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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POST-CONSTRUCTION PERFORMANCE EVALUATION
REPORT SUPPLEMENT (PERS1)

MONKEY CHUTE HABITAT REHABILITATION
AND ENHANCEMENT PROJECT

POOL 21, RIVER MILE 325
MARION COUNTY, MISSOURI

APRIL 1998

ACKNOWLEDGMENT

Many individuals of the Rock Island District of the U.S. Army Corps of Engineers; the U.S. Fish and Wildlife Service; the Missouri Department of Conservation; and the Illinois Department of Natural Resources contributed to the development of this Supplemental Post-Construction Performance Evaluation Report for the Monkey Chute Habitat Rehabilitation and Enhancement Project. These individuals are listed below:

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TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (Continued)

Section **Page**

List of Figures

List of Plates

No. **Title**

List of Appendices

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POST-CONSTRUCTION PERFORMANCE EVALUATION
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1. INTRODUCTION

The Monkey Chute Habitat Rehabilitation and Enhancement Project, hereafter referred to as the "Monkey Chute project," is an ongoing part of the Upper Mississippi River System (UMRS) Environmental Management Program (EMP). The Monkey Chute project land is owned by the U.S. Army Corps of Engineers (Corps) and is located in Marion County, just upstream of Lock and Dam 21. The project is administered by Missouri Department of Conservation (MDOC) through a Cooperative Agreement between the Corps and the U.S. Fish and Wildlife Service (USFWS). Plate 1 contains the site plan and vicinity map.

a. Purpose. The purposes of this report are as follows:

(1) Supplement monitoring results and project operation and maintenance discussed in the March 1995 Post-Construction Evaluation Report;

(2) Summarize the performance of the Monkey Chute project based on the project goals and objectives;

(3) Review the monitoring plan for possible revisions;

(4) Summarize project operation and maintenance efforts to date; and

(5) Review engineering performance criteria to aid in design of future projects.

b. Scope. This report summarizes all available monitoring data, project inspections, and project observations made by the Corps, the USFWS, and the MDOC for the period November 1989 through September 1997.

2. PROJECT GOALS, OBJECTIVES, AND MANAGEMENT PLAN

a. General. As stated in the DPR, the Monkey Chute project was initiated primarily because sedimentation in the lower end of Monkey Chute was becoming acute. In severe cases when Pool 21 water levels were below normal, sediment deposits prevented access to the chute. The sediment deposits isolated the chute from the river, resulting in stranded fish and stagnant water.

b. Goals and Objectives. The Monkey Chute project was the first project designed and constructed by the Rock Island District under the EMP. The goal of this project was to restore access to otherwise vanishing Upper Mississippi River backwater habitat. The project objectives were to encourage the flow of oxygen-rich main channel water into the backwater areas and retain 88 acres of backwater lake as year-round fish habitat.

c. Management Plan. A formalized management plan is not required for this project.

3. PROJECT DESCRIPTION

a. Project Features. The constructed project consisted of hydraulically dredging a channel 600 feet long by 30 feet wide to a depth of 6 feet below flat pool, and placing dredged material in an in-water confined placement site. A silt retaining fence was constructed approximately 200 feet upstream of an existing berm to hold the dredged material in place (see Figure 3-1 and plate 1).

