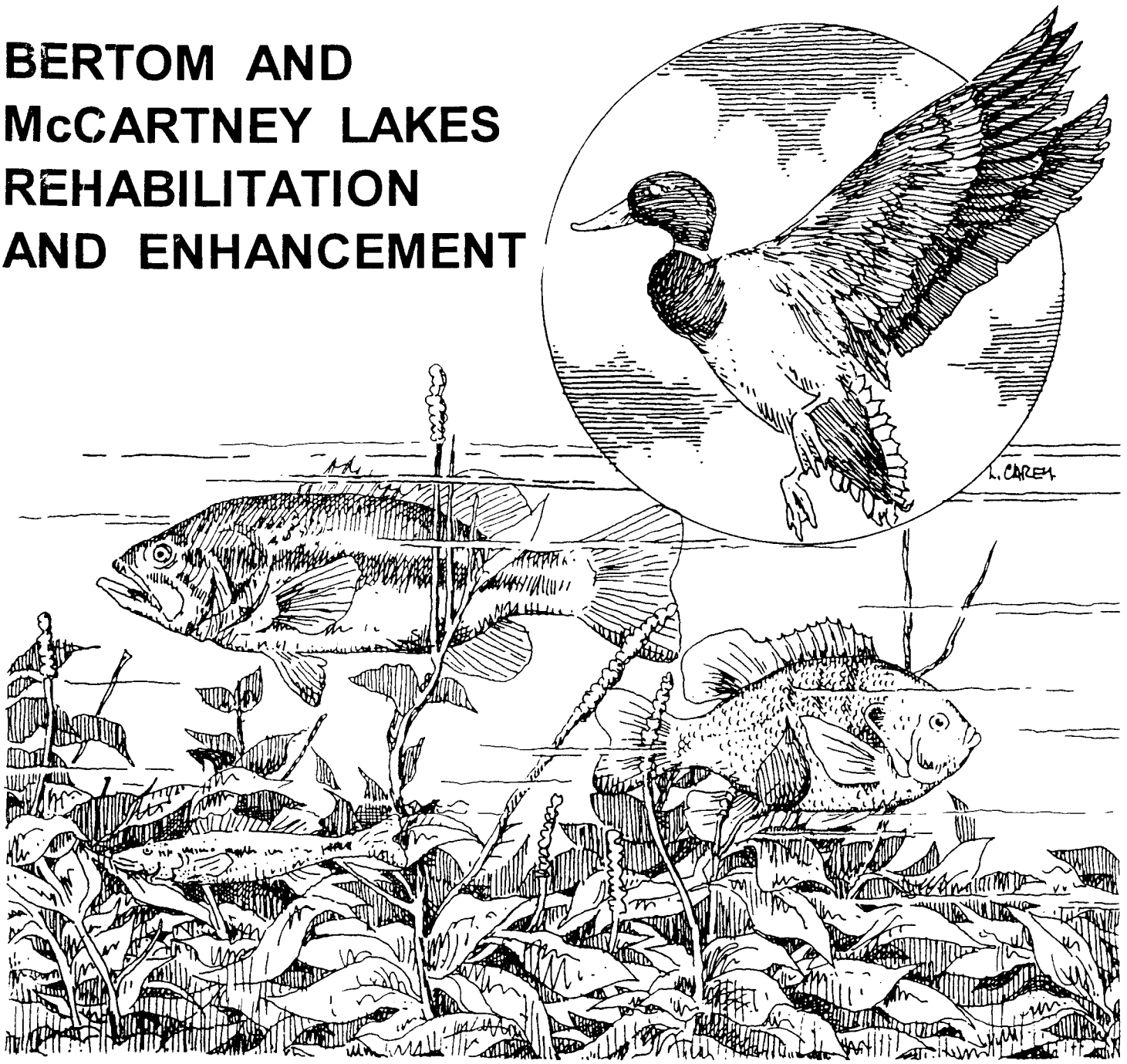
Kimler (pls. return)

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POST-CONSTRUCTION PERFORMANCE
EVALUATION REPORT (PER3F)

BERTOM AND McCARTNEY LAKES REHABILITATION AND ENHANCEMENT



MAY 1995

US Army Corps
of Engineers
Rock [illegible] District

POOL 11
UPPER MISSISSIPPI RIVER
MILE 599-603
GRANT COUNTY, WISCONSIN

ED-

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO ATTENTION OF:

May 22, 1995

Planning Division

SEE REPORT DISTRIBUTION LIST (APPENDIX E)

The Rock Island District of the U.S. Army Corps of Engineers has enclosed the final Performance Evaluation Report for the Bertom and McCartney Lakes, Wisconsin, Habitat Rehabilitation and Enhancement Project (HREP), as part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

Performance Evaluation Reports such as this one are the primary vehicle for communicating project effectiveness and will be the basis for assessing the overall success or failure of the UMRS-EMP's HREP element.

The Bertom and McCartney Lakes HREP project included constructing a barrier island from dredged material; dredging of approximately 400,000 cubic yards of material from side channels and sloughs adjacent to McCartney Lake; lining 1,500 feet of a side channel with rock of varying sizes, gradations and type; installing fish cover structures in the rock lined side channel; and constructing an underwater rock partial closing structure. The project's construction contract was awarded in January 1990 and construction was completed in June 1992.

This report has been coordinated with the U.S. Fish and Wildlife Service, the Environmental Management Technical Center, and the Wisconsin Department of Natural Resources. The report was reviewed by program management and technical staff at the Corps of Engineers' North Central Division prior to this distribution. A Performance Evaluation Supplement will be prepared annually, consistent with the scheduled resource monitoring and data collection activities portrayed in Table B-1 of the subject report.

Should you have any questions regarding this correspondence, please call Mr. Darron Niles of our Waterway Systems Branch, telephone 309/794-5400, or write to our address above, ATTN: Planning Division.

The following is a list of the Performance Evaluation Report Development team members from Planning Division (PD) and Engineering Division (ED). The telephone number is 309/794-XXXX (number as shown in list):

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Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

UPPER MISSISSIPPI RIVER SYSTEM
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POST-CONSTRUCTION PERFORMANCE EVALUATION

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POOL 11, RIVER MILES 599-603
GRANT COUNTY, WISCONSIN

MAY 1995

ACKNOWLEDGMENT

Many individuals of the Rock Island District, Corps of Engineers, the U.S. Fish and Wildlife Service, and the Wisconsin Department of Natural Resources contributed to the development of this first Post-Construction Evaluation Report for the Bertom and McCartney Lakes Rehabilitation and Enhancement Project. These individuals are listed below:

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UPPER MISSISSIPPI RIVER SYSTEM
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BERTOM AND McCARTNEY LAKES REHABILITATION AND ENHANCEMENT

POOL 11, RIVER MILES 599-603
GRANT COUNTY, WISCONSIN

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BERTOM AND McCARTNEY LAKES REHABILITATION AND ENHANCEMENT

POOL 11, MISSISSIPPI RIVER MILES 599-603
GRANT COUNTY, WISCONSIN

1. INTRODUCTION

a. Purpose

The purposes of this report are as follows:

(1) Summarize the performance of the Bertom and McCartney Lakes EMP project based on the project goals and objectives;

(2) Review the monitoring plan for possible revisions;

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

(4) 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 Rock Island District, U.S. Army Corps of Engineers (CENCR), the U.S. Fish and Wildlife Service (USFWS), and the Wisconsin Department of Natural Resources (WDNR) since project completion in fall 1991 through August 1994. This report also includes monitoring data from the pre-project, construction, and post-construction phases of the project.

c. Project Authorities and Construction Documents

Published reports which relate to the Bertom and McCartney Lakes EMP project or which were used as references in production of this document are presented below.

(1) "Definite Project Report with Integrated Environmental Assessment, Bertom and McCartney Lakes Rehabilitation and Enhancement," June 1989.

This presents a detailed proposal for the rehabilitation and enhancement of Bertom and McCartney Lakes. The report marks 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) "Plans and Specifications, Upper Mississippi River System, Environmental Management Program, Pool 11, River Miles 599-603, Bertom and McCartney Lakes," October 1989.

This document was prepared to provide sufficient detail of project features to allow construction of the project by a contractor.

(3) "Draft Operation and Maintenance Manual, Bertom and McCartney Lakes Rehabilitation and Enhancement," November 1990.

This manual has been prepared to serve as a guide for the operation and maintenance of the Bertom and McCartney Lakes Rehabilitation and Enhancement project. Operation and maintenance instructions for major features of the project are presented. These instructions are consistent with the general procedures presented in the Definite Project Report. This manual has been written for project and management personnel who are familiar with the project and does not contain detailed information which is common to site personnel or which is presented in other existing manuals or regulations.

(4) "Bertom and McCartney Lakes Habitat Rehabilitation and Enhancement Project Great Flood of 93 Damage Assessment," February 1994.

This report has been prepared to provide a summary describing the damage, proposed corrective actions, and estimated cost for repairs to Flood of 1993 damage.

2. PROJECT GOALS, OBJECTIVES, AND MANAGEMENT PLAN

a. General

As stated in the Corps of Engineers' Definite Project Report, dated June 1989, the Bertom and McCartney Lakes EMP project was initiated primarily because sedimentation was occurring in this backwater complex due to normal fluvial processes of the river and erosion from adjacent upland drainage systems. Sedimentation has rapidly decreased the extent and diversity of aquatic habitat in the project area. Physical changes such as shoaling and substrate burial have combined with resultant turbidity and temperature elevations to produce less than optimal conditions for aquatic life.

Three problems were identified in the project areas affected by sedimentation: (1) winter oxygen demands brought on by decaying vegetation and low light conditions in shallow protected areas and low velocity habitats created fish kill situations; (2) wind and wave action on unprotected shoals resulted in sedimentation resuspension and turbidity which, in turn, prevented light penetration and establishment of aquatic vegetation during the growing season; and (3) fish attracted to the stable temperature of anoxic spring-fed flows were trapped and killed in the spring areas by a combination of shoaling, ice cover, and a lack of inflow and circulation.

b. Goals and Objectives

Goals and objectives were formulated during the project design phase. Table 2-1 provides a summary of project goals and objectives.

TABLE 2-1
Project Goals and Objectives

Goal	Objective	Project Features
Enhance aquatic habitat	Restore deep (6') aquatic habitat volume	Dredging
	Restore lentic-lotic habitat access cross-sectional area	Dredging
	Increase rock substrate aquatic habitat	Rock Habitat Channel
	Establish mussel bed	Rock Habitat Channel
	Reduce movement of bedload sediment into the Bertom Lake	Rock Partial Closing Structure
	Improve dissolved oxygen concentration during critical seasonal stress periods	Dredging
Enhance migratory waterfowl habitat	Establish aquatic vegetation bed	Confined Dredged Material Placement Site

c. Management Plan

There is currently no formalized management plan developed for this Environmental Management Program (EMP) - Habitat Rehabilitation and Enhancement Project (HREP). The project is operated as generally outlined in the Draft Operation and Maintenance manual.

3. PROJECT DESCRIPTION

a. Features

The constructed project includes: (1) a submerged rock partial closing structure to reduce the movement of Mississippi River bedload sediment directly into the Bertom and McCartney Lakes complex; (2) hydraulic dredging of approximately 400,000 cubic yards of fine-grained material from McCartney Lake side channels and sloughs to ensure a minimum water depth of 6 feet throughout the project life. The minimum water depth is 10 feet in the cut area adjacent to the railroad tracks from station 126+00 to 136+00; (3) placement of dredged material in an in-water confined dredged material placement site; and (4) construction of a fish and mussel rock habitat channel to improve aquatic habitat in the inlet channel to Bertom Lake by providing a rock substrate channel bottom and installing fish structures.

The dredging was designed to increase the amount of deep-water habitat and encourage the flow of oxygen-rich main channel water into Bertom and McCartney Lakes.

b. Construction and Operation

Dredging began during the late summer of 1990 and was essentially completed in the fall of 1991. Final inspection was performed after the vegetation at the dredged material placement site was given a growing season to establish itself. This time was given to address concerns that seeding or earth work would be needed in sandy areas to allow sufficient vegetative growth. Adequate vegetation established itself, and this additional work was not needed. Final inspection of project construction was made in the summer of 1992. The project requires no operational activities.

4. OPERATION, MAINTENANCE, AND PROJECT MONITORING

a. General

The Performance Evaluation Plan is presented in Appendix A. This plan was developed during the design phase and serves as a guide to measure and document project performance. The Resource Monitoring and Data Collection Summary is presented in Appendix B. This schedule presents the types and frequency of data that

have been collected to meet the requirements of the Performance Evaluation Plan. A summary of the Resource Monitoring Plan is presented for Bertom Lake on plate 1 and McCartney Lake on plate 2.

b. Corps of Engineers

The Rock Island District, U.S. Army Corps of Engineers (CENCR), as part of the Flood of 1993 Damage Assessment, has collected data at the 4 McCartney Lake dredging transects, the 2 substrate channel transects, and 1 of the 5 Bertom Lake transects as defined in Appendix A, shown on Plates 1 and 2, and summarized in Table B-1 Notes of Appendix B. Four additional sedimentation transects of the dredged channels in McCartney Lake have been performed as part of the post-Flood of 1993 Damage Assessment. These locations are shown on Plates 1 and 2. The CENCR has collected water quality data at 5 stations. The relative success of the project as related to original project objectives will be measured using this data along with other data, field observations, and project inspections performed by the USFWS and the WDNR. The CENCR has overall responsibility to measure and document project performance. The physical locations of the sampling stations referenced on the Performance Evaluation Plan and the Resource Monitoring and Data Collection Schedule are presented on Plates 1 and 2.

c. U.S. Fish and Wildlife Service

The USFWS is responsible for maintaining the Bertom and McCartney Lakes HREP. The USFWS does not have project-specific monitoring responsibilities. This is a Corps of Engineers responsibility as identified in the 5th Annual Addendum for the UMRS-EMP. The USFWS Refuge Manager is required to conduct annual inspections of the project and participate in periodic joint inspections of the project with the Corps of Engineers. On-site qualitative observations are a valuable component of assessing the performance of the project.

d. Wisconsin Department of Natural Resources

The WDNR has collected and submitted data at water quality and fish stations. All available WDNR monitoring data is included in Appendix C.

5. EVALUATION OF AQUATIC HABITAT OBJECTIVES

a. Restore Deep (6 feet) Aquatic Habitat Volume

(1) Monitoring Results

Fish habitat is being monitored by electrofishing, observing changes in sedimentation transects over time, and by monitoring water quality. The results of water quality monitoring are presented in paragraph f. of this section and in Appendix D. A general observation of electrofishing by WDNR was that the rock channel held more target species. Also, the fish sampled were represented by all stages of age and maturity.

Transects associated with McCartney Lake dredging have been taken by the CENCR at locations S-M601.2B, S-M600.8B, S-M600.2B, S-M599.6B, and at 3 additional locations as indicated on Plates 1 and 2. The 7 transects taken represent 12 dredged channel cross sections (see Plates 4 and 5). The range of sediment accumulation in these 12 cross sections is from 0.0 to 1.1 feet. Of these 12 cross sections, only 2 had areas where the sedimentation was greater than or equal to 1 foot. Those 2 sections, located in Dredge Area G and Dredge Area A, had a maximum sediment accumulation of 1.0 and 1.1 feet, respectively.

(2) Conclusions

The post-flood survey data does provide sufficient information on the condition of the dredged channels. Observed sedimentation is likely attributable to sloughing from the steep (1:1) walls of the dredge cut and not attributable to sedimentation occurring in the backwater complex. Even with the minor sloughing, 33% of the Dredge Area A's channel bottom and 67% of Dredge Area G's channel bottom remains free of sediment accumulation deposits above the constructed elevation of 594 feet. Since the completion of dredging in the fall of 1991, water depth has remained steady at approximately 9 feet and 13 feet deep in the dredged channels. Sedimentation in the dredged channels does not appear to be significant.

General observations by CENCR personnel indicate that the dredged channels have provided an increase in fish habitat and appear to be providing a viable over-wintering area for fish within McCartney Lake. All available fish and water quality data has been submitted by WDNR and is included in Appendix C.

b. Restore Lentic-Lotic Habitat Access Cross-Sectional Area

(1) Monitoring Results

The post-flood survey data does provide information that indicates the lentic-lotic habitat access cross-sectional area appears to be adequate. Also, no winter fish kills have been observed in the project area.

(2) Conclusions

The absence of winter fish kills indicates that the lentic-lotic access appears to be of adequate cross-sectional area to allow fish ingress and egress during stress periods.

c. Increase Rock Substrate and Aquatic Habitat

(1) Monitoring Results

Transect S-M602.1G of the rock habitat channel indicates some scouring of the rock substrate (see Plate 3). The rock habitat channel appears free of sedimentation.

(2) Conclusions

Aside from the one transect, there is not sufficient data available at this time to evaluate the success of the aquatic habitat.

d. Establish Mussel Bed

(1) Monitoring Results

A mussel survey has not been performed to date.

(2) Conclusions

A mussel survey is scheduled for 1997 and this should provide information on the success or failure of this project objective.

e. Reduce Movement of Bedload Sediment into Bertom Lake

(1) Monitoring Results

As indicated on the Bertom Lake Monitoring Plan (Plate 1), sedimentation rates are being monitored at 3 locations within Bertom Lake and 1 location in the channel leading from the closing structure into Bertom Lake. CENCR transects will be taken every 5 years, beginning in 1997, as outlined in the Data Collection Summary, Appendix B. Hydrographic soundings were conducted by the CENCR on selected transects and at other locations within the project area as part of the post-Flood of 1993 Damage Assessment. However, aside from the submerged partial closing structure, transects related to Bertom Lake were not surveyed as part of this assessment.

Transect S-M602.1J of the Submerged Partial Closing Structure shows 1 to 2 feet of missing rock material below the 599 foot design elevation and a depth of scour of 3 to 5 feet along the 24-inch-thick blanket which had tied the closing structure into the bank. Field inspection shows additional loss of material on the upstream riprap protection wing. Approximately 300 feet of the riprap protection wing has been washed away. Scour and loss of material appear to be a direct result of the 1993 flood. There is no indication of sedimentation at the closing structure.

(2) Conclusions

The pre-project average sedimentation rate for Bertom Lake is 0.70 inch/year with a target of reducing this rate to 0.55 inch/year. The data obtained for the post-Flood of 1993 Damage Assessment was used to evaluate potential damage to project features and therefore does not include the Bertom Lake sediment transects. All sediment transects are scheduled to be surveyed for the first time in 1997 to determine the sedimentation rate for the first 5 years of the project. Therefore, at this time there is insufficient data to compute a sedimentation rate which is comparable to pre-project values.

The closing structure is free of sedimentation but does require repair of the damage apparently caused by the Flood of 1993. The needed repair is the placement of rock to restore the closing structure and its adjacent 24-inch-thick riprap protection wing.

f. Improve Dissolved Oxygen Concentration During Critical Seasonal Stress Periods

(1) Monitoring Results

Water quality parameters are being monitored by the CENCR at 5 separate sites as indicated on Plate 2 and in Table B-1. No historic water quality data is available, however, based on the historic occurrence of winter fish kills and WDNR's pre-project data available from 1987 onward, it is reasonable to conclude that water quality and dissolved oxygen, in particular, were at a low level and would continue to deteriorate without implementation of the project.

Comparison of pre-project and post-construction water quality data shows that some positive trends may be emerging. Examination of the available data shows improvement in several areas. Flow through the partial closing structure appears to be quite good, providing an opportunity for oxygenated water to enter the backwater area. Measurable velocities are routinely observed beneath the ice within the dredged channels at most locations sampled. This indicates that fresh water is reaching the previously isolated areas where fish tend to move during the winter. Evidence of an improvement in dissolved oxygen concentrations at several locations is also apparent. Areas which were previously observed to experience low dissolved oxygen concentrations fairly frequently, now routinely have acceptable dissolved oxygen concentrations.

