memorandum.

w/d all Incls



C. A. SELLECK, JR.
Colonel, Corps of Engineers
Division Engineer

MISSOURI NATIONAL RECREATIONAL RIVER

GAVINS POINT DAM, SOUTH DAKOTA
TO PONCA STATE PARK, NEBRASKA
GENERAL DESIGN MEMORANDUM NO. MRR-1

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SECTION I - INTRODUCTION

1. BACKGROUND: As a concept, the Missouri National Recreational River has had a diverse background. This is summarized briefly in the following paragraphs.

1.1 Preauthorization: The earliest efforts which recognized the many resource values of the Missouri River began in 1967. A Recreation Task Force, established for the Missouri River Basin Comprehensive Framework Study, identified the recreational potential and recommended that the 58-mile reach be considered for inclusion in either a national or state recreational rivers system. The recommendation was contained in the 1967 Recreation Task Force report and also in the Missouri River Basin Framework Study report published in December 1971.

The second effort in 1971 was initiated by the Bureau of Outdoor Recreation (BOR) -- now the Heritage Conservation and Recreation Service (HCRS) -- when that agency began an investigation to determine the area's potential for inclusion under Section 5(d) of the Wild and Scenic Rivers Act. As a result of that investigation, BOR recommended that the values of the Gavins Point to Ponca segment were such that it should be given status under Section 5(d) of the Wild and Scenic Rivers Act. This would have assured that any future Federal planning and programs involving the segment proceed on a basis of a complete recognition of the natural, historic, and recreational values of the river and a clear understanding of how these values would be affected. However, this reach of the river was never included under Section 5(d).

The segment was also identified in the Framework Study for Nebraska's state water plan, dated May 1971, as one with attributes which would qualify it for preservation in its existing free-flowing state.

The proposed recreational river segment had received additional support at the regional level through the Missouri River Basin Commission. The Commission's Missouri River Basin Water Resources Plan published in 1977 recommended designation and development as a National Recreation River. Further, the Commission's 1979 Priorities Report cited the management plan study as the number two regional priority among nine proposed Federal implementation studies.

In the early 1970's, intense local concerns about conservation, erosion control, public access, and recreational uses of this river led to a grass-roots movement to seek ways to control a worsening erosion problem and yet preserve the values associated with the river. Diverse elements found a common meeting ground predicated on combining bank stabilization with retention of the then existing nature of the river.

Emerging as the spokesman for these interests was the Missouri River Bank Stabilization Association (MRBSA), a local organization of land-owners, environmentalists, hunting, boating, and fishing interests and conservationists. Enjoying effective support from these diverse elements, the MRSBA has proved to be a highly successful organization; it was the driving force behind the movement which culminated in the inclusion of this segment of the Missouri River in the National Wild and Scenic Rivers System. Indeed, so effective was this citizens group that it earned the Outdoor Recreation Achievement Award from the Secretary of the Interior in 1978.

This reach of the river has also been named in a number of resolutions to consider bank stabilization, construction of a lock and dam, improvement for navigation, flood protection, and power development for which investigations have been carried out.

1.2 Umbrella Study: A review report for Water Resources Development, Missouri River, South Dakota, Nebraska, North Dakota, Montana published by the U.S. Army Corps of Engineers, Missouri River Division, August 1977, hereinafter referred to as the Umbrella Study, gave recognition to this segment. The report recommended a plan to be authorized for Phase I design memorandum stage of advanced engineering and design. The plan included designation of the reach from Gavins Point Dam to Ponca State Park, Nebraska, as a National Recreation River under Public Law 90-542 as amended, through establishment of recreation and scenic easements and development of new areas and access facilities. The plan also included construction of bank stabilization at 25 areas of active erosion between Gavins Point Dam and Ponca, Nebraska. The selected plan as outlined in the Umbrella study was the basis for the authorized project.

1.3 Completed and Current Activities: Under provisions of Section 14 of the Flood Control Act of 1946, emergency bank protection measures were constructed along the right bank of the Missouri River between the Gavins Point tailwaters area and a location immediately upstream from U.S. Highway 81. The work was completed prior to the completion of Gavins Point Dam at a cost of \$578,791.

The Water Resources Development Act of 1974, Public Law 93-251, authorized bank protection measures along the left bank of the Missouri River in the vicinity of Yankton. The project was constructed to protect Sacred Heart Hospital, the city water plant, and the U.S. Highway 81 bridge abutment. Cost of the project was \$191,000.

Under provisions of Section 32 of the Water Resources Development Act of 1974, Public Law 93-251 and Section 161 of the Water Resources Development Act of 1976, Public Law 94-587, streambank erosion control

demonstration projects have been constructed along both banks of the Missouri River between Yankton and Ponca State Park. When the current program is completed these measures will be in place at 12 locations. Total cost of these measures is estimated to be \$7,300,000.

The completed and ongoing streambank erosion control work will reduce the number of current active erosion areas from the 25 in the Umbrella Report to 13.

At the time of designation, an assessment of the 13 remaining high priority erosion sites was made. Ten sites were determined to be critical; these included 8 of the 13 identified in the Umbrella Study and 2 new sites determined to be critical, high priority erosion sites due to changing river conditions.

2. AUTHORIZED PROJECT: This segment of the Missouri River was designated as a National Recreational River (see plate 1) and authorized by Section 707 of the National Parks and Recreation Act of 1978 (Public Law 95-625). Section 707 amended Section 3(a) of the Wild and Scenic Rivers Act (Public Law 90-542), referring to the Review Report for Water Resources Development, South Dakota, Nebraska, North Dakota, Montana for a description of the designated segment of the Missouri River. Project costs under the authorization are limited to \$21,000,000. In addition, Section 707 assigns primary responsibility for implementing this project to the Secretary of the Interior and subsidiary responsibility to the Secretary of the Army acting through the Chief of Engineers. The mechanism specified by Section 707 to more accurately define the responsibilities of each department in implementing this project is a Cooperative Agreement. This agreement was signed by the Assistant Secretary for Fish, Wildlife, and Parks for the Department of the Interior (DOI) on 1 January 1980 and the Chief of Engineers for the Department of the Army (DOA) on 1 February 1980. A copy of the Cooperative Agreement is inclosed as exhibit 1. The Department of the Interior will administer the designated segment as a Recreation River under the provisions of the Act. The responsibility for implementation and the day-to-day management of the designated river, including operations, maintenance and replacement of recreational and erosion control features and facilities, lies with the Corps of Engineers.

The total cost of the authorized plan limited to \$21,000,000 by the Act was adjusted from the plan presented in the Umbrella Study. The adjustment was basically on the bank stabilization program due to elimination of areas that were protected under Section 32, Public Law 93-251, and other authorities as discussed in paragraph 1.3 and due to elimination of areas that were not in the designated reach of the river.

3. OBJECTIVES: The objectives of the Missouri National Recreational River are based on the intent of Congress as outlined in the Wild and Scenic Rivers Act, Public Law 90-542, enacted 2 October 1968:

"It is hereby declared to be the policy of the United States that certain selected rivers of the nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect water quality of such rivers and to fulfill other vital national conservation purposes."

4. MANAGEMENT PLAN: After an interim Memorandum of Understanding (MOU) was signed by the Director, HCRS, DOI and the Chief of Engineers on 7 June 1979, an interagency planning team was organized by DOI to formulate a management plan for this project to meet the objectives outlined above. From 21 to 23 August 1979, the interagency planning team revised a draft management plan proposed by HCRS. Public hearings for the project were conducted in the evenings at Newcastle, Nebraska; Yankton, South Dakota; and Vermillion, South Dakota.

DOI defined the scope of this project with the Missouri National Recreational River Management Plan. The Plan shows the designated corridor and presents the goals and programs for identified resources to meet the objectives of the Recreational River.

The Management Plan was prepared to guide the administration of the authorized project consisting of the 58-mile reach of the Missouri River from Gavins Points Dam, South Dakota, to Ponca State Park, Nebraska, as a component of the National Wild and Scenic Rivers system. The document was filed in the Federal Register on 26 March 1980 and is the official plan for the Recreation River. Specifically, the plan provided Congress conceptual management programs for the administration of the Missouri Recreational River. Additional advanced planning and studies are required to specifically identify resources to be preserved and to implement programs to preserve or protect these resources.

The Recreation River corridor as identified in the Management Plan consists of about 19,000 acres. This plan includes an additional estimated 15,000 acres identified as lands on which interest may be desirable for river management that were not included in the Umbrella Study. The Plan included other river resources considered to be of value and consistent with the objectives of the National Wild and Scenic Rivers Act in addition to the recreation, visual resources, and bank stabilization presented in the Umbrella Study. These included fish and wildlife,

cultural and natural resources, minerals, grasslands management, woodlands, agricultural lands, and water.

5. CURRENT STATUS: Since the Management Plan was published, detailed studies, specified in the Cooperative Agreement, have been initiated to identify specific resources that should be preserved, and protected to meet the objectives of the National Recreational River designation. These studies are discussed in sections II through IX of this document.

Studies of the bank erosion areas, recreational features, and real estate acquisition procedures will be completed in Fiscal Year 1980. Studies of fish and wildlife and visual and cultural resources will be completed in Fiscal Year 1981. These ongoing study efforts are being integrated into feature design memoranda for the first segments of the plan to be implemented in the event funds are appropriated for that purpose.

6. PURPOSE AND SCOPE: The purpose of this document is to serve as a general design memorandum (GDM) that provides the basic data and delineates the general procedure for implementation of the authorized project. This document provides an extension of the conceptual management program identified in the Management Plan and provides an update of the project cost estimate from 1978 to 1980 price levels.

General scopes of work, based on information available from ongoing studies is presented for recreation, cultural, visual, and fish and wildlife resources and for the bank preservation program.

The other resources outlined in the Management Plan, though not considered essential to implementation of the Management Plan but yet required, are discussed briefly; however, no additional data or programs for plan implementation are presented.

7. PRIOR INVESTIGATIONS AND REPORTS: Prior reports by the Corps of Engineers covering the reach of the Missouri River are listed in table 1.

8. STUDY PARTICIPANTS AND COORDINATION: The DOI had the principal responsibility for coordinating the Management Plan. The responsibility for implementation of the Plan lies with the Corps of Engineers and HCRS.

Coordination with the following agencies was part of the effort to formulate the Management Plan and the implementation thereof.

State Historic Preservation Officers, Nebraska and South Dakota
Nebraska Office of Planning and Programming
Missouri River Bank Stabilization Association

Table 1 PRIOR REPORTS BY CORPS OF ENGINEERS
ON THE MISSOURI RIVER

Report	Date	Type	Remarks
H. Ex. Doc. 92, 46th Cong., 3d Sess.	Febr. 1881	Preliminary report on navigation on the Missouri River.	No specific conclusions or recommendations on Missouri River above Sioux City, Iowa
H. Doc. 91, 62nd Cong., 1st Sess.	Dec. 1910	Report on 6-foot navigation channel, Missouri River, Sioux City to Williston, North Dakota.	Generally unfavorable to improvement, but snagging, rock removal, and limited stabilization recommended.
H. Doc. 594, 69th Cong., 2d Sess.	Oct. 1926	Preliminary examination report, Missouri River, Kansas City, Kansas, to Pierre, South Dakota.	Channel improvements above Sioux City not justified.
H. Doc. 238, 73d Cong., 2d Sess.	Mar. 1933	The 308 report on examination and survey of Missouri River	Recommended completion of navigation project below Sioux City and construction of Fort Peck Dam and Reservoir.
H. Doc. 214, 76th Cong., 1st Sess.	Dec. 1938	Re-examination report on navigation channel, Missouri River, Sioux City to mouth.	Recommended 9-foot channel in lieu of 6-foot channel. Subsequently authorized by River and Harbor Act of 1945.
H. Doc. 821, 76th Cong., 3d Sess.	Apr. 1940	Re-examination report with respect to flood control on Missouri River, Sioux City, Iowa to Kansas City, Missouri	Recommended flood control project for protection of riparian lands against erosion between Kenslers Bend, Nebraska and Sioux City, Iowa.
H. Doc. 475, 78th Cong., 2d Sess.	Dec. 1943	Review Report on flood control on Missouri River from Sioux City to the mouth.	Recommended construction of 5 multiple-purpose dams on Missouri River above Sioux City, Iowa.
Investigation of Bank Erosion on Missouri River at Buford-Trenton Irrig. Project, North Dakota.	Dec. 1951	Reconnaissance report on bank erosion near pump intake U/S from mouth of Yellowstone on Missouri River left bank.	Recommended emergency funds of \$30,000 be allocated under Sec. 14 of 1946 FCA to construct measures to protect Buford-Trenton pumping plant.
Protective Works in the Williston Area of the Garrison Reservoir	Dec. 1953	Responded to Senate Report on FY 1954 Appropriation Bill for protection to Williston, N.D., Lewis & Clark Irrig. Dist., & East Bottom of Buford-Trenton Irrigation District.	Presented a plan of protective works due to Lake Sakakawea impacts & due to sediment deposits in upper end of the Lake. PL 84-183 provided funds for purchase in lieu of protection, of Lewis & Clark Irrigation District and East Bottom. The Act was modified by PL 84-641 & PL 83-38 & East Bottom was purchased in 1958.
Review Report on Bank Stabilization Buford-Trenton Irrig. Dist., Missouri River, N.D.	Aug. 1961	Responded to 28 Jan. 55 resolution for determining methods of preventing land loss in Buford-Trenton Irr. Dist. from bank erosion.	Negative report since PL 85-58 in 1957 authorized purchase of East Bottom & for protection of intake structure of Buford-Trenton pumping plant & for bank protection works adjacent to Dist. Protective works completed in 1961.
Garrison Dam to Oahe Dam Bank Erosion Study	1961-1963	Response to 20 April 1959 Public Works resolution for determining measures for reducing bank erosion problems.	In 1961, State of North Dakota requested deferral of study, subsequently isolated 5 high value areas in need of protection, Direct authorization of protective works by PL 88-153 on Dec. 1963 and works constructed.
Missouri River, Ft. Peck Reservoir to Vicinity of Ft. Benton, Mont.	Jun. 1963	Joint Survey by Army & Interior on Missouri River power potential above Fort Peck, Montana.	Recommended High Cow Creek & Ft. Benton projects of 1020 mw to meet power demands. Plan not supported by Montana. No action taken on report.
Review Report, Missouri River, N.D., S.D., and NE.	Apr. 1965	Survey report on navigation & bank stabilization from Montana-North Dakota Stateline to Sioux City, IA.	Recommended extension of navigation U/S to Gavins Pt. Dam & Bank protection works in same reach. Sec'y of Army returned report in Apr. 1969.
Supplemental Report, Bank Erosion Problems, Gavins Point Dam - Sioux City, Iowa.	Mar. 1972	Supplement to 1965 report prepared by joint task force of Nebraska, South Dakota, Universities, landowners, and BSAW and C of E on bank erosion measures.	Concluded best alternative would be selected land acquisition and bank protection measures in combination. Plan included in River & Harbors Bill in 1971 but vetoed by President Nixon.
Modification of Operation of Lake Francis Case, South Dakota	Oct. 1972	Response to Sec. 116 FCA 1970 to limit drawdown at Ft. Randall to reduce adverse environmental & aesthetic effects from normal 80-ft. drawdown.	The Coordinating Committee adopted a compromise operation limiting drawdown to 12.3 ft. except during droughts.
Review Report for Water Resources Development, South Dakota, Nebraska, North Dakota, Montana	Aug. 1977	Investigate a wide range of water resource problems and opportunities linked to the Missouri River.	Recommended a plan of additional hydro-power at Ft. Peck and Garrison Projects, pumped storage in Gregory County, S.D., bank stabilization between Ft. Peck Dam and Ponca, NE, construction of fish rearing ponds and shoreline plantings at Lakes Oahe and Francis Case, and designation of the reach from Gavins Point Dam to Ponca State Park, NE as a National Recreational River.

Nebraska Game and Parks Commission
South Dakota Department of Game, Fish and Parks
Vermillion Area Chamber of Commerce
U.S. Fish and Wildlife Service
National Park Service
Nebraska Natural Resources Commission
Siouxland Interstate Metropolitan Planning Council
Dakota Environmental Council
Missouri River Basin Commission
South Dakota Department of Natural Resources
Southeastern Council of Governments
Lewis and Clark Natural Resources District
Congressional Delegations, Nebraska and South Dakota

The DOI is responsible for seeking the establishment of a Missouri Recreational River Citizen's Advisory Group (CAG), which will consist of representatives from Federal and State agencies and local units of government in the vicinity of the Recreational River. Until the CAG is formed, the Corps of Engineers will continue to coordinate with the agencies listed above.

SECTION II - REAL ESTATE

1. GENERAL: This section contains descriptions of lands within designated corridor, project scope, negotiations, and an explanation of the proposed easement documents. An integral part of the Missouri National Recreation River is to obtain land from willing sellers for preservation and enhancement within the designated corridor. Section 707 of the National Parks and Recreation Act, Public Law 95-625, 92 Stat. 3528, 95th Congress, 2nd Session provides that the Gavins Point Dam, South Dakota - Ponca State Park, Nebraska Segment of the National Wild and Scenic Rivers System shall be administered as a recreational river. As provided by Section 3(b) of the Act, detailed boundaries of each component of the System shall be established. These boundaries are to include an average of not more than 320 acres per mile on both sides of the river. This amounts to approximately 19,000 acres to be included in the Gavins Point - Ponca State Park Segment. Boundaries, classification and development plans are to be published in the Federal Register, and will not become effective until ninety days after they have been forwarded to the President of the Senate and the Speaker of the House of Representatives. Section 6(a) of the Act contains authorization for the acquisition in fee title to an average of no more than 100 acres per mile on both sides of the river. Section 6(a) does not specify the method of acquisition, that is, by purchase or condemnation. However, Section 707 of the Public Law 95-625 stipulates that notwithstanding the authority to the contrary contained in Section 6(a), no land or interests in land may be acquired without the consent of the owner. However, Section 707 also provides that up to five percent of the acreage within the designated river boundaries may be acquired in less than fee title without the consent of the owner where the Secretary of Interior determines that activities are occurring or threatening to occur thereon which constitutes serious damage or threat to the integrity of the river corridor in accordance with the value for which the river was designated. Thus, easements can be condemned in not more than five percent of the designated acreage in instances where the above determination has been made by the Secretary of Interior. Section 6(a) provides that lands owned by a State may be acquired only by donation and lands owned by an Indian tribe or a political subdivision of a state may be acquired with the consent of the appropriate governing body.

