AD-A127 211 GREAT I STUDY OF THE UPPER MISSISSIPPI RIVER TECHNICAL APPENDIXES VOLUME 5 FISH AND WILDLIFE(U) GREAT RIVER ENVIRONMENTAL ACTION TEAM M J VANDERFORD SEP 80

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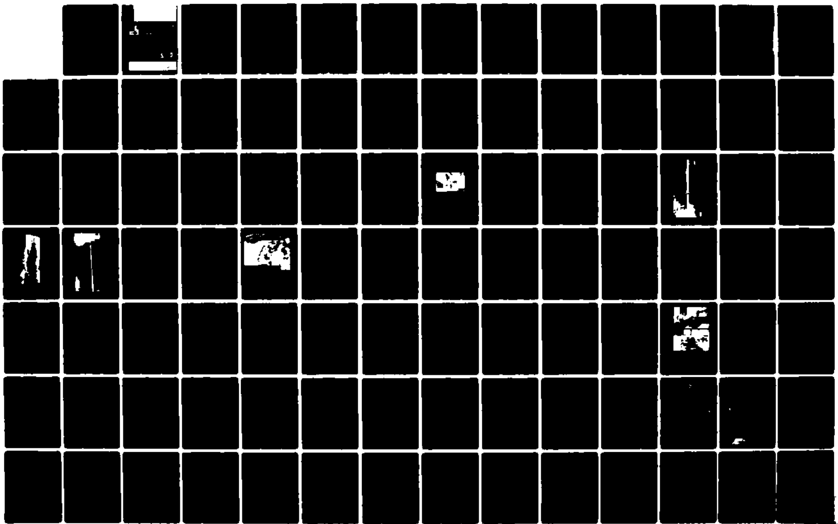

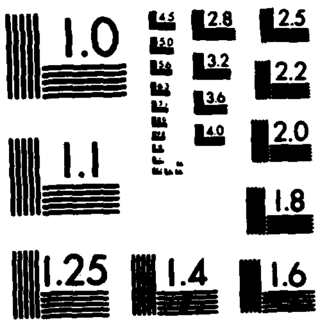

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VOLUME 5

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The report confirms the decline in backwaters habitat due to sedimentation and describes extensive pilot projects in backwater rehabilitation. Recommendations are given such as partial blocking of dams to reduce sediment influx, culvert design, side channels, and also attempted to predict biological results of physical changes in river, and inventories vegetative character of habitats.

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SEPTEMBER 1980

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- B. DREDGED MATERIAL USES
- C. DREDGING REQUIREMENTS

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VOLUME 9
- M. ENVIRONMENTAL IMPACT STATEMENT

September 1980
(Second Edition)

FISH AND WILDLIFE WORK GROUP I

FINAL REPORT

to the

GREAT RIVER ENVIRONMENTAL ACTION TEAM I

(In Two Volumes)

Michael J. Vanderford

Editor

The Combined Report of the Fish and Wildlife Management Work Group and the Side Channel (Openings) Work Group of the GREAT I.

Work Group Chairmen

Fish and Wildlife Management

Donald F. La Pointe - 1974-75
Joseph F. Scott - 1975
Dennis E. Chase - 1975
Michael J. Vanderford - 1976
John P. Wolflin - 1977-78

Side Channel (Openings)

Joseph F. Scott - 1974-75
Michael J. Vanderford - 1975-78

Fish and Wildlife Work Group

John P. Wolflin - 1978
Michael J. Vanderford - 1978-1980

GREAT address: 1135 U.S. Post Office and Customs House, St. Paul, Minnesota 55101

NOTE ON THE REVISED REPORT

(September 1980)

These two volumes of the Fish and Wildlife Work Group Final Report to the GREAT I contain numerous revisions and updates to the August 1979 edition. No changes have been made to the recommendations or the conclusions approved by the work group. Additions and changes were only made where they would make the report more useful or accurate. I have made a great effort to assure that the report continues to represent the sentiments and intent of the work group membership as expressed in our final set of formal meetings in La Crosse, Wisconsin, from August 1978 through May 1979.

Following, I have listed specific sections where significant changes have been made in the August 1979 edition.

Michael J. Vanderford
Fish and Wildlife Work Group Chairman

Sections Added or Changed for the Final Fish & Wildlife Work Group Report
(Changes from the August 1979 edition)

Work Group Membership
1974 - 1979

The following individuals have made significant contributions as members of the work group and/or to this final report.

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Don Bonneau
*Dean Dalziel
Bob De Cook
*Tom Gengerke
*Dave Moeller
Larry Moore
*Jim Ripple

Lake Onalaska Rehabilitation District

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*Scot Ironside
*David Kennedy
*Tom Lovejoy
*Ron Nicklaus
Rick Ranthum
*Mark Riebau
*Mike Talbot

* = active work group member

FOREWORD:

WHY SAVE WETLANDS?
WHY WORRY ABOUT THE MISSISSIPPI RIVER?
WHY IS GREAT IMPORTANT?

Why Save Wetlands?

Saving wetlands is the theme of the GREAT channel maintenance plan, most of GREAT's recommendations, and certainly this work group's final report. A large majority of the other work groups' work and reports are variations on this same theme: how to keep dredged material out of the wetlands, what equipment and methods are needed to mitigate impacts on wetlands, how to keep fine sediments out of the wetlands. The loss of wetlands in the Upper Mississippi River floodplain was the primary reason for pursuing the multi-million dollar GREAT program.

Freshwater wetlands in the Upper Mississippi River floodplain produce, feed, and rest millions of waterfowl. They spawn, feed, and rear millions of sport and commercial fish, including many thousands of mussels. The wetlands also support beaver, muskrat, fox deer, turtles, herons, egrets, and two endangered species - the bald eagle and the Higgin's eye clam.

For some, this is still not enough justification for all of the fuss and expense to save them. But there are additional reasons. For instance, the Corps of Engineers estimates the wetlands of the Charles River Basin (Massachusetts) provide $1,203,000 in annual flood control benefits.* The water quality benefit of the Alcovey River's wetlands (Georgia) is estimated at $1,000,000* per year. The value of the wetlands to hunters, fishermen, tourists, and other recreationists is enormous.

But still, why such concern? Because we are losing them rapidly, particularly in this region. According to Fish and Wildlife Service surveys,* the north central United States is losing up to half of its remaining wetlands every 10 years. Southeast Wisconsin had already lost over 60 percent of its

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* From: Our Nations Wetlands, 1978. U.S. Government Printing Office. # 041-011-00045-9.

original wetland acreage by 1968. We are losing our valuable wetlands at an ever increasing rate throughout the Mississippi River basin to tillage, housing and industrial developments, and highways.

Why save wetlands? They are this country's most cost effective flood control and water quality tools available, and they provide one of the cheapest and best recreation and natural resources imaginable. Further, if present trends are allowed to continue, we will lose all of the wetlands' inherent benefits within several generations.

Why Worry About the Mississippi River?

The Upper Mississippi River and its floodplain are perhaps this country's richest riverine resource. The wetlands and river channels in the floodplain combine to produce a diversity and wealth of fish and wildlife unknown on any other single river system in the country. The same system also provides a critical link in the country's agricultural economy, namely a bulk commodity transport system for midwestern grains.

The problem is exemplified by the fact that the U.S. Congress has specifically authorized that the river be managed concurrently as a wildlife refuge and a commercial navigation channel for 284 miles of its length. With both management objectives being so vital to the Nation and the means to their ends being so incompatible, there is urgent need to give the Upper Mississippi River special attention. The decline of the river's wetland values over the past decades is a critical symptom that the historical method of managing the river is inadequate.

The Upper Mississippi River is still the country's richest natural resource. However, unless we change our methods of managing the river, it will be just another navigation canal in short time.

Why is GREAT Important?

A Story of Interagency Cooperation

The U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers have, in the Midwest, put into motion an object lesson in government cooperation. Together they are working to devise a rational management strategy for one of our nation's greatest natural resources, the Upper Mississippi River. This can only mean increased benefit to the people of the region and the country.

This program, recognized and funded by Congress, is being implemented by GREAT, the Great River Environmental Action Team. In GREAT, Federal and State agencies have joined in partnership to take action toward providing a better balance of uses of the upper portion of the Mississippi River. GREAT has already broadened Federal-State cooperation in resource planning. The partnership team effort uses a coordinated approach to resource management, which is what Congress intended in the passage of the 1958 Fish and Wildlife Coordination Act and the 1969 National Environmental Policy Act. Through an active public involvement program, the people of the region are included in the partnership venture to restore and revitalize their river.

We expect this problem-solving approach will become a national model. Interagency teamwork, extended to all areas of resource management, can make lasting contributions to meet society's needs while still preserving our natural heritage.

NATHANIEL P. REED
Assistant Secretary for Fish, Wildlife and Parks
U.S. Department of the Interior

JOHN W. MORRIS
Major General, USA
Director of Civil Works
Office of the Chief of Engineers
Department of the Army

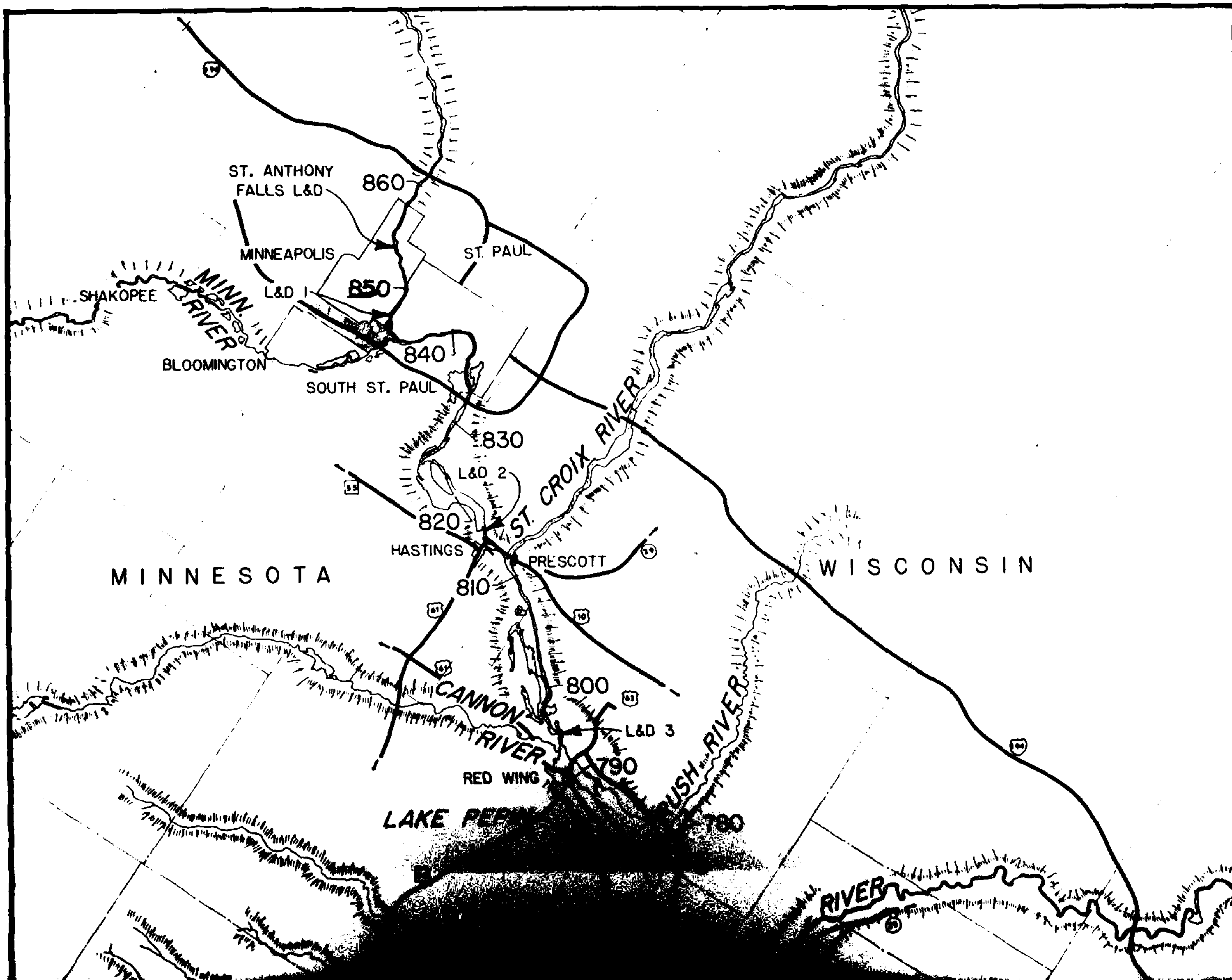
(from The New Imperative: A Story of Interagency Cooperation, 1975, U.S. Government Printing Office: 0-668-851)

EXECUTIVE SUMMARY
OF THE
FISH and WILDLIFE WORK GROUP-I
FINAL REPORT
TO THE
GREAT RIVER ENVIRONMENTAL ACTION TEAM-I

The Great River Environmental Action Team (GREAT I) dealt with a 240-mile section of the Upper Mississippi River and its tributaries from Minneapolis, Minnesota to Guttenberg, Iowa (Figure E.S. 1). The Mississippi in this area is both a navigation channel for barge traffic and a wild and beautiful maze of backwater sloughs, lakes, and floodplain hardwoods. Dams and dredging are used to maintain a 9-foot deep watercourse for national commerce on this stretch of the river. But consistent with nature's course, these efforts to maintain the main channel are also resulting in adverse side-effects on the river's remaining areas. Fish and wildlife habitat that flourished for centuries, and was initially enhanced by the locks and dams, are showing clear signs of decline due to the 9-foot channel project.

The GREAT-I was formed in 1974 amidst the turmoil and conflict of agency fighting agency over the 9-foot channel project on the Upper Mississippi River. The issue was primarily the Corps of Engineers' methods of dredged material disposal, but the crux of the matter was the associated destruction and decline of fish and wildlife habitat in the river corridor. In 1974 it was generally believed that improved dredged material disposal methods could solve the problems of habitat decline and destruction. Therefore, the GREAT was structured to primarily address the dredging problems and their possible remedies.

Being composed of all State and Federal agencies having management jurisdiction associated with the river, the GREAT set up eleven work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SHAKOPEE
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RIVER
BLOOMINGTON
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SOUTH ST. PAUL
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ST. CROIX RIVER
L&D 2
820
HASTINGS
PRESCOTT
MINNESOTA
WISCONSIN
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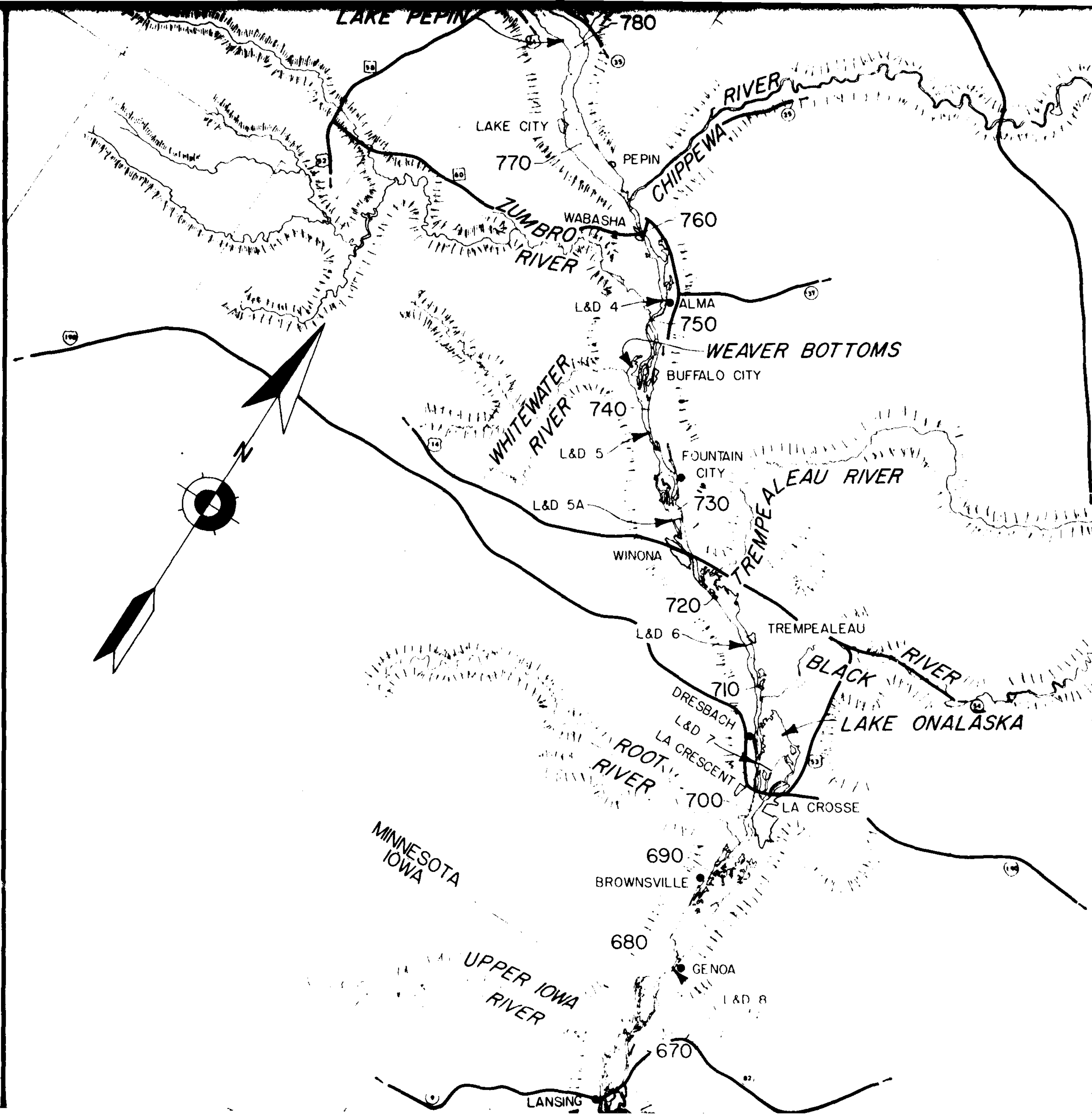

LAKE PEPIN
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ZUMBRO RIVER
WABASHA
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L&D 4
ALMA
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WEAVER BOTTOMS
BUFFALO CITY
WHITEWATER RIVER
740
L&D 5
FOUNTAIN CITY
730
TREMPEALEAU RIVER
L&D 5A
WINONA
720
L&D 6
TREMPEALEAU
BLACK RIVER
710
DRESBACH
L&D 7
LA CRESCENT
LAKE ONALASKA
ROOT RIVER
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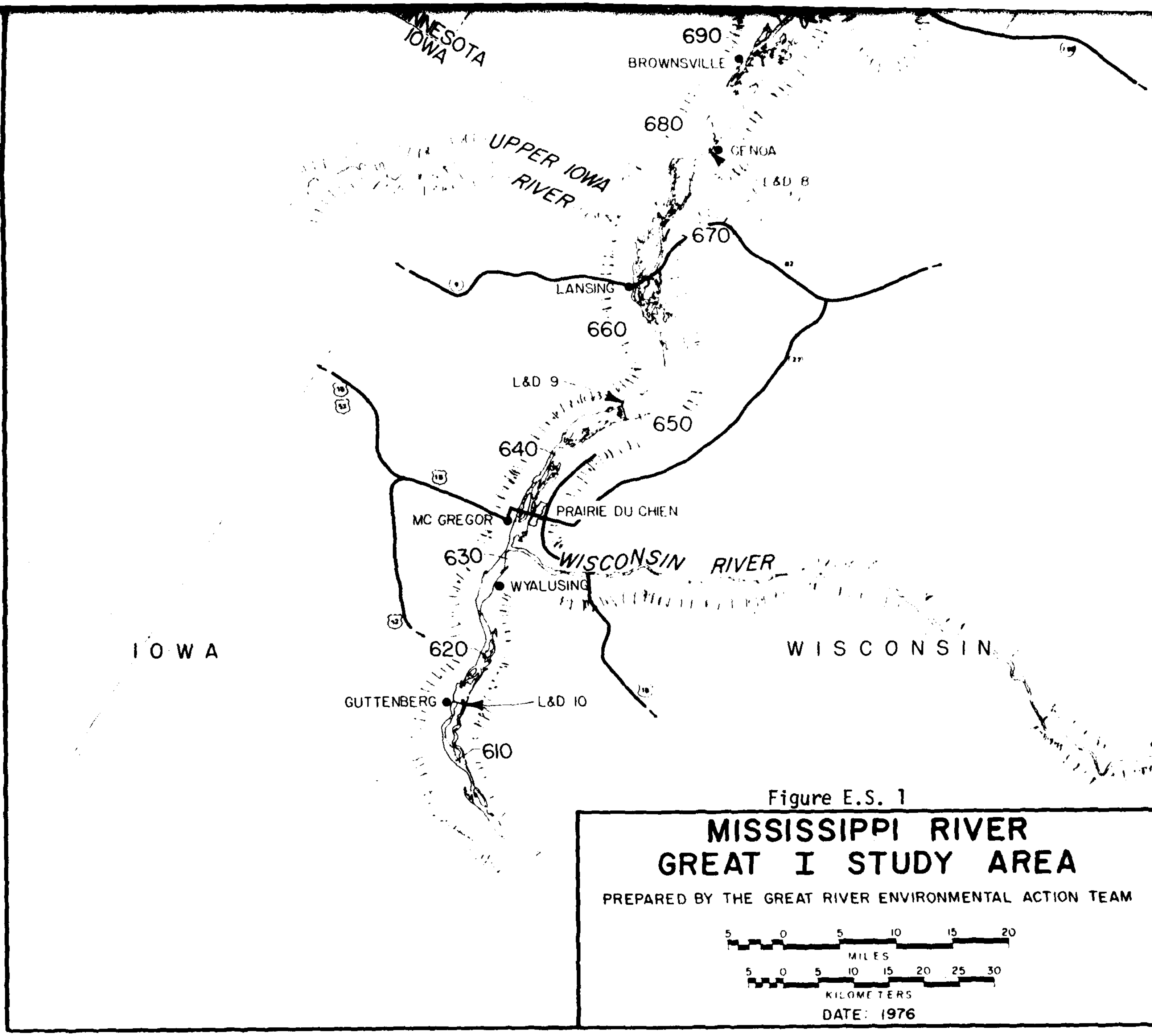

Figure E.S. 1

MISSISSIPPI RIVER
GREAT I STUDY AREA

PREPARED BY THE GREAT RIVER ENVIRONMENTAL ACTION TEAM

DATE: 1976

groups to specifically tackle the several facets of the problem as it was perceived. The Fish and Wildlife Management Work Group (FWMWG) was one of these task groups. The FWMWG was assigned to specifically investigate habitat decline problems and possible remedial actions. The Side Channel Openings Work Group (SCOWG) was also established at that time. Its task was to determine the value of opening side channels from the main channel to backwater areas as a solution or mitigation to the habitat decline caused in part by the 9-foot channel project.

The FWMWG and SCOWG were composed primarily of 25 field level biologists from the States of Iowa, Minnesota, and Wisconsin and the Fish and Wildlife Service. The work groups pursued their respective responsibilities by contracting for research and studies with four local universities and by conducting pilot projects and studies themselves. During the term of the study the work groups also developed On-Site Inspection Teams (OSITs) assigned to specific river pools to deal with each year's dredged material disposal problems on a site-by-site basis.

The results of the work groups' efforts, research, and OSIT program confirmed the habitat decline problem, but they also revealed some very real ways to both mitigate and solve different facets of the problem. Some of these remedial developments were as follows: 1) a means for rehabilitating large backwater lakes was developed, 2) the use of partial blocking dams to reduce sediment influx to areas was developed, 3) the benefits of culverts to backwaters was documented and a better culvert design developed, 4) numerous means for making side channel openings were demonstrated, 5) means were developed for predicting biological results of physical changes on the river, and 6) means were developed for inventorying vegetative character of habitats.

The work groups did not explore primary solutions to the habitat decline problem, that is developing means for keeping sediments out of the river system. But the Sediment and Erosion Work Group of the GREAT I did tackle this, did propose means for at least mitigating the

problem, and the FWMWG and SCOWG have supported these proposed actions in our recommendations.

The work groups also did not develop a detailed plan for using the backwater management tools developed to rehabilitate the whole of the study area. We did, however, recommend an interagency coordinating group, policy changes, and some additional site specific investigations to facilitate development of such a well-thought out comprehensive management plan.

The FWMWG and SCOWG have proposed means to mitigate adverse impacts of dredged material disposal on fish and wildlife resources to the greatest extent possible. These measures are being implemented and proposed through the On-Site Inspection Teams and by our working on the development of the GREAT's channel maintenance plan. Should these measures be implemented much of the most direct and immediate adverse impacts of the 9-foot channel project would be eliminated.

CONCLUSIONS

The FWMWG and SCOWG came to the following specific conclusions:

FWMWG Conclusion 1: The Fish and Wildlife Management Work Group successfully fulfilled nearly all of its responsibilities within the GREAT.

FWMWG Conclusion 2: Partial closing dams, which are specifically designed to enhance fish and wildlife, can be used successfully to reduce sediment influx to the backwaters while maintaining adequate water flow resulting in good habitat maintenance.

FWMWG Conclusion 3: Well designed, gated culverts constructed through the dikes of the locks and dams can greatly enhance the fish and wildlife habitat quality and diversity of the backwater areas for

several miles downstream of a dike.

FWMWG Conclusion 4: Small side channel openings can be very beneficial to backwater habitat diversity and quality if they are well designed to avoid additional sediment transport into the backwater.

FWMWG Conclusion 5: Rehabilitation of major backwater areas is possible if the problems are well investigated and recommended remedial measures are well designed.

FWMWG Conclusion 6: State and/or Federal regulations may preclude the implementation of any major backwater rehabilitation on the Upper Mississippi River.

FWMWG Conclusion 7: The regressions simulation model (Claflin, et al, 1977) is a useable and reasonably accurate predictive model, capable of predicting the benthos and rooted aquatic macrophyte response to physical changes proposed for backwaters in the GREAT I study area. The model should be used in backwater project planning.

FWMWG Conclusion 8: The concept of "logical predictive capability" is generally sound when applied to the fish and wildlife resources of the Mississippi backwaters.

FWMWG Conclusion 9: The vegetative inventory (Meyer, et al, 1977) is a valid and useable base for establishing a fish and wildlife habitat inventory of the Upper Mississippi, with the exception of some aspects of fish and wildlife habitat requirements.

FWMWG Conclusion 10: There is a need for a submergent vegetation inventory in order to establish fish and wildlife habitat definition on the river.

FWMWG Conclusion 11: The vegetative inventory needs to be redone

periodically, possibly every 10 years, in order to continue as a valid base for a habitat inventory of the river.

FWMWG Conclusion 12: The On-Site Inspection Team process has increased cooperation between the Corps of Engineers and the natural resource agencies, resulted in more environmentally sound dredged material placement, and should be continued.

FWMWG Conclusion 13: Increased use of land treatment programs in the upland agricultural areas could substantially reduce fine sediment deposition in the backwaters downstream of Lake Pepin.

FWMWG Conclusion 14: There is a need for establishing what fish and/or wildlife species specific areas of the river are to be managed for.

SCWG Conclusion 1: The Side Channel Work Group was partially successful in fulfilling its responsibilities within the GREAT.

SCWG Conclusion 2: Side Channel openings can enhance boat access to the river for many years.

SCWG Conclusion 3: Side channel openings accomplished for improved boat access may be detrimental to fish and wildlife resources.

RECOMMENDATIONS:

The FWMWG and the SCOWG made the following specific recommendations:

Recommendations to Change Management Policies

Recommendation 1: The U.S. Army Corps of Engineers should institute a new dredging and spoil disposal policy which assures that fish and wildlife habitat will be protected during dredging or the placement of dredged material. To accomplish this the Corps should be provided the needed authority and means to establish fish and wildlife as project purposes of the 9-foot channel.

Recommendation 2: An "Interagency Coordinating Committee" should be formed to provide direction and guidelines regarding fish and wildlife matters associated with main channel dredging, spoil disposal, physical river modifications, and river management studies and investigations. The interagency coordinating committee would be comprised of representatives of the U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, the Iowa Conservation Commission, and U.S. Army Corps of Engineers.

Recommendation 3: Establish and maintain an interagency On-Site Inspection Team for dredging and channel maintenance activities to eliminate environmentally adverse consequences.

Recommendation 4: Development of an agreement between the Corps, the Fish and Wildlife Service and the States to manage pool levels to benefit fish and wildlife. The management decisions should be coordinated through the Interagency Coordinating Committee and should be evaluated by the Committee according to probable effects on the whole of the GREAT I area.

Recommendation 5: Implement and use fully the programs administered by USDA agencies, including SCS and ASCS, and similar state programs, to effect reduction in fine sediments reaching the Upper Mississippi River and its backwaters and to maintain and restore wetlands in sediment and runoff-contributing watersheds. Congress and the state legislatures are urged to continue supporting these soil conservation measures authorized for implementation by their executive agencies.

Recommendation 6*: Provide the organization, authority, and funds necessary to manage the Upper Mississippi River and its backwaters

*work group divided on procedure for this recommendation

as a biological unit, maintaining suitable habitat for all fish and wildlife on the river.

Recommendation 7: Because present state and federal funding and management for fish and wildlife resources on the river are inadequate, it is recommended that objectives and budgets of the respective agencies be realigned such that potential fish and wildlife resource benefits on the UMR system are realized.

Recommendation 8*: Provide the land control and authority necessary for development and management of the Upper Mississippi River Wild Life and Fish Refuge as a fully effective component of the National Wildlife Refuge System in meeting national needs for fish and wildlife restoration, protection, and use.

Recommendation 9: The Fish and Wildlife Service in consultation with the states should develop and implement a comprehensive plan for the management of the Upper Mississippi River Wild Life and Fish Refuge that considers all the fish resources and wildlife resources of the area and consists of the necessary strategic and operational components to make explicit the background, authorities, and justification for the refuge, and objectives, policies, coordination measures, and procedures by which it will be operated.

Recommendation 10: Implement administrative policy and procedures on General Plan and Fish and Wildlife Service fee lands of the Upper Mississippi River Wild Life and Fish Refuge to eliminate the vesting of exclusive private or commercially advantageous rights to public lands and waters in individuals or commercial enterprises by permits, where those activities or rights are detrimental to fish and wildlife values or management purposes.

*work group divided on procedure for this recommendation

Recommendation 11*: The U.S. Army Corps of Engineers should be provided authority and means to modify backwater areas for fish and wildlife and recreation management purposes as recommended by the Interagency Coordinating Committee.

Recommendations to Gain Additional Information

Recommendation 12: Implement Phase II of the Weaver Bottoms rehabilitation and conduct the Phase III study.

Recommendation 13: Provide means to map the distribution of submerged aquatic vegetation, invertebrates (including clams), bottom types and depths, and submerged physical features of the river.

Recommendation 14: Continue monitoring program at Kruger Slough and Island 42 to document effects of opening side channels.

Recommendation 15: Investigate the potential of using the "Finger Lakes" at the dike of Lock and Dam 4 as a "physical model" for backwater management techniques which have been and may be proposed for the future.

Recommendation 16: Provide means to conduct life history studies of the fishes of the Upper Mississippi River.

Recommendation 17: Conduct an investigation to assess the potential environmental impact of late fall and early winter barging and navigation practices on waterfowl, furbearers, and fishes of the river. And further, investigate the economic impact of restricting fall navigation.

*The work group was divided on this recommendation.

Recommendation 18: Develop a program to evaluate dredging and island creation in backwater areas for restoration purposes.

Recommendation 19: Provide means to determine the most beneficial procedures for bottomland hardwood timbers management for wildlife enhancement on the Upper Mississippi River.

Recommendations to Implement Specific Projects

Recommendation 20: The Corps of Engineers should continue restoring aand establishing shoreline protection on a yearly basis following the design and priority list provided by the Fish and Wildlife Management Work Group, until completion.

Recommendation 21: Construct a gated culvert through the dike of Lock and Dam 10 to provide a water supply to the waterfowl ponds in pool 11.

Recommendation 22: Investigate the impact of altering the cuts between the islands separating Lake Onalaska from the main channel of the Mississippi. Initiate structural measures if the results of the investigation determine that the alterations would benefit Lake Onalaska.

Recommendation 23: Place a set of two gated culverts at the dike of Lock and Dam 4.

Recommendation 24: Determine and implement the best means for reducing fine sediment flow into Big Slough (RM 670.5, Iowa) while keeping the slough open to fishing boats.

Recommendation 25: Develop agreement between the Corps, the Service, Vernon County (Wis.), and the Wisconsin DNR for placing culverts and opening side channels at Blackhawk County Park near Victory in pool 9.

Recommendation 26: Construct a dike along the channel side of Spring Lake in pool 2 in order to return the lake to a productive fish and wildlife habitat and provide recreational facilities.

The Fish and Wildlife Work group of the GREAT I believes that implementing the recommendations that we have developed would make the management of the Upper Mississippi River sound and responsible. The rich resource that is the river depends on the intent of these recommendations for survival into posterity. The success of these recommendations and the GREAT-I program will not only foster more constructive and cooperative work by the river management agencies, but will greatly enhance the river's chances of maintaining the many qualities that nature gave it and that man demands of it.

PREFACE

This report has been prepared by the Great River Environmental Action Team (GREAT I) Fish and Wildlife Work Group. The report was not formally approved by the Fish and Wildlife Work Group but represents the contributions of all work group members. The GREAT I Team is the group to which this report is submitted. Therefore, the GREAT I Team has not reviewed or approved the report at this date. Further, the views and recommendations expressed within this report do not necessarily represent those of the agencies participating in the GREAT I.

In voting on the final recommendations of the Fish and Wildlife Work Group, the staff of the Upper Mississippi River Wild Life and Fish Refuge represented the vote of the U.S. Fish and Wildlife Service. The U.S. Army Corps of Engineers was represented by the staff of their Environmental Resources Branch. The States of Iowa and Minnesota were represented by field biologists of their Conservation Commission and Department of Natural Resources, respectively. The State of Wisconsin was represented in their votes by staff members of the Upper Mississippi River Work Unit of the Department of Natural Resources.

ACKNOWLEDGEMENTS

Special recognition is due several members of the Fish and Wildlife Work Group for their service above and beyond the call of duty. John Wolflin (FWS) provided the direction and relentless prodding necessary to get the twenty-five plus members of the work group to agree to the enclosed set of recommendations, and to complete the draft work group report. Tom Lovejoy (WDNR) made a significant contribution toward the re-drafting of the final report. Nicholas Gulden (MDNR) provided exceptional support and input to the work group efforts throughout the study period.

The cover design of the final report was developed by Claud R. Alkire, (FWS). The pen and ink artwork which appears in the fisheries chapter and the wildlife chapter was provided by Diane Whiting (freelance artist, Stacy, Minnesota).

Typing of the drafts and final work group report was accomplished by Renee Arcand, Lynn Grundtner, Betty Kruger, Laura Ochs, Judy O'Donnell, Lois Quam, and Barbara Swanberg. Considering the volume and the number of rewrites of this report, these ladies deserve much credit for their patience and persistence. All are or were staff of the Fish and Wildlife Service in Saint Paul.

Final editorial review of the work group report was provided by writer-editors Mary Muraski (COE) and Norman Klopfenstein (FWS).

September 1980

FISH AND WILDLIFE WORK GROUP

FINAL REPORT

to the

GREAT RIVER ENVIRONMENTAL ACTION TEAM

(IN TWO VOLUMES)

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THE FISH AND WILDLIFE

WORK GROUP

ITS ACTIVITIES AND ITS RESULTS

Figure 1. During a tour of prospective side channel modifications in June 1975, members of the Fish and Wildlife Work Group stopped at Prairie Island at Lock and Dam 5A near Winona to inspect and discuss the notches in the dike of the dam structure. Around the car from the left are Don Buckhout, Dick Huber, Dave Moeller, Gary Ackerman, Carl Pospichal, Jim Ripple, Dr. Bill Green, Bruce Hawkinson, Gary Grunwald, and Willy Fernholz.

Chapter I

DESCRIPTION OF THE STUDY AREA

A. BACKGROUND INFORMATION

1. STUDY AREA LOCATION

The GREAT study area covers the reach of the Mississippi River from the head of navigation at Minneapolis, Minnesota (857.6 miles upstream from the mouth of the Ohio River), to Guttenberg, Iowa (614 miles upstream from the Ohio). The lower 24.5 miles of the St. Croix River, the lower 14.7 miles of the Minnesota River, and the lower 1.4 miles of the Black River are also included. The study area also includes all floodplain lands adjacent to the main channel of these rivers.

The prominent feature present throughout these river reaches is a navigation channel of 9-foot minimum depth designed to accommodate commercial towboats and barges. This channel is continually being marked by the U.S. Coast Guard and maintained by the U.S. Army Corps of Engineers. Locks and dams built primarily in the 1930's to maintain 9-foot water depths in this channel are predominant features along the Mississippi. They have had a major impact on the character and appearance of the Mississippi River in this area.

The rivers in the study area drain large areas of Iowa, Minnesota, and Wisconsin. The areas are largely cereal crop agricultural lands and forest lands. The terrain is generally flat or low rolling hills and was produced by glacial activity thousands of years ago. Glacial till is a major component of the soil of much of the drainage basin. As a result, the rivers in the study area contain large percentages of sand in their sediments.

The Mississippi River flows through the major metropolitan area of Minneapolis-St. Paul, Minnesota, at the upper end of the study area. This section of the river is restricted between steep bluffs and has no backwaters. The Minnesota River joins the Mississippi between the Twin Cities after flowing through a wide, predominantly cultivated floodplain reaching through western Minnesota to the South Dakota

border. The Minnesota River contributes a major load of fine sediments to the Mississippi River.

The Mississippi River widens and develops an extensive system of backwater lakes and sloughs just downstream of St. Paul. The St. Croix River joins the Mississippi approximately 20 miles downstream of the Twin Cities after flowing from the north through an area predominated by deciduous forests.

Downstream of the St. Croix, the Mississippi continues to widen with extensive backwaters and rich wetland habitat until it reaches Lake Pepin just south of Red Wing, Minnesota. Here the river flows as one river channel approximately 2 miles wide to the mouth of the Chippewa River. Lake Pepin ends at the delta of the Chippewa River where the Mississippi returns to a single major main channel with a wide floodplain of extensive backwaters.

The effects of the large volume of coarse sand sediments flowing out of the Chippewa are apparent for many miles downstream. Accumulations of sand sediments which develop in the main channel have been dredged up and placed along the border of the main channel by the Corps of Engineers for nearly 40 years.

The Mississippi River continues its flow downstream through its wide floodplain bordered by high bluffs from Lake Pepin to the end of the study area at Guttenberg, Iowa. These floodplain backwater areas serve as significant wetland habitat for millions of fish and wildlife. Much of these backwaters are part of the Upper Mississippi River Wild Life and Fish Refuge. The relatively wild character of the river's floodplain through this reach is significantly interrupted by only the three metropolitan areas of Winona, Minnesota, and La Crosse and Prairie du Chien, Wisconsin, and three electric generating plants at Alma and Genoa, Wisconsin, and Lansing, Iowa.

Figure 2. Typical section of the Upper Mississippi River within the study area: a broad floodplain bordered by high bluffs, a well-defined main channel, and an extensive area of floodplain forest and backwaters between the bluffs and the main channel.

The approximately 250 miles of river from Minneapolis to Guttenberg forms the border between Wisconsin and Minnesota for much of its distance and the border between Wisconsin and Iowa for the lower 60 miles. The St. Croix River forms the Wisconsin-Minnesota border north of its junction with the Mississippi at Prescott, Wisconsin.

The study area included sections of each of the following counties:

Iowa:
Allamakee and Clayton

Minnesota:
Dakota, Goodhue, Hennepin, Houston, Ramsey, Scott, Wabasha, Washington, and Winona

Wisconsin:
Buffalo, Crawford, Grant, La Crosse, Pepin, Pierce, St. Croix, Trempealeau and Vernon

2. RECENT HISTORY: A CHANGING RESOURCE

The most significant recent changes to the Upper Mississippi River's natural resources have been associated with navigation. As early as 1824, the Federal Government authorized removal of snags, shoals, and sandbars; excavation of rock in several of the rapids; and closing off of meandering sloughs and backwaters to confine flows to the main channel and thus assure more adequate depths for navigation in times of low water. The first comprehensive alteration of the upper river for navigation was authorized by the River and Harbor Act of June 18, 1878, to obtain a 4½-foot channel from the mouth of the Missouri River to St. Paul. In 1890 the 4½-foot channel was extended to Minneapolis. The River and Harbor Act of March 2, 1907, authorized a 6-foot channel for the upper river. The additional depth was obtained primarily by

construction of rock and brush wing dams (Figures 3 & 4) which were low structures extending radially from shore into the river for long distances to constrict low-water flows. The 6-foot channel was further improved by construction of locks and dam 1 and locks and dam 2 near the Twin Cities. In 1930 Congress authorized the 9-Foot Channel Navigation Project on the Upper Mississippi River between the mouth of the Missouri River and Minneapolis. The authorizing legislation (River and Harbor Act of July 3, 1930) provided for a navigation channel of 9-foot depth to be achieved by construction of a system of locks and dams supplemented by dredging. In 1937, Congress authorized a 4.6-mile extension of the project at its upstream end at Minneapolis to above the Falls of St. Anthony (River and Harbor Act of August 26, 1937). The majority of the locks and dams were constructed between 1930 and 1940. The opening of the upper St. Anthony Falls lock to navigation in 1963 placed in operation all the locks and dams of the 9-foot channel project.

The 9-foot channel project has become part of a complex setting which integrates man's socioeconomic activities with an interrelated web of physical, chemical, and biological factors throughout the Upper Mississippi River valley. The 9-foot channel project has had economic, social, and biological effects. It is not always possible to clearly determine whether a given development is beneficial or adverse; however, some effects of the project have been determined. This section provides a description of some of the changes in the fish and wildlife habitat resulting from construction, operation, and maintenance of the 9-foot navigation channel project.

Green (1960) described the character of Upper Mississippi River habitat with regard to changes that occurred from the inception of the 9-foot channel until 1960 (Appendix "S"). The following discussion has been developed from Green's comments.

Before the 9-foot navigation project, the river bottoms were primarily wooded islands, with many deep sloughs and hundreds of lakes and ponds

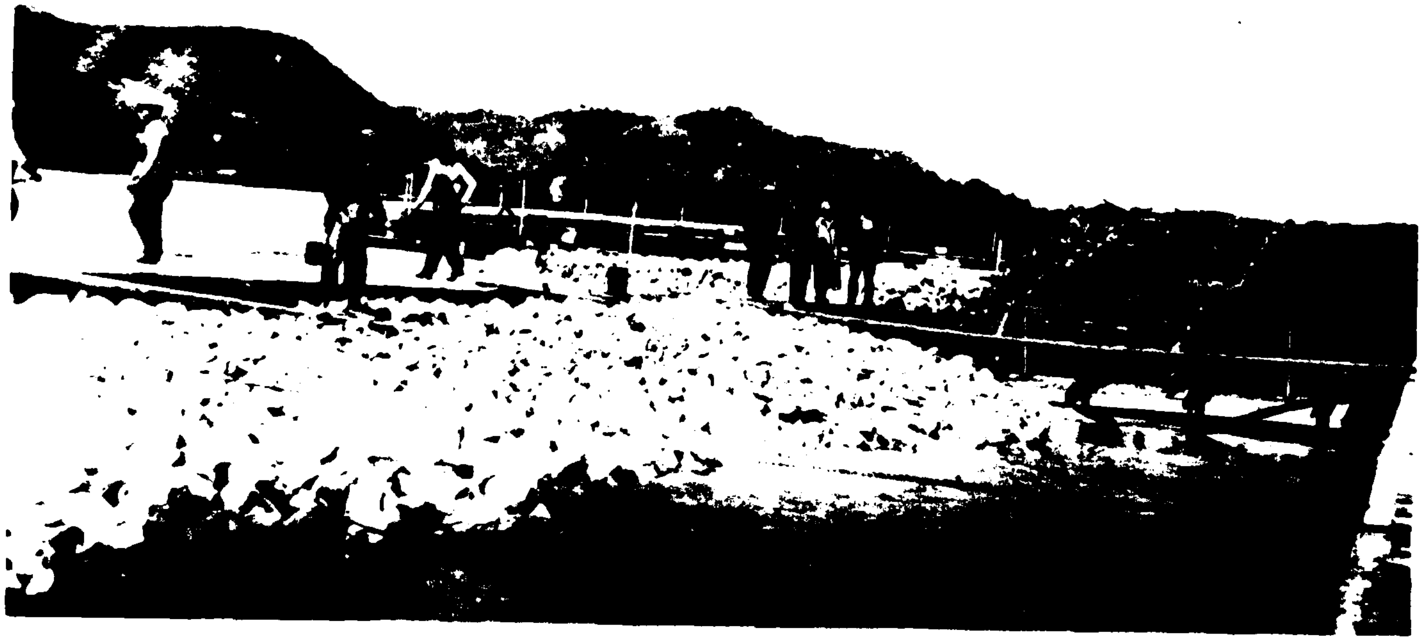


Figure 3. Wing Dam under construction in the Saint Paul District (circa 1900). Alternating layers of willow matts and riprap provided extra stability to the structure.

CORPS OF ENGINEERS ST. PAUL DISTRICT MISSISSIPPI RIVER

WING DAMS ALONG RIGHT BANK OF RIVER AT ST. PAUL PARK, MINNESOTA

PHOTOGRAPH TAKEN IN 1910 MILE 830.0 ABOVE CAIRO

Figure 4. Typical emergent wing-dam structures used for creating the 4½- and 6-foot channel projects.

scattered through the wooded areas. There were some hay meadows on the islands, together with some small farming areas, but the bottoms were essentially wooded. These bottomland forests provided excellent habitat for many upland game birds and hunting in these areas was considered exceptionally good (VanDyke, 1892; Appendix T).