In general, it appears that many of the original water quality objectives have been met. Results of studies to determine the extent of sediment resuspension are not as definitive. Appendix D contains a more extensive water quality analysis which includes data and discussion of backwater discharge, velocity, dissolved oxygen, chlorophyll *a*, turbidity, secchi disc depth, and wave height.

(2) Conclusions

An improvement in dissolved oxygen concentrations at many sampling locations following project completion is apparent. Pre-project water quality data demonstrated that dissolved oxygen concentrations were observed to fall below 5.0 mg/l at various locations both during the summer and winter months. At site W-

600.3C, which is near WDNR's Site #1 (see Plate 2), dissolved oxygen concentrations below 5 mg/l were observed during continuous monitoring conducted by the WDNR during July through August 1988 and 1989.

Based on grab samples taken by the CENCR since the fall of 1990, no dissolved oxygen concentration below the project objective target level of 5.0 mg/l has been observed at this location (W-M600.3C) at any time during the year. It is apparent that adequate flow is reaching the areas which previously experienced dissolved oxygen problems or were on the verge of experiencing problems. While insufficient time has passed for extreme summer and winter conditions to be observed, it seems likely that the dredging of channels has improved the circulation of water within the backwater complex and, in particular, to previously isolated areas.

6. EVALUATION OF MIGRATORY WATERFOWL HABITAT OBJECTIVES

a. Increase Aquatic Vegetation Bed

(1) Monitoring Results

The formation of migratory waterfowl habitat will be monitored by yearly performance of an aerial survey. To date, these surveys have not been formally performed and documented but will begin this year. The post-Flood of 1993 Damage Assessment noted that the dredged material placement site had lost all vegetation for the year as a result of the flood. Observations made in 1994 indicate that there was a successful vegetative recovery. Vegetative cover will be noted on subsequent inspections and surveys.

Based on site observations, the confined dredged material placement site appears to have created an unanticipated and additional benefit with the formation of a "perched" wetland on top of the placement site itself.

(2) Conclusions

The aerial surveys have not yet been performed; therefore, with the limited amount of data available at this point in the post-construction monitoring effort, it is difficult to draw conclusions regarding the success or failure of the migratory waterfowl habitat objective. However, future surveys will pay

particular attention to the dredged material placement site and the unanticipated habitat benefits which are possibly being achieved there.

b. Other

There are no other migratory waterfowl habitat objectives.

7. PROJECT OPERATION AND MAINTENANCE

a. Operation

The project requires no operational activities.

b. Maintenance

(1) Inspection

Inspections of the Bertom and McCartney Lakes project are to be made by the Upper Mississippi Wildlife Refuge District Manager (the USFWS Refuge Manager) at least annually and will follow inspection guidance presented in the Draft Operation and Maintenance Manual. Other project inspections should be scheduled by the manager following high water events. These inspections are necessary to determine maintenance needs.

(2) Maintenance Based on Inspections

Joint inspections of the Bertom and McCartney Lakes Project are to be conducted periodically by the USFWS and the CENCR. The results of these joint inspections will be summarized in future Post-Construction Performance Evaluation Reports.

8. CONCLUSIONS AND RECOMMENDATIONS

a. Project Goals, Objectives, and Management Plan

Based on data and observations collected since project completion, it appears that the stated goals and objectives are being met. Further evaluation of the unexpected benefits of the placement site will help determine if any management plan is needed there. Further data collection will better define the degree of reduced movement of bedload sediment into Bertom Lake, improved dissolved oxygen concentration during critical seasonal stress periods, and increased migratory waterfowl habitat.

Further survey data also will evaluate the restoration of or establishment of the rock substrate habitat, lentic-lotic habitat access cross-sectional area, mussel bed, and volume of deep (6 feet) aquatic habitat objectives.

b. Performance Evaluation and Monitoring Schedules

The next Post-Construction Performance Evaluation will be completed in 1997 following collection of data for the first 5-year interval. A Performance Evaluation Supplement will be prepared annually.

c. Operation and Maintenance

Project operation and maintenance has generally been conducted in accordance with the Draft Operation and Maintenance Manual. There are no operational requirements attached to this project and, based on the data available, the maintenance of project features appears to be adequate.

d. Project Design Enhancement

Maintenance and monitoring activities at the Bertom and McCartney Lakes Project have resulted in the following general conclusions regarding project features which may affect future project design:

(1) Littoral zone development is not observable yet on the lee-side of the island in McCartney Lake. It may be too soon to evaluate the effectiveness of wind fetch reduction or a response may have been delayed by the 1993 flood conditions. Future performance evaluations will continue to evaluate the establishment of an aquatic vegetation bed.

(2) It is too early to fully evaluate the pond and associated wetland community which is developing on the island at this time. However, the current habitat success of the island likely is attributable to the good water clarity in the pond because it catches runoff from the island and the stable water levels in the pond because it functions essentially independent of river levels.

A P P E N D I X A

PERFORMANCE EVALUATION PLAN

Measurement of the project features provides an indication as to the success of meeting project goals and objectives. The table in this appendix summarizes the project goals with their corresponding objectives and features as outlined in Table 2-1 in the main body of this report. This is followed by an indication of the unit of measure for each project feature. A comparison is then made between measured values at year zero without project construction, year 2 with project construction, and target values at year 50 with project construction. The last two columns list the method of accomplishing feature measurements along with an indication of what the site manager is expected to note during annual field observations.

TABLE A-1

PERFORMANCE EVALUATION PLAN

Goal	Objective	Enhancement Feature	Unit	Enhancement Potential: Year 0 Without Alternative	Enhancement Potential: Year 2 With Alternative	Enhancement Potential: Year 50 Target With Alternative	Feature Measurement 1/	Annual Field Observations by Site Manager
Enhance aquatic habitat	Improve dissolved oxygen concentration during critical seasonal stress periods	McCartney Lake dredging	mg/l	<5.0	≥5.0	≥5.0	Perform water quality tests at Stations W-M600.3C, W-M598.9E, W-M599.8B	Observe aquatic life changes (i.e., fish kills, sport fishing)
Enhance aquatic habitat	Restore deep (≥ 6 feet) aquatic habitat	McCartney Lake dredging	AC-FT	0	250	200	Perform hydrographic soundings	Observe sedimentation effects by pole soundings or depth gauging
	Restore lentic lotic habitat access cross-sectional area	McCartney Lake dredging	SQ-FT	300	not measured	1800	Perform hydrographic soundings	Observe sedimentation erosion changes
	Increase rock substrate aquatic habitat	Fish and mussel rock	SQ-YD	0	partially measured	10,000	Perform profile of rock substrate transect	Observe changes in rock substrate (i.e., movement, sedimentation, organic growth)

TABLE A-1 (Cont'd)

PERFORMANCE EVALUATION PLAN

Goal	Objective	Enhancement Feature	Unit	Enhancement Potential: Year 0 Without Alternative	Enhancement Potential: Year 2 With Alternative	Enhancement Potential: Year 50 Target With Alternative	Feature Measurement 1/	Annual Field Observations by Site Manager
Enhance aquatic habitat	Establish mussel bed	Fish and mussel rock habitat	Number Per SQ-YD	0	Unknown	10	Perform area mussel survey	Observe mussel changes
	Reduce movement of bedload sediment into Bertom Lake	Partial closure structure	IN/YR	0.7	Unknown	0.55	Perform hydrographic soundings of transect	Observe condition of dam and localized effects
							Perform water quality tests at Station W-M602.2E	
Enhance migrating waterfowl habitat	Establish aquatic vegetation bed	In-water confined dredged material placement site	AC	0	Unknown	10	Perform aerial survey of vegetation	Observe aquatic bed changes

1/ See Table B-1

A P P E N D I X B

RESOURCE MONITORING AND DATA COLLECTION SUMMARY

The table in this appendix outlines the resource monitoring and data collection as well as identifies the responsible sampling agency. It lists the parameters to be measured and schedule of data collection for water quality, engineering, and natural resource data.

TABLE B-1

Resource Monitoring and Data Collection Summary

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA				
	Pre-Project Phase		Design Phase		Post Const. Phase		Pre-Project Phase	Design Phase	Post. Const. Phase	Pre-Project Phase	Design Phase	Post. Const. Phase		
TYPE MEASUREMENT	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR							Sampling Agency	Remarks
POINT MEASUREMENTS														
Station W-M600.3C													COE	WDNR #20
Turbidity	-		-	-	2W	1M								
Secchi Disk Transparency	-		-	-	2W	1M								
Dissolved Oxygen	-		-		2W	1M								
Specific Conductance	-		-		2W	1M								
Water Temperature	-		-		2W	1M								
Velocity	-		-		2W	1M								
Water Depth	-		-		2W	1M								
Water Elevation	-		-		2W	1M								
Ice Depth	-		-	-	-	1M								
Snow Depth	-		-	-	-	1M								
Total Alkalinity	-		-		2W	1M								
pH	-		-		2W	1M								
Chlorophyll	-		-		2W	1M								
Suspended Solids	-		-		2W	1M								
Wind Direction	-		-		2W	1M								
Wind Velocity	-		-		2W	1M								
Wave Height	-		-		2W	1M								
Cloud Cover					2W	1M								

TABLE B-1 (cont'd)

Resource Monitoring and Data Collection Summary

TYPE MEASUREMENT	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA				
	Pre-Project Phase		Design Phase		Post Const. Phase		Pre-Project Phase	Design Phase	Post. Const. Phase	Pre-Project Phase	Design Phase	Post. Const. Phase	Sampling Agency	Remarks
	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR								
Stations W-M599.5D, W-M599.2C													COE	WDNR #20
Turbidity	-		-	-	2W	1M								
Secchi Disk Transparency	-		-	-	2W	1M								
Dissolved Oxygen	-		-		2W	1M								
Specific Conductance	-		-		2W	1M								
Water Temperature	-		-		2W	1M								
Velocity	-		-		2W	1M								
Water Depth	-		-		2W	1M								
Water Elevation	-		-		2W	1M								
Ice Depth	-		-	-	-	1M								
Snow Depth	-		-	-	-	1M								
Total Alkalinity	-		-		2W	1M								
pH	-		-		2W	1M								
Chlorophyll	-		-		2W	1M								
Suspended Solids	-		-		2W	1M								
Wind Direction	-		-		2W	1M								
Wind Velocity	-		-		2W	1M								
Wave Height	-		-		2W	1M								
Cloud Cover					2W	1M								

TABLE B-1 (cont'd)

Resource Monitoring and Data Collection Summary

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA				
	Pre-Project Phase		Design Phase		Post Const. Phase		Pre-Project Phase	Design Phase	Post. Const. Phase	Pre-Project Phase	Design Phase	Post. Const. Phase		
TYPE MEASUREMENT	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR							Sampling Agency	Remarks
Stations W-598.9E, W-M599.8B													COE	22
Turbidity	-		-	-	2W	1M							(Springfed sites)	
Secchi Disk Transparency	-		-	-	2W	1M								
Dissolved Oxygen	-		-		2W	1M								
Specific Conductance	-		-		2W	1M								
Water Temperature	-		-		2W	1M								
Velocity	-		-		2W	1M								
Water Depth	-		-		2W	1M								
Water Elevation	-		-		2W	1M								
Ice Depth	-		-	-		1M								
Snow Depth	-		-	-		1M								
Total Alkalinity	-		-		2W	1M								
pH	-		-		2W	1M								
Chlorophyll	-		-		2W	1M								
Suspended Solids	-		-		2W	1M								
Wind Direction	-		-		2W	1M								
Wind Velocity	-		-		2W	1M								
Wave Height	-		-		2W	1M								
Cloud Cover	-		-		2W	1M								

TABLE B-1 (cont'd)

Resource Monitoring and Data Collection Summary

TYPE MEASUREMENT	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA			Sampling Agency	Remarks
	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								
Station W-M602.2E														WNDR #34
Velocity														
Water Depth														
Water Elevation														
Suspended Solids														
Station 6/														
Bulk Sediment Analysis				1									COE	
Station 7/														
Elutriate Analysis			1	-									COE	
Station 8/														
Ambient Water Analysis			1	-									COE	
Station 9/														
Column Setting Analysis			-	1									COE	
Station W-M600.5C														
Dissolved Oxygen			7C	-	7C	-							WDNR	WDNR #18 (rock)
Water Temperature			7C	-	7C	-								
Station W-M601.0H														
Dissolved Oxygen			7C	-									WDNR	WDNR #2 (channel above rock)
Water Temperature			7C	-										
Light Data			7C	-										
Station W-M600.3C														
Dissolved Oxygen					7C	-							WDNR	WDNR #20
Water Temperature					7C	-								
Stations														
F-M _____										X	X	X	WDNR	
										Need WDNR Input				
Fish Structures														
Perform Condition Survey									5Y				COE	

TABLE B-1 (cont'd)

Resource Monitoring and Data Collection Summary

TYPE MEASUREMENT	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA			Sampling Agency	Remarks
	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								
TRANSECT MEASUREMENTS														
Transects 2/ Hydrographic Soundings									5Y				COE	
Transects 3/ Profile									5Y				COE	
Trnasects 4/ Hydrographic Soundings									5Y				COE	
Transects 5/ Vegetation Survey												5Y	COE	
AREA MEARUREMENTS														
Fish and Mussel Habitat Area Mussel M-M602.1G Survey												5Y	COE	
Bertom/McCatney Lake Vertical Stereo Areal Photography (1:5000)											1	5Y	COE	

LEGEND

W = WEEK, 2W = ONCE EVERY TWO WEEKS
M = MONTH
Y = YEAR, 5Y = ONCE EVERY FIVE YEARS
nW = n-WEEK INTERVAL
nY = n-YEAR INTERVAL
1,2,3,--- = NUMBER OF TIMES DATA IS COLLECTED WITHIN DESIGNATED PROJECT PHASE
C = CONTINUOUS
1,2,3, ...nC = x-DAY CONTINUOUS

TABLE B-1 NOTES

1/ Post Construction monitoring sites/transects are shown on Plates 1 and 2. See the DPR for Pre-Project and Design Phase station locations. The following monitoring was performed by the COE/Construction Contractor during the construction phase for the purpose of meeting Permit requirements.

Station	Frequency
Dredge Carriage Water Inside of Discharge Weir	
Suspended Solids	3/W*
Dissolved Oxygen	3/W
Temperature	3/W
pH	3/W
Ammonia Nitrogen	3/W
500' Downstream of Discharge of Weir	
Suspended Solids	3/W
Dissolved Oxygen	3/W
Temperature	3/W
pH	3/W
Ammonia Nitrogen	3/W
Vicinity Sample	
Suspended Solids	W**
Dissolved Oxygen	W
Temperature	W
pH	W

2/ Transects (Lake Dredging)

S-M601.2B	DPR T13
S-M600.8B	DPR T16
S-M600.2B	DPR T19
S-M599.6B	DPR T23

3/ Transects (Substrate Channel)

S-M602.1G	DPR EE
S-M602.1D	DPR FF

4/ Transects (Bertom Lake)

S-M602.1J	DPR DD
S-M602.2J	DPR CC
S-M602.3B	DPR TO
S-M602.2B	DPR T2
S-M602.0B	DPR T6

5/ Transects (Aquatic Bed)

V-M599.5B	DPR T26
V-M599.2B	DPR T28

6/ Stations (Design Phase Bulk Sediment Analysis)

DPR BM-1
DPR BM-2
DPR BM-4
DPR BM-5
DPR ML-1
DPR ML-2
DPR ML-3

7/ Staions (Deisgn Phase Elutreate Analysis)

DPR ML-1
DPR ML-2
DPR ML-3

8/ Station (Ambient Water Analysis)

DPR BM-1
DPR M-1

9/ Stations (Column Settling Analysis)

DPR BM88-6-1
DPR BM88-6-2

* 3/W = three per week
** W = one per week

A P P E N D I X C

COOPERATING AGENCY REFERENCES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
McGregor District
Post Office Box 460
McGregor, Iowa 52157

IN REPLY REFER TO:

September 28, 1994

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 3

To Jeff Scukanec	From John Lyons
Dept./Agency	Phone # 319 873-3423
Fax # 309 794-5404	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Memorandum

To: Jeff Scukanec, RID/COE
CENCR-ED-DN

From: District Manager, Upper Mississippi River NW&FR, Mcgregor, IA

Subject: Bertom-McCartney HREP Evaluation

This responds to your FAX of 9/26/94 on subject. Photographs are being obtained as requested. We should be able to mail them to you within 10 days.

Responses below are keyed to your questionnaire. Copy attached.

1. The flood conditions of 1993 have tended to obscure or delay observation of cause and effect changes from the HREP project.

We have not yet been able to detect any change visually in lateral transport of sediments into either the upper (Bertom Lake) or fish channel forks. Fish numbers, numbers of kinds, or size composition changes in the fish channel and dredged channel areas should be obtained from Kurt Welke (WDNR). Anglers are reporting difficulty catching fish, however this may be attributable to the drought related conditions of 1988 and 1989 and the flood related conditions of 1993 and their impacts on fish populations. Care should be used in evaluating the project in the context of these major environmental events.

As regards the island, it was intended to be beneficial as a place to economically place spoils and to intercept wind and waves and afford an area for littoral zone development. Littoral zone development is not observable yet. It may be too soon or response may have been delayed by flood conditions last year. The outside perimeter of the island proper, where seeded, has developed a good grass cover. Cottonwood and willows are started on the rest of the island and when grown will enhance the wind interception and shadow effect of the island on lee-side littoral zone development.

There is an isolated pond on the island which is essentially independent of river levels. It catches runoff from the island, has good water clarity, stable levels, and an interesting wetland community is developing. Pondweeds including curly-leafed and sago, soft stemmed bulrush, lily and cattails are developing in this clear water

environment, attracting ducks and geese. Because this is a depression it is buffered from visual or sound disturbance and there is no boating disturbance. No waterfowl nests or broods were seen on the island or pond. Last year there was some use by soft shelled turtles and killdeer on the island.

2. The island and its contained pond probably qualify as unique features. It is too early to evaluate them fully.

Also, the rock fish channel is unique. See Kurt Welke for evaluation information.

3. Again, it is too early to evaluate fluvial or geomorphic changes because manifestation has not developed or has been obscured by flood conditions. I am not aware of unanticipated benefits yet.

John R. Lyons

Bertom and McCartney Lakes, HREP
Performance Evaluation Questionnaire

1. What notable species, or changes in the aquatic or wetland community have been observed at the project site? (ie., at dredged channels? at dredged island? ...)

2. Are there any unique features of the project that you consider beneficial or non-beneficial?

3. Qualitatively speaking, are the project's intended goals and objectives being achieved at this time? Are there any notable unanticipated benefits being achieved?

WDNR

PRE-PROJECT

WATER QUALITY DATA

SUMMARY REPORT

Lynn A. Bartsch and John F. Sullivan

Project: Monitoring of dissolved oxygen levels in selected backwater areas of the Upper Mississippi River during the winter of 1988-1989.

Period: December 14, 1988 - March 27, 1989

Objective:
1. To determine the rate and extent of depletion of dissolved oxygen in selected back water areas of the Mississippi.
2. To create a data base that may be used to design habitat improvements and then to later judge the effectiveness of such improvements.

INTRODUCTION

This report is not an attempt to summarize all the limnological data that is contained within the tables, but rather an effort to document general trends that are of importance. No attempt was made to hypothesize a cause for data irregularities, nor were they referenced in the manuscript unless they indicated impending water quality problems. The emphasis of this report is to document general trends which would indicate existing or eminent water quality problems.

Seven locations were monitored during the December 14, 1988 to March 27, 1989 period. The locations were selected because they had previously demonstrated water quality problems or were areas that were suspected of having poor water quality. The selected areas were: Big Lake - Pool 4, Long Lake and Belle Island areas of Pool 7, French Lake and I-90 in Pool 8, Gremore Lake, Pool 10 and McCartney Lake, Pool 11.