In summary, only approximately 900 acres out of approximately 19,000 acres may be acquired as easements by condemnation therefore, it is apparent that the successful implementation of the project hinges on obtaining the necessary lands from willing sellers.

2. LANDS WITHIN THE CORRIDOR DESIGNATED BY THE MISSOURI NATIONAL RECREATIONAL RIVER MANAGEMENT PLAN: Within the designated corridor, shown on plates 2 through 10, are approximately 19,600 acres. It may be desirable to obtain scenic and preservation easements on as much as 15,600 acres of the designated corridor. The intent of the scenic easement is to preserve the use of the land adjacent to the river in its present state whether that be agricultural, timber, grassland, or cabin development. Of the approximate total acreage, two-thirds or 10,500 acres would have to be negotiated independently from bank stabilization. The remaining one-third is tied directly to the project's bank preservation programs. Approximately 3,400 acres is adjacent to eroding areas that will require bank stabilization structures on which the Corps of Engineers will assume operation and maintenance.

Approximately 2,100 acres within the designated corridor have the potential for passive recreation use. A scenic recreation and preservation easement would be obtained on these sites which allow public access. Approximately 1,800 acres would have to be obtained by negotiation with the bankside landowner. The remainder, 200 acres that is eroding and 100 acres adjacent to presently stabilized sites, would have to be obtained in conjunction with the Recreational River erosion control programs.

Another 600 acres will have to be acquired in fee. Much of this land would be acquired for the development of a major park in South Dakota. The remainder would be small sites with access at several points along the designated corridor. Potential facilities include boat ramps, parking lots from 2 to 5 acres in size, and a security fence to protect adjacent property.

Another 1,300 acres is already in public ownership. Of this, approximately 700 acres is Ponca State Park and approximately 600 acres includes various State and county lands.

3. SCOPE: It is not intended to acquire all the land by fee or easement within the corridor designated by DOI's Missouri National Recreational River Management Plan from DOI. Negotiations will be conducted for land and interests in land that meet the objectives of the Recreational River which is made available from willing sellers within the designated corridor. In conjunction with the bank preservation program, land and interests in land will be acquired to the extent landowners make it available.

4. NEGOTIATIONS WITH LANDOWNERS: At proposed bank preservation sites, the visual inventory, the cultural resources management plan, the fish and wildlife management plan, the recreation management plan, and the Missouri National Recreational River Management Plan will be used as a guide to determine where interests in land should be acquired. Once this selection is made, meetings will be held with the concerned landowners to explain the project, the interests in land to be acquired, the contents of the easements, and to answer questions. After such a meeting takes

place, the negotiations for land and interests in land will begin. Prior to the initiation of construction of bank preservation features, all necessary interests in land will be acquired.

5. LAND ACQUISITION: Because the implementation of this project depends on land being made available by willing sellers, an evaluation of the landowners' intent to participate in the project was conducted. The intent of the landowners was measured by their willingness to sign a right-of-entry **for the** archeological and engineering survey work at the seven sites initially identified as potential bank stabilization areas. This right-of-entry (R/E) program was conducted by Real Estate Division, Corps of Engineers; 66 landowners were contacted. Of the landowners contacted, 58 signed R/E forms. In two of the seven areas, all landowners contacted granted R/E. In all cases, landowners of lots and/or small acreages used or planned for recreational purposes signed the R/E forms, as did all landowners who experienced erosion in 1979. In most cases, landowners who did not experience erosion in 1979 did not sign.

6. EASEMENTS: It is anticipated that four easement estates in addition to a fee estate will be utilized in acquiring land and interests in land. These include a scenic preservation easement, a scenic recreation and preservation easement, and two types of bank preservation.

The scenic preservation easements will maintain in perpetuity the land use at the time of acquisition. The purpose of this easement will be to preserve the scenic beauty of bankside lands as they are viewed from the river.

The scenic recreation and preservation easement will maintain the present scenic features and additionally will allow the public to enter the area for hiking, picnicking, fishing, and tent camping. Trails and sanitation facilities will be constructed as needed.

The bank preservation easements will be utilized only where bank preservation features are constructed. One easement allows public access and the other easement does not. The first will be coupled to a recreation and scenic preservation easement and the second to a scenic preservation easement.

Fee acquisition is contemplated in those areas where major recreational development will occur.

7. LOCAL COOPERATION: Section 10(e) of the Act provides that the Federal Agency charged with the administration of any component of the National Wild and Scenic Rivers System may enter into written cooperative agreements with the Governor of a State, the head of any state agency, or the appropriate official of a political subdivision of a state for state or local governmental participation in the administration of the component. However, no new local cooperation agreements are anticipated in this segment of the river.

The major recreational facilities will be constructed on fee owned land. Operation and maintenance of these facilities will be the responsibility of the Corps of Engineers. Contracts for the actual performance of these functions will be entered into preferably with local units of government.

Section 707 provides for governmental operation and maintenance of all streambank stabilization structures constructed within this segment whether constructed before or after passage of Public Law 95-625. Presently there are five existing Section 221 contracts in this segment consisting of nine sites constructed under authority of Sec. 32, Public Law 93-251. In addition there are three other sites constructed under other authorities. Operation and maintenance is presently being performed by the government on all these sites except for a Sec. 14 Contract at Sacred Heart Hospital, Yankton, South Dakota. The operation and maintenance of the sites constructed under authority of Sec. 32 are to become the responsibility of the local sponsor when it is demonstrated that they provide sound and functional erosion control.

Section 707 also provides that the construction or maintenance of any streambank stabilization structure is conditioned upon the availability to the United States of such land and interests in land in such ownership as the Chief of Engineers deems necessary to carry out such construction or maintenance and to protect and enhance the river in accordance with the purpose of the act. Thus, operation and maintenance of any streambank stabilization structure would not be assumed by the government unless there is a willing seller of sufficient real estate interests in additional land to preserve the scenic features and other values required by the Act.

When operation and maintenance of a streambank stabilization structure is assumed by the government it will require that a supplemental agreement be entered into and that the real estate interests held by the local interests be transferred to the government.

8. ONGOING STUDIES: Research of title evidence is being conducted at seven sites where bank erosion is critical. A gross appraisal of the land within the designated corridor will be initiated in FY80. This information will be integrated with other resource programs to identify those lands available within monetary constraints to implement the project.

SECTION III - VISUAL RESOURCES

1. GENERAL: As presented in the Management Plan, the 58-mile reach of the Missouri River designated as a National Recreational River is one of the few reaches where the river is still free flowing and in a relatively natural state. Its visual and scenic values are considered varied and rare enough to be preserved and protected.

2. CORRIDOR CHARACTERISTICS: The visual resources along the Recreational River corridor vary from natural to man-made features. The natural features include the two large wooded islands, the wooded Nebraska bluffs which come into contact with the river in five locations, and views of wide expanses of water with sandbars and steep or gentle riverbanks. The whole succession of a forest development is visible along the river's banks and edges. Succession goes from bare sandbars to sandbars covered with grasses; then cottonwood saplings; and finally, medium-sized cottonwoods.

The most common man-made features viewed along the river are the flat, flood plain farmlands. Some of these farmlands have center pivots which draw their water from either the river or from wells. An occasional farmhouse and barn can be seen from the river. Some cabins, trailers, and docks are also visible along the river. Some blend in with the surrounding vegetation; others are not screened by vegetation. The Corps of Engineers bank stabilization structures are also often visible along the riverbanks. Their visual impact varies according to the rock type, shape, size and color used, and the extent of revegetation of the banks. Makeshift bank stabilization constructed by private interests consists of car bodies, broken concrete, or a combination of both. Trash is frequently seen along the river, particularly along the Yankton County, South Dakota, reach. One urban view is offered by the city of Yankton. Other towns are too far from the river to be seen.

3. PRESERVATION AND PROTECTION OBJECTIVES: To preserve and protect the visual qualities of the designated corridor of the National Recreational River, the following five objectives will be pursued.

3.1 Preserve, for the long term, the unique and outstanding scenic features along the river.

3.2 Preserve the designated river corridor by conducting a program to reduce or eliminate visual intrusions.

3.3 Establish a program to plant trees and shrubs on scenic and recreation easements to preserve the designated corridor.

3.4 Remove unsightly debris and trash from bankside land.

3.5 Encourage the general public to preserve the scenic resources by educating them as to the value and care of the resources. Interpretive programs will be utilized to accomplish this management objective.

4. PRESERVATION AND PROTECTION METHODS: A person moving along the Recreational River corridor can observe six groups of outstanding scenic features. These will be preserved and protected through the Visual Resource Management Plan.

The first group of features are the Nebraska bluffs at the five locations where they come in contact with the river (at RM 811.0R, 787.5R, 776.0R, 763.5R, and 753.0R). These 300- to 400-foot high bluffs are outstanding because they are a scarce topographic feature in the flat to gentle hills of the surrounding landscape. Although not very large, they do contrast greatly with the flat, horizontal flood plain of the river. Due to the river's action, some of the bluffs have eroded into sheer cliffs. The soil and subsoils show up clearly in brown, yellow, and grey horizontal layers. Where the bluffs are not eroded, mature elm-oak tree cover also adds to their scenic quality. These bluff forests offer a rare view in a predominantly flat agricultural landscape.

The second group of scenic features are the two large high bank islands called James River Island, (RM 801) and Jake's Island, (RM 786). They are outstanding for two reasons. First, high bank islands are rare in the Missouri River and add unique interest to the visual resource of the river. From Garrison Dam to North Dakota downstream to Rulo, Nebraska, there are only seven other natural large wooded islands in the Missouri River. Secondly, both islands also have dense cottonwood and dogwood tree cover which add to their uniqueness since such extensive mature forests are rare in this row-crop, agricultural landscape.

The eight smaller islands at RM 768.5, 771.0, 794.0, 801.0, 803.0, 804.5, and 806.0 are also unique because all islands are rare. Most of these smaller islands are sandbars that have become vegetated over the past few years. Many have interesting sandy beach areas with grasses and sedges growing around them.

The high bank shoreline forest dominated by cottonwood trees, as outlined by the boundaries of the river corridor, are outstanding features also because they are not commonly seen in this predominantly agricultural landscape. Large trees adjacent to water together form one of the most scenic views in this part of the United States.

The Elk Point sand dunes at RM 765.5L are the largest group of sand dunes and the most outstanding. These bright white undulating sandhills with their smooth uniform texture rise up to 20 feet and contrast sharply with the green cottonwood forests behind them. Other sand dunes are visible on accretion lands along the river at four other locations.

These features will be preserved and protected through donation or purchase of scenic and preservation easements from willing sellers. Those areas most likely to be lost, such as the wooded, high bank areas, will be the first acquired from willing sellers. Eminent domain for easements can also be used in cases where a use along the river would ruin the unique scenic features. A total of 19,000 acres of scenic and recreation lands have been delineated. Bank protection will be used to protect the outstanding scenic features from being lost due to river erosion.

Bank protection structures to be constructed in the designated corridor of the Recreational River are designed to blend with the background scenery. The toe fill of the structures and the hardpoints are covered with soil and gravel which allow natural revegetation.

Visual intrusions consist of car bodies and junk used as bank stabilization measures, dilapidated cabins and trailers, irrigation structures, duck blinds, and poorly maintained docks and piers. Reducing or eliminating these visual intrusions would be accomplished by several methods. The car bodies and junk used for bank stabilization are located along the river in 14 specific areas. These areas are located at the following RM: 763.OR, 768.4L, 782.3-798.5L, 802.4-802.5L, 807.2-807.6R, and 809.8L. Most of these intrusions would be removed and replaced through the bank stabilization program where the need for bank stabilization is eminent. Remaining visual intrusions which clutter an outstanding river scene may be removed as part of the bank preservation program or operation and maintenance program.

The other intrusions such as boat docks, piers, and irrigation structures will conform to Recreational River objectives by using the Corps of Engineers Section 10/404 permit program which insures that any work in the river would blend with the surrounding landscape. Private bank preservation structures will also be required to conform to standards which meet the Recreational River objectives by using the Section 10/404 permit program.

In areas where trees were removed along the riverbank after November 1978, measures through the long-range operation and maintenance program will be incorporated to obtain easements to reestablish vegetation. In these areas, easements may extend a minimum of 100 feet back from the edge of the bank at the time the easement is acquired.

Removal of debris and trash at various locations along the corridor will require a special effort which has not been identified. This could be accomplished in connection with the bank stabilization program or under the operation and maintenance program.

5. ONGOING STUDIES: A survey boat trip has been taken to provide a detailed visual inventory of the Recreational River. The Bureau of Land Management visual resource method and manual were used. The collected information will give a scenic value rating to each section of the river. This rating will be used in prioritizing areas for acquisition of scenic easements and in determining the details for the scenic easement contracts. This inventory will be completed in FY 1980. A management plan for the visual resources program will be completed in FY 1981.

SECTION IV - RECREATION RESOURCES

1. GENERAL: This natural reach of the Missouri River offers many present and future outdoor recreation opportunities. With the designation of the river as a National Recreational River, the protection and preservation of existing recreation areas and the future development of new areas is made possible.

2. CORRIDOR CHARACTERISTICS: The land adjacent to the river ranges from a relatively level flood plain to steep, tree-covered bluffs on the Nebraska side and a relatively level flood plain on the South Dakota side.

The river channel remains essentially in a natural condition; however, the riverflow is regulated through the Gavins Point Dam. The reach is free from any impoundments and other structures which might impede flow. Riverbanks vary from relatively flat, sandy beach areas to vertical faces 10 to 15 feet high where active erosion is taking place.

2.1 Existing Development and Public Access: This section of the Missouri River is a major recreational resource because of its nearness to major population centers and its availability for year-round recreational use. As a result, developed sites have become increasingly popular. Public access to the river and developed facilities for recreational uses, however, are limited. The developed sites vary from areas having little or no facility development to fully developed boating and camping areas. These areas are owned and have been developed by the Federal Government; State, County, and city governments; or private interests.

Table 2 lists the existing river recreation areas, their location by river mile and bank, the current owner, and the recreation facilities available.

In addition, a few small, privately operated recreational enterprises are located along the river. These include boat rentals and charter, lots for cabins and trailers, overnight camping facilities, picnic areas, and private access.

2.2 Interpretive Programs: The Corps of Engineers, the State of South Dakota, and the State of Nebraska include interpretive programs in their management areas. Most of these programs consist of camper-oriented media such as campfire talks and short nature trails. Of particular importance is the Lewis and Clark Visitor Center, where the Lewis and Clark project and the Corps' Missouri River Basin plan are interpreted with exhibits, slide shows, overlooks, and personal contact.

Table 2
EXISTING RIVER RECREATION AREAS

<u>Owner</u>	<u>Area</u>	<u>River Mile Bank</u>	<u>Facilities</u>
Corps of Engineers	Chief White Crane Pierson Ranch Cottonwood Training Pike Overlook Nebraska tailwaters	810.5L	Camp pads, picnic areas, swimming beach, fishing pier, 2 river boat ramps, 1 lake boat ramp (Lake Yankton)
City of Yankton	Riverside Park	805.5L	Ball diamond, boat ramp, playground, picnic area
City of Yankton	River access (by foot trail)	805.5R	None
Cedar County	River access	799.OR	Boat ramp
Cedar County and Private Landowner	Public river access	785.OR	Boat ramp, restaurant (Sportsman's Steak House)
Vermillion Boat Club (Private)	River access	782.7L	Boat ramp and pier
State of South Dakota	Clay County State Recreation Area	781.0L	Boat ramp, river access for fishing, camp pads, picnic area, zoo acres
State of Nebraska	Ponca State Park	753.OR	Boat ramp, camp pads, picnic area, pool swimming, cabins, cross-country and hiking trails

2.3 Visitation: The Corps of Engineers 1977 Review Report for Water Resources Development South Dakota, Nebraska, North Dakota, Montana stated that an estimated 950,000 recreation days occurred in 1977 along this reach of the river. This estimate was provided by HCRS. Studies to determine the current visitations at the Lewis and Clark downstream recreation areas are being conducted in association with the Master Plan on the Gavins Point Dam and Reservoir. These estimates will be available during the fourth quarter of FY 1980.

2.4 Other Resources: In addition to the existing recreation areas, the river in this reach has other recreation resources. Its wide, free-flowing setting offers opportunities for boaters, fishermen, hunters, and the more experienced canoeist. Sandbars and the constantly shifting main channel offer challenges to all boaters.

The high bank wooded islands in the river have potential recreation uses such as fishing, hiking, picnicking, bird watching, nature study, nature photography, and tent camping.

Wooded and nonwooded sites along the riverbanks that have county road access have the potential for more intensive or active recreation development. This development could include camping areas; boat ramps; picnicking areas; fishing access; hiking trails; and the access roads, parking, sanitary, and water facilities needed for these activities.

2.5 Needs: There is an additional need for more water-oriented outdoor recreation areas. Recreation Planning Region III of Nebraska, which includes the National Recreational River, has a present deficiency of 3,682 acres of Class I and II land (high density and general outdoor recreation areas) and 2,029 acres of Class III and (natural environment areas) according to the minimum guidelines set by the 1979 Nebraska SCORP. These deficiencies are projected to increase to 6,036 and 4,383 acres, respectively, by 1995. These projected deficiencies were provided by the Nebraska Game and Parks Commission.

More public river access sites are needed in Nebraska. With 70 percent of Nebraska's population living within 1 to 3 hours drive from the National Recreational River, additional recreational access sites are needed and will relieve some of the crowded conditions occurring at other existing river access sites.

The greatest needs of the three South Dakota counties along the recreational river are for 2,750 acres of parkland and 400 camp pads by 1990.

3. RECREATION OBJECTIVES: The recreation objectives stated in the Management Plan are twofold -- to preserve and protect the river's existing recreation areas and to develop new areas for the enjoyment of present and future generations. The specific objectives are as follows:

3.1 Preserve the river values that are attractive to the recreating public.

3.2 Provide accessibility to the river and riverbed for the general public.

3.3 Provide facilities that support and accommodate the recreational activities along the river.

4. RECREATION PROGRAM: Eleven areas for recreation development and 13 areas for public use have been delineated; these areas have the potential to meet the program objectives. The 11 areas delineated for recreation development cover 600 acres of land; have public road access; and would have facilities for camping, picnicking, fishing, and boating. The 13 potential public use areas cover 2,500 acres and would allow the public access onto the land to recreate. No facilities would be constructed in these 13 public use areas other than sanitary facilities and trails. In addition, existing boating and other recreation facilities would be upgraded where needed.