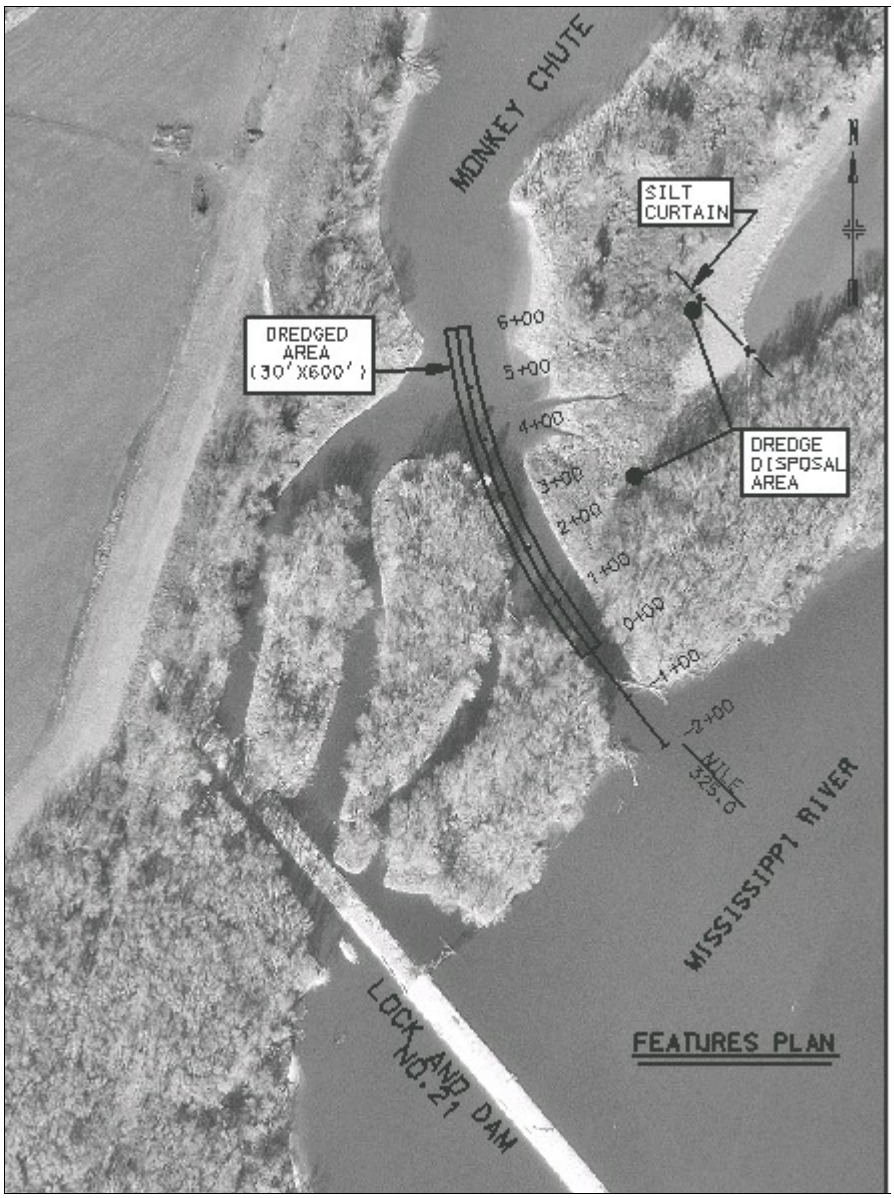

FIGURE 3-1. Project Features.

b. Construction and Operation. Dredging began during the late summer of 1988 and was essentially complete in June 1989. The contractor experienced a dredging problem when the remains of a regulating structure (wing dam) were discovered within the project limits. The contractor did not have the equipment to remove the structure. The Rock Island District Channel Maintenance crew removed the structure (within the 30-foot-wide project limits) with their derrick barge. During placement of dredged material in the in-water dredged material placement site, the silt fence was subjected to periods of a maximum head differential of 2 feet. The silt fence performed satisfactorily under this condition. The silt retaining fence was left in place to reduce the amount of dredged material re-entering the Monkey Chute backwater. The project requires no operational activities.

4. OPERATION, MAINTENANCE, AND PROJECT MONITORING

a. General. Because this project has no operational requirements, an Operation and Maintenance Manual was not prepared.

Appendix A presents the Monitoring and Performance Evaluation Matrix and Resource Monitoring and Data Collection Summary. The schedule presents the types and frequency of data that have been collected to assess project performance.

b. Corps of Engineers. The Corps has collected bathymetric data profiling the excavated channel. No post-construction water quality data has been collected for this project.