The winter of 1988-89 was one of above normal December and January temperatures and sporadic snow events (Thompson 1988 and 1989). The duration of the snow cover was generally short (Figure 10). The exception to this was March, when significant snow cover was present. The duration of snow cover during March was longer than in January or February. The greater depth of the March snows provided enough shading in some areas to inhibit photosynthesis. This was evident by rapid depletion of surface dissolved oxygen levels in some backwater areas.

METHODS

Sampling sites were established at each study area using previous site locations where possible. The sites were located by nearby landmarks. A hole (17.7 cm dia.) was drilled into the ice using a power auger. The hole was drilled to a depth just before breaking through the bottom surface of the ice. The hole was completed with an ice chisel. The use of the ice chisel prevented re-aeration and sediment disturbance by the auger blade.

Dissolved oxygen (DO) measurements were taken with either a Yellow Springs Instrument (YSI) model 54 or 57 DO meters. The meters were pre-calibrated each day by an air calibration technique (WDNR, 1983) at temperatures within the expected working range (0-4 degrees C). Field calibration checks were made at each site. Changes in calibration (drift) were noted. If the change was greater than +/- 0.1 mg/l the unit was then recalibrated at the site. A final calibration check was made at the end of each day using the current barometric pressure. The final calibration check was to estimate drift due to changes in the barometric pressure. A second YSI meter was present and used as a backup.

Conductivity was measured using a YSI model 33 S-C-T meter. The conductivity measurements correspond to depths at which the dissolved oxygen measurements were taken. The cell constant was checked monthly with standard KCI solution and ranged from 1.02-1.05 during the study period.

Current velocity was measured using a Marsh-McBirney 201D current meter. The unit was found to be functioning within acceptable limits based on calibration checks performed before and after the study period. Measurements were taken 10-20 cm below the bottom surface of the ice. The direction and current velocity was recorded. If the current velocity was less than 0.01 ft/sec the current was recorded as not detectable (ND).

All electronic equipment was housed in a heated box using a small catalytic heater. This eliminated problems with frozen probes and slow instrument response time.

Depths at which measurements were taken dependant on the total depth of the water column, if stratification was expected or the presents of flow. Water quality data were normally taken at top, mid, and bottom. The top was that strata which was located immediately below the bottom surface of the ice. Mid depth was located equa-distant from the water surface and the water/sediment interface. The bottom measurement was taken immediately above the water/sediment interface. In the case where shallow water and thick ice was present, only the top and bottom measurements were taken. If flowing water was present, which prevented stratification, only a mid-depth measurement was made.

RESULTS

Big Lake Area - Pool 4

The Big Lake area is located in Pool 4 of the Mississippi River above Alma, Wisconsin (Figure 2). Big Lake is a shallow, well vegetated, back water area that receives major inflows from the main channel of the Mississippi River through Indian and Catfish Sloughs at the western and eastern ends, respectively. Big Lake also receives minor inflows from the Chippewa River bottom lands and a small tributary along the northeastern shoreline.

Gremore Lake can quickly become anoxic during periods of thick snow cover (10 or more cm). The DO depletion is rapid and appears most pronounced at the northern end. However, this area has the ability to quickly recover from anoxia when snow cover is absent or minimal. This would indicate sufficient photosynthetic activity to support fish populations during very mild winters, but Gremore Lake may experience prolonged and severe DO depletion during winters of deep snow cover.

McCartney Lake - Pool 11

McCartney Lake is located in Pool 11 below Cassville, Wisconsin. The study area was located in the western (upstream) end of McCartney Lake (Figure 9). This area is a shallow, highly vegetated backwater area that consists of a series of flowing channels and isolated sloughs. Adjacent to these channels and sloughs are shallow ponds (sites 9, 5, 6 and 7), many of which have significant groundwater interactions along the northern shoreline.

McCartney Lake area was sampled on two dates, January 17 and February 10. DO valves ranged from 14.8 mg/l to greater than 20.0 mg/l (Table 7). The concentrations and ranges of DO would indicate that the McCartney area will sustain high oxygen levels during a mild atypical winter period. Although serious DO depletions would be expected in sites 5, 6, 7, and 9, these depletions did not occur since snow cover was absent or minimal and resulted in pronounced photosynthetic activity at these sites.

The McCartney area appeared to be capable of sustaining acceptable levels of DO during the winter period. The level of flow into the area was sufficient (242 cfs at site 1 on February 10) to prevent stratification in the flowing channels. This flow may carry well oxygenated water from the main channel. This would become important during periods of increased snow cover. Areas which may have DO problems are the isolated sloughs and ponds, but this was not observed during the two sample dates.

CONCLUSION

Dissolved oxygen monitoring during the winter of 1988-89 has provided data on the response of the backwater during a low precipitation winter. Dissolved oxygen levels were elevated and quite variable in many of the monitored backwater areas. The elevation in DO levels was attributed to decreased snow cover which allowed for greater photosynthetic activity in areas with vegetation or algae. The variability in DO was attributed to the sporadic and short term snow accumulations that occurred during the sample period. Many of the areas did not exhibit DO problems until the persistent snows of March. Other areas were anoxic from the first sample date. The marked difference between areas were generally a response to flow patterns or the morphometric characteristic of the specific area.

Many of the areas monitored did experience short or long-term anoxia at one or more sites. The appearance of anoxic conditions during the low snow fall winter of 1988-89 would indicate severe oxygen problems during harsh winters of deep and persistent snow cover.

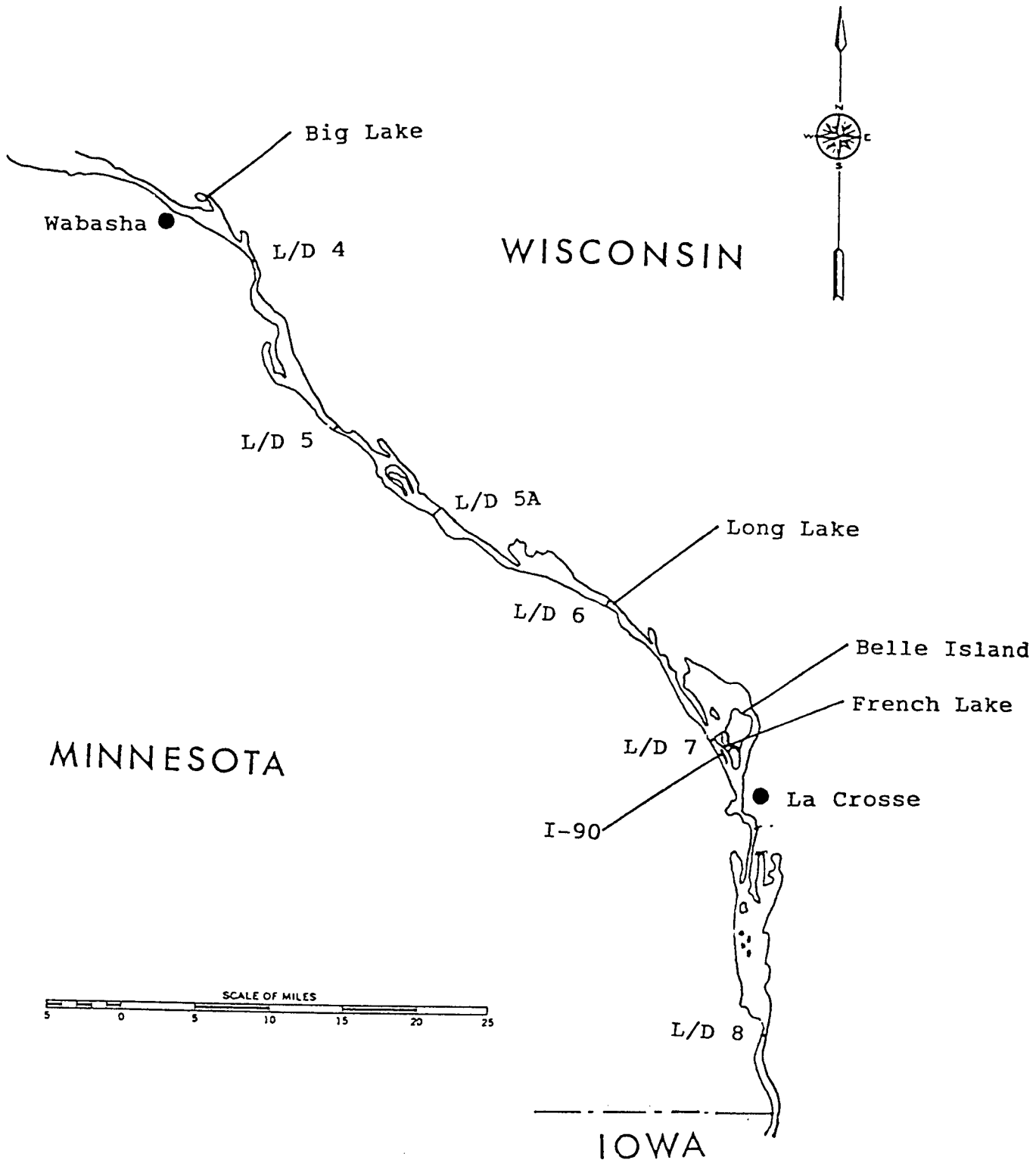


FIGURE 1 - Location of areas monitored on the Mississippi River, 1988 & 89

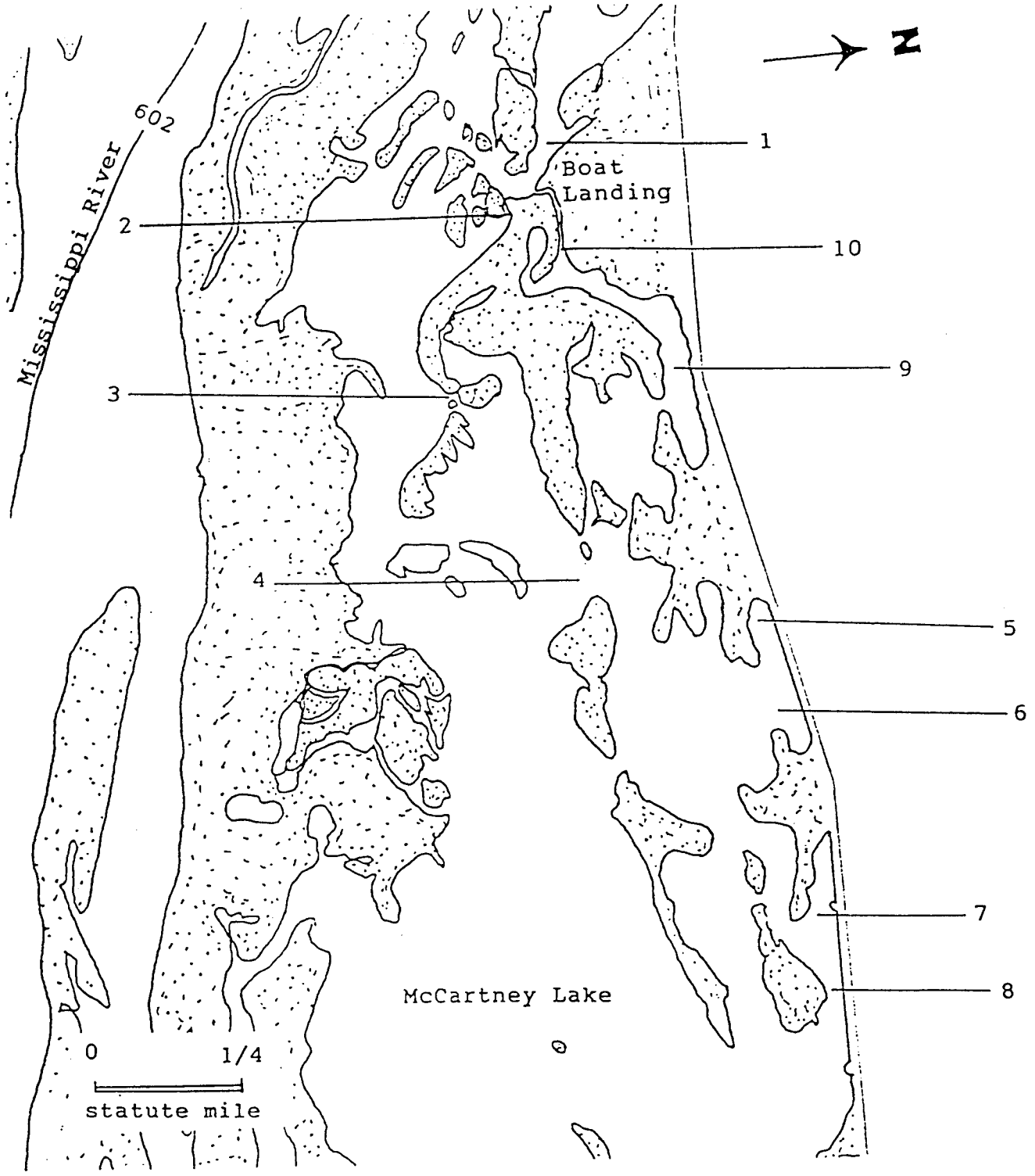


FIGURE 9 - Location of sampling sites in the McCartney Lake area, 1989

TABLE 7 - Water Quality Data Collected at Sites in the McCartney Lake Area

Date	Time	Site #	Snow Depth (cm)	Ice (cm)	Max. Depth (m)	Current Velocity (cm/s)	Current Direct. From	Depth	Temp C	D.O. (mg/l)	D.O. Calb. Drift (mg/l)	Cond. umho/cm 25 C	Comments
1-17-89	1040	1	0.0	33.0	4.1	3.7	NW	Top	0.0	14.8	0.0	390	BP. 744mm at 720, BP. 735mm at 1700
								Mid	0.0	15.0		390	Weather - Clear sky
								Bot	0.0	14.9		390	D.O. meter YSI 54 FISH LAK.
													Sampling crew - Bartsch, Welke
	1105	2	0.0	25.4	1.2	1.8	WNW	Top	0.0	15.3	-0.2	390	
								Bot	0.0	15.3		390	
	1140	3	0.0	30.5	0.9	3.4	SW	Mid	0.0	15.5	0.2	390	
	1205	4	0.0	29.2	1.8	2.7	NW	Top	0.0	15.6	0.0	390	
								Mid	0.0	15.6		390	
								Bot	0.0	15.6		400	
	1230	5	0.0	12.7	0.4	-	-	Mid	3.0	>20.0	0.0	633	
	1240	6	0.0	20.3	0.5	-	-	Mid	1.0	>20.0	0.0	697	
	1300	7	0.0	22.9	0.6	-	-	Mid	3.0	>20.0	0.0	484	
	1375	8	0.0	22.9	1.5	3.4	WNW	Top	0.0	16.2	0.1	400	
								Mid	0.5	16.2		403	
								Bot	0.5	16.1		403	
	1355	9	0.0	25.4	0.8	ND	-	Mid	1.0	16.8	0.2	471	
	1410	10	0.0	12.7	0.3	5.8	W	Mid	0.5	16.8	0.0	383	Final DO Calibration -0.2 mg/l
2-10-89	1010	1	-	43.2	3.4	2.1	NW	Top	0.0	16.4	0.1	400	BP.752mm AT 720, BP. 753mm AT 1530
								Mid	0.0	16.4		400	Weather - clear sky
								Bot	0.0	16.3		400	DO Meter YSI 54 FISH LAK
													Sampling crew - Bartsch,Sullivan,Wilk
	1200	3	-	17.8	0.9	4.0	SW	Top	0.0	16.9	0.0	400	
								Mid	0.0	17.0		400	Snow depth was estimated between 3.8
								Bot	0.0	17.0		400	and 6.3 cm
	1218	4	-	33.0	1.9	3.0	SW	Top	0.0	17.4	-0.2	400	Discharge at site 1 was 242 cfs
								Mid	0.0	17.4		400	
								Bot	0.0	16.7		410	
	1319	5	-	10.2	0.6	-	-	Top	2.0	16.0	0.1	673	
								Bot	2.5	>20.0		671	
	1305	6	-	12.7	0.5	-	-	Top	1.0	15.4	0.0	697	
								Bot	1.0	15.6		697	
	1340	7	-	30.5	0.6	-	-	Mid	0.5	17.4	-0.1	460	
	1355	8	-	19.1	1.3	3.4	N	Top	0.0	16.8	0.0	410	
								Mid	0.0	17.0		410	
								Bot	0.0	17.0		410	
	1140	9	-	25.4	0.8	ND	-	Top	0.0	17.3	0.1	429	
								Bot	1.0	15.4		452	
	1120	10		7.6	0.3	5.5	W	Mid	0.0	17.0	0.0	400	
	1100	11		25.4	0.9	1.2		Mid	0.0	17.2	0.0	-	Final DO Calibration -0.3 mg/l

ND - Not detected
- - No data

(WQMSUM4L.WK3) Sheet N

BERTOM/MCCARTNEY LAKE	AUG87	AUG87	JUL-AUG 88	JUL-AUG 88	JUL89	JUL89	JUL90	JUL90	AUG90	AUG90	AUG91	AUG91

Table 13. Summary of water quality and physical data collected at Bertom/McCartney Lake, Pool 11, during the summers of 1987, 1988, 1989, and 1990. Dissolved oxygen, water temperature, and light data represent continuous measurements during the monitoring period. Source: Wisconsin Department of Natural Resources, La Crosse, WI.

Parameter	1987 Rock Aug. 13-20 Avg. (SD)	1987 Site 4 Aug. 13-20 Avg. (SD)	1988 Site 1 Jul 26-Aug 2 Avg. (SD)	1988 Site 4 Jul 26-Aug 2 Avg. (SD)	1989 Site 1 July 22-28 Avg. (SD)	1989 Rock July 22-28 Avg. (SD)	1990 Site 1 July 24-31 Avg. (SD)	1990 CDF July 24-31 Avg. (SD)	1990 Site 1 Aug. 23-30 Avg. (SD)	1990 Rock Aug. 23-30 Avg. (SD)	1991 Site 1 Aug. 7-14 Avg. (SD)	1991 Rock Aug. 7-14 Avg. (SD)
Dissolved Oxygen (mg/l)												
Avg. Daily Maximum	4.7 (2.5)	7.6 (1.0)	3.7 (1.2)	8.8 (1.6)	8.5 (0.9)	9.2 (1.1)	12.7 (1.1)	11.1 (1.4)	7.1 (1.0)	6.0 (1.0)	8.6 (1.7)	9.4 (2.3)
Avg. Daily Minimum	0.8 (0.6)	5.3 (0.3)	0.2 (0.6)	5.3 (1.6)	4.1 (0.3)	0.1 (0.3)	7.9 (0.9)	7.6 (0.4)	5.4 (0.7)	2.5 (1.0)	5.2 (0.6)	6.3 (1.2)
Avg. Daily Max-Min	3.8 (2.5)	2.7 (0.6)	3.5 (1.3)	3.5 (1.2)	4.7 (0.5)	8.9 (1.2)	5.0 (0.7)	3.3 (1.3)	1.5 (0.7)	3.8 (0.7)	2.8 (1.1)	3.7 (1.3)
Average	2.4 (1.5)	6.4 (0.5)	1.5 (0.6)	7.1 (1.6)	6.1 (0.4)	3.6 (2.0)	10.2 (0.8)	9.4 (1.1)	6.3 (1.2)	4.4 (1.0)	7.2 (0.9)	7.7 (1.4)
Avg. % Saturation	16.0 (25.4)		18.8 (17.9)	90.9 (22.7)	79.0 (22.7)	41.0 (40.4)	127.2 (25.4)	115.6 (19.8)	77.3 (13.7)	52.1 (19.7)	88.0 (18.7)	92.5 (24.6)
% Values less than 5.0	89.6	3.0	100	10.3	14.8	65.5	0	0	8.4	63.4	0	4.8
Calibration Error (mg/l)	-3.5	-0.3	0.5	-0.2	-0.4	-2.1	-1.0	-0.5	0	-0.8	-0.3	-0.6
Water Temperature (C)												
Avg. Daily Maximum	23.9 (1.4)		27.5 (0.8)	29.6 (27.8)	28.6 (1.9)	26.5 (1.5)	27.4 (0.9)	26.8 (0.8)	26.3 (1.0)	26.4 (0.7)	25.0 (1.5)	24.6 (1.2)
Avg. Daily Minimum	21.9 (1.8)		25.1 (1.0)	27.8 (0.6)	25.3 (1.1)	23.0 (1.0)	24.2 (0.7)	25.1 (0.6)	25.0 (1.0)	24.4 (0.7)	22.3 (1.1)	22.7 (1.1)
Avg. Daily Max-Min	1.7 (0.7)		2.4 (0.6)	1.9 (0.5)	4.2 (0.8)	4.1 (0.6)	3.0 (0.7)	1.6 (0.6)	1.7 (0.3)	2.2 (0.5)	3.3 (1.1)	2.4 (1.0)
Average	23.1 (1.3)		26.2 (0.8)	28.7 (0.5)	26.7 (1.3)	24.7 (1.2)	25.8 (0.9)	26.0 (0.7)	25.7 (0.8)	25.4 (0.6)	23.7 (1.0)	23.6 (0.9)
Light Data												
Avg. Daily PAR (mols/m)		32.8 (9.2)		49.5 (3.7)	41.0 (4.0)		32.9 (9.3)		30.9 (4.7)		40.3 (13.6)	
Extinction Coeff. (1/m)		5.3 (0.6)										
1% Compensation Depth (m)		0.9 (0.1)										
Current Velocity (cm/s)	9.1 - 10.7	ND - 9.8	ND - 4.3	ND - 3.0	3.0	7.3	6.7 - 9.4	4.3 - 5.5	15.5 - 17.7		<11.0	
River Discharge @McGregor (cfs)	26575 (1415)	26575 (1415)	10500 (1000)	10500 (1000)	16329 (1106)	16329 (1106)	NA	NA	NA	NA		

Instrument calibration drift at end of monitoring period.