4.1 Development Areas: The 11 recreation development areas may consist of two large parks, four small parks, and five sites primarily used for river access. The two large parks at RM 781.0 (100 acres) and 758.5 (180 acres) may each have up to 50 camp pads with electric hookups, a picnic area, a three-lane boat ramp, parking, trails, a water supply, four vault toilets, two showers, and landscaping. Each of the four small parks, consisting of about 20 acres, may have 20 camp pads without electric hookups, a picnic area, a two-lane boat ramp, parking, trails, a water supply, two vault toilets, a shower, and landscaping. The five river access areas may each have a one-lane boat ramp, parking, eight picnic tables, one vault toilet, and a water supply.

4.2 Public Use Areas: Thirteen potential public use areas have been identified. Development in these areas may consist of trails and sanitary facilities. A combination of scenic and recreation easements would be used to acquire interests in land in those areas, including the riverbed, not involving the development of recreational facilities. A fee-simple estate would be obtained in those areas where recreational facilities would be located.

4.3 Trails. The Missouri River corridor was the path of the famous explorers, Lewis and Clark (1804-1806), during their travels towards the Pacific coast. As they sailed upstream in 1804, the Lewis and Clark party camped at several locations that are in the Recreational River reach. Some were near Elk Point, South Dakota, at the mouth of the James River and at Calumet Bluff. During the 10 days they spent along this river reach, they visited the Ionia "Volcano"; hunted, killed and salted their first buffalo; and had a peaceful meeting with the Sioux Indians and their chiefs at Calumet Bluff.

On the downstream journey in 1806, Lewis and Clark made three stops along the Recreational River reach. Today their route is a National Historic Trail, and the National Park Service (NPS) is working on the final plan for this trail. The Boy Scouts of America have designated a Lewis and Clark Historic Canoe Trail. The first segment of the canoe trail extends from Sioux City, Iowa, to Yankton, South Dakota, which includes the Recreational River. All trails and interpretive work in the 11 recreation development areas and in the 13 public use areas will be coordinated with the NPS's Lewis and Clark National Historic Trail.

4.4 Existing Areas: Upgrading the existing recreation areas will consist of improving the boat ramps at Ponca State Park and at the two Cedar County parks, RM 799.OR and 785.5R. Ponca State Park will also be improved by the addition of a courtesy dock, improvement of fishing access, and the addition of a handicapped fishing dock at the river's edge. The other recreation areas will be improved with plant materials provided by the nursery that will be established in the river corridor.

4.5 Interpretive Program. An interpretive program will be developed for this stretch of the Missouri River. Initial steps will include the formulation of a Missouri National Recreational River Interpretive Prospectus. The prospectus will consider the following criteria.

- Formulation of interpretive objectives, including using interpretive programs as a distinct management tool, making this interpretive program an integral part of the Corps national interpretive program, and enriching the recreational experience of the visitors.

- Analysis of visitation.
- Inventory of interpretive resources.
- Selection of interpretive themes.
- Selection of interpretive media.
- Cost estimate.
- Personnel requirements.

At the present time, several assumptions have been made in regard to the interpretive program including:

Taking into account the nature of a long, narrow 58-mile recreational area, no one place of visitor activity will be planned; the interpretive program will be decentralized. One place such as a Visitor Center will not be established as a central interpretive distribution point. Interpretive programs will be distributed evenly throughout the river corridor.

Considering the natural character of this stretch of river and the outdoor recreational activities in which visitors will be engaged, the interpretive programs will be utilized rather than highly technical audio-visual programs and sophisticated trail systems. The interpretive program will be of a self-guiding nature. Personal contact interpretation will be utilized whenever possible, however.

The interpretive planning effort will be coordinated with the various State and local agencies who are involved in interpretation in the same locale. The Corps will not duplicate previous efforts.

The interpretive implementation plan will define priorities for the interpretive programming. For example, it will establish interpretive shelters first, trails second, and campfire programs third.

Interpretive program evaluations will take place on a periodic basis in order to meet the ever-changing interpretive interests of the general public. The Interpretive Prospectus will be updated via amendment approximately every 5 years.

5. FEASIBILITY OF IMPLEMENTATION: The 11 areas delineated for recreation development are proposed to be acquired on the basis of the landowners' willingness to sell and on the budget limitations within the schedule as outlined in section X.

Because the viability of developing the recreation program hinges on the constraints imposed by the authorizing legislation, the 16 landowners of the 11 areas proposed for recreation development were contacted to determine their willingness to sell. Of the 16 contacted, nine of the landowners indicated an interest in selling their land for the specified purpose. Six landowners are not willing to sell. Based on the response of the landowners contacted, however, alternative areas in the vicinity are presumed to be available.

The 13 potential public use areas, as identified on plates 2-10, consist of seven areas in islands and six areas on the existing riverbanks. Some of the islands are in multiple ownerships or in unknown ownerships. No attempt was made to determine the viability of acquiring easements for the islands. For the areas on the existing banks, landowners of three of the areas were established and contacted. These landowners indicated an interest in selling recreation easements on their lands.

The recreation development areas to be acquired in fee will be easier to obtain than the potential public use areas. The public use areas, acquired through easements, leave the owner with a tax liability on the land. In conclusion, the recreation development areas can be acquired but the potential public use areas are going to be more difficult to obtain.

6. ONGOING STUDIES: In 1980, schematic plans of each of the 11 recreation development sites will be developed for use. These will be in the final corridor Recreation Master Plan for the river scheduled for FY 1981. As sites are purchased, advanced plans and specification drawings will be developed.

The remaining 10 passive recreation site landowners will be contacted this fiscal year to determine their interest in selling a recreation easement on their land.

The acquisition of the recreation easement for the passive recreation areas will be accomplished based on the following criteria.

- 6.1 Type or quality of existing vegetation on the site.
- 6.2 Suitability of site for location of boat ramp.
- 6.3 Conditions of road access to site.
- 6.4 How close the site is to existing recreation areas.
- 6.5 The bank erosion conditions at the site (present and future).
- 6.6 The size of the site.
- 6.7 Ultimately, the willingness of the owner to sell.

One or two areas will be selected in FY 1981 for purchase in coordination with the States and local groups. Development of the remaining sites will depend upon the availability of funds and the owners' willingness to sell their land.

SECTION V - FISH AND WILDLIFE RESOURCES

1. GENERAL: The plant and animal community in the Recreational River corridor is quite diverse. Species from at least 27 families of plants, 17 families of mammals, 29 families of birds, 10 families of reptiles and amphibians, 15 families of fishes, and 45 families of insects occur, or are expected to occur, in the corridor. The abundance of some of the individual species of these families is discussed in the paragraphs below. Also discussed are the preliminary objectives for protecting and preserving the fish and wildlife resources of the corridor to maintain their diversity and increase their abundance. Ongoing studies to support sound management decisions are also discussed.

2. CORRIDOR CHARACTERISTICS: As specified in the Cooperative Agreement, the Omaha District is conducting an inventory of wildlife resource values. In line with this, Recreation River habitats are discussed in the following paragraphs.

2.1 Terrestrial Habitat and Species: Terrestrial habitat in the corridor consists of agricultural land and natural vegetation. Most agricultural land is used for corn, oats, soybeans, or alfalfa. Those lands planted with corn provide an important source of food for migrating ducks and geese. The combination of the corn fields, the constant ice/water patterns of the river during winter months, and the slower current speed of the river reach (relative to the channelized reach below Ponca State Park) provide the essential wintering elements for tens of thousands of various waterfowl, most of which are Mallard ducks.

Natural terrestrial habitat in the corridor consists mainly of five different habitat types including elm-oak, cottonwood-dogwood, willow-cottonwood, sand dune, and sandbar. James R. Clapp, in his 1976 thesis entitled "Wildlife Habitat Evaluation of the Unchannelized Missouri River in South Dakota", determined the amount of land, within a distance of five-eighths of a mile on both sides of the Recreational River reach, that presently exists in these natural habitats. The amounts determined by Clapp are presented in table 3.

The elm-oak habitat occurs on the Nebraska side of the corridor which consists of steep topography and a wide variety of trees; the most important of these are bur oak, box elder, slippery elm, and eastern red cedar. Much of the understory has been grazed; therefore, the value of the habitat for most forms of wildlife has been reduced. The oak mast, however, does provide much food for big game and fox squirrels.

Cottonwood-dogwood habitat occurs on the large islands in the river and on both sides of the river along the high banks. Cottonwood

Table 3
 AMOUNT OF NATURAL HABITAT WITHIN FIVE-EIGHTHS OF A MILE OF THE
 MISSOURI NATIONAL RECREATIONAL RIVER

<u>Habitat Type</u>	<u>Acres</u>
Elm-oak	1,912
Cottonwood-dogwood	6,765
Willow-cottonwood	4,157
Sand dune	1,066
Sandbar	<u>678</u>
 TOTAL	 14,578

is generally the only mature tree present in this habitat type. Slippery elm, green ash, and box elder are common young trees present. Red osier dogwood is the dominant shrub species. This habitat provides good to excellent cover and food for most of the wildlife species inhabiting the corridor, especially white-tailed deer, mule deer, and various species of birds.

Willow-cottonwood habitat occurs predominantly on the islands and the lower terraces adjacent to the river. This habitat consists of an interspersion of open areas with herbaceous growth, rushes, or horsetail; chutes with cattail peripheries; patches of willow and tall cottonwood; and dense thickets of willows. This habitat also provides much food and cover for most of the wildlife species inhabiting the corridor. It is especially excellent habitat for big game and receives much use by white-tailed deer. The habitat also provides excellent cover for ring-necked pheasants and mourning doves.

Sand dune habitat is interspersed between the other habitats in the corridor. Distribution of vegetation in this habitat is variable. The habitat includes areas of sand with no vegetation; areas with considerable grass/forb cover; and areas of sand with tall cottonwoods only or with tall cottonwoods and an understory of willows, cottonwood saplings, or alfalfa; any combination of the three may also occur. Terrestrial birds make moderate use of this habitat; sand-dwelling reptiles, such as hognose snakes and great plains toads, are numerous.

Sandbar habitat occurs in or adjacent to the river and is essentially nonvegetated. This habitat provides important resting areas for migrating waterfowl and feeding locations for breeding shorebirds such as killdeer, upland sandpipers, and spotted sandpipers. It also provides important breeding sites for piping plovers and interior least terns.

2.2 Aquatic Habitat and Species: Aquatic habitat in the corridor consists mainly of seven different habitat types; these types are main channel, main channel border, chute, backwater, marsh, sandbar, and pool. Estimates of the existing amount of each of these habitat types is not presently known.

Main channel habitat in the Recreational River is that part of the river with the swiftest current. Surface velocities in this habitat usually exceed 3 feet per second. Depths in this habitat, as well as in others where there is considerable current, constantly change because of the shifting sand bed of the river. The most abundant species in this habitat are channel catfish and paddlefish.

Main channel border habitat is that part of the river adjacent to the main channel shoreline; it is usually no more than 40 feet wide. It is usually bordered by high, friable banks and contains large quantities of logs, stumps, and other debris. Gizzard shad, carp, river carp sucker, channel catfish, shorthead redhorse, gold eye, blue sucker, and sauger are the most abundant species in this habitat.

Chute habitat includes all side channels from the main channel of the river in which there is current during most of the year. Fish species found in this habitat are basically the same as those in the main channel border habitat.

Backwater habitat consists of areas connected to the river that have little or no current. These areas are usually formed when the upstream end of a chute is closed by the lowering of water levels. This habitat is usually surrounded by marsh. This habitat contains the largest number of fish species that exhibit a preference for a particular habitat type. Gar, buffalo, gizzard shad, carp, northern pike, red shiner, darters, yellow perch, and members of the sunfish family are the dominant users of this habitat type.

Marsh habitat in the corridor exists in flooded lowland areas adjacent to backwaters and chutes. Water depths in the marshes are highly responsive to changes in releases from Gavins Point Dam and fluctuate from 3 feet to complete dryness. Many species of fish use marsh habitat as a spawning and nursery ground. The dominant species are carp, yellow perch, emerald shiner, blue gill, green sunfish, Johnny darter, red and sand shiners, river carpsucker, gizzard shad, and smallmouth and bigmouth buffalo. This habitat is also excellent for muskrat, mink, diving ducks, such as the lesser scaup, migrating mallards, pintails, and blue-winged teals, and other waterfowl. Other birds which use this habitat are great blue herons, red-winged blackbirds, yellow-headed blackbirds, common grackles, Forster's terns, and American coots. Turtles and frogs are also abundant in this habitat.

Sandbars are one of the main features of the Recreational River reach. Associated with these bars is what is known as sandbar aquatic habitat, which includes those areas immediately adjacent to exposed bars where the water depth is 5 feet or less. Sandbar habitat is used primarily as nursery grounds for emerald and sand shiners, river carp-sucker, shorthead redhorse, yellow perch, sauger, carp, and smallmouth and bigmouth buffalo.

Pools in the Recreational River are areas with reduced current velocities that occur on the downstream side of sandbars and have depths ranging from 3 to 10 feet. These pools are constantly being formed and destroyed due to the transient nature of the sandbars with which they are associated. The most abundant species in the pools are goldeye, shovelnose sturgeon, river carp-sucker, and gizzard shad. Other species commonly occurring in this habitat are paddlefish, sauger, walleye, carp, and smallmouth and bigmouth buffalo.

2.3 Federally Listed Endangered Species: The only federally listed endangered species that is currently present in the corridor is the bald eagle. This species occurs as a winter resident during mild winters. It utilizes the many large cottonwood trees adjacent to the river's edge as perch sites while feeding. It also utilizes the large cottonwood trees that are well protected from the wind and have stout, horizontal branches extending over open areas for roosting. The abundance of this species in the corridor is highly dependent on the severity of the winter; the sighting of one dozen bald eagles in the corridor on a winter's day is not uncommon. The endangered whooping crane and peregrine falcon also occur in the corridor occasionally during their migration.

2.4 State-Listed Endangered Species - Nebraska: The pallid sturgeon and the interior least tern are two species that are on the Nebraska State list of threatened species and are known to inhabit the Recreational River reach.

The pallid sturgeon prefers a habitat of unpolluted water, a firm sandy bottom, and a strong current. The last documented occurrence of this species in the corridor was in 1979.

The interior least tern arrives in the corridor in April and departs in August. Its preferred nesting habitat is the large, low, open sandbars in the river. The number of breeding colonies is currently being investigated by the Nebraska Game and Parks Commission. The Commission estimates at this time that the corridor supports the largest number of breeding colonies in the State.

2.5 State-Listed Endangered Species - South Dakota: Fish and wildlife species uncommon in South Dakota that are on the South Dakota list of

threatened and endangered species and are known to inhabit the recreational river corridor are presented in table 4. Also presented in table 4 are the species preferred habitat and data regarding the most recent recorded observation of the species.

Table 4
THREATENED AND ENDANGERED WILDLIFE SPECIES THAT OCCUR
IN THE CORRIDOR

<u>Species</u>	<u>Preferred Habitat</u>	<u>Current Observation Data</u>
Osprey	Large cottonwood trees	Regularly migrate through corridor
Eastern Hognose snake	Sand dune	Fairly common in corridor
Spiny soft shell turtle	Sandbar/pool	Occasionally observed
False map turtle	Backwaters/snags	Fairly common in corridor
Sicklefin chub	Large turbid rivers	1962 - 5 miles south of Yankton
Sturgeon chub	Large rivers	1962 - Yankton County
Pallid sturgeon	Main channel/pool	1978 - Yankton County
Interior least tern	Large sandbars	Fairly common in corridor

2.6 State Game Production Areas: There are four Stage game production areas managed by the South Dakota Department of Game, Fish, and Parks in the corridor. The name and size of each of the four areas are listed in table 5. All areas are managed predominantly for the benefit of big game species.

Table 5
GAME PRODUCTION AREAS IN THE CORRIDOR

<u>Area</u>	<u>Size</u>	<u>Shown on</u>
Myron Grove Area	90 acres	Plate 5
Frost Wilderness Area	111 acres	Plate 7
Bolton Area	50 acres	Plate 9
Warren Wilderness Area	160 acres	Plate 10

3. PRESERVATION AND PROTECTION OBJECTIVES: The major objectives for maintaining the diversity and increasing the abundance of fish and wildlife species in the Recreational River corridor are listed below. These objectives are explained in the paragraphs that follow.

- 3.1 Protect terrestrial and aquatic habitat heavily used by threatened and endangered species.
- 3.2 Protect large island habitat from erosion.
- 3.3 Protect State game production areas from erosion.
- 3.4 Preserve existing backwater habitat.
- 3.5 Preserve all habitat types for use by nonabundant species.

The habitat that is heavily used by threatened and endangered species will be targeted for protection; the habitat types are high-bank cottonwood-dogwood, sand dune, backwaters, and sandbars. Cottonwood-dogwood and, in some cases, selected sand dune areas adjacent to the riverbanks will be targeted for protection by bank stabilization. Such stabilization will help to insure the continued use of the corridor by the bald eagles and ospreys and the eastern hognose snakes. Backwaters adjacent to bank stabilization areas will be preserved and enhanced to help insure the continued common occurrence of the false map turtle and many species of fish. Selected sandbars will be targeted for protection from recreational use to help insure the continued reproductive success of the least tern.

The large islands that are targeted for preservation are the James River Island (sometimes referred to as Hog Island) at RM 801 and Jakes Island (sometimes referred to as Goat Island) at RM 786. These two islands provide large amounts of excellent and irreplaceable wildlife habitat. They will be targeted for stabilization at their upstream ends.

State game production areas are obviously a valuable wildlife resource. At this time, one of these areas is actively eroding away. Serious erosion can be expected to begin at other areas at any time. Stabilizing the eroding banks in these areas is also planned in order to prevent their disappearance.

Backwater habitat is the most valuable habitat type in the corridor. The major preservation measure targeted for these areas is to deepen them. Also, additional backwater habitat will be created in conjunction with bank stabilization. Such measures will significantly increase the numbers of many species in the corridor.

Specific preservation measures for all habitat types are currently being determined. Measures such as managing timber that favors mast-producing tree species, thinning dense stands of trees to stimulate understory growth, and building brush piles for escape and winter cover are anticipated to be used. Preservation measures to increase the numbers of raptor and cavity nesting species will be given special attention.

4. ONGOING STUDIES: Lists of ongoing and future studies are presented below.

4.1 Studies that are currently being conducted to support fish and wildlife resource preservation and enhancement decisions are:

4.1.1 a literature inventory,

4.1.2 a comprehensive inventory of habitat in seven critically eroding areas,

4.1.3 a comprehensive inventory of all aquatic habitat in the corridor, and

4.1.4 a documentation of field observations.