Marsh development was limited to the shores of the lakes and guts leading off the sloughs. Marsh flora was also limited, with river bulrush being the dominant type of vegetation. The marshes often dried up completely by the end of the summer. Also, many lakes and ponds dried up completely, while water levels in others receded markedly. Fish rescue work was a big activity, with crews rescuing fish trapped in bottomland lakes and ponds when the river receded.

Constant drying out of marsh areas and ponds resulted in considerable loss to marsh and aquatic species, especially the annual plants. Reseeding occurred during floods in the spring and fall, but good aquatic beds were limited, and before they became well-established recurring drying would again eliminate or greatly reduce such growth.

Impoundment abruptly changed the river bottoms from an area of wide fluctuations in pool levels ranging from floods in the spring to drying out in the summer, to an area of semi-stabilized water in which, while spring floods still occur, the bottoms do not dry out in the summer. Thus, instead of wooded islands and dry marshes, excellent marsh and aquatic habitat have resulted from the fairly stable water levels throughout the year. Even record floods have not altered the fact that water conditions are much more stable now than they were prior to impoundment. Spring floods always occurred, and they can be expected annually. However, instead of drying up in the summer and winter, the marshes, lakes and ponds have water available throughout the year. Lack of marsh and aquatic plants is no longer a problem, and fish rescue is a thing of the past. Hay meadows and timbered areas are now in marsh, which offers excellent habitat for furbearers and waterfowl.

Three distinct zones can generally be observed in the navigation pools. In the upper ends of the pools, conditions are much as they were prior to impoundment except that water levels are more constant. In this zone marsh development is generally limited. Islands and water courses off the main channel are prominent. In the middle of each pool, impoundment backed up water over islands and hay meadows, forming large areas of marshes and shallow water. In the lower ends of the pools immediately above each dam, water was impounded to a depth which precluded marsh development, and at present this lower zone is deep open water.

Dr. Green described a great many changes to the river that have benefited fish and wildlife. The impoundments have also had adverse impacts and some of these impacts have become more ominous since Dr. Green revised his report in 1960.

The initial harnessing of the river resulted in a direct change in habitat from a natural river system which fostered fast water species, to an artificial pool system which favored a lake-type fishery. A number of fish species, such as skipjack herring, were adversely affected by limiting north-south migrations (Carlander, 1954). The dams also slowed the current and increased deposition of silt. This eliminated gravel bars that are necessary for the feeding and breeding of some species.

The long-term result of sedimentation is the filling in of the backwaters. It has been the most significant factor in limiting both the fish and wildlife resources. The patterns of flow in the river have been altered by channel control structures and accumulated dredged material (Figure 5). The impoundments have increased the rate of accumulation of sand and silt in the river, because the pools and specifically the backwaters act as sediment traps and decrease the ability of the river to transport sand and silt downstream. It is generally accepted that the backwaters and the lower pools are rapidly filling with sediment (Simons, _et al_, 1975), resulting in attendant losses of water surface and fish and wildlife habitat.

Figure 5. Such areas as this at Betsey Slough in Pool 5A are increasingly affected by the 9-foot channel project. Primary and secondary effects of spoil disposal from dredging the main channel are most obvious.

In view of these project impacts which are affecting the abundant resource that presently exists, and the apparent future of these resources, many resource managers question the benefits that have been derived by modifying the Upper Mississippi River. The following paragraph from "A History of Fish and Fishing in the Upper Mississippi River" (Carlander, 1954) represents this view well:

> "Man has changed the Upper Mississippi River both deliberately and indirectly. These changes have had their effect both on fish and on fishing methods. It is almost impossible to separate the effects of the various changes, or even to say whether the individual changes were favorable or unfavorable to the fishery resources of the river."

B. HABITAT DESCRIPTION

The Upper Mississippi River has a rich variety of aquatic habitat types. Habitat diversity has temporarily been increased by the locks and dams for the 9-foot navigation channel. The impoundments inundated numerous acres of terrestrial habitat, as well as areas that were seasonally flooded. Water levels have been stabilized relative to the free-flowing or natural river system which existed before channel modifications. These factors have resulted in the outstanding fish and wildlife habitat. The primary habitat types are described in this section.

1. AQUATIC HABITAT

River Lakes and Ponds -- These areas have been broadly referred to as "backwaters" and are often connected with the river at normal river stages. These lakes were formed by artificial impoundment and natural dams or dikes, isolated oxbows or meanders, and natural depressions. However, the greatest acreage of backwaters was created by the locks and dams.

Backwaters characteristically have little or no flow, relatively

shallow depths, and a bottom layer of silt and sand 2 or more feet thick. They vary in size from several acres up to thousands of acres.

The vegetation diversity is exceptional. This diversity is typical of the backwaters. It is not unusual to find more than two dozen species in a relatively small area (Claflin, et al, 1977; Fremling, et al, 1976; Nielsen, et al, 1978).

A diversity of fish species use the backwaters for all life functions. Predominant commercial species are catfish, carp, and bigmouth buffalo. Typical game fish are northern pike, largemouth bass, and bluegill. Deeper water areas with sufficient flows in this habitat type provide wintering areas for largemouth bass, crappie, northern pike, and bluegills (Figure 13). For example, during the winter of 1976, Lake Onalaska produced an estimated catch of 250,000 bluegills (Rach, 1977). The bluegill accounts for 37% of all fish sampled from Lake Onalaska (Held, 1978). Lake Onalaska also supports large populations of smallmouth bass (Wisconsin DNR, 1978) and eighteen other sport fish species (Held, 1978). Emergent aquatic vegetation found in backwater areas provides spawning habitat for northern pike during spring high water flows.

As a result of accelerated eutrophication, many areas experience low dissolved oxygen levels. This restricts fish use in these areas and is an increasing problem in many backwater areas (Wisconsin DNR, 1978; Fremling, et al, 1979).

River lakes and ponds are also used by migratory water birds including ducks, geese, swans, egrets, herons, and a large group of less numerous species. Resident wildlife using these aquatic environments are muskrat, beaver, mink, and otter. In addition, at certain times of the year, these areas serve as feeding locations for migratory raptorial birds and other resident wildlife. The type of use that

these areas afford includes the full range of life cycle activities for waterfowl and most other resident species. They further serve as feeding areas for migratory species.

Lake Onalaska, an example of a major aquatic system in Pool 7 near La Crosse, Wisconsin, has exceptionally high wildlife value in terms of duck use days during fall and spring migrations. It also hosts a number of wildlife species for breeding during the summer. The diverse system present here has open water qualities particularly attractive to diving ducks and extensive shallow water marsh areas used for feeding by wading birds, interspersed with terrestrial habitat utilized by deer, raccoons, and other resident wildlife.

Side Channels -- Side channels include all departures from the main channel and main channel border in which there is current during normal river stage. Side channels typically occur in the upper and middle pool zones. They range from fast flowing watercourses with banks to sluggish streams winding through marshy areas. Unless they are former main channels, the banks are usually unprotected. Undercut or eroded banks are common along side channels near their departure from the main channel. This occurs mainly in the upper sections of the pool where banks are highest and the current is swifter.

Closing or diversion dams constructed by the Corps of Engineers are present at many locations where the side channels leave the main channel or main channel border and infrequently at other locations. These structures are mostly submerged.

The bottom type usually varies from sand in the upper reaches to silt in the lower. In the swifter current there is no rooted aquatic vegetation, but vegetation is common in the shallower areas having silty bottoms and moderate to slight current (Nord, 1967). Predominant fish species are those using the transition zone between the current of the main river and quiet backwaters, and may be

species which typically depend more on either of those habitat types.

Nearly all species of commercial value, such as channel catfish, carp, buffalo, and freshwater drum, utilize this habitat throughout the year. Game species such as largemouth bass, smallmouth bass, bluegill, and crappie use side channels for all life functions. Such areas provide rearing and wintering for northern pike, white bass, and paddlefish (Figure 13).

The predominant wildlife species using side channels are wood ducks and resident furbearers. Occasionally, a valuable area for wood duck brooding or nesting is found along side channels in bottomland forest. Muskrat, beaver, mink, and raccoon use these areas as travel corridors and for feeding and den sites.

Sloughs and Side Streams -- Sloughs and side streams are relatively narrow branches or offshoots of other bodies of water. They are characterized by having little or no current at normal water stage, mud bottoms, and an abundance of submerged and emergent aquatic vegetation. Many sloughs and side streams are former side channels that have been cut off by sedimentation or deposition of dredged material.

The sloughs, side streams, and some of the ponds and smaller lakes are representative of the accelerated ecological succession taking place in the river bottoms from aquatic to marsh habitat. Siltation is gradually degrading the quality of this habitat for fisheries. Bluegills, bullheads, largemouth bass, and carp are the predominant species found in this habitat year-round, although several other species depend on these areas as spawning and rearing grounds. Sloughs are similar in value to side channels for various commercial species such as carp and buffalo.

Sloughs and side streams are used extensively by wading birds for feeding. Like side channels, these areas provide valuable brood and nesting sites for migratory waterfowl such as wood ducks and are common den and feeding areas for furbearers.

Main Channel -- The main channel includes only the portion of the river through which large commercial craft can operate. It is defined by combinations of various channel control structures, natural features, and navigation markers. It has a minimum depth of 9 feet and a minimum width of 300 feet. A current nearly always exists, varying in velocity with water stages. The bottom type is mostly a function of current. The upper section within a pool usually has a sand bottom, changing to silt over sand in the lower section. Patches of gravel are present in a few areas. Most of the main channel is subject to scouring action during periods of rapid water flow and by passage of towboats in the shallower stretches. Generally, no rooted aquatic vegetation is present (Olson and Meyer, 1976).

Fish species associated with main channel habitat are those adapted for swift currents; deeper open water; and coarse sand, gravel, or scattered rock bottom. Commercial fish in this area are sturgeon, paddlefish, freshwater drum, and channel catfish which use this habitat for spawning, feeding and wintering. However, lake sturgeon and paddlefish are no longer fished commercially in Minnesota or Wisconsin. Predominant game fish are walleyes, sauger, smallmouth bass and white bass. Main channel habitat provides valuable deep-water wintering areas for nearly all species in the river, particularly the commercially valuable species (Figure 13).

Wildlife use of the main channel is restricted to birds, primarily fish eaters such as gulls, bald eagles, and ospreys. Mergansers and some diving ducks also make limited use of the area. Generally, species use of the main channel is limited because of continued disturbance from commercial and recreational navigation. In addition, the turbulence caused by commercial navigation maintains an unstable bottom type that does not generally permit growth of aquatic organisms used by wildlife in other sections of the river.

Main Channel Border -- This zone is between the 9-foot channel and the main river bank, islands, or submerged definitions of the old main river channel. It includes all areas in which wing dams occur

along the main channel. Buoys often mark the channel edge of this zone. Where the main channel is defined only by the bank, a narrow border still occurs, and often the banks have riprap.

The bottom is mostly sand along the main channel border in the upper sections of a pool and silt in the lower. Little or no rooted aquatic vegetation is present. However, the rock substrate of the wing dams, closing dams (built by the Corps of Engineers for the 6-foot channel project), and shoreline protection devices associated with the main channel border are excellent habitat for walleye , sauger, smallmouth bass, and other species of fish (Fremling, et al, 1973). Rock substrate has a large surface area upon which invertebrates and periphyton colonize. A food study of various fishes in Pool 8 during 1977 showed that forage fish use these rock substrate areas extensively to feed on the invertebrates (Wisconsin DNR, 1978). Fish also use rock substrate for spawning and cover. Smallmouth bass are typically associated with either wing dams or riprap. Larger specimens of other species of fish such as bluegill, black crappie, walleye, and sauger seek out wing dams as either feeding areas or for sanctuary (Wisconsin DNR, 1978).

The main channel border is a primary habitat for freshwater mussels. These organisms are a food source for aquatic furbearers. Furbearers generally use this area as they do side channels and sloughs for feeding, and the banks occasionally serve as den sites.

The shallow waters within the main channel border are used for feeding by shore and wading birds. Egrets and herons are common along the shoreline of this habitat type. Some waterfowl use can also be noted, mainly by wood ducks and mallards.

In some areas, habitat loss has occurred as a result of extensive sedimentation between the wing dams. Dredged material has been

placed in some sections of this zone, sometimes covering wing dams (Grunwald, 1976).

The variety of cover, food, and general habitat values provided in the main channel border permits use by a wide diversity of species on a year-round basis. Conditions determining the degree of use by various species depend on season, river stage, and accessibility to other habitats.

Tail Waters -- Tail waters include the main channel and main channel border in the area immediately below the dams which are affected by turbulence of the passage of water through the gates of the dams and out of the locks. These areas change in size according to water stage. Therefore, no geographic lower boundary has been set below the dams. The bottom is mostly sand and gravel. No rooted aquatic vegetation is present (Claflin, *et al*, 1977). This habitat closely resembles the habitat that existed before impoundment. It is similar to natural river rapids except for deep scour holes below dams.

Available food sources and fast, highly oxygenated water are among the factors that make tail waters valuable fishery habitat (U.S. Army Corps of Engineers, 1974). This habitat type has allowed the survival of paddlefish and sturgeon which were displaced by inundation of the natural river. Such habitat also provides spawning, rearing, and wintering areas for walleye, sauger, yellow perch, catfish, freshwater drum, and white bass (Figure 13). A tail water creel census conducted by the Wisconsin Department of Natural Resources for pools 7, 8, and 9 shows that a projected 57,000 anglers caught 53,000 walleye and sauger during spring and fall 1977. During the spring period from 1968 to 1974, Minnesota Department of Natural Resources personnel interviewed anglers and estimated that 25,600 walleye and 121,600 sauger were taken by 77,700 angler trips at lock and dam 3, and 29,900 walleye and 22,000 sauger were taken by 36,600 angler trips at lock and dam 4 (Sternberg, 1974).

Relative to the other habitat types, the tail waters probably receive the least amount of use by wildlife. Use is limited to gulls, eagles, and osprey feeding. In the winter when most of the water surface is ice, these areas remain open and are used as feeding areas by the raptors that overwinter in the area. However, during other seasons eagle and osprey use is limited by human disturbances such as fishing and boating.

2. AQUATIC VEGETATION

A representative listing of the aquatic vegetation existing in the Upper Mississippi River in the study area was compiled from two sources (Neilsen, *et al*, 1978 and Chaflin, *et al*, 1978) and is shown below. No attempt was made to designate which habitats these plants would occur in due to the many overlapping habitat characteristics.

Emergent Vegetation	Common Name
Family Alismaceae	
Sagittaria latifolia	Arrowhead
Sagittaria rigida	Narrow Leaf Arrowhead
Family Lemnaceae	Duckweed
Family Nymphaeaceae	
Nelumbo lutea	American Lotus
Nelumbo pentapentala	Lotus
Nuphar variegatum	Yellow Water Lily
Nymphaea odorata	Sweet Water Lily
Nymphaea tuberosa	White Water Lily
Family Pontederiaceae	
Pontederia cordata	Pickerelweed

Family Scirpus	
Scirpus fluviatilis	River Bulrush
Scirpus validus	Soft-stemmed Bulrush
Family Sparganiaceae	
Sparganium eurycarpum	Bur Reed
Family Typhaceae	
Typha angustifolia	Narrow-leaf Cattail
Typha latifolia	Cattail
Family Zizania	
Zizania aquatica	Wild Rice
Submergent Vegetation	Common Name
Family Ceratophyllaceae	
Ceratophyllom demersum	Coontail
Family Haloragidaceae	
Myriophyllum exalbescens	Water Milfoil
Hippurus vulgaris	Mare's Tail
Family Hydrocharitaceae	
Elodea candensis	Waterweed
Elodea nuttalli	Waterweed
Vallisneria americana	Wild Gelery
Family Lentibulariaceae	
Utricularia sp.	Bladderwort

Family Najadaceae

Najas flexilis	
Potamogeton americanus	River Pondweed
Potamogeton crispus	Curly-leafed Pondweed
Potamogeton foliosus	Leafy Pondweed
Potamogeton pectinatus	Sago Pondweed
Potamogeton richardsonii	Clasping-leaf Pondweed
Potamogeton zosteriformis	Flat-stemmed Pondweed

Family Pontederiaceae

Heteranthera dubia	Star Grass

3. TERRESTRIAL HABITAT

Bottomland Hardwood Forest -- The bottomland hardwood forest of the Upper Mississippi River system most clearly resembles the preimpoundment natural river configuration. Presently the majority of the forests lie in the upper and middle pool zones. This habitat includes areas which are seasonally flooded but generally well-drained during the growing season. Terrestrial vegetation is typically hardwood forest overstory composed of elm, maple, willow, ash, and cottonwood over 30 feet in height. Typical understory is composed of nettle, poison ivy, wild grape, woodbine, dogwood, chokecherry, and tree seedlings (U.S. Army Corps of Engineers, 1974).

Bottomland forest areas have some value to fish. When these areas are inundated, they provide spawning habitat for northern pike, channel catfish, yellow perch, carp, and buffalo. When flooded, these areas also serve as marginal feeding habitat for largemouth bass, bluegill, and walleye.

The bottomland forest also provides habitat for tree nesting ducks (such as wood ducks and mergansers), raccoon, white-tailed deer, cotton-

tail rabbit, fox, songbirds, upland game birds, salamanders, frogs, snakes and turtles (U.S. Army Corps of Engineers, 1974).

Meadows and Prairies -- Meadows and prairies are typically found on the perimeters of the middle zone of the pools. They are low-lying areas dominated by grasses, rushes, and sedges, which are seasonally flooded, and which have water-saturated soils at or are saturated within a few inches of the surface during the growing season. These areas are generally old hay meadows that were formerly farmed. They have become waterlogged as a result of inundation from the 9-foot navigation project.

Adequate water depths for fish use are usually present only during high water events and thus limit the utility of these areas as fishery habitat. Predominant fish species which utilize these areas when inundated are those which require fairly dense vegetation and shallow water for spawning. These areas, particularly locations with reed canary grass, are important spawning habitat for northern pike and carp. However, reproductive success is dependent on sustained water levels for at least 2 weeks. Abundant food supplies often attract numerous other species such as crappie, bluegill, and suckers into this habitat type during floods.

Meadows and prairies provide valuable pairing, nesting, and feeding habitat to migratory waterfowl. Raptorial birds feed throughout these areas. Deer, pheasant, wild turkey, squirrel, mice, songbirds and various other wildlife use this habitat type.

Agricultural Lands -- Agricultural lands are generally those areas in private ownership that are not normally saturated with water. There is generally little standing water with the exception of spring flooding of low-lying areas. These areas serve as secondary food sources for upland wildlife. Wildlife use is similar to that of meadows and prairies. These areas are generally too high and dry to serve as fishery habitat.

Urban Habitat -- The urban environment has a profound effect on wildlife using the Upper Mississippi River in that encroachment tends to eliminate much of the diversity and, therefore, number of wildlife species using that area. Occasionally, adaptations by different wildlife species to the urban environment have occurred. This is the case with the increased incidence of urban mallard and Canada geese flocks in and around the cities and towns along the river.

4. TERRESTRIAL VEGETATION

Terrestrial vegetation provides food sources, nesting materials, cover, and numerous other requirements for survival. Although most terrestrial vegetation is generally considered valuable only to wildlife, spring flooding over normally dry areas creates excellent spawning areas for some fish species.

A representative listing of the terrestrial vegetation in the Upper Mississippi River corridor is shown below (from Pool 5A; Claflin, *et al*, 1979).

WOODLAND

Trees	Common Name
Acer negundo L.	Box-elder
Acer saccharinum L.	Silver Maple
Betula nigra L.	River Birch
Carya ovata (Mill.) K. Koch.	Shagbark Hickory
Fraxinus pennsylvanica Marsh. var. *subintegerrima* (Vahl) Fern.	Green Ash
Juniperus virginica L.	Red Cedar
Platanus occidentalis L.	Sycamore
Populus deltoides Marsh.	Cottonwood
Quercus bicolor Willd.	Swamp White Oak

Quercus macrocarpa Michx.	Bur Oak
Quercus rubra L.	Red Oak
Salix nigra Marsh.	Black Willow
Tilia americana L.	Basswood
Ulmus americana L.	American Elm
Ulmus rubra Muhl.	Slippery Elm

Shrubs

Cornus stolonifera Michx.	Red Osier Dogwood
Sambucus canadensis L.	Elderberry
Xanthoxylum americanum Mill.	Prickly Ash
Toxicodendron radicans (L.) Kuntze.	Poison Ivy

Vines

Menispermum canadense L.	Moonseed
Parthenocissus quinquifolia (L.) Planch.	Virginia Creeper
Parthenocissus vitacea (Knerr) Hitchc.	Virginia Creeper
Smilax glauca Walt.	Catbrier
Smilax hispida Muhl.	Bristly Catbrier
Vitis aestivalis Michx.	Summer Grape
Vitis riparia Michx.	Riverbank Grape
Toxicodendron radicans (L.) Kuntze.	Poison Ivy

Herbs

Boehmeria cylindrica (L.) Sw.	Swamp Milkweed
Campanula uliginosa Rydb.	Marsh Bellflower
Eupatorium rugosum Houtt.	White Snakeroot
Laportea canadensis (L.) Wedd.	Wood Nettle
Lobelia cardinalis L.	Cardinal Flower
Lysimachia nummularia	Moneywort

Pilea pumila (L.) Gray	Clearweed
Veronicastrum virginicum (L.) Farw.	Culver's Root

SHORE FLORA

Shrubs

Amorpha fruticosa L.	False Indigo
Cephalanthus occidentalis L.	Buttonbush
Cornus stolonifera Michx.	Red Osier Dogwood
Ilex verticillata (L.) Gray	Winterberry
Salix interior Rowlee	Sandbar Willow
Spirea alba Du Roi	Meadowsweet
Toxicodendron radicans (L.) Kuntze.	Poison Ivy

Vines

Parthenocissus quinquifolia (L.) Planch.	Virginia Creeper
Parthenocissus vitacea (Knerr) Hitchc.	Virginia Creeper
Smilax glauca Walt.	Catbrier
Toxicodendron radicans (L.) Kuntze.	Poison Ivy
Vitis riparia Michx.	Riverbank Grape

Herbs

Asclepias incarnata L.	Swamp Milkweed
Athyrium angustum (Willd.) Presl	Northeastern Lady Fern
Carex laeviconica Dewey	Sedge
Carex lupulina Muhl.	Hop's Sedge
Carex tribuloides Wahl.	Blunt Broomsedge
Dryopteris cristata (L.) Gray	Crested Woodfern
Equisetum arvense L.	Field Horsetail
Hibiscus militaris Cav.	Halberd-leaved Rose Mallow

Leersia oryzoides (L.) Sw.	Rice Cutgrass
Lycopus americanus Muhl.	Water Horehound
Matteuccia struthiopteris (L.) Tod.	Ostrich Fern
Onoclea sensibilis L.	Sensitive Fern
Phalaris arundinacea L.	Reed Canary Grass
Pilea pumila (L.) Gray	Clearweed
Polygonum amphibium L.	Water Smartweed
Ranunculus septentrionalis Poir.	Swamp Buttercup
Scirpus cyperinus (L.) Kunth.	Bulrush
Scirpus fluviatilis (Torr.) Gray	River Bulrush
Spartina pectinata Link	Prairie Cordgrass

5. AQUATIC - TERRESTRIAL INTERFACE

Shorelines -- Despite the loss of extensive terrestrial acreage as a result of impoundment, habitat diversity within the river corridor greatly increased as many miles of shoreline were created. At the confluence of land and water a number of habitat requirements are present for fish and for wildlife. Numerous species and numbers of both fish and wildlife are present in this area, because of the ecotone or edge effect created by the presence of such a variety of habitat requirements (Leopold, 1933).

Sand -- This habitat is composed of bare or sparsely vegetated sand. Sandbars or shoals are commonly found along the sides or on the downstream ends of islands and along main or side channels (Olson and Meyer, 1976). Such areas may result from natural deposition or from dredged material placement. This habitat type receives primary use from smallmouth buffalo for spawning and feeding habitat for walleye and sauger, although numerous other species may use this habitat in association with other habitat types.

Turtles use sandy shorelines for nesting and resting. Wading birds occasionally also use these areas for feeding (Thompson and Landin, 1978).

Mud -- Areas of bare mud or vegetated mud flats are generally found in off-channel areas and are exposed to seasonal water level fluctuations. Fish use of mud flats is limited by water levels and direction of flooding. Primary use comes from carp and buffalo which use the habitat for spawning and rearing. Young sauger sometimes frequent shallow mud flats, feeding on mayflies and midges, and have been collected in this habitat type in Lake Pepin near the mouth of the Chippewa River (Nord, 1967).

Mud flats are used by wading birds and ducks as feeding sites. These species groups feed on benthic organisms or emergent aquatic vegetation (Martin, _et al_, 1951).

Chapter II

ORGANIZATION

Outline	Page

A. THE GREAT RIVER ENVIRONMENTAL ACTION TEAM

1. SCOPE OF GREAT

The GREAT is an interagency partnership team formed to resolve conflicts arising from multiple use demands on the Upper Mississippi River which could not be solved by any single agency or program existing in 1974. The overall study effort was initiated to address the problems associated with dredged material disposal and river resource management practices. The study began in October 1974 and is scheduled to conclude in September 1979.

As a result of increasing concern for the Upper Mississippi River management problems, the Upper Mississippi River Basin Commission (UMRBC) set forth a scope of work for a Great River Study in October 1974. The GREAT was directed to develop a river system management strategy incorporating total river resource requirements.

The UMRBC adopted the following objectives for the study:

1. Assure all navigation project authorizations include fish, wildlife, and recreation resources as project purposes.

2. Develop physical and biological base-line data to identify factors controlling the river system.

3. Identify sites that can be developed to provide for fish and wildlife habitat irretrievably lost to water development projects.

4. Identify and develop productive uses for dredged material.

5. Implement programs to meet present and projected recreation demands on the river system.

6. Strive to comply with Federal and State water quality standards.

7. Strive to comply with Federal and State floodplain management standards.

8. Develop procedures for assuring an appropriate level of public participation.

9. Develop ways to significantly reduce the volume of dredged material removed for the navigation project.

10. Open backwater areas that have been deprived of necessary fresh-water flow as a result of channel maintenance.

11. Assure necessary capability to maintain the total river resources on the Upper Mississippi River in an environmentally sound manner.

12. Contain or stabilize all floodplain dredged material disposal sites to benefit the river resource.

The Upper Mississippi River Basin Commission directive was also the basis of congressional authorization for the study as noted in section 117 of the Water Resources Development Act of 1976. Through the act, Congress authorized the Corps of Engineers to investigate and study the Upper Mississippi River in cooperation with interested State and Federal agencies. The format for the study and plan development was to be similar to that of the Great River Study, a subdivision of the Upper Mississippi River Basin Commission.

The Great River Study consisted of three components. GREAT I covers the Upper Mississippi River and its major tributaries from Minneapolis, Minnesota, to Guttenberg, Iowa. GREAT II and GREAT III concentrate on the Upper Mississippi River south of the GREAT I study reach to the confluence with the Ohio River, at Cairo, Illinois (R.M. 0).

2. ORGANIZATION OF GREAT

The GREAT I was organized to provide the widest range of Federal-State coordination for effective and responsive management of the study. The team was cochaired by representatives of the U.S. Fish and Wildlife Service and Corps of Engineers. These agencies have the major management responsibilities on the river. However, equal partnership was achieved through equal vote distribution among involved States and Federal agencies. Participants in GREAT I were: Iowa, Minnesota, Wisconsin, Corps of Engineers, Department of Transportation, Environmental Protection Agency, Fish and Wildlife Service, and Soil Conservation Service (Figure 6). The Heritage Conservation and Recreation Service of the Department of the Interior was an original member agency, but had to drop its participation because of budget cuts during 1976. Additional participants included the Minnesota-Wisconsin Boundary Area Commission, Upper Mississippi River Conservation Committee and members of the public.

GREAT was organized into 12 functional work groups:

Fish and Wildlife Management
Side Channel Openings
Dredging Requirements
Commercial Transportation
Dredged Material Uses
Material and Equipment Needs
Floodplain Management
Plan Formulation
Public Participation and Information

Figure 6. One of the first meetings of the GREAT (winter 1975). Agency representatives from left are: Shirley Hunt, UMRBC; Ray Sanford, Corps; Ralph Bartels, Dept. of Transportation; Jerry Schnepf, Iowa; Chester Weldon, Dept. of Agriculture; Joe Scott, Fish and Wildlife Service; Bill Pearson, Corps; Don Buckhout, Minnesota; John Masseso, EPA; Bob Whiting, Corps; Dennis Cin, Corps; Keith Larson, Fish and Wildlife Service; and Larry Larson, Wisconsin.

Recreation
Sediment and Erosion
Water Quality

Each work group was charged with accomplishing objectives which related to those adopted by the Upper Mississippi River Basin Commission. Work groups were chaired by a representative from the participating agency most suited for or most interested in the primary responsibility of the given work group.

As a result of the interdisciplinary partnership team organization, a broad range of complex issues that must be considered in water resource planning were considered.

B. THE FISH AND WILDLIFE MANAGEMENT WORK GROUP (FWMWG)

The FWMWG was one of the 12 original work groups of the GREAT. Its responsibility was to provide biological expertise to the GREAT; help develop environmentally sound main channel dredging and disposal methods; and develop a workable approach to managing backwater and main channel habitat areas (specific objectives are discussed in Chapter III).

The FWMWG was chaired by a representative of the U.S. Fish and Wildlife Service. The work group originally had one representative from each resource management agency having responsiblity on the river. However, the group was quickly expanded to include nearly all fish and wildlife management biologists working on the river in the study area. In addition, several members of the public (not affiliated with any government agency) became active in the FWMWG shortly after its formation.

The work group's first formal meeting was held on February 10, 1975, in La Crosse. Work group meetings were generally held once a month in either Winona or La Crosse. Attendance at the meetings ranged from 15 to 25. Almost always, at least one representative from each fish and wildlife management agency attended the meetings. The Corps usually was represented

also, while the Environmental Protection Agency and Minnesota Pollution Control Agency rarely participated.

Work group actions were generally decided by majority vote, with each individual at the meeting voting. However, as a result of the controversy involved with some of the work group's final recommendations, the voting procedure was changed to one-agency/one-vote in fall 1978.

The following agencies were represented on the FWMWG (the names of the individuals representing these agencies are listed on page ii):

- Iowa Conservation Commission
  - Divisions of Fish and Wildlife
  - Division of Waters
- Minnesota Department of Natural Resources
  - Bureau of Planning
  - Divisions of Fish and Wildlife
  - Division of Waters
- Minnesota Pollution Control Agency
  - Division of Water Quality
- Wisconsin Department of Natural Resources
  - Division of Environmental Assessment
  - Division of Fish and Wildlife
  - Division of Floodplain Management
- U.S. Army Corps of Engineers
  - Environmental Resources Branch
  - Operations and Maintenance Branch
- U.S. Fish and Wildlife Service
  - Division of Ecological Services
  - Upper Mississippi River Wild Life and Fish Refuge

C. THE SIDE CHANNEL (OPENINGS) WORK GROUP (SCOWG)

The SCOWG was also one of the original work groups of the GREAT. Its responsibility originally was to determine whether side channel openings could solve the problems developing in the backwaters (specific objectives are discussed in Chapter IV). That responsibility was later expanded by the work group to include the determination of effects of other types of side channel modifications. It was at that time that the work group's name was changed to the Side Channel Work Group (SCWG) to more accurately describe the work group's responsibility.

The organization of and representation on the SCWG was essentially identical to that of the FWMWG (described in the preceding section) except that different chairmen were designated whenever possible. Voting procedures were also generally identical to that of the FWMWG. The first formal meeting of the work group occurred on January 3, 1975, in La Crosse.

D. THE FISH AND WILDLIFE WORK GROUP (FWWG)

The FWWG was not one of the original work groups of GREAT; it is a combination of the FWMWG and SCWG.

The interrelated nature and responsibilities of the two work groups had always been acknowledged by the members of both work groups and the GREAT as a whole. Projects and research contracts handled by one work group almost always related to or provided information for the other work group as well.

When it came time to prepare the work group reports (appendices) for the GREAT, the chairmen of the two work groups agreed that much effort and many sections would be duplicated if each work group prepared a separate report. It was also agreed that the SCWG's responsibilities were primarily

subdivisions of the FWMWG's responsibilities. Therefore, the two chairmen agreed to combine the efforts and reports of the two work groups. The resulting work group is called the Fish and Wildlife Work Group (FWWG) with one chairman designated for the work group. The organization, agency representation, and procedures for the FWWG are essentially identical to its two predecessors.

E. PUBLIC INPUT INTO THE WORK GROUPS (FWMWG, SCOWG, SCWG, AND FWWG).

The FWWG and its predecessors have sought out and received extensive public input and participation. Public involvement was particularly important to the work group's endeavors of pilot projects and applied research investigations. Citizens participated regularly in work group meetings and provided direction to the work group through the Public Participation and Information Work Group and public hearings.

One or more nonaffiliated citizens attended each FWWG meeting. The voting procedure used by the work group through nearly the entire tenure of the work group provided for voting rights for any citizen attending a meeting who considered himself or herself qualified to vote on the given matter.

The FWWG provided to the Public Participation and Information Work Group (PPIWG) copies of all correspondence and notices. All responses to information requests or clarification requests by the PPIWG were provided directly to the coordinator of the PPIWG. In nearly all cases, the PPIWG handled news releases for the FWWG.

On numerous occasions when the FWWG was involved with a specific project or investigation, citizens were involved directly with the success of the project. They would often provide the original suggestions for projects, such as side channel modifications. In other cases the participation of citizens was crucial for making the proper contacts

or providing integral pieces of information.

Through the course of the study the SCOWG received many requests by private citizens who wished to have side channel openings dredged by the GREAT. The SCOWG's primary charge was not to make such openings but rather was to determine the effects of such openings on fish and wildlife resources. However, each request was recorded and evaluated.

Chapter III

THE FISH AND WILDLIFE MANAGEMENT WORK GROUP (FWMWG)

A. OBJECTIVES

The original objectives and plan of action of the FWMWG were relatively limited in scope and were aimed at identifying what could be done to mitigate and/or compensate for the effects of the 9-foot channel project on fish and wildlife resources. It was planned that if some concrete remedies could be found the work group would then pursue getting these remedies implemented. However, numerous unstated expectations of the work group tended to expand those responsibilities. Following is a brief discussion of the established and the unstated responsibilities of the FWMWG.

1. FWMWG STATED OBJECTIVES

The objectives of the FWWG were first officially distributed on April 30, 1975, under the signature of work group chairman Joseph Scott. The work group agreed on the following wording:

> "The primary objective of the Fish and Wildlife (Management) Work Group is to determine the means and to make recommendations for preserving, protecting, and enhancing the fish and wildlife resources of the Upper Mississippi River. However, while investigations are being conducted to determine these long-term means, this work group will recommend procedures for each year's dredging season to the entire partnership team."

These objectives were to be accomplished through a specific plan of action, which is listed below. However, several work group responsibilities were obvious in the objectives.

First: The FWMWG was to determine what projects and/or methods could be used on the river to preserve, protect, and enhance the fish and wildlife resources.

Second: The work group was to recommend that these projects and methods be implemented.

Third: Each year during the GREAT's tenure the work group would recommend short-term spoil disposal measures to be used by the Corps to protect fish and wildlife.

2. PROBLEMS IDENTIFIED BY THE FWMWG

The work group identified three primary fish and wildlife resource problems in developing its objectives and the plan to accomplish those objectives. Those problems were:

a. There was a "Lack of knowledge on the distribution and abundance of the fish and wildlife resources of the Upper Mississippi River."
b. There were many "Adverse effects of channel maintenance and modification, industrial development, commercial transportation and flood plain encroachment on the fish and wildlife resources."
c. There was a "Lack of ability to predict the response of the fish and wildlife resources to alterations of the riverine environment."

The problems identified brought up two additional responsibilities for the FWMWG.

First: The work group was to find a way to determine and quantify the distribution and abundance of fish and wildlife habitat existing on the river.

Second: The work group was to develop ways to predict what biological responses would result in specific areas when physical changes, such as side channel openings, were made in the backwaters.

3. PLAN OF ACTION

The FWMWG action plan as stated on April 30, 1975, reads:

"The attainment of the primary objective and the solution of the identified problems are contingent upon the fulfillment of the following action plan objectives:

a. Describe the fish and wildlife resources.
   1. Devise a fish and wildlife habitat classification system.
   2. Inventory the fish and wildlife habitat.
   3. Inventory the fish and wildlife populations.
b. Inventory the water development project elements (stream alteration devices).
c. Identify areas with crucial problems related to fish and wildlife management.
d. Conduct in-depth investigation in identified crucial problem areas.
e. Investigate possible approaches to predicting the response of the fish and wildlife resources to alterations of the riverine environment.
f. Determine the effects of water development project elements (channel maintenance and modification, industrial development, commercial transportation and flood plain encroachment) on the fish and wildlife resources.
g. Analyze the effects of water development projects on fish and wildlife resources in order to determine alternative means to alleviate adverse effects and encourage beneficial effects.
h. Test and evaluate alternatives by employing predictive capabilities previously developed (e).
i. Recommend and encourage the implementation of river management practices and programs developed to preserve, protect, and enhance fish and wildlife resources of the Upper Mississippi River."

By its own direction, the work group was responsible for accomplishing each item.

4. UNSTATED EXPECTATIONS

The FWMWG was actually charged with those responsibilities listed above

in the statement of the objectives, problems, and plan of action. However, other expectations were unstated. One expectation was that the FWMWG would develop a comprehensive management plan for the land and waters of the Upper Mississippi River floodplain and that this plan would specify what areas should be managed for which species of fish or wildlife. It was further expected that the plan would describe how these areas should be physically managed.

The source of this expectation was the often stated goal of the GREAT to develop a total resource management plan. Though the specific objectives of the GREAT were oriented to address the 9-foot channel project and its effects, many individuals expected that a total resource management plan would provide for a comprehensive land use plan.

The Sierra Club has proposed that specific areas of the Upper Mississippi River Wild Life and Fish Refuge be designated as wilderness areas. The Department of the Interior has studied the proposal but is officially delaying taking action on the designation of wilderness areas in the refuge until the GREAT I and GREAT II programs have been completed. Because the designation of wilderness would substantially affect fish and wildlife management practices within the refuge, many people expected the FWMWG to evaluate the proposal.

B. WHAT THE FWMWG ACCOMPLISHED

1. RESPONSIBILITY:

Determine what projects and/or methods could be used on the river to preserve, protect, and enhance the fish and wildlife resources (objectives).

Accomplishments:
The FWMWG depended heavily on the work of the Side Channel (Openings) Work Group (SCWG) to determine which projects and/or methods could

be used to preserve, protect, and enhance fish and wildlife resources. As was mentioned in the organization section, the membership of the two work groups was virtually identical and the work group goals were largely interchangeable.

The work groups conducted several pilot projects intended to determine which techniques and projects would preserve, protect, and/or enhance the resource. The pilot projects which produced the most information relating to potential fish and wildlife benefits resulted from a research contract with Winona State University and Saint Mary's College, The Feasibility and Environmental Effects of Opening Side Channels on the Mississippi River (Fremling, et al, 1979). Although none of the three pilot projects designated in the original study was accomplished due to changes in GREAT priorities, due to preliminary results of the study itself, and by legal difficulties with local landowners, two pilot projects of major importance were accomplished.

The first pilot project was a partial closing dam at the entrance of Devil's Cut, Fountain City Bay, pool 5A (Figure 7). The dam (partially funded and built by the Corps) was to reduce sediment transport into the Fountain City Bay backwater between Cochrane and Fountain City, Wisconsin. The report concludes that the dam has worked very well and that such partial closing dams, designed specifically to benefit the backwaters, can be used effectively where there is a major problem of coarse sediment transport into the backwaters. See section "C" of The Feasibility and Environmental Effects of Opening Side Channels in Five Areas of the Mississippi River for details.

The second pilot project associated with the side channel opening contract was the construction of a set of three gated culverts through lock and dam 5, near Cochrane, Wisconsin (Figure 7). The culverts were constructed to provide freshwater flow to a major backwater area isolated from the main channel by a dike and to reduce a head deficit in the backwater

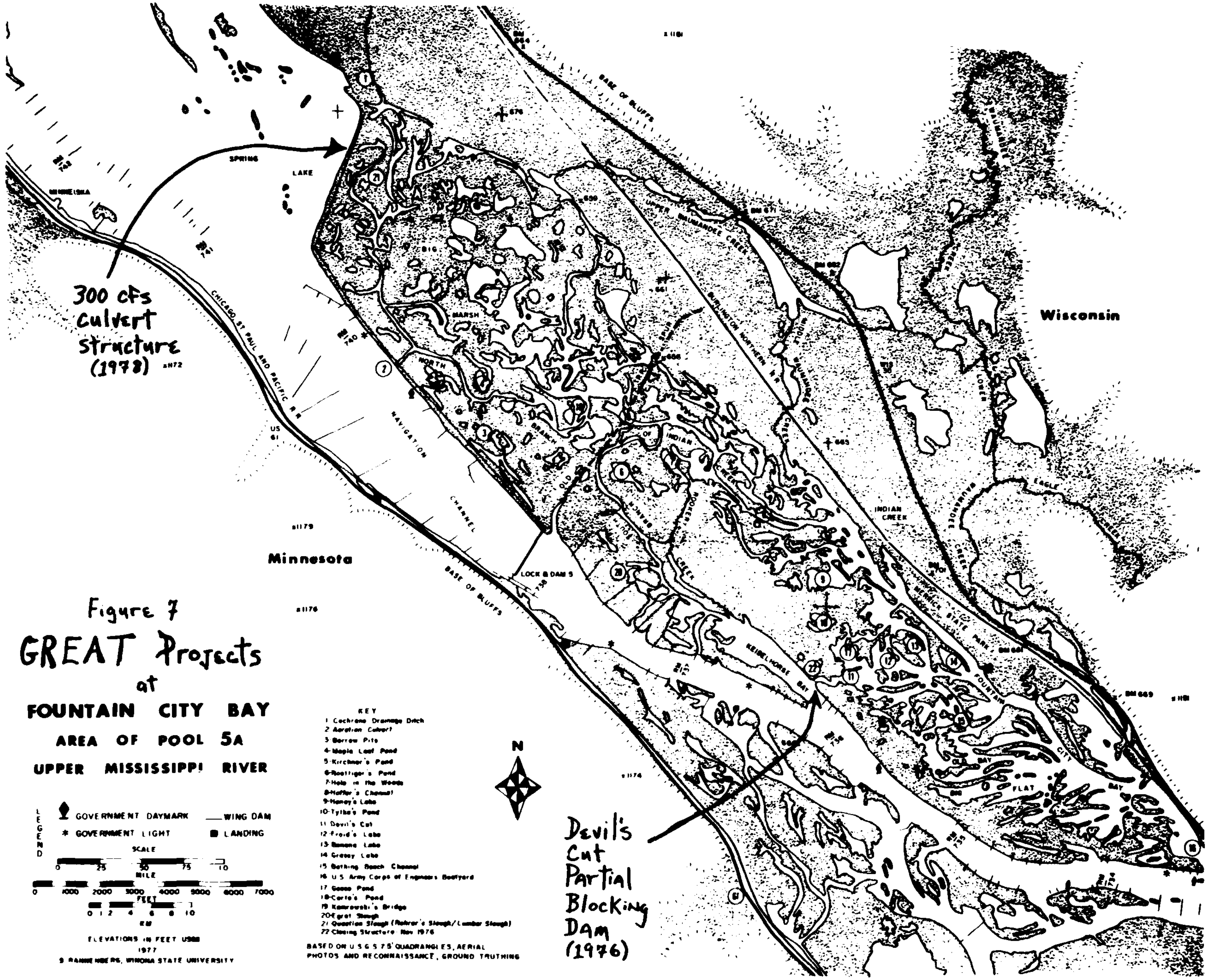


Figure 7
GREAT Projects at
FOUNTAIN CITY BAY
AREA OF POOL 5A
UPPER MISSISSIPPI RIVER

which encourages excessive sediment influx during high water periods. The results of this project were documented by the River Studies Center of the University of Wisconsin- La Crosse (Claflin and Rada, 1979) and by the original study contractors (Fremling et al., 1979(. The preliminary results indicate that the culverts have been exceptionally successful at restoring habitat diversity to the backwater. Whether the culverts have had a beneficial effect on the head deficit and sediment influx problem is still a question as of this writing. Reference should be made to the final report of Winona State and Saint Mary's College (Fremling, et al, 1979) for conclusions on this matter.

Two additional projects associated with the Winona State/Saint Mary's contract will provide still more documentation of possible means to benefit the backwaters. A side channel opening at the lower end of Blackbird Slough (pool 6 just below lock and dam 5A) was substantially enlarged by the Corps in 1976 to assure continued flow into a productive fishing backwater (Figure 8). The area was monitored before and after the opening was enlarged and should answer questions such as how long an unprotected opening will remain open and whether the effects of this sort of opening on the fisheries are beneficial or detrimental.

The second additional project is the opening of three small side channels, somewhat remote from the main channel, at Kruger Slough, Island 42, and Old John's Ditch, all in pool 5 near the West Newton Colony (Figure 9). These openings are all intended for biological benefit and were due to be opened in the summer of 1978. However, no contractors could be found to do the work. Subsequently, the Corps of Engineers has agreed to do the openings with GREAT funds during summer 1979. Though we have lost the time needed for our research contractors to document the impacts of these biological openings, the pilot openings project will be accomplished and the Minnesota Department of Natural Resources and the Fish and Wildlife Service - Ecological Service Office have agreed to monitor the results through 1982 (Appendix Q).