Photosynthetic active radiation (PAR) measured in the 400-700nm wavelength spectrum.

Light extinction and compensation depth for the period between 1000 and 1400 hours.

Flow data from USGS.

WDNR

DURING CONSTRUCTION AND POST-CONSTRUCTION

WATER QUALITY DATA

	1994 Site 1 Aug 4-11		1994 Rock Aug 4-11	
Dissolved Oxygen (mg/l)	Avg.	(SD)	Avg.	(SD)
Avg. Daily Maximum	9.8	(0.9)	10.6	(2.2)
Avg. Daily Minimum	7.5	(0.5)	6.5	(0.5)
Avg. Daily Max-Min	2.4	(0.3)	4.9	(1.4)
Average	8.5	(1.0)	8.3	(2.0)
Avg. % Saturation	101.4	(14.8)	99.7	(27.4)
% Values Less Than 5.0	0.0		0.0	
Calibration Error (mg/l)	-0.2		-0.7	
Water Temperature				
Avg. Daily Maximum	25.3	(1.2)	26.4	(1.7)
Avg. Daily Minimum	22.1	(1.3)	22.1	(1.3)
Avg. Daily Max-Min	2.7	(0.7)	4.0	(1.3)
Average	23.5	(1.8)	23.9	(2.1)
Light Data				
Avg. Daily PAR (mols/m)	39.0	(16.1)		
Extinction Coeff. (1/m)	8.2	(2.3)		
1% Compensation Depth (m)	0.6	(0.1)		
Current Velocity (cm/s)	24.4		No Current	
River Discharge @ McGregor (cfs)	NA		NA	

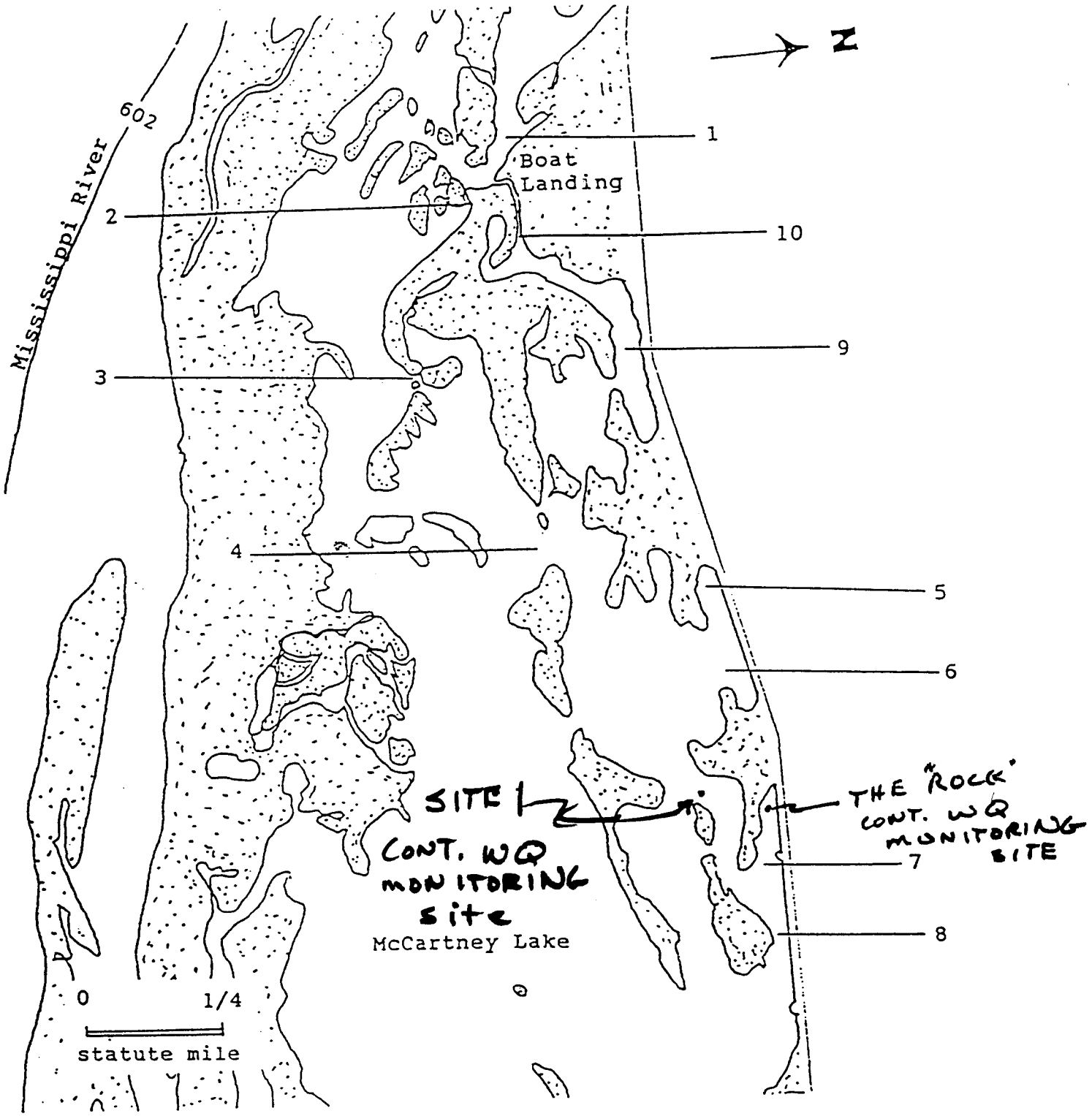


FIGURE 9 - Location of sampling sites in the McCartney Lake area, 1989

WATER QUALITY DATA COLLECTED AT BERTOM/MCCARTNEY LAKE AREA, POOL 11 DURING JANUARY 1994.
WISCONSIN DEPARTMENT OF NATURAL RESOURCES, LA CROSSE, WISCONSIN.
SAMPLING CREW: SULLIVAN AND JANVRIN. WEATHER: CLOUDY, WINDS 15-25 FROM EAST
B.P. 758 @ 10:30; 756 @ 17:00. FINAL DO CAL DRIFT = -0.2 mg/l. YSI 57 LAX WQ
A FEW CFS FLOWING INTO UPPER CUT (AREA "A"). FISHING SLOW, 6 PEOPLE WERE OUT.
CHANNEL DISCHARGE IN DREDGE CUT NEAR CONTINUOUS WATER QUALITY MONITORING SITE 1 = 159.6 cfs

DATE	TIME	SITE	MAX. DEPTH ft.	SAMPLE DEPTH ft.	DO mg/l	TEMP. C	VEL. ft/sec	COND. umhos/cm	ICE ft.	SNOW ft.	COMMENTS
1-26-94	10:45	9	9.7	T	10.6	0.0	0.01	245	1.3	0.3	DO CAL. 0.4 HIGH, RECAL.
				M	10.6	0.1		250			
				B	6.5	2.8		350			
1-26-94	11:10	12	8.5	T	11.0	0.0	ND	245	0.9	0.4	WATER/SLUSH ON TOP OF ICE
				M	11.0	0.0		245			DO CAL. 0.4 LOW, RECAL.
				B	10.6	0.0		245			
1-26-94	11:30	11	12.8	T	11.0	0.0	ND	245	1.0	0.5	DO CAL OK
				M	11.0	0.0		250			
				10.0	10.1	0.8					
				B	3.5	2.0		285			
1-26-94	11:45	7	9.5	T	11.2	0.0	0.01	245	0.3	1.0	3-4 in. COMPACTED SNOW DUE
				M	11.1	0.0	FROM EAST	245			TO FISHING
				B	5.2	1.7		285			DO CAL 0.2 LOW, RECAL.
1-26-94	12:41	"88" GAGING SITE	8.7	T	11.2	0.0	0.24	250	0.3	0.9	SNOW COMPACTED DUE TO TRAV
				M	11.2	0.0		250			TRANSECT HOLE #8
				B	11.2	0.0		250			DO CAL OK
1-26-94	13:00	5	9.9	T	11.2	0.0	0.01	250	0.3		
				M	11.2	0.0	FROM EAST	250	COMPACTED		
				8.0	10.2	0.3					
				B	5.8	1.2		280			
1-26-94	13:11	6B	4.2	T	11.1	0.0	ND	300	0.3	0.9	EDGE OF CUT EAST OF SITE 6
				B	10.9	0.0		300	COMPACTED		DO CAL 0.2 HIGH, RECAL.
1-26-94	13:19	9B	9.0	T	10.8	0.0	ND	250			
				M	10.8	0.0		255			
				7.0	10.8	0.2					
				B	4.5	2.2		275			
1-26-94	13:46	1	6.5	T	11.2	0.0	0.13	245	0.5	0.8	DO CAL. 0.2 LOW, DIDN'T RE

ND = NO DETECTABLE VELOCITY

TABLE 5 - WATER QUALITY DATA COLLECTED AT BERTOM/MCCARTNEY LAKE, POOL 11, DURING THE WINTER OF 1993. SOURCE: WDNR-LAX.

DATE	TIME	SITE	SNOW DEPTH cm	ICE DEPTH cm	MAX DEPTH m	CURRENT VELOCITY cm/s	CURRENT DIRECT (FROM)	DEPTH m	TEMP C	DO mg/l	COND @25 C uS/cm	COMMENTS
1-28-93	1045	12	12.2	36.6	3.0			0.9	0.9	11.3		BP 745mm AT 700
								1.6	0.8	11.1		OVERCAST, DAMP, NW WIND 20mph
								2.5	0.9	11.1		SAMPLING CREW: SULLIVAN, WELKE, CLEMMENT, MCLIMANS, HALVERSON
	1105	11	9.1	33.5	4.1			1.1	0.7	11.0		DO METERS: YSI 57 PDC & YSI 54 EP
								2.4	0.6	11.1		
								3.3	0.8	11.0		
								3.8	1.4	7.6		
	1115	7	4.6	36.6	3.2			0.9	0.5	11.2		"THE ROCK"
								2.1	0.6	11.2		
								2.7	0.9	11.0		
								3.0	1.4	9.5		
	1130	6	6.1	39.6	3.1			0.9	0.8	11.3		THE SPRING, SOUTH
								2.0	0.5	11.4		
								2.6	0.8	11.0		
								2.9	1.2	7.9		
	1130	8		12.2	2.8		12.2	0.3	0.0	11.8		
	1153	9	3.0	41.1	2.7		0.6	0.5	0.0	11.8		
								1.4	0.0	11.6		
								2.6	1.2	9.5		
	1155	5	12.2	39.6	3.0			0.9	0.5	11.1		THE SPRING, NORTH
								2.0	0.5	11.1		
								2.5	0.8	11.1		
								2.8	1.5	7.5		
	1210	98	9.1	39.6	2.9			0.9	0.4	11.4		
								1.9	0.7	11.5		
								2.4	1.2	9.3		
								2.7	1.6	9.0		
	1215	1	15.2	12.2			11.6		0.0	11.8		BAD ICE RDB; DO CAL. -0.2

BMWIN93.WK3

WATER QUALITY DATA COLLECTED AT BERTOM/MCCARTNEY LAKE AREA, POOL 11 DURING THE SUMMER AND FALL OF 1992.
WISCONSIN DEPARTMENT OF NATURAL RESOURCES, LA CROSSE, WISCONSIN, AND PRAIRIE DU CHEIN, WISCONSIN.

C	TIME	SITE	MAX. DEPTH ft.	SAMPLE DEPTH ft.	DO mg/l	TEMP. C	SECCHI ft.	VEL. ft/sec	COMMENTS
7-9-92	12:15	1 (BERTOM LANDING)	8.0	0.4	6.9	24.0	1.0		B.P. 742 @ 09:15, 740 @ 19:30
				4.0	6.6	23.8			OVERCAST (9/10), WIND 0-5 MPH
				7.9	6.4	23.8			80 DEG. F
									YSI 54A LAXFISH
7-9-92	12:40	9 (AREA A)	9.0	0.5	9.3	24.8	1.1		SAMPLING CREW: J. JANVRIN
				4.5	6.6	23.8			FINAL DO CAL.: 0.0
				8.5	4.3	23.0			
7-9-92	13:05	5 (AREA F)	10.0	0.5	11.8	25.8	1.7		CAL. CHECK OK ON 0-20 SCALE
				2.0	7.8	24.3			
				3.0	6.9	24.0			
				4.0	5.0	23.5			
				5.0	5.2	23.4			
				6.0	5.2	23.2			
				7.0	5.1	23.2			
				8.0	4.9	23.0			
				9.5	3.7	23.0			
7-9-92	13:26	7 (UPPER END OF) (AREA H)	9.5	0.5	9.0	26.2	1.5		CAL. CHECK OK ON 0-20 SCALE
				2.0	6.7	24.0			
				3.0	5.4	24.0			
				4.0	4.9	23.5			
				5.0	4.6	23.4			
				6.0	4.5	23.4			
				7.0	4.3	23.2			
				8.0	4.2	23.2			
				9.0	4.0	23.2			
7-9-92	13:39	8 (AREA G)	9.0	T	7.5	25.0	1.1	0.42	VELOCITY @ 3.5 ft
				M	6.1	24.0			
				B	5.5	23.8			
11-17-92	09:35	9 AREA "A"	9.1	T	12.1	3.0	2.7	0.01	B.P. 747 @ 07:30 & 16:30
				M	12.1	3.0			CLOUDY, CALM, 3 DEG. C
				B	10.4	4.0			FINAL DO CAL.: 0.0 mg/l
									VEL. MEASURED AT 0.6 OF DEPTH
11-17-92	11:15	9B AREA "C"	9.1	T	11.8	3.2	2.8	0.00	SAMPLE CREW: WELKE, MCLIMANS
				M	12.2	3.4			*AND HALVERSON*
				B	12.0	3.8			
11-17-92	12:10	5 AREA "F"	10.0	T	12.3	3.2	3.0		
				M	12.1	3.6			
				B	11.9	4.0			
11-17-92	12:15	6 AREA "F"	10.1	T	12.1	3.2	2.7		
				M	12.2	3.2			
				B	11.3	3.6			
11-17-92	13:00	7 AREA "H	9.1	T	12.2	3.4	2.5		30 YARDS N OF "THE ROCK"
				M	12.2	3.5			
				B	12.1	3.8			
11-17-92	13:40	8 AREA "H/G"	9.7	T	12.5	3.2	2.3	0.19	IN CHANNEL, AT CLOSED AREA
				M	12.4	3.2			SIGN BELOW "THE ROCK"
				B	12.4	3.2			
11-17-92	13:48	11 AREA "K/J"	14.3	T	12.4	3.5	2.8		BETWEEN CUTS (CENTER)
				M	12.4	3.5			CALIB. OK
				B	8.7	3.9			
11-17-92	14:22	12 CUT BELOW "I"	9.3	T	12.4	3.5	2.5		
				M	12.1	3.5			
				B	8.6	3.8			
11-17-92	14:58	1 BERTOM LANDING	11.2	T	12.7	3.2			OUT FROM LANDING IN MID-CHAN.
				M	12.5	3.2			COULDN'T HOLD BOAT STILL FOR
				B	12.5	3.2			VEL. MEASUREMENT

[WINTER91.WK3]

TABLE 7 - WATER QUALITY DATA COLLECTED AT BERTOM/MCCARTNEY LAKE AREA, POOL 11, DURING THE WINTER OF 1991. WISCONSIN DEPARTMENT OF NATURAL RESOURCES, LA CROSSE, WISCONSIN.

DATE	TIME	SITE	SNOW DEPTH cm	ICE DEPTH cm	MAX DEPTH m	CURRENT VELOCITY cm/s	CURRENT DIRECT (FROM)	DEPTH m	TEMP C	DO mg/l	COND @25 C uS/cm	COMMENTS
1-7-91	1426	1	11.4	25.4	3.20			0.3	0.0	12.9		BP. 765mm AT 800
								1.5	0.0	12.9		SUNNY, CALM, TEMP 20 DEG. F
								3.0	0.0	12.8		DO METER: YSI 57 WQ
	1500	9	11.4	40.6	2.87			0.0	0.0	12.8		SAMPLING CREW: SULLIVAN
								1.4	1.0	12.4		FINAL DO CALIBRATION: -0.8 MG/L
								2.7	1.2	11.5		
	1514	5	11.4	34.3	0.43			TOP	0.0	3.8		
	1525	6	11.4	29.2	0.36			TOP	0.0	3.8		
	1540	7	11.4	39.4	2.83			0.3	0.0	12.0		
								1.4	0.0	11.8		
								2.7	1.0	10.7		
2-8-91	1500	1	3.8	35.6	2.50	3.7	W	TOP	0.0	11.6		BP. 745mm AT 800, 746mm AT 1620
								MID	0.0	11.4		CLEAR, CALM, TEMP 45 DEG. F
								BOT	0.5	11.4		DO METER: YSI 54 EP
	1515	9	0.0	52.1	2.80	ND		TOP	0.5	11.3		SAMPLING CREW: SULLIVAN
								MID	1.0	10.9		FINAL DO CALIBRATION:+0.5 MG/L
								BOT	1.2	8.6		
	1525	5	12.7	35.6	0.43	ND		MID	0.0	9.9		
	1535	6	12.7	31.8	0.37	ND		MID	0.0	7.0		
	1550	7	2.5	52.1	2.74	ND		TOP	0.0	11.8		
								MID	0.0	11.6		
								BOT	1.0	10.8		
	1610	8	0.0	33.0	2.50	4.6	NW	TOP	0.0	11.8		
								MID	0.0	11.5		
								BOT	0.5	8.2		
	1635	11	7.6	33.0	0.82	ND		MID	2.0	2.5		
	1645	12	0.0	47.0	2.96	ND		TOP	0.0	11.8		
								MID	0.5	11.6		
								BOT	1.0	11.0		

ND = NOT DETECTED

WDNR

PRE-PROJECT AND POST-CONSTRUCTION

FISH SAMPLING DATA

Department of Natural Resources
111 W. Dunn St.
Prairie du Chien, Wis 53821
(608)326-0233

To: All interested parties

From: Kurt Welke

Subject: Fisheries sampling, Fish and Mussel Rock Channel, Bertom - McCartney Project, November 7, 1990.