4.2 Studies that will be conducted are:

4.2.1 an aerial-photograph inventory of all terrestrial habitat in the corridor that existed as of November 1978,

4.2.2 an assessment of specific problems and needs, and

4.2.3 a determination of specific management objectives.

Each of these studies are briefly described in the following paragraphs.

The literature inventory consists of the coordination of a list by the Corps of references which document flora and fauna inhabiting the corridor. Input is being obtained from the U.S. Fish and Wildlife Service (FWS), the South Dakota Department of Game, Fish, and Parks (SDDGFP), and the Nebraska Game and Parks Commission (NGPC). Input will also be obtained from the colleges and universities in the area. This inventory will enable the Corps and other agencies to better understand the ecology of the 58-mile long ecosystem.

A comprehensive inventory of the condition of habitat in seven critically eroding areas is currently being conducted by the FWS for the Corps. This inventory will prioritize the ecological resources in each area that should be preserved in conjunction with bank stabilization. This study will also be used to verify the aerial-photograph inventory of terrestrial habitat.

A comprehensive inventory of all aquatic habitat in the corridor is also underway and will take 1 year for completion. This study is being conducted by the University of South Dakota at Vermillion for the Corps. The study will determine the total surface areas of the seven aquatic habitat types in the corridor. This base condition can then be monitored, which will permit better management decisions.

Documentation of field observations is currently being made and will continue to be made by all professional biologists working in the corridor. The documentations are being coordinated by the Corps.

An aerial-photograph inventory of all terrestrial habitat in the corridor will be conducted by the FWS. The Corps will contract for color-infrared aerial photographs of the corridor in late July 1980 for use by the FWS. The FWS will then determine the total surface areas of the five terrestrial habitat types in the corridor. This base condition can then also be monitored, which will permit better management decisions.

An assessment of specific fish and wildlife problems and needs will then be made by the Corps with input from the FWS, SDDGFP, and NGPC. Input from these agencies will also be obtained for use in the determination of management objectives more specific than those identified above. At this time, those areas of habitat in critical need of bank stabilization will be identified, prioritized, and then scheduled for protection. The Corps will prepare a detailed 5- or 10-year fish and wildlife management plan for the corridor to be used in the preparation of the Master Plan for the Missouri National Recreational River. This will include plans for Jake's Island which is under study for inclusion in the Missouri River Fish and Wildlife Mitigation Plan.

SECTION VI - CULTURAL RESOURCES

1. GENERAL: Man has been drawn to the Missouri River valley for thousands of years. The river, its flood plain, and the bluffs have provided for the basic human needs in an otherwise harsh plains environment. The river has provided drinking water; transportation; and, in recent years, irrigation water, recreation, and hydropower. The fertile flood plain and heavily dissected bluffs have provided wood for fuel and lodging, fertile farmlands, shelter from the elements, and numerous game animals. The designated National Recreational River corridor is one of the few remaining portions of the Missouri River which has not been impounded or channelized. As such it represents a unique opportunity to study, preserve, and interpret the vital role which the Missouri River valley played in the prehistory and history of our Nation.

2. CORRIDOR CHARACTERISTICS: The following paragraphs generally describe the potential cultural resource characteristics of the designated corridor.

2.1 Cultural Resources Chronology: Few cultural resources investigations have been conducted within the corridor area. It is possible, however, to construct a tentative cultural chronology based upon investigations conducted outside but in the general vicinity of the study area. The chronology can be divided into two major eras -- the prehistoric era and the historic era.

The prehistoric era is divided into four major periods -- the Paleo-Indian, Archaic, Woodland, and Plains Village. The Paleo-Indian Period extended from approximately 11,500 to 8,000 years ago. Sites of this period generally consist of very distinct forms of stone and bone tools which are found in association with bones from mammoth and extinct species of bison. The Paleo-Indian people are believed to have lived in small nomadic bands. They relied heavily on the large game animals for food with a lesser dependence on plant foods and smaller game animals.

The Archaic Period lasted from 8,000 to 2,500 years ago. Archaic peoples, like their predecessors, were nomadic; however, they used a wider subsistence base. They relied more heavily on small game and wild plant foods. They also developed a wider range of tools and projectile point types.

The Woodland Period started approximately 2,500 years ago. These peoples were more sedentary than their predecessors. They lived in larger population groups. It was the Woodland peoples who first developed pottery and the bow and arrow. They still relied upon hunting and gathering for food.

About 1,000 years ago, the Woodland peoples began to be influenced by cultures outside of their area. They developed large, permanent villages and agriculture. Through time, they became a part of the Plains Village Tradition.

The Historic Era began sometime during the 1700's. The first white men to see the area were probably French trappers and fur traders who came to trade among the Indians. The Siouan speaking peoples also arrived in the area about this time. Numerous groups of explorers traveled through the area in the late 18th and 19th centuries. These early explorers used the river as a highway. The maps and journals which they created during their journeys reveal much about the area and its native inhabitants. Numerous topographic features which they noted are still evident today; these include the Calumet Bluff and the Ionia Volcano. Lewis and Clark are probably the most famous explorers of the period. They passed through the area in 1804 on their way up the river and again in 1806 on their return trip down the river. The first steamer passed through the area in 1831.

The period of exploration was followed by a period of settlement. The area was opened to white settlement during the late 1850's. The towns of Yankton, Ponca, Elk Point, and Vermillion, South Dakota, were established during this period. Steamboats loaded with settlers and mining supplies plied the river on their way to the gold fields in Montana. The flood plain was rapidly being cleared of timber which was used for steamboat fuel and construction. The cleared land was used for agriculture.

The Missouri River was the main highway to the Northern Plains until the construction of the railroads in the 1870's and 1880's. The steamboat era came to a close in the first decade of the 1900's.

2.2 Cultural Resources Locations: The two most basic geographic land units within the corridor are the flood plain and the heavily dissected bluffs. It is generally believed that the majority of the cultural resources identified within the corridor will be located in the bluffs. Most of the resources which were once located in the flood plain have probably been destroyed or deeply buried by the channel shifts and flooding of the river. In addition, modern agricultural practices have probably resulted in the damage or destruction of others.

3. OBJECTIVES: The objectives to achieve the cultural resources program of the Management Plan are as follows:

3.1 To comply with the provisions of the National Historic Preservation Act of 1966 and the procedures of the Advisory Council on Historic Preservation;

3.2 To establish and maintain an ongoing inventory of all lands within the river management corridor to identify, evaluate, and protect prehistoric and historic cultural resources;

3.3 To preserve and protect the historic and archeological sites; and

3.4 To provide interpretation of historic and archeological sites for visitor enjoyment and to insure that each visitor is provided the opportunity to become acquainted with the unique cultural history of the area.

Investigations will be conducted for those areas considered for bank preservation development and regulatory permits during 1980 and 1981. These areas will be investigated by a staff archeologist. The archeologist will conduct a literature and records search for the corridor area to be affected by the project. It will be determined if the area has been recently created or disturbed. A survey will be conducted of the undisturbed areas. Procedures for compliance with cultural resources legislation and regulations will be followed.

4. ONGOING STUDIES: Long-range investigations to accomplish the objectives of the Cultural Resources program have been divided into three phases.

- I. Literature and records search
- II. Field survey and evaluation
- III. Mitigation, protection, and interpretation

4.1 Phase I - Literature Search: The objectives of the literature search which will be conducted from bluff top to bluff top from Ponca State Park to Gavins Point Dam are as follows:

- 4.1.1 To develop a cultural resources data base,
- 4.1.2 To provide a cultural resources chronology,
- 4.1.3 To locate known prehistoric and historic sites,
- 4.1.4 To identify areas with high potential for cultural resources,
- 4.1.5 To identify areas in which cultural resources would have been destroyed by the recent meanderings of the river,
- 4.1.6 To provide interpretative data, and
- 4.1.7 To provide information from which to develop cost estimates for Phases II and III.

Funds will be transferred to Interagency Archeological Services of the HCRS. HCRS will contract for a prehistoric and an historic literature search. The contractors will search various record repositories, interview local informants, and examine artifact collections. Concurrently, the Corps of Engineers will provide a set of maps, which indicate historic channel shifts, to the contractors who will furnish the report.

4.2 Phase II - Field Survey and Evaluation: Land areas within the Recreational River corridor which have not been formed or destroyed by recent river meanderings will be surveyed and evaluated. The objectives for this phase of the program are as follows:

- 4.2.1 To establish and maintain a cultural resources inventory;
- 4.2.2 To evaluate the significance of cultural resources;
- 4.2.3 To identify sensitive areas which should be avoided, protected, mitigated, or interpreted;
- 4.2.4 To comply with Federal legislation and regulations; and
- 4.2.5 To develop cost estimate figures for Phase III.

The scope of this phase will be determined by Phase I. Phase II will be initiated in FY 1981 and completed in FY 1982.

4.3 Phase III - Interpretation and Protection: The objectives of the phase of the program are as follows:

- 4.3.1 To preserve and protect historic and archeological resources, and
- 4.3.2 To provide interpretation and enjoyment of historical and archeological resources.

The scope of this phase of the program will depend upon the information obtained from the literature search and the field survey and evaluation. A management plan will be developed in coordination with the visual and recreation resources management plans to provide for the interpretation, protection, and enjoyment of the historical and archeological sites of importance to the corridor. This management plan will also identify mitigation and protection measures which meet the objectives of the DOI Management Plan.

SECTION VII - BANK PRESERVATION PROGRAM

1. GENERAL: One of the major programs of this project is the bank preservation program which is discussed in this section.

1.1 Background: The review report on the Umbrella Study outlined a program of bankline preservation between Gavins Point Dam and Ponca State Park to preserve the values along the river contributing to the possible designation as a National Recreational River. The program included the preservation of the location of the high bankline and the preservation of recreational areas and features between the high banks. As envisioned in the review report land losses would be reduced by about 80 percent.

Secion 707, Public Law 95-625, included bank preservation as an integral part of the Missouri National Recreational River designation. In addition the authorizing Act provides for Federal operation and maintenance of those bankline preservation works constructed as part of the Recreational River designation and those constructed under other authorities prior to implementation of the Act.

The Recreational River mandate does not specifically delineate or quantify the esthetic, environmental, recreational or economic values which are to be created or preserved by the designation. Accordingly, it must be assumed that the overall river corridor, as presently identified in the Management Plan, represents the characteristics which the public, acting through Congress, is attempting to maintain. Erosion is rapidly changing the relationships between the aforementioned values. Therefore, a prompt comprehensive erosion control program, as detailed in the following paragraphs, is essential to satisfy the basic intent, as well as the mandate of the Recreational River designation.

1.2 Present River Characteristics: The following information briefly summarizes the existing field conditions in the project area. The present-day river is undoubtedly in a transient stage between a channel form representing predam conditions and an ultimate form which will be determined by many parameters, including flow-duration relationships, bed degradation, erosion, and bank preservation measures. The present form varies with time, location, and river stage from a meandering stream to a braided stream. The river slope averages about 1.0 foot per mile; however, the slope can vary with time, location, and river stage from 0.6 to 1.5 feet per mile. Flood plain width (distance between high banks) averages over 2,000 feet and varies from 600 feet to over 1 mile. Primary channel depths usually average between 10 and 20 feet; however, 30-foot depths occur regularly and 40- to 50-foot deep scour holes are occasionally recorded. Since the closure of Gavins Point Dam, extended flow durations during the open-water season have ranged from about 30,000 c.f.s. to 65,000 c.f.s. The 50-percent flow for this

period is about 35,000 c.f.s. The calculated water surface profile for this discharge represents the "Normal Water Surface" (NWS) used for engineering analyses and structural designs. Primary banks range from vegetated bars with a height 2 feet above NWS to chalk/shale bluff formations rising to 150 feet and more above NWS. However, typical high banks requiring erosion control are comprised of fine sands and silts and range from 8 to 16 feet above NWS. Five bluff contacts provide a minor degree of natural control along the reach. Erosion and degradation problems are very severe and are individually discussed in the following paragraphs.

1.3 Erosion Problems: Severe erosion has always been common throughout the project river reach. Prior to completion of the Missouri River dams (Gavins Point Dam in particular), however, the erosion losses were generally offset by accretions of equally high and fertile lands. Now, the high bank erosion continues, but accretions are limited to lower elevation bars, which are considerably less fertile than the higher bank areas formed prior to completion of the dams. The flood plain is steadily widening, as sandbars are replacing high bank areas. Although the average water surface area and average depths are remaining relatively constant, the river is tending to braid more and the number of channels is increasing. This present process is gradually increasing navigational difficulties along the reach. Some areas are now very difficult to traverse by small motor boats. Should these trends continue, recreational boating, as now conducted on this river, will become impractical. The braiding reduces, but does not eliminate, the erosive capacity of the river. At any given location, the multiple channels may consolidate along the high bank and cause severe erosion. The massive mid-channel bars then serve to further aggravate the erosion problem.

The erosion is not limited to the high bank area. Islands and vegetated bar areas are also being lost rapidly. Like the high banks, the higher island areas cannot be recreated naturally. Although new, vegetated bars are developing, it appears the rate of higher vegetated bar/island destructions exceeds the rate of formation.

Erosion rates along the high bank have been periodically measured for many years. Since the closure of Gavins Point Dam, losses exceeding 300 acres per year have been measured. The overall rate of erosion is not totally indicative of the problem. Severe erosion is usually confined to a few areas at any given time. Site-specific erosion rates have been measured which exceed 90 acres per mile per year. This represents a lateral recession of the bankline exceeding 700 feet. Problems of this magnitude could eventually occur at almost any location along the erodible banks in this reach.

A summary of historic erosion rates-versus-mile is graphically depicted on plates 11 and 12. Extensive backup data is available in the District Office.

1.4 Degradation Problems: Bed degradation is a problem affecting the entire Missouri River reach from Gavins Point Dam to Blair, Nebraska. The impacts of degradation will vary since future degradation is expected to increase. According to preliminary results from ongoing studies, the short-term and intermediate levels of degradation should cause very minor structural effects on the types of bank stabilization structures presently used; however, the esthetic effects of these two levels of degradation will be significant since larger sections of revetment toe fills will be exposed. The extent of future degradation has not been completely determined at this time. Continuing studies will be necessary to refine the degradation estimates in order to project the significant effects on design of future erosion control structures and maintenance of existing structures.

2. OBJECTIVES: The objective of the bank preservation program as authorized and as identified in the Management Plan are as follows:

- Protect the location of high banks and those features, such as wooded areas, islands, and vegetated low bars, that contain values which contribute to the designation as a recreational river;
- Implement, as soon as possible, bank preservation measures at previously identified critical erosion problem sites; and
- Assure the continued effectiveness of bank preservation features to preserve the characteristics of the river existing at the time of designation.

3. BANK PRESERVATION PROGRAM: The following paragraphs discuss the bank preservation sites.

3.1 Site Identification: Aerial survey evaluations, input from other entities, and extensive field investigations were utilized to identify, delimit, and categorize existing and potential erosion problems. Twenty-two high bank areas and nine island/vegetated bar areas were identified as existing or potential erosion problem areas. The identified banklines were categorized as follows:

<u>Category</u>	<u>Description</u>	<u>Percent of Total Problem Areas</u>
A	Existing erosion problems along high banks	53
B	High bank islands preservation	7
C	Potential problems along high banks	32
D	Low island/vegetation bar preservation	8

3.2 Potential Erosion Areas: A total of 31 erosion areas have been identified in this reach of the river. These areas, combined with the existing bank protection projects in the designated corridor, would

result in the direct protection of about 50 percent of the high bank-line in the project reach and indirect, long-term protection to another 20 percent. High bank erosion would be virtually eliminated. The upstream portion of three major higher bank island areas would be directly protected. The downstream portion of these areas would be subject to some gradual loss. Protection of lower island/vegetated bar areas would affect only 25 percent of such areas. The remainder would be subject to future erosion. Other similar areas will form, but these will be of lower elevation and will be less fertile than the present areas.

3.3 Critical Areas: Currently, 10 erosion sites have been identified as critical problem areas and are shown on table 6. Implementation of bank preservation at those 10 sites will assist in meeting the Recreational River objective of corridor preservation through erosion control, environmental enhancement through the creation or improvement of areas of aquatic and terrestrial habitat in association with erosion control, and recreational enhancement incorporated with the bank preservation program to the extent deemed desirable by the managing authorities. This 10 site bank preservation plan, however, is not expected to establish sufficient hydraulic constraints to provide long-term controls over this dynamic river throughout its reach. Special ongoing studies will be necessary as part of the bank preservation program to monitor changes in the river characteristics, determine the river's response to bank preservation measures, and determine the need for any corrective actions to maintain the natural values for which the river was designated.

3.4 Site Priority: Anticipated funding levels would support construction of 1 or 2 projects or project increments annually. Consequently, periodic evaluation of the relative priority of each proposed site will be necessary. The following definitive criteria will be used to develop recommendations as to which projects or project increments should be constructed each year.

- Importance of the area to the total Recreational River plan.
- Availability of landowners willing to make available the necessary land interests.
- Comparative erosion rates.
- Present and proposed future land use.
- Environment factors (site adaptability to various bank preservation measures).
- Relationship to the total erosion control plan (existing and proposed erosion control projects and natural river controls).
- Impacts on endangered species.

Table 6
RECREATIONAL RIVER CRITICAL EROSION SITES

<u>Area</u>	<u>State</u>	<u>Bank</u>	<u>Mile</u>	<u>Land Use</u>	<u>Comments</u>
Yankton Reach ^{1/}	NE	R	804	Agriculture, Timber, Cabins	-Surveys complete.
James River ^{1/}	SD	L	802	Timber, Island	-High quality habitat. Pas- sive recreation recommended. Possible title problems.
Highline ^{2/}	SD	L	787	All Timber, Some Cabins	-Includes State game produc- tion area.
Clay County Park ^{1/}	SD	L	781	70-Percent Timber	-Includes a 200-acre State Park.
North Alabama	NE	R	779	Timber Fringe	-Potential for backwater treatment.
Mulberry Point ^{1/}	SD	L	777	50-Percent Timber, 50-Percent Agricul.	-High potential for backwater enhancement. Includes part of State game production area.
Fairview ^{1/}	SD	L	773	Mostly Timber A Few Cabins	
Burbank ^{3/}	SD	L	768	Mostly Timber, A Few Cabins	-High potential for backwater enhancement.

Table 6 (Cont'd)
RECREATIONAL RIVER CRITICAL EROSION SITES

<u>Area</u>	<u>State</u>	<u>Bank</u>	<u>Mile</u>	<u>Land Use</u>	<u>Comments</u>
Volcano Hill	NE	R	765	Mostly Timber, A Few Cabins	-High potential for backwater enhancement. Includes a privately owned campground that is open to the public.
Bolton Bend ^{1/}	SD	L	764	50-Percent Timber, 50-Percent Agricul. (center pivot)	-Includes State game production area.