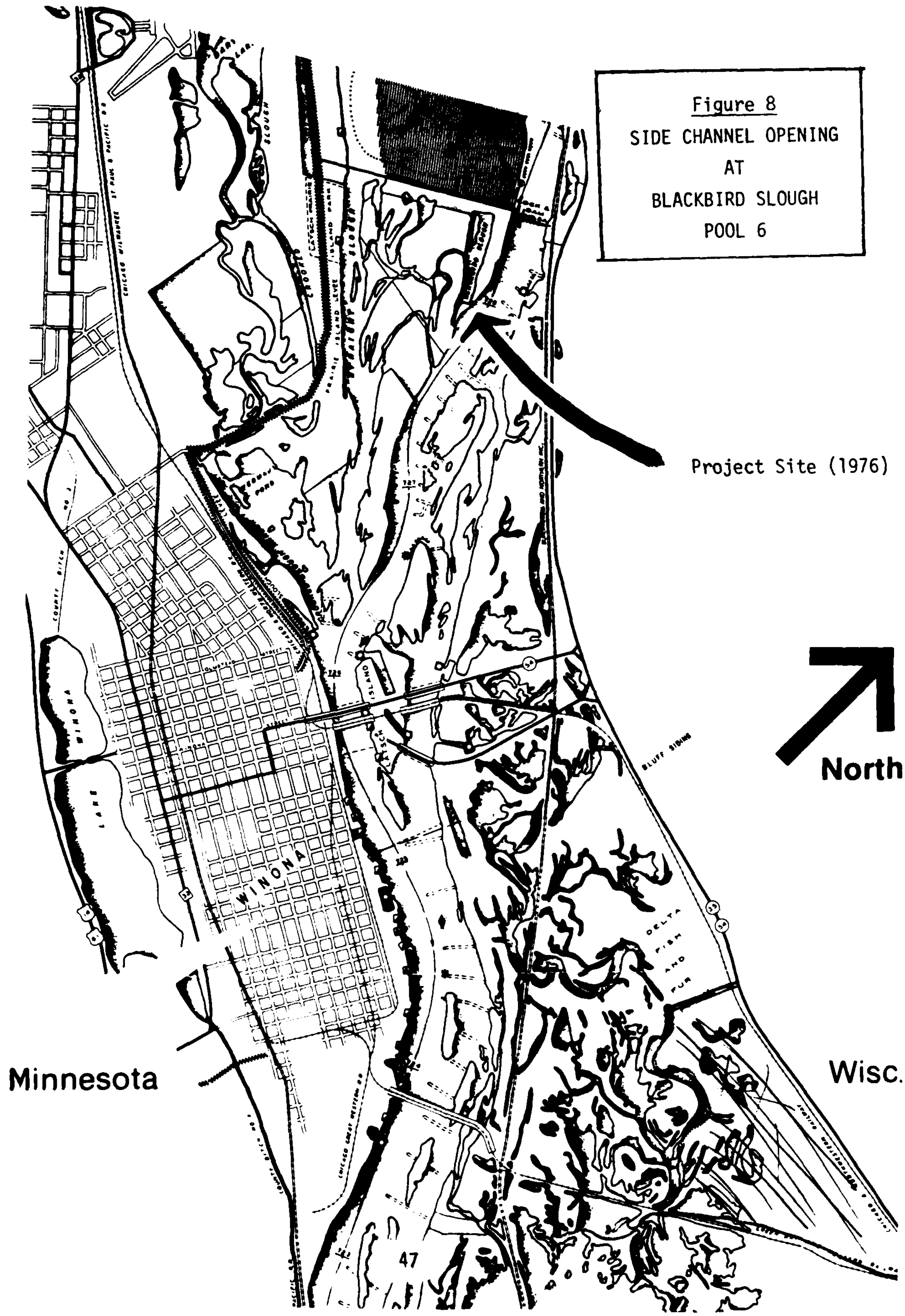


Figure 8
SIDE CHANNEL OPENING
AT
BLACKBIRD SLOUGH
POOL 6
Project Site (1976)
North
Minnesota
Wisc.
WINONA
DELTA FISH AND FUR
BLUFF SIDING

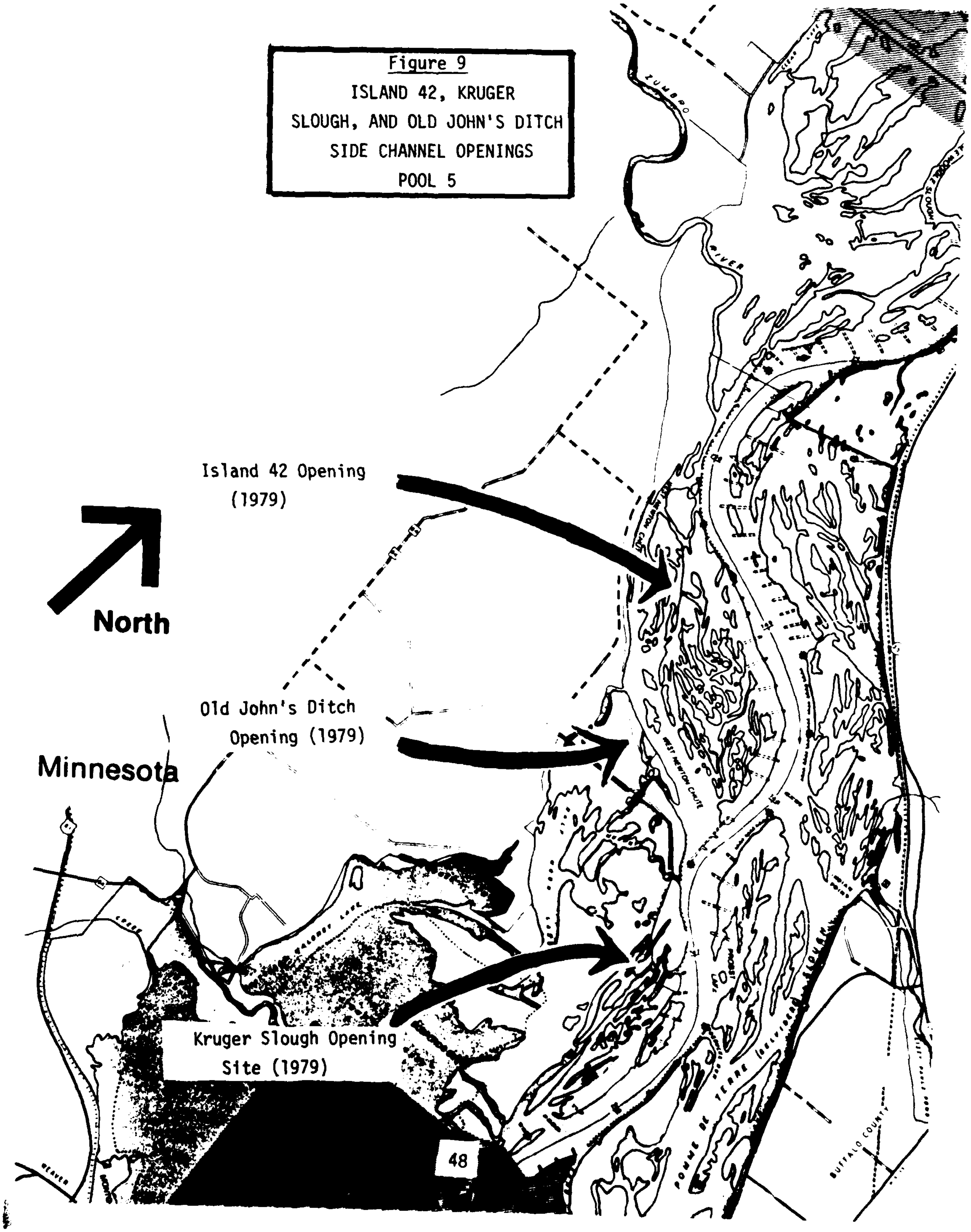


Figure 9
ISLAND 42, KRUGER
SLOUGH, AND OLD JOHN'S DITCH
SIDE CHANNEL OPENINGS
POOL 5

2. RESPONSIBILITY:

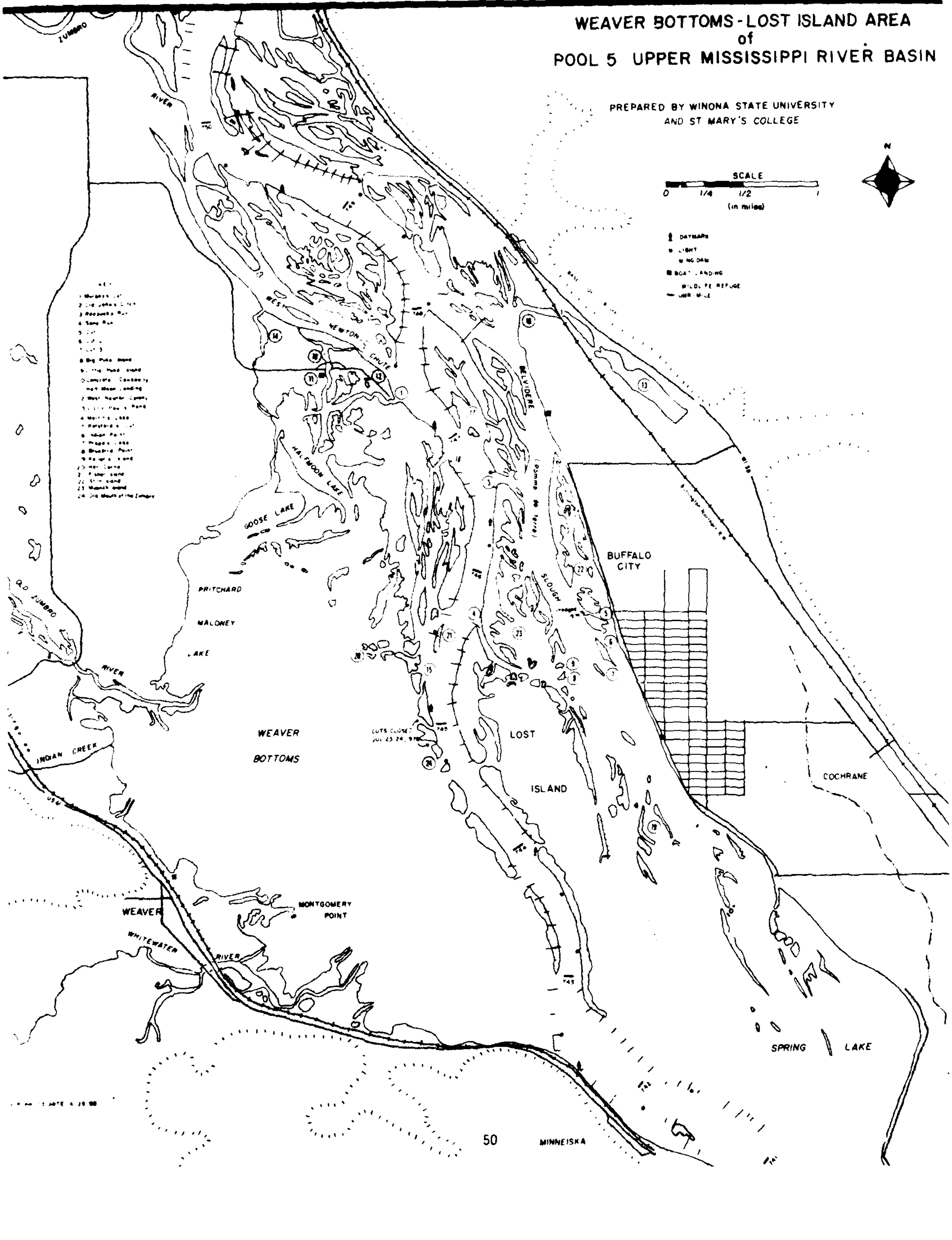
Identify areas with crucial problems related to fish and wildlife management and conduct in-depth investigation to determine the cause of the problems (plan of action).

Accomplishments:
The original intent of the FWMWG was to identify several backwater areas which had major environmental problems developing and contract for comprehensive investigations of each to identify the source of the problems. The work group believed that once problem sources were identified it would be obvious what remedial measures should be implemented. The three areas tentatively targeted for these investigations were the Weaver Bottoms (pool 5), Lake Onalaska (pool 7) and Lansing Big Lake (pool 9).

The first contract was set with Winona State and Saint Mary's College to do the investigation of the Weaver Bottoms (Fremling, et al, 1976) (Figure 10). By the time the report was completed in 1976, we had concluded that such major rehabilitation work as was intended for Weaver, Onalaska, and Lansing required much more information than we had contracted for. The original Weaver report contained some startling conclusions on what the problem sources were and how to rehabilitate the backwater (see section "C" of this chapter). The impacts of the recommended rehabilitation projects were obviously going to extend to the Wisconsin side of the river, and further investigations would be necessary.

The work group decided to develop an extended contract for investigating the entire Weaver Bottoms/Belvidere Slough area (Figure 10). The work group would then attempt to extrapolate the conclusions from the comprehensive Weaver study to the other critical areas once the Weaver pilot project was completed. The expanded contract was made with Winona State and Saint Mary's College (Nielsen, et al, 1978)

- Figure 10 -


WEAVER BOTTOMS - LOST ISLAND AREA
of
POOL 5 UPPER MISSISSIPPI RIVER BASIN
PREPARED BY WINONA STATE UNIVERSITY
AND ST MARY'S COLLEGE
SCALE
0
1/4
1/2
1
(in miles)
N
BUFFALO CITY
COCHRANE
WEAVER BOTTOMS
LOST
ISLAND
SPRING
LAKE
WEAVER
MONTGOMERY POINT
WHITEWATER
RIVER
INDIAN CREEK
PRITCHARD
MALONEY
LAKE
GOOSE LAKE
HALFMOON LAKE
WEST
NEWTON
CHUTE
BELVIDERE
SLOUGH
ZUMBRO
RIVER
OLD ZUMBRO
MINNEISKA

and the resulting report received in July 1978. This follow-up report contained an engineering analysis of the proposed rehabilitation project (subcontracted to Colorado State University).

The Wisconsin Department of Natural Resources has objected to implementing the pilot project, citing the shallowness of the engineering analysis and the conclusion that flood stages would be increased on the Wisconsin side by 4 to 6 inches during moderate floods if the project were constructed.* Attempts are being made to overcome the problems, including the possibility of conducting a physical model study of the area. If this study is done, math models developed by Colorado State University could be tested and calibrated against the physical model, making the math models credible for use with proposed rehabilitation projects at other locations. Details of the work proposed for the Weaver Bottoms are contained in the "Special Features" chapter of the Channel Maintenance Plan, an appendix to the final GREAT I report.

3. RESPONSIBILITY:

Develop ways to predict what biological responses would result in specific areas when physical changes are made in the backwaters (plan of action).

Accomplishments:
The FWMWG decided that it was wise to try two different approaches to developing predictive capability. One was to attempt a specific model based on mathematical relationships between physical and biological parameters. The other was to develop a logical predictive ability based on the results of several pilot side channel openings.

The math model approach was pursued through a contract with the River Studies Center of the University of Wisconsin, La Crosse (Claflin, et al., 1977). The model was developed from physical, chemical and biological data collected throughout pool 8. The report, submitted in March 1977, documented correlations between physical/chemical

* See Appendix P_1.

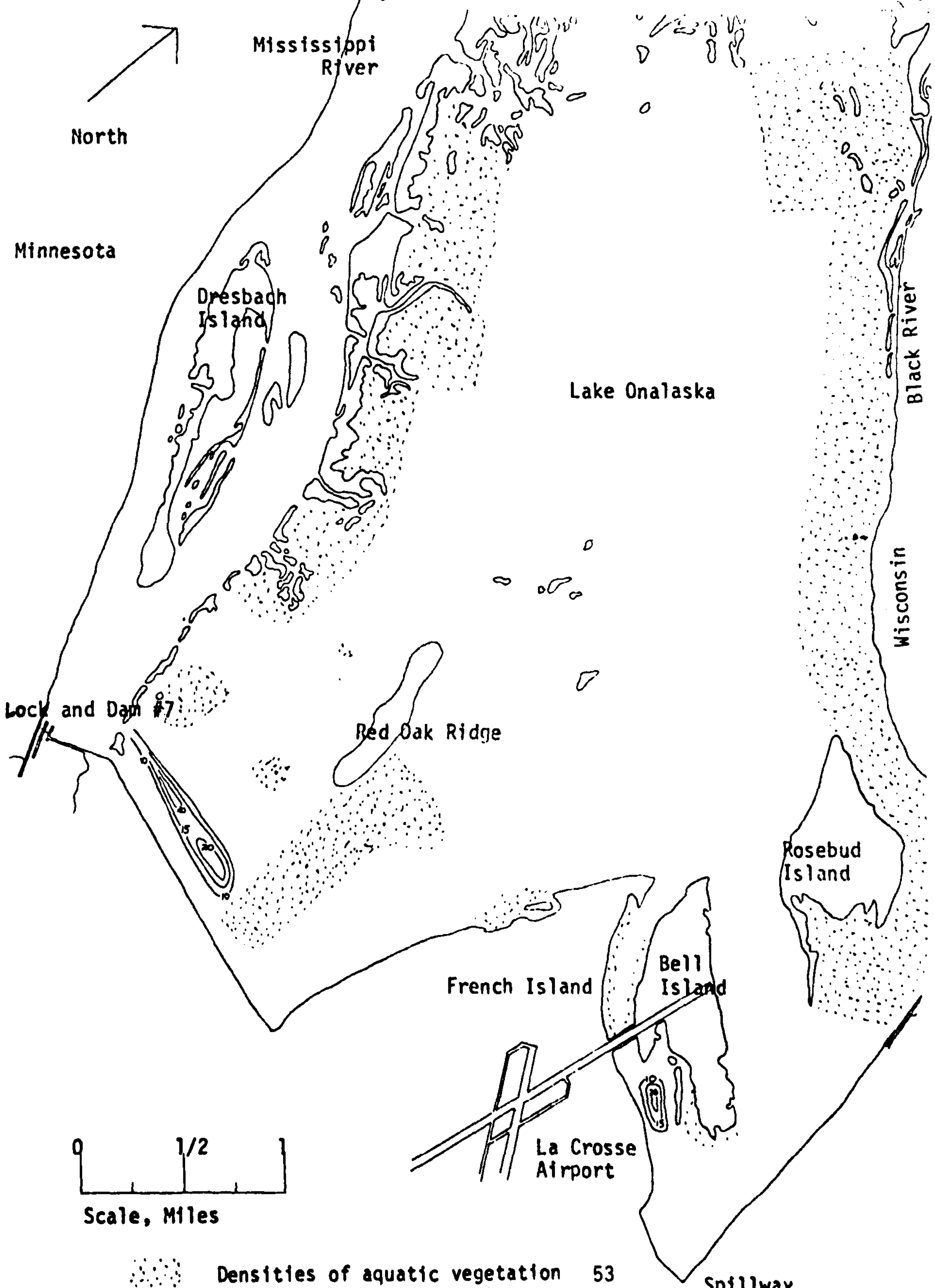
data and populations of benthic organisms and biomass of rooted aquatic macrophytes.

The FWMWG believed the model had enough potential to warrant ground-truthing. A contract was set with the River Studies Center to use the culverts to be constructed at lock and dam 5 to test the model against a real world situation. The report is presently in draft stage (Claflin and Rada, 1979). Estimates of physical and chemical parameters are necessary to develop the biological predictions. The premise that the model is a useful tool is based on the assumption that benthic organisms and rooted macrophytes are good definition parameters for fish and wildlife habitat. The final report will include a user's manual for the use of the model.

The work group also contracted with the River Studies Center to determine if the model was applicable to Lake Onalaska, one of the three critical areas discussed earlier (Figure 11). The report provided some base-line data on the area and concluded that the parameter data for the lake were within the range of data used to establish the model (Claflin and Weinzierl, 1978). Therefore, the model could be used to predict biological responses to physical changes made to the lake.

The second approach to developing predictive capability was pursued through the contract with Winona State and Saint Mary's College (Fremling, et al, 1979) to determine the effects of opening side channels on the Upper Mississippi River. The concept was that one could develop a reasonable predictive ability if pilot openings were constructed in several different types of areas and the effects were monitored. This approach was viewed as a necessary backup to the development of the math model just described. The math model seemed scientific but unrealistic to many, while the empirical approach seemed at least logical.

Figure 11. Lake Onalaska in Pool 7 (Map by Wisconsin DNR).



Densities of aquatic vegetation greater than 80 plants/m^2.

A problem developed with this second approach in our case, however, as none of the openings designated for modifications were opened. The three areas which were closely monitored in the first year of the contract were never modified, and the follow-up studies could not be conducted to establish the logical predictive model.

The alternative modifications which were, and are being, accomplished in association with the contract, however, are providing a greater amount of information. The final results will actually exceed the expectations of the original contract. Whereas the original concept called for developing an understanding of the effects of one type of modification tried in several different locations, we actually developed (or are developing) an understanding of three different types of backwater modifications. If we are successful in getting the side channel openings made at Kruger Slough, Island 42, and Old John's Ditch (Figure 9), the predictive ability that the work group originally sought through practical application will be accomplished and exceeded.

4. RESPONSIBILITY:

Find a way to determine and quantify the distribution and abundance of fish and wildlife habitat existing on the river (Problems list). Specifically (plan of action):

a. Devise a fish and wildlife habitat classification system.
b. Inventory the fish and wildlife habitat.
c. Inventory the fish and wildlife populations.

Accomplishments:
The work group believed that the most effective way to determine and quantify the fish and wildlife habitat was to use aerial photography and interpretation. The only major question was whether submergent vegetation beds in the river would be detected by aerial photography techniques.

Under an existing Fish and Wildlife Service contract the Remote Sensing Lab of the University of Minnesota (Meyers, et al, 1977) photographed the study area south of Hastings, Minnesota, with color infrared film and developed a vegetative map of the area from the aerial photographs. The photographs were taken during the late summer 1975. The interpretation and vegetative maps were completed in 1977. The contract also provided for similar work to be done on the river from Guttenberg, Iowa, to the Ohio River.

The resulting vegetative maps are quite detailed and have been very useful tools in our work. However, the photography was unable to consistently detect submerged aquatic vegetation. As a result, we have very good data for describing some of the river's wildlife habitat, but as yet, an uncertain data base for describing fish habitat or some waterfowl feeding areas.

The work group used the vegetative maps and the work group members' knowledge of habitat requirements to develop a system to classify and evaluate the habitat existing on the river. This system was first used by the work group as a tool for evaluating the habitat values of areas proposed as possible spoil disposal sites (this project is described in more detail in the next section of this chapter). The habitat classification system may become much more useful if the Computer Inventory and Analysis (CIA) program being developed through GREAT proves satisfactory. The CIA program (Environmental Systems Research Institute, 1979; described in more detail in next section of the chapter) should be able to assign a habitat classification to any given area on the river on the basis of the vegetative inventory and the FWMWG habitat criteria. The vegetative inventory will have to be updated periodically for the CIA's habitat classification assignments to be valid.

The work group did not attempt to solve the problem of poor submergent habitat data. Mr. Rory Vose of Saint Mary's College in Winona believes

that substantial information on submergent vegetation and habitat can be obtained by documenting relationships between submergent and emergent vegetation he and his staff observed while working on the Weaver Bottoms contracts. However, the work group did not pursue this possibility because it lacked funds.

The work group could not inventory the fish and wildlife populations. Though the work group originally assigned itself this responsibility, there were no reasonable means to accomplish such a comprehensive census. We concluded that establishing good habitat data would provide us with a majority of the information needed to evaluate and respond to the impacts of the 9-foot channel project.

5. RESPONSIBILITY:

Recommend short-term dredged material disposal measures to be used by the Corps to protect fish and wildlife (objectives).

Accomplishments:

The work group organized and participated in the On-Site Inspection Teams (OSIT) which were established in each pool to deal with channel maintenance dredging and dredged material disposal. The teams were to coordinate the efforts of agencies and individuals concerned about impacts of the channel maintenance activity, assure effective communication of those concerns, and expedite the evaluation and possible use of environmentally sound dredged material disposal methods.

The OSIT process has only occasionally been used effectively. However, it has great value and potential for ensuring environmentally sound disposal decisions. The work group is recommending the process be continued even after GREAT's pool plans take effect. See Appendix A_1 for post-GREAT I OSIT procedure details. OSIT reports of the 1976 and 1979 dredging seasons appear in Appendix "B" and "B_1", pages $374\text{-}405_{jj}$.

6. RESPONSIBILITY:

Recommend the use of projects and methods that will preserve, protect, and enhance the fish and wildlife resources (objectives).

Accomplishments:
Chapter V of this report lists all recommendations approved by the work group. These recommendations were proposed and endorsed to preserve, protect, and enhance the fish and wildlife resources. Disagreements did arise between fisheries biologists and wildlife biologists, and between federal biologists and state biologists on what methods should be used to preserve, protect, and enhance the fish and wildlife resources. However, the recommendations which did receive work group approval address the major actions that should be implemented.

7. RESPONSIBILITY: (all from plan of action):

- Inventory the water development project elements.
- Determine the effects of water development project elements on the fish and wildlife resources.
- Analyze the effects of water development projects on fish and wildlife resources in order to determine alternative means to alleviate adverse effects and encourage beneficial effects.
- Test and evaluate alternatives by employing predictive capabilities previously developed.

Accomplishments:

The responsibilities listed above were part of the FWMWG's original plan of action. This section of the plan of action was an unrealistically simple approach to identifying the effects of the 9-foot channel project and developing remedial and protective measures. The idea was to identify the spoil sites, wing dams, closing dams, etc., on the habitat maps; determine the difference in habitat between areas adjacent to and areas not adjacent to the project elements; describe the impacts of these elements on the habitat; and recommend ways to prevent future adverse impacts and enhance the areas already affected.

The work group realized that this approach would not be effective in addressing our major objectives quite early in the GREAT's program and went on to emphasize other approaches. However, the elements of the plan of action describing this original approach were never officially deleted.

The last element, regarding the use of predictive models to evaluate the effects of recommended physical modifications is still valid, and the work group believes that when such changes are recommended the models should be used. As was described earlier, the mathematical model (Claflin and Rada, 1979) and logical predictive capability (Fremling, et al, 1979) developed through the SCWG will be ready for use in spring 1979.

8. UNSTATED RESPONSIBILITY

Develop a specific "land use plan" for fish and wildlife management on the Upper Mississippi River and evaluate wilderness proposals for the Upper Mississippi Refuge.

Response:

The work group did not address a specific "land use plan". The original and primary objective of the work group dealt with how to protect fish and wildlife resources from the detrimental effects of the 9-foot channel

maintenance practices. The work group was to respond to the specific threat to the resource. It was not our charge to develop a specific fish and wildlife management plan. Further, it would have been of little value to develop a comprehensive land use plan, if we had not dealt effectively with mitigating the decline in habitat values on the river.

The question of designating parts of the refuge as wilderness was addressed by the work group to a limited extent. However, the GREAT, as a whole, decided in 1978 that the wilderness issue had such broad implications that it should be handled by the Team rather than by a single work group. Therefore, any implied responsibility that the work group had for evaluating the wilderness issue was assumed by the Team (the entire GREAT).

C. FWMWG PROJECTS

This section will describe in more detail those research projects and work group projects mentioned in the previous section. The projects are specifically titled and organized for reference purposes.

The majority of the FWMWG's investigations and field work was accomplished through study and research contracts. This was due to the complexity and size of most of the problems which the work group dealt with. Those investigations or projects which could be effectively accomplished by the work group were accomplished by the work group members. However, members of the work group generally had to add the work of GREAT to their already full work loads and therefore were limited in the amount of time and effort that they could spend on work group projects.

A description of the study and research contracts and the major work group projects that the FWMWG accomplished are listed below.

1. STUDY AND RESEARCH CONTRACTS

a. The Weaver Bottoms: A Field Model for the Rehabilitation of Backwater Areas of the Upper Mississippi River by Modification of Standard Channel Maintenance Practices. 307 pages.

Prepared by: *Winona State University and St. Mary's College;* Winona, Minnesota.

Primary investigators: Dr. Calvin Fremling (WSU), Dr. David McConville (SMC), Dr. Dennis Neilsen (WSU), and Mr. Rory Vose (SMC).

Contract let: June, 1975

Report completed: June, 1976

Contract cost: $50,000.00 GREAT Funds

Summary: *This investigation was made to determine why the fish and* wildlife habitat of the Weaver Bottoms (Figure 10) of pool 5 had declined so drastically since the 1940's. Biological, physical, and chemical characteristics of the entire Weaver Bottoms and adjacent inlets and tributaries were measured and documented during 1975; detailed comparisons were made between 1975 and historical aerial photographs of the entire area. Historical files from the Corps and local sources were also researched for relevant information.

The area has become much more riverine than marsh-like, because several major breaks in the natural levee have occurred and current velocities within the Weaver Bottoms are substantial, especially during floods. Waves caused by south winds in the summer also disturb the habitat because turbidity remains high reducing photosynthesis and germination. Current flows and sedimentation should be re-

duced by partially blocking some of the cuts in the levee while completely blocking others. A spit is recommended for the southern edge of the Weaver Bottoms to reduce the wind fetch and, thus, the wave intensity.

Evaluation: This report was well done and provided significant understanding of a major problem area. The work changed everyone's opinion as to the problem at Weaver Bottoms and its solution. The recommendations set the stage for a significant pilot program being pursued by GREAT.

b. Phase I Study of the Weaver-Belvidere Area, Upper Mississippi River. approx. 225 pages.

Prepared by: Winona State University, St. Mary's College, and Colorado State University.

Primary investigators: Dr. Dennis Nielsen (WSU), Rory Vose (SMC), Dr. Yung Hai Chen (CSU), Dr. Calvin Fremling (WSU), Dr. David McConville (SMC), Dr. Daryl Simons (CSU).

Contract let: July, 1977

Report completed: September, 1978

Contract cost: $61,206.35, GREAT Funds

Summary: This investigation was made to determine the probable hydraulic effects of implementing the recommendations from the original Weaver Bottoms report and to obtain a biological,

physical, and chemical data base on the Wisconsin side of the river comparable to that obtained in the Weaver Bottoms in 1975. Hydraulic effects estimates were made using actual physical data collected in the field and mathematical models and calculations developed at Colorado State University. Biological, physical, and chemical characteristics and history of the Wisconsin side of the river were obtained in similar manner to those methods used in the Weaver Bottoms.

The mathematical models and calculations predict that the remedial projects recommended for the Weaver Bottoms will reduce the current and sedimentation in the Weaver Bottoms while not significantly increasing flood stages or sedimentation on the Wisconsin side. The cut closing apparently should be pursued. The spit would not significantly reduce wave action, however. A series of wave-break islands should be evaluated rather than building a spit.

Evaluation: This report was well-written and provided nearly all the information the work group wanted. The work group believes the report provided the hydraulics data and calculations and Wisconsin base-line data needed to proceed with the rehabilitation pilot at the Weaver Bottoms. Flood stage increases are not expected to be greater than 0.3 to 0.6 foot (Appendix D_1).

c. The River Environment and A Summary of the River Environment. 569 and 78 pages, respectively.

Prepared by: Colorado State University

Primary investigators: Dr. Daryl Simons, Dr. Peter Lagasse, Dr. Stan Schumm, Dr. Yung Hai Chen

Contract let: July, 1974

Report completed: December, 1975 (Summary; June, 1976)

Contract cost: $95,000.00, U.S. Fish and Wildlife Service Funds

Summary: This report and its summary were intended to provide a basic understanding of the characteristics and dynamics of river systems and to illustrate the use of current knowledge and techniques on physical problems which occur in rivers. The report and summary were compiled by reviewing and digesting existing knowledge of river mechanics and maintenance techniques. Concepts and techniques were written for a layperson's level of engineering knowledge. No results are developed because the document was intended only for reference. The report provides a description of what data are needed for evaluating river systems and where that information may be obtained.

Evaluation: The report and summary together provide an excellent layperson's reference document. The writing generally is clear and nontechnical. The document could provide most anyone familiar with the river a sound understanding of what physical forces are at work in the system.

d. Regression Simulation Model of Navigation Pool No. 8. 497 pages.

Prepared by: University of Wisconsin - La Crosse

Primary investigators: Dr. Thomas Claflin, Dr. Sy Sohmer, Dr. Jay Grimes, Dr. John Held, Dr. Stan Schabert, Dr. Ron Rada

AD-A127 211 GREAT I STUDY OF THE UPPER MISSISSIPPI RIVER TECHNICAL APPENDIXES VOLUME 5 FISH AND WILDLIFE(U) GREAT RIVER ENVIRONMENTAL ACTION TEAM M J VANDERFORD SEP 80 2/4

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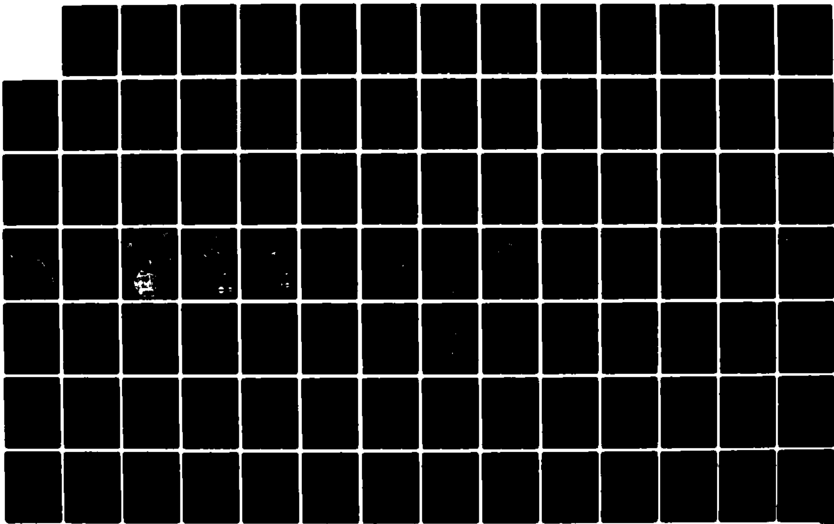
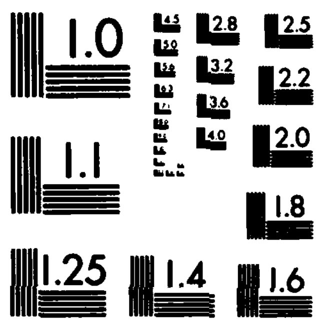




Contract let: May, 1975

Report completed: February, 1977

Contract cost: $118,949.00, GREAT Funds

Summary: This investigation was to provide a predictive model for the Upper Mississippi River which would enable field biologists to determine what biological effects would result from side channel modification projects. The method used to establish the model was to inventory 41 different areas of pool 8, noting the associated biological, physical, and chemical characteristics of each. Once the data base was obtained, a statistical analysis was used to establish correlations between physical/chemical characteristics and biological characteristics. These correlations formed the base of the model. The model can be used for predicting the response of benthic and rooted macrophyte communities to physical changes such as side channel modification. Using the responses of these two biological communities as indicators, many habitat values can be judged.

Evaluation: This work provided the basics for a valuable tool in backwater management. However, it was difficult for a majority of the field biologists to understand what was being discussed in the report. If the follow-up investigations of the model are presented in a clearer fashion, this work may be much more valuable. A working model that could be used by field biologists in their normal operations is the final product desired from this research and its follow-up tests.

e. A Field Test of the Regression Simulation Model in Fountain City Bay and A Study of the Effects of Diverting Water into Upper Fountain City Bay, Wisconsin. 131 pages.

Contracted to: University of Wisconsin - La Crosse

Primary investigators: Dr. Thomas Claflin and Dr. Ron Rada

Contract let: July, 1977

Report completed: October 1979

Contract cost: $28,692.00 GREAT Funds

Summary: This investigation provided additional data for refining the predictive model developed in pool 8 and to ground-truth (or test) the existing model to determine its accuracy. Physical, chemical, and biological data were collected from a backwater of pool 5A (Figure 7) before and after a 300-cubic foot per second culvert was placed in the dike which isolated the backwater from the main channel of the river. Postopening physical and chemical data were used to develop "predictions" (or simulation) of what the area's biological character should be after the culverts were opened. The actual postopening benthic and rooted macrophyte data were then compared with "predicted" characteristics. A discussion of the model's usefulness in future project planning is included.

Evaluation: The field test showed that the Regression Simulation Model is an accurate and usable tool for predicting benthic and macrophyte population and biomass response to physical/chemical changes in the river. The report also provides a description of the effects of the culverts on the upper portion of Fountain City Bay, pool 5A.

Regression Simulation Model Users Manual. 45 pages.

This product was completed under the "Field Test" contract. It provides clear direction on how to gain access to and use the Regression Simulation Model. It describes what information is required to use it, and what the products of the program will be.

f. Regression Model Workbook. 70 pages.

This report was prepared as part of the regression model test contract and was presented at the January, 1978, seminar called for in that contract.

Summary: This workbook was required to provide the GREAT with a simple explanation of how the model worked and could be used, as well as to have a presentation of the predictions generated from the "before" data collections. The basics of conversational computer operations were presented, along with some examples of the output one would get from the model being tested under this contract.

The predictions presented in this document were generated by first taking the physical and chemical data from the "before" conditions and calculating through the regression formulas to obtain a description of what aquatic plants and benthos should be there before the culvert construction. Then, using estimates of the physical changes that would be caused by the culverts, the regression formulas were used to describe what aquatic plant and benthos communities would develop. The accuracy of these predictions will be compared to actual data and the result presented in the model-test contract final report.

Evaluation: This workbook and the seminar were well-prepared and provided a resolve to some of the misunderstandings resulting from the original regression model final report.

g. Regression Model Application to Lake Onalaska. 58 pages.

Contracted to: University of Wisconsin - La Crosse
Primary investigators: Dr. Thomas Claflin, Dr. Ron Rada, Dr. Ed Weinzierl

Contract let: August, 1976

Report completed: May, 1978

Contract cost: $4,500, GREAT Funds

Summary: This investigation was intended to provide some basic data (and therefore understanding) on Lake Onalaska (Figure 11) and determine if the pool 8 regression model had a similar enough data base to be usable in Lake Onalaska. Physical, chemical, and biological data were collected throughout Lake Onalaska. Data from two specific areas were used to attempt trial runs of the model. The ranges of data values within Lake Onalaska appear to fall within the value limits of the model. The trial runs of the model were successful and the model apparently can be applied to situations in Lake Onalaska.

Evaluation: The report is not exhaustive in its investigation, but it is certainly adequate to fulfill its objective. The GREAT contract was a tangent investigation to a larger scope study being done by Dr. Claflin, et al, for the Lake Onalaska Rehabilitation District (the report to the district is included in the report to the GREAT). The information provided in the combined reports will be valuable in making future management decisions for Lake Onalaska.

h. The Feasibility and Environmental Effects of Opening Side Channels in Five Areas of the Upper Mississippi River (West Newton Chute, Fountain City Bay, Sam Gordy's Slough, Kruger Slough, and Island 42).

Contracted to: Winona State University and St. Mary's College of Winona

Primary investigators: Dr. Calvin Fremling (WSU), Dr. David McConville (SMC), Dr. Dennis Nielsen (WSU), Rory Vose (SMC)

Contract let: June, 1975

Contract revised: November, 1977

Report completed: June 1979

Contract cost: original - $159,000, Fish and Wildlife Service
revision - $36,959.68, GREAT Funds

Summary: This investigation was intended to provide an empirical base for predicting the biological effects of modifying side channels of the river. Several areas were surveyed thoroughly to provide base-line data before major alterations were made affecting water flow through the areas. Additional thorough biological, physical, and chemical surveys were to be made periodically after the water flows were changed in each area. However, the projects originally studied for this contract were not accomplished. Several other projects were subsequently studied.

Preliminary indications are that a side channel opening, a partial blocking dam, and a set of culverts have all proved very beneficial. Preliminary studies of three small side channel opening projects will provide a base for postproject monitoring.

Evaluation: Through the progress of this contract much valuable information has been developed and many concepts of river problems and solutions have been changed. The investigators have been exceptionally adaptable and constructive throughout the contract period despite numerous project collapses caused by the GREAT and many

contract administration problems caused by the GREAT's actions and the Fish and Wildlife Service's contracting procedures. Although the original openings to be monitored in the project were never opened, the alternative projects that were pursued have provided exceptionally valuable documentation of the effects of culverts, partial closing dams, and recreational openings.

i. Study to Evaluate Fish and Wildlife Resources of the Upper Mississippi River ("The Vegetative Inventory").

Contracted to: University of Minnesota, St. Paul, Minnesota

Primary investigators: Dr. Merle Meyers, Mr. John Minor, Mr. Lee Werth, Mr. Roy Hagen, Ms. Loyola M. Caron

Contract let: June, 1975

Products completed: November, 1977

Contract costs:	$51,775.00,	GREAT I area
	$81,460.00,	GREAT II area
	$ 5,380.00,	Water penetrating film experiment
	$138,615.00	Total Fish and Wildlife Service Funds

Summary: This work was intended to provide a comprehensive inventory of the submergent, emergent, and terrestrial vegetation of the river from the Twin Cities to the Ohio River. Remote sensing (aerial photography - color infrared film) was used during the peak of the growing season of 1975. The photography was interpreted with the aid of numerous ground-truthing field trips.

The remote sensing and interpretation techniques provided an

accurate depiction of the emergent and terrestrial vegetation in the river corridor, but were not able to provide an inventory of submergent species. The water penetrating film was not capable of penetrating the Mississippi River's turbidity.

Evaluation: The products provided to GREAT I were excellent and of sufficient detail for many of the work group's needs. The inventory is being used to produce a habitat inventory. The lack of submergent plant information limits the use of the inventory in depicting some fish and wildlife habitats.

The inventory will be more useful when copies of the products are provided to each of the States and each district office of the Upper Mississippi Refuge. Similar remote sensing inventories at 10-year intervals will probably be needed to keep pace with the river's dynamics and to detect trends. Because the cost of the inventory is relatively small, these periodic updates also appear reasonable.

j. Computerized Inventory and Analysis System (renamed: Upper Mississippi River Geographic Inventory System in 1978).

Prepared by: Environmental Systems Research Institute, Redlands, California; InterDesign, Inc., Minneapolis, Minnesota; L. Salmen and Associates

Primary investigators: Steve Mills (ESRI), Jack Dangermond (ERSI), Dr. Kent Smith (ESRI), Roger Martin (InterDesign), and Larry Salmen (Salmen and Associates)

Contract let: September, 1976

Products completed: (pilot) December, 1978

Contract costs: $63,000 (for pilot): $35,000, GREAT funds,
$27,900, Fish and Wildlife Service funds.

Summary: The Computerized Inventory and Analysis System (CIA) was designed to provide all GREAT members with an effective and functional resource management tool for use on the Upper Mississippi River. The phase prepared for the GREAT I was a pilot project which dealt with the Mississippi River from the Chippewa River delta to lock and dam 5 (26 miles). The pilot was used to determine if a computerized system could be developed for the river which could display areas for any of a number of different activities on the river and show where there were conflicts between activities. Forty-five activities ranging from dredged material disposal sites to prime fish spawning habitat were evaluated for suitability using 14 categories of physical and cultural data.

Evaluation: The pilot showed that such a system can work effectively on the river, although a relative lack of data on submergent characteristics has made designation of some fish and wildlife habitat less certain than other designations in the system. The pilot has proven that the system is sound enough to merit development of a system for the entire GREAT I area south of Lake Pepin (the Chippewa River delta).

The GREAT and the Fish and Wildlife Service contracted in October 1978 to accomplish the work for the entire study area. The products are due in January of 1980. The Fish and Wildlife Service is contributing $200,000 to the contract and the GREAT is contributing $43,000. The Service is funding a large portion of the CIA work because it has potential for use in developing a master plan for the Upper Mississippi River Wild Life and Fish Refuge.

Note on Contracts:

The cost figures cited do not include the cost of contract administration by the Corps or the Service, which was generally 10 percent of the contract cost. The evaluations are provided to indicate the value of the contracts' products to the objectives of the work group.

2. WORK GROUP PROJECTS

a. Fish and Wildlife Habitat Classification System and Dredged Material Site Assessment Procedure

Primary developers: Entire FWMWG

Project begun: June, 1977 (Classification System)

Project completed: July, 1978 (Assessment Procedure)

Project Description:
The FWMWG developed a habitat classification process primarily to fulfill a major work group objective. The habitat classification was used to evaluate disposal sites proposed for the GREAT I channel maintenance plan. The assessment procedure evaluated the impact that dredged material placement would have on fish and wildlife habitat. The work group based its evaluation process on the inventory of vegetation. The inventory interpretation scheme was used to compute the relative value of habitats essential for the survival activities of fish and wildlife. Spawning, rearing, and wintering were identified as essential activities for fish. Nesting, brooding, and feeding were identified for wildlife. As a result, physical and vegetation features (Table 1) were evaluated for their value to fish and wildlife species or species groups. These evaluations are shown in the work group's matrixes A and B (Figures 12 and 13).

TABLE 1. Vegetative Inventory Classification Scheme.
(from Meyer, et al, 1977)

Class	Symbol	Type Description
Open Water	MCh	Main Channel - the 9-foot channel and all open water between it and the river bank or the first island or the first bed of aquatic vegetation.
	SCh	Side Channel - all free flowing bodies of water separated from the main channel by an island and appear to be navigable by large pleasure boats.
	L	Lake (sometimes referred to as River-Lake) - a non-linear body of water greater than or equal to 10 acres in size and appearing to have little current.
	P	Pond - a small body of open water less than 10 acres in size and appearing to have little current. The borders may be defined by shoreline or aquatic vegetation.
	SS	Sidestream - usually shown as a symbol —··—··—, but where substantial acreage is present, it is given as SS in the acreage summary.
	River	River - where large rivers enter from the side, the acreage is shown under River in the acreage summary.
	Sl	Slough - all remaining water bodies whether flowing or stagnant and usually linear in nature.
	— — —	Narrow sloughs not wide enough to permit delineation on the overlay.
	—··—··—	Small sidestream
Sand and Mud	S	Bare or sparsely vegetated sand.
	Md	Bare or sparsely vegetated mud.