On 11/7/90, WDNR personnel sampled the rock channel portion of the B/M project. Both banks were electrofished in a downstream direction for the entire length of the channel, as well as the bank protection and closing structure features at the channel's upstream end. Reference sampling was also conducted in the unimproved side channel that flows into Bertom L. See enclosed map.

The samples serve as the first comparative measure of the fishery response to the habitat work. Further work will be conducted in 1991 to again re-evaluate fishery response in the areas sampled this November, and in the dredge cuts after construction has ended and the areas stabilize.

SUMMARY:

All stations 425 Volts, Approx. 3.5 Amps, 80 pulses/sec, 20% duty

Run #1: Channel, LDB, Effort = 13.3 min. 11 Species
Run #2: Channel, RBD, Effort = 22.5 min 14 Species
Run #3: Banks and Closing Structure, Effort = 8.75 min, 8 Species
Run #4: Index, LDB, Effort = 8.75 min. 7 Species
Run #5: Index, RDB, Effort = 11.6 min. 10 Species

Species sampled in Rock Channel not sampled in unimproved areas:

- Smallmouth Bass
- Yellow Perch
- Black Crappie
- Rock Bass
- Spotted Sucker
- Silver Redhorse

Species sampled in Unimproved Areas not sampled in Rock Channel:

- Bigmouth Buffalo

For target species of Catfish, Walleye, Smallmouth Bass:

	# Sampled - Rock	# Sampled - Unimproved
SMB	6	0
LMB	34	3
Walleye	11	1
Sauger	26	2

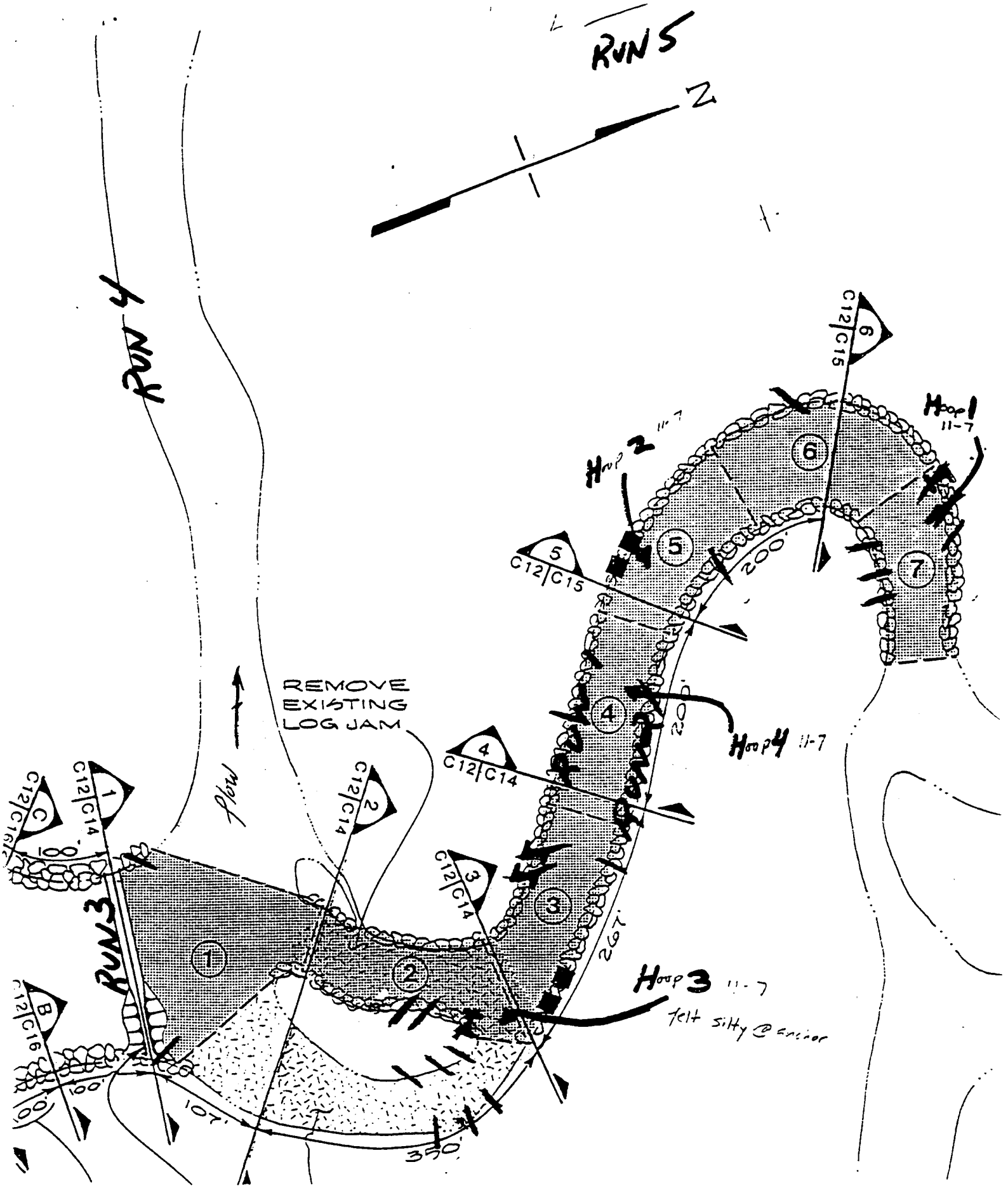
A general observation was that the rock channel held more target species. This may be in fact due to the proportionately higher amount of effort directed toward the coverage of the channel but it seems intuitive that the presence of desired substrate and the cover and food resources associated with that substrate account to a significant degree for the observed numbers of percid and centrachid fishes. Note also the representation by all stages of age and maturity, ie, YOY, juveniles, and adults.

Four hoop nets (unbaited) were also fished in the channel in the following method:

Hoop 1: Section 7, LDB in deep hole (16') Effort = 21.3 hrs.
Hoop 2: Section 5, LDB adjacent lunker (4.5') Effort = 21.2 hrs.
Hoop 3: Section 2, RDB adjacent lunker (4') Effort = 21.3 hrs.
Hoop 4: Section 4, RDB adjacent pipe (4.5') Effort = 21 hrs.

See enclosed map

While no catfish were sampled, other ictalurids (Yellow Bullhead) were caught as well as 1 Golden Redhorse.


RUN 5
RUN 4
RUN 3
REMOVE
EXISTING
LOG JAM
flow
Hoop 1
11-7
Hoop 2
11-7
Hoop 3
11-7
felt silty @ anchor
Hoop 4
11-7
C12/C15
C12/C14
C12/C16
200'
100'
107'
350'
267'

Bertom McCartney HREP (FILENAME: HREPSMRY.WK3)
MASTER SUMMARY
Centrachids in Dredged area (STATIONS 1-4)
Electrofishing comparisons for: 3/87, 5/87, 8/88, 11/92, 10/93, 8/94

Bertom McCartney HREP
Sample date: 3/23/87
Gear: electrofishing, 5 min. stations (20 minutes total)

	BGILL	LMB	BCRAP	WCRAP
Total No:	12	4	0	0
Size Range:	4.3" - 7.8"	8.5" - 16.5"		
Ave Length:	6.03"	13.6"		
SD of Length:	.76"	3.1"		
# Stock Size:	14	4		
# Quality Size:	9	2		
PSD:	64	75		
CPUE (#/hr):	42/HR	12/HR		

File name: 387SMRY.WK3

Bertom McCartney HREP
Sample Dates: 5/20 & 5/21/87
Gear: electrofishing, 5 min. stations (20 minutes total)

	BGILL	LMB	BCRAP	WCRAP
Total No:	84	3	0	0
Size Range:	1.6" - 8.4"	3.9" -17.6"		
Ave. Length:	4.2"	11.3"		
SD of Length:	2.7"	5.7"		
# Stock Size:	38	2		
# Quality Size:	30	2		
PSD:	79	100		
CPUE (#/hr):	252/HR	9 /HR		

File name: MS1-4M87.WK1

Bertom McCartney HREP
Sample date: 8/17 & 8/18/87
Gear: electrofishing, 5 min. stations (20 minutes total)

	BGILL	LMB	BCRAP	WCRAP
Total No:	9	5	1	0
Size Range:	1.1" - 6.5"	2.8" - 4.5"		
Ave. Length:	2.47"	3.5"	2.9"	
Sd of Length:	1.33"	0.7"		
# Stock Size:	10	0		
# Quality Size:	3	0		
PSD:	33	0		
CPUE (#/hr):	141/HR	15/HR	3/HR	

File Name: BERTMC87.WK3

Bertom McCartney HREP
Sample date: August 1988
Gear: electrofishing, 5 min. stations (20 minutes total)

	BGILL	LMB	BCRAP	WCRAP
Total No:	0	0	0	0
Size Range:				
Ave. Length:				
Sd of Length:				
# Stock Size:	NOTE: No analysis performed due to NO centrachids sampled			
# Quality Size:	in Stations 1-4, August 1988 by electrofishing			
PSD:				
CPUE (#/hr):				

File Name: BERTMC88.WK3

Bertom McCartney HREP
Sample date: 11/17/92
Gear: Mini boomshocker Time: 1.65 hr
ALL AREAS - SUMMARY

	BGILL	LMB	BCRAP	WCRAP
Total #	94	102	35	5
Size Range	2.8"-8.1"	3.3"-15.8"	3.5"-11.6"	3.9"-11.4"
Ave. Length	5.07"	7.3"	8.3"	9.34"
SD of Length	1.04"	2.8"	2.3"	2.8"
# Stock size	93	38	33	4
# Quality size	13	55	19	4
PSD	14	59	58	100
CPUE, (# / hr)	57/HR	62/HR	21/HR	3/HR

Bertom McCartney HREP
Sample date: 10/19 & 10/20/93
Gear: Big Boomshocker Time: 2.24 hrs.
ALL AREAS - SUMMARY (dredge pockets A,C,F,H,K/J,I)

	BGILL	LMB	BCRAP	WCRAP
Total #	318	104	12	2
Size Range	1.1" - 7.9"	3.7" - 16.4'	4.6" - 8.2"	3.7" - 11.0"
Ave. Length	4.57"	10.7"	6.45"	8.65"
SD of Length	1.22"	3.08"	1.25"	
# Stock size	220	43	8	1
# Quality size	30	31	3	1
PSD	21	72	37	100
CPUE, (# / hr)	142/HR	46/HR	5/HR	.9/HR

Filename: BERTFSH93.WK3

Bertom McCartney HREP
Sample date: 8/29/94
Gear: Big Boomshocker Time: 2.92 hrs.
ALL AREAS - SUMMARY (dredge pockets A,B/C,F,H,K/J,I)

	BGILL	LMB	BCRAP	WCRAP
Total #	107	32	2	4
Size Range	1.5"-8.1"	4.2-16.2"	7.2"-8.2"	4.2-11.7"
Ave. Length	4.4"	10.9"	7.7"	9.0"
SD of Length	1.3"	3.5"	0.5"	2.9"
# Stock size	69	24	1	3
# Quality size	29	18	1	3
PSD	42	75	100	100
CPUE, (# / hr)	37/HR	11/HR	0.7/HR	1.4/HR

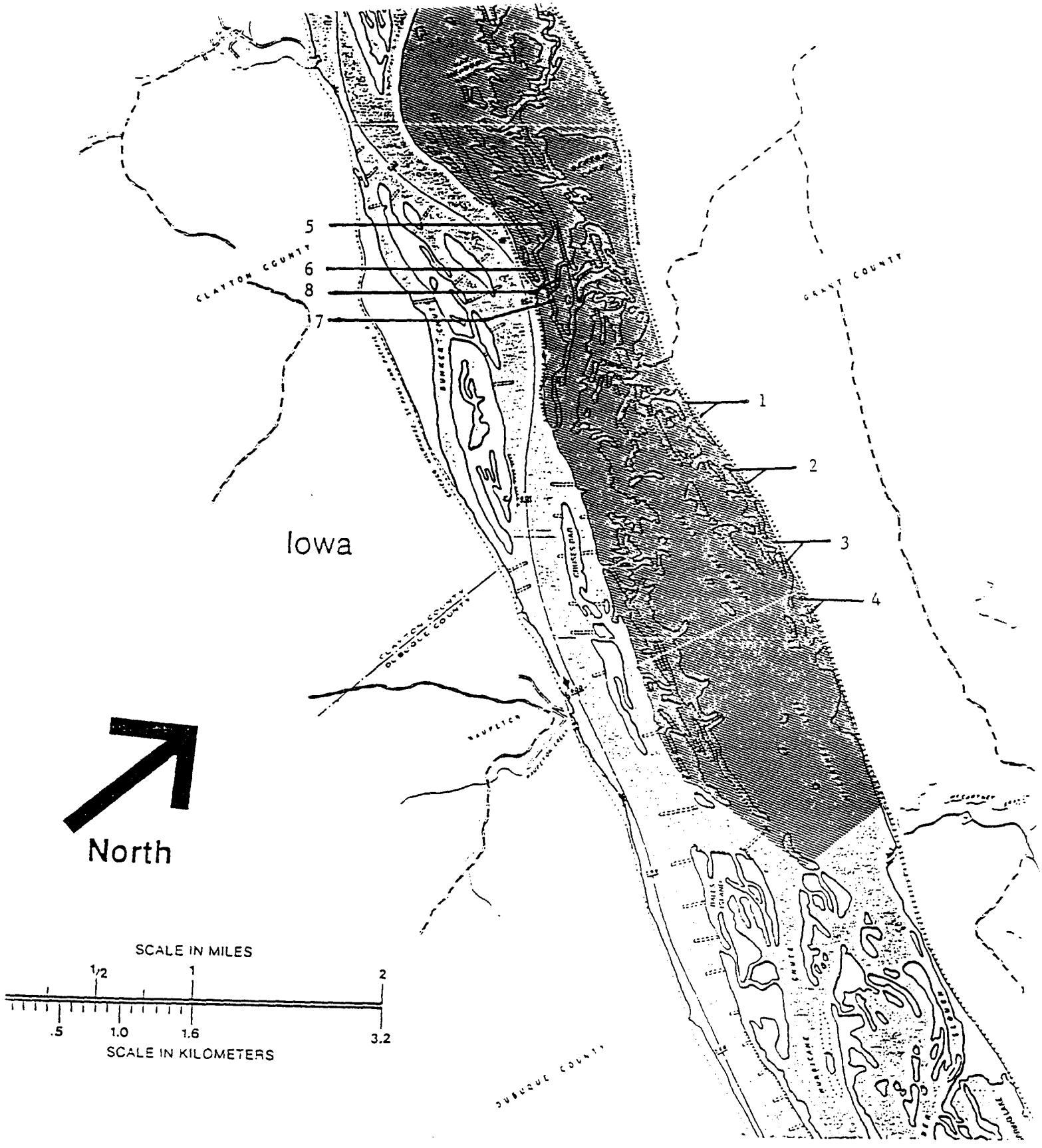


Figure 2. Map of Bertom and McCartney Lakes showing inventory stations 1-8.

August 29, 1994
Big Boom, 2 netters
Areas A, B/C, I, F, H, K/J
Total time = 2.92 hr (175.54 minutes)

Area A = 42 min.

		LMB
1.7	10	5
1.7		5.1
2		8.5
2.1		9.5
2.1		11.7
2.2		12.8
2.2		12.8
2.8		13.8
3.1		14.5
3.1		16.1
3.2		16.2
3.3		
3.6		
3.9		
4		
4.5		
5		
5		
5.6		
5.8		
6.3		
6.5		
6.5		
6.6		
6.6		
6.8		
7.2		
8.1		

Area "A" Summary

	BGILL	BCRAP	WCRAP
Total #	28	0	1
Size Range	1.7"-7.2"		10.0"
Ave. Length	4.34"		10.0"
SD of Length	1.92"		
# Stock Size	20		
# Quality Size	8		
PSD	40		
CPUE #/hr	40		1.42

Area B/C = .39 hr (23:33 minutes)

BG	LMB
2.1	8.6
3.4	11.8
3.7	13
4	
6.6	
6.7	
6.8	
7.2	
7.5	
7.8	

Area "B/C" Summary

	BGILL	BCRAP	WCRAP	LMB
Total #	10	0	0	3
Size Range	2.1"-7.8"			8.6"-11.8"
Ave. Length	5.6'			11.1"
SD of Length	2.45"			1.86"

# Stock Size	9	3
# Quality Size	6	2
PSD	67	67
CPUE #/hr	26	8

Area "F" = .66 hr (39:58 minutes)

BG	WC	LMB
1.5	4.2	4.2
1.6	10.2	5.1
1.6		5.2
1.7		7.3
1.9		9.1
2		10.9
2.1		12.5
2.1		13.1
2.1		13.2
2.1		13.9
2.2		14
2.2		
2.3		
2.4		
2.5		
2.6		
2.6		
2.6		
2.8		
2.8		
3.1		
3.1		
3.2		
3.3		
3.4		
3.6		
3.6		
3.9		
4		
4.6		
4.8		
4.9		
4.9		
5.1		
5.2		
6		
6.2		
6.4		
6.5		
6.5		
6.6		
6.6		
7.1		
7.6		

Area "F" Summary

	BGILL	BCRAP	WCRAP	LMB
Total #	44		2	11
Size Range	1.5"-7.6"		4.2"-10.2"	4.2"-14.0"
Ave. Length	3.7"		7.2"	9.9"
SD of Length	1.7'			3.7'
# Stock Size	24			7
# Quality Size	9			5
PSD	38			71
CPUE #/hr	67		3	17

AREA "H" =.3hr (20:00 minutes)

BG No Wcrap, Bcrap., LMB

2.5
5.5
6.5
6.9

Area"H" Summary

	BGILL
Total #	4
Size Rang	2.5"-6.9"
Ave. Leng	5.4"
SD of Len	1.7"
# Stock S	3
# Quality	2
PSD	67
CPUE #/hr	12

AREA K/J = .56hr (33:50 minutes)

BG	BC	WC	LMB
2	7.2	11.7	4.8
2.1	8.2		12.4
2.2			12.5
3.6			12.7
3.9			12.8
4.7			
4.8			
4.9			
5.2			
5.2			
5.2			
5.3			
5.3			
5.4			
5.8			
6.4			
7			
7.1			
7.3			

Area K/J Summary

	BGILL	BCRAP	WCRAP	LMB
Total #	19	2	1	5
Size Range	2.0"-7.3"	7.2"-8.2"	11.7"	4.8"-12.8
Ave. Length	4.9"	7.7"	11.7"	11.0"
SD of Length	1.5"			3.1"
# Stock Size	16	1		4
# Quality Size	4	1		4
PSD	25	100		100
CPUE #/hr	34	4	2	9

Area "I" = .275 hr (16:33 minutes)

BG	BC	WC	LMB
5.1			13.0
6.8			13.7

AREA I Summary	BGILL	BCRAP	WCRAP	LMB
Total #	2	0	0	2
Size Range	5.1-6.8"			13.0"-13.7"
Ave. Length	5.9"			13.4"
SD of Length				
# Stock Size	2			2
# Quality Size	2			2
PSD	100			100
CPUE #/hr	7			7

ALL AREAS Combined(COMBINED DATA SET)

BG	BC	WC	LMB
1.5	7.2	4.2	4.2
1.6	8.2	10	4.8
1.6		10.2	5
1.7		11.7	5.1
1.7			5.1
1.7			5.2
1.9			7.3
2			8.5
2			8.6
2			9.1
2.1			9.5
2.1			10.9
2.1			11.7
2.1			11.8
2.1			12.4
2.1			12.5
2.1			12.5
2.1			12.7
2.2			12.8
2.2			12.8
2.2			12.8
2.2			13
2.2			13
2.3			13.1
2.4			13.2
2.5			13.7
2.5			13.8
2.6			13.9
2.6			14
2.6			14.5
2.8			16.1
2.8			16.2
2.8			
3.1			
3.1			
3.1			
3.1			
3.2			
3.2			
3.3			
3.3			
3.4			
3.4			
3.6			
3.6			
3.6			
3.6			
3.7			
3.9			
3.9			
3.9			
4			
4			
4			
4.5			
4.6			
4.7			
4.8			
4.8			
4.9			
4.9			
4.9			
5			
5			
5.1			
5.1			
5.2			
5.2			