^{1/} Specifically listed in Section 32 EIS.

^{2/} Includes part of Vermillion Boat Club Area 2, which was specifically listed in Section 32 EIS.

^{3/} A downstream extension of the Vermillion River Chute Area, which is covered by the EIS. Different name used to avoid confusion in contract identification and record keeping.

3.5 Design Considerations: Field conditions, parameters, and objectives that form the basis by which alternative schemes will be developed and evaluated are presented in appendix A. Development of site-specific detailed plans, based on field surveys and investigations, will reflect thorough evaluation of all these considerations.

3.6 Statutory Compliance: Erosion control projects constructed under the Recreational River will comply with all applicable Federal, State, and local statutory requirements, including the Section 10/404 permit program, flood plain ordinances, National Environmental Policy Act (NEPA), water quality standards, and the Endangered Species Act.

4. SPECIAL STUDIES: Due to the special nature of the bank preservation program, additional information is desirable. The special information is discussed in the following paragraphs.

4.1 Requirements: Previous sections in this report detailed the primacy of the erosion control program relative to the overall Recreational River plan, from initial implementation through long-term operations and maintenance. The multiple objectives and many criteria which each erosion control project must satisfy were also delineated. The above factors alone necessitate and justify a comprehensive monitoring and evaluation program. Additionally, the following requirements are directed or implied by applicable statutes, regulations, and official reports.

4.1.1 Environmental Monitoring is required by NEPA and the guidelines for evaluating wild, scenic and recreational rivers (Public Law 90-542).

4.1.2 The project authorization and the Management Plan place responsibility upon the Corps of Engineers to report physical changes in the river to DOI and recommend corrective actions. Many significant changes would be subtle and detectable only through controlled, quantitative measurements of physical parameters.

4.1.3 Quantitative monitoring is required by the Management Plan for assurance of continued effectiveness of erosion control, accurate recordings of changes in river characteristics, and continuation of natural values.

4.1.4 The Management Plan also requires that continuing studies will be conducted to accurately determine changes in river hydraulic characteristics, to determine the river's response, and to furnish the data necessary for preservation of the river's characteristics.

The monitoring program and evaluations necessary to satisfy all of the above requirements are discussed in the following paragraphs.

4.2 Monitoring: The following data acquisition program will provide the information necessary for conducting studies during the implementation phase.

4.2.1 Aerial Photography - Annual color coverage and periodic infrared coverage.

4.2.2 Water Surface Profiles - Three per year - spring, summer, and fall.

4.2.3 Degradation Ranges - Establish one per mile and measure once per year.

4.2.4 Hydrographic Surveys - As needed to develop erosion control plans or to investigate anomalies indicated by other monitoring activities.

4.3 Geomorphic Evaluations: Previous sections denoted the ongoing change in the morphology of the river channel and the relationship of these changes to the esthetic, recreational, and environmental quality of the Recreational River. Thus, geomorphic evaluations, as follows, will be necessary for proper assessment, planning and design for erosion control measures and to assure long-term preservation of the essential Recreational River values.

4.3.1 Parameter Delineation: Quantitative parameters must be developed to measure river features such as channel shape, island/bar size and shape, water surface types (main channel, backwater, etc.), marshes, erosion and accretion. Parameters must reflect relationships between channel dynamics and environmental quality.

4.3.2 Baseline Measurement: The existing channel morphology must be quantified to provide the baseline information necessary to document those values which qualified this river reach for "National Recreational River" status. The products of this study will be used for future comparisons.

4.3.3 Periodic Reevaluations: The parameters delineated above must be periodically measured and compared to the baseline data to quantify changes and permit development of sound recommendations for the long-term management of the river.

4.3.4 Structural Impact: Satisfaction of the Recreational River mandates necessitates accurate assessment of the effects of the bank preservation program upon the total river system. The assessment must address the relationship between erosion control projects and wildlife habitats, recreational facilities, esthetics, and river hydraulic parameters.

4.3.5 Erosion Rates: Erosion rates must be monitored and periodically evaluated to determine impacts on esthetic, recreational, and biological characteristics of the river. Results are also required as input for the determination of bank preservation project priorities.

SECTION VIII - OTHER PROGRAMS

1. MANAGEMENT PLAN: The Management Plan for the Recreational River includes other studies as follows:

- Minerals
- Grasslands management
- Natural resources
- Woodlands
- Agricultural lands
- Water

1.1 For the minerals study, all mineral rights that would have the potential for destroying visual and/or natural resources within the designated corridor of the Recreational River would be purchased provided the seller is willing.

1.2 Grasslands management assistance is available from DOA under several programs. The Corps will encourage landowners to use those programs. Where grassland is obtained for the project with an easement, the landowner will be able to continue to use the land for grazing cattle on scenic easements.

1.3 The natural resources study is part of the fish and wildlife resources study. The inventories specified in the Management Plan for this program will be in the fish and wildlife management plan.

1.4 A woodlands study will be achieved as part of the fish and wildlife study and the visual resources study. The fish and wildlife management plan will contain plans for using woodlands as wildlife habitat. Part of the visual resource study includes plantings in areas adjacent to the river.

1.5 Goals of the agricultural lands study will be achieved by working with landowners. Several programs are available from DOA to encourage good agricultural management of land. The Section 404 permit program will be used to assure that pumping facilities and associated pipelines are compatible with the Recreational River.

1.6 The goals of the water study will be achieved by the Corps of Engineers' operation of Gavins Point Dam releases and the Section 404 permit program for the Recreational River.

SECTION IX - SECTION 404 AND 10 PERMITS

1. PERMIT ACTIONS: Section 10 and 404 permit actions that will be processed in the Recreational River corridor will be subject to special requirements before they will be issued. These requirements, suggested by DOI, are designed primarily to meet the objectives of the visual resources and water quality studies. These requirements are described in the following paragraphs.

1.1 Requirements: Pumping plants will have to be set back a minimum of 50 feet from the riverbank. There will also be some restriction on the noise level near overnight use areas and near picnic areas. It will also be necessary that pumping plants, fuel tanks, and powerpoles be visually screened from the river. Intakes must be placed in free-flowing channels except in areas where special fisheries habitat is present. No intakes will be placed in shallow water or shallow embayments. All intakes should be screened with wire mesh or hardware cloth with openings no larger than one-quarter inch square. Intakes must also be designed so that the approach velocity does not exceed 0.5 foot per second. This does not apply when placed in the flowing channel where flows exceed 0.5 foot per second. No intake can be placed in an area that may be hazardous to boaters or other recreational users. The storage areas for the fuel supply necessary for the pumping plants must be bermed to contain 110 percent of the fuel supply in order to capture spills in the event of leaks.

1.2 Car bodies, trash, tires, asphalt, chemically stained concrete, lath, plaster, pipe, scrap iron, and brick will not be permitted to be used for bank protection. Broken concrete, if chemically acceptable, may be used but no protruding reinforcement rebars are allowable. Any fill material must be placed below the normal water surface elevation created by 35,000 c.f.s. flows unless the material is covered with good soil, revegetated, and properly maintained. The use of natural stone is encouraged. Field stone and chalk is preferable. It should, however, be well graded and of a small size.

1.3 Trees can be cabled together and to the banks if placed along the banks with the trunk or butt ends facing upstream.

1.4 Construction of boat docks will also be allowed. They should be constructed to withstand the forces of maximum flows. Biocide chemical containers or barrels, however, may not be used for support purposes. Metal drum bouyancy units will be permitted if they are filled with flotation foam. Proper maintenance will be required.

1.5 Chute crossings will be permitted in accordance with current criteria.

1.6 All permit actions that may affect rare or endangered species, recreational use areas, and archeological sites will be handled on a case-by-case basis.

1.7 Noncompliance is subject to the provisions of Federal law, with possible fines and criminal prosecution.

SECTION X - COST ESTIMATES

1. FIRST COSTS: Section 3(a)(22) of the Wild and Scenic Rivers Act, Public Law 90-542, as amended, authorized \$21,000,000 for implementation of the project. The costs of the authorized plan were identified for bank preservation and recreation development and preservation. These costs were updated from the authorized plan to October 1980 price levels.

2. BANK PROTECTION: The scope of the bank protection plan for Gavins Point Dam to Ponca State Park river reach, as described in the Umbrella Study, included 25 sites. The Federal construction cost for this reach was estimated at \$11,900,000 at 1976 price levels. Of the original 25 sites, 12 have been constructed under the authority of the Streambank Erosion Control Demonstration Act, Section 32 of the Water Resources Development Act of 1974; one site was constructed under authority of Section 39, Public Law 93-251. At the time of designation, an assessment of critical high priority erosion sites was made. Ten bank protection sites were determined to be critical; Federal construction costs for these 10 sites was estimated at \$10,400,000 at 1978 price levels; land requirements were estimated to be \$751,000 based on 1978 price levels. Eight of these 10 sites were included under the Umbrella Study plan. Two new sites were determined to be critical, high priority erosion sites due to changing river conditions. It is estimated that Federal construction costs at October 1980 price levels for these 10 critical sites will be \$12,220,000.

Interest in lands updated to October 1980 price levels is estimated to be \$1,029,000. These lands would be used to meet the objectives of the authorizing Act; therefore, this cost is included under land and damages for recreation development, preservation, and protection.

3. RECREATION DEVELOPMENT AND PRESERVATION: Project first costs for the acquisition of lands and interest in lands and for development of associated facilities in the Umbrella Study was \$2,835,000 for lands and damages, \$2,630,000 for recreation facilities, and \$1,350,000 for river feature stabilization. These values were updated to October 1980 price levels and are \$3,884,000, \$3,090,000 and \$1,586,000, respectively.

A detailed breakdown of project costs will not be available until ongoing studies are completed. Authorized and updated project cost estimates including planning study costs are presented in table 7.

Table 7
PROJECT COST ESTIMATES

<u>Item</u>	<u>Project Cost</u>	
	<u>As Authorized</u>	<u>Current October 1980 price levels</u>
Lands and Damages		
Recreation Development, Preservation, and Protection	\$ 2,835,000	\$ 3,884,000
Recreation Facilities	751,000	1,029,000
Bank Preservation	2,630,000	3,090,000
Recreation Feature Preservation	10,400,000	12,220,000
	<u>1,350,000</u>	<u>1,586,000</u>
SUBTOTAL	\$17,966,000	\$21,809,000
Engineering and Design	1,295,000	1,521,000
Supervision and Inspection	863,000	1,013,000
Planning	<u>620,000</u>	<u>700,000</u>
TOTAL	\$20,744,000	\$25,043,000
Rounded	(\$21,000,000)	(\$25,100,000)

4. ONGOING STUDY COSTS: The major planning effort for the project will be completed during FY 1980. The literature search for the cultural resources and initial interpretative work and the development of the management plans for the visual, recreation, and fish and wildlife resources will be completed in FY 1981. This will include preparation of a supplement to this GDM upon completion of all ongoing studies. This supplement will also include detailed cost estimates for the resource management plans. The completion of the planning effort in FY 1981 will cost approximately \$200,000. Table 8 presents the planning costs by resource program for FY 1980 and FY 1981.

5. OPERATION, MAINTENANCE, AND REPLACEMENT COSTS: The project operation, maintenance, and replacement (OM&R) costs based on the scope of the project described in the Umbrella Study and updated to 1980 price levels may amount to \$933,200. The following activities will be essential for the satisfactory operation and maintenance of bank preservation and recreation facilities in compliance with Recreational River requirements.

Table 8
PROJECT PLANNING COSTS
(\$1,000)

<u>Resource Program</u>	<u>FY 1980 (AE&D)</u>	<u>FY 1981 (Construction)</u>	<u>Total</u>
Real Estate	\$ 30	\$ --	\$ 30
Erosion Control	220	--	220
Visual	36	11	47
Recreation	20	11	31
Cultural/interpretative	66	90	156
Fish and wildlife	44	78	122
Environmental statement Management	17 <u>67</u>	-- <u>10</u>	17 <u>77</u>
TOTAL	\$500	\$200	\$700

5.1 Bank Preservation:

5.1.1 Existing Structures: Recreational River mandates require Federal assumption of operation and maintenance for all existing bank preservation projects, providing that landowners make available those interests in lands necessary to achieve all Recreational River objectives. Maintenance of the existing projects, including ten projects constructed under Section 32 authority, can include reconfiguration of structures severely affected by degradation, and the replacement or reconfiguration of private bank preservation measures.

5.1.2 New Structures: Planning and design of future erosion control structures will reflect all of the considerations discussed in the above sections. The annual operation, maintenance and replacement costs as authorized and presented in the Umbrella Study amounted to \$595,000 for operation and maintenance, and \$119,000 for replacement. Updated to October 1980 price levels, these values are estimated to be \$611,000 and \$122,200, respectively. Since detailed studies have not been completed, these figures are estimates for both the existing structures and the new structures identified for 10 critical areas.

5.2 Recreation Development and Preservation: The annual operation and maintenance costs for recreation lands and facilities as authorized and presented in the Umbrella Study was approximately 12 cents per recreation day. Additional annual operation and maintenance costs included \$67,500 for maintenance of the river stabilization features, for a total annual operation and maintenance cost of \$148,350. The average annual value of future replacements was estimated at \$17,450. Since detailed studies have not been completed, these values, updated to October 1980 price levels, are estimated to be \$200,000 annually. A breakdown of this total is as follows:

Maintenance of river preservation measures	\$ 79,500
Land and facilities	100,000
Future replacements	<u>20,500</u>
OM&R COSTS	\$200,000

5.3 Operational Concepts and Policies: Specific operational concepts and policies concerning the operation and maintenance of the Recreational River project will be identified upon completion of ongoing studies. It is recognized, however, that additional personnel and equipment will be necessary to meet the Corps of Engineers requirements of the operational function of the project under the terms of the authorizing Act and the Cooperative Agreement.

SECTION XI - IMPLEMENTATION

1. GENERAL: As specified in the authorizing legislation and in the Cooperative Agreement, the Corps of Engineers is responsible for developing and implementing detailed plans for the Missouri National Recreational River Project. The project will include programs for bank preservation, recreation, and preservation and enhancement of identified resources which meet the requirements necessary to carry out the provisions of the authorizing legislation within the objectives defined in the Management Plan by DOI. Implementation of the total plan and of each segment of the plan will be conditioned upon the availability of lands and interest in lands necessary to protect and enhance the river in accordance with the purposes of the Wild and Scenic Rivers Act. Prior to implementation of this project, ongoing studies will be completed. Resource management plans will be developed for each of the resources identified in this document. These management plans will identify the outstandingly remarkable values for which the river is designated and prioritize these values on the basis of need to protect, enhance, and/or preserve. This information will be used to develop an "Implementation Plan", a design memorandum which will supplement this document. The Implementation Plan will serve as the basis for implementing the project and provide the detail necessary to satisfy the Cooperative Agreement. This document would be updated every 5 years unless conditions warrant otherwise.

Once the Implementation Plan is completed, specific detailed plans would be developed to initiate implementation of the project on a segment of the river. This plan would be formulated based on the priorities outlined for the resource programs in the Implementation Plan. The specific detailed plan would be incorporated in a Development Design Memorandum (DDM). The plan would be designed to meet all objectives of the Recreational River within that segment of the river. Selection of the segments of the river for this and future DDM's would be coordinated with the Recreational River CAG and DOI agencies.

A draft DDM would be presented to the Recreational River CAG for concurrence with the detailed plan. If the Recreational River CAG concurs with the plan as identified in the draft DDM it will be finalized and forwarded to the Missouri River Division for approval. When the DDM is approved, the plan will be implemented to the extent funds are available. Subsequent DDM's would be formulated, coordinated, and prepared on the next segment of the river based on remaining priorities. This procedure would continue until the total plan is completed.

If Congress provides construction funds for the project in FY 1981, the first segment of the project could be implemented. This segment

would consist of interest in land for a recreation site, bank preservation measures, and scenic and recreation easements at Bolton Bend and Volcano Hill sites provided that easements are available from willing sellers. This segment of the river was selected because the results of the R/E program. That program indicated that, currently, the landowners in this segment of the river may be willing sellers. Since the Recreational River CAG may not be formed in time for their review of the proposed plan for this segment of the river, the plan will be presented to the interagency planning team with whom coordination on this project is currently being conducted.

Upon approval of the plan by the interagency planning team, plans and specifications would be prepared; and when necessary interest in lands required to meet the Recreational River objectives are available and acquired, then implementation of the project would be initiated.

2. PLAN IMPLEMENTATION SCHEDULE: The projected project implementation schedule is based on a 10-year period and is shown on plate 15. This schedule is tentative based on information of studies conducted to date. The schedule is based on funding availability in FY 1981 of \$2.2 million; however, the FY 1981 budget does not contain any funds. The total costs of the project are scheduled over the remaining years based on a uniform rate of funding with a completion date tentatively scheduled for FY 1989. The schedule is shown for project costs based on the authorized limit of \$21 million and for the updated costs to 1980 price levels of \$25.1 million. Plate 14 shows the planning and implementation work elements for each of the resource programs for the project. The critical path for project implementation shown on plate 15 is basically accurate through FY 81 in terms of ongoing studies only and will be revised upon completion of these studies.

SECTION XII - CONCLUSIONS

Section 3(a)(22) of Public Law 90-542, as amended, imposed a limitation of \$21 million for the purposes of carrying out the provisions of the Wild and Scenic Rivers Act for the Missouri National Recreational River authorized in 1978. Although costs have increased due to inflationary pressures since authorized by \$4.1 million, the authorizing limitation is not a constraint that would preclude implementation of the project at this time. The ultimate success of the Missouri National Recreational River hinges upon the availability of lands from willing sellers and upon public perception developed during implementation of the initial segments of the plan. The total cost of carrying out the provisions of the Wild and Scenic Rivers Act will not be known until ongoing studies are completed. It is recognized that current estimates may be high due to the uncertainties of land costs, bank preservation costs, and to what extent interest in lands will actually be required to meet the intent of the act.

Therefore, based on the studies accomplished to date and on available information, it is concluded that at this time that the plan can be implemented and the objectives of the Missouri National Recreational River designation can be achieved. The ultimate success will to a large measure depend on public perceptions developed during implementation of the initial segments of the plan. The following factors will influence implementation:

- 1.1 The willingness of landowners to sell, dedicate, or donate interests in lands required to achieve the objectives of recreational river designation;
- 1.2 The ability of Federal, State, local, and individual interests to coordinate efforts to maximize opportunities for preserving values associated with Recreational River designation;
- 1.3 The sequential implementation of segments based on availability of necessary lands, contributions of completed segments to plan objectives, and availability of funds within the monetary limitations imposed by legislative authorities.