The relative success of the project compared to original project objectives will be measured using this data along with other data, field observations, and project inspections performed by the MDOC. The Corps has overall responsibility to measure and document project performance. The physical locations of the sampling stations referenced on the Resource Monitoring and Data Collection Summary are presented on plate 1 and Figure 4-1.

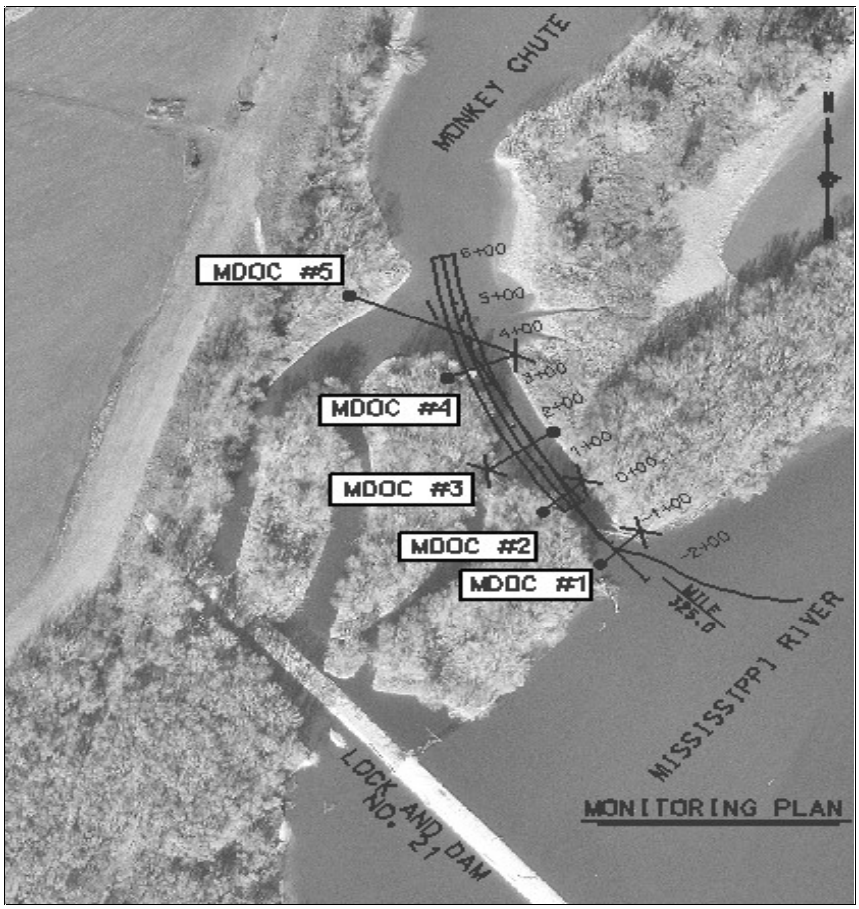

FIGURE 4-1. Monkey Chute Monitoring Plan.

c. U.S. Fish and Wildlife Service. The USFWS has not conducted any post-construction monitoring.

d. Missouri Department of Conservation. The MDOC has collected sediment transect data on an annual basis and, beginning in 1997, on a semi-annual basis since project completion. The transect locations are shown in Figure 4-1 and on plate 1. The MDOC sediment transect data are shown on plates 2 and 3. The MDOC has also conducted fish sampling for largemouth bass (with the Illinois Department of Natural Resources) and paddlefish.

5. EVALUATION OF PROJECT OBJECTIVES

a. Encourage the Flow of Oxygen-Rich Main Channel Water into Monkey Chute Backwater Areas and Retain Year-Round Access to 88 Acres of Backwater Lake.

(1) Monitoring Results. Channel depths are more or less the same as previous surveys, ranging from 4 feet to 11 feet below flat pool (elevation 470 feet NGVD 1912). The MDOC commented that trees marked as boundary posts apparently fell in the river soon after the project was completed (see Appendix B). The MDOC notes that there continues to be movement at both the upstream and downstream sides of the mouth. This is evident in the lateral movement of the channel at MDOC transect 1.