Sampled
8-29-94
Electro
Eert/MC

5.2
5.2
5.3
5.3
5.4

5.5
5.6
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6.6
6.6
6.6
6.6
6.7
6.8
6.8
6.8
6.9
7
7.1
7.1
7.2
7.2
7.3
7.5
7.6
7.8
8.1

ALL AREAS - SUMMARY

	BGILL	BCRAP	WCRAP	LMB
Total #	107	2	4	32
Size Rang	1.5"-8.1"	7.2"-8.2"	4.2"-11.7"	4.2"-16.2"
Ave. Leng	4.4"	7.7"	9.0"	10.9"
SD of Len	1.9"	0.5	2.9"	3.5"
# Stock S	69	1	3	24
# Quality	29	1	3	18
PSD	42	100	100	75
CPUE #/hr	37	0.7	1.4	11

Bertom McCartney Sampling DATE: [illegible]

DATA SHEET Gear: (Big Boom) Mini hoop Fyke

FORM 3600–49

DEPARTMENT OF NATURAL RESOURCES

Effort: 10:39 [illegible]

Station: [illegible] ([illegible] Chnl)

Pocket ___ Dredge Cut ___ Rock Chnl

Time in: Lift Time: Pull Time:

Date in: Lift Date: Pull Date:

volts: amps:

	Carp	Longnose	[illegible]	Bl. [illegible]	FWD	White [illegible]	Sh. Red	Northern [illegible]	Sm. Buff	B[illegible] Bu
	19.6	[illegible]	12.0	9.0	1[illegible]	11.9	17.0	16.5	15.7	1[illegible]
	19.1	30.5					16.[illegible]			
	[illegible]2	2[illegible].0					15.7			
	1[illegible].8						16.0			
	14.7									
	17.7									
	20.4									
	18.2									
	21.9									
	21.1									
	17.1									
	17.2									
	18.[illegible]									
	17.2									

+37 Carp not [illegible]

+1 F.H. CAT 40 LB+

Bertom McCartney Sampling DATE: 8-2[illegible]

DATA SHEET Gear: Big-Boom Mini hoop Fyke DEPARTMENT OF NATURAL RESOURCES
FORM 3600-49 Effort:

Station: 19:03 Control Chnl Time in: Date in: volts:
Lift Time: Lift Date: amps:
Pull Time: Pull Date:

BW Pocket ___ Dredge Cut ____ Rock Chnl

Rainbow LMB	Gizzard	[illegible]	W. Bass	S. H. Red	N. Pike	Carp/Sucker	R. Crappie	Crappie	Walleye	Fl
24.6	5.5	5.9	5.1	10.1	23.5	16.2	9.2	13.2	35.0	3.
12.2	5.9		5.3	16.7				13.1		3
4.0	4.5		2.9	10.6				12.1		
	6.1			5.3				17.1		
	5.[illegible]							13.7		
	5.6							16.2		
	5.8							16.[illegible]		
	5.5							16.1		
	4.[illegible]							24.2		
					LM Huff 17.2	Hybrid 17.[illegible]	Silver Red 12.9			
T30	[illegible]									
					N 00[illegible] 8					

Weight of fish [illegible] which was old Orion

Bertom McCartney Sampling

DATE: 7-27-94

DATA SHEET
FORM 3600-49

Gear: (Big Boom) Mini hoop Fyke

DEPARTMENT OF NATURAL RESOURCES

Effort: 12:45 RDB 2 passes

Time in: Date in: volts:
Lift Time: Lift Date: amps:
Pull Time: Pull Date:

Station:

BW Pocket ___ Dredge Cut ___ (Rock-Chnl)

BG	SMB	F.W	LMB	*CARPSKR	CARP	GSh.r	SA Rock	SBuff	S
6.5	11.2	4.0	4.6	18.5	16.1	6.1	15.2	16.6	20
2.3	13.2	15.6	12.1	20.2	16.6	4.5	10.2		42
5.5	10.5	21.2	8.5		18.2	5.6	18.5		91
	10.8	12.5	4.1		17.7	6.2	11.4		
	5.1	4.7	13.8		19.3	4.1	15.2		
	4.3	10.3			16.8	5.3	16.3		
		4.4			18.8	5.5	10.7		
		3.9				5.4	11.3		
						6.1	17.9		
						5.4	12.2		
						5.1	15.1		
						6.1	16.1		
						5.2	9.9		
						5.6	6.4		
						5.0			
						5.1			
						4.9			
						4.7			

Logperch	FAT	RR.S	CCat	Gsh.sn	ORSF
	11.0	2.5	16.3	3.2	2.3
	12.2	5.2			
	12.7				

Bertom McCartney Sampling

DATE: 8-29-94

DATA SHEET
FORM 3600-49

Gear: (Big Boom) Mini hoop Fyke

Effort: 14:45 2 dippers

DEPARTMENT OF NATURAL RESOURCES

Time in: Date in: volts:
Lift Time: Lift Date: amps:
Pull Time: Pull Date:

Station:

BW Pocket ___ Dredge Cut ___ (Rock Chnl) LDC + closing

1500 pm

SHR	LMB	SMB	CARP	FCAT	RBASS	BOW	WE	GShad	Fw
18.5	10.2	13.7	18.3	11.2	8.2	6.9	27.4	5.7	4.
16.4	12.5	15.4	18.7	9.6		4.9		5.6	
17.1	12.6	7.1	21.0	11.8				6.1	
15.5		16.7	17.5	12.0				5.5	
16.3			16.4	11.8				5.6	
15.8			18.4						
17.2			17.1						
15.6			16.5						
10.[illegible]			17.2						
15.[illegible]			21.8						
15.9			16.3						
10.5			17.7						
11.4									
9.0									
14.9									
17.9									
16.3									
14.3									
			WRaw						
			13.0						
			4.6						

A P P E N D I X D

CORPS OF ENGINEERS DATA

BERTOM AND McCARTNEY LAKES WATER QUALITY SUMMARY

INTRODUCTION

Comparison of pre-project and post-project water quality data shows that some positive trends may be emerging. Examination of available data shows improvement in several areas. Flow through the rock cuts leading to Bertom Lake seems to be quite good, providing an opportunity for oxygenated water to enter the backwater area. Measurable velocities are routinely observed beneath the ice within the dredged channels at most locations sampled. This indicates that fresh water is reaching the previously isolated areas to where fish tend to move during the winter. Evidence of an improvement in dissolved oxygen concentrations at several locations is also apparent. Areas which were previously observed to experience low dissolved oxygen concentrations fairly frequently, now routinely have acceptable dissolved oxygen concentrations. Results of studies to determine the extent of sediment resuspension are not as definitive. In general, it appears that many of the original water quality objectives have been met.

PROJECT OBJECTIVES

As part of the general goal of enhancing the aquatic habitat within the backwater complex, specific water quality objectives were established. These included increasing water exchange between lotic and lentic areas and reducing resuspension of fine-grained bottom sediments. Because of sediment deposition, some areas within the project site had become isolated from oxygenated, flowing water sources. Groundwater interactions further reduced dissolved oxygen concentrations during critical periods such as under snow and ice cover. By selectively dredging access channels to these isolated areas, it was anticipated that the occurrence of low dissolved oxygen concentrations could be avoided.

Much of the sediment deposited to the backwater complex is very fine-grained and easily resuspended by wind-induced wave action. This resuspension greatly reduces water clarity and makes for an unsuitable substrate in which aquatic plants can become established. By constructing and strategically orienting an island, it was anticipated that some wind-sheltering effect would be realized. This would potentially reduce sediment resuspension, improve light penetration, and promote aquatic plant growth. Once aquatic plants become established, the bottom would be stabilized and thus be less subject to resuspension.

RESULTS AND DISCUSSION

Water Discharge

Discharge measurements were made at the upstream entrance to Bertom Lake, near the boat landing in Bertom Lake and in the flowing channel near site W-M600.3C. Figure D1 shows these locations. Measurements were made by the Wisconsin Department of Natural Resources (WDNR); the U.S. Geological Survey, Wisconsin District (WUSGS); and the Corps of Engineers (COE). Methods for determining discharge followed general procedures as developed by the U.S. Geological Survey. Table D1 lists the results of these surveys.

TABLE D1

Summary of Discharge Measurements

Location	Date	Cross-Sectional Area (sq ft)	Maximum Depth (ft)	Maximum Velocity (ft/sec)	Discharge (cfs)	Discharge at L/D 10 (cfs)	Data Source
Above Boat Landing	10 Feb 89	1,875	13.0	0.17	242	20,700	WDNR
Above Boat Landing	2 Feb 94	1,795	16.0	0.434	453	32,000	COE
Above Boat Landing	30 Mar 94	2,115	19.5	1.20	1,500	81,000	COE
Above Boat Landing	13 Feb 95	1,348	14.3	0.230	224	22,500	WUSGS
Above Rock	28 Jan 93	836	9.3	0.40	254	33,000	WDNR
Above Rock	26 Jan 94	839	9.2	0.245	160	33,000	WDNR
Above Rock	13 Feb 95	712	8.1	0.247	136	22,500	WUSGS
Transect E	26 Apr 89	500	7.0	1.56	621	56,300	COE
Transect E	2 Feb 94	560	11.0	0.691	217	32,000	COE
Transect G	26 Apr 89	1,188	13.0	1.41	1,350	56,300	COE
Transect G	2 Feb 94	1,065	9.5	0.969	638	32,000	COE

Discharge into the backwater complex through the rock structure near river mile 602 was determined on two occasions. A relatively small portion (approximately 1% to 2%) of the overall Mississippi River flow, as measured at Lock and Dam 10, entered through this inlet on these occasions. Approximately 40% of this flow passed into Bertom Lake through the upper channel. At both locations, higher flows were observed when total river flows were high. Flow within the complex above the boat landing in Bertom Lake amounted to between 0.9% and 1.8% of the total river flow. The limited data available at this location indicate that flow is positively correlated with total river flow (Figure D1).

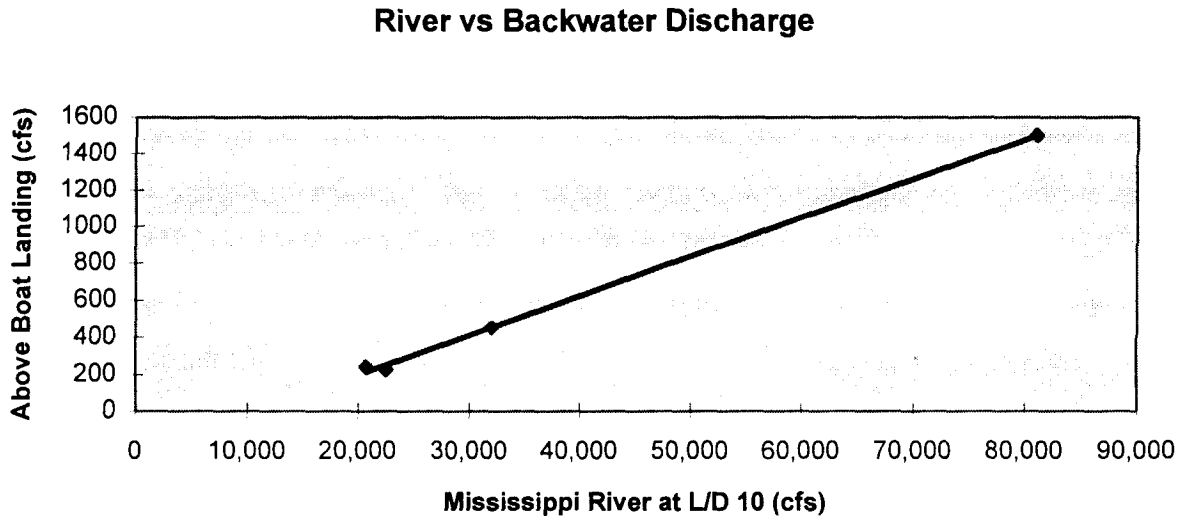


Figure D1. Backwater discharge relative to Mississippi River discharge.

Near monitoring site W-M600.3C, observed flow comprised between 0.4% and 0.7% of the total river flow. Again, higher flows were observed when total river discharge was high. Also, although less definitive, the percent of the total river flow measured at locations within the backwater complex appeared to increase with total river flow. Comparisons of pre- and post-project flows at specific sites are not conclusive. This is partially due to the limited number of discharge measurements available. This type of comparison is also complicated by the fact that flow within the backwater complex is affected by the total river discharge.

Velocity

Velocity measurements were made at several locations within the backwater complex, including the discharge measurement locations and the flowing water monitoring sites. Measurements were made by WDNR, WUSGS, and COE. Instrumentation varied from investigator to investigator, but measurement techniques generally followed the guidelines established in the LTRM procedures manual. The location with the most measurements was site W-M600.3C. Prior to construction, approximately 60 velocity measurements were made at this location. Following construction, approximately 40 measurements were made. The range of stages was comparable during the pre- and post-construction periods and the measurements were fairly representative of stages experienced during the entire period. The only exception was that the very high stages experienced during the summer of 1993 are not represented. By establishing a relationship between river stage (at Cassville, WI) and velocity during the two periods, it was possible to compare the velocities during the two periods. Based on available data, there does not appear to be a discernible difference between velocity characteristics at this location during the two periods.

At other locations, less data are available. Near the boat landing in lower Bertom Lake, the velocity measurements following construction averaged about 0.6 feet/second. The only measurement made prior to construction was at a relatively low stage and was 0.17 feet/second. Other areas where velocity measurements were made are near the inlet to Bertom Lake (transects E and G). At both of

these sites, some placement of rock occurred. Based on the little data available at these sites, it is not possible to identify any difference between pre- and post-construction velocities.

Dissolved Oxygen

All dissolved oxygen measurements were made in the field using an oxygen sensitive membrane electrode and appropriate meter. Surface dissolved oxygen concentrations were monitored regularly at 2 sites since 1989. Table D2 lists the site locations, the number of monitoring events included during this period, and a summary of the data gathered.

TABLE D2

Surface Dissolved Oxygen Summary

Statistic	W-M600.3C	W-M599.8B
Total samples collected	68	46
Preproject samples collected	34	12
Range (mg/l)	1.0 - 15.8	1.1 - 16.0
Mean (mg/l)	7.9	10.7
Percent of samples < 5.0 mg/l (%)	21	8
Post-project samples collected	34	34
Range (mg/l)	4.9 - 17.3	3.7 - 15.9
Mean (mg/l)	9.8	9.5
Percent of samples < 5.0 mg/l (%)	3	3

Prior to project construction, surface dissolved oxygen concentrations were observed to fall frequently below 5.0 mg/l at site W-M600.3C, both during the summer and winter months. Based on samples taken since project completion, only one surface dissolved oxygen concentration below 5.0 mg/l has been observed at this location. At site W-M599.8B, similar findings were observed. Prior to project construction, dissolved oxygen concentrations as low as 1.1 mg/l were observed at the surface. Following project construction, dissolved oxygen concentrations have been above 5.0 mg/l with the exception of one sample taken during the summer of 1994.

In addition, dissolved oxygen profiles were determined at the same two sites from 1992 through 1994. These data are presented in Figures D2 - D5. The results show that little evidence of stratification was observed. Dissolved oxygen concentrations at site W-M600.3C were consistently above 5 mg/l throughout the water column, with the exception of the single instance (22 June 1994, Figure D3) when the surface concentration was observed to be low. At site W-M599.8B, stratification was more pronounced; however, only once did the dissolved oxygen concentration fall below 5 mg/l near the bottom when the surface concentration was above 5 mg/l.

The WDNR conducted continuous monitoring of dissolved oxygen during the summers of 1987-1991 (see Appendix C for WDNR water quality data). At the WDNR locations called "the Rock" and at "WDNR Site #1 Continuous Water Quality Monitoring" which is near site W-M600.3C, WDNR personnel consistently observed dissolved oxygen concentrations below 5 mg/l during the summers of 1987-1990 prior to project construction. In August 1994, following construction, WDNR again sampled at these locations for a period of 8 days. At no time did the dissolved oxygen concentration drop below 5 mg/l.

It is apparent that adequate flow is reaching the areas which previously experienced dissolved oxygen problems or were on the verge of experiencing problems. While insufficient time has past for extreme summer and winter conditions to be observed, it seems likely that the dredging of channels has improved the circulation of water within the backwater complex and in particular to previously isolated areas.

Chlorophyll a

Samples were taken for chlorophyll a determination at five sites following project construction. All samples were placed in plastic bottles, labeled, refrigerated and transported to the laboratory for immediate analysis. Results of the analyses are presented in Table D3.

TABLE D3

Results of Chlorophyll a Analyses

Chlorophyll a (mg/m^3)	W-M600.3C	W-M599.8B	W-M598.9E	W-M599.5D	W-M599.2C
Number of Samples Collected	46	46	46	46	45
Mean (mg/m3)	27	29	27	28	25
Maximum (mg/m3)	142	121	149	166	112
Minimum (mg/m3)	2	4	2	2	3

Chlorophyll a concentrations have correlated fairly closely with dissolved oxygen concentrations throughout the sampling period. Maximum chlorophyll concentrations have been observed during the late summer months when flows were relatively low. To date, algal blooms have not been sufficient to present a problem at the time of die off.

Turbidity

Turbidity samples were taken at five locations following project construction. All samples were collected in plastic bottles, labeled, and returned to the laboratory where they were analyzed immediately. A summary of these data is presented in Table D4.

TABLE D4

Summary of Turbidity Results

Turbidity (NTU)	W-M600.3C	W-M599.8B	W-M598.9E	W-M599.5D	W-M599.2C
Number of Samples	48	48	48	48	48
Mean	22	18	23	26	20
Maximum	62	54	62	69	54
Minimum	2	2	3	3	2

Turbidity measurements at site W-M599.8B appeared to be consistently less than the other sites monitored. This site is relatively protected from wind and wave action. At sites W-M599.5D and W-M599.2C, measurements were taken in an attempt to identify any sheltering and subsequent reduction in resuspension of bottom sediments which might be attributable to the presence of the newly constructed island. In order for the island to have any beneficial impacts in this regard, the predominate wind direction must be from a westerly direction. In order for aquatic plants to benefit from improved water clarity, data gathered only during warm weather months are applicable. While site W-M599.2C (the protected side of the island) does appear to have slightly lower turbidity values compared to site W-M599.5D, due to the relatively short period of time over which data have been gathered, insufficient data are available to determine if the island is providing sufficient protection to promote aquatic plant growth. An attempt will be made to gather continuous data over an extended period of time so that the impact of the island can be better assessed.

Secchi Disc Depth

Field secchi disc depth measurements were made at 5 sites following project construction. Objectives were similar to those for turbidity. Results of these measurements are presented in Table D5.

TABLE D5

Summary of Secchi Disc Measurements

Secchi Disc Depth (Feet)	W-M600.3C	W-M599.8B	W-M598.9E	W-M599.5D	W-M599.2C
Number of Measurements	47	47	47	47	47
Mean	0.45	0.48	0.41	0.37	0.50
Maximum	2.15	2.0	2.0	2.0	2.0
Minimum	0.03	0.15	0.18	0.03	0.18

Interpretation of the results of secchi disc measurements is subject to the same limitations as are turbidity data. Site W-M599.8B appears to have better water clarity compared to the flowing water sites. Also, there does appear to be a discernible difference between the two sides of the island, with the sheltered side having generally greater values. Definitive statements, however, can only be made when more data are available.