SECTION XIII - RECOMMENDATIONS

I recommend approval of this General Design Memorandum as a basis for proceeding with the additional studies required, preparation of necessary plans and specifications, and initiation of construction.

EXHIBIT I

COOPERATIVE AGREEMENT
BETWEEN THE
U.S. DEPARTMENT OF THE INTERIOR
AND THE
U.S. DEPARTMENT OF THE ARMY

Cooperative Agreement
Between the
U.S. Department of the Interior
and the
U.S. Department of the Army
for
Implementation of Section 707
of
Public Law 95-625

The Secretary of the Interior, acting through the Assistant Secretary for Fish and Wildlife and Parks, and the Secretary of the Army, acting through the Chief of Engineers, herein set forth the terms and conditions of cooperative responsibility to be accomplished pursuant to Section 707 of Public Law 95-625 (92 Stat. 3528), an act amending the Wild and Scenic Rivers Act (16 U.S.C. 1271 et. seq.). The Wild and Scenic Rivers Act is hereinafter referred to as "The Act."

WHEREAS, The recreational segment of the Missouri River in Nebraska and South Dakota was added to the National Wild and Scenic Rivers System to preserve and protect and to make available its resources for public use as generally described in the document entitled, "Review Report for Water Resources Development, South Dakota, Nebraska, North Dakota, Montana," prepared by the Division Engineer, Missouri River Division, Corps of Engineers, dated August 1977.

NOW, THEREFORE, IT IS AGREED THAT:

I. THE SECRETARY OF THE INTERIOR, ACTING THROUGH THE ASSISTANT SECRETARY FOR FISH AND WILDLIFE AND PARKS, AND THE SECRETARY OF THE ARMY, ACTING THROUGH THE CHIEF OF ENGINEERS, JOINTLY WILL:

(A) Develop and implement detailed plans for acquisition of lands and interests in lands, development, protection and management of the designated river reach incorporating those recreation and bank stabilization aspects, real estate and other requirements necessary to carry out the provisions of the act;

(B) Establish criteria and priorities for river protection measures which are compatible with designation of the segment as a component of the National Wild and Scenic Rivers System;

(C) Establish criteria and procedures to permit access for such pumping and associated pipelines as may be necessary to secure an adequate supply of water for owners of land adjacent of the river;

(D) Confer on budget allocations required to carry out the purposes of the act; and

(E) Establish a conceptual theme for the design of recreational features and development.

II. THE SECRETARY OF THE INTERIOR, ACTING THROUGH THE ASSISTANT SECRETARY FOR FISH AND WILDLIFE AND PARKS, WILL:

(A) Administer the designated segment as a Recreational River under the provisions of the act;

(B) Initiate efforts to establish a Recreational River Advisory Group which may include members representing those organizations identified in section 3(a)(22) of the act and define the duties and responsibilities of the Recreational River Advisory Group;

(C) Upon request, provide technical assistance to the U.S. Army Corps of Engineers in those instances where the Department of the Interior has unique capability by virtue of law or special expertise required for planning and implementation of the act;

(D) Determine, upon notification by the Secretary of the Army (acting through the Chief of Engineers), or otherwise, if activities are occurring or threatening to occur along the designated river segment which constitute serious damage or threat to the values for which the segment was designated; and

(E) Submit budget requirements through normal Departmental channels.

III. THE SECRETARY OF THE ARMY, ACTING THROUGH THE CHIEF OF ENGINEERS,

WILL:

(A) Submit budget requirements for project planning, acquisition of lands and interests in lands, development of interpretive facilities and features, and construction of recreational and stream-bank stabilization;

(B) Submit budget requirements for operations, maintenance and replacement of such features and facilities;

(C) Notify the representative of the Secretary of the Interior and other members of the Recreational River Advisory Group about activities that are occurring along the designated river segment which constitute a threat to the values for which the river was designated and to land and interests in land acquired by the United States, and make recommendations concerning the issuance of a determination by the Secretary of the Interior as provided for in Article II(D) of this Agreement; and

(D) Notify Interior of the congressional budget hearings on the Recreational River so that Interior will be able to testify.

IV. THE SECRETARY OF THE ARMY, ACTING THROUGH THE CHIEF OF ENGINEERS, SUBJECT TO APPROPRIATIONS WILL:

(A) Conduct or cause to be conducted during detailed planning and design for implementation of the Recreational River Management Plan (incorporated herein by reference), and in coordination with appropriate agencies of the Department of the Interior:

1. A survey to determine the sites of historical and archeological resources which may be located within the river corridor;

2. A visual resource analysis to identify any outstandingly remarkable scenic areas which should be protected as part of the Recreational River;

3. An inventory and assessment of wildlife resource values which should be protected and enhanced to maintain those qualities which led to designation of the segment; and

4. A mineral resource inventory and analysis for management of these resources.

(B) Determine the extent and location of streambank stabilization structures and other works necessary to control erosion and the legal interest in lands required for the construction and maintenance of such works;

(C) Further determine, prior to the initiation of construction (or the Federal assumption of maintenance), of any streambank stabilization structure, the extent of additional related lands or legal interests in lands within the same ownership which are required to protect and enhance the river in accordance with the purposes of the act;

(D) Condition the construction or maintenance of any streambank stabilization structure, other works necessary to control erosion, or of any recreational river feature, upon the availability to the United States of such land and interests in land in such ownership as is deemed necessary to carry out such construction and maintenance and to protect and enhance the river in accordance with the purposes of the act.

(E) Acquire in the name of the United States such additional lands and legal interests in lands required to carry out the river preservation and recreational purposes of the act in accordance with normal real estate practices of the Corps of Engineers, section 3(a)(22) of the act, and the requirements of Public Law 91-646;

(F) Design, construct, operate, and maintain the recreation and interpretive features in consonance with the Recreational River Management Plan;

(G) Design, construct, operate and maintain streambank stabilization and river preservation structures;

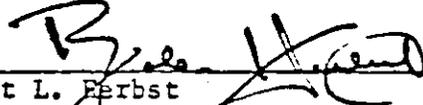
(H) Seek written cooperative agreements for State or local governmental participation as provided for by section 10(e) of the act; and

(I) Failing to negotiate adequate protection or willing cessation of activities which threaten the land or interests in land acquired by the United States or which threaten the values for which the river segment was designated, as determined by the Secretary of the Interior, exercise eminent domain or other appropriate remedy to prevent or terminate such adverse activities.

V. RENEGOTIATION OR TERMINATION

Either party may initiate renegotiation or termination of this agreement by 30 days written notice.

U.S. Department of the Interior

By  1/4/80
Robert L. Perbst (Date)
Assistant Secretary for Fish and Wildlife and Parks

U.S. Department of the Army

By  2/1/81
J.W. Morris (Date)
Lieutenant General, USA
Chief of Engineers

APPENDIX A

DESIGN CONSIDERATIONS FOR BANK PRESERVATION STRUCTURES

This appendix presents the conditions, parameters, and objectives by which alternative bank preservation schemes and site-specific detailed plans will be developed and evaluated. The relative importance of each item is site-specific and varies from area to area.

1. PRIMARY DESIGN CONSIDERATIONS:

1.1 Field Conditions: Field conditions are physical conditions which must be delineated and evaluated to permit development of structural designs that are simultaneously functional, constructible, and environmentally acceptable.

- Channel location and alignment (main and secondary).
- Channel geometry (floodway cross section).
- Bar/island formation (location, orientation, elevation, material).
- Near-bank flow conditions (depth, velocity).
- Bank heights and configuration.
- High bank land use.
- Riverbed and bank material types and conditions.
- Stage-duration relationships (average daily and long-term probability).
- Tributary streams and surface runoff locations.
- Ground water seepage.
- Potential wind/wave erosion.
- Potential boat wake wave erosion.
- Existing erosion controls (natural, manmade).
- Degradation projections.

1.2 Constructibility Factors: Constructibility factors are those practical factors relative to actual construction materials, operations, and techniques which must be considered to assure optimum project economics and to minimize potential environmental degradation. These factors are listed below.

- Material sources (quality and low-grade stone, earth, cobbles, gravel).

- quality
- quantity available
- location (haul distance)
- cost, at source (royalties, quarrying, gathering)

- Land access to structure locations.
 - haul road locations and conditions
 - near-bank conditions (height, soils, vegetation)
 - mobilization and materials handling sites

- River access (floating plant construction).
 - river depths along project bankline
 - near-bank conditions
 - mobilization and material handling sites
 - river depths, distance, and alignment from project site to potential mobilization and material handling sites.

1.3 Engineering Objectives: Those goals established to provide perspective and scope to individual project formulation and design.

- Least-cost, multipurpose problem solutions.
 - materials
 - construction techniques
 - structure type, location, and orientation

- Minimize potential future maintenance costs.

- Avoid environmental degradation.
 - minimize clearing
 - minimize turbidity increases
 - minimize detrimental disturbance of important fauna

- Provide environmental/recreational enhancement.
 - create desirable aquatic habitat diversity
 - protect critical wildlife habitat areas
 - vegetate structures and disturbed areas with native species, beneficial to wildlife
 - improve wildlife access to the river
 - improve, when desirable, recreational opportunity
 - provide for future recreational development, when desirable

- Protect or avoid cultural resources, as appropriate

2. EROSION CONTROL TECHNIQUES:

2.1 General: The following information summarizes techniques which have proven to be economical and environmentally sound for completed bank preservation projects in the Recreational River reach. These methods will undoubtedly be improved with time and other better methods may also evolve. Plate 13 depicts a typical river reach and the techniques which would be used for erosion control. A schematic drawing and typical section is shown for each structure type.

2.2 Revetments: Revetments will generally be utilized where river flows are concentrated along the bank and where the depths, curvature, or bankline conditions preclude use of other methods. General applications will include many variations of three basic designs, as field conditions and environmental considerations dictate. Revetments will be built in segments with the bank left untouched between segments. This provides construction cost savings and preservation of relatively natural conditions.

- Windrow Revetment.

Consists of placing erosion-resistant material in a trench excavated near and approximately parallel to the eroding bankline. As the erosion undercuts the trench, the erosion-resistant material sloughs into the river and eventually forms a naturally configured protective blanket over the erodible bankline.

Used where deep swift flow is immediately adjacent to the bankline, in order to avoid the possibility of excessive over-runs.

Uses a wide shallow trench where present land use permits, or a narrower, deeper cut on the bankline, when necessary, to reduce clearing and/or to avoid improvements.

Windrow material may be all high quality stone or may include a lower grade material in that part of the fill that will eventually become the underwater toe and blanket. That part of the fill designed to become paving in the splash zone or on the upper bank will be high quality stone.

Specified rate of application (tons/linear foot) of the erosion-resistant material can be varied to satisfy prevailing conditions in the most economical manner.

- Composite Revetment.

Consists of a toe of erosion-resistant material, an upper bank treatment covering the zone of normal seasonal fluctuations, and a freeboard zone, generally vegetated.

Composite revetment will be used where revetment is required, but where field conditions do not warrant, or do not permit, use of other revetment types.

Toe crown elevation will be the estimated low water elevation to reduce exposure to freeze-thaw and wet-dry cycles and thus permit use of relatively low quality, erosion-resistant material in the toe.

Toe material will generally be placed on the natural riverbed unless minor excavation is necessary to provide an adequate structural section.

Specified rate of application (tons/linear foot) of toe material can be varied to provide cost savings.

Upper bank treatments can include many erosion-resistant materials placed in multiple combinations and configurations to best satisfy esthetic, environmental, and economic criteria.

- Reinforced Revetment.

Consists of a toe of erosion-resistant material placed somewhat riverward of the bankline. The toe is reinforced by intermittent stone-fill tieback, which are placed on the riverbed or in an excavated trench and extend landward from the toe to, or into, the riverbank.

Toe fill material may either be high quality stone or low grade material or both. Fill material used in the tieback is generally stone.

Toe material will be placed on the riverbed generally parallel to the natural bankline. Minor excavation may be necessary to provide a minimum structure section.

The toe fill crown will be constructed to normal water surface elevation or lower. Stone tiebacks will generally slope upward from the toe to several feet above the normal water surface elevation at the bank.

Between tiebacks, the upper bank is graded to fill in voids between the tiebacks, the bank, and the toe.

Specified rate of application (tons/linear foot) of toe material will be varied to provide cost savings.

The upper bank surfaces are generally treated with either gravel or topsoil and seed to satisfy esthetic and environmental considerations.

2.3 Hardpoints: Hardpoints are generally utilized, where reasonably feasible, in lieu of revetments as a more economical measure, and to provide diversity to the aquatic environment. Variations of hardpoint length, strength, and materials will be used as field conditions and environmental considerations dictate. Each hardpoint consists of two components, a short spur of erosion-resistant material extending from the bank into the river and a root of erosion-resistant material placed in a trench excavated landward from the bank.

- Spurs.

Vary in length generally from 30 to 50 feet.

Crown width varies up to 10 feet in width and is generally inversely proportional to water depth. This width may also reflect maintenance and access considerations.

Crown elevation is generally NWS at the outer end and slopes up to varying heights at the bankline, dependent upon bank height and root type.

Designed to provide an adequate amount of material to withstand anticipated scour conditions.

- Roots.

Vary in length generally from 30 to 50 feet.

Two basic types - a deep "V" excavation for high banks and a wide, shallow trench for low banks.

- Placement.

Overall length of hardpoint (root plus spur) will vary from 60 to 100 feet and is generally dependent upon prevailing bankline conditions and land use, plus existing or anticipated flow pressures.

The upstream-most hardpoint in a multihardpoint system will be longer and of heavier section than the "shaded" downstream hardpoints.

When conditions include a high bank with shallow water, a longer spur with minimum root will be utilized.

When deeper water prevails, the spur length will be reduced and the root length increased, unless the banks are excessively high.

If local bank material is somewhat erosion-resistant, roots will be shorter.

Length will generally be directly proportional to spacing increment.

Variations in spacing will be used to provide the most economical configuration.

Existing hardpoints (natural or manmade) will be incorporated into the system to the maximum feasible degree.

Excessively high banks and/or deep water will be avoided as much as possible by spacing alteration or by using an alternate treatment (revetment), if necessary.

Hardpoints will be placed at the end of existing roads, tracts, and fencelines, to the greatest possible extent to reduce clearing of timber.

2.4 Earth-Core Dikes: Earth-core dikes are utilized where immediately available earth or sand can be borrowed to construct shaped fills that induce moderate diversion of flows or that prevent lateral migration of the channel. The structure serves to hold higher velocity flows away from erodible banks. Each earth-core dike usually consists of the dike projecting riverward from the bankline and a stone-fill root buried into the bankline.

- Dike.

Length varies, dependent upon actual field conditions.

Crown width is generally 15 feet in width for access.

Crown elevation is generally about 3 feet above NWS.

A stone-fill toe will protect the upstream face and riverward end of the fill.

Embankment surfaces exposed to water surface fluctuations, wave wash, and high river flows will be protected by a stone and gravel cover and vegetated.

Usually includes a specially designed flow control gap to preserve or enhance aquatic habitat downstream from the structure.

- Root.

Consists of a stone-fill placed on the bank or buried in a trench.

Length varies with field conditions.

Two basic types - a deep "V" excavation for high banks and an exposed root on low banks.

2.5 Miscellaneous:

- NWS will be developed on analysis of recent water surface profiles, as adjusted to a selected "normal" discharge of 35,000 c.f.s. This discharge represents the 50-percent exceedence flow from Gavins Point Dam during the open-water season. Plate 14 shows this flow duration relationship.

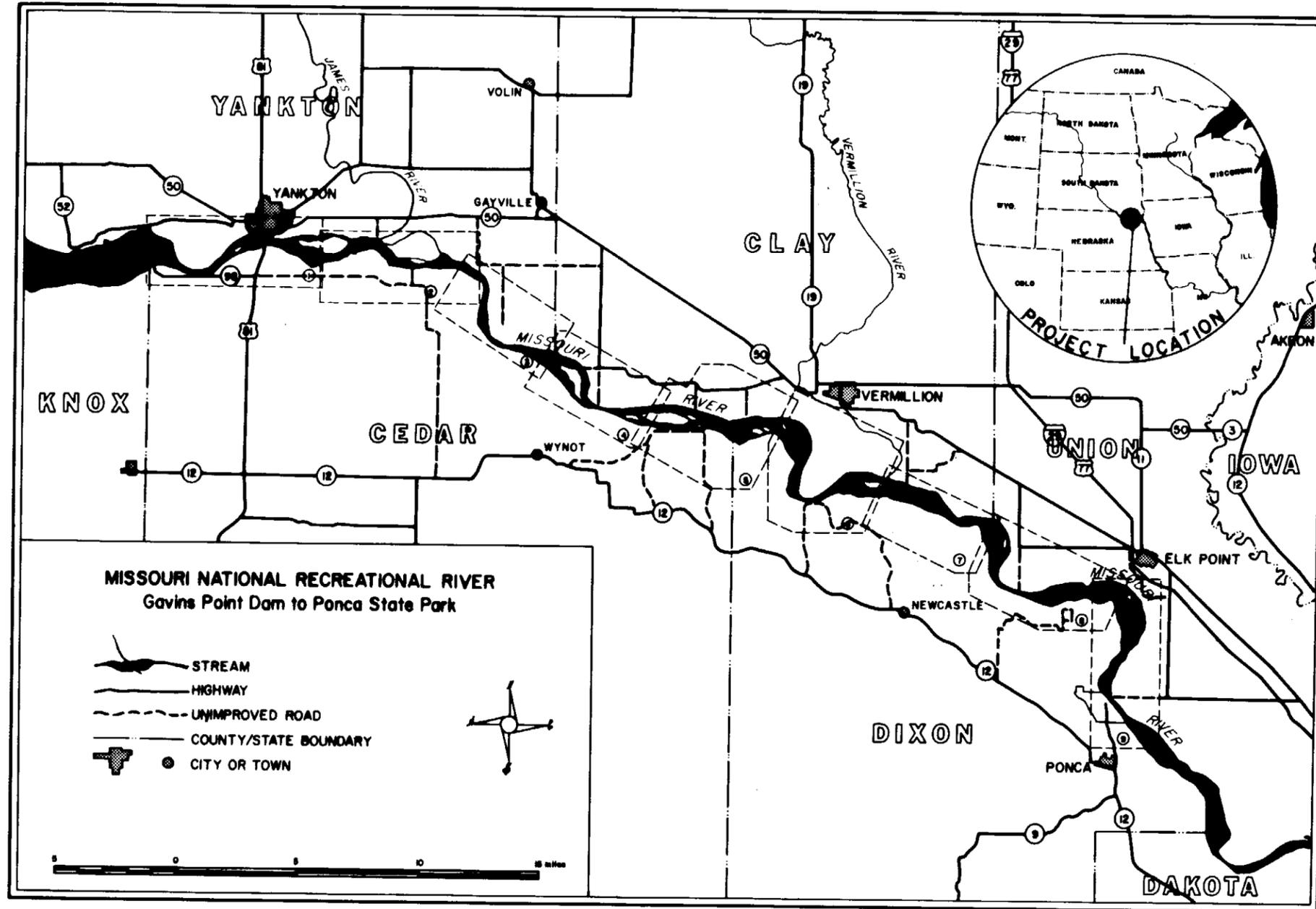
- Low Water Elevation. The low water elevation is estimated to be 3 feet below NWS. This reflects an approximate discharge of about 20,000 c.f.s. between Gavins Point Dam and Ponca State Park.