TABLE 1. Vegetative Inventory Classification Scheme---continued

Class	Symbol	Type Description
Aquatic and Marsh Vegetation	Pt	Pontederia (pickerelweed)
	Pg	Phragmites (reed grass)
	Py	Polygonum (smartweed)
	Cy	Cyperus
	SaL	Sagittaria latifolia (broadleaf arrowhead)
	SaR	Sagittaria rigida (bur arrowhead)
	Sc	Scirpus (bulrush)
	Sp	Sparganium (bur reed)
	T	Typha (cattail)
	Tm	Cattail marsh-mixture of Typha, Scirpus, Sparganium
	Z	Zizania (wild rice)
	N	Nelumbo (American lotus)
	Ny	Nymphaea (water lily)
	Po	Potamogeton (pondweed)
	C	Ceratophyllum (coontail)
	Lm	Lemnaceae (duckweeds)
	V	Vallisneria (wild celery)
	10	Nymphaea-Ceratophyllum-Potamogeton Lemnaceae
	11	Lemnaceae-Ceratophyllum
	12	Sagittaria latifolia - S. rigida
	13	Sagittaria latifolia - Phalaris
	14	Nymphaea-Ceratophyllum-Potamogeton
	15	Sagittaria latifolia - Salix
	17	Lemnaceae-Ceratophyllum-Potamogeton
	18	Nelumbo-Lemnaceae-Ceratophyllum
	19	Vallisneria-Potamogeton-Heteranthra
	22	Scirpus-Sagittaria latifolia
	23	Scirpus-Polygonum
	24	Scirpus-Phragmites
	27	Scirpus-Echinocystis-Xanthium-Polygonum

TABLE 1 . Vegetative Inventory Classification Scheme---continued

Class	Symbol	Type Description
Terrestrial Herbaceous Vegetation	G	Grass
	Le	Leersia (rice cutgrass)
	Am	Ambrosia (ragweed)
	M	Upland Meadow - includes a rich variety of brushy plants and grasses and occasional sedges and forbs. Generally, a fairly well-drained site most of the year.
	Sm	Sedge Meadow - less well-drained than upland meadow - includes several species of Carex (sedge) as the dominant vegetation. Also included are Polygonum and other forbs and grasses.
	Ph	Phalaris (reed canary grass)
	Sr	Spartinia (cord grass)
	Ec	Echinocystis (wild cucumber)
	21	Roadside and levee grass-brush-forb mixture often containing introduced plants.
	28	Leersia-Carex-Sagittaria latifolia-Polygonum (occasional scattering of Scirpus, Sparganium, Typha, Xanthium and other forbs and grasses).
	29	Type 28 covered by Echinocystis (cucumber) - may include a scattering of mixed lowland hardwoods or cottonwood-willow.
	30	Grazed meadow
Woody Vegetation	1a	Cottonwood and/or tree willow with an average height of less than 20 feet.
	1b	Cottonwood and/or tree willow with an average height of greater than 20 feet.
	2a	Mixed lowland hardwoods with an average height of less than 20 feet-principally elm, silver maple and river birch.
	2b	Mixed lowland hardwoods with an average height of greater than 20 feet.

TABLE 1. Vegetative Inventory Classification Scheme---continued

Class	Symbol	Type Description
Woody Vegetation	Px	Plantation - usually red pine or another of the conifers.
	B	Brush - Cornus (dogwood), Cephalanthus (buttonbrush), Rhus (sumac), Sambucus (elderberry), Prunus (chokecherry and plum), Toxicodendron (poison ivy). All of the above may occur as understory in the forest types - especially poison ivy.
	W	Salix (willow)
	25	Open stand of mixed lowland hardwoods and prominent understory of grass - most likely Phalaris.
Land Use	A	Agricultural - all areas under cultivation or recently cultivated.
	Dp	Park or other developed recreation area such as a boat landing or resort.
	D	Developed - all areas which are unvegetated or marginally vegetated due to man's activities.
	R	Residential - streets, houses, lawns, shrubs and trees.
	Ro	Rock rip-rap
Physical Features	——·——·——	Two-lane paved highway
	══·══·══	Four-lane paved highway
	├─┼─┼─┼─┼─┤	Railroad
	——·.——·.——	Levee
	——xx——xx——	Dam
	....	Wing dam
	x——x——x	Power line right-of-way

	[illegible], 27	FB	F		F	F	NF	NF		F	F	F		9	4
TERRESTRIAL HERBACEOUS VEGETATION	G, Sm, Sr, 28	NFB	F		F	F	NFB	NF	NFB	F	F	F	F	11	5
	Le	FB	F		F	F	NFB	NF	NFB	F	F	F	F	11	5
	M	NF	F		F	F	NFB	NF	NFB	F	F	F	F	11	5
	Ph	NFB	F			F	NFB	NF	NFB	F	F	F	F	10	5
	Ec	NF	F			F	NFB	NF	NFB	F	F	F	F	10	5
	29	FB	F			F	NFB	NF	NFB	F	F	F	F	10	5
	30	NF	F		F	F	NFB	NF	NFB	F	F	F	F	1'	5
	A	NF	F		F	F	NFB	NF	NFB	F	F	F	F	11	5
WOODY VEGETATION	1a, 2a					NF		NF	NFB	F	F	F	F	7	3
	1b, 2b	N				NF		NF	NFB	NF	F	F	F	8	4
	Px							NF	NFB	NF		F	F	5	2
	B, W	N				NF	F	NF	NFB	F	F	F	F	9	4
	25	NF				NF	NF	NF	NFB	NF	F	F	F	9	4
SAND & MUD	S					F	NF	F		F				4	2
	M					F	F	F		F		F		5	2
PHYS FEAT	Rip rap		F		F	F	F	NF		F	F			7	3

WILDLIFE ACTIVITIES KEY:

N = nesting
F = feeding
B = brooding

KEY TO RIVER FEATURES:

In vegetative inventory classification scheme (Table 1, immediately following next figure)

Figure 12. FWWG Matrix A: Wildlife Habitat Values of Physical Features and Vegetation Beds of the Upper Mississippi River. Evaluations by the GREAT-I Fish and Wildlife Work Group. Values Range From a Low of 1 to a High of 5.

	WILDLIFE SPECIES → / RIVER FEATURE ↓	Dabbling Ducks	Diver Ducks and Coots	Swan	Geese	Wading Birds	Shore Birds	Song Birds	Upland Game Birds	Birds of Prey	Aquatic Mammal	Terrestrial Mammals	Deer	Number of Species Using Habitat	Habitat Value
OPEN WATER	MCh		F			F	F	NF		F	F			6	3
	SCh, Sl	B	F		F	F	F	NF		F	F			8	4
	L, P	B	F	F	F	F	F	NF		F	F			9	4
AQUATIC & MARSH VEGETATION	Pt	FB	F		F	F	F	F		F	F	F		9	4
	Pg	FB	F		F	NF	NF	NF	F	F	F	F		10	5
	Py	FB	F		F	F	F	NF	F	F	F	F		10	5
	Cy	FB	F		F	F	F	NF	F	F	F	F		10	5
	SaL, SaR	FB	F	F	F	F	F	F		F	F	F		10	5
	Sc	FB	F		F	F	NF	NF	F	F	F	F		10	5
	Sp	FB	F		F	F	NF	NF	F	F	F	F		10	5
	T	FB	F		F	NF	NF	NF	F	F	F			9	4
	Z	FB	F		F	F	F	F		F	F	F		9	4
	N	FB	F		F	F	F	F		F	F			8	4
	Ny, Po, C, Lm, 10, 11, 14, 17, 20, 21	FB	F		F	F	F	F		F	F	F		9	4
	V, 18, 19	FB	F		F	F	F	F		F	F			8	4
	12, 16	FB	F	F	F	F	F	F		F	F	F		10	5
	13, 15	FB	F	F	F	F	F	NF		F	F	F		10	5
	22	FB	F	F	F	F	NF	NF		F	F	F		10	5
	23, 24, 27	FB	F		F	F	NF	NF		F	F	F		9	4
	G, Sm, Sr, 28	NFB	F		F	F	NFB	NF	NFB	F	F	F	F	11	5

	FISH SPECIES → / RIVER FEATURE ↓	Walleye	Sauger	North. Pike	Lg. Mouth Bass	Sm. Mouth Bass	White Bass	Rock Bass	Crappie	Bluegill	Yellow Perch	Catfish	Bullhead	Fresh Water Drum
OPEN WATER	MCh	SRW	SRW	W	RW	SRW	SRW	SRW	W	W	SRW	SRW		SRW
	SCh, SS, Sl	SRW	SRW	RW	SRW	SRW	RW	SRW	SRW	SRW	SRW	SRW	SRW	SRW
	L, P	W	RW	RW	SRW	SRW	W	SRW	SRW	SRW	SRW	SRW	SRW	
	MCh Border	SRW	SRW	RW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW		SRW
AQUA. & MARSH VEG.	Pt, Pg, Py, Cy, SaL, SaR, Sc, Sp, T, Z, N, Ny, Po, C, Lm, V, 10-24, 27	SRW	RW	SRW	SRW	SRW	RW	SR	SRW	SRW	SRW	SRW	SRW	
TERR. HERB. VEG.	G, Le, M, Ph, Sr, Ec, Sm, 28, 29	SR	R	SR		R	R	R			SR	SR	SR	
WOODY VEG.	1a, 1b, 2a 2b, 25	SR		SR		R		R			SR	SR		
	W, T	SR	SR	SR		R		R			SR	SR		
SAND & MUD	S													
	M													
PHYSICAL FEATURES	Closing Dams	SRW	RW	W		RW	SRW	RW			RW	SRW	SRW	SRW
	Lock & dam (Tail water)	SRW	SRW	W	W	RW	SW	RW	W	W	SRW	SRW	W	SRW
	Rip rap	SRW	SRW	R	W	SRW	SRW	SRW	RW	R	SRW	SRW		SRW

Fish Activities Key:
S = spawning
R = rearing
W = wintering

Key To River Features:
In vegetative inventory classification scheme (Table , immediately following next figure)

Figure 13. FWWG Matrix and Vegetati Evaluations Values Rang

Catfish	Bullhead	Fresh Water Drum	Sturgeon	Paddle Fish	Bowfin	Carp	Sucker Redhorse	Lg. Mouth Buffalo	Sm. Mouth Buffalo	Golden Mooneye	Gizzard Shad	Gar	Amer. Eel	Number of Species Using Habitat	Habitat Value
SRW		SRW	SRW	SRW	RW	W	SRW	W	SRW	SRW	SR	RW	W	23	5
SRW	SRW	SRW	SRW	RW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	W	24	5
SRW	SRW			R	SRW	SRW	SRW	SRW		SRW	SRW	SRW		20	5
SRW		SRW	SRW	RW	SRW	SRW	SRW	SRW	SRW	RW	SRW	RW	W	23	5
SRW	SRW		RW		SRW	SRW	RW	SRW		R	SRW	RW		20	5
SR	SR				SR	SR	SR	SR		R	SR	R		16	4
SR					R	SR	SR	SR		R	SR	R		13	4
SR					R	SR	SR	SR	SR	R	SR	R		15	4
									S					1	1
						SR		SR						2	1
SRW	SRW	SRW	R	RW		W	RW	W	RW	RW	SR	R	W	20	5
SRW	W	SRW	R	RW			RW	W	W	RW	SR	R	W	22	5
SRW		SRW	S	SW		W	RW	W	SRW	RW	R	RW	W	22	5

re13. FWWG Matrix B: Fish Habitat Values of Physical Features and Vegetation Beds of the Upper Mississippi River. Evaluations by the GREAT-I Fish and Wildlife Work Group. Values Range From a Low of 1 to a High of 5.

For example, in matrix B each habitat type (physical and vegetation features) was evaluated to determine if any essential fish activity took place in the habitat. The larger the number of species using that habitat for spawning, rearing, or wintering, the higher the value that particular habitat type had for fish. This habitat value is noted in the habitat evaluation column of the matrix. The end product of each matrix is a numerical habitat evaluation denoting the value each habitat type had for fish. For simplicity, the numerical habitat evaluations were then reassigned relative numerical values on a scale of 1 to 5 (5 representing the highest value) as noted on the respective matrixes.

Each disposal site was then assessed objectively for value to fish and wildlife. For instance, if a proposed site contained primarily woody vegetation which was inundated only during spring high water, the fisheries value would depend on the number of species which would use this area for spawning and rearing activities. Wintering activities would not occur at this site. However, the value would not be lessened if at least one or more of the essential activities takes place at this type of site.

Based on the number of species (or species groups) which use the habitat of the proposed site for one or more of the identified essential activities, a fishery habitat value can be determined for this site. The same is true for wildlife; the number of species (or species groups) which use the site for one or more of their essential activities (nesting, brooding, feeding) can be used to determine the habitat value this site has for wildlife.

A value of 5 for fisheries and 4 for wildlife would indicate this site has a relatively high objective habitat value.

In addition, a subjective determination of fish and wildlife value (also 1 to 5 scale, 5 representing highest value) was made for each site based on the following general criteria:

1. Habitat diversity associated with a site.
2. Important and/or unique biological features.
3. Human intrusion at the site or adjacent area.

This evaluation, basically the assessor's professional assessment of the area, allowed consideration for unique, site specific variables which affect that site's value to fish and wildlife and which would not be taken into account in the objective evaluation. The assessors were fisheries and wildlife biologists and managers from representative agencies who were familiar with all areas along the river.

By combining the objective and subjective evaluations, a relative habitat value for fish and wildlife was determined for each proposed disposal site using the numerical scale of 1 to 5 for both objective and subjective assessments, a combined value of 10 for fish would indicate that this site is of highest value for fisheries. The same site may have a combined value of 6 for wildlife (3 objective and 3 subjective) denoting the same site has a moderate value for wildlife. A site having a combined fish and wildlife value of 16, as in the above example, indicates this particular site is of relatively high habitat value to fish and wildlife and probably is not acceptable to the work group as a disposal site.

In addition to habitat assessment, it was necessary to consider other site specific characteristics which would make a site more or less acceptable from a fish and wildlife standpoint. Other variables which were considered for each site included the following:

1. Type and acreage of wetlands.
2. Potential use of area by endangered species.
3. Enhancement potential (could fish and wildlife benefit from disposal - i.e.,island creation, side channel closure, etc.)
4. Potential impact from side channel closure.
5. Could protection (revegetation, berming, diking) make site suitable?

By combining the habitat assessment (objective and subobjective) with the above listed site specific variables, the FWMWG evaluated proposed disposal sites and indicated whether the sites were acceptable in terms of impact on fish and wildlife habitat.

All evaluations were performed individually on a pool-by-pool basis considering various dredged material placement alternatives. These placement alternatives as identified by the Plan Formulation Work Group in the Channel Maintenance Appendix included:

1. Selective placement (site specific disposal).
2. Centralized disposal (one site per pool).
3. Beneficial uses.
4. Environmental enhancement.
5. Removal from the floodplain.
6. Interim placement.
7. Regional placement (several sites per pool).
8. Most probable future without GREAT.

If a particular site could satisfy more than one disposal alternative's criteria, a separate evaluation was made for each alternative. Sites were further classified in terms of 100-percent containment (minimum 7-day retention of dredged slurry) and noncontainment (for hydraulic dredging).

When dredging is accomplished mechanically, containment is not generally necessary because no slurry exists. However, because hydraulic dredging is likely and dredged material must be contained as a result of possible contamination, all proposed disposal sites were evaluated recognizing that dredging may be accomplished hydraulically.

When appropriate, usually after rejecting a proposed placement site, the work group recommended changes or conditions on the development of location of a site to make it acceptable from a fish and wildlife standpoint. In several instances the work group suggested alternative disposal site locations not previously considered.

b. Shoreline Protection Inventory*and Technical Report Documenting Suitability of Rock Riprap for Enhancing Fish and Wildlife Habitat

Primary developers: Tom Lovejoy (WDNR), John Wolflin, (FWS), Jim Holzer (WDNR), Bruce Hawkinson (MDNR), Gary Grunwald (MDNR), Ron Nicklaus (WDNR), John Lindell (FWS), Scot Ironside (WDNR)

Project begun: Fall, 1977

Project complete: Summer, 1979

Project Description:
This study was conducted by the FWWG at the request of the St. Paul District Corps of Engineers for carrying out their bank protection program. The purpose is to establish priority for those shoreline areas that are most severely eroding and therefore increasing the sediment load in the Mississippi River. Impacts resulting from shoreline erosion are increased dredging requirements, side channel closing effects, backwater siltation

* See Appendix "Y".

and lack of riparian habitat as well as water quality related detriments. From the recommendations made by this study the Corps can reduce these impacts by protecting the bank at those high priority sites.

In conjunction with the inventory, a technical report was to be prepared by Thomas Lovejoy (Wisconsin Department of Natural Resources) to document the suitability of rock substrate (riprap) as a method for protecting shorelines while considering the enhancement of fish and wildlife habitat. A literature search and review was begun to provide that documentation. However, the project was not completed.

The inventory phase of this study is completed and priority has been established for specific sites in need of shoreline protection (Appendix "Y", Pages 659-668). The Sediment and Erosion and the Dredging Requirements Work Groups were cooperatively involved in this process. The list of sites recommended for bank protection measures were provided to the Corps of Engineers for future action.

c. The On-Site Inspection Team Procedure

Primary developer: Michael Vanderford (Fish and Wildlife Service)

Project begun: Spring, 1976

Project completed: Still operating, procedure revised in 1977, 1978, and 1979

Project Description:

The On-Site Inspection Team (OSIT) procedures were developed to deal more effectively with the site specific dredged material disposal problems in the St. Paul District on the Upper Mississippi River. The intent was to coordinate and facilitate the input of river biologists into the Corps dredged material disposal decisions, document the value of habitat being affected by the Corps decisions, and document the end results of each dredging project's disposal method. The coordination was needed to increase the effectiveness of the biologists' input to the Corps. The documentation was needed to more quantitatively describe the effects of maintenance dredging on the fish and wildlife resource on the river.

The interim guidelines, procedures, and evaluation forms used by the 1979 OSIT's are included in Appendix "A". Guidelines approved by the GREAT I for the period following GREAT appear in Appendix A_1, pages 373_a-373_1. The evaluations of the 1976 and 1979 dredging seasons in the St. Paul District, which were based on the OSIT documentation process, are located in Appendix "B" and "B_1", pages 374-405_{jj}. The 1976 evaluation was reviewed and approved by the GREAT I. The 1979 evaluation was not reviewed by GREAT I because of time limits and priority in reviewing the final GREAT I report. The 1979 report is, therefore, the product of the OSIT coordinator and membership.

d. Experimental Island Creation for Habitat Enhancement. 11 pages. (See Appendix "V", pages 606-618)

Primary participants: Pam Thiel, Wisconsin DNR; David Kennedy, Wisconsin DNR, Bruce Hawkinson, Minnesota DNR; Jim Holzer, Wisconsin DNR; Nick Gulden, Minnesota DNR; Ron Nicklaus, Wisconsin DNR, Tom Lovejoy, Wisconsin DNR

Project begun: January, 1979

Project completed: April, 1979

Project description:
This report was the product of a literature review conducted to provide justification for constructing islands to enhance fish and wildlife habitat. In particular the report was to provide documented justification for a recommendation by the work group for island creation within the Weaver Bottoms, pool 5.

Advantages and disadvantages for both fish and wildlife were discussed and criteria recommended for materials used for construction and engineering design. Results of this report showed that island creation would enhance this area by creating stable shoreline habitat. However, it was recommended that thorough hydraulic study or physical modeling be conducted before construction of islands at Weaver Bottoms or any other riverine area. The report also cautioned that island construction for enhancement purposes should not be interpreted by the Corps of Engineers as blanket endorsement to indiscriminately construct islands out of dredged material as a channel maintenance alternative.

D. CONCLUSIONS (Following are conclusions which can be directly justified by the work of the Fish and Wildlife Work Group)

FWMWG CONCLUSION 1:
The Fish and Wildlife Management Work Group successfully fulfilled nearly all of its responsibilities within the GREAT.

Justification:

The FWMWG:

a. Determined what methods could be used to protect and enhance the river's fish and wildlife resource.

b. Identified several crucial areas and accomplished an in-depth investigation of one of these.

c. Developed two means for predicting the biological response to physical changes in the backwaters.

d. Accomplished a partial habitat inventory of the river from Hastings to Guttenberg using vegetation and physical characteristics.

e. Recommended and facilitated the use of short-term dredged material disposal measures which would protect fish and wildlife.

f. Developed a set of recommendations for projects, methods, and changes that will preserve, protect, and enhance the fish and wildlife resources.

The FWMWG failed to:

a. Construct an overly simple approach to documenting the effects of the 9-foot channel project on the resources.

b. Develop a specific land use plan for management purposes (an unstated objective).

c. Complete an evaluation of wilderness proposals for the Upper Mississippi River Wild Life and Fish Refuge (an unstated objective).

FWMWG CONCLUSION 2:

Partial closing dams, which are specifically designed to enhance fish and

wildlife, can be used successfully to reduce sediment influx to the backwater, while maintaining adequate water flow resulting in good habitat maintenance.

Justification:

The pilot project at Devils Cut, documented in the final report for the contract titled The Feasibility and Environmental Effects of Opening Side Channels in Five Areas of the Upper Mississippi River by Fremling, McConville, Nielsen, and Vose. Due May 1979.

FWMWG CONCLUSION 3

Well designed, gated culverts constructed through the dikes of the locks and dams can greatly enhance the fish and wildlife habitat quality and diversity of the backwater areas for several miles downstream of a dike.

Justification:

The pilot project at lock and dam 5 documented in Field Test of the Regression Simulation Model by Claflin and Rada due in August 1979; and Fremling, et al, 1979.

FWMWG CONCLUSION 4

Small, side channel openings can be very beneficial to backwater habitat diversity and quality if they are well designed to avoid additional sediment transport into the backwater.

Justification:

Chapter IV of this report, describing the Mule Bend side channel opening, and Fremling, et al, 1979.

FWMWG CONCLUSION 5

Rehabilitation of major backwater areas is possible if the problems are well investigated and recommended remedial measures are well designed.

Justification:

The Weaver Bottoms: A Field Model for the Rehabilitation of Backwater Areas of the Upper Mississippi River by Modification of Standard Channel Maintenance Practices by Fremling, McConville, Nielsen, and Vose (1976); and Phase I Study of the Weaver - Belvidere Area of the Upper Mississippi River by Nielsen, Vose, Fremling, and McConville (1978).

FWMWG CONCLUSION 6

State and/or federal regulations may preclude the implementation of any major backwater rehabilitation on the Upper Mississippi River.

Justification:

The FWMWG has encountered serious problems in obtaining Wisconsin DNR support for the Weaver Bottoms rehabilitation project due to floodplain regulations (Appendix R). It is not clear, presently, whether these problems, or other similar undetected problems, can be solved to allow for the project. If this project fails to gain approval, it is unlikely that similar large-scale rehabilitation projects at other areas will be pursued.

FWMWG CONCLUSION 7

The regression simulation model (Claflin, et al, 1977) is a usable and reasonably accurate predictive model, capable of predicting the benthos and rooted aquatic macrophyte response to physical changes proposed for backwaters in the GREAT I study area. The model should be used in backwater project planning.

Justification:

Field Test of the Regression Simulation Model at Fountain City Bay by Claflin and Rada. Due in August 1979.

FWMWG CONCLUSION 8

The concept of "logical predictive capability" is generally sound when applied to the fish and wildlife resources of the Mississippi backwaters.

Justification:

The work group's experience with the several pilot projects and the "effects of opening side channels" contract (Fremling, et al, 1979) have proven out the general accuracy of the river biologists' estimates of what biological effects will result from physical changes made in confined areas of the Mississippi River backwaters. Although this conclusion is very general, documenting the accuracy of the logical predictive capability was a goal of the work group. The "logical predictive capability" of the present State, Federal, and university river biologists regarding biological characteristics in the backwaters has proven reasonably accurate.

FWMWG CONCLUSION 9

The vegetative inventory (Meyer, et al, 1977) is a valid and usable base for establishing a fish and wildlife habitat inventory of the Upper Mississippi River, with the exception of some aspects of fish and wildlife habitat requirements.

Justification:

Section C-2 of the chapter, describing the "Fish and Wildlife Habitat Classification System".

FWMWG CONCLUSION 10

An inventory of submergent vegetation is needed to define fish and wildlife habitat on the river.

Justification:

Same as for number 9 above. Such an inventory may be possible using the existing vegetative inventory and establishing correlations between submergent and emergent vegetation (Rory Vose, Saint Mary's College, Winona).

FWMWG CONCLUSION 11

The vegetative inventory needs to be redone periodically, possible every 10 years, to continue as a valid base for a habitat inventory of the river.

Justification:

The river is a dynamic system (Simons, et al, 1975). The vegetative inventory is obviously static and will become outdated if not periodically updated.

FWMWG CONCLUSION 12

The On-Site Inspection Team process has increased cooperation between the Corps of Engineers and the natural resources agencies, resulting in more environmentally sound dredged material placement; the process should be continued.

Justification:

Having adequate advance information has made it possible for the river biologists and engineers to work out problems, document situations, and come to on-site inspection meetings better prepared to constructively deal with dredged material disposal. The improved preparation makes disposal problems easier to solve with mutual satisfaction (Appendix B).

FWMWG CONCLUSION 13

Increased use of land treatment programs in the upland agricultural areas could substantially reduce fine sediment deposition in the backwater downstream of Lake Pepin.

Justification:

The work and conclusions of the Sediment and Erosion Work Group.

FWMWG CONCLUSION 14

There is a need for establishing what fish and/or wildlife species specific areas of the river are to be managed for.

Justification:

The FWMWG had difficulties making specific recommendations for backwater projects or rehabilitation because of the broad range of interpretations as to what areas were to be managed for.

This type of obstacle to clear decision-making will continue until land and water management objectives are established and defended for all major backwater areas on the river.

Chapter IV

THE SIDE CHANNEL (OPENINGS) WORK GROUP (SCWG)

A. OBJECTIVES OF THE SCWG

The Side Channel Openings Work Group was assigned a specific function when the GREAT was formed: document the effects of side channel openings and recommend openings. In 1974 the issue of plugged side channels and the prospect of rejuvenating backwater habitat by opening side channels became very important. The Corps of Engineers had responded to Department of the Interior requests for such openings with a conditional yes (see Appendix C). State and federal biologists began intensively exploring and documenting possible sites to have openings made (Appendix F). The public was interested. Generally, side channel openings became a very tangible sign of progress toward possible habitat improvement and interagency cooperation on the Upper Mississippi River.

When the concept of interagency cooperation materialized into the "Saint Paul Study Team" in October 1974, it was considered essential to maintain the program of side channel openings as a prominent feature of the team. When the Saint Paul Study Team evolved into the Great River Environmental Action Team, the importance of side channel openings dictated a distinct group be established to develop the program.

1. SCWG STATED OBJECTIVES

The objectives of the SCWG were officially issued on March 17, 1975. The objectives were developed by the original work group members. On March 17, the SCWG membership was composed of the following representatives:

- Joseph Scott, Jr. - Fish and Wildlife Service (Chairman)
- Robert Whiting - Corps of Engineers
- Don Buckhout - Minnesota Department of Natural Resources
- Jerry Schnepf - Iowa Conservation Commission
- Larry Larson - Wisconsin Department of Natural Resources
- Willis Fernholz - Wisconsin Department of Natural Resources
- Dr. William Green - Fish and Wildlife Service

The objectives of the work group were:

a. ". . . to determine the effects of opening side channels to the backwaters of the Upper Mississippi River. Effects of concern include those on fish and wildlife resources and recreational accesses to the backwaters."

b. ". . . to implement specific openings and structural changes should such projects prove beneficial to fish and wildlife resources and their compatible uses."

2. PROBLEMS IDENTIFIED

The SCWG identified two basic problems in 1975 which we felt should be addressed. The problems were that:

a. Backwater sloughs and channels are becoming blocked by sediments and dredged material resulting in habitat loss.

b. No one is certain what effects will result from altering flows into backwaters.

Problem "a" brought up the additional responsibility for the SCWG of working to alleviate the adverse impacts of fine sediment deposition and dredged material disposal on the backwater sloughs and channels.

3. PLAN OF ACTION

The SCWG's plan of action, issued on March 17, 1975, was as follows:

Determination of Effects

The effects of side channel openings and structural changes on the backwater areas will be determined by studying several experimental sites specifically chosen for openings. Two distinct opening types

will be studied--those openings made to alter the biological character of a backwater area and those made to improve access to the backwaters. Funding for making these experimental openings will be provided by the GREAT through the Corps of Engineers.

The work group will determine the effects of side-channel openings on the biological character of the backwaters by contracting studies with colleges and States along the river within the St. Paul District. The general methods desired in these contracted studies are outlined in the Objectives and Step-Down Plan for Side Channel Openings Research (Figure 14). The scope and specifics of the research work desired are delineated in the Request for Proposal for Stream Alteration Research (Appendix D). Funding for the contracted research will be provided by the GREAT through the U.S. Fish and Wildlife Service and Corps of Engineers.

Those experimental sites in which a side channel opening is made to improve recreational access to a backwater area will not be studied as extensively. Work at these sites will be limited to depth monitoring, recreational use surveys, some quantitative limnological monitoring, and qualitative assessment of biological change. Work will be done by the work group members. No special funding will be provided for this work.

Recommendations and Implementation

At the conclusion of the investigations and research studies, the work group will recommend and pursue implementation of those side-channel openings within the St. Paul District which could be beneficial to fish and wildlife or recreation access.

These recommendations will be based upon the criteria outlined in "Figure 15" and the results of the above studies. Recommendations will be specific, designating which sites should be opened and what dimensions they should have. A tentative list of sites to be considered is included in Attachment 4 (Appendix E).

Objective and Step-Down Plan for Side Channel Openings Research

Develop an ability to predict the consequences to fish and wildlife resources of providing freshwater flows to backwater areas by means of side channel openings from the main channel of the Mississippi River.

Determine what changes in fish and wildlife resources result when freshwater flows are restored to a wide range of backwater types by side channel openings.

Compare and correlate backwater condition and fish and wildlife use data obtained before and after side channel projects are completed at the experimental sites.

Determine what conditions exist and what fish and wildlife use exists in each of the experimental and control backwater areas prior to a side channel cut.

Determine what conditions exist and what fish and wildlife use exists in each of the experimental and control backwater areas after a side channel cut.

Select experimental backwater sites (or site) which represent a wide range of conditions existing in the backwaters of the river, which feasibly could have side channel cuts made to them.

Select a set of physical, chemical, and biological parameters which describe and affect the fish and wildlife resources of backwater areas.

Figure 14. Step-down plan designed by the SCWG in 1975 to address the major objective of developing a means to predict the consequences of opening side channels.

SIDE CHANNEL OPENINGS:
PROJECT CRITERIA
March 1975
Page 1
Attachment 3

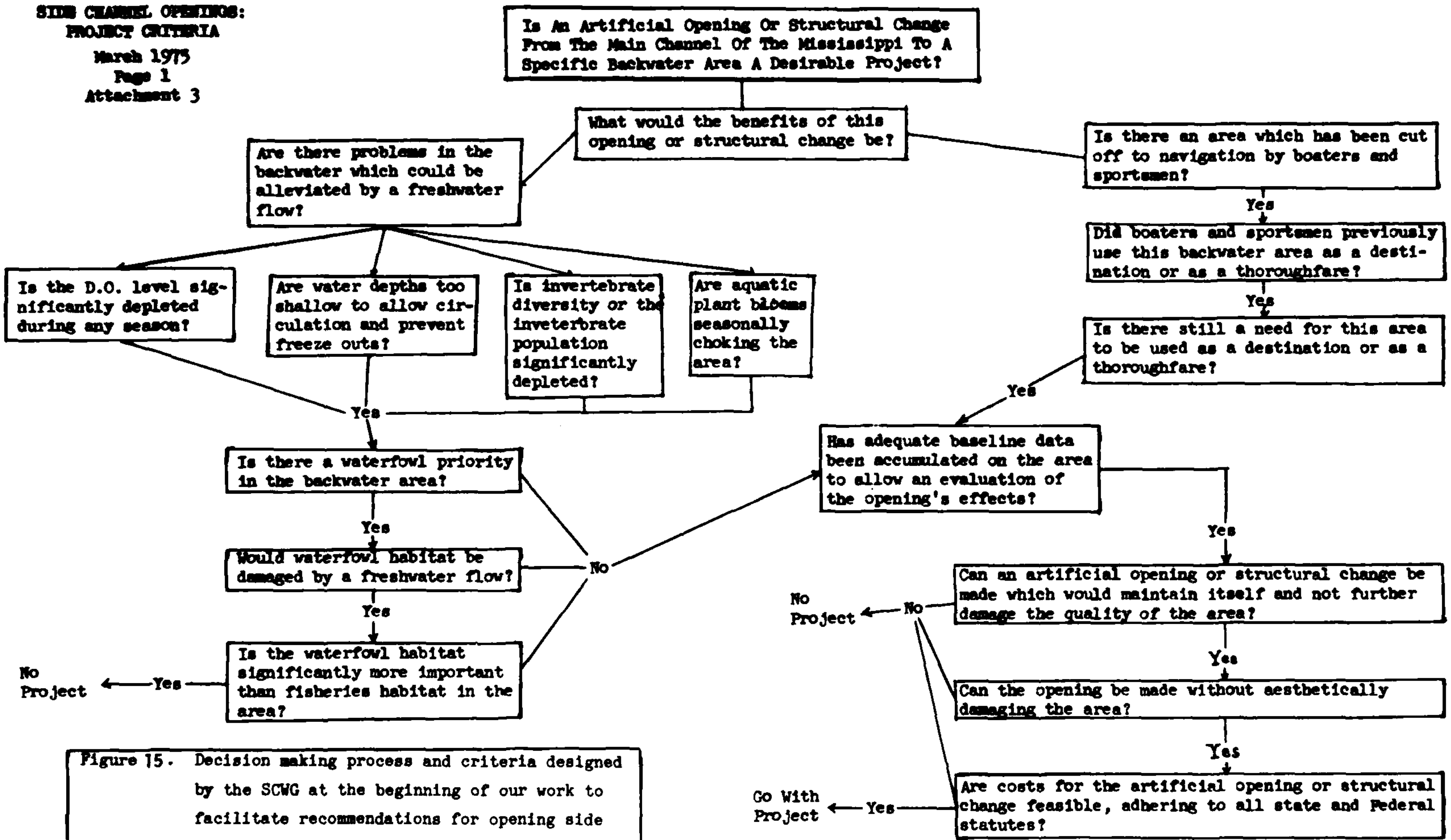


Figure 15. Decision making process and criteria designed by the SCWG at the beginning of our work to facilitate recommendations for opening side channels.

The plan of action thus described in great detail what the SCWG was responsible for.

4. UNSTATED EXPECTATIONS

The SCWG was actually charged with those responsibilities listed above in the statement of the objectives, problems, and the plan of action. However, there were additional expectations of the work group which were never actually stated as objectives.

The first expectation was that the SCWG would be able to have numerous side channels and backwaters opened at the request of local citizens, particularly for recreational benefit. This expectation resulted from the impressions citizens received of GREAT at the first set of town meetings in winter 1975. Because the SCWG was intended to be the most tangible part of the GREAT to the public, statements were frequently made which promised more of the SCWG's ability to have side channels opened than we actually had. Whereas the work group's objectives stated we would pursue having side channel openings accomplished when we determined if they were beneficial to fish and wildlife, the public was given the impression that we were a dredging crew ready to take on requests immediately.

The second expectation was that the SCWG would determine the effects of a broad range of side channel modifications, not just side channel openings. The work we began quickly led us to this expectation, as we realized that openings would not be a cure-all and that several different types of projects might be needed to alleviate the problems of backwater sloughs. These alternative modifications included culverts, partial blocking dams, and complete blockages.

The third unstated expectation was that we would conduct a comprehensive side channel inventory. This inventory was verbally requested by the GREAT in 1976 and generally accepted by the work group as a worthwhile

project. We believed the inventory would contribute to our understanding of the dynamics of side channels.

B. ACCOMPLISHMENTS

1. RESPONSIBILITY:

Determine the effects of side channel modification on fish and wildlife resources and on recreation access (objectives, problems identified, plan of action, and unstated expectations).

Accomplishment:
The SCWG's responsibility to determine the effects of side channel modifications is very similar to the FWMWG's responsiblity to develop ways to predict what biological responses would result in specific areas when physical changes were made in the backwaters (Chapter III, section B-2). However, while the FWMWG dealt only with problems of the fish and wildlife resources, the SCWG was to also deal with recreational access problems.

The production of the river mechanics reference document, The River Environment and the Summary of the River Environment (Simons et al, 1975 and 1976), is generally attributed to the SCWG and cited as our first accomplishment. Work on side channel openings and the setting of the contract by the Fish and Wildlife Service with Colorado State University for this document started at the same time. Further, the biologist originally working on the side channel projects in 1974 asked for such a reference.

The River Environment did provide a very sound and generally understandable reference to the physical mechanics of the river. Though the pure size of the document has intimidated some potential readers and benefactors, the document was very helpful in establishing a

common understanding of what forces we were dealing with on the Mississippi River. Additional specifics on the document appear in the previous chapter in the "FWMWG Projects" section.

The most serious attempts at specifically addressing the SCWG's responsibility to determine the effects of side channel modifications were made through research contracts with the joint team of Winona State University and St. Mary's College of Winona and with the River Studies Center of the University of Wisconsin - La Crosse. The numerous contracts pursued by the SCWG are described in some detail in the previous chapter. It should be reemphasized that these contracts provided the GREAT with an abundance of valuable information on backwater dynamics and substantially addressed the responsibility of the SCWG.

The contracts that the SCWG let in cooperation with the FWMWG were:

a. <u>The Feasibility and Environmental Effects of Opening Side Channels in Five Areas of the Upper Mississippi River</u>. 1979. Fremling, C., D. McConville, D. Nielsen, R. Vose, and R. Faber.

<u>Addressed</u>: Specific effects of side channel openings, culverts, and partial blocking dams. Also provided an abundance of basic data and understanding of backwater problems and rehabilitation.

b. <u>Regression Simulation Model of Navigation Pool No. 8</u>. 1977. Claflin, T., S. Solmer, J. Grimes, J. Held, S. Schabert, and R. Rada. <u>Field Test of the Regression Simulation Model in Fountain City Bay and A Study of the Effects of Diverting Water into Upper Fountain City Bay, Wisconsin</u>. 1979. Claflin, T., and R. Rada. <u>Regression Model Application to Lake Onalaska</u>. 1978. Claflin, T., R. Rada, and E. Weinzierl.

Addressed: Specific development of ability to predict biological response to physical changes made on the river. Also provided monitoring data on the effects of culverts and basic data on the character of Lake Onalaska and pool 8.

c. The Weaver Bottoms: A Field Model for the Rehabilitation of Backwater Areas of the Upper Mississippi River by Modification of Standard Channel Maintenance Practices. 1976. Fremling, C., D. McConville, D. Nielsen, and R. Vose.

Phase I Study of the Weaver-Belvidere Area, Upper Mississippi River. 1978. Nielsen, D., R. Voss, C. Fremling, and D. McConville.

Addressed: Probable effects of side channel modifications on a large scale to facilitate the rehabilitation of a large area of backwaters. Included engineering analysis of likely physical changes which would result from the side channel modifications.

Side channel modifications accomplished to facilitate the research projects with Winona State, St. Mary's, and the River Studies Center are also discussed in the previous chapter. These included a side channel opening at Blackbird Slough (pool 6), a set of culverts placed at Fountain City Bay (locks and dam 5), a partial closing dam built at Devil's Cut (pool 5A), and three side channel openings scheduled by the GREAT and the Corps for spring 1979 at Kruger Slough, Island 42, and Old John's Ditch (all in pool 5).

Several additional side channel modifications were pursued by the SCWG with varying degrees of success. The side channel opening at Mule Bend (Island 42, pool 5; Figure 16) was accomplished in October, 1974, just as the GREAT was officially getting its start. Although Mule Bend was actually opened before there was an official Side Channel Openings Work Group, the project illustrates that for side channel openings the formation of the GREAT merely formalized the work being done by numerous State and Federal

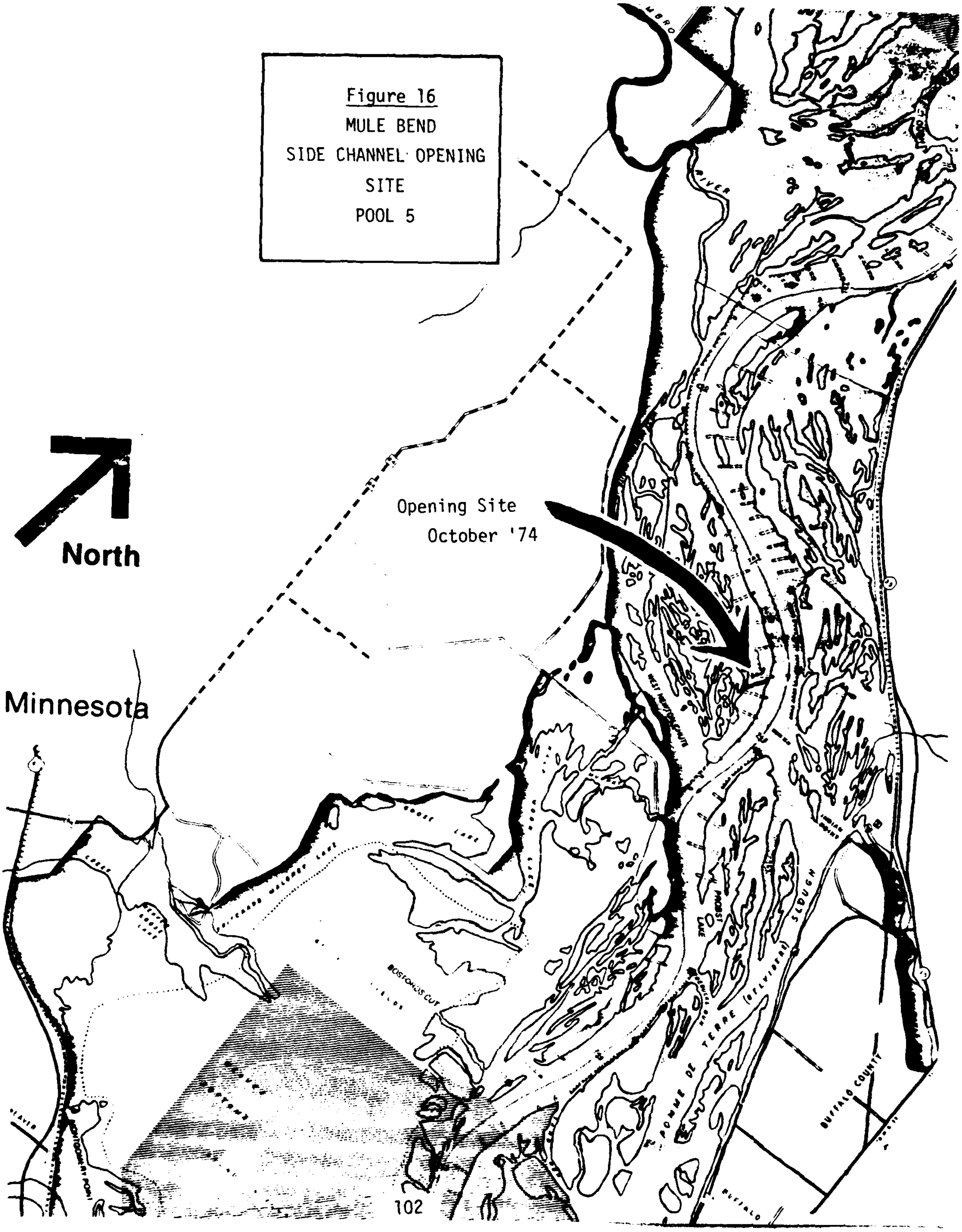


Figure 16
MULE BEND
SIDE CHANNEL OPENING
SITE
POOL 5
Opening Site
October '74
North
Minnesota
SLOUGH
BUFFALO COUNTY

biologists and the St. Paul District (see Appendix C).

The site at Mule Bend was selected for opening after an intensive inspection and evaluation of many possible opening sites, including Old John's Ditch, Bullet Chute, Betsy Slough, and lower Fountain City Bay (Appendix F). The opening at Mule Bend was accomplished specifically to improve the backwater habitat of Island 42. It was not a pilot study opening, and there was only minimal monitoring of the opening scheduled. However, the Minnesota DNR and Fish and Wildlife Service have monitored the depth of the opening and the openings's effects on dissolved oxygen and macrophytes periodically and have found the opening to be generally sound and beneficial to the area's fisheries (Figures 27 - 30)*.

To address the matter of recreational access openings, the SCWG attempted to have several openings accomplished improving boat access as pilot projects. The openings were then to be monitored periodically to determine how well the cuts made would maintain themselves and if the openings were being used by boaters. Two openings were accomplished, one in Belvidere Slough at Buffalo City, Wisconsin (pool 5, Figure 17), and one in Picnic Island Slough at Fort Snelling State Park (Minnesota River, Dakota County, Figures 18 and 19).

The recreational opening at Buffalo City was accomplished in the fall of 1975 to provide improved access in and out of Buffalo City. Reports were received from the Wisconsin DNR that this area was in jeopardy of being cut off from the river by sedimentation. The work was done by a "Mudcat", a small hydraulic dredge developed by National Car Rental. The opening has maintained a good channel since opening (see SCWG "Projects" section) and has been used as a main avenue to the river by the hunters and fishermen according to Brad Bauman, former owner of the Buffalo City Resort*.

* Further study of the Island 42 (Mule Bend) and Belvidere Slough areas is documented in Fremling _et al._, 1979 and in Nielsen _et al._, 1978.