Wave Height

Wave height determinations were routinely made at two locations, one on either side of the dredged island. As was the case with turbidity and secchi disc depth, wind sheltering effects were anticipated as a result of the presence of the dredged island. Estimates of wave height were based on visual observations by comparing to objects of known height. Results of the wave height data are summarized is Table D6.

TABLE D6

Summary of Wave Height Results

Wave Height (feet)	W-M599.2C	W-M599.5C
Number of Measurements	37	37
Mean	0.23	0.25
Maximum	1.2	1.2
Minimum	0	0

Based on the limited data available and due to the subjectivity of the measurements, no clear trends are present.

Overall, it is clear that many of the original water quality objectives of this project have been achieved. Discharge and velocity into and within the project area are good. Adequate oxygenated water is now available to areas which previously experienced less than desirable concentrations at different times throughout the year. Water depth has been improved at both flowing water and backwater locations. While the water quality impacts of the newly constructed island can not yet be determined, some evidence exists for improvement in water clarity on the sheltered side of the island. Finally, no negative water quality impacts have been observed.

FIGURE D2
DISSOLVED OXYGEN
McCARTNEY LAKE, 1992-93
W-M599.8B

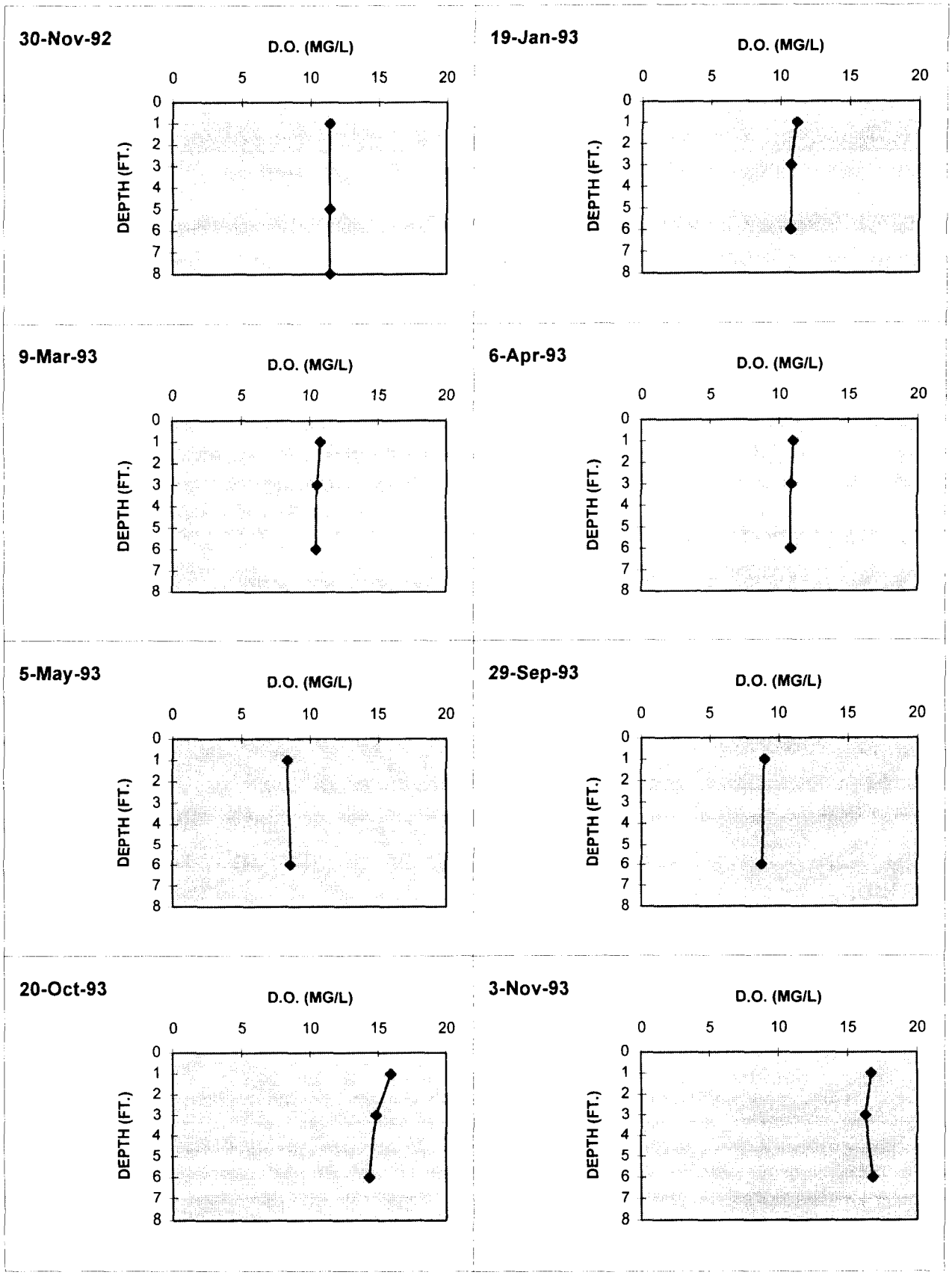


FIGURE D3
DISSOLVED OXYGEN
McCARTNEY LAKE, 1994
W-M599.8B

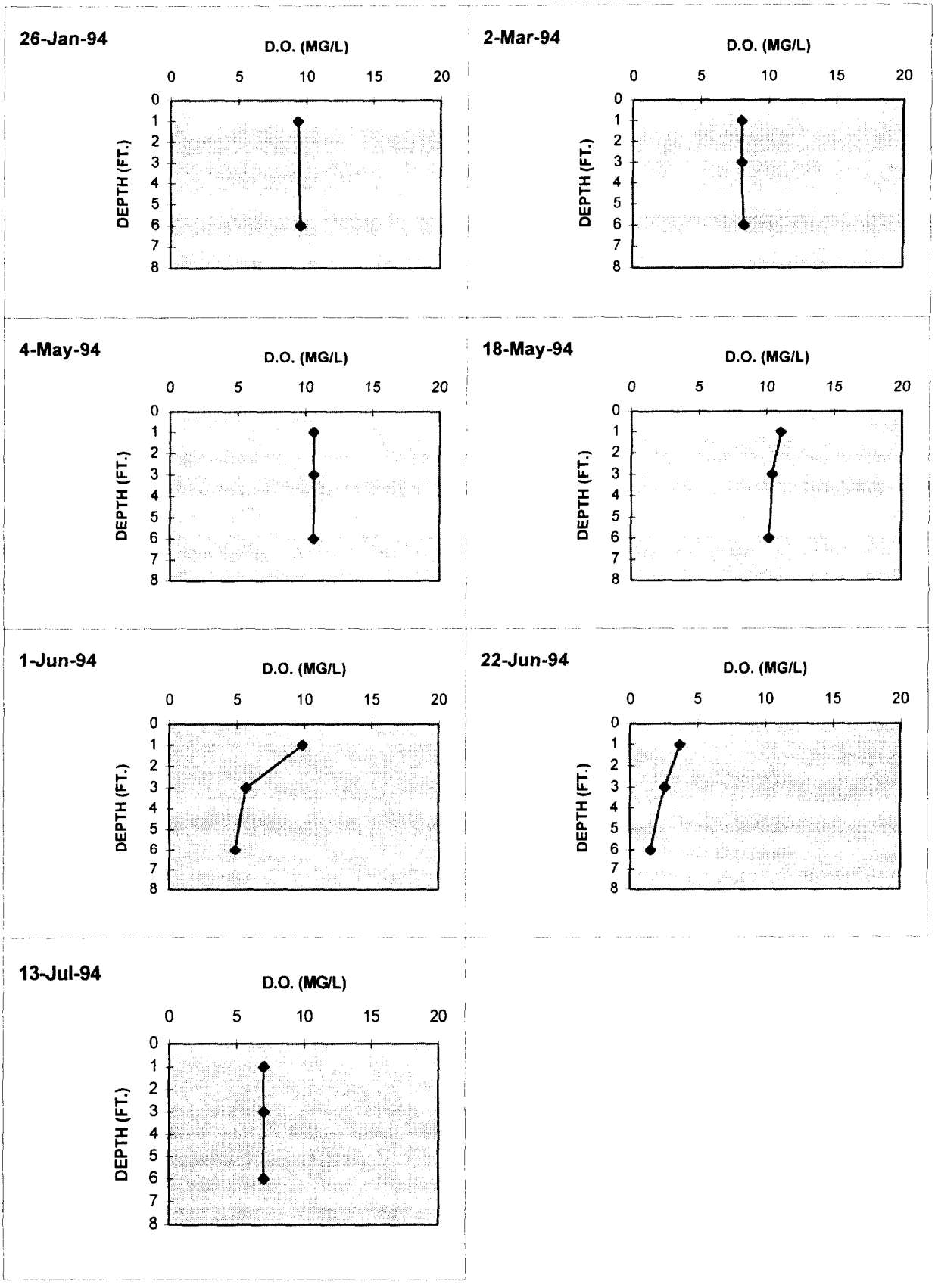


FIGURE D4
DISSOLVED OXYGEN
McCARTNEY LAKE, 1992-93
W-M600.3C

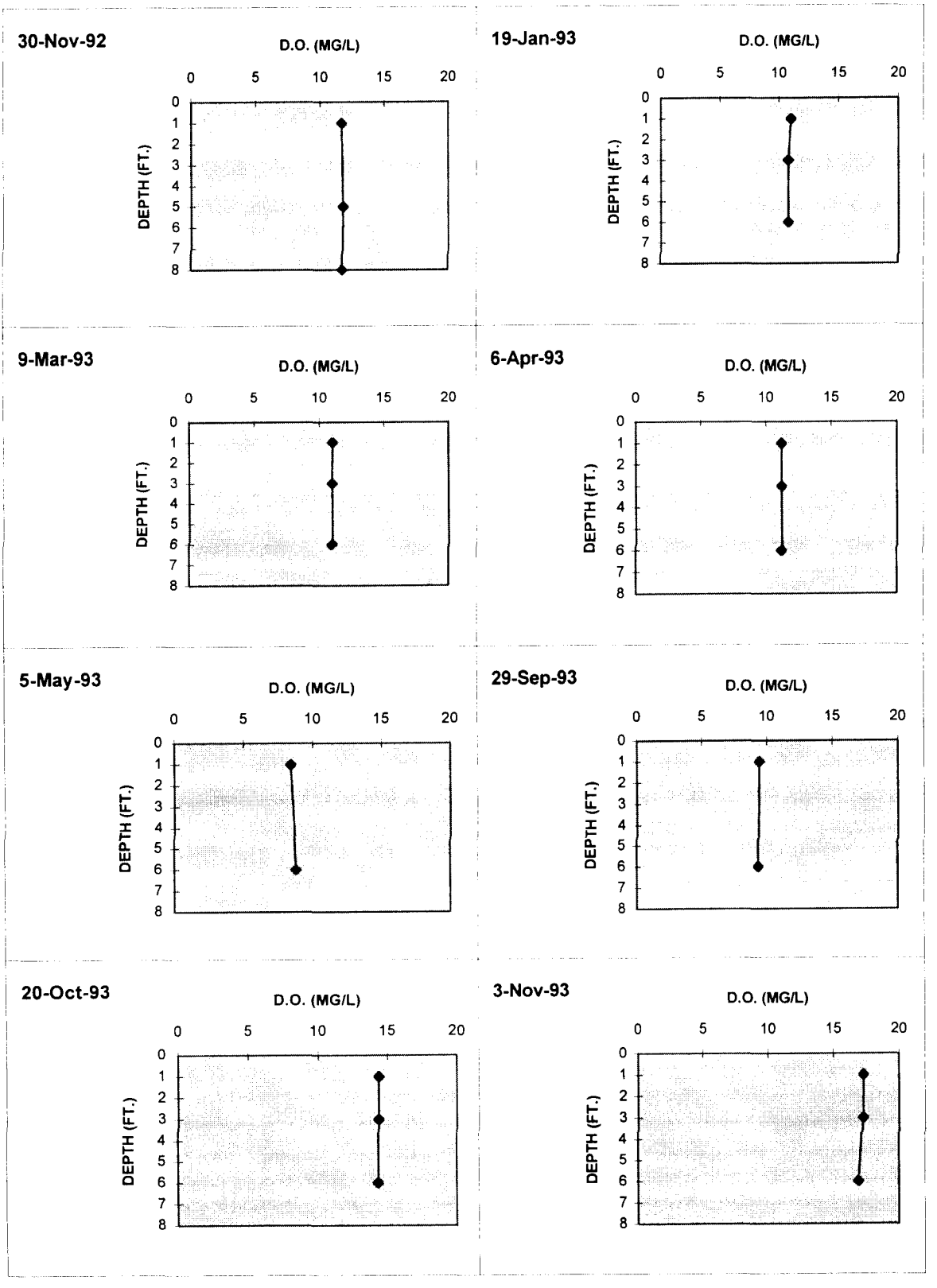
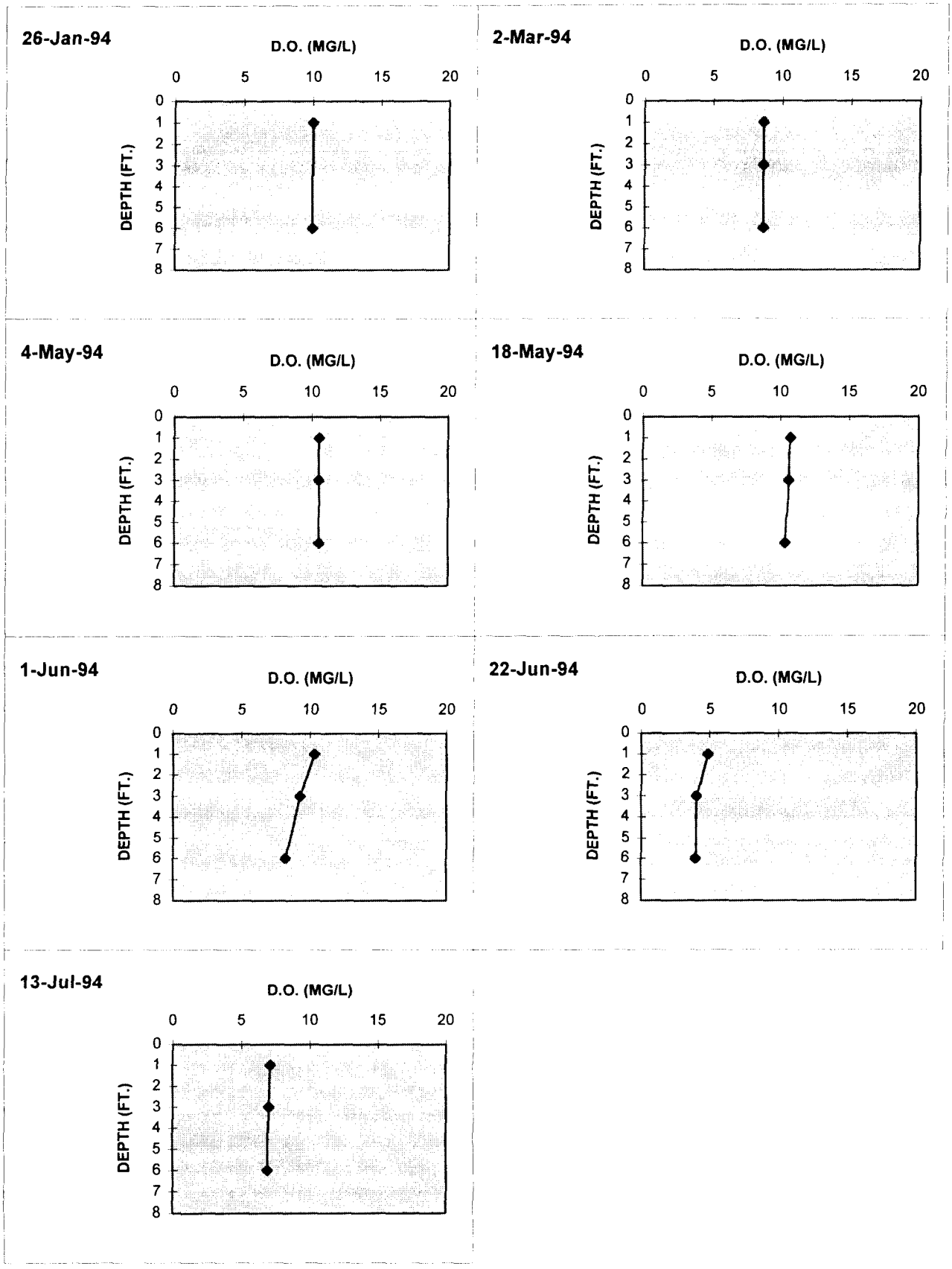


FIGURE D5
DISSOLVED OXYGEN
McCARTNEY LAKE, 1994
W-M600.3C



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District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
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1/ All addresses receive one copy of the document except where noted in parentheses.

A P P E N D I X F

PROJECT PHOTOGRAPHS

Photo # 1 - View of dredged material placement site from nearby bluff, August 1992

Photo #2 - Aerial view of dredged channels; August 1992

Photo #3 - Wetland on dredged material placement site; August 1992

Photo #4 - Wetland on dredged material placement site; October 1994

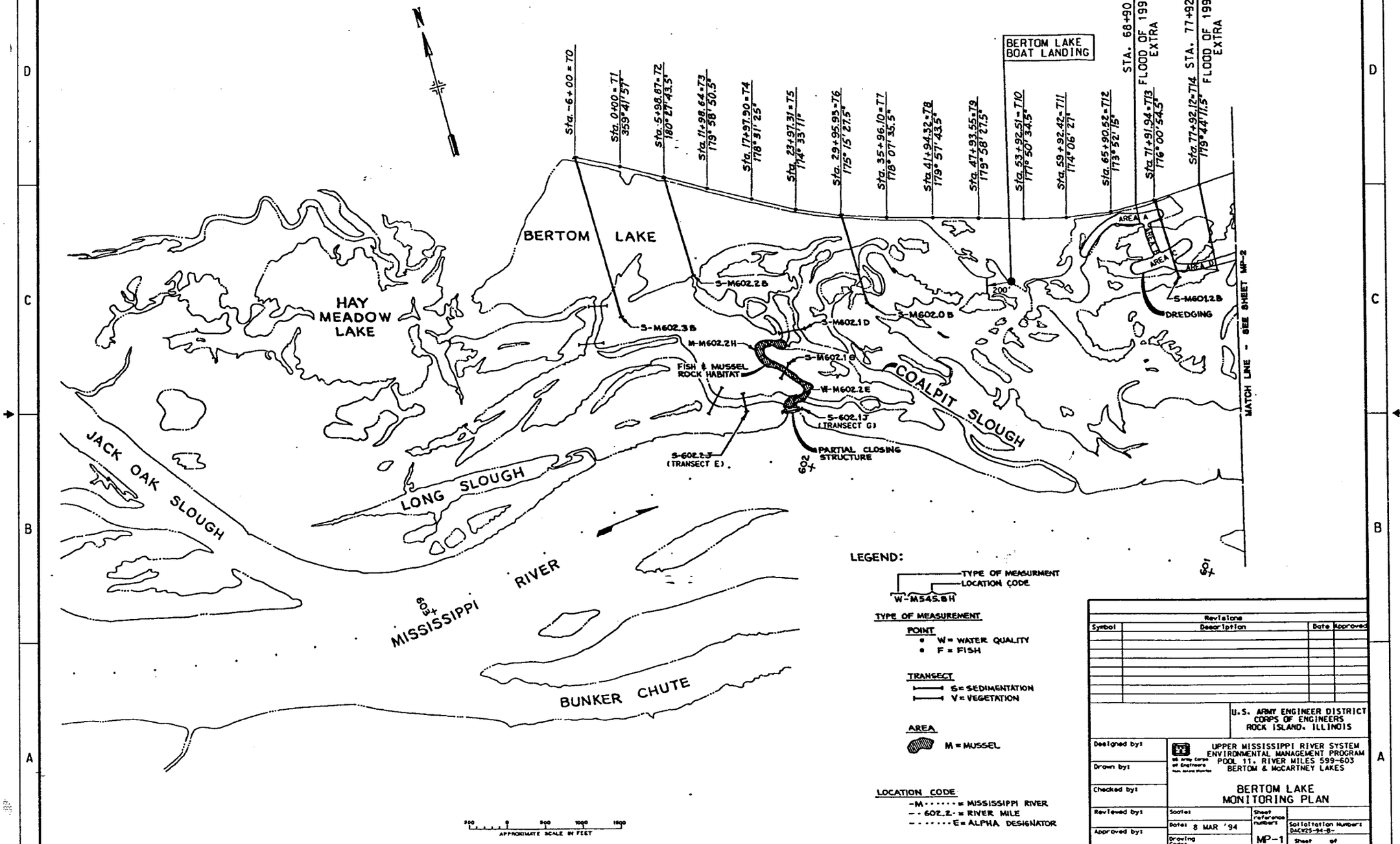
Photo #5 - Erosion on north side of dredged material placement site; May 1994