- Materials. In general, all materials will be subject to the specific approval of the Contracting Officer.

Stone. Specifications for quality and gradations of high quality stone will be generally similar to present practices on Missouri River contracts. Alterations in gradations may be dictated by field conditions or environmental considerations.

Low Grade Material. This will be stone material such as chalks, shales, and soft sandstone that is generally substandard relative to normal riprap specifications. It will be specified only by a minimum specific gravity, a maximum allowable absorption and loss after a reasonable period of immersion, a liberal gradation range, and a requirement that it can be obtained from the source and placed in the structure without excessive deterioration or mechanical breakdown.

Gravel. Specifications for quality of gravel will be similar to present specifications, but gradation limits will be more liberal to promote use of locally available material and possibly material from the channel bed in the vicinity of the structures.

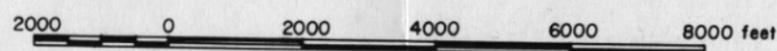


MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
LOCATION MAP & PLATE INDEX
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980



EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.

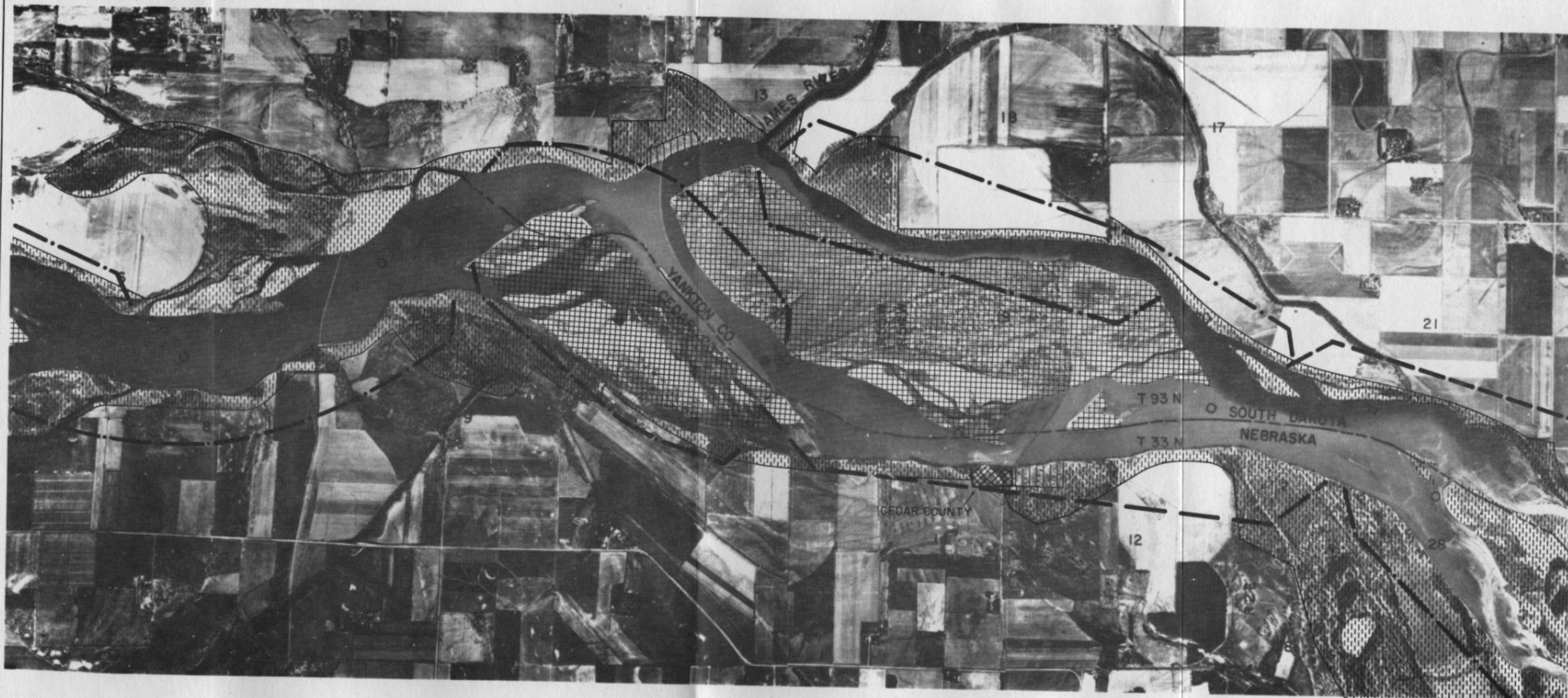
-  EXISTING RECREATION OR PUBLIC USE SITE
-  SCENIC AREA
-  POTENTIAL PUBLIC USE AREA
(ISLAND AREAS MAY INCLUDE EROSION PROTECTION)
-  COMPLETED EROSION CONTROL WORK
-  CURRENT EROSION AREAS
-  APPROXIMATE CORRIDOR BOUNDARY



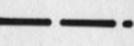
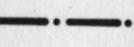
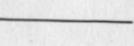
PHOTOS TAKEN 21 APR 1978

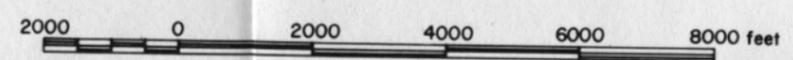
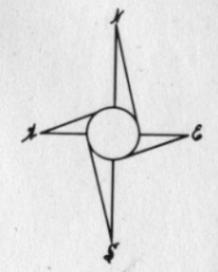
DISCHARGE - 30,000 cfs

MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980



EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.

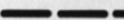
-  POTENTIAL RECREATION DEVELOPMENT
-  EXISTING RECREATION OR PUBLIC USE SITE
-  SCENIC AREA
-  POTENTIAL PUBLIC USE AREA
(ISLAND AREAS MAY INCLUDE EROSION PROTECTION)
-  COMPLETED EROSION CONTROL WORK
-  CURRENT EROSION AREAS
-  APPROXIMATE CORRIDOR BOUNDARY

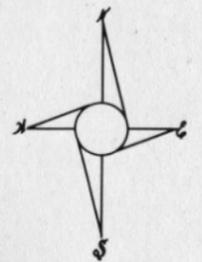
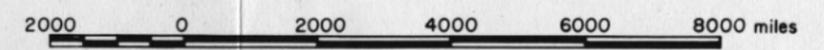


PHOTOS TAKEN 21 APR 1978
DISCHARGE = 30,000 cfs

MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980



-  POTENTIAL RECREATION DEVELOPMENT
-  SCENIC AREA
-  POTENTIAL PUBLIC USE AREA
(ISLAND AREAS MAY INCLUDE EROSION PROTECTION)
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EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.

PHOTOS TAKEN 21 APR 1978

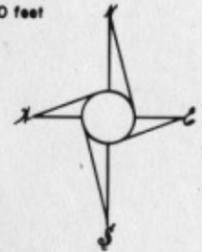
DISCHARGE - 30,000 cfs

MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980



-  EXISTING RECREATION OR PUBLIC USE AREA
-  POTENTIAL RECREATION DEVELOPMENT
-  SCENIC AREA
-  POTENTIAL PUBLIC USE AREA
(ISLAND AREAS MAY INCLUDE EROSION PROTECTION)
-  COMPLETED EROSION CONTROL WORK
-  CURRENT EROSION AREAS
-  APPROXIMATE CORRIDOR BOUNDARY

2000 0 2000 4000 feet



EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.

PHOTOS TAKEN 21 APR 1978
DISCHARGE - 30,000 cfs

MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980

2000 0 2000 4000 6000 8000 feet

EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.



-  EXISTING RECREATION OR PUBLIC USE AREA
-  POTENTIAL RECREATION DEVELOPMENT
-  SCENIC AREA
-  POTENTIAL PUBLIC USE AREA (ISLAND AREAS MAY INCLUDE EROSION PROTECTION)
-  COMPLETED EROSION CONTROL WORK
-  CURRENT EROSION AREAS
-  APPROXIMATE CORRIDOR BOUNDARY

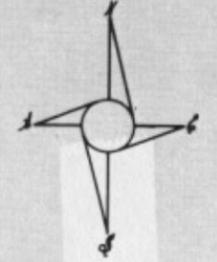
PHOTOS TAKEN 21 APR 1978
DISCHARGE = 30,000 cfs

MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980



-  EXISTING RECREATION OR PUBLIC USE AREA
-  POTENTIAL RECREATION DEVELOPMENT
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-  APPROXIMATE CORRIDOR BOUNDARY

2000 0 2000 4000 6000 feet



SOUTH DAKOTA DEPARTMENT OF GAME, FISH, AND PARKS

PHOTOS TAKEN 21 APR 1978

DISCHARGE = 30,000 cfs

EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.

MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980



-  POTENTIAL RECREATION DEVELOPMENT
-  SCENIC AREA
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(ISLAND AREAS MAY INCLUDE EROSION PROTECTION)
-  COMPLETED EROSION CONTROL WORK
-  CURRENT EROSION AREAS
-  APPROXIMATE CORRIDOR BOUNDARY

2000 0 2000 4000 6000 8000 feet



PHOTOS TAKEN 21 APR 1978

DISCHARGE - 30,000 cfs

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MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE - 1980



EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.

PHOTOS TAKEN 21 APR 1978

DISCHARGE = 30,000 cfs

MISSOURI NATIONAL RECREATIONAL RIVER
 NEBRASKA AND SOUTH DAKOTA
 GAVINS POINT DAM TO PONCA
 AERIAL MOSAIC
 U.S. ARMY ENGINEER DISTRICT, OMAHA
 CORPS OF ENGINEERS OMAHA, NEBRASKA
 JUNE - 1980



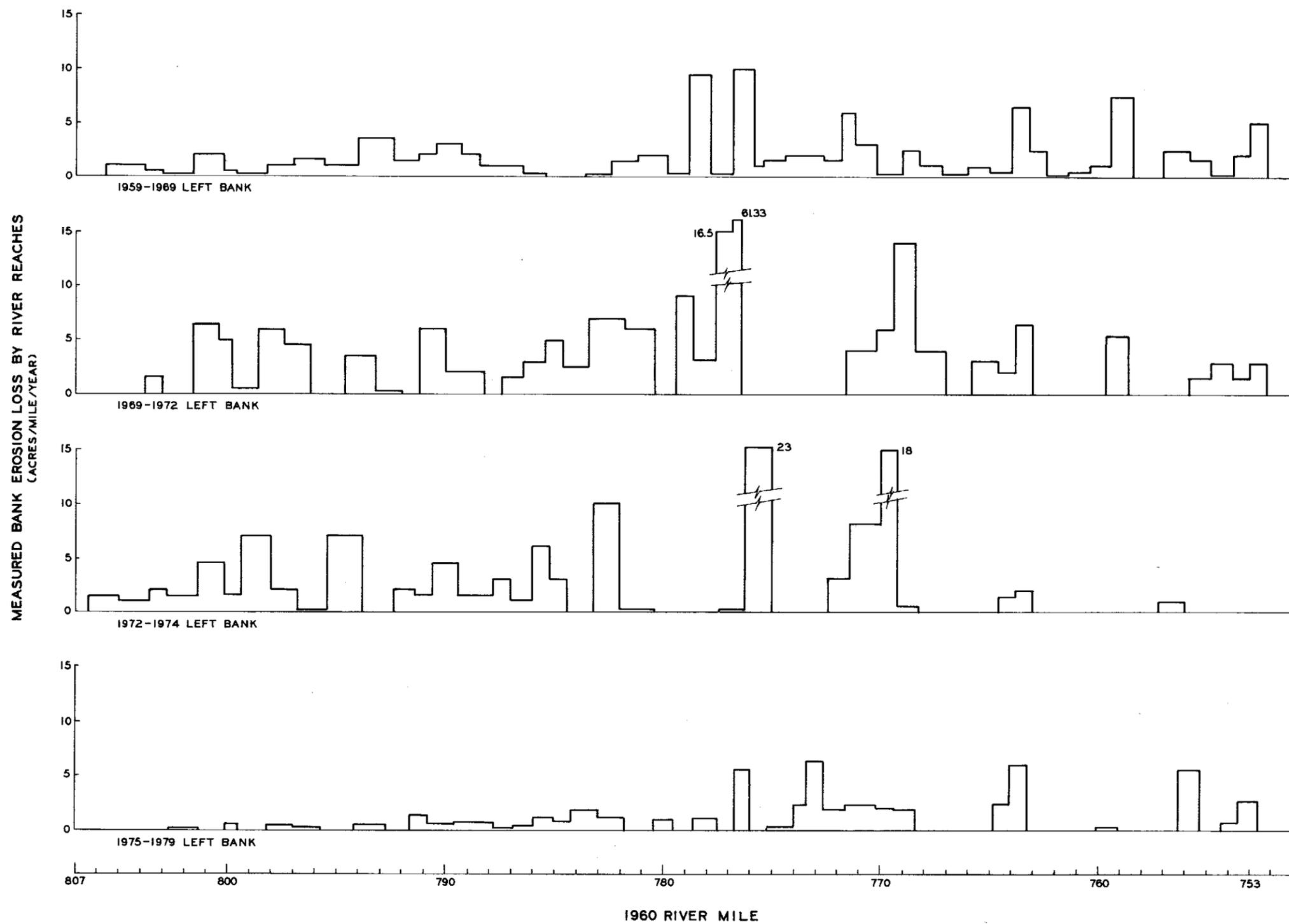
- APPROXIMATE CORRIDOR BOUNDARY
- ▨ EXISTING RECREATION OR PUBLIC USE AREA
- ▤ POTENTIAL RECREATION DEVELOPMENT
- ▧ SCENIC AREA
- ▩ POTENTIAL PUBLIC USE AREA
(ISLAND AREAS MAY INCLUDE EROSION PROTECTION)
- CURRENT EROSION AREAS
- COMPLETED EROSION CONTROL WORK



2000 0 2000 4000 feet

EROSION AREAS ARE BASED ON MAY 1980 EVALUATIONS AND ANALYSES AND ARE SUBJECT TO CHANGE.

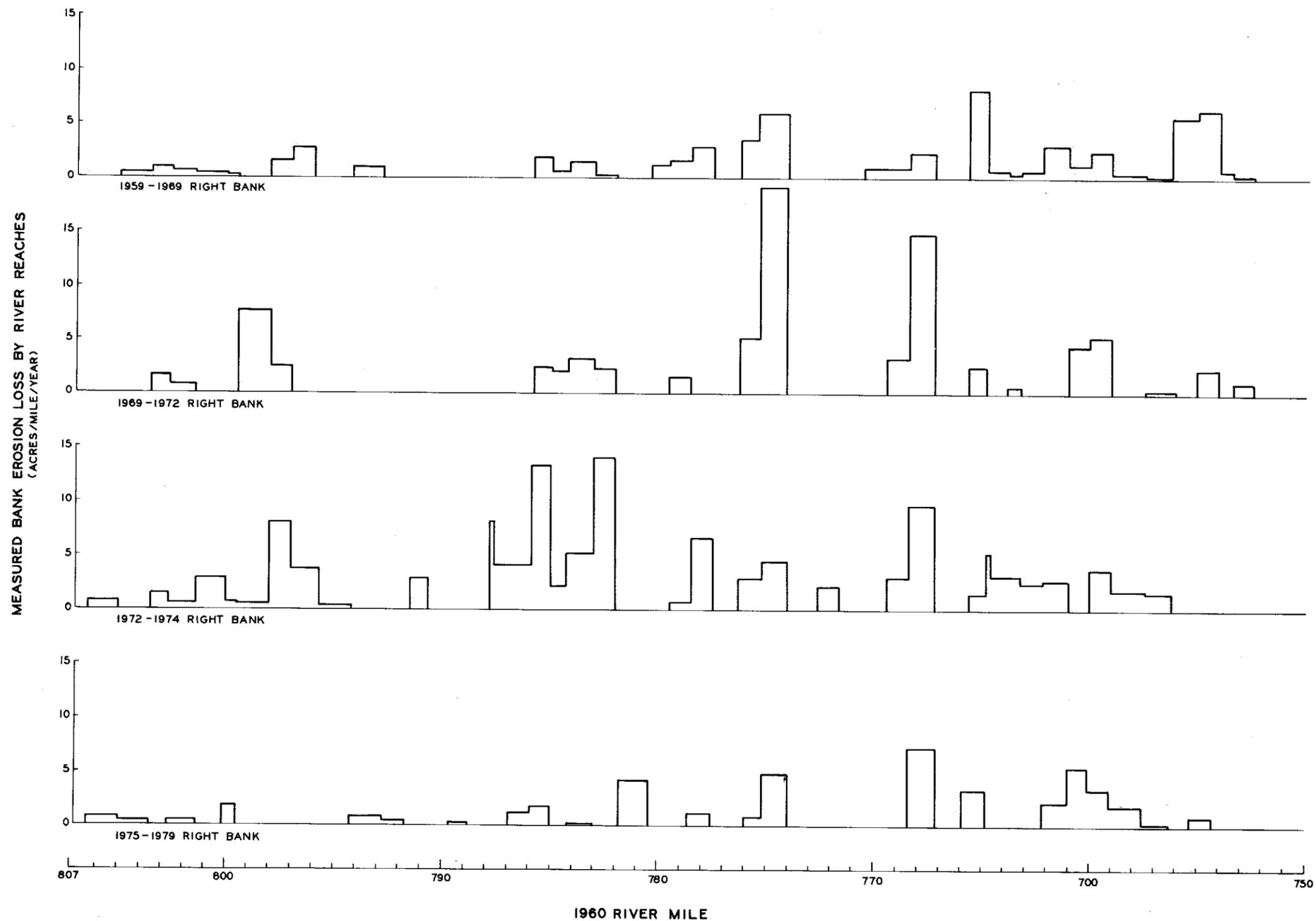
MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
AERIAL MOSAIC
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE-1980



SCALE: VERT. 1 INCH = 4 FEET
 HORIZ. 1 INCH = 2 MILES

THIS DRAWING HAS BEEN REDUCED TO
 THREE-EIGHTHS THE ORIGINAL SCALE.