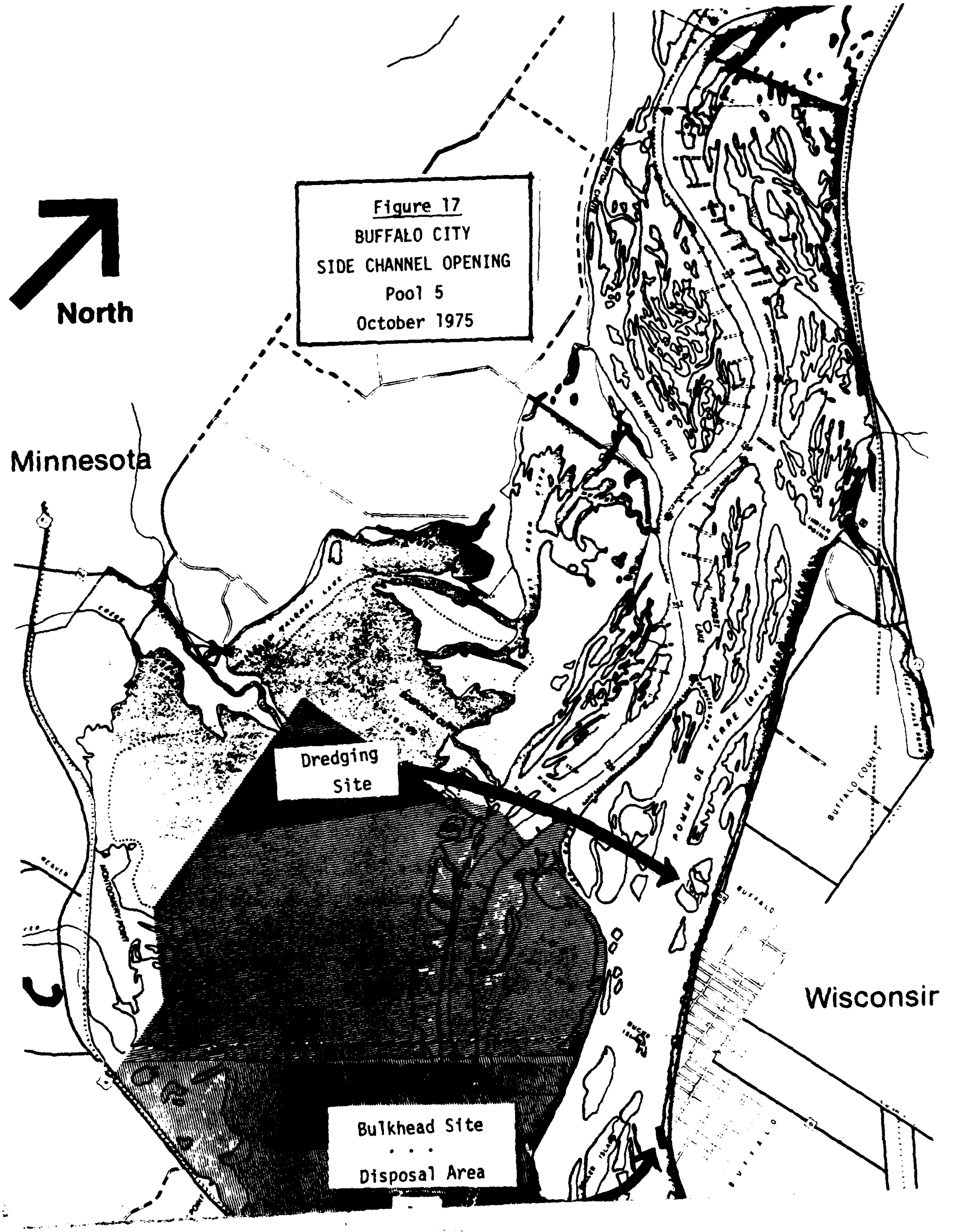


Figure 17
BUFFALO CITY
SIDE CHANNEL OPENING
Pool 5
October 1975
North
Minnesota
Wisconsin
Dredging Site
Bulkhead Site
. . .
Disposal Area
POMME DE TERRE
BUFFALO COUNTY

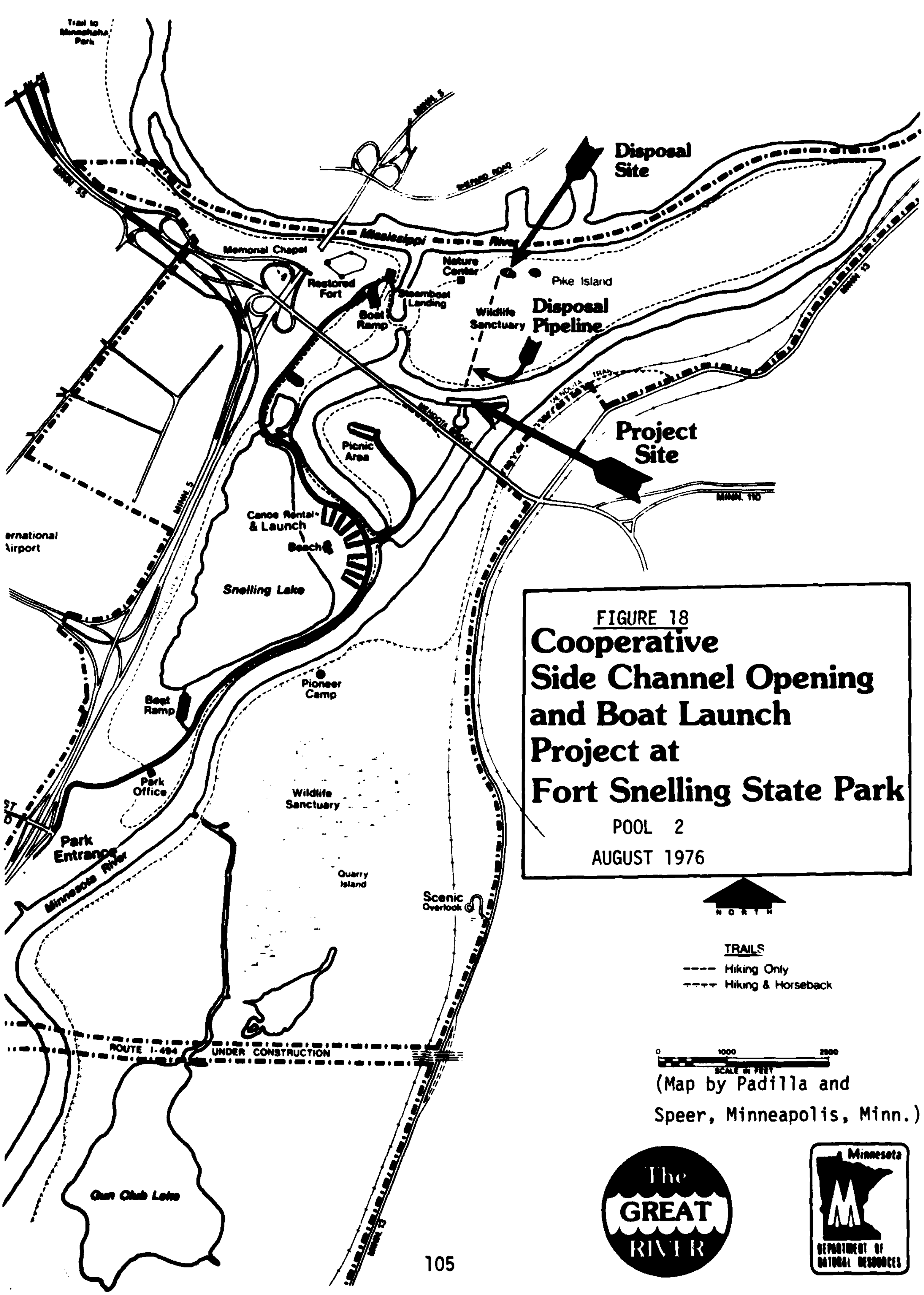


FIGURE 18

Cooperative Side Channel Opening and Boat Launch Project at Fort Snelling State Park

POOL 2

AUGUST 1976

(Map by Padilla and Speer, Minneapolis, Minn.)

The GREAT RIVER

Minnesota DEPARTMENT OF NATURAL RESOURCES

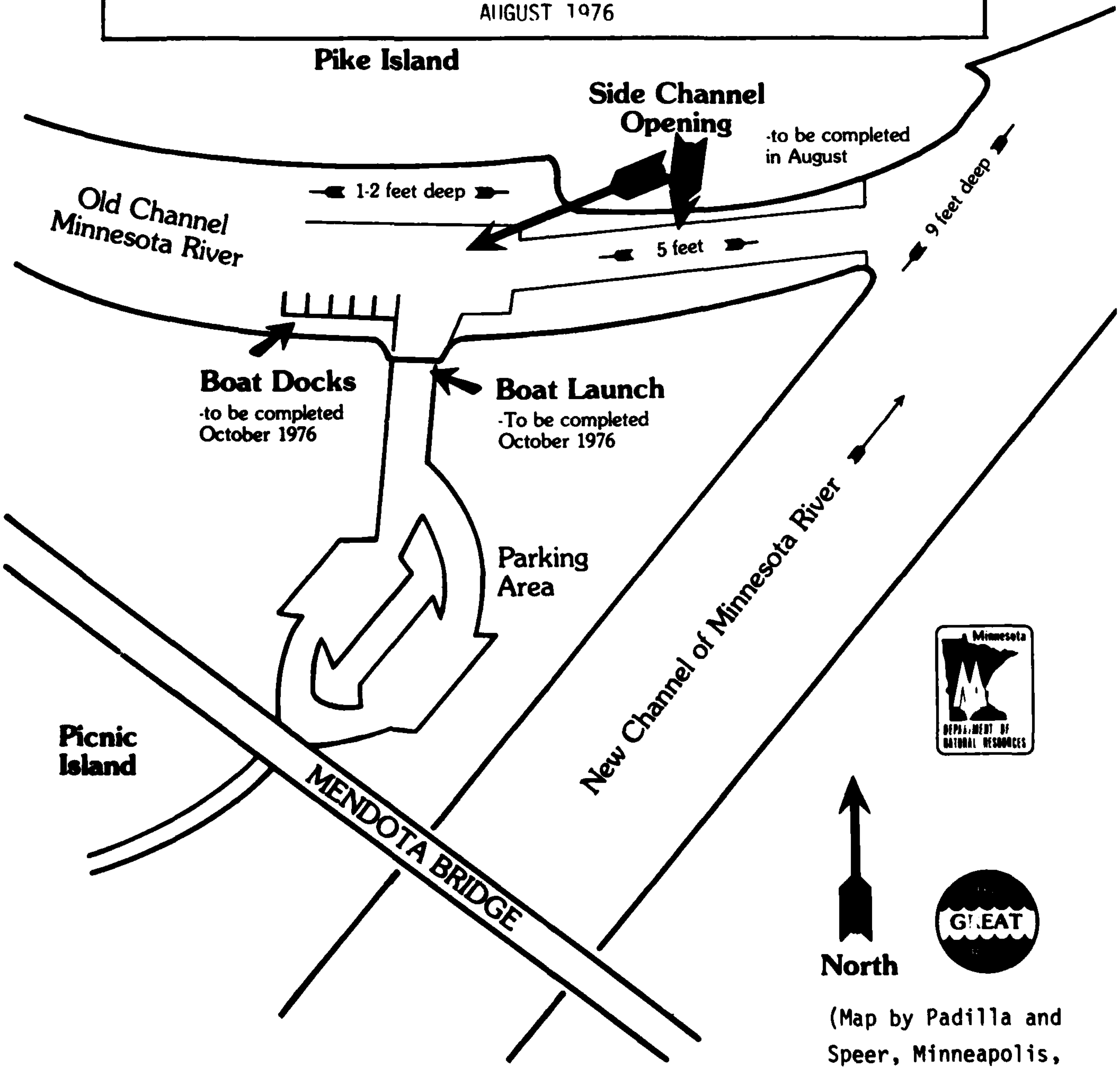
FIGURE 19

Cooperative Side Channel Opening and Boat Landing Project

at Fort Snelling State Park

POOL 2

AUGUST 1976



(Map by Padilla and Speer, Minneapolis, Minn.)

The opening at Fort Snelling State Park was accomplished to provide a navigable access to a new boat launch in the park. There are very few launch facilities for small boats on the Mississippi or Minnesota Rivers in the Twin Cities area, and this opening was to improve that situation, as well as to provide information. The work was done with a "Mudcat" during summer 1976. As of 1978, the channel we dredged at Fort Snelling had filled in approximately 10 percent, from a depth of 5 feet, to a depth of 4.5 feet, according to a 1978 Corps project reconnaissance report. The opening and boat launch are receiving a tremendous amount of use (personal communication with William Weir, Regional State Parks Supervisor, Minnesota DNR)*.

The work group also attempted to open side channels at Sam Gordy Slough (Pool 6, RM 724.5L; Figure 20) and Sny Magill Boat Landing in Johnson Slough (Pool 10, RM 627.3; Figures 21 and 22). Both openings were scheduled for summer or fall of 1976. The GREAT had granted funding to the SCWG adequate to do the work with the "Mudcat". However, the GREAT turned down our request (Appendix G) to use the money budgeted to attempt these two side channel openings. The funds (approximately $15,000) were reclaimed by the GREAT for work higher on its priority list.

The GREAT determined that an opening at Sam Gordy Slough would most probably not provide sufficient benefits to warrant the expense. The opening at Sny Magill boat launch was turned down because of a change in opinion about the appropriateness of GREAT accomplishing side channel openings to enhance only recreation access. Therefore, neither opening was accomplished.

2. <u>RESPONSIBILITY</u>:

<u>Implement side channel modifications should such projects prove</u>

* The channel was again dredged in 1980 by the MinnDNR to increase its capacity, and additional measures are being taken to ensure the long life of the channel originally opened by the Side Channel Work Group.

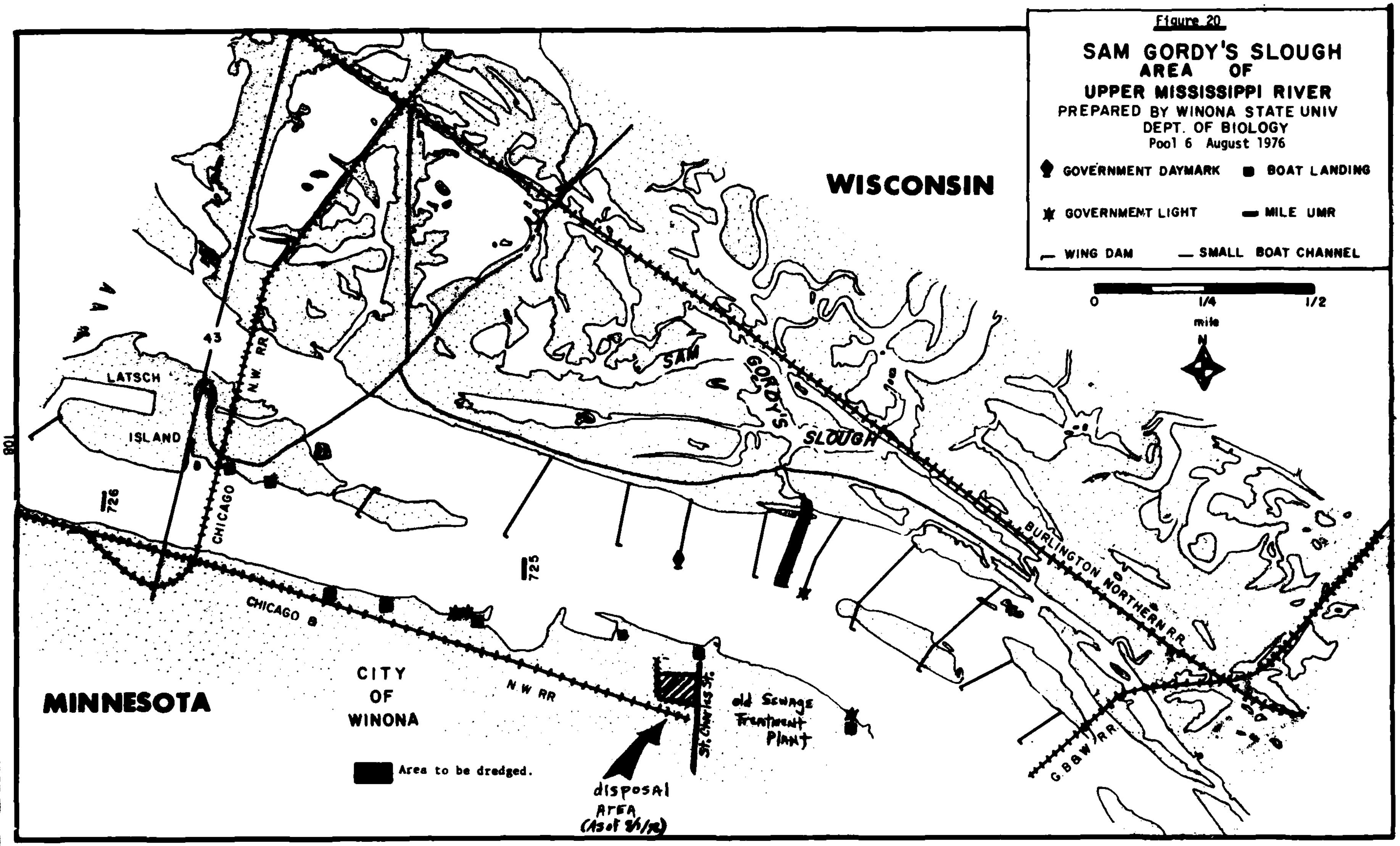
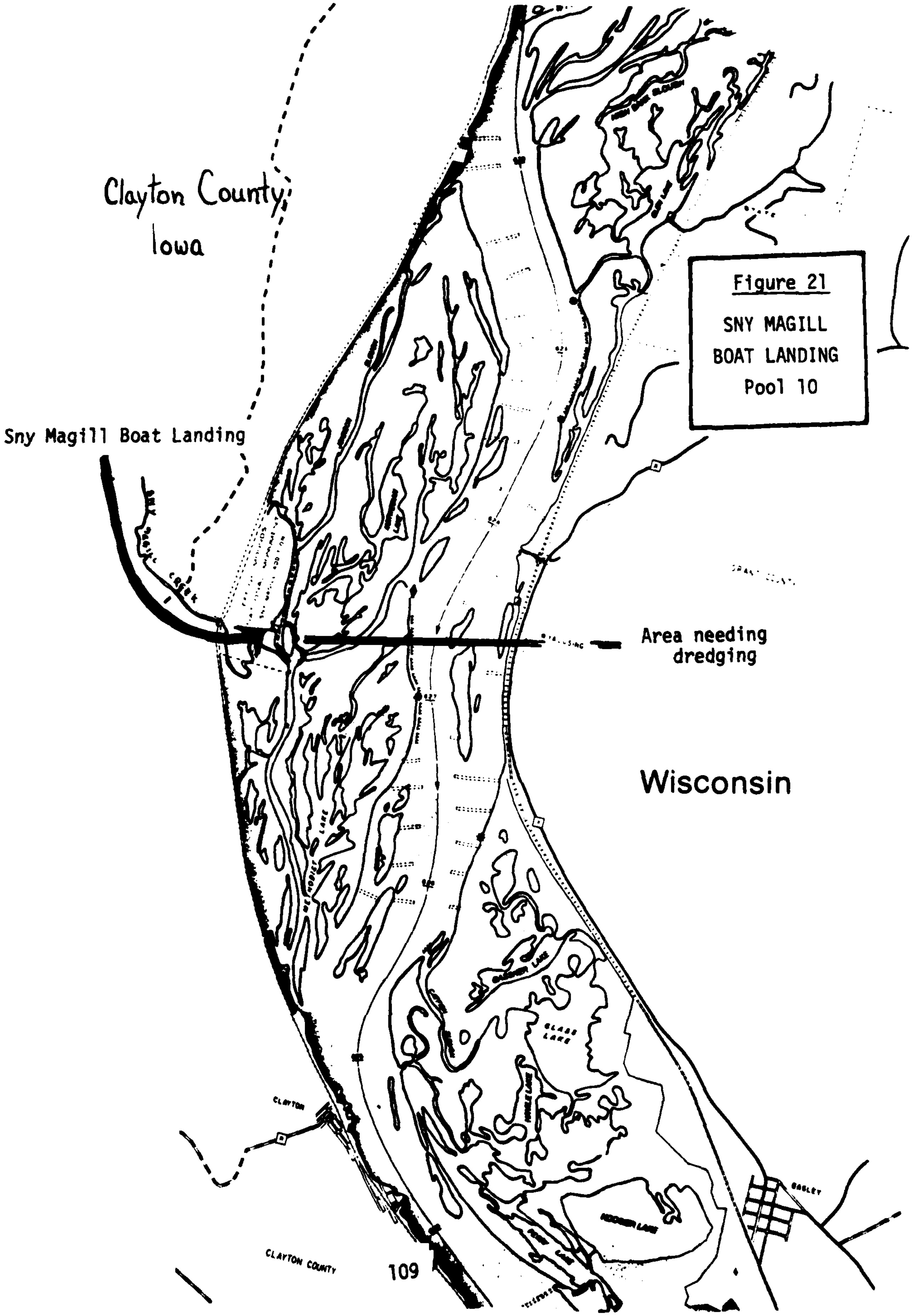


Figure 20
SAM GORDY'S SLOUGH
AREA OF
UPPER MISSISSIPPI RIVER
PREPARED BY WINONA STATE UNIV
DEPT. OF BIOLOGY
Pool 6 August 1976
GOVERNMENT DAYMARK
BOAT LANDING
GOVERNMENT LIGHT
MILE UMR
WING DAM
SMALL BOAT CHANNEL
0
1/4
1/2
mile
N
WISCONSIN
MINNESOTA
CITY OF WINONA
SAM GORDY'S SLOUGH
BURLINGTON NORTHERN RR
G.B.&W. RR
N W RR
CHICAGO
CHICAGO B
LATSCH ISLAND
43
726
725
Area to be dredged.
old Sewage Treatment Plant
St. Charles St.
disposal area


Clayton County
Iowa
Figure 21
SNY MAGILL
BOAT LANDING
Pool 10
Sny Magill Boat Landing
Area needing
dredging
Wisconsin
CLAYTON
CLAYTON COUNTY

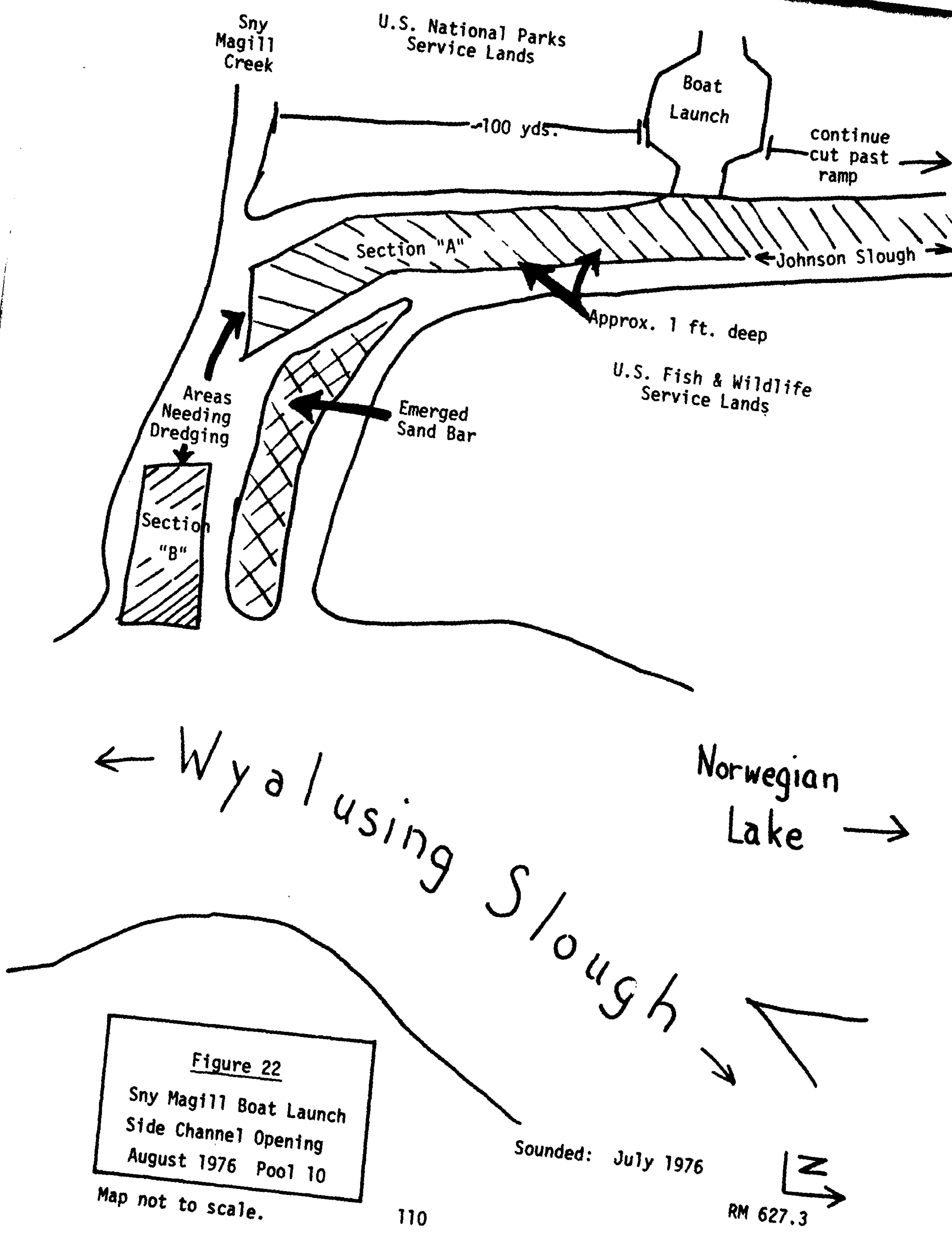


Figure 22
Sny Magill Boat Launch
Side Channel Opening
August 1976 Pool 10

Map not to scale.

beneficial to fish and wildlife resources and their compatible uses (objectives and plan of action).

Accomplishment:

The SCWG was methodical in addressing this responsibility. The first step, as stated above, was to show the effects of side channel modifications (described in preceding responsibility). The second step was to facilitate implementing modifications that seemed appropriate. Both of these required a priority list of potential modification projects be developed.

The work group began the development of this list by roughly evaluating all modifications suggested by the work group members according to the projects' probable biological benefit and hydrological soundness (Appendix E). The entire work group made a tour of the potential modification project sites from Guttenberg to Minneapolis to better determine the relative importance of each project (Appendix H). Based on these evaluations, the SCWG produced an annotated list, with priorities noted, of side channel openings and culverts that the work group recommended for implementing, both to conduct pilot biological modifications and to make recreational openings (Appendix I).

This list was revised in July, 1976 (Figures 23 and 24), primarily to separate out those projects we felt the Corps should take responsiblity for. The Corps had agreed to take responsibility for side channel modifications where a side channel had been closed as a result of direct dredged material placement or obvious secondary movement of material (Appendix C). The Corps had also agreed to provide culverts in the dikes of the locks and dams where it could be shown that the dike was responsible, because of a project deficiency, for adversely affecting the habitat quality of the backwater immediately downstream of the dike (U.S. Army Corps of Engineers, 1969). Therefore, culvert projects were also listed and priorities assigned.

July 29, 1976

Figure 23

GREAT

SIDE CHANNEL OPENINGS WORK GROUP
PROJECT PRIORITY LIST *

1st Priority: Culverts and Side Channel Openings for Biological Investigations

Priority 1. Culvert - Lock and Dam 5 into Fountain City Bay
2. Side Channel Opening - Sam Gordy Slough
3. Side Channel Opening - Kieselhorse-Fountain City

2nd Priority: Side Channel Openings for Recreational Benefit and Culverts for Biological Benefit

Side Channel Openings

Priority 1. Buffalo City Access (Pool 5) ++ Accomplished
2. Ft. Snelling State Park Channel (Pool 2) +++ Underway
3. McDonald Slough (Pool 10)
4. Sny Magill (Pool 10)
5. Bullet Chute (Pool 7)
6. Blackbird Slough (Pool 6)
7. Jackson Run (Pool 3)
8. Ferry Slough (Pool 9)

Culverts

Priority 1. Lock and Dam 10 - Waterfowl Ponds
2. Lock and Dam 5A - Crooked Slough
3. Lock and Dam 4 - Finger Lakes
4. Lock and Dam 8 - Reno Bottoms

O&M Project Sites: Side Channel Sites Which Have Apparently Been Closed Due to Channel Operation or Maintenance

Priority 1. Wyalusing Slough (Pool 10)
2. Blackbird Slough (Pool 6)
3. Swift Slough (Pool 11)
4. Kieselhorse-Fountain City Bay (Pool 5A)
5. Bullet Chute (Pool 7)
6. Ferry Slough (Pool 9)

* This revised priority list developed at the SCOWG meeting of June 29, 1976.

August 1, 1975

Figure 24

OUTLINE:
RECOMMENDATIONS OF THE SIDE CHANNEL
OPENINGS WORK GROUP

<u>1st Priority</u>: Culverts and Side Channel Openings for Biological Investigations

Priority 1. Culvert A - Lock and Dam 5 into Fountain City Bay
2. Culvert B - Lock and Dam 5 into Fountain City Bay
3. Side Channel Opening - Sam Gordy Slough
4. Side Channel Opening - Kieselhorse-Fountain City

<u>2nd Priority</u>: Side Channel Openings for Recreational Benefit and Culverts for Biological Benefit

<u>Side Channel Openings</u>

Priority 1. Buffalo City Access (Pool 5)
2. Ft. Snelling State Park Channel (Pool 2)
3. *4th Cut into Lower Lake (Pool 4)
4. McDonald Slough (Pool 10)
5. *Bullet Chute (Pool 7)
6. *Blackbird Slough (Pool 6)
7. Glen Lake (Pool 10)
8. Jackson Run (Pool 3)
9. Johnson Slough (Pool 10)
10. *Ferry Slough (Pool 9)

<u>Culverts</u>

Priority 1. Lock and Dam 10 - Waterfowl Ponds
2. Lock and Dam 5A - Crooked Slough
3. Lock and Dam 4 - Finger Lakes
4. Lock and Dam 8 - Reno Bottoms
5. Lock and Dam 5A - Blackbird Slough

* Sites where dredge spoil has been the obvious cause of the channel alteration.

The list of projects recommended to the Corps was further refined and officially forwarded to the Corps through the GREAT's Dredging Requirements Work Group on July 8, 1977 (Appendix J). On March 15, 1978, we also provided a list of possible dredged material disposal sites for some of these sites for which the Corps had accepted responsibility (Appendix K).

The several side channel modifications accomplished to conduct biological research have already been discussed (pages 44-46). They include the side channel opening at Blackbird Slough (Pool 6), the partial blocking dam at Devil's Cut (Pool 5A), the set of culverts constructed at the dike of lock and dam 5, and the side channel openings at Kruger Slough, Island 42, and Old John's Ditch (Pool 5). Details of these projects may be found in Fremling, et al, 1979, The Feasibility and Environmental Effects of Opening Side Channels in Five Areas of the Mississippi River. The side channel opening at Mule Bend (Pool 5) should also be included in this category.

The side channels opened primarily for recreation access benefits are at Buffalo City in Belvidere Slough (pool 5) and at Fort Snelling State Park (pool 2/Minnesota River). An additional opening at Wyalusing Slough (Figures 25 and 26) was accomplished by the Corps in November, 1978. This project was the top priority side channel opening recommended to the Corps in 1977 (Appendix J). The Corps has also been willing to open the side channels recommended at Bullet Chute (pool 7) and Dead Slough (pool 10) (Appendix J); however, acceptable disposal sites for the dredged material could not be identified.

One additional project was accomplished at least partially as a result of recommendations of the SCWG. Two additional notches in the spillway dike of lock and dam 10 were constructed in fall 1975 in association with some repair work at the spillway. The project was recommended very shortly after we were informed that the repair work was scheduled. The notches were recommended solely to help dissolved oxygen levels in State Line Slough, Grant County, Wisconsin.

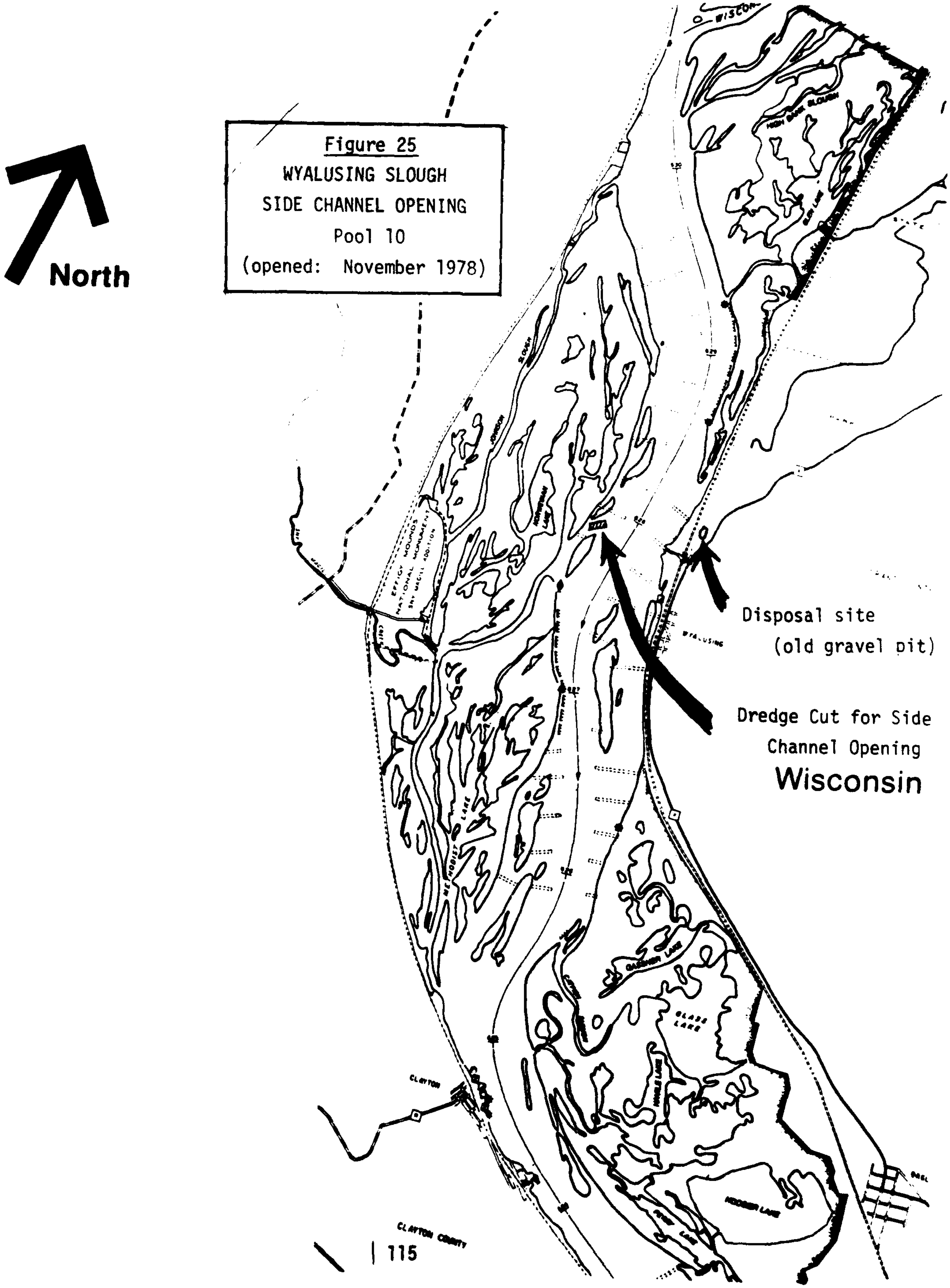


Figure 25
WYALUSING SLOUGH
SIDE CHANNEL OPENING
Pool 10
(opened: November 1978)

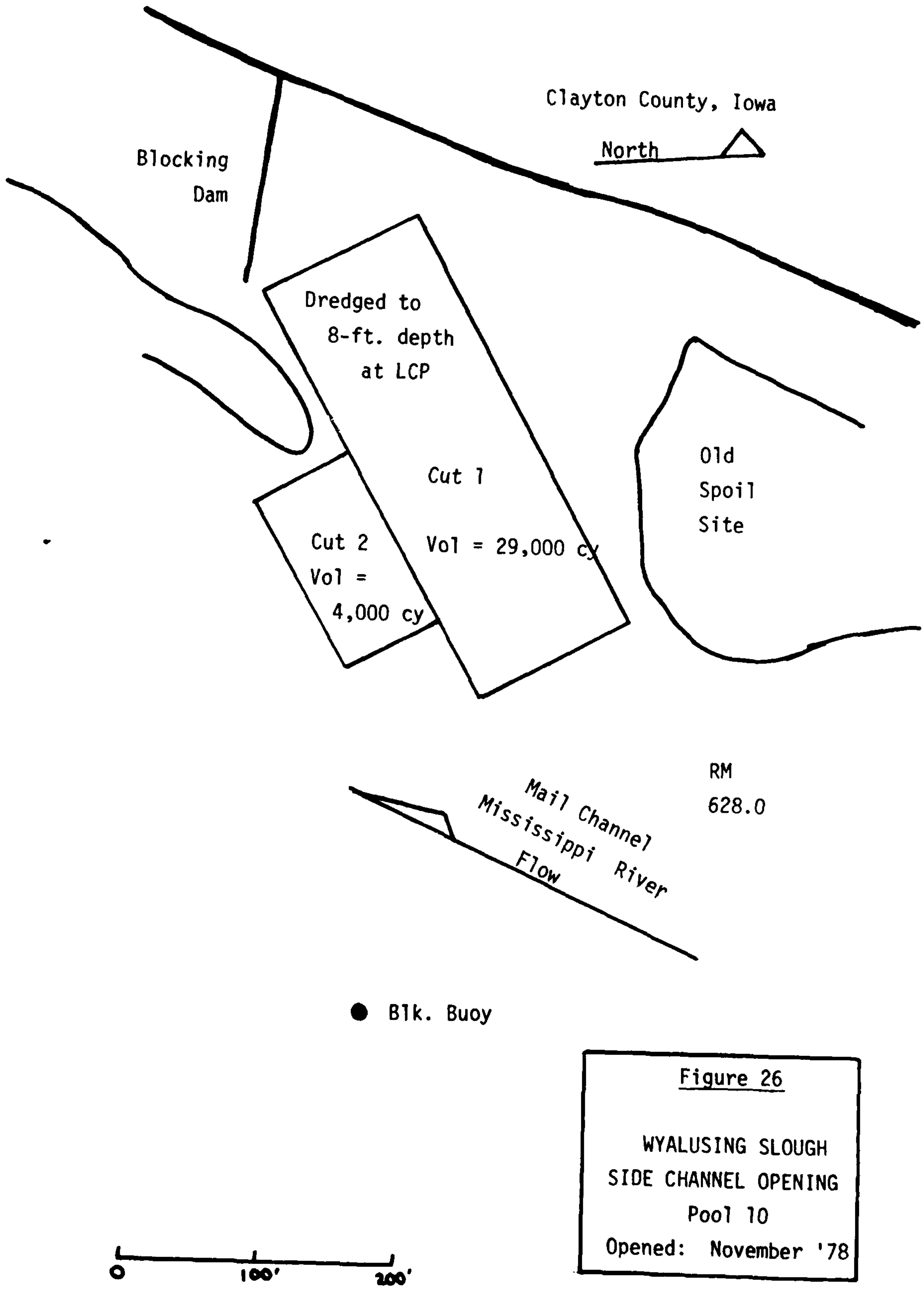


Figure 26

WYALUSING SLOUGH
SIDE CHANNEL OPENING
Pool 10
Opened: November '78

Generally, the work group has not undertaken a full program of side channel modifications to date because of the condition it set on March 17, 1975: implement side channel modifications should such prove beneficial to fish and wildlife resources and their compatible uses. Our work has indicated that culverts are generally beneficial, and we have made specific recommendations for several new culverts (see Chapter V). However, the members of the work group have different conclusions on side channel openings and partial closing dams.

Some concerns within the FWWG (SCWG) and the GREAT regarding side channel modifications are still unresolved. The concerns include effects on sediment influx, waterfowl habitat, floodstages, dissolved oxygen levels, and effects of increased boating on waterfowl resting and feeding areas. The basic question of effects is still insufficiently answered for some of the work group and Team members.

Some specific side channel modification projects are being recommended (Chapter V). Subsequent to monitoring the openings at Kruger Slough, Island 42, and Old John's Ditch, many questions will be sufficiently answered to prepare a more comprehensive list of projects to pursue.

The work group has addressed opening recreational accesses in sponsoring Recommendation Number 11 in Chapter V. The recommendation calls for the granting of authority to the Corps to do specific work in the backwaters at the request of the GREAT or its logical successor. This would enable the Corps to accomplish many of the projects being requested by agencies and the public if the interagency team can agree that the project is worthwhile and would not adversely affect fish and wildlife resources.

3. RESPONSIBILITY:

Work to alleviate the adverse impacts of fine sediment deposition and dredged material disposal on the backwater sloughs and channels

(problems).

Accomplishment:
The SCWG did not pursue any specific programs to attempt to address this responsiblity. Our plan of action did not provide for such an effort, primarily because the two matters were to be addressed by the Sediment and Erosion Work Group and the Fish and Wildlife Management Work Group. The FWWG recommendations Numbers 1, 2, 3, 5, and 11 in Chapter V are all intended to help alleviate these adverse impacts.

4. RESPONSIBILITY:

Open side channels at the request of local citizens, particularly for recreational benefit (unstated expectations).

Accomplishment:
The work group received many requests for side channel openings, and a record was kept of each. The work group did not attempt to implement these recommended projects unless they would serve to develop our understanding of modification effects or our justification for doing them. One such project was to place a set of culverts in the dike of lock and dam 4 at Sand Prairie (see SCWG Projects, section C of this chapter). We received many letters of interest, opinion, and support on this project.

Generally, however, it would be most honest to state that the SCWG did not accept this responsibility. We do have an interest in providing a means to have some of this work done (see Recommendations numbers 1 and 11 in Chapter V), but primarily we wanted to gain the most information we could from each project we accomplished.

5. RESPONSIBILITY:

Conduct a comprehensive side channel inventory (unstated expectations).

Accomplishment:

The work group started this inventory in summer 1977. Schedules were set, 1939 and 1975 aerial photographs were obtained, and inventory forms were developed. To date, we have not completed this work. The reasons for the inventory not being complete are that priorities shifted within the work group and the GREAT toward the end of the GREAT program, and the leader of our pilot task group was lost in the middle of the pilot effort.

C. SCWG PROJECTS

This section will describe in more detail those research projects and work group projects mentioned in the previous section. The projects are specifically titled and organized for reference purposes.

The work group's projects were pursued through research contracts and by firsthand field work. The more complex and time-consuming work was accomplished by research contracts with Winona State/St. Mary's College and with the River Studies Center. Those projects which could be accomplished by the work group itself were attempted by the work group.

1. STUDY AND RESEARCH CONTRACTS

a. The Feasibility and Environmental Effects of Opening Side Channels in Three Areas of the Upper Mississippi River (West Newton Chute, Fountain City Bay, and Sam Gordy's Slough).

Contracted to: Winona State University and St. Mary's College of Winona.

This contract was developed by and designed for the Side Channel Work Group in 1975 to address our plan of action. See page 68 for a for more detailed description.

b. Regression Simulation Model of Navigation Pool No. 8. 497 pp.
Field Test of the Regression Simulation Model. 170 pp.
Regression Model Workbook. 79 pp.
Regression Model Application to Lake Onalaska. 58 pp.

Contracted to: River Studies Center of the University of Wisconsin-La Crosse.

These contracts were developed by and designed for the SCWG to address our objectives. See pages 63-67 for more detailed descriptions.

c. The River Environment (and A Summary of the River Environment). 569 (and 78) pp.

Contracted to: Colorado State University

As was discussed in the "SCWG Accomplishments" section, these documents were prepared primarily at the request of the biologist working on side channel investigations in 1974. A more detailed description is located on page 62.

2. WORK GROUP PROJECTS

a. Recommend Sites for Side Channel Openings and Culverts from Minneapolis to Guttenberg.

Primary Developers: Dennis Chase (FWS), Michael Vanderford (FWS), and entire work group.

Project Begun: Spring 1974

Project Completed: Summer 1975, revised numerous times

<u>Project Description</u>:
The project was to provide a priority list of side channel openings and culverts to enable the SCWG to fulfill its studies and objectives. The list was to describe projects to be studied as pilots for biological and recreation access benefits.

The work group compiled a list of all openings the work group members considered good projects and then evaluated each for biological and hydrological soundness (Appendix E). The entire work group then field inspected potential project sites which were not already included in contract studies (Appendix H). A final listing was then developed to forward to the GREAT and the Corps (Appendix I).

The work group subsequently revised the list to separate out a list of "recreation" openings which we felt the Corps should accomplish using operation and maintenance funds (Appendix J). A list of possible disposal sites for some of these opening projects was also provided (Appendix K).

b. <u>Side Channel Opening Project at Mule Bend on Island 42, Pool 5</u>.
Primary developers: Dennis Chase (FWS), Dick Sternberg (MDNR), Nick Gulden (MDNR), Michael Vanderford (FWS), Gary Grunwald (MDNR).

Project begun: July 1974

Project completed: Opened in October, 1974; monitoring continues

Project Description:

Mule Bend was the first officially authorized* side channel opening accomplished by the St. Paul District. The opening was done with the Derrickbarge Hauser and cost approximately $27,000 in operations and maintenance funds. The site was selected by Fish and Wildlife Service and Minnesota Department of Natural Resources biologists after evaluating numerous side channels which had been blocked by dredged material placement (Appendix F). The purpose of the project was specifically to restore freshwater flow to an interior slough and lake of Island 42. It was not a pilot project by design, although some monitoring of the dissolved oxygen levels and the cut depth has been performed by Minnesota Department of Natural Resources and Fish and Wildlife Service work group members (Figures 27 - 30). The monitoring work has proved the project to be successful thus far in improving fish habitat and diversity in the Island 42 area, however, secondary movement from an upstream spoil area continuously threatens to close the chute. Plans were under way in 1980 to redredge the opening through the cooperation of the COE, St. Paul District. This redredging is being undertaken in response to the results of the Minnesota DNR's continued monitoring (see Appendix "Z").

c. Side Channel Opening Pilot Project at Buffalo City, Wisconsin in Belvidere Slough

Primary developers: Dennis Chase (FWS), Willis Fernholz (WDNR), Michael Vanderford (FWS), entire work group.