Photo #6 - Close-up of erosion in above photograph; May 1994

Photo #7 - Upstream end of riprap protection wing at closing structure, riprap washed away during flood of 1993; August 1994

Photo #8 - Downstream end of riprap protection wing at closing structure, riprap soundly intact; August 1994

PLATES



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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILES 599-603
BERTOM & McCARTNEY LAKES

BERTOM LAKE MONITORING PLAN

Scales:
Date: 8 MAR '94
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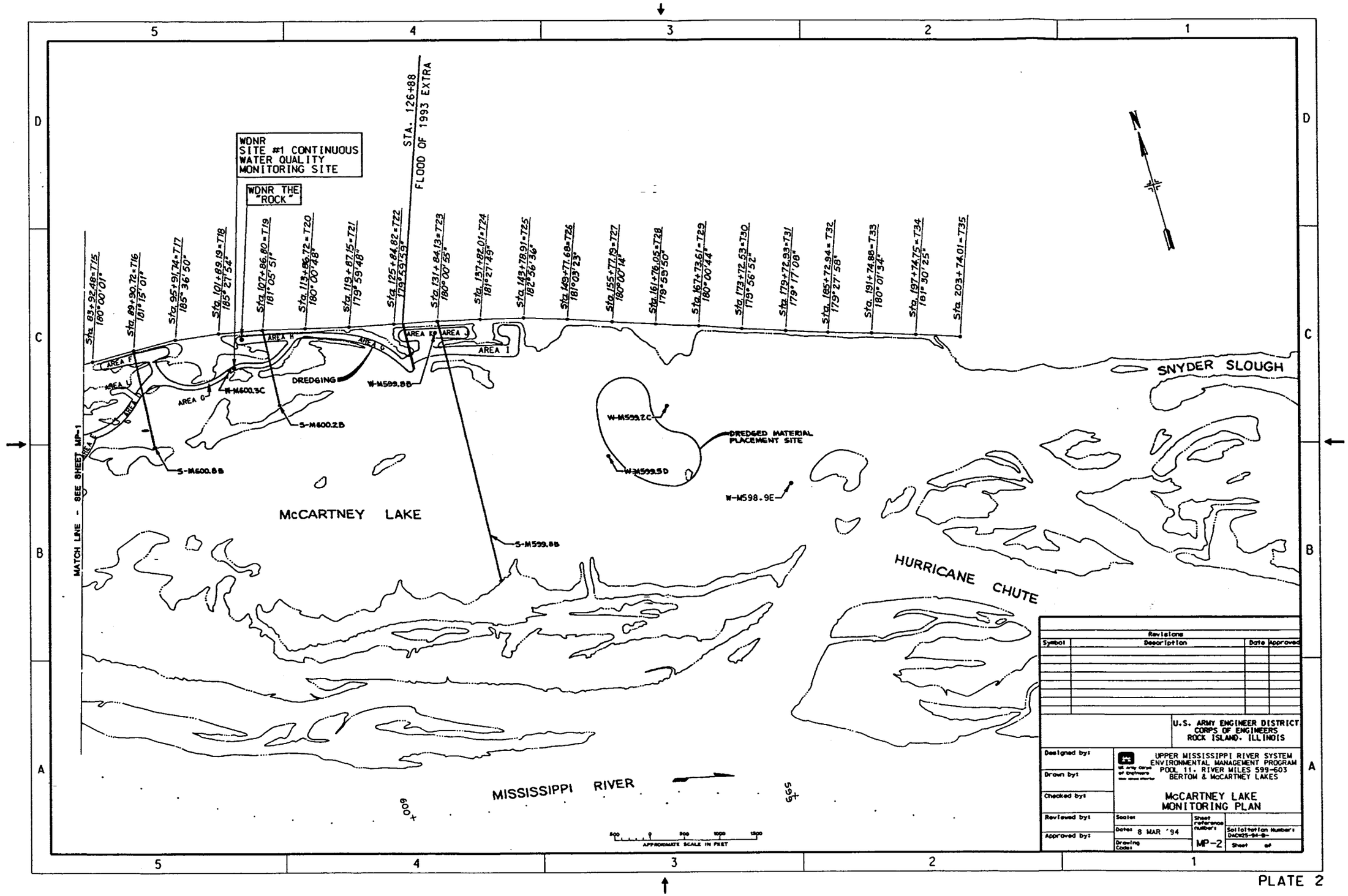
Sheet reference numbers: MP-1
Solicitation Numbers: DACW25-94-B-
Sheet of

PLATE 1


WDNR
SITE #1 CONTINUOUS
WATER QUALITY
MONITORING SITE
WDNR THE "ROCK"
STA. 126+88
FLOOD OF 1993 EXTRA
Sta. 83+92.48=T15
180° 00' 01"
Sta. 89+90.72=T16
181° 15' 01"
Sta. 95+91.74=T17
185° 36' 50"
Sta. 101+89.19=T18
185° 27' 54"
Sta. 107+86.80=T19
181° 05' 51"
Sta. 113+86.72=T20
180° 00' 48"
Sta. 119+87.15=T21
179° 59' 48"
Sta. 125+84.82=T22
179° 59' 55"
Sta. 131+84.13=T23
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Sta. 137+82.01=T24
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179° 17' 08"
Sta. 185+72.94=T32
179° 27' 58"
Sta. 191+74.88=T33
180° 01' 54"
Sta. 197+74.75=T34
181° 30' 25"
Sta. 203+74.01=T35
AREA F
AREA E
AREA D
AREA C
AREA B
AREA A
AREA H
AREA G
AREA K
AREA J
AREA I
DREDGING
W-M600.3C
S-M600.2B
S-M600.8B
W-M599.8B
S-M599.8B
W-M599.2C
W-M599.5D
DREDGED MATERIAL PLACEMENT SITE
W-M598.9E
SNYDER SLOUGH
McCARTNEY LAKE
HURRICANE CHUTE
MISSISSIPPI RIVER
MATCH LINE - SEE SHEET MP-1
600+
595+
APPROXIMATE SCALE IN FEET
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McCARTNEY LAKE
MONITORING PLAN
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Dates 8 MAR '94
Drawing Codes
Sheet reference numbers
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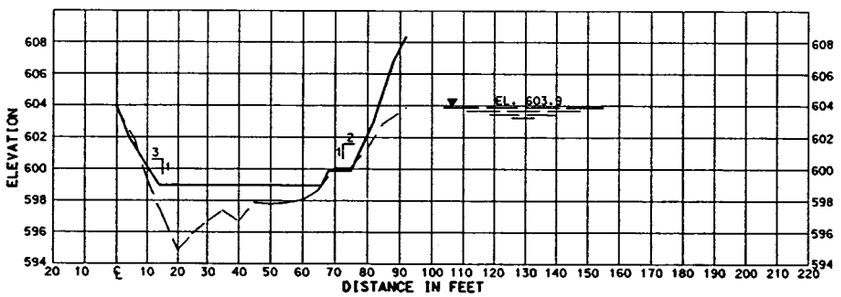
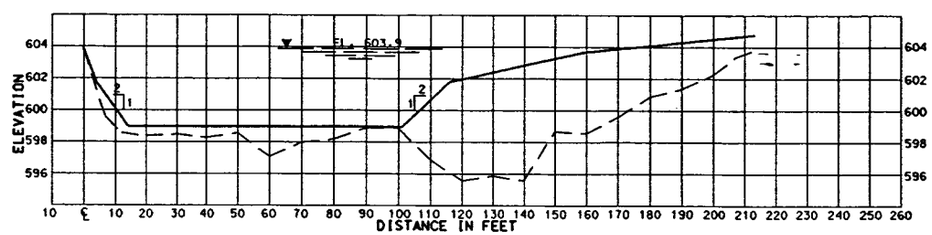
PLATE 2



ROCK HABITAT CHANNEL–TRANSECT S–M 602.1G



SUBMERGED PARTIAL CLOSING STRUCTURE–TRANSECT S–M602.1J

LEGEND:

——— STRUCTURE AS-BUILT

— — — POST FLOOD SURVEY

NOTE:
WATER SURFACE DURING SURVEY: 603.9
FLAT POOL ELEVATION: 603.0

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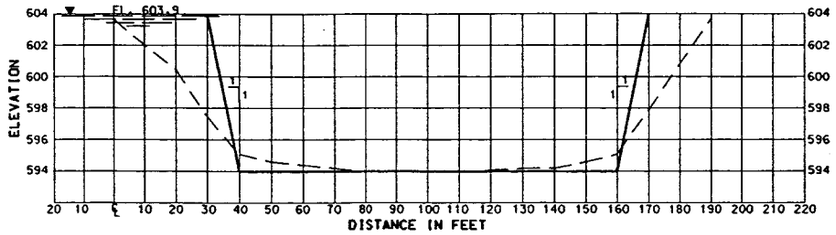
POST 1993 FLOOD SOUNDINGS

Scales AS SHOWN
Dates 8 MAR '94
Drawing Codes
Sheet reference numbers C-1
Solicitation Numbers DACW25-94-B-
Sheet of

PLATE 3



STA. 68+90
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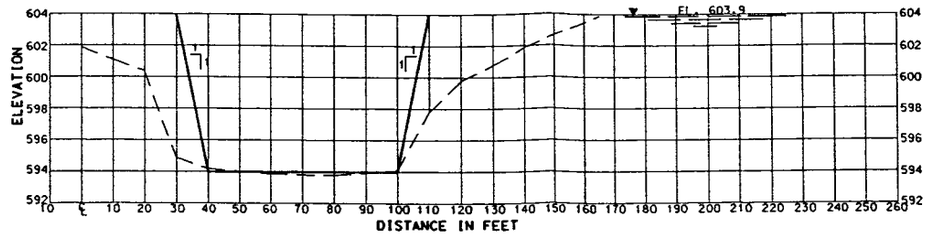
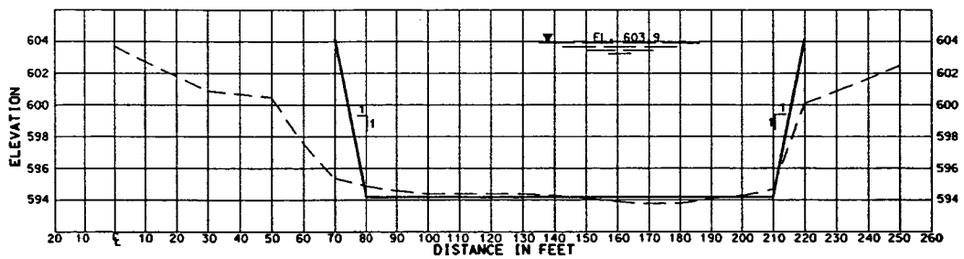


STA. 77+92.12
(DREDGE AREA D)



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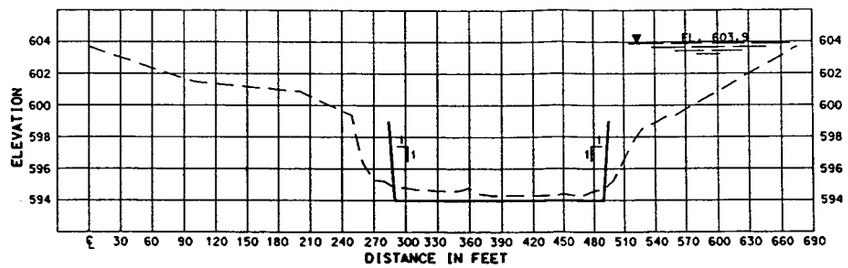
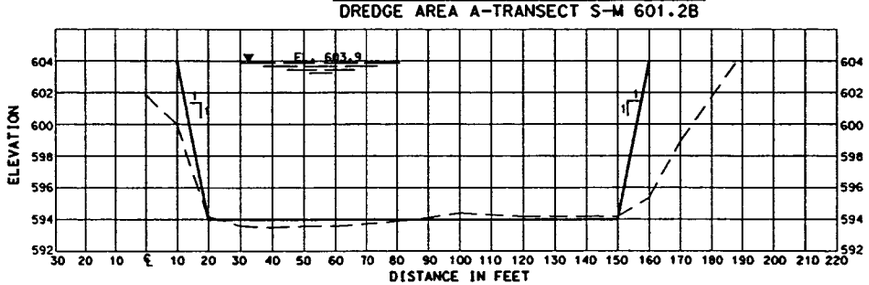
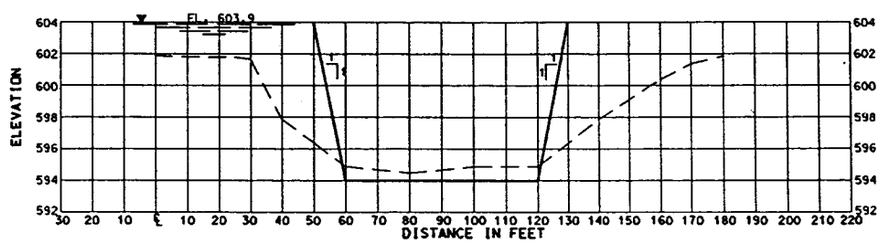


STA. 71+91.94
DREDGE AREA C & PARTIAL D-TRANSECT S-M 601.2B



STA. 89+90.12
DREDGE AREA F-TRANSECT S-M600.8B



STA. 89+90.22
DREDGE AREA D-TRANSECT S-M600.8B

LEGEND:

——— CHANNEL AS-BUILT

— — — POST FLOOD CHANNEL SURVEY

NOTE:
WATER SURFACE DURING SURVEY: 603.9
FLAT POOL ELEVATION: 603.0

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POST 1993 FLOOD SOUNDINGS

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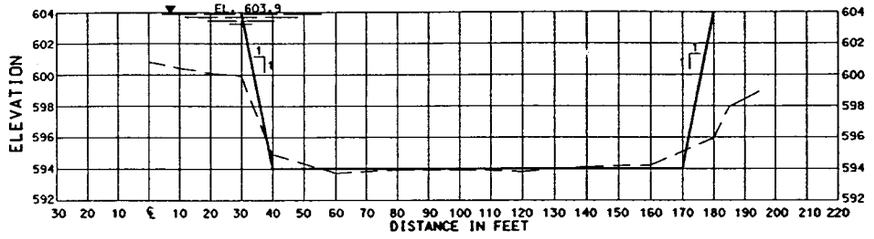
PLATE 4



STA. 107+86.80
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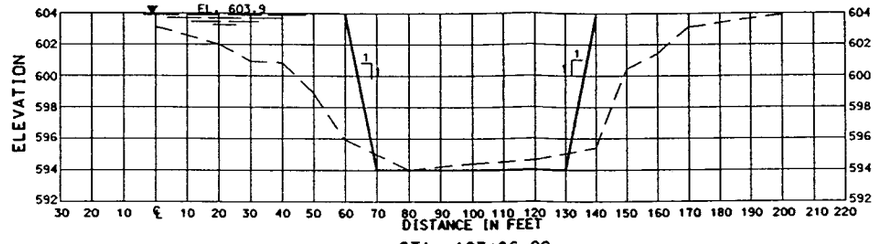
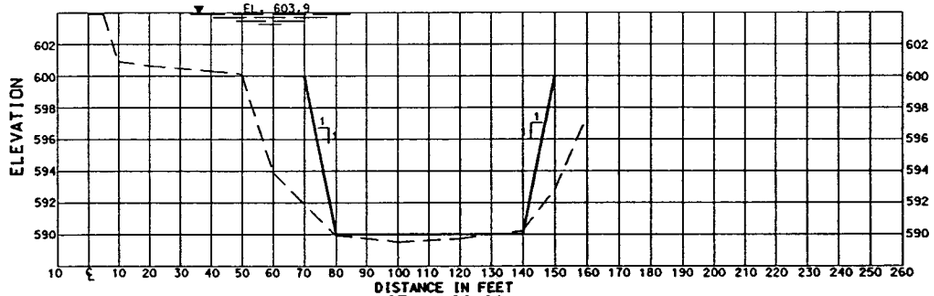
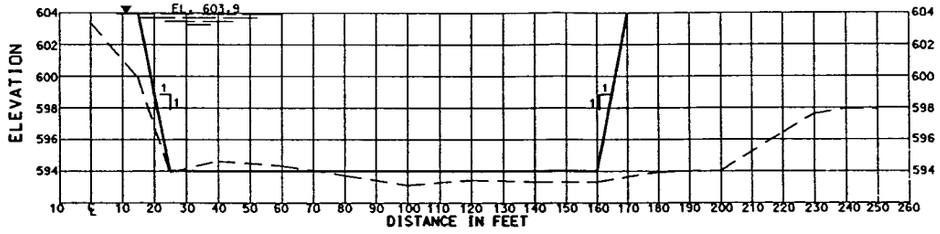


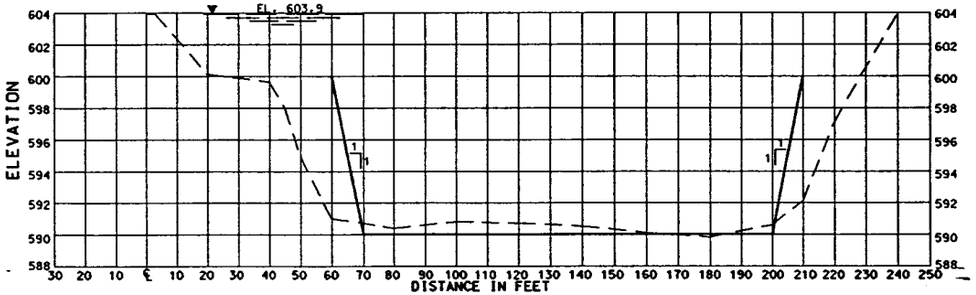
STA. 107+86.82
DREDGE AREA G-TRANSECT S-M600.2B



STA. 126+88
DREDGE AREA K



STA. 126+88
(DREDGE AREA I)



STA. 131+84.13
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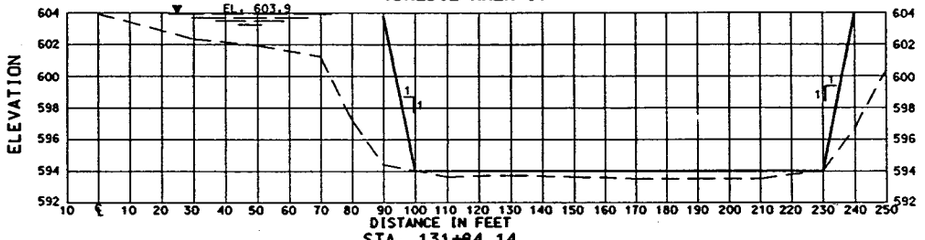

STA. 131+84.14
DREDGE AREA I-TRANSECT S-M599.6B

LEGEND:

——— CHANNEL AS-BUILT

— — — POST FLOOD CHANNEL SURVEY

NOTE:
WATER SURFACE DURING SURVEY: 603.9
FLAT POOL ELEVATION: 603.0

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POST 1993 FLOOD SOUNDINGS

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PLATE 5