MISSOURI NATIONAL RECREATIONAL RIVER
 NEBRASKA AND SOUTH DAKOTA
 GAVINS POINT DAM TO PONCA
 BANK EROSION STUDY
 U. S. ARMY ENGINEER DISTRICT, OMAHA
 CORPS OF ENGINEERS OMAHA, NEBRASKA
 JUNE 1980



SCALE: VERT. 1 INCH = 4 FEET
 HORIZ. 1 INCH = 2 MILES

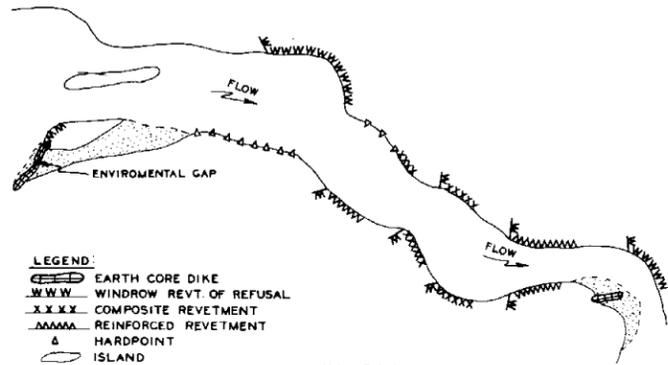
THIS DRAWING HAS BEEN REDUCED TO
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MISSOURI NATIONAL RECREATIONAL RIVER
 NEBRASKA AND SOUTH DAKOTA
 GAVINS POINT DAM TO PONCA
 BANK EROSION STUDY
 U. S. ARMY ENGINEER DISTRICT, OMAHA
 CORPS OF ENGINEERS OMAHA, NEBRASKA
 JUNE 1980

\$\$ - THINK VALUE ENGINEERING - \$\$

GENERAL DESIGN MEMORANDUM NO. MRR-1

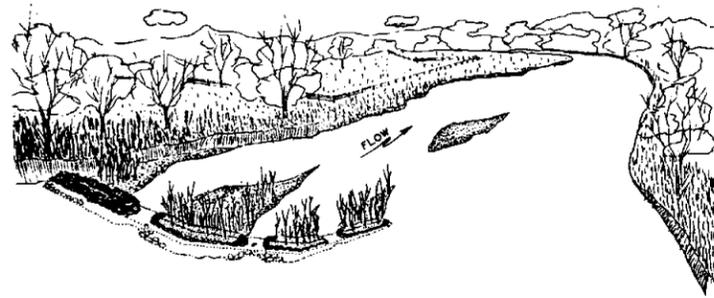
PLATE 12



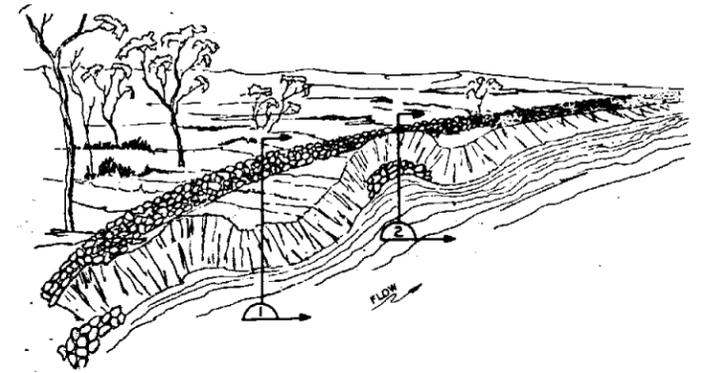
- LEGEND:**
- EARTH CORE DIKE
 - W.W.W. WINDROW REVT. OF REFUSAL
 - XXXXX COMPOSITE REVETMENT
 - AAAAA REINFORCED REVETMENT
 - △ HARDPOINT
 - ISLAND
 - ▭ SANDBAR

Note: This layout represents a typical scheme only and does not propose construction for any particular area.

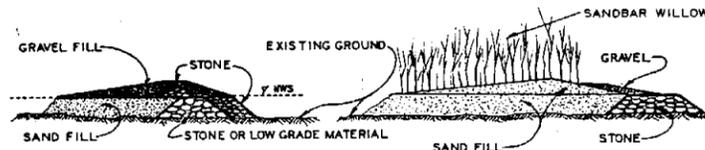
TYPICAL BANK PROTECTION SCHEMES FOR EROSION CONTROL



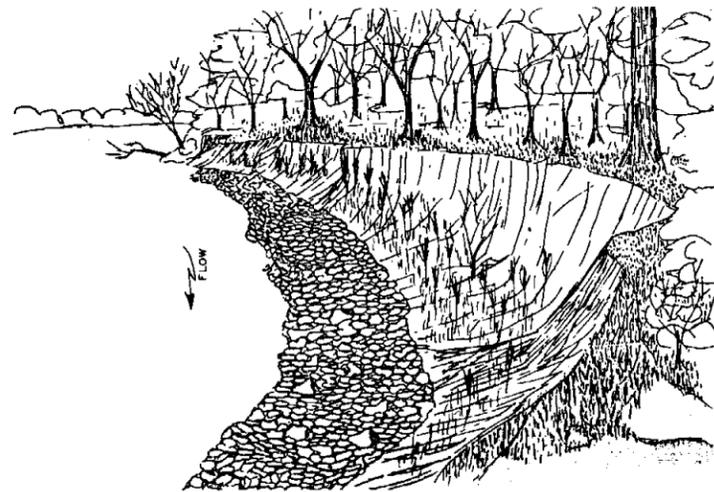
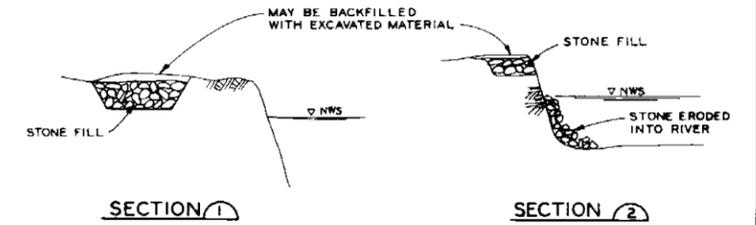
EARTH CORE DIKE



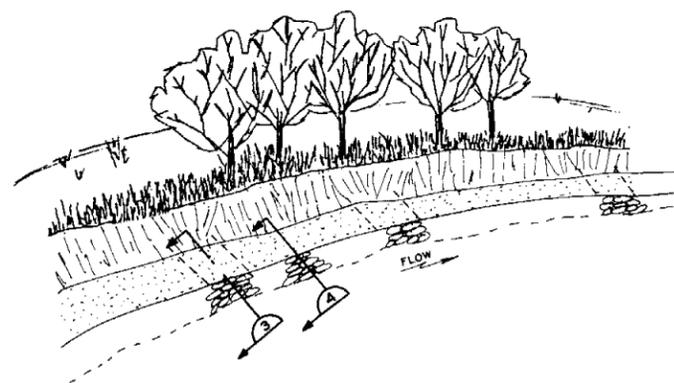
WINDROW REVETMENT



TYPICAL SECTIONS



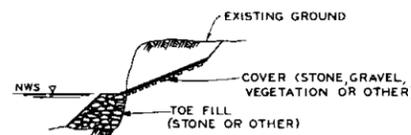
COMPOSITE REVETMENT



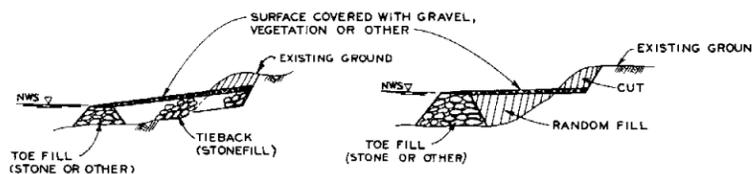
REINFORCED REVETMENT



HARD POINT SYSTEM

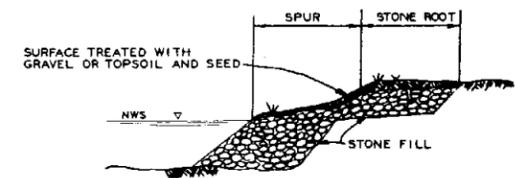


TYPICAL SECTION



SECTION 3

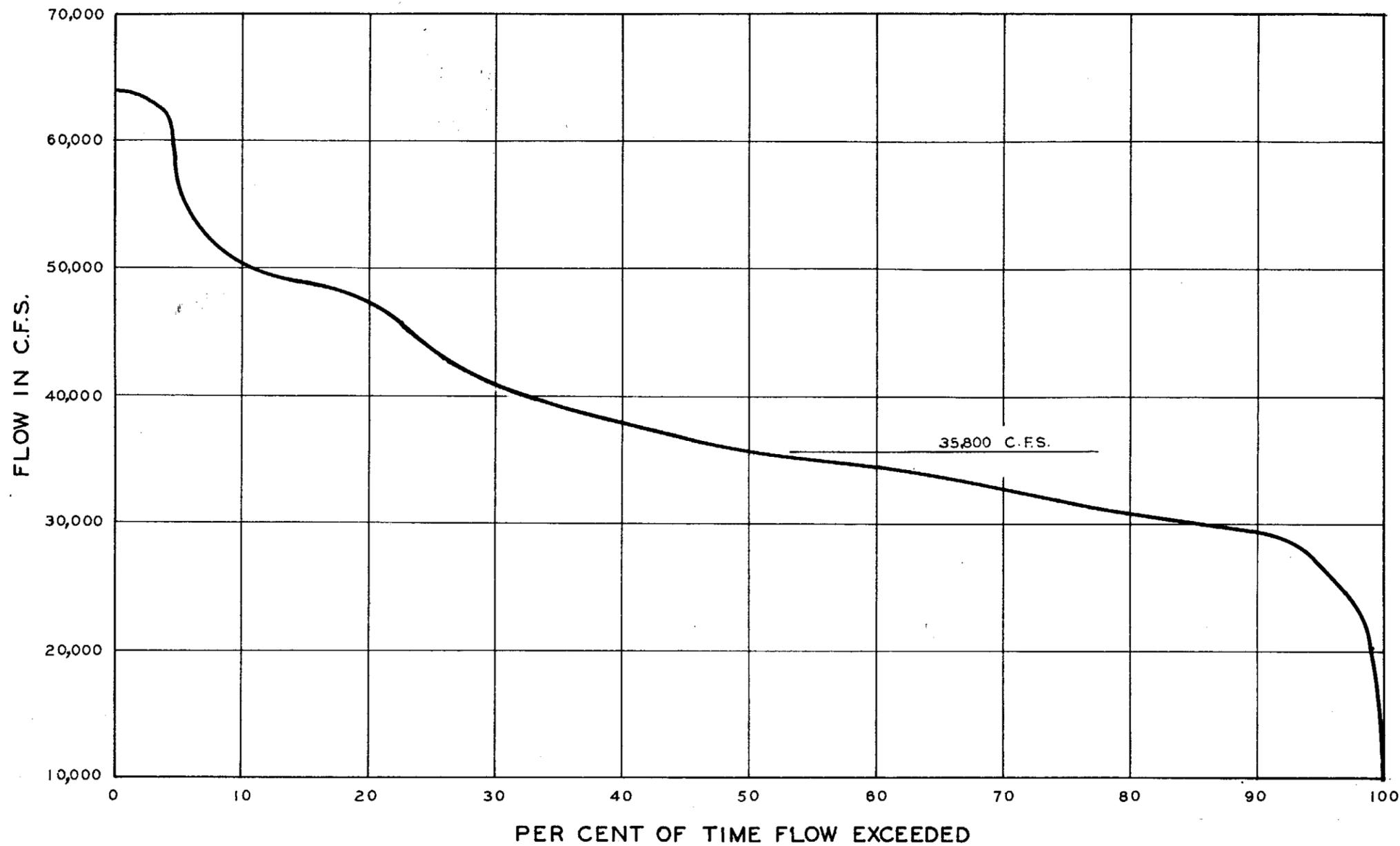
SECTION 4



TYPICAL SECTION

THIS DRAWING HAS BEEN REDUCED TO THREE-EIGHTHS THE ORIGINAL SCALE.

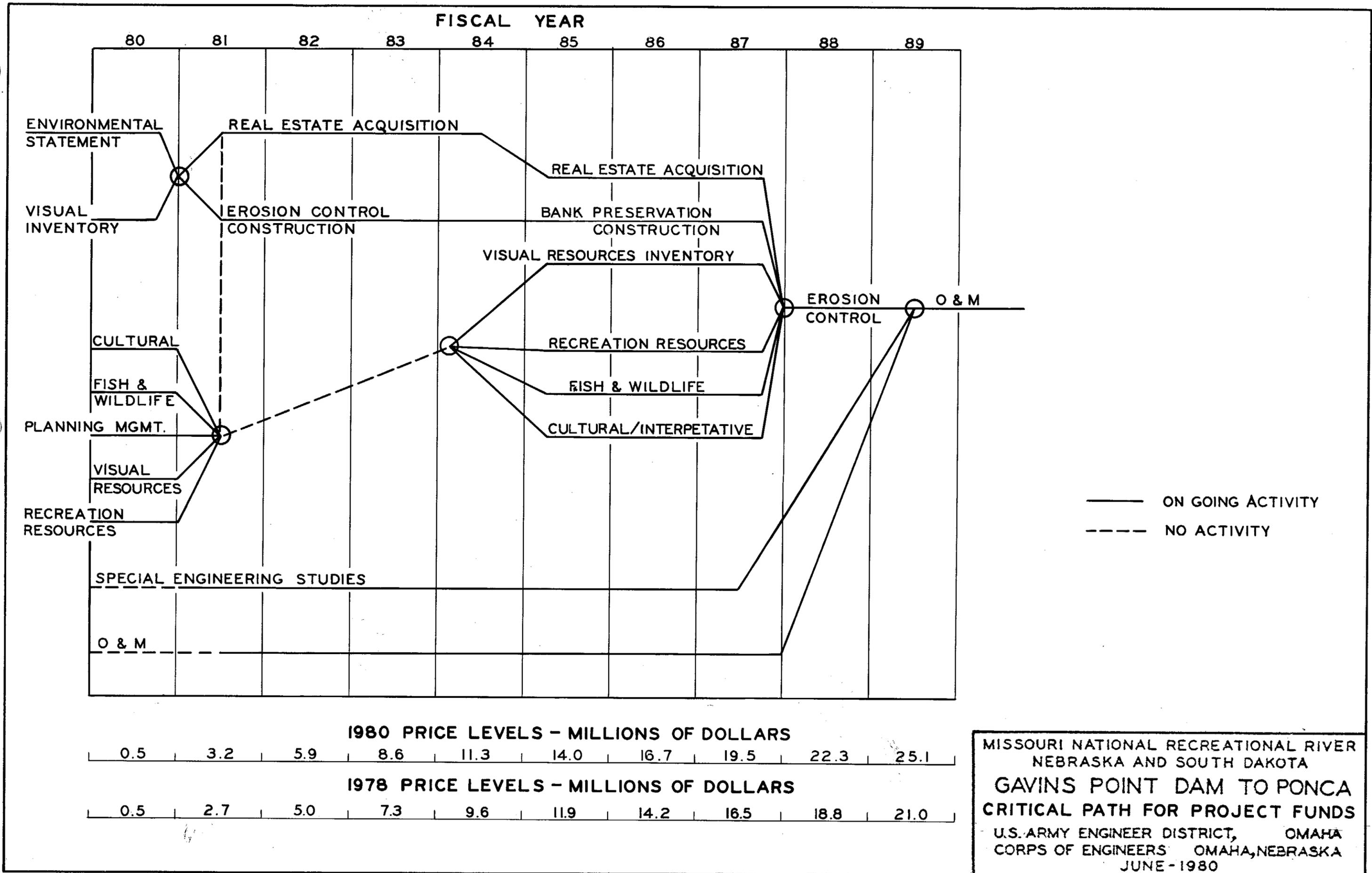
MISSOURI NATIONAL RECREATIONAL RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
TYPICAL BANK PROTECTION SCHEMES
U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1960



MIN. DAILY Q - 6,000 C.F.S.
 MAX. DAILY Q - 63,400 C.F.S.
 AVERAGE Q - 38,209 C.F.S.

THIS GRAPH IS BASED ON MISSOURI RIVER
 DATA AT YANKTON, SOUTH DAKOTA FOR
 THE PERIOD APRIL 1 THROUGH OCTOBER
 31 OF EACH YEAR 1967 THROUGH 1976.

MISSOURI NATIONAL RECREATIONAL RIVER
 NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA
FLOW DURATION CURVE
 U.S. ARMY ENGINEER DISTRICT, OMAHA
 CORPS OF ENGINEERS OMAHA, NEBRASKA
 JUNE - 1980



FISCAL YEAR

80 81 82 83 84 85 86 87 88 89

ENVIRONMENTAL STATEMENT

REAL ESTATE ACQUISITION

REAL ESTATE ACQUISITION

VISUAL INVENTORY

EROSION CONTROL CONSTRUCTION

BANK PRESERVATION CONSTRUCTION

VISUAL RESOURCES INVENTORY

EROSION CONTROL

O & M

CULTURAL

RECREATION RESOURCES

FISH & WILDLIFE

FISH & WILDLIFE

PLANNING MGMT.

CULTURAL/INTERPETATIVE

VISUAL RESOURCES

RECREATION RESOURCES

SPECIAL ENGINEERING STUDIES

O & M

— ON GOING ACTIVITY
 - - - NO ACTIVITY

1980 PRICE LEVELS - MILLIONS OF DOLLARS

0.5 3.2 5.9 8.6 11.3 14.0 16.7 19.5 22.3 25.1

1978 PRICE LEVELS - MILLIONS OF DOLLARS

0.5 2.7 5.0 7.3 9.6 11.9 14.2 16.5 18.8 21.0

MISSOURI NATIONAL RECREATIONAL RIVER
 NEBRASKA AND SOUTH DAKOTA

GAVINS POINT DAM TO PONCA
 CRITICAL PATH FOR PROJECT FUNDS

U.S. ARMY ENGINEER DISTRICT, OMAHA
 CORPS OF ENGINEERS OMAHA, NEBRASKA
 JUNE - 1980