Project begun: Evaluation begun spring 1975

Project completed: Opened October 1975, monitoring continues

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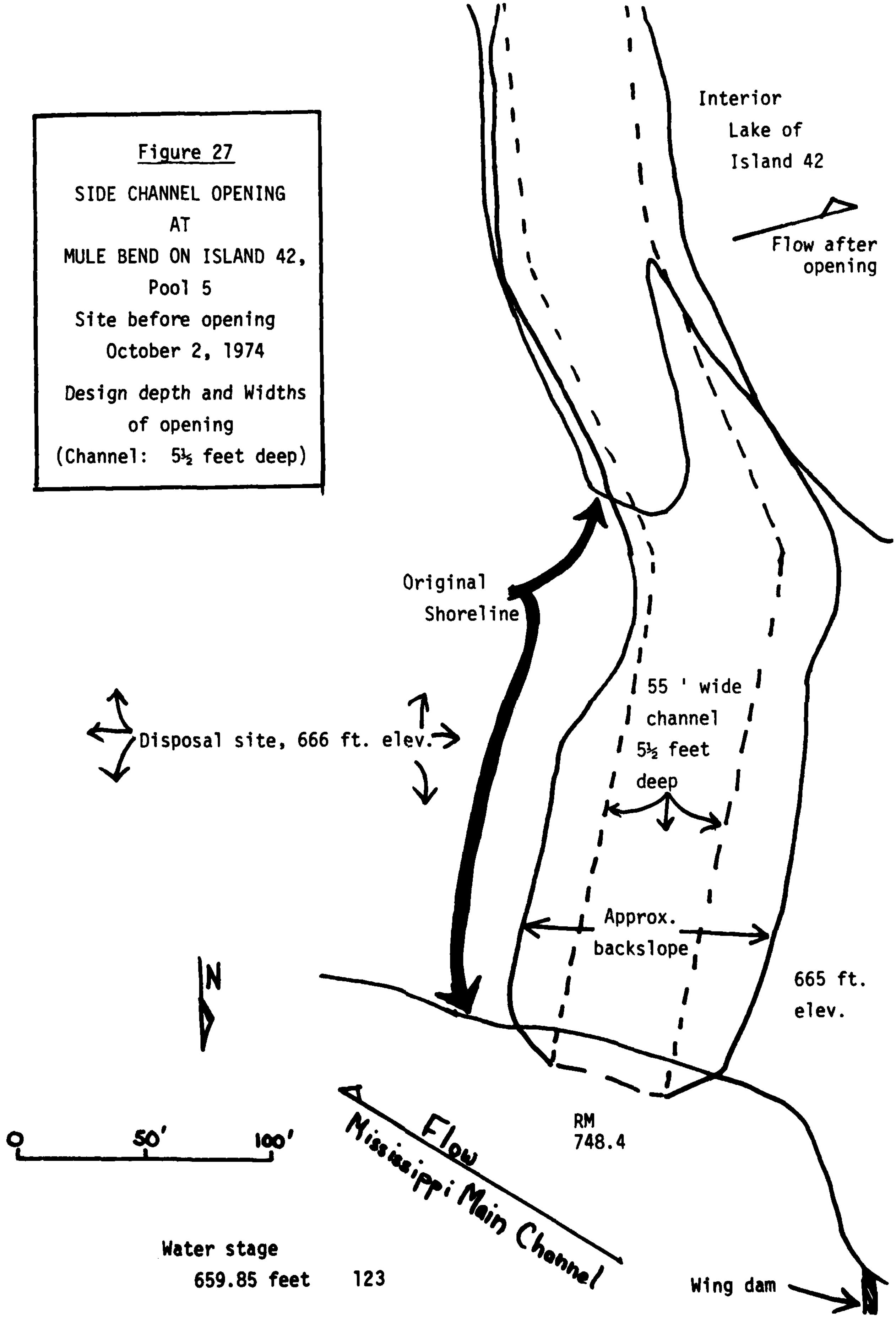
* Corps records show that two recreational openings were accomplished by the Dredge Thompson previously in pools 6 and 5A. A 4,780-cubic yard opening at Horseshoe Bend (RM 735.0) was done on September 3, 1948, and an 833-cubic yard opening at Blackbird Slough (RM 728.0) was done on August 31, 1948.

Figure 27

SIDE CHANNEL OPENING
AT
MULE BEND ON ISLAND 42,
Pool 5
Site before opening
October 2, 1974

Design depth and Widths
of opening
(Channel: 5½ feet deep)



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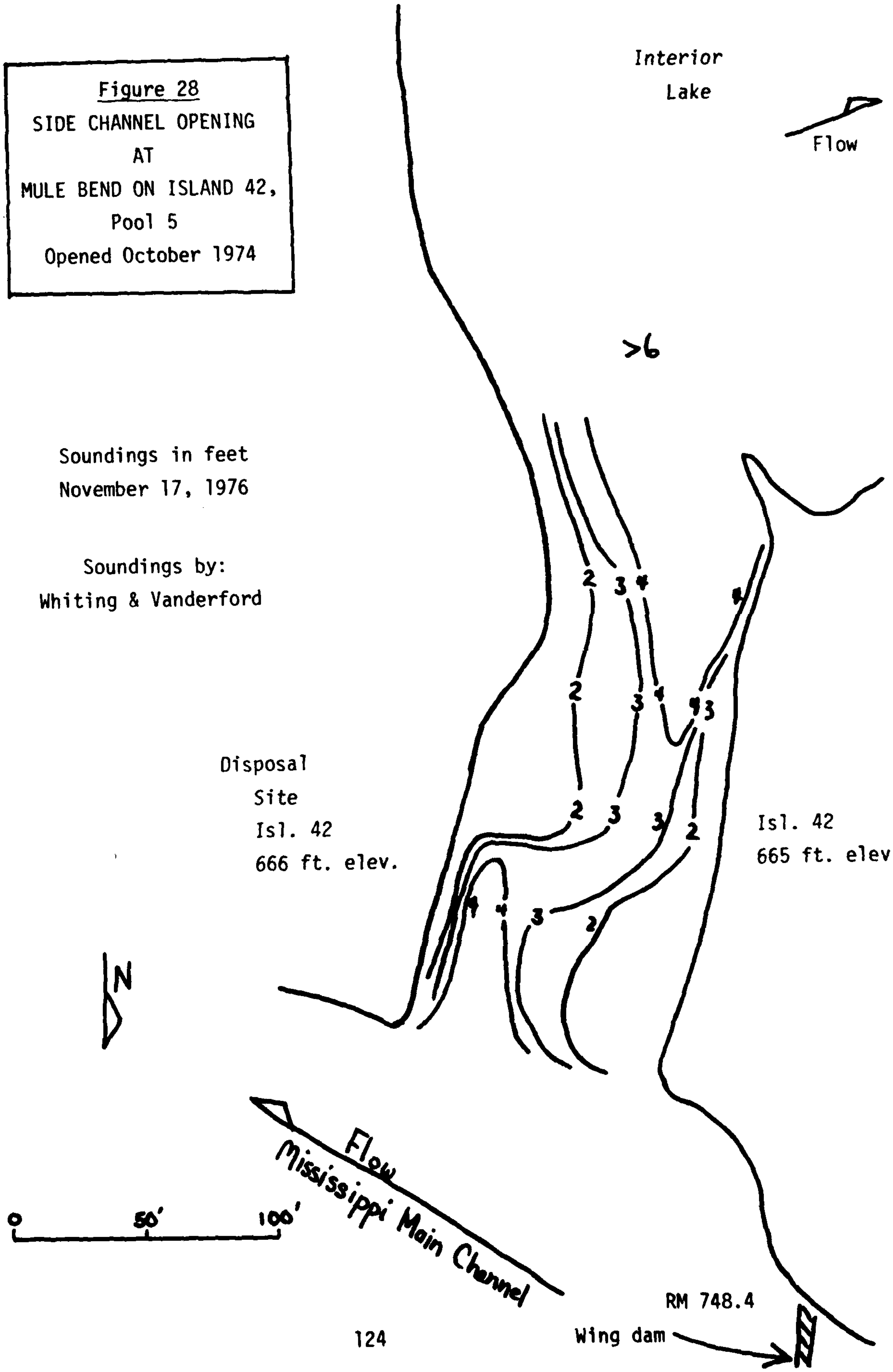


Figure 28
SIDE CHANNEL OPENING
AT
MULE BEND ON ISLAND 42,
Pool 5
Opened October 1974

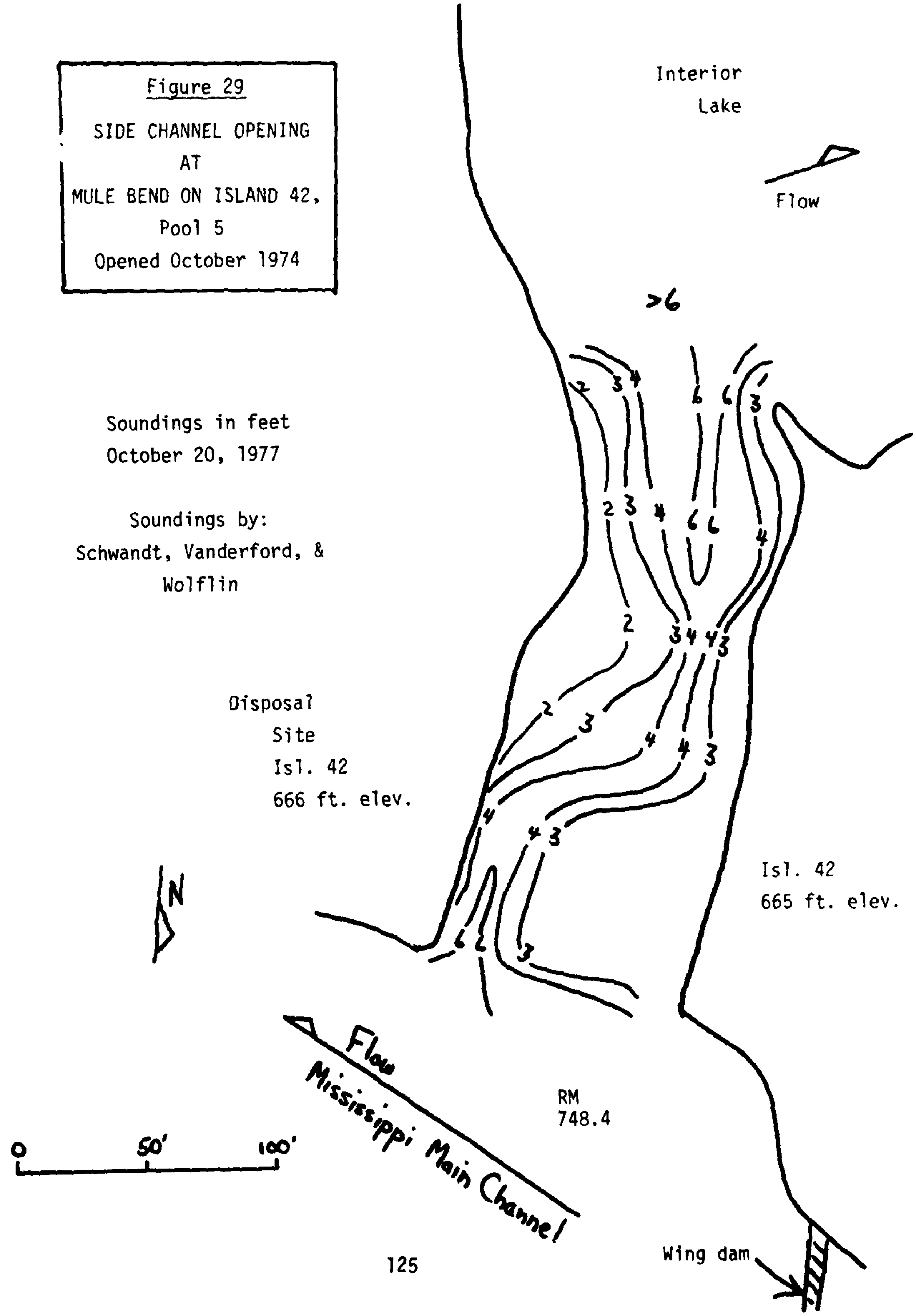


Figure 29

SIDE CHANNEL OPENING
AT
MULE BEND ON ISLAND 42,
Pool 5
Opened October 1974

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

Figure 30

UNITED STATES GOVERNMENT

Memorandum

TO : Regional Director, USFWS, Twin Cities, MN. (ES) DATE: November 13, 1974

FROM : Supervisor, Mpls. Area Office, ES

SUBJECT: Dissolved Oxygen Concentrations in Recently Opened Backwater Sloughs at Mule Bend (Island 42), Mississippi River

Work to open the closed backwater slough at Mule Bend was completed by the Corps of Engineers on October 24, 1974. A biologist from MAO inspected the area and took water samples for dissolved oxygen determinations on October 26. Observations made on that date indicate that a considerable flow of water exists from the main channel, through the new cut, and through the previously closed-off interior sloughs of Island 42. Also, a significant improvement in water quality was already apparent.

Water samples from the locations indicated on the attached map were analyzed for dissolved oxygen. Concentrations of 17ppm were present at "A" in the surface waters of the interior slough at the mouth of the cut, at "B" in the slough 500 yards from the mouth, and at "C" where the slough empties into the interior lake of the island. A water sample taken at a 4-foot depth at site "A" had a concentration of 12ppm. Significantly, at "D" in a closed-off slough just adjacent to site "A", a DO concentration of 4ppm was measured, and zero ppm was measured at "E" in a backwater area adjacent to site "D".

Concentrations greater than 10ppm DO are unusual in lake systems, however, the lotic systems of streams and rivers have characteristics that allow for much higher concentrations. As cited in Ecology of Inland Waters and Estuaries by G. K. Reid, 100 percent saturation of a river's water can be over 20ppm under certain conditions. The low temperature of the water, the dense algae bloom, the bright sunshine, and the lack of water-surface vegetation existing on the date the samples were taken could have easily produced the concentrations observed in the newly opened slough.

Joseph F. Scott, Jr.

Attachment

cc: Refuge Manager, Upper Miss. R. Fish & Wild Life Refuge, Winona

MJVanderford:lj

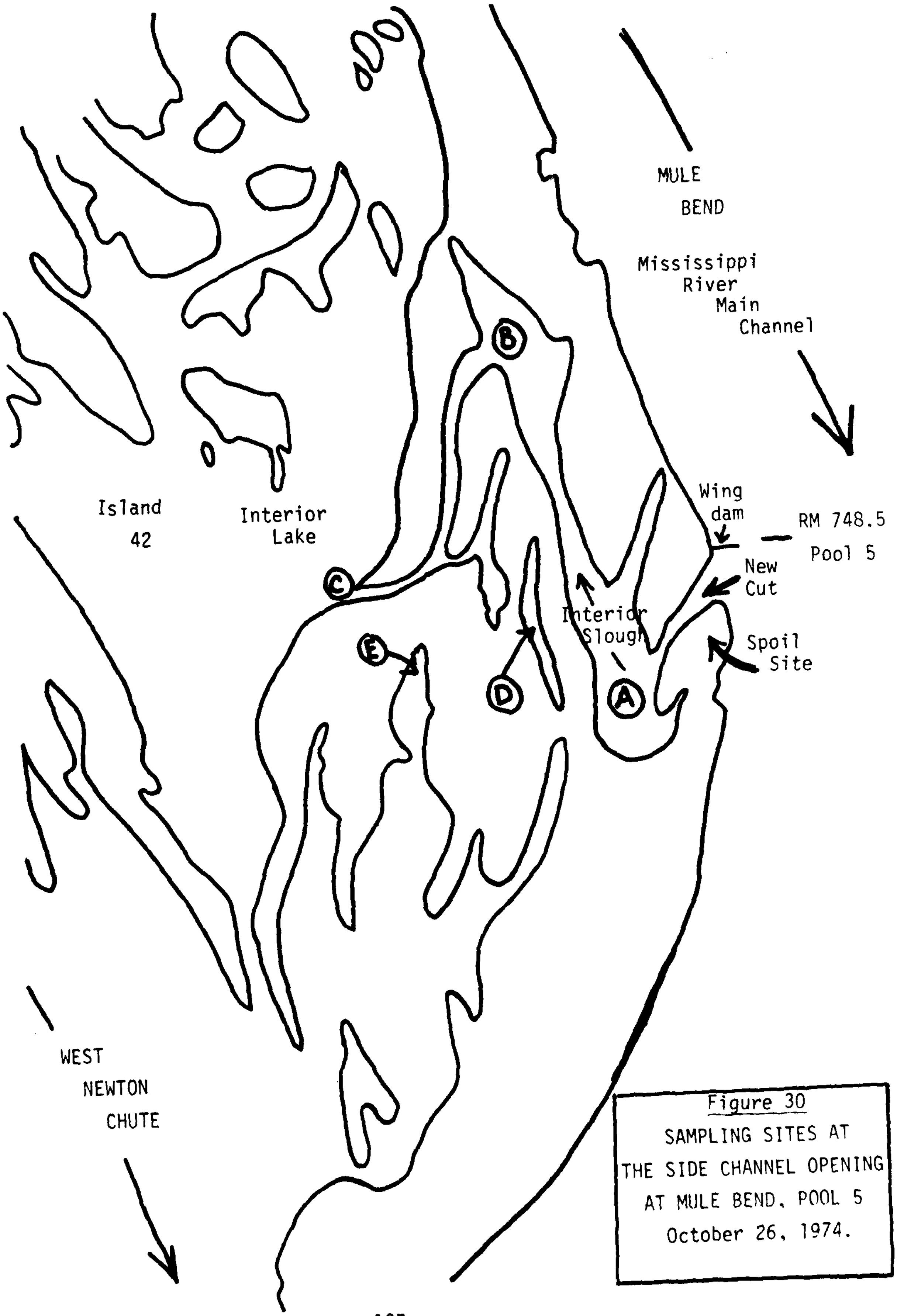


Figure 30

SAMPLING SITES AT THE SIDE CHANNEL OPENING AT MULE BEND, POOL 5 October 26, 1974.

Project Description:

The recreation opening at Buffalo City was the first pilot side channel opening accomplished by the SCWG. The project was the work group's first priority, aside from the modifications needed for our contract research projects. The opening was accomplished by Corps personnel with a small hydraulic dredge called a "Mudcat" (National Car Rentals), which was being tested during the project for its suitability for work in the backwaters of the river. An additional pilot element of the project was that the dredged material was pumped directly to the site of a highway improvement project for beneficial use.

The opening cost approximately $30,000 of GREAT funds and removed about 10,000 cubic yards of material from the side channel. The Buffalo County Highway Department used the sand as a base for raising the level of a county road above the 100-year flood level. The remaining side channel provided a much improved hunting and fishing access route in and out of Buffalo City. Monitoring of the cut depth shows the channel to be slowly narrowing, but it is still much better than the channel before it was dredged (Figures 31-34).

d. Side Channel Opening Pilot Project at Fort Snelling State Park (Pool 2/Minnesota River)

Primary developers: Michael Vanderford (FWS), Don Buckhout (MDNR), Bill Weir (MDNR)

Project begun: Evaluation began spring 1975

Project completed: Opened during July and August, 1976; monitoring continues

FIGURE 31

BUFFALO CITY

SIDE-CHANNEL OPENING

Dimensions before dredging

1" = 125'

0 125' 250'

September 17, 1975

Soundings by: Chase, Vanderford, & Wolflin

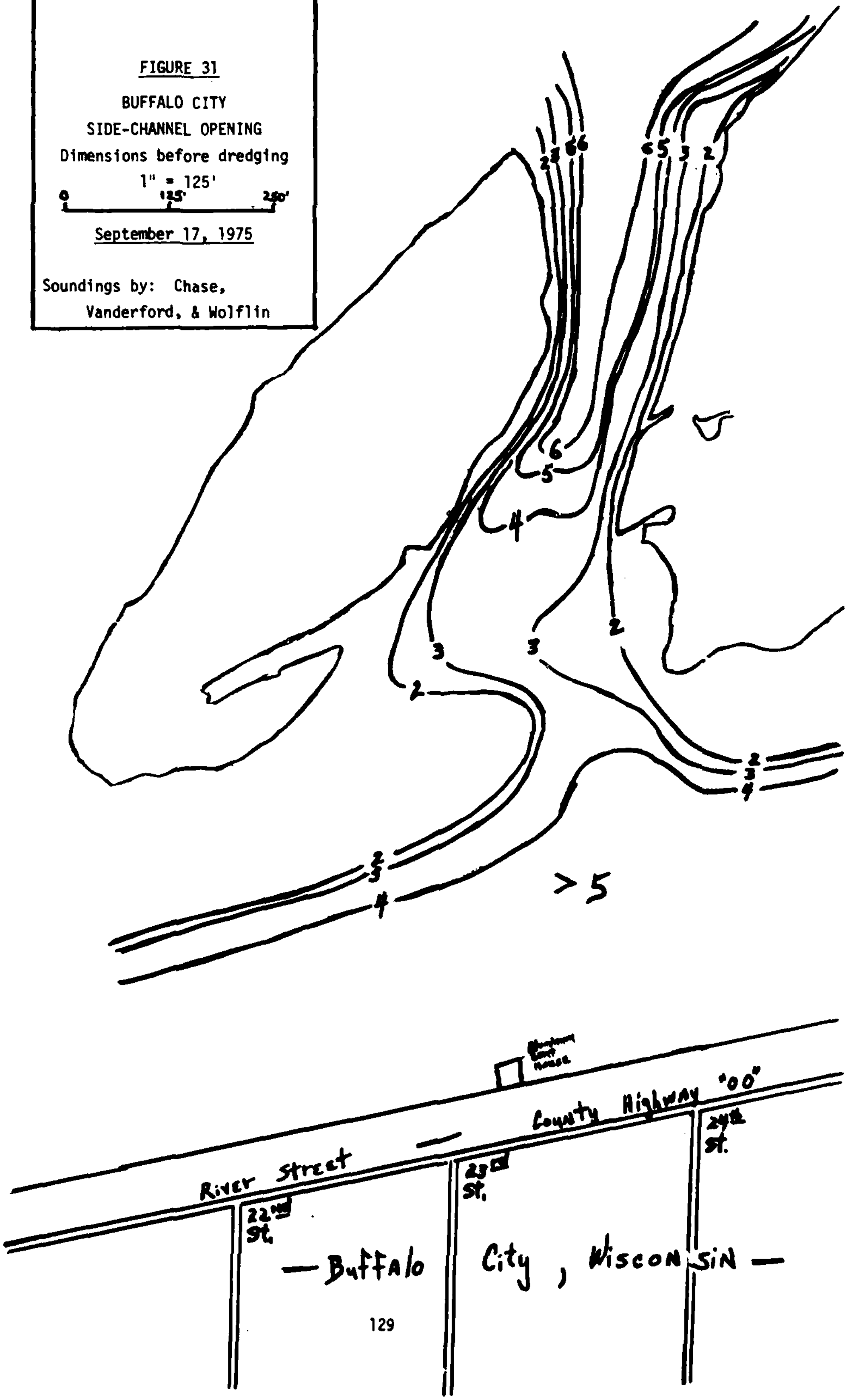


FIGURE 32

BUFFALO CITY

SIDE-CHANNEL OPENING

Dimensions after dredging

1" = 125'

December 11, 1975

Soundings by: Larson

[illegible]erford

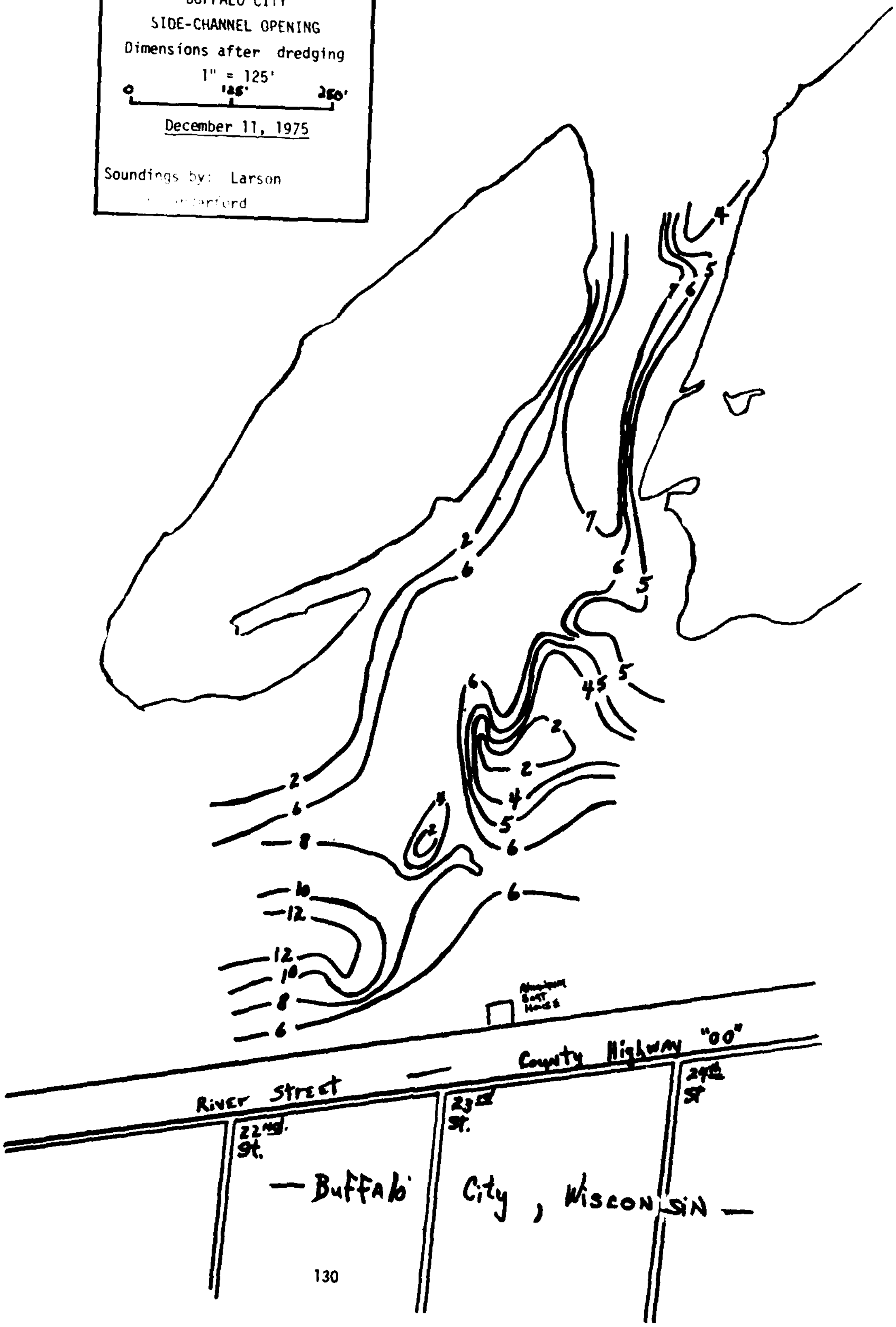
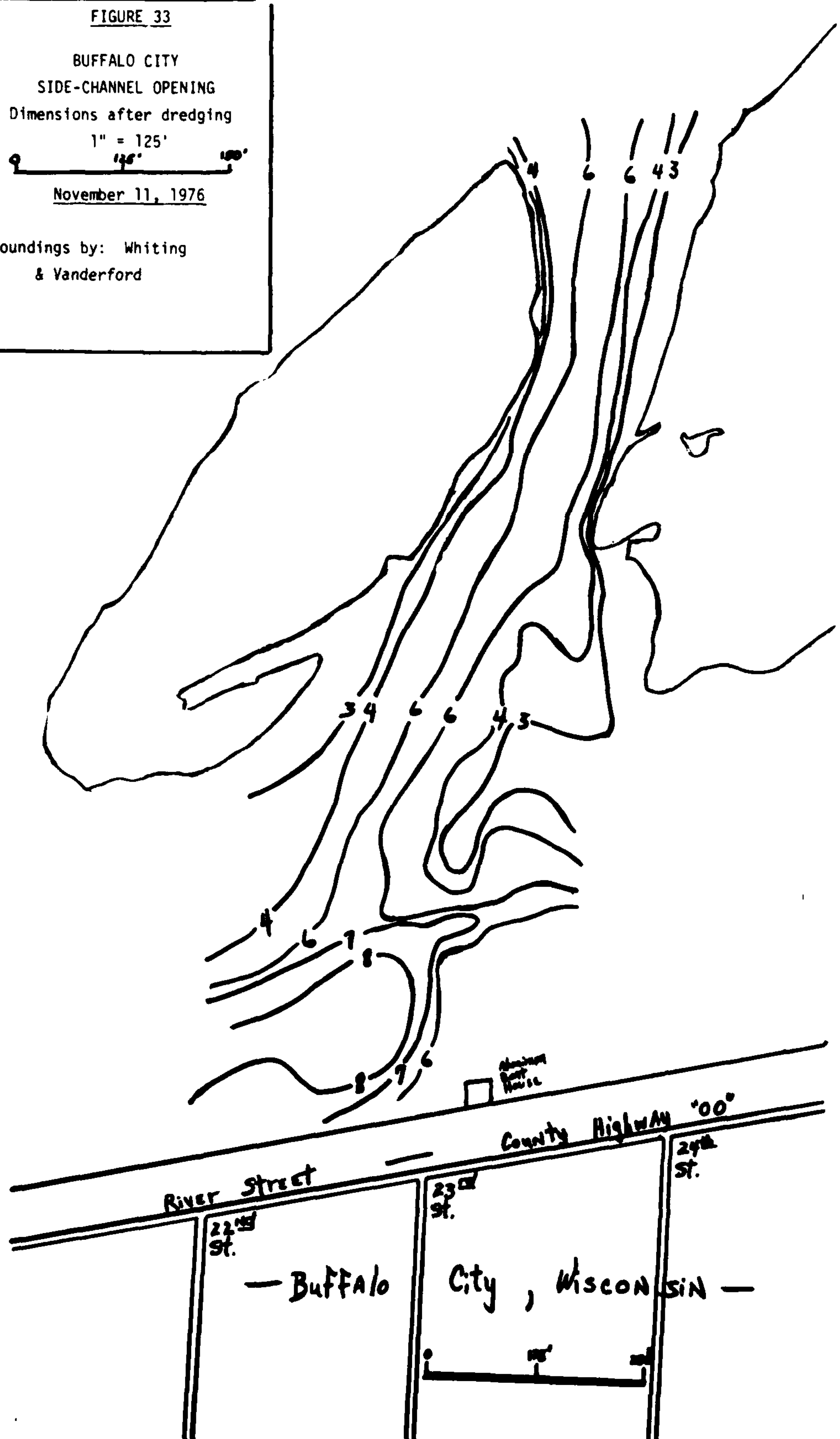


FIGURE 33

BUFFALO CITY
SIDE-CHANNEL OPENING
Dimensions after dredging
1" = 125'

November 11, 1976

Soundings by: Whiting
& Vanderford



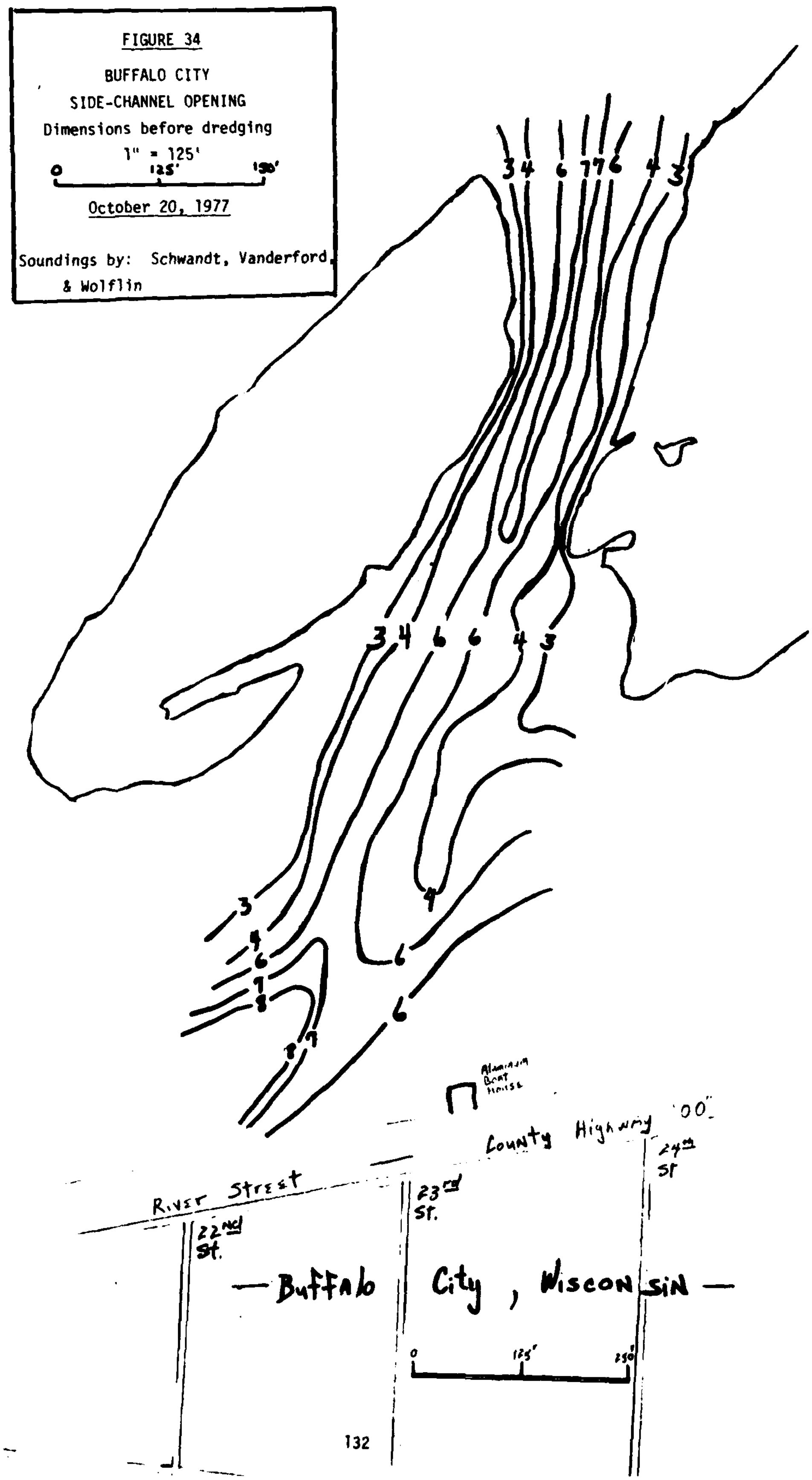


FIGURE 34
BUFFALO CITY
SIDE-CHANNEL OPENING
Dimensions before dredging
1" = 125'
0 125' 250'
October 20, 1977
Soundings by: Schwandt, Vanderford, & Wolflin
County Highway 'OO'
River Street
22nd St.
23rd St.
24th St
— Buffalo City, Wisconsin —
0 125' 250'

Project Description:
The opening at Fort Snelling (Figures 18 and 19) was intended to serve as an additional pilot project for "recreational" side channel openings. The opening was accomplished to make it possible for the Minnesota Department of Natural Resources to develop a new small-boat launching facility at Fort Snelling State Park.

The work was done under the supervision and coordination of the SCWG chairman using temporary employees of the Fish and Wildlife Service. Approximately 10,000 cubic yards of silt were removed from the channel and pumped to a sandpit on Pike Island using the same "Mudcat" rented for the Buffalo City project. Cost of the project was $15,934 of GREAT funds.

Monitoring conducted by the Minnesota DNR and FWS shows that the channel is filling at a slow rate. The channel was originally cut to 5 feet at low control pool in 1976. The minimum depth in the channel at low control pool during summer 1978 was 4.5 feet. The Minnesota DNR re-dredged the channel in 1980 to increase capacity, and additional measures are being taken to ensure the longevity of the project.

e. Side Channel Inventory of the GREAT I Area of the Upper Mississippi River

Primary developers: Doug Mullen (FWS), Ron Nicklaus (WDNR), Jim Ripple (ICC), Michael Vanderford (FWS)

Project begun: Summer 1977

Project completed: Not completed

Project Description:
The side channel inventory was to provide the basic data needed to assess the present status of the river's primary side channels and the losses or gains in side channels. The work was to include field inspection of each pool by boat, stopping and documenting the condition and characteristics of each side

channel that branched from or entered the main channel of the river (Figure 35). Each pool inventory team would be made up of one biologist who would tour all the pools and several biologists familiar with the pool being inventoried. The inventory was not completed.

f. Two Additional Culverts for the Dike of Lock and Dam 4

Primary developers: Hilma Volk (FWS), Bruce Hawkinson (MDNR), Gary Grunwald (MDNR), David McConville (St. Mary's College), Michael Vanderford (FWS)

Project begun: Evaluations began spring 1975

Project completed: Recommendation by GREAT in April, 1978; Corps project planning underway.

Project Description:

The concept of putting in additional culverts into the dike of lock and dam 4 was introduced during the SCWG's original priority list evaluation process. Hilma Volk of the Trempealeau Refuge suggested the project, and the work group included it in our priority list (Appendix I). The culverts would improve habitat quality in the "Finger Lakes" immediately downstream from the dike by providing a minimum flow of water through the lakes and water flow control.

The work group recommended that the Corps construct the culverts and got approval of the recommendation by the entire

Figure 35

Inventory of Side Channels
of the Upper Mississippi River, Minneapolis to Guttenberg, Iowa
1978

Side Channel

State ______
Pool ______
RM ______
Bank ______
Name ______
Side Channel #: ______
Navigation Chart
Page #: ______

Gained/
Lost
☐

Status

Post Impoundment	1975
Existing	Existing
None Existing	None Existing
Category	Category

1975 Information

Any apparent effects from dredge spoil: ______
Approximate length of channel: ______
Body of water that channel empties into: ______

Comments/
Recommendations

Fish & Wildlife Work Group:

Public & Recreation Work Group:

Side Channel

State ______
Pool ______
RM ______
Bank ______
Name ______
Side Channel #: ______
Navigation Chart
Page #: ______

Gained/
Lost
☐

Status

Post Impoundment	1975
Existing	Existing
None Existing	None Existing
Category	Category

1975 Information

Any apparent effects from dredge spoil: ______
Approximate length of channel: ______
Body of water that channel empties into: ______

Comments/
Recommendations

Fish & Wildlife Work Group:

Public & Recreation Work Group:

Side Channel

State ______
Pool ______
RM ______
Bank ______
Name ______
Side Channel #: ______
Navigation Chart
Page #: ______

Gained/
Lost
☐

Status

Post Impoundment	1975
Existing	Existing
None Existing	None Existing
Category	Category

1975 Information

Any apparent effects from dredge spoil: ______
Approximate length of channel: ______
Body of water that channel empties into: ______

Comments/
Recommendations

Fish & Wildlife Work Group:

Public & Recreation Work Group:

GREAT (Appendix L). The field work of the Minnesota Department of Natural Resources in the area (Appendix M) was very important in providing justification for the project.

The Corps is developing the plans for the project. It held an interdepartmental, interagency meeting on the project planning process on January 7, 1979. Initial cost estimates for the project ranged from $250,000 to $400,000.

D. CONCLUSIONS (Following are conclusions which can be directly justified by the work of the Side Channel Work Group)

SCWG CONCLUSION 1

The Side Channel Work Group was partially successful in fulfilling its responsibilities within the GREAT.

Justification:

The SCWG:

a. Conducted numerous pilot projects and related studies to determine the effects of several types of side channel modifications.
b. Implemented and recommended numerous side channel modifications.
c. Worked with the Corps on the On-Site Inspection Teams to mitigate the adverse impacts of dredged material disposal on the fish and wildlife resources.

The SCWG failed to:

a. Complete a study to definitively describe the effects of side channel openings on fish and wildlife resources (postopening studies will begin at Kruger Slough, Island 42, and Old John's Ditch in summer 1979).
b. Complete a side channel inventory of the river from Minneapolis to Guttenberg (unstated objective).

c. Actively respond to public requests for side channel openings (unstated objective).

SCWG CONCLUSION 2:

Side channel openings can enhance boat access to the river for many years.

Justification:
Side channel opening pilot projects at Buffalo City, Wisconsin, Fort Snelling State Park, Minnesota, and Mule Bend on Island 42.

SCWG CONCLUSION 3:

Side channel openings accomplished for improved boat access may be detrimental to fish and wildlife resources.

Justification:
Both State and Federal biologists have identified increasing recreational use pressure and/or the wakes and wash of large pleasure boats as partial causes of the habitat decline in some areas of the river. Providing improved boat access to the river encourages increased pressure and activities which are destructive to fish and wildlife resources.

OTHER CONCLUSIONS:

FWMWG conclusions 2 through 14, listed in Chapter III, would also be the conclusions of the SCWG.

Chapter V

FWWG RECOMMENDATIONS, JUSTIFICATIONS, AND PROCEDURES

Outline	Page

A. INTRODUCTION

When the GREAT was formed several things were occurring on the river which were very disturbing to the agencies responsible for managing fish and wildlife resources. First, dredging activities were causing the loss of habitat as a result of indiscriminant dredged material disposal methods. Second, backwaters were becoming filled with sediments at a very rapid rate and causing a rapid decline in habitat and species diversity. Third, State and Federal agencies lacked authority to conduct effective management programs on the river.

The objective of the Fish and Wildlife Work Group of GREAT in making the following recommendations is to deal with these three basic problems:

First: Change dredging and dredged material disposal practices to safeguard fish and wildlife habitat adjacent to the main channel.

Second: Implement programs to reduce the source of fine sediments which are reaching the backwaters and the volume of sediments reaching some specific backwaters, thereby prolonging the life of the habitat existing on the river.

Third: Provide authority and means for the protection and management of fish and wildlife resources on the river.

Ultimately the objective of the Fish and Wildlife Work Group is to assure that the Upper Mississippi River floodplain continues as viable habitat for fish and wildlife. By addressing problems of dredging, sedimentation, and restoration the Fish and Wildlife Work Group intends to have the present trend of habitat decline retarded and ultimately counteracted by restorative programs. In order to achieve this, the work group is making three types of recommendations: 1) recommendations of major importance relating to policy changes, 2) recommendations of major importance relating to information needs, and 3) recommendations of less overall importance relating to projects which are needed now at specific locations.

B. MAJOR RECOMMENDATIONS RELATING TO POLICY CHANGES:

RECOMMENDATION 1:

The U.S. Army Corps of Engineers should institute a new dredging and spoil disposal policy which assures that fish and wildlife habitat will be protected during dredging or the placement of dredged material. To accomplish this the Corps should be provided the needed authority and means to establish fish and wildlife as project purposes of the 9-foot channel project.

Justification:

The U.S. Congress designated that the Upper Mississippi River should be maintained as a sanctuary for wildlife, wildflowers, and fish, citing its rich and varied habitat (U.S. Congress, 1924). Several years later, Congress also authorized the Corps to develop a 9-foot navigation channel on this same stretch of river. The past and present methods of dredging and dredged material disposal used by the Corps to maintain this navigation channel often result in destruction of fish and/or wildlife habitat (Appendix 373; Grunwald, 1976; and U.S. Army Corps of Engineers, 1974). To protect the rich and varied habitat in a manner consistent with the direction of Congress, dredging and disposal methods which do not harm the habitat need to be adopted by the Corps.

It is essential to obtain Congressional authority and funding for the Corps 9-foot channel project to recognize fish and wildlife resources as part of the project purpose. Without such specific authority, the Corps may legitimately claim that it cannot barge dredged material, open side channels, alter wing dams and blocking dams, construct partial blocking dams, construct berms, obtain additional dredging equipment, or hire private dredging contractors if the work or equipment is to solely or primarily benefit fish

or wildlife resources. Specific postauthorization language needs to be included in the 9-foot channel project authorization so we can use what we have learned.

Procedure: The GREAT has developed a set of dredged material disposal plans for each pool in the St. Paul District. Disposal sites were evaluated according to their effects on fish and wildlife habitat. The dredging and disposal recommendations coming from the GREAT should show which disposal sites and dredging methods are least harmful to fish and wildlife habitat. This Fish and Wildlife Work Group recommends that the Corps adopt these methods.

It is essential that additional authorization be obtained for the Corps so that the natural resources of the river are considered equal to the navigation channel when dredging and disposal or channel modification decisions are made. We believe this could be done by including the protection and enhancement of fish and wildlife resources as a project purpose of the 9-foot channel project. This addition would generally limit the Corps authority to doing those things which have direct relationship to maintaining the 9-foot channel project or recreational facilities associated with the project. However, it would also give them authority to modify side channels located in the backwaters for the benefit of fish, wildlife, or recreation.

RECOMMENDATION 2:

An "Interagency Coordinating Committee" should be formed to provide direction and guidelines regarding fish and wildlife matters associated with main channel dredging, spoil disposal, physical river modifications, and river management studies and investigations. The Interagency Coordinating Committee would be composed of representatives

of the Fish and Wildlife Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, Iowa Conservation Commission, and Corps of Engineers.

Justification:

As the GREAT recommendations regarding dredging and main channel modifications are implemented, frequent consultation and clarification regarding fish and wildlife matters will be needed. A specific coordinating team will be needed to respond quickly in providing direction as to which course of action will best protect fish and wildlife resources. This will minimize delays in times when direction and consultations are needed.

There will also be a continuing need for coordination of broad scope river management studies and investigations. Such an interagency group as the ICC will be critical in developing and facilitating research too comprehensive for any one agency to handle.