The MDOC 1995 monitoring efforts noted a deep hole (maximum depth of 12 feet) between MDOC transects 4 and 5. The MDOC had purchased a new 3-D depth finder in 1995 and wanted to see if fish were using the project area. The depth finder identified the hole, which MDOC subsequently verified with manual measurements. Because the hole does not fall along one of the transects, its presence was not detected prior to this time. The 1995 MDOC transect 5 appears to encompass a portion of this hole. The MDOC 1997 monitoring efforts indicate that the hole has increased both in size and in depth from 1995 to 1997.

The MDOC also notes that flow patterns in Monkey Chute vary with opening and closing of the gates at Lock and Dam 21. When the gates are closed and flow is limited, water backs up into the chute. When the gates are open, flow is drawn from the chute.

The backwater area includes several deep holes in excess of 10 feet deep. MDOC staff inquiries as to the history of the deep holes indicate that the Monkey Chute backwater area was used as a borrow source for construction of the Fabius Drainage District levee.

MDOC staff micro-tagged paddlefish in Monkey Chute as part of the Mississippi Interstate Cooperative Resource Agreement paddlefish program. The four paddlefish tagged ranged in size from 19.5 to 22.0 inches (eye to fork measurement) and ranged in weight from 4 to 7 pounds. The Illinois Department of Natural Resources (IL DNR), in cooperation with the MDOC, sampled largemouth bass in Monkey Chute in 1996 and 1997. Sampling results can be found in Appendix C. The MDOC and IL DNR fisheries biologists noted that a rather small number of bass were present in September 1996. Data collected in Monkey Chute in July 1997 was combined with other sites in Pool 21. The combined 1997 data included a larger number of small fish (age 0) and few larger fish.

(2) Conclusions. With the exception of the mouth (MDOC transect 1) and MDOC transect 5, the channel cross sections indicate that the dredge cut has stabilized. The dredged channel is providing a source of main channel flow to the backwater area, and present channel depths are providing year-round access for fish. No fish kills have been

reported, indicating that sufficient dissolved oxygen is available in the backwater during the winter months. The deep holes provide depth diversity as well as fish and boater access.

The continued movement at MDOC transect 1 indicates that the channel side slopes have not stabilized in this vicinity. Debris and eddy currents during high flows and the proximity of the spillway at Lock and Dam 21 may also be contributing factors. The shallower area between transects 3 and 4 may be due to the remnant wing dam.

The MDOC discussed possible reasons for the existence and expansion of the deep hole in a December memo (see Appendix B). One possibility for the existence of the hole was that it was created during project construction or was a borrow source for construction of the Fabius Drainage District levee. Another possible reason for the hole and its apparent movement may be that the hole filled with loose sediment after dredging, which was subsequently flushed during recent high water events (1993, 1995, and 1997). Water flowing across the dredged material placement site during high flow may be creating turbulent water as it meets with water from the main portion of the project area. Finally, the dredged channel may have been close enough to an existing deep hole that the side slopes on the deep hole failed, resulting in its subsequent enlargement.

The MDOC should continue biennial monitoring of the transects. Continued monitoring will help determine the dynamics of the deep hole at MDOC transect 5. The Corps will profile the channel and deep hole area following the 1998 high water period. If monitoring efforts note continued movement of the deep hole, the Corps will initiate a hydraulic model study.

Based on the results of the largemouth bass sampling effort, fisheries biologists are concerned by the low numbers of fish. Local anglers state that the area is fished heavily during fishing tournaments and they believe that there has been large-scale removal of harvestable fish. However, overfishing would not explain the low numbers of smaller fish in 1996. The low numbers of smaller fish may be the result of poor year class recruitment that occurred in 1995 and 1996. More data are needed to determine if overfishing is a problem. Sampling efforts should continue as scheduled.

b. Other.