Procedure:

Equal participation should be afforded to the Fish and Wildlife Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, Iowa Conservation Commission and Corps of Engineers. The committee would deal with comprehensive river programs and recommendations, leaving individual dredging project coordination to the On-Site Inspection Teams. However, the committee would be responsible for coordinating the On-Site Inspection Team functions.

RECOMMENDATION 3:

Establish and maintain an interagency On-Site Inspection Team (OSIT) for dredging and channel maintenance activities to eliminate environmentally adverse consequences.

Justification:

The process of making sound decisions regarding main channel maintenance is going to have to be as dynamic as the river and its resources. Though the GREAT will be presenting a package of approved channel maintenance sites and procedures, the river and its resources will likely change in the coming years. Continued consultation and communication between river management agencies will be needed as new situations arise, at particular sites, for particular problems. A continued On-Site Inspection Team is essential.

Procedure:

An On-Site Inspection Team procedure very similar to the one used by GREAT should be established (Appendix A). Some portions of the procedure will need to be modified to compensate for the phase out of some of the GREAT's formal structure. However, the GREAT's OSIT procedure has been able to deal quickly and effectively with main channel maintenance problems and should be continued. It is especially important that the appeal procedure be continued. The Interagency Coordinating Committee should be responsible for coordinating the OSIT functions.

RECOMMENDATION 4:

Develop an agreement between the Corps, Fish and Wildlife Service, and States to manage pool levels to benefit fish and wildlife. The management decisions should be coordinated through the Interagency Coordinating Committee and should be evaluated by the Committee according to probable effects on the whole of the GREAT I area.

Justification:

For many years, fluctuating water levels have concerned those agencies that deal with fish and wildlife management. Some fluctuations have obviously been caused by abundance or dearth of precipitation; however, some result from artificial manipulation at the

dams along the river. These artificially caused fluctuations that occur at inopportune times are of most concern. They often catch fish and wildlife unaware, which results in stress, loss of habitat, and sometimes death to the animals (Vanderford, 1977).

Agreements between the Corps and resource management agencies have been made to alter pool level fluctuation procedures to benefit fish and wildlife resources (Carlander, 1954). However, on many occasions the Corps decides to change a pool stage when it is very important for spawning fish, nesting birds, or den-building fur-bearers to have relatively stable pool levels. These critical times are primarily in the early spring and late fall.

An agreement that would reduce the amount of artificially created stress and obstacles to the fish and wildlife inherent in pool level fluctuations is needed. This agreement will become more important through the next several decades as the amount of spawning, nesting, and lodge-building habitat is reduced by siltation. The agreement would reduce the adverse impacts of the 9-foot channel project on the fish and wildlife resources and would make it possible to enhance the habitat.

Procedure:

During the early spring, fall, and winter, the Corps would consult with the Interagency Coordinating Committee before changing pool levels. A set of general guidelines would be provided by the committee to help reduce the need for consultation on minor matters. Every attempt would be made by the Corps to maintain stable water levels if the Interagency Coordinating Committee determines that there is a critical need for stable conditions to assure successful spawning, nesting, or lodge building on the river. A procedure should also be developed whereby the Interagency Coordinating Committee could have artificial fluctuations in pool levels accomplished or pool

levels maintained during any time of the year to enhance fish and wildlife resources, when it would not conflict with navigation of the river.

RECOMMENDATION 5:

Implement and use fully the programs administered by USDA agencies, including SCS and ASCS, and similar state programs, to effect reduction in fine sediments reaching the Upper Mississippi River and its backwaters and to maintain and restore wetlands in sediment and runoff-contributing watersheds. Congress and the state legislatures are urged to continue supporting these soil and water conservation measures authorized for implementation by their executive agencies.

Justification:

The most serious threat to the longevity of fish and wildlife resources of the Upper Mississippi River is sedimentation in the backwaters (McHenry, et al, 1978). Studies done for GREAT indicate that the backwaters will survive for approximately 30 to 50 more years before habitat diversity is reduced to predominantly type 2 and 3 wetlands. The highest priority possible must be given to sediment reduction if the rich diversity of the river as we know it is to survive. The very rapid rate of sedimentation further demands that something of substance be done within a few years.

Procedure:

The U.S. Soil Conservation Service has determined that the fine sediments entering the river's backwaters and pools are coming primarily from 17 counties in Minnesota, Wisconsin, and Iowa (Sediment and Erosion Work Group, 1979). The Soil Conservation Service estimates that the amount of sediments reaching the river could be

reduced by one-half if the newly enacted Rural Clean Water Act (RCWA) (U.S. Congress, 1977) were implemented in full force.

There are degrees of latitude available to Department of Agriculture administrators in emphasis and funding of programs. For a national resource such as the Mississippi River, priority should be given to the full and effective use of existing legislative and program authorities, funding sources, and organizational capabilities to effect water conservation and erosion control practices in watersheds of the river, so that the values to society provided by the river may continue to be realized at their fullest potential for the longest time possible.

Further, the Agricultural Stabilization and Conservation Service (ASCS) proposals for soil conservation projects eligible for funding on the land are subject to funding modifications as well as additions, deletions, or increased cost sharing for specific practices at numerous decision-making levels. County, State and national reviewing groups can change program objectives or emphasis depending on policies formulated by their various administrators. We recommend that the ASCS emphasize soil and water conservation measures at all of these decision-making levels, with full recognition of the consequences to the Upper Mississippi River and its tributaries.

The potential of the Rural Clean Water Act program should be quickly and fully explored to determine if it is environmentally sound and economically feasible. If the program is shown to be environmentally and economically sound, the Fish and Wildlife Service and State departments of natural resources should do everything possible to get the program implemented. If other programs can be used to attain the same goal, they also should be quickly investigated and pursued.

RECOMMENDATION 6:

Provide the organization, authority, and funds necessary to manage the Upper Mississippi River and its backwaters as a biological unit, maintaining suitable habitat for all fish and wildlife on the river.

Justification:
Effective management of fish and wildlife resources in the Upper Mississippi river corridor has traditionally been hampered by a lack of authority to initiate land management on General Plan land of the Upper Mississippi River Wild Life and Fish Refuge (UMRWFR), lack of continuity in management planning and implementation, and lack of funds for these efforts. Piecemeal efforts by various agencies have been ineffective in achieving substantial progress toward solving the problems facing fish and wildlife management. The initiation of management of the river as a single system or biological unit is expected to increase program effectiveness for all species and interests. Without this new management approach, the diversity of habitat along the river system will continue to decline.

Procedure:
Several means could be used to implement this recommendation. However, the form and authority which could be used to accomplish this recommendation are controversial. The FWWG has found it impossible to agree on which form and authority would be best. Therefore, the FWWG is presenting a number of possible alternatives that could be used to address the recommendation. None of these procedures has the unanimous support of the FWWG, although the recommendation itself has strong support from all work group members.

Alternative Procedures

Procedure "a":
Provide authority and means to the Fish and Wildlife Service to plan for and manage the fish and wildlife on the Upper Mississippi

River in equal partnership with the States of Iowa, Minnesota, and Wisconsin consulting with the Corps of Engineers when its interests are involved or affected. This group would be called the Fish and Wildlife Partnership Team.

Advantages: One existing agency would have the lead role. A Federal agency in the lead role would make congressional funding and authorization less complex. The resources of the biologists from all the involved management agencies would be available to the Team for decisions on any given area of the river. One group could have comprehension of and authority over the management of the entire river system.

Disadvantages: The team would have no means of arbitrating disagreements when they occurred between the different agencies. The agencies involved would all have to agree to delegate their respective management decision-making authorities to the team.

The support within the FWWG for this procedure alternative is as follows:

SUPPORT	OPPOSE
Wisconsin DNR	Minnesota DNR
Iowa Cons. Comm.	Fish and Wildlife Service
	Corps of Engineers

Procedure "b":

Provide authority and means to the Fish and Wildlife Service to plan for the management of the fish and wildlife on all of the Upper Mississippi River with major consultation and implementation assistance from the States of Iowa, Minnesota, and Wisconsin, consulting with the Corps of Engineers when its interests are involved or affected. Management plans would be implemented only if the agency with jurisdiction over the area in question agreed to pursue the projects. This group would be called the Fish and Wildlife Management Team.

Advantages: One existing agency would be in the lead role. A federal agency in lead role would make U.S. congressional funding and authorization less complex. The resources of the biologists from all the involved agencies would be available to the team for decisions on any given area of the river. One group would be providing management input over the entire river system.

Disadvantages: The States would have limited influence on the final river management priorities and decisions of the Service.

The support within the FWWG for this procedure alternative is as follows:

SUPPORT	OPPOSE
Minnesota DNR	Wisconsin DNR
Corps of Engineers	Iowa Cons. Comm.
	Fish and Wildlife Service

Procedure "c":

Implement Recommendations 8, 9, and 10 using the Fish and Wildlife Service as the lead agency in a loose organization form.

Essentially this procedure is the same as procedure "b", although there is no specific reference to the creation of a partnership team and it emphasizes lands within the Refuge boundaries. Advantages and disadvantages would be the same as in procedure "b", with the additional disadvantage of being limited to Refuge areas.

The support within the FWWG for this procedure alternative is as follows:

SUPPORT	OPPOSE
Minnesota DNR	Wisconsin DNR
Fish and Wildlife Service	Iowa Cons. Comm.
Corps of Engineers	

Procedure "d":

Expand the concepts of Recommendations 2 and 9 so that the Interagency Coordinating Committee (ICC) would coordinate the development of an interagency, comprehensive management plan for the GREAT I study area including the backwaters, with each agency taking the lead role in their respective areas.

This would expand the responsibilities of the ICC beyond the main channel to include the backwaters. The management direction of the ICC to the various agencies would have the same advisory authority that the ICC would have with the Corps in main channel dredging matters. The Refuge, the Corps, and the States would all develop their respective management plans for the river with active participation from the other members of the ICC, using common guidelines and format.

Advantages: One coordinating group would deal with both main channel and backwater areas of the river. Duplication of efforts would be avoided and a means to closely coordinate management decisions for the main channel and backwater areas would be provided. The Corps would be an active participant.

Disadvantages: No agency would have specific authority to implement recommendations made.

The support within the FWWG for this procedure alternative is as follows:

SUPPORT	OPPOSE
Fish and Wildlife Service	Minnesota DNR
Corps of Engineers	Wisconsin DNR
	Iowa Cons. Comm.

Procedure "e":

An interagency approach, with regulatory powers, should be used for all management on the Upper Mississippi River. The interagency

group should be formed under the GREAT format and be directed by the Upper Mississippi River Basin Commission.

Advantages: The Upper Mississippi River Basin Commission would provide direction and an arbitrating function when impasses are reached on management decisions.

Disadvantages: Basin commissions as an entity may be discontinued in the future. It is not clear what authority the management team would have.

The support within the FWWG for this procedure alternative is as follows:

SUPPORT	OPPOSE
(NONE)	Minnesota DNR
	Wisconsin DNR
	Iowa Cons. Comm.
	Fish and Wildlife Service
	Corps of Engineers

RECOMMENDATION 7:

Because present State and Federal funding and management for fish and wildlife resources on the river are inadequate, it is recommended that objectives and budgets of the respective agencies be realigned so that potential fish and wildlife resource benefits on the Upper Mississippi River are realized.

Justification:
The studies of the backwaters commissioned by the Fish and Wildlife and the Sediment and Erosion Work Groups have shown that the backwaters will change significantly in the next 50 years if the present land treatment practices and river management practices

continue unchanged (Claflin and Weinzierl, 1978; Fremling, et al, 1979; Grunwald, 1976; Holzer and Ironside, 1977; McHenry, et al, 1978; Sediment and Erosion Work Group, 1978; Weldon, 1975-1978). The backwaters will experience serious losses in depth, open water areas, and diversity of vegetation and fauna.

A major barrier exists to implementing management programs on the river's backwaters which are so urgently needed. Neither the Fish and Wildlife Service's Upper Mississippi River Wild Life and Fish Refuge nor the States' natural resources agencies have funding adequate for backwater management. If the productivity of the Upper Mississippi River floodplain is to be maintained, increased funds must be provided to the refuge and to the states.

Funds must be provided to implement maintenance and restorative programs if habitat for such priority species as the canvasback duck, walleye, and bald eagle is to be maintained on the Upper Mississippi River. The sediment loads entering the river and trapping efficiency of the reservoir-like pools of the river are pushing the backwaters toward terrestrial habitat (McHenry et al, 1978). Physical management must be used if this evolution is to be retarded or stopped.

Procedure: Funding for this purpose should be a continuing annual appropriation.

RECOMMENDATION 8:

Provide the land control and authority necessary for development and management of the Upper Mississippi River Wild Life and Fish Refuge as a fully effective component of the National Wildlife Refuge System in meeting national needs for fish and wildlife restoration, protection, and use.

Justification:

The Fish and Wildlife Service has very limited authority to manage the refuge for the protection and enhancement of fish or wildlife. No authority is available to control access to and use of closed areas when they are needed for waterfowl sanctuaries during migrations. Land management authority is limited on land within the refuge. Private land inholdings can preclude appropriate fish or wildlife management practices by the refuge staff. Some additional authority is needed to effectively manage the refuge for the benefit of fish and wildlife.

Procedure:

a. Replace the 1963 Cooperative Agreement between the Department of the Army and the Department of the Interior with a revised agreement that generally affords authority to the Fish and Wildlife Service to manage all General Plan(1) lands and waters as if owned in fee title by the Fish and Wildlife Service and includes specific authorities to:

   1. Manage for wildlife purposes all timber on lands included in the General Plan.
   2. Prevent the disposal of General Plan lands for commercial or industrial uses when these uses will be detrimental to the fish and wildlife resources of the Upper Mississippi River.
   3. Make capital developments on General Plan lands in the same manner as they might be made on Fish and Wildlife Service fee title lands subject only to required environmental permits from the Corps.(2)
   4. Manage the permitting or development of public use facilities

(1) General Plan for Use of Project Land and Water Areas for Wildlife Conservation and Management. Revised 1963.

(2) This relates to Corps/Service interagency agreement permits.

on General Plan lands consistent with the purposes of the Upper Mississippi River Wild Life and Fish Refuge.

5. Manage all lands, including those designated as suitable for agriculture, in a manner designed to provide planned wildlife management benefits whether that is by use of agricultural practices or other means.
6. Determine disposition of dredge spoil, if any, within the Upper Mississippi River Wild Life and Fish Refuge.

b. Complete the public acquisition of all lands and waters and rights to such lands and waters that are appropriate and desirable for fish and wildlife management purposes within the river corridor.

c. (There is a disagreement within the FWWG on the wording of section c of this recommendation. Three different forms were proposed. The three alternatives and their respective support are as follows:)

First Procedure:

Provide authority to designate and enforce wildlife sanctuaries closed to all or selected types of public use during fall waterfowl migrations for protection and management of endangered species and migratory waterfowl, except for the main channel area, with approval of affected states.

SUPPORT	OPPOSE
Minnesota DNR	Fish and Wildlife Service
Wisconsin DNR	Corps of Engineers
Iowa Cons. Comm.	

Second Procedure:

Provide authority to designate and enforce wildlife sanctuaries closed to all or selected types of public use during fall waterfowl

migrations for protection and management of endangered species and migratory waterfowl, except for the main channel area, with consultation with the affected states.

SUPPORT	OPPOSE
Fish and Wildlife Service	Minnesota DNR
Corps of Engineers	Wisconsin DNR
	Iowa Cons. Comm.

Third Procedure:

Provide authority to designate and enforce wildlife sanctuaries closed to all or selected types of public use during fall migrations for protection and management of endangered species and migratory waterfowl, except for the main channel area. (No specific reference to either approval of or consultation with the states.)

SUPPORT	OPPOSE
Fish and Wildlife Service	Minnesota DNR
Corps of Engineers	Wisconsin DNR
	Iowa Cons. Comm.

RECOMMENDATION 9:

The Fish and Wildlife Service in consultation with the states and the Corps of Engineers should develop and implement a comprehensive plan for the management of the Upper Mississippi River Wild Life and Fish Refuge. The plan should consider all the fish resources and wildlife resources of the area and consist of the necessary strategic and operational components to make explicit the background, authorities, and justification for the refuge and objectives, policies, coordination measures, and procedures by which it will be operated.

Justification:

A specific and explicit plan for the Upper Mississippi River Wild Life and Fish Refuge would provide the basis needed to achieve

objectives, whether they be for waterfowl, fish, or furbearers. Further, it is the best communication and coordination mechanism for operational programs in the multijurisdictional effort.

A specific and explicit plan for the refuge is prerequisite as the frame of reference on which to base objective program evaluations and redirections.

No comprehensive or consistent plan or policy directs the actions of individuals and agencies involved in managing the fish resources and wildlife resources of the refuge. Each pursues proposed accomplishments perceived individually as desirable with only loose coordination and direction of effort. The result is unnecessary misunderstanding between persons and agencies, loss of effectiveness and efficiency, and the inability to optimize since objectives and alternative approaches to them are not identified.

Procedure:
The Fish and Wildlife Service, in consultation with the States, should continue to develop a comprehensive plan for the management of the refuge. This plan should consider and provide for all fish resources and wildlife resources on the river. The plan should consist of the necessary strategic and operational components to make explicit the background, authorities, and justification for the refuge and objectives, policies, coordination measures, and procedures by which it will be operated. The development and implementation of this comprehensive plan would include the active participation of the States.

RECOMMENDATION 10:

Implement administrative policy and procedures on General Plan and Fish and Wildlife Service fee lands of the Upper Mississippi River Wild Life and Fish Refuge to eliminate the vesting of exclusive private or commercially advantageous rights to public lands and waters in individuals or commercial enterprises by permits, where those

activities or rights are detrimental to fish and wildlife values or management purposes.

Justification:

Many areas supposedly set aside and dedicated to the enhancement of fish and wildlife resources are being used by public or private interests for activities which displace fish and/or wildlife uses.

Procedure:

This is a matter that can generally be handled by existing regulations and authorities. However, it is also a matter that impacts the total resource on the river if eliminating such inappropriate and disruptive uses is not accomplished.

Therefore, we are recommending that such regulations and authorities which are available should be used to eliminate all public and private uses of fish and wildlife refuges and sanctuaries which disrupt or displace fish and wildlife resources.

RECOMMENDATION 11:

(Note: This was the only recommendation approved by the FWWG which did not receive unanimous support of the recommendation concept. See the end of the recommendation procedure for the description of the division.)

The U.S. Army Corps of Engineers should be provided authority and means to modify backwater areas for fish and wildlife and recreation management purposes as recommended by the Interagency Coordinating Committee.

Justification:

Many areas in the backwaters need side channel modifications to

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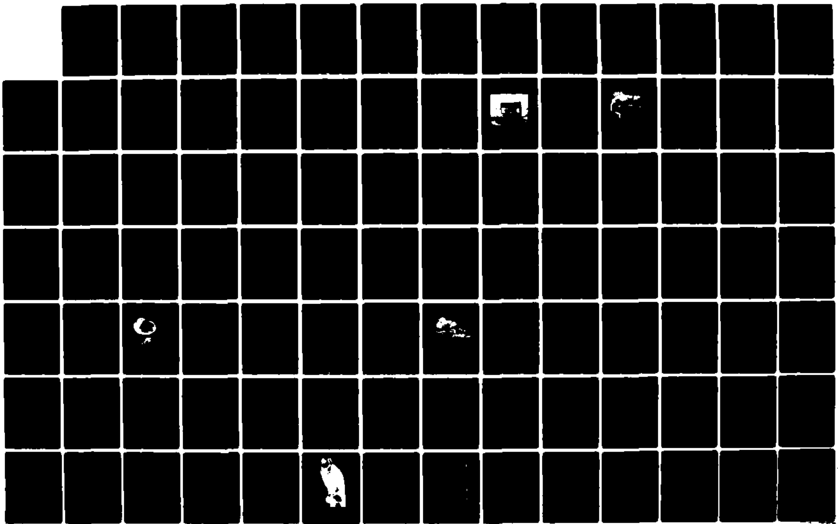

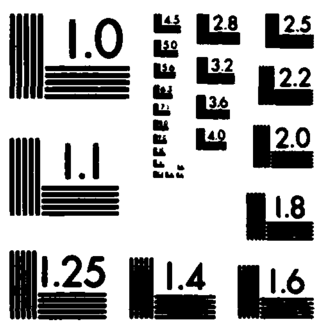

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restore flow, restore access, or reduce sedimentation because of long-term impacts of the 6- and 9-foot channel projects (Carlander, 1954; Fremling, et al, 1979; Claflin and Weinzierl, 1978; Fremling, et al, 1976). Although the 9-foot channel increased habitat values and recreation access (Green, 1960), and the 6-foot channel project provided structures which are now valuable as fish habitat (Wisconsin Department of Natural Resources, 1978), the long-term effect of these two projects has been a decline in the habitat values and access (Corps of Engineers, 1974) that the projects originally enhanced.

These projects are designed to maintain the main channel and prevent the meandering character of a natural river. The projects are becoming effective (U.S. Army Corps of Engineers, 1974). Backwater areas are being filled with sediment and total water volume and flow in the backwater are being reduced (McHenry, et al, 1978). Further, the locks and dams have created reservoir conditions which accelerate sedimentation and water volume reduction (Claflin and Weinzierl, 1978).

The projects are having adverse effects on habitat values and recreation access which they originally enhanced. The Corps of Engineers needs authority to compensate for these secondary adverse impacts in the backwaters to maintain the high habitat values and recreation access.

Procedure:

Specific congressional authority should be sought for the Corps to open or modify side channels in the backwaters which have been adversely affected by secondary impacts of the 6- and 9-foot channel projects. The congressional authority should be sought by both the Corps and the Upper Mississippi River Basin Commission.

The authority should provide the Corps the means to open or modify side channels both adjacent and remote to the main channel. The authority should prescribe that the Corps would be able to make

these openings or modifications only at the recommendation of the Interagency Coordinating Committee. Any proposed modification will be evaluated for secondary impacts on sediment transport.

The support within the FWWG for this recommendation is as follows:

SUPPORT	OPPOSE	NOT VOTING(1)
Minnesota DNR	Fish and Wildlife Service	Iowa Cons. Comm.
Wisconsin DNR		Corps of Engineers

C. MAJOR RECOMMENDATIONS RELATING TO INFORMATION NEEDS:

RECOMMENDATION 12:

Implement phase II of the Weaver Bottoms rehabilitation and conduct the phase III study. (Appendix O; Nielsen, et al, 1978)

Justification:
On April 26, 1977, the GREAT agreed to a three-part program for the implementation of a remedial program for the Weaver Bottoms, pool 5 (Appendix O). Phase I was a study of the probable effects of the remedial program on the flood stage and sedimentation on the Wisconsin side of the river. Phase II was to implement the rehabilitation program should Phase I show that the program's likely effects on flood stages and sediment transport would be minimal. Phase III was to be a follow up study of the Weaver Bottoms and Belvidere areas to document the effects of the program.

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(1) No representatives of the Iowa Conservation Commission or the Corps of Engineers were present when this recommendation was considered by the work group (April 17, 1979). Neither agency asked to have the issue brought up again at any later meetings.

Phase I is complete (Nielsen, et al, 1978). The study has concluded that flood stages may increase on the Wisconsin side by a maximum of 0.3 to 0.6 foot during moderate floods (Appendix P). Less impact is predicted for abnormally high floods such as those that occurred during 1965 and 1969. Sediment transport would not increase in Belvidere Slough or Spring Lake (Simons and Chen, 1977).

The Phase I report has provided the positive answers needed to proceed with Phase II, implementing the rehabilitation measures. The rehabilitation program has been well researched (Fremling et al, 1976; Nielsen, et al, 1978), is urgently needed to improve the Weaver Bottoms, and is needed to prove the methods being tried so that they can be used to maintain and restore other backwater areas.

Procedures:

The projects required to implement the Weaver Bottoms rehabilitation project should be pursued through the Corps. The Corps could conduct the project with present authority as a predicted side effect of the rehabilitation project is the improved sediment transport capacity of the main channel through the Weaver Bottoms-Belvidere area (Simons and Chen, 1977). Drs. Simons and Chen have calculated that dredging requirements would be reduced from 15 to 25 percent in the area if the rehabilitation project were implemented.

An Environmental Impact Statement (EIS) will probably be necessary. The Fish and Wildlife Service and the Corps should be responsible for this report.

The Phase III study should be conducted under the direction of the Interagency Coordinating Committee (Recommendation 2). The Fish and Wildlife Service or the Corps would fund the research and be responsible for contracting and administering the work.

RECOMMENDATION 13:

Provide means to map the distribution of submerged aquatic vegetation, invertebrates (including clams), bottom types and depths, and submerged physical features of the river.

Justification:
This information is essential to properly manage the resources on the Upper Mississippi River. Base-line data are crucial in the development of a comprehensive management plan for the river's natural resource. Although some inventory work was accomplished by the FWWG during the GREAT program, much of the work did not deal with submergent habitat, and that which did was for limited areas.

Procedure:
The Interagency Coordinating Committee (Recommendation 2) should solicit proposals for accomplishing such an inventory to determine what methods may be possible and practical. If a method does emerge which appears possible and practical the ICC should seek multiagency funding and an agency to administer the contract for the work.

RECOMMENDATION 14:

Continue monitoring program at Kruger Slough and Island 42 to document effects of opening side channels.

Justification:
Obtaining quantitative and qualitative data on the effects of side channel openings is crucial to justifying such work on the river. Side channel opening may be a very valuable tool for backwater management. GREAT has very limited documentation of side channel opening effects; however, GREAT has provided for two openings to be made in pool 5 and has obtained extensive preopening data at the sites (Fremling, et al, 1979). Therefore, it is crucial to

future backwater management programs that follow-up monitoring be conducted at these openings.

Procedure: The Fish and Wildlife Service and the Minnesota Department of Natural Resources have made a commitment to conducting such a monitoring program through 1982 (Appendix Q). The data and reports are to be submitted to the Upper Mississippi River Conservation Committee annually, with a final comprehensive report on the projects to be published in the Upper Mississippi River Conservation Committee Proceedings in 1983.

RECOMMENDATION 15:

Investigate the potential of using the "Finger Lakes" at the dike of lock and dam 4 as a "physical model" for backwater management techniques which have been and may be proposed for the future.

Justification:
Although the FWWG has investigated the potential use of numerous backwater management techniques, some techniques were not tested; some that were are still subjects of some question. Testing these techniques in a well-controlled situation would be very beneficial in providing answers to concerns of citizens and agencies.

The GREAT has asked the Corps to place a system of culverts into the series of lakes (Appendix R) to control water flow into all five of the lakes. The Corps has indicated that it will probably install the culverts within 2 years (by the end of 1980) if money is available. When the culverts are in place, the Finger Lakes will become an ideal real world model which could be used to test numerous rehabilitation techniques being considered for backwaters. Water flows could be altered, channels could be altered, structures

could be placed, and other techniques could be tried in a small-scale system, where control systems could be established immediately next to the test system.

Procedure:
The development of studies and the use of the area as a research model should be accomplished through the Interagency Coordinating Committee (Recommendation 2).

RECOMMENDATION 16:

Provide means to conduct life history studies of the fishes of the Upper Mississippi River.

Justification:
The life histories of river fishes are significantly different than those of lake resident fishes. Knowledge of river fishes is essential to the development of an effective protection and management program for fish on the river, because maintenance and operation of the 9-foot channel may be seriously affecting the survival of numerous species.

Procedure:
These studies should be accomplished through the Interagency Coordinating Committee (Recommendation 2). The Interagency Coordinating Committee would identify the species to be studied in the following priority:

1. Major sport fishes.
2. Major commercial fishes.
3. Minor sport and commercial fishes.
4. Minnows.

RECOMMENDATION 17:

Conduct an investigation to assess the potential environmental impact of late fall and early winter barging and navigation practices on waterfowl, furbearers, and fishes of the river. And further, investigate the economic impact of restricting fall navigation.

Justification:
Late fall and early winter commercial navigation on the river increases hazards to fish and wildlife. Water levels are sometimes kept high until freeze-up, then dropped when the navigation channel seems impassable. Barges containing toxicants or other hazardous materials are more subject to hazards during ice conditions while the fish populations are concentrating in the main channel to overwinter, thus making them more vulnerable to a toxicant spill. The environmental hazards must be more precisely defined, and the economic implications of closing the navigation channel during late fall before ice starts forming on the river must be determined.

Procedure:
The investigation of the ecological impact of late fall and early winter barging and of the economic impact of restricting late fall navigation should be accomplished through the Interagency Coordinating Committee (Recommendation 2).

RECOMMENDATION 18:

Develop a program to evaluate dredging and island creation in backwater areas for restoration purposes.

Justification:
Because sedimentation threatens the life expectancy of backwater

areas, dredging operations may be needed to prolong and/or restore their biological productivity. This practice has been done in many areas of the Nation with success.

Island creation associated with deep-water, low-flow, and away-from-main-channel conditions should be constructed with backwater sediments, not channel maintenance materials. This will extend the life expectancy of critical backwater areas.

This method of backwater restoration has a dual benefit to the environment. The islands created from these fine sediments have unlimited revegetation potential and could produce a highly acceptable waterfowl habitat. The hole left from dredging would enhance fishery habitat in the backwater.

Procedure:
The investigation of dredging and island creation in backwaters may be able to be accomplished in conjunction with the Phase II and Phase III projects in the Weaver Bottoms. The Interagency Coordinating Committee should determine if it can be accomplished through the Weaver Bottoms projects or will require a separate investigation project.

RECOMMENDATION 19:

Provide means to determine the most beneficial procedures for bottomland hardwood timbers management for wildlife enhancement on the Upper Mississippi River.

Justification:
The major emphasis on wildlife management on the Mississippi River has centered on aquatic ecosystems. A major portion of the river's corridors is in bottomland hardwood timber. Information is needed on the extent of use of the habitat type by all species of wildlife and optimum management measures which can be applied to enhance this use.

The southeastern section of the country is the only region which has developed methods for effectively managing their bottomland woodlands for the maximum benefit of wildlife. If similar methods are developed for the Upper Mississippi River, the river's bottomland forests could be manipulated to provide much more habitat for wildlife.

Procedure:

The development of more effective forest management techniques to benefit wildlife should be accomplished through the Interagency Coordinating Committee (Recommendation 2).

D. RECOMMENDATION FOR SITE SPECIFIC PROJECTS:

(Lesser overall importance than those in sections B and C)

RECOMMENDATION 20:

The Corps of Engineers should continue restoring and establishing shoreline protection on a yearly basis following the design and priority list provided by the Fish and Wildlife Management Work Group until completion.

Justification:

The Corps of Engineers began a program of shoreline protection in the St. Paul District during the GREAT program. The Fish and Wildlife Management Work Group provided the Corps with a priority list of old and new sites where such work should be done. We believe that restoring and creating shoreline protection is worthwhile for the benefit of the river's fishes (Wisconsin DNR, 1978) and the maintenance of the navigation channel.

Procedure:

The Corps of Engineers should continue to restore and establish

shoreline protection structures using existing authority and funding within the Operations and Maintenance Branch of the Corps.

RECOMMENDATION 21:

Construct a gated culvert through the dike of lock and dam 10 to provide a water supply to the waterfowl ponds in pool 11.

Justification:
One of the first recommendations of the Side Channel Work Group was that a culvert with a control gate be placed through the dike of lock and dam 10 at Guttenberg, Iowa, to convert a series of old fish ponds into a productive waterfowl resting and feeding area (Appendix I). This project was not attempted during the GREAT program because other projects had higher priority. However, the culvert is still considered very important to restoring the ponds to productive use and restoring the freshwater flows to the adjacent sloughs that were cut off when the lock and dam 10 dike was built.

The fish ponds were constructed at the same time that the lock and dam were constructed. However, the designers of the ponds and dam failed to provide for a water supply for the fish ponds, substantially limiting the usefulness of the ponds for either fish production or waterfowl use. Rectifying this oversight is appropriate. The culvert would enable the wildlife biologists to fluctuate the water levels in the ponds, and possibly the adjacent sloughs, to produce the most attractive waterfowl feeding habitat possible.

Procedure:
The Corps should accomplish this work using Operation and Maintenance funds to correct a project deficiency. A 100-cubic foot per second gated culvert should be constructed through the dike of lock and dam 10, using existing Corps authority. A trash rack should be placed n the culvert. The culvert gate adjustments

should be made by personnel from the refuge or the Iowa Conservation Commission.

RECOMMENDATION 22:

Investigate the impact of altering the cuts between the islands separating Lake Onalaska from the main channel of the Mississippi. Initiate structural measures if the results of the investigation determine that the alterations would benefit Lake Onalaska.

Justification:
The loss of depth and diversity within Lake Onalaska is indisputable (Claflin and Weinzierl, 1978). The primary cause of this problem is fine sediments transported into the lake from the main channel, especially during floods (Claflin and Weinzierl, 1978). The vast majority of these sediments are entering the lake through three side channels from the main river channel. Therefore, it is essential for the maintenance of the excellent fish and wildlife habitat existing in Lake Onalaska that the possible effects of altering these three side channels be investigated, and the alterations be accomplished if they appear promising.

Procedure:
The investigation of the probable effects of the side channel alterations should be accomplished through the Interagency Coordinating Committee (Recommendation 2). The investigation should focus on determining the best methods of reducing sediment transport into Lake Onalaska while maintaining adequate water flow for fish survival, the effect the Black River has on sedimentation rates in the lake, and the effect reduced water flow would have on fish in the lake. Any investigations should be coordinated with the Fish and Wildlife Service's National Fisheries Research Laboratory, the Northern Prairie Research Laboratory, and the

National Pesticides Laboratory, all of which were conducting investigations in Lake Onalaska at the end of the GREAT I term.

If the proposed rehabilitation work appears promising and feasible the Corps should undertake the project. Existing authority would probably cover the project because the partial blocking dams would increase the sediment transport efficiency of the main channel, decreasing dredging requirements at Dakota and Dresback, Minnesota. Any projects which would partially block the channels at the upper end of Lake Onalaska should provide for continued access for fishing boats.

RECOMMENDATION 23:

Place a set of two gated culverts at the dike of lock and dam 4.

Justification:
The GREAT unanimously endorsed this project in a letter sent to the St. Paul District in 1978 (Appendix L). The critical need for additional water flow in the area immediately downstream from the dike was well documented in that letter. The Minnesota Department of Natural Resources provided much data establishing the problems in the area (Appendix M). Freshwater flows are needed to restore the quality of fish habitat.

Procedure:
The Corps has been asked to construct these culverts. Authority and precedent already exist for the project.

RECOMMENDATION 24:

Determine and implement the best means for reducing fine sediment flow into Big Slough (RM 670.5, Iowa) while keeping the slough open to fishing boats.

Justification:

The primary inlet to Lansing Big Lake, pool 9, is Big Slough, RM 670.5. Big Slough is located immediately below a major source of fine sediments, the Upper Iowa River, and on the outside of a bend of the Mississippi. The result is that the slough is carrying large quantities of both fine and coarse sediments into Lansing Big Lake (Eckblad, et al, 1977; personal communication with Doug Mullen). The situation closely resembles that of Murphy's Cut at the upper end of the Weaver Bottoms in pool 5 where the GREAT has recommended remedial work as a pilot project (Nielsen, et al, 1978).

Procedure:

The determination of the best means of reducing the sedimentation rates in Big Slough should be accomplished through the Interagency Coordinating Committee (Recommendation 2). The investigation should be a thorough engineering study leading to a recommended approach for reducing the transport of sediment into Big Slough and a design for the structure or structures recommended. The structure designs should include means for maintaining boat access.

RECOMMENDATION 25:

Develop agreement between the Corps, the Fish and Wildlife Service, Vernon County (Wis.), and the Wisconsin DNR for placing culverts and opening side channels at Blackhawk County Park near Victory in pool 9.

Justification:

When Blackhawk County Park was built in Vernon County, Wisconsin, numerous side channels and sloughs were cut off by the construction of roads and the placing of fill material. Though some culverts were placed in the roadways, they are nearly all too high to provide water flow at low control pool. At one location a side

channel was cut off for the park road without attempting a culvert. Subsequently, dredged material provided to a private property owner by the Corps was used to partially fill one of the sloughs.

The park is located on land leased to Vernon County by the Corps, and is part of an area designated for fish and wildlife management by the Fish and Wildlife Service. The road to the park from Wisconsin Highway 35, while passing through private land, was built and is maintained by the county.

By constructing effective culverts and removing the blockages from the side channels above and in the county park, oxygen depletions and freeze-outs could be eliminated throughout De Soto Bay and the area could be substantially enhanced as fish habitat. Improving the design of the culverts along the road to the park could also reduce road maintenance costs. The present culverts do not allow for sufficient water to pass during floods to avoid damage to the gravel top roads. Therefore, larger and better designed culverts would benefit the county highway department and the fishes of the river.

Procedure: We recommend that the county, Corps of Engineers, Fish and Wildlife Service, and Wisconsin Department of Natural Resources develop and implement an agreement to place effective culverts in the county's road and remove the fill from the sloughs in the park and on the private lands upstream of the park. When an arrangement is made to accomplish these tasks, the Interagency Coordinating Committee should develop a program to monitor the physical and biological effects of the culverts on De Soto Bay.

RECOMMENDATION 26:

Construct a dike along the channel side of Spring Lake in Pool 2

in order to return the lake to a productive fish and wildlife habitat and provide recreational facilities.

Justification:

Spring Lake in pool 2 is a wide place in the river approximately 10 miles downstream from the Twin Cities' major sewage treatment plant at Pig's Eye Lake. Diversity of vegetation is comparatively poor and water quality is bad (U.S. EPA, 1975; Einsweiler, 1973). Therefore, fish and wildlife use and human use of the area are limited (Einsweiler, 1973).

Spring Lake could be changed into productive fish and wildlife habitat as well as an attractive area for fishermen if a dike could be built paralleling the river's main channel, extending the natural dike to RM 820.3 (Einsweiler, 1973; extrapolated from Fremling, et al, 1976 and Nielsen et al, 1978). The dike would reduce the effects of barges, winds, and main channel river currents on the lake and the magnitude of the impact of the sewage treatment plant. With these impacts minimized, Spring Lake would have a much improved chance to develop a diverse stand of vegetation and thereby attract fish and wildlife species.

Procedure:

The dike could be built along the line of submerged bank protection and wing dams. Though some armoring or stabilization would definitely be required, dredged material could be used for the core of the dike. The dike would probably reduce dredging requirements at Boulanger Bend as a result of the increased transport efficiency in the main channel (extrapolation from Simons and Chen, 1977). The Corps could probably construct such a dike gradually as a beneficial use project for dredged material from pool 2.

E. SUMMARY OF THE FWWG RECOMMENDATIONS

The FWWG developed 26 recommendations intended to mitigate the recent decline of fish and wildlife resources on the Upper Mississippi River caused by human activity in and adjacent to the river valley. The recommendations are grouped into three categories: recommendations to change existing river management policies, recommendations to gain additional information about the river, and recommendations to implement a number of specific projects that the work group feels warrant action now. The recommendations were:

Recommendations to Change Management Policies

RECOMMENDATION 1 - The U.S. Army Corps of Engineer should institute a new dredging and spoil disposal policy which assures that fish and wildlife habitat will be protected during dredging or the placement of dredged material. To accomplish this the Corps should be provided the needed authority and means to establish fish and wildlife as project purposes of the 9-foot channel.

RECOMMENDATION 2 - An "Interagency Coordinating Committee" should be formed to provide direction and guidelines regarding fish and wildlife matters associated with main channel dredging, spoil disposal, physical river modifications, and river management studies and investigations. The Interagency Coordinating Committee would be comprised of representatives of the U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, the Iowa Conservation Commission, and U.S. Army Corps of Engineers.

RECOMMENDATION 3 - Establish and maintain an interagency On-Site Inspection Team for dredging and channel maintenance activities to eliminate environmentally adverse consequences.

RECOMMENDATION 4 - Development of an agreement between the Corps, the

Fish and Wildlife Service and the States to manage pool levels to benefit fish and wildlife. The management decisions should be coordinated through the Interagency Coordinating Committee and should be evaluated by the Committee according to probable effects on the whole of the GREAT I area.

RECOMMENDATION 5 - Implement and use fully the programs administered by USDA agencies, including SCS and ASCS, and similar state programs, to effect reduction in fine sediments reaching the Upper Mississippi River and its backwaters and to maintain and restore wetlands in sediment and runoff-contributing watersheds. Congress and the state legislatures are urged to continue supporting these soil conservation measures authorized for implementation by their executive agencies.

RECOMMENDATION 6 - [(1)] Provide the organization, authority, and funds necessary to manage the Upper Mississippi River and its backwaters as a biological unit, maintaining suitable habitat for all fish and wildlife on the river.

RECOMMENDATION 7 - Because present state and federal funding and management for fish and wildlife resources on the river are inadequate, it is recommended that objectives and budgets of the respective agencies be realigned such that potential fish and wildlife resource benefits on the UMR system are realized.

RECOMMENDATION 8 - [(1)] Provide the land control and authority necessary for development and management of the Upper Mississippi River Wild Life and Fish Refuge as a fully effective component of the National Wildlife Refuge System in meeting national needs for fish and wildlife restoration, protection, and use.

RECOMMENDATION 9 - The Fish and Wildlife Service in consultation with the states should develop and implement a comprehensive plan for the management of the Upper Mississippi River Wild Life and Fish Refuge that considers all the fish resources and wildlife resources of the

(1) work group divided on procedure for this recommendation

area and consists of the necessary strategic and operational components to make explicit the background, authorities, and justification for the refuge, and objectives, policies, coordination measures, and procedures by which it will be operated.

RECOMMENDATION 10 - Implement administrative policy and procedures on General Plan and Fish and Wildlife Service fee lands of the Upper Mississippi River Wild Life and Fish Refuge to eliminate the vesting of exclusive private or commercially advantageous rights to public lands and waters in individuals or commercial enterprises by permits where those activities or rights are detrimental to fish and wildlife values or management purposes.

RECOMMENDATION 11 - (1) The U.S. Army Corps of Engineers should be provided authority and means to modify backwater areas for fish and wildlife and recreation management purposes as recommended by the Interagency Coordinating Committee.

Recommendations to Gain Additional Information

RECOMMENDATION 12 - Implement Phase II of the Weaver Bottoms rehabilitation and conduct the Phase III study.

RECOMMENDATION 13 - Provide means to map the distribution of submerged aquatic vegetation, invertebrates (including clams), bottom types and depths, and submerged physical features of the river.

RECOMMENDATION 14 - Continue monitoring program at Kruger Slough and Island 42 to document effects of opening side channels.

RECOMMENDATION 15 - Investigate the potential of using the "Finger Lakes" at the dike of lock and dam 4 as a "physical model" for backwater

(1) The work group was divided on this recommendation.

management techniques which have been and may be proposed for the future.

RECOMMENDATION 16 - Provide means to conduct life history studies of the fishes of the Upper Mississippi River.

RECOMMENDATION 17 - Conduct an investigation to assess the potential environmental impact of late fall and early winter barging and navigation practices on waterfowl, furbearers, and fishes of the river. And further, investigate the economic impact of restricting fall navigation.

RECOMMENDATION 18 - Develop a program to evaluate dredging and island creation in backwater areas for restoration purposes.

RECOMMENDATION 19 - Provide means to determine the most beneficial procedures for bottomland hardwood timbers management for wildlife enhancement on the Upper Mississippi River.

Recommendations to Implement Specific Projects

RECOMMENDATION 20 - The Corps of Engineers should continue restoring and establishing shoreline protection on a yearly basis following the design and priority list provided by the Fish and Wildlife Management Work Group until completion.

RECOMMENDATION 21 - Construct a gated culvert through the dike of lock and dam 10 to provide a water supply to the waterfowl ponds in pool 11.

RECOMMENDATION 22 - Investigate the impact of altering the cuts between the islands separating Lake Onalaska from the main channel of the Mississippi. Initiate structural measures if the results of the investigation determine that the alterations would benefit Lake Onalaska.

RECOMMENDATION 23 - Place a set of two gated culverts at the dike of lock and dam 4.

RECOMMENDATION 24 - Determine and implement the best means for reducing fine sediment flow into Big Slough (RM 670.5, Iowa) while keeping the slough open to fishing boats.

RECOMMENDATION 25 - Develop agreement between the Corps, the Service, Vernon County (Wis.), and the Wisconsin DNR for placing culverts and opening side channels at Blackhawk County Park near Victory in pool 9.

RECOMMENDATION 26 - Construct a dike along the channel side of Spring Lake in pool 2 in order to return the lake to a productive fish and wildlife habitat and provide recreational facilities.

Figure 36. The side channel opening at Fort Snelling State Park on the Minnesota River was a unique project which facilitated the solution of a long standing controversy over the 9-foot channel project and the state park facilities.

Chapter VI

EXISTING FISHERIES RESOURCE AND USES

Outline | Page

Figure 37. The walleye (Stizostedion vitreum) is one of the most prized sport fish in the north central United States. Despite the commonly held notion that the Mississippi River is a poor quality water body, the walleye still flourishes in the river and can frequently be found along the numerous wing dams. (Drawing by Diane Whiting).

A. EXISTING FISHERIES RESOURCE

Approximately 100 species of fish have been recorded in the GREAT I study reach of the Upper Mississippi River. Rasmussen (1979) has classified these fish species by distribution and relative abundance by pools. Table 2 displays this information for the study reach.

Rasmussen (ibid) notes that only four species are classified as abundant throughout the river. These are gizzard shad, carp, emerald shiner, and bluegill. The gizzard shad and emerald shiner are important as forage species; the carp is an important commercial species. Although not classified as abundant throughout the river, the river shiner and bullhead minnow are plentiful in most areas and provide significant contributions to the river's forage base.

Thirteen species are common to the entire river, but their populations are generally smaller than those species that are classified as abundant (Table 2). However, during spawning migrations or in certain specific locations such as below the navigation dams, near wing dams and near submerged brush, large concentrations of species such as white bass, white crappie, black crappie, sauger, and freshwater drum may be found.