(1) Monitoring Results. All vegetation growing on the dredged material is voluntary and consists of cottonwood, silver maple, box elder, mulberry, sandbar willow, black willow, and herbaceous vegetation.

(2) Conclusions. Vegetation growing on the dredged material provides marginal benefits to wildlife; however, it may be acting as a filter during high water events, reducing sediment deposition in the project area.

6. OPERATION AND MAINTENANCE SUMMARY

a. Operation. The project has no operational requirements.

b. Maintenance.

(1) Inspection. The MDOC inspects the Monkey Chute project on an annual basis. Other project inspections are scheduled following high water events.

(2) Maintenance Based on Inspections. No maintenance has been performed on this project.

7. CONCLUSIONS AND RECOMMENDATIONS

a. Project Goals, Objectives, and Management Plan. Based on data and observations collected since project completion, the goals and objectives are being met. The channel appears to have stabilized, except at the mouth and near transect 5. Present depths allow for flow of oxygen-rich main channel water and provide year-round access to the backwater lake. The vegetation growing on the dredged material provides only marginal benefits to wildlife, but it may be acting as a filter during high water events and reducing sediment deposition in the project area. The project sponsor is very pleased with the performance of this project.

b. Post-Construction Evaluation and Monitoring Schedules. In general, monitoring efforts have been performed according to the Post-Construction Evaluation Plan and the Resource Monitoring and Data Collection Summary in Appendix A. The next Post-Construction Performance Evaluation will be completed in 1999 after 10 years of data collection. Continued monitoring will help to determine the dynamics of the deep hole at MDOC transect 5. The Corps will profile the channel and deep hole area following the 1998 high water period. If monitoring efforts note continued movement of the deep hole, the Corps will initiate a hydraulic model study.

c. Project Operation and Maintenance. There are no operational requirements attached to this project.

A P P E N D I X A

POST-CONSTRUCTION EVALUATION PLAN

TABLE A-1

MONITORING AND PERFORMANCE EVALUATION MATRIX

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Sedimentation Problem Analysis	System-wide problem definition. Evaluates planning assumptions.	USGS	USGS (EMTC)	LTRMP	--
	Pre-Project Monitoring	Identifies and defines problems at HREP site. Establish need of proposed project features.	Sponsor Corps	Sponsor	Sponsor	--
	Baseline Monitoring	Establishes baselines for performance evaluation.		Field Station or Sponsor thru Cooperative Agreements or Corps	HREP/-Sponsor	--
Design	Data Collection for Design	Includes quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	--
Construction	Construction Monitoring	Assess construction impacts; assures permit conditions are met.	Corps	Corps	HREP	See State Section 401 Stipulations
Post-Construction	Performance Evaluation Monitoring	Determine success of project as related to objectives.	Corps (quantitative) Sponsor (field observations)	Field Station or Sponsor thru Cooperative Agreement, Sponsor thru O&M, or Corps	HREP/-Sponsor	See Table A-2

TABLE A-2

RESOURCE MONITORING AND DATA COLLECTION SUMMARY

Type Measurement	Water Quality Data						Engineering Data			Natural Resource Data			Sampling Agency	Rema
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar								
INT MEASUREMENTS														
Stations [1/] ectrofishing										1		1Y	MDOC/ILDNR	
NSECT ASUREMENTS														
imentation Transects [2/] drographic Soundings							1/1		5/2Y				Corps/MDOC	
EA MEASUREMENTS														
pping [3/] getative Response												1	Corps	
rial Photography/ mote Sensing										1		3	Corps	

end

Y = Yearly
Y = n-Year Interval
,3 = Number of times data was collected within designated project phase

TABLE A-2 (Cont'd)

[1/] Fish Stations (Pre-Design Phase)

MDOC
Electrofishing surveys, 1983, 1984, 1996, 1997

[2/] Sedimentation Channel Profiles and Transects (Pre- and Post-Construction Phase)