The shortnose gar and bowfin are commonly collected and are considered important predators which compete for food with piscivorous game fish. The silver chub is considered a forage species; while the river carpsucker, bigmouth buffalo, channel catfish, flathead catfish and freshwater drum are important components of the commercial harvest. The white bass, largemouth bass, white crappie, black crappie, sauger, and channel catfish are considered important gamefish.

Twenty-one species are considered common in certain portions of the river and occasional, uncommon, rare or even a stray from a tributary

TABLE 2

Distribution and relative abundance of Upper Mississippi River fishes by pools. Mississippi River pools are numbered according to U.S. Army, Corps of Engineers nomenclature in which a pool carries the same number as the dam which has impounded it. Data from UMRCC Fisheries Compendium (Rasmussen, 1979).

SPECIES	POOL NUMBERS 1	2	3	4	5	5A	6	7	8	9	10
Chestnut lamprey (Ichthyomyzon castaneus)				H	H			H	H	H	R
Silver lamprey (Ichthyomyzon unicuspis)					H			H	H	H	O
Lake sturgeon (Acipenser fulvescens)			H	R	H		H		H	H	H
Shovelnose sturgeon (Scaphirhynchus platorynchus)				O	O	O	O	O	O	O	O
Paddlefish (Polyodon spathula)				R	R	R	R	R	R	O	O
Longnose gar (Lepisosteus osseus)	C	C	C	C	C	C	C	C	C	C	C
Shortnose gar (Lepisosteus platostomus)	C	C	C	C	C	C	C	C	C	C	C
Bowfin (Amia calva)	C	C	C	C	C	C	C	C	C	C	C
American eel (Anguilla rostrata)			O	O	O	O	O	O	O	O	O
Gizzard shad (Dorosoma cepedianum)	A	A	A	A	A	A	A	A	A	A	A
Goldeye (Hiodon alosoides)			H	H	H		H		H		H
Mooneye (Hiodon tergisus)	C	C	C	C	C	C	C	C	C	C	C
Rainbow trout (Salmo gairdneri)								X		X	X
Mudminnow (Umbra limi)								X	X	X	
Grass pickerel (Esox americanus)										X	X
Northern pike (Esox lucius)	C	C	C	C	C	C	C	C	C	C	C
Muskellunge (Esox masquinongy)	H	H	H	H	H	X	H	H	H		
Stoneroller (Campostoma anomalum)				U				U	U	U	U
Carp (Cyprinus carpio)	A	A	A	A	A	A	A	A	A	A	A
Brassy minnow (Hybognathus hankinsoni)	H		H	H			H			H	
Silvery minnow (Hybognathus nuchalis)				C	C	C	C	C	C	C	C
Speckled chub (Hybopsis aestivalis)				C	C	C	C	C	C	C	C
Silver chub (Hybopsis storeriana)	C	C	C	C	C	C	C	C	C	C	C

Table 2 (continued)

SPECIES	POOL NUMBERS 1	2	3	4	5	5A	6	7	8	9	10
Hornyhead chub (Nocomis biguttatus)	C			X							
Golden shiner (Notemigonus crysoleucas)				O			H	H	H	O	O
Pallid shiner (Notropis amnis)			H	H	H			R		H	H
Pugnose shiner (Notropis anogenus)				X							
Emerald shiner (Notropis atherinoides)	A	A	A	A	A	A	A	A	A	A	A
River shiner (Notropis blennius)	A	A	A	A	A	A	A	A	A	A	A
Ghost shiner (Notropis buchanani)	R	R	R	R	R	R	R	R	R	R	R
Common shiner (Notropis cornutus)	O								H	H	H
Bigmouth shiner (Notropis dorsalis)	O	O	O	O	O	O	O	O	O	O	O
Pugnose minnow (Notropis emiliae)	O	O	O	O	O	O	O	O	O	O	O
Spottail shiner (Notropis hudsonius)	C	C	C	C	C	C	C	C	C	C	C
Rosyface shiner (Notropis rubellus)							X				
Spotfin shiner (Notropis spilopterus)	C	C	C	C	C	C	C	C	C	C	C
Sand shiner (Notropis stramineus)	O	O	O	O	O	O	O	O	O	O	O
Weed shiner (Notropis texanus)				U	U	U	U	U	U	U	U
Mimic shiner (Notropis volucellus)			R	R	R	R	R	R	R	R	R
Suckermouth minnow (Phenacobius mirabilis)					H				H	H	H
Bluntnose minnow (Pimephales notatus)	O	O	O	O	O	O	O	O	O	O	O
Fathead minnow (Pimephales promelas)	U	U	U	U	U	U	U	U	U	U	U
Bullhead minnow (Pimephales vigilax)				A	A	A	A	A	A	A	A
Creek chub (Semotilus atromaculatus)			X	X					X	X	
Pearl dace (Semotilus margarita)	X										
River carpsucker (Carpiodes carpio)	C	C	C	C	C	C	C	C	C	C	C
Quillback (Carpiodes cyprinus)	C	C	C	C	C	C	C	C	C	C	C
Highfin carpsucker (Carpiodes velifer)	O	O	O	O	O	O	O	O	O	O	O
White sucker (Cataostomus commersoni)	C	C	C	C	C	C	C	C	C	C	C
Blue sucker (Cycleptus elongatus)				U	H	H	H	H	H	H	H
Northern hog sucker (Hypentelium nigricans)				R	R	R	R	R	R	R	R
Smallmouth buffalo (Ictiobus bubalus)	R	R	R	R	R	R	R	R	R	R	R
Bigmouth buffalo (Ictiobus cyprinellus)	C	C	C	C	C	C	C	C	C	C	C
Black buffalo (Ictiobus niger)				H	H	H	H	H	H	H	H

Table 2 (continued)

SPECIES	POOL NUMBERS 1	2	3	4	5	5A	6	7	8	9	10
Spotted sucker (Minytrema melanops)				O	O	O	O	O	O	O	O
Silver redhorse (Moxostoma anisurum)	U			U	U	U	U	U	U	U	U
Golden redhorse (Moxostoma erythrurum)				U	U	U	U	U	U	U	U
Shorthead redhorse (Moxostoma macrolepiodotum)	O	O	O	O	O	O	O	O	O	O	O
Greater redhorse (Moxostoma valenciennesi)					H				H		
Black bullhead (Ictalurus melas)	O		O	O	O	O	O	O	O	O	O
Yellow bullhead (Ictalurus natalis)		O		O	O	O	O	O	O	O	O
Brown bullhead (Ictalurus nebulosus)		H	H	H	H		H		H	H	
Channel catfish (Ictalurus punctatus)	C	C	C	C	C	C	C	C	C	C	C
Stonecat (Noturus flavus)				H			H			H	H
Tadpole madtom (Noturus gyrinus)			U	U			H	H	H	U	
Flathead catfish (Pylodictis olivaris)	C	C	C	C	C	C	C	C	C	C	C
Pirate perch (Aphredoderus sayanus)					X	X	X	X	X	X	
Trout-perch (Percopsis omiscomaycus)	O	O	O	O	O	O	O	O	O	O	O
Burbot (Lota lota)			H	H	H				H	H	
Brook silverside (Labidesthes sicculus)			C	C	C	C	C	C	C	C	C
Brook stickleback (Culaea inconstans)				X				X			
White bass (Morone chrysops)	C	C	C	C	C	C	C	C	C	C	C
Yellow bass (Morone mississippiensis)							O	O	O	O	O
Rock bass (Ambioplites rupestris)	C	C	C	C	C	C	C	C	C	R	R
Green sunfish (Lepomis cyanellus)		O		O	O		O	O	O	O	
Pumpkinseed (Lepomis gibbosus)			C	C	C	C	C	C	C	C	C
Warmouth (Lepomis gulosus)							U	U	U	U	U
Orangespotted sunfish (Lepomis humilis)			C	C	C	C	C	C	C	C	C
Bluegill (Lepomis macrochirus)	A	A	A	A	A	A	A	A	A	A	A
Smallmouth bass (Micropterus dolomieui)	O	O	O	O	O	O	O	O	O	U	U
Largemouth bass (Micropterus salmoides)	C	C	C	C	C	C	C	C	C	C	C
White crappie (Pomoxis annularis)	C	C	C	C	C	C	C	C	C	C	C
Black crappie (Pomoxis nigromaculatus)	C	C	C	C	C	C	C	C	C	C	C
Crystal darter (Ammocryta asprella)							H		H		
Western sand darter (Ammocryta clara)				O	O	O	O	O	O	O	O

Table 2 (continued)

SPECIES	1	2	3	4	5	5A	6	7	8	9	10
Mud darter (Estheostoma asprigene)				H	H	H	H	H	H	H	H
Bluntnose darter (Estheostoma chlorosomum)									H	H	
Iowa darter (Estheostoma exile)					X			X	X	X	
Fantail darter (Estheostoma flabellare)				X							X
Johnny darter (Estheostoma nigrum)	U	U	U	U	U	U	U	U	U	U	U
Banded darter (Estheostoma zonale)										X	X
Yellow perch (Perca flavescens)	C	C	C	C	C	C	C	C	C	C	C
Logperch (Percina caprodes)		C	C	C	C	C	C	C	C	C	C
Blackside darter (Percina maculata)				X	X				X	X	X
Slenderhead darter (Percina phoxocephala)				H			H	H		H	
River darter (Percina shumardi)		C	C	C	C	C	C	C	C	C	C
Sauger (Stizostedion canadense)	C	C	C	C	C	C	C	C	C	C	C
Walleye (Stizostedion vitreum)	C	C	C	C	C	C	C	C	C	C	C
Freshwater drum (Aplodinotus grunniens)	C	C	C	C	C	C	C	C	C	C	C

*Key to the status of a species:

X - Probably occurs in the pool only as a stray from a tributary stream.
H - Records of occurrence are available for this pool, but the species hasn't been recorded in UMRCC collections in the last ten years.
R - Considered to be rare in this pool. Some species in this catagory may be on the verge of extirpation.
U - Uncommon, does not usually appear in sample collections, populations are small, but the species in this category do not appear to be on the verge of extirpation.
O - Occassionally collected, not generally distributed, and local concentrations may occur.
C - Commonly taken in most sample collections throughout the pool, can make up a large portion of some samples.
A - Abundantly taken in all river surveys.

in other river reaches (Table 2). This phenomenon can probably be attributed to environmental variables and preferences which characterize the natural range of the species. Species such as the northern pike, mooneye, white sucker, trout perch, rock bass, yellow perch, log perch, and walleye appear to prefer the relative clarity, coolness and quietness of the upper, pooled portions of the river. On the other hand, species such as the goldeye, flathead chub, and red shiner thrive in the lower, more turbid reaches of the open river.

Species worthy of mention which occur on an occasional basis in the river include the chestnut and silver lampreys. As with many lampreys, both Mississippi River species are parasitic during a portion of the adult life, attaching themselves to the bodies of other fishes for several days at a time feeding on the blood of the host fish (Pflieger, 1975). The American eel, considered a prized delicacy by some fishermen, is unusual in that it migrates to the Sargasso Sea area of the Atlantic Ocean for spawning (Pflieger, 1975).

The yellow bass (Monroe mississippiensis) has in recent years begun to decline significantly in numbers in the upper portions of the river. The smallmouth bass, although present in small numbers in the river is very uncommon in certain reaches.

Many species are noted as uncommon in particular areas (Table 2). These populations do not appear to be diminishing; however, they are small in number. This is inevitably a response to the habitat available for life functions of these species. In many instances, this is likely the result of the construction of the navigation channel by increasing sedimentation and limiting migratory avenues.

The following species have been adversely affected by a modification of the river system and as a result occur in relatively low numbers: paddlefish, American eel, skipjack herring, Alabama shad, shovelnose

sturgeon, blue sucker, blue catfish and lake sturgeon (Carlander, 1954). Those species listed as rare in all or portions of the river are in many cases being extirpated from their natural range and deserve special consideration in all aspects of river management. The same is true for those species which were previously collected from the river, but have not been included in UMRCC samples during the last 10 years. The lake sturgeon, for example, was once an important component of the Mississippi River commercial fishery. Its numbers have declined drastically in this century probably because of overfishing, water pollution, and the construction of dams which have blocked its movements and destroyed habitat (Pflieger, 1975; Carlander, 1954). Lake sturgeon are protected to varying degrees by the states. Population numbers appear to have increased under this protection. In the past few years several specimens of lake sturgeon have appeared in the creel survey below lock and dam 4 (Sternberg, 1974). This may signify a comeback of the species in the Mississippi River or be related to other factors.

Twenty-eight species are recorded for the river as stragglers from the tributaries. Six additional species are listed as stragglers in certain portions of the river, while in other portions they are given a different status. Smith, Lopinot and Pflieger (1971) suggest that 30 species should be considered in this category.

One species presently occurring south of the study reach deserves special attention. This is the grass carp or white amur (Ctenopharyngodon idella). Grass carp, an exotic species, has been introduced in the Mississippi River. The species is beginning to appear in the catches of commercial fishermen in both the Mississippi and Missouri Rivers. Grass carp accounted for 10,645 pounds of the commercial catch in the lower pools for the three year period from 1975 to 1977 (Rasmussen, 1979). It is possible that the grass carp might eventually establish itself as a normal component of the Mississippi River fishery in most river reaches. However, this will depend upon the fish's ability to

reproduce in the Mississippi River valley.

B. COMMERCIAL FISHERIES

Commercial fishing is one of the two major uses of the fisheries resource in the Upper Mississippi River; the other is sport fishing. Commercial fishing has long been practiced on the river and continues to be a major consumptive use of the resource. This activity provides a viable food supply, a valuable fish management tool, and a profession for numerous residents of river towns. Contained in this section is a description of the magnitude of commercial fisheries activity on the Upper Mississippi River and the species which are most directly affected by this activity. For the purpose of management and depicting the importance of the commercial fishery, we will be describing the Upper Mississippi River as a single unit, pools 3 through 26 as reported in the UMRCC Fisheries Compendium (Rasmussen, 1979).

Commercial Fishery of the Upper Mississippi River - Pools 3 through 26

The following quote from Dr. John T. Greenbank (1945) probably best describes the river's commercial fishery.

"Commercial fishery in the Upper Mississippi is licensed and carried on for two ostensible reasons - a source of revenue to the fisherman, and as a measure of removal and control of the rough fish for the betterment of the fine fish and game fish. Producing literally millions of pounds of food per year, and providing employment for scores of men, it is an industry by no means unimportant to the region."

Use of the commercial fishery resources is best described by the catch records reported by commercial fishermen. These records give the best estimate of commercial harvest and value. Analysis of long range trends can provide a guide for management of the resource.

Due to the difference in the regulations between the states governing the commercial fisheries, a difference in the fisheries has developed. Of the five states involved, only two, Iowa and Illinois, have any reciprocal agreements pertaining to the fishery.

Reported commercial catch of fish from 1953 through 1972 was 221,483,663 pounds, with a yearly average of 11,074,183 pounds (Table 3; Figure 38). The reported commercial fishery harvest has shown a significant increase from 1953 through 1977 (Rasmussen, 1979).

Distribution of harvest in the Upper Mississippi River provides insight into important fishing areas (Figure 39). Pool 9 (32,196,575 pounds), pool 5A (30,705,615 pounds), and pool 19 (18,374,645 pounds) stand out as the most productive single areas in the region. Pool 9, pool 5A and pool 19, combined with pools 8 (15,517,420 pounds), 18 (14,645,445 pounds) and 13 (13,134,295 pounds), yielded 125,074,095 pounds per year, which accounts for 56.4 percent of the total yield.

Generally, the larger the water acreage, the more pounds of fish harvested. The seven largest pools can be ranked as follows according to total surface acreage: 9, 19, 13, 8, 4, 5a and 10. This ranked group contains all but one (pool 18) of the six major harvest areas mentioned earlier and shown in Figure 39. These pools rank as follows according to total harvest: 9, 5a, 19, 8, 18 and 13. Despite its smaller size, pool 18 provides a larger harvest than pool 10.

The commercial fishery is composed of four major species groups (carp, buffalo, catfish and freshwater drum) and 12 minor species groups (paddlefish, sucker-redhorse, bullhead, carpsucker, shovelnose sturgeon, gar, bowfin, eel, crappie, northern pike, mooneye and goldeneye).

The four major species which dominate Upper Mississippi River commercial

Table 3. Species composition of the commercial fishery from the Upper Mississippi River between 1953 and 1977 (Rasmussen, 1979).

Species	Reported Harvest (lb)	Yearly Average (lb)	Reported Value	Yearly Average
Carp	130,965,875	5,238,635	$ 6,795,268	$271,811
Buffalo	60,397,170	2,415,887	8,494,648	339,786
Catfish	40,423,305	1,616,932	11,861,618	474,465
Drum	34,340,103	1,373,604	3,122,567	124,903
Paddlefish	2,726,684	109,067	373,573	14,943
Sucker-Redhorse	2,086,248	83,450	103,610	4,144
Bullhead	2,046,237	81,849	332,460	13,298
Carpsucker	2,077,477	83,099	111,732	4,469
Sturgeon	1,206,448	48,258	268,951	10,758
Gar	698,146	27,926	23,395	936
Bowfin	289,531	11,581	8,758	350
Mooneye-Goldeye	249,479	9,979	10,499	420
Northern Pike (none in 1973-77)	165,201	8,260	30,807	1,540
Crappie (none in 1973-77)	131,043	6,552	25,392	1,270
American Eel	31,949	1,278	5,658	226
Grass Carp[1]	10,645	3,548[1]	2,281	760[1]
Other [2]	476,660	19,066	28,650	1,146
Total	278,322,201	11,132,888	$31,599,877	1,263,995

1 First recorded in 1975 (3 years).

2 Gar, bowfin, eel, mooneye, goldeye and yellow perch are referenced.

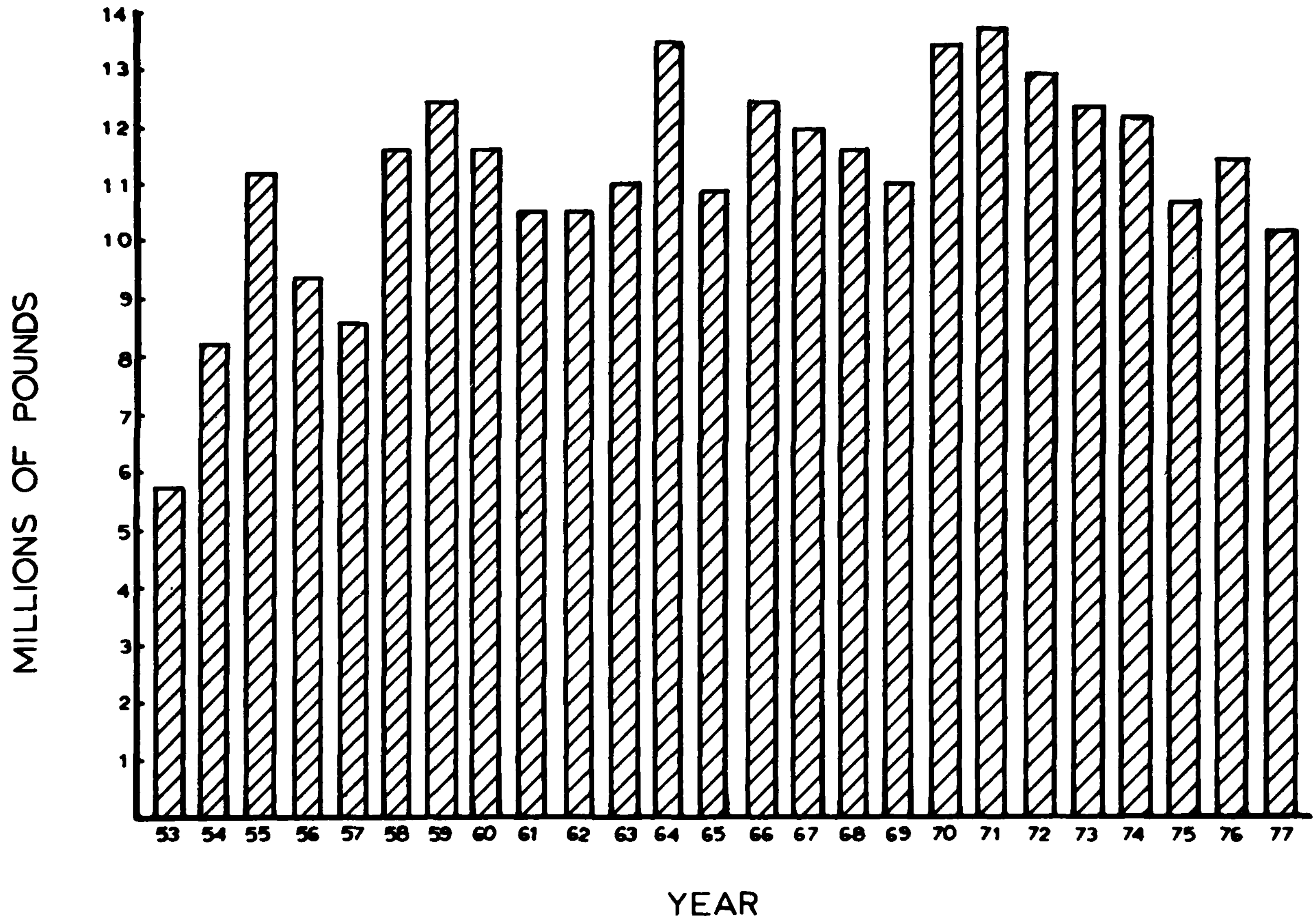

Figure 38. Total reported annual harvest of all commercial fishes from the Upper Mississippi River during the 25-year period 1953-1977 (Rasmussen, 1979).

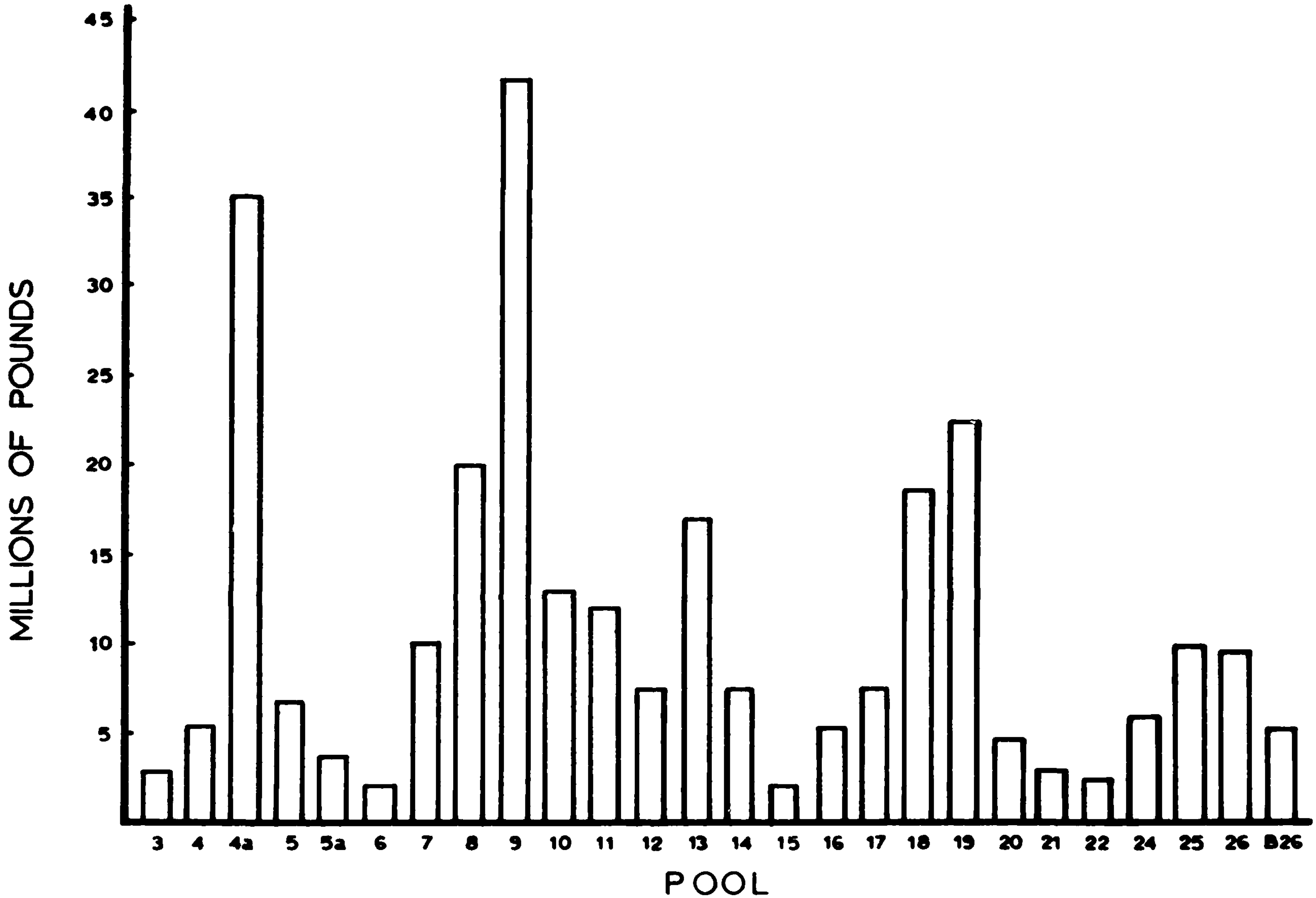

Figure 39. Total reported harvest of all commercial fishes from each area of the Upper Mississippi River from 1953 through 1977. (Rasmussen, 1979).

fishing contributed 95.74 percent of the catch and 95.85 percent of the value for the 24-year period (1953-1977). Data for these four species are treated separately in the following discussion (all figures compiled from the UMRCC Fisheries Compendium (Rasmussen, 1979)).

Carp (Cyprinus carpio)

Rank by weight harvested: 1st

Rank by value: 3rd

Percent of total commercial harvest: 46.79

Average annual harvest: 5,238,635 lb.

Percent of total commercial value: 21.63

Average annual value: $271,811

Significant trends: Increase - Pools 5a,7,8,9,10,11,15,16,25

Decrease - none

Carp are extremely abundant and under-harvested. This is because their economic value is low.

Buffalo (Ictiobus spp.)

Rank by weight harvested: 2nd

Rank by value: 2nd

Percent of total commercial haverst: 21.79

Average annual harvest: 2,415,887 lb.

Percent of total commercial value: 26.58

Average annual value: $339,786

Significant trend: Increase - Pools 4a,5a,9,10,11,12,16,20,22

Decrease - Pool 4

The harvest of buffalo species has increased significantly over the 20 year period.

Catfish (*Ictalurus spp.*)

Rank by weight harvested: 3rd

Rank by value: 1st

Percent of total commercial harvest: 14.92

Average annual harvest: 1,616,932 lb.

Percent of total commercial value: 37.48

Average annual value: $474,465

Significant trend: Increase - Pools 4, 7, 13, 14
Decrease - Pools 6, 9, 19

Catfish are the most sought after commercial fish species in the River and appear to have been overexploited in many pools during the last twenty years. The harvest of catfish has decreased significantly over the 20-year period.

Fresh Water Drum (*Aplodinotus grunniens*)

Rank by weight harvests: 4th

Rank by value: 4th

Percent of total commercial harvest: 12.24

Average annual harvest: 1,373,604 lb.

Percent of total commercial value: 10.16

Average annual value: $124,903

Significant trend: Increase: Pools 7, 8, 9, 10, 15, 16, 21, 22
Decrease: Pools 3, 4, 5, 26

Fresh water drum are very important to the river's fishery. They rank 4th in both the sport and commercial harvest. The commercial harvest of fresh water drum has increased significantly over the 20-year period.

Paddlefish (*Polyodon spathula*)

Rank by weight harvested: 5th

Rank by value: 5th

Percent of total commercial harvest: 0.95

Average annual harvest: 109,067 lb.

Percent of total commercial value: 1.17

Average annual value: $14,943

There has been no significant trend in the harvest of paddlefish over the 20-year period.

Suckers and Redhorse
(*Catostomus* and *Moxostoma*)

Rank by weight harvested: 6th

Rank by value: 8th

Percent of total commercial harvest: 0.78

Average annual harvest: 83,450 lb.

Percent of total commercial value: 0.36

Average annual value: $4,144

The sucker-redhorse group has shown a significant increase in total annual harvest over the 20-year period.

Bullhead (*Ictalurus spp.*)

Rank by weight harvested: 7th

Rank by value: 6th

Percent of total commercial harvest: 0.71

Average annual harvest: 81,849 lb.

Percent of total commercial value: 1.03

Average annual value: $13,298

Bullhead harvest has increased significantly over the 20-year period. Pool 9 has been by far the most important pool of harvest.

Carpsucker (*Carpiodes spp.*)

Rank by weight harvested: 8th

Rank by value: 9th

Percent of total commercial harvest: 0.61

Average annual harvest: 83,099 lb.

Percent of total commercial value: 0.30

Average annual value: $4,469

There has been no significant trend in the harvest of carpsucker during the 20-year period.

Shovelnose Sturgeon (*Scaphirhynchus platorynchus*)

Rank by weight harvested: 9th

Rank by value: 7th

Percent of total commercial harvest: 0.43

Average annual harvest: 48,258 lb.

Percent of total commercial value: 0.79

Average annual value: $10,758

Sturgeon harvest has not shown a significant trend during the 20-year period.

Gar (*Lepisosteus spp.*)

Rank by weight harvested: 10th

Rank by value: 13th

Percent of total commercial harvest: 0.25

Average annual harvest: 27,926 lb.

Percent of total commercial value: 0.08

Average annual value: $936

Bowfin (*Amia calva*)

Rank by weight harvested: 12th

Rank by value: 15th

Percent of total commercial harvest: 0.11

Average annual harvest: 11,581 lb.

Percent of total commercial value: 0.03

Average annual value: $350

There has been no significant trend in the harvest of bowfin during the 20-year period.

Mooneye and Goldeye (*Hiodon spp.*)

Rank by weight harvested: 13th

Rank by value: 14th

Percent of total commercial harvest: 0.09

Average annual harvest: 9,979 lb.

Percent of total commercial value: 0.04

Average annual value: $420

Northern Pike (*Esox lucius*)

Rank by weight harvested: 14th

Rank by value: 10th

Percent of total commercial harvest: 0.08

Average annual harvest: 8,260 lb.

Percent of total commercial value: 0.13

Average annual value: $1,540

Iowa was the only state to allow commercial fishing for northern pike. Pike were taken off the commercial fishing list in 1959, so the data cover only a 7-year period.

Crappie (*Pomoxis spp.*)

Rank by weight harvested: 15th

Rank by value: 11th

Percent of total commercial harvest: 0.06

Average annual harvest: 6,552 lb.

Percent of total commercial value: 0.11

Average annual value: $1,270

Illinois is the only UMRCC state to ever allow commercial harvest of crappie.

American eel (*Anguilla rostrata*)

Rank by weight harvested: 16th

Rank by value: 16th

Percent of total commercial harvest: 0.01

Average annual harvest: 1,278 lb.

Percent of total commercial value: 0.02

Average annual value: $226

There has been a significantly increasing trend in eel harvest over the 20-year period.

Other Species

Rank by weight harvested: 11th

Rank by value: 12th

Percent of total commercial harvest: 0.17

Average annual harvest: 19,066 lb.

Percent of total commercial value: 0.10

Average annual value: $1,146

Most of the minor species have been included in this category at some time during the 20-year period. Those species which have appeared in the reports are: gar, bowfin, eel, mooneye, goldeneye and yellow perch.

Since it was organized in 1943, management of most Upper Mississippi River commercial fish species has been carried on through the auspices of the UMRCC. Liberalization of regulations has been the general rule, based on biological information collected and discussed by the member States.

Carp were unknown in the fishery until the early 1880's (Carlander, 1954). They achieved prominence in 1899 and have dominated the fishery since the early 1900's. Harvest data for buffalo show a definite decline in the fishery as the carp harvest increased. Drum have shown a wide range in harvest, but have increased during the last 20 years. Catfish harvest shows a decrease over the period from 1953 to 1977.

The catfish group stands out as the only one showing signs of over-harvest (Carlander, 1954). This situation should be remedied before the catfish stock is seriously depleted.

The harvest and value of the Upper Mississippi River commercial fishery has been documented through the data base supplied by the annual reporting system. A commercial fishery with an average annual harvest of over 11 million pounds and value of over $1 million is established

in the region. Although the total harvest is relatively stable, the variation in yield between species and pools has been large (Rasmussen, 1979).

C. SPORT FISHERIES

Sport fishing is the primary use of the fisheries resource in the Upper Mississippi River and is becoming more important each year. The numbers of sport fishermen on the river far outnumber the commercial fishermen; however, sport fishermen use a different group of fishes than do the commercial fishermen. Therefore, there is little competition between the two users. Commercial fishing is generally believed to help in managing the river for a good sport fishery.

Contained in this section is a description of the sport fishing pressure on specific sections of the Upper Mississippi River. The description reports the results of numerous creel surveys done by the States of Iowa, Minnesota and Wisconsin as an indication of the magnitude of the pressure on the resource and the species and pools which are most affected by this use (Rasmussen, 1979).

This section is a summary of some of the sport fishing creel censuses harvest data. A brief description of each creel's results is provided as well as a summary at the end of the report which may reflect sport fishing trends for the area. Although the creel information was gathered in basically the same manner for all the creels, it should be noted that the ice-fishing creel and the walleye-sauger creel information will be separate and totals will pertain only to those fishes. The final species composition will not include this information because of the specialization of the creel techniques. Table "4" lists the species taken by anglers interviewed during the surveys.

Table 4. Species composition of the sport fishery in three pools of the Upper Mississippi River from creel surveys conducted in (B) 1962-63, (C) 1967-68 and (D) 1972-73. Occurrence in all three surveys is denoted by (A) (Rasmussen, 1979).

Species	Pool 4	Pool 5	Pool 7
Lake sturgeon (Acipenser fulvescens)	B	B	
Shovelnose sturgeon (Scaphirynchus platorynchus)			D
Paddlefish (Polyodon spathula)			
Gar (Lepisosteus spp.)			C
Bowfin (Amia calva)	CD		A
American eel (Anguilla rostrata)			
Gizzard shad (Dorosoma cepedianum)			
Mooneye (Hiodon tergisus)	A	A	C
Northern Pike (Esox lucius)	A	A	A
Carp (Cyprinus carpio)	A	A	A
Suckers (Catostomidae)	A	CD	A
Blue catfish (Ictalurus furcatus)			
Channel catfish (Ictalurus punctatus)	A	A	A
Flathead catfish (Pylodictis olivaris)	A	A	A
Bullhead (Ictalurus spp.)	A	A	A
White bass (Morone chrysops)	A	A	A
Yellow bass (Morone mississippiensis)			B
Rock bass (Ambloplites rupestris)	A	A	A
Warmouth (Lepomis gulosus)			C
Green sunfish (Lepomis cyanellus)	CD	CD	D
Orangespotted sunfish (Lepomis humilis)			
Bluegill (Lepomis macrochirus)	A	A	A
Smallmouth bass (Micropterus dolomieui)	A	A	A
Largemouth bass (Micropterus salmoides)	A	A	A
Crappie (Pomoxis spp.)	A	A	A
Other sunfishes (Centrarchidae)	A	CD	A
Yellow Perch (Perca flavescens)	A	A	A
Sauger (Stizostedion canadense)	A	A	A
Walleye (Stizostedion vitreum)	A	A	A
Freshwater drum (Aplodinotus grunniens)	A	A	A

Analysis Of The Sport Fish Harvest For All Pools Surveyed

The sport fishery of the Upper Mississippi River includes 14 families, 25 species and 5 species groups. However, carp (Cyprinus carpio), channel catfish (Ictalurus punctatus), flathead catfish (Pylodictis olivaris), bullheads (Ictalurus spp.), white bass (Morone chrysaps), bluegill (Lepomis macrochirus), largemouth bass (Micropterus salmoides), crappie (Pomoxix spp.), sauger (Stizostedion canadense), walleye (Stizostedion vitreum), and freshwater drum (Aplodinotus grunniens) were the only species harvested in all three surveys cited in this section. The only rare species found in the creel surveys was lake sturgeon (Acipenser fulvescens) taken during a 1962-1963 study. The species was not found in the 1967-68 or the 1972-73 studies and, because of the decline of the lake sturgeon, all five UMRCC member States include the species on their lists of threatened or endangered wildlife.

Bluegill and crappie have remained the two most important species over the past 15 years while other species have shifted in importance during this period and show no distinct trends.

Harvest trends of major fish species and their relative importance to the fishery are shown in the ranking of the ten most abundant fish species harvested in the total creel period (Table 5).

Table 5. Top ten ranking of sport fish by total number of fish harvested in Upper Mississippi River during three creel surveys on pools 4, 5, 7, 11, 13, 18 and 26 (Rasmussen, 1979)

Species	Period 62-63		Period 67-68		Period 72-73	
	Number Caught	Percent of Catch	Number Caught	Percent of Catch	Number Caught	Percent of Catch
Bluegill	537,587	37.0	414,280	28.7	350,510	26.1
Crappie	397,322	27.4	366,469	25.4	219,445	16.4
White bass	123,556	8.5	100,524	6.9	140,617	10.5
Freshwater drum	94,224	6.5	153,806	10.7	159,849	12.9
Sauger	85,002	5.9	116,480	8.1	213,242	15.9
Channel Catfish	76,554	5.2	116,008	8.0	77,461	5.8
Yellow perch	52,190	3.6	29,995	2.2	35,105	2.6
Walleye	34,116	2.4	77,347	5.4	92,811	6.9
Bullhead	25,742	1.8	29,112	2.0	14,720	-
Largemouth Bass	24,961	1.7	37,804	2.6	19,970	1.6
Green Sunfish	160	-	4,404	-	16,978	1.3

Analysis of Sport Fishing Pressures

In Pool 4:

Pool 4 consists of 38,800 acres of fishery habitat, is 44 miles in length, and is located between Red Wing, Minnesota, and Alma, Wisconsin.

The creel survey taken during 1962-1963 showed that 340,304 fish were

caught and these fish weighed 298,858 pounds. The fishing pressure on the area was 10.93 man hours per acre with a success rate of 0.802 fish per hour and a yield of 7.70 pounds of fish per acre (Nord, 1964). During 1967-68 another survey was taken which included 387,291 pounds of fish. The fishing pressure was 13.68 man hours per acre with a success rate of 0.712 fish per hour and a yield of 9.98 pounds of fish per acre (Wright, 1970). The final creel survey was taken in 1972-73; 312,071 fish were caught weighing 303,079 pounds. Fishing pressure was 13.94 man hours per acre with a success rate of 0.653 fish per hour and a yield of 8.84 pounds per acre (Fleener, 1975).

In Pool 5:

Pool 5 consists of 12,600 acres and has a length of approximately 15 miles, running from Alma, Wisconsin, to Whitman, Minnesota.

The 1962-63 creel survey showed that 195,620 fish were caught weighing 122,899 pounds. Fishing pressure was 12.46 man hours per acre with a success rate of 1.25 fish per hour yielding 9.75 pounds of fish per acre (Nord, 1964).

In 1967-68, 134,081 fish were caught which weighed 131,239 pounds. The fishing pressure in the pool was 14.74 man hours per acre with a success rate of 0.722 giving a yield of 10.41 pounds per acre (Wright, 1970).

The last census for this area was in 1972-73. A total of 168,937

fish were creeled which weighed 171,199 pounds. Fishing pressure in the pool was 25.69 man hours per acre with a success rate of 0.678 fish per hour, and a yield of 17.64 pounds per acre (Fleener, 1975).

In Pool 7:

Pool 7 consists of 13,600 acres and is approximately 11 miles long. Pool 7 lies between Trempealeau, Wisconsin, and Dresbach, Minnesota.

The 1962-63 creel survey showed 444,943 fish caught weighing 208,473 pounds. Fishing pressure was heavy at 22.70 man-hours per acre with a success rate of 1.44 fish per hour and yielding 15.33 pounds per acre (Nord, 1964).

Creel surveys from 1967-68 showed that 258,634 fish were caught; these fish weighed 166,893 pounds. The fishing pressure exerted on the area was 17.81 man-hours per acre with a success rate of 1.06 fish per hour and a yield of 12.27 pounds per acre (Wright, 1970).

The last creel survey taken in pool 7 during 1972-73 revealed that 327,493 fish weighing 166,949 pounds were caught. Fishing pressure was 19.80 man-hours per acre with a success rate of 1.48 fish per hour and a yield of 15.13 pounds per acre (Fleener, 1975).

In pool 7, Lake Onalaska provides a major bluegill fishery. During the winter of 1976-77, a creel census was conducted to estimate the winter harvest of bluegill. The total projected harvest for the winter was 233,061 bluegills taken by 25,402 anglers over a 17-week season. The total projected weight of the catch was 69,816 pounds, with a success rate of 2.41 fish per hour (Rach, 1977).

In Pool 9 (during winter):

Two areas in pool 9 were creeled during the winter months of 1975-76 (Ackerman, 1976). The first of these areas was Lansing Big Lake. This lake is a composite of productive major and smaller fishing areas in the Lansing Bottoms. The principal fisheries were at Phillipee Lake, Beck Lake, Battsford Lake, Mass Lake and Shore Slough. The combined acreages of this ice fishery is estimated at 782 acres.

The creel of this area showed that 34,115 fish weighing 10,681 pounds were caught over an 81-day period. Fishing pressure was 15.7 man hours per acre, yield was 13.7 pounds per acre and the success rate was excellent at 2.9 fish per hour (Ackerman, 1976). Species composition of the catch is shown in Table 6.

The second area in pool 9 to be creeled during the winter ice fishing season of 1975-76 was the Winneshiek Bottoms. This area is a composite of eight lakes and ponds in the Wisconsin boundary waters of pool 9, directly across the channel from Lansing. Some of the principal ponds having ice fisheries were Chickadee Lake, Chain-of-Lakes, Charles City Bay, and Indian Basin. The combined surface area of this fishery is 484 acres.

The creel survey in this area revealed that 3,755 fish weighing 1,194 pounds were creeled over an 80-day ice fishing period. The fishing pressure on the area was 8.3 man hours per acre, with a yield of 2.5 pounds per acre, success rate was low at 0.90 fish per hour (Ackerman, 1976). Species composition of the catch is shown in Table 6.

In Pool 10 (during the winter):

Two special creel surveys were also conducted in pool 10 during the ice fishing season of 1975-76 (Ackerman, 1976). The first of these

Table 6. Species composition of Pool 9 ice fishery creel (Ackerman, 1976).

Big Lake			Winneshiek Bottoms		
Species	Number Caught	Percent of Catch	Species	Number Caught	Percent of Catch
Bluegill	32,710	95.9	Bluegill	3,331	88.7
Black crappie	478	1.4	White crappie	199	5.3
White crappie	307	0.9	Black crappie	199	5.3
Largemouth bass	409	1.2	Largemouth bass	19	0.5
Yellow perch	75	0.2	Northern pike	7	0.2
Rock bass	34	0.1			
Northern pike	102	0.3			

Table 7. Species composition of Pool 10 ice fishery creel (Ackerman, 1976).

Bussey Lake			Sny Magill		
Species	Number Counted	Percent of Catch	Species	Number Counted	Percent of Catch
Bluegill	3,948	81.5	Bluegill	7,098	71.0
Black crappie	678	14.0	Black crappie	2,340	24.0
White crappie	19	0.4	White crappie	350	3.5
Largemouth bass	24	0.5	Largemouth bass	120	1.0
Yellow perch	175	3.6	Yellow perch	80	0.6
			Warmouth	10	Trace

surveys took place in Bussey Lake. Bussey Lake is a 213-acre backwater bay located at the north end of Guttenberg, Iowa. The ice fishery, however, is located primarily on a 10-acre area of the west bank of the lake.

The creel of this area showed that 4,844 fish weighing 1,568 pounds were creeled during the 78-day ice fishing season. Fishing pressure was 16.3 man hours per acre, with a success rate of 1.44 fish per hour. The yield was 7.4 pounds of fish per acre (Ackerman, 1976). Species composition of the catch is shown in Table 7.

The second area in pool 10 to be surveyed was Sny Magill. The Sny Magill area is composed of several small ponds and two large sloughs--Norwegian Slough, which contains 174 acres, and 100-acre Methodist Slough. This area is in the middle of pool 10, 6 miles south of McGregor, Iowa.

The creel survey revealed that 9,988 fish weighing 3,333 pounds were creeled during the 80-day season. Fishing pressure exerted on the area was 20.1 man hours per acre, giving a success rate of 2.5 fish per hour and yielding 12.2 pounds of fish per acre (Ackerman, 1976). Species composition of the catch is shown in Table 7.

L/D 7 Tail water (spring):

An early spring tail water fishery survey was conducted in pool 7 by the Wisconsin Department of Natural Resources and was mainly concerned with the walley-sauger fishery after the area was opened to year-round fishing (Ranthum, 1975). This study was conducted over a 5-year period, 1969-1973, during the months of March and April. Most of the catch of both species was made in April, and boat fishing was the most productive. An average of 4.5 hours of fishing was required to catch either a walleye or sauger over the study period.

The walleye fishery was composed chiefly of fish 2 and 3 years old. The most significant year class shifted from age 3 to age 2 over the five surveys. Most of the sauger taken were age 3 in all censuses. (Ranthum, 1976). Because no acreages or total pounds were given, it was impossible to compute pressure or yield in a meaningful manner.

Pools 5A, 6, and 8

No comprehensive creel surveys have been conducted in pools 1-4, 5A, 6, or 8. Therefore, no data are available on sport fishing pressure or yield in these pools.

Summary

The Upper Mississippi River is diverse in quality and quantity of sport fish. It has a rich resource of species, but these fishes are subject to substantial pressure from sport anglers. This pressure is summarized in Table 8.

Anglers have been most successful in catching crappie and bluegills on the Upper Mississippi River during the last 15 years. However, white bass, freshwater drum, sauger, catfish, yellow perch, walleye, bullhead, largemouth bass, and green sunfish have