Corps (Channel Profiles)
1986
1988
1989
1993
1994
1997

MDOC (Transects)
1
2
3
4
5

[3/] Mapping (Pre- and Post-Construction Phase)

1984 Aerial Photography
1989 Aerial Photography
1993 Aerial Photography
1994 Aerial Photography
1995 Black and White Aerial Photography
1996 Color Oblique Aerial Photography

A P P E N D I X B

COOPERATING AGENCY CORRESPONDENCE

A P P E N D I X C

MDOC POST-CONSTRUCTION DATA

Monkey Chute Period 60 minutes 25 September 1996*			
	Number	**Length, mm**	
Largemouth bass	1	460's	
Largemouth bass	1	410's	
Largemouth bass	1	380's	
Largemouth bass	1	370's	Hook injury
Largemouth bass	1	350's	
Largemouth bass	3	330's	Hook injury - 1
Largemouth bass	2	320's	
Largemouth bass	1	310's	
Largemouth bass	2	300's	
Largemouth bass	1	290's	
Largemouth bass	1	280's	
Largemouth bass	1	270's	Hook injury
Largemouth bass	1	260's	
Largemouth bass	1	210's	
Largemouth bass	1	130's	
Largemouth bass	1	120's	
Largemouth bass	4	110's	
Largemouth bass	2	100's	
Largemouth bass	4	80's	
Largemouth bass	1	70's	

* Sampling conducted by the Illinois Department of Natural Resources and the Missouri Department of Conservation.

Combined Pool 21* Largemouth Bass Length Frequency Data – 1997** Period 200 minutes total 15 July 1997		
	Number	**Length (mm)**
Largemouth bass	38	<110 (Age 0)
Largemouth bass	19	110-300
Largemouth bass	6	>300

* Combined Pool 21 data includes sampling in Monkey Chute (60 minutes of sampling effort), Cottonwood Island (90 minutes), Quincy Bay (40 minutes), and dike fields (10 minutes).

** Sampling conducted by the Illinois Department of Natural Resources and the Missouri Department of Conservation.

Paddlefish Tagging
by Missouri Department of Conservation
22 May 1997

	Length (inches)*	Weight (lbs.)
Cottonwood Chute	27.0 18.5 23.5 18.5 22.5 16.0 19.0 20.0	12 -- 7 3 5 -- -- --
Monkey Chute	22.0 20.5 19.5 19.5	7 5 4 4

* Length is eye to fork.

A P P E N D I X D

REFERENCES

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PLATES

REFERENCES

Published reports which relate to the Monkey Chute Habitat Rehabilitation and Enhancement EMP Project or which were used as references in production of this document are presented below.

(1) *Definite Project Report (R1), Monkey Chute Restoration Project, Pool 21, Upper Mississippi River, Marion County, Missouri*, February 1987. The Definite Project Report (DPR) presented a proposal to dredge the downstream end of Monkey Chute to retain 88 acres of backwater lake as year-round fish habitat and maintain its suitability for waterfowl and furbearers. The report marked the conclusion of the planning process and serves as a basis for approval of the preparation of final plans and specifications and subsequent project construction.

(2) *Monkey Chute Dredging, Mississippi River, Marion County, Missouri*, Plans and Specifications, September 1987 and June 1988. These documents were prepared to provide sufficient detail of project features to allow construction of the project by a contractor. At the request of the contractor, the first contract was terminated. The second contract was awarded 15 July 1988. Work was 100 percent completed on 5 May 1989.

(3) *Monkey Chute Habitat Rehabilitation and Enhancement Project, Great Flood of 93 Damage Assessment*, March 1994. This report was prepared to provide a summary describing the damage, proposed corrective actions, and estimated cost for repairs to Flood of 1993 damage.

(4) *Monkey Chute Restoration Project, Post-Construction Performance Evaluation Report*, March 1995. This document was prepared to summarize all available monitoring data, project inspections, and project observations by the Corps and the MDOC for the period November 1988 through March 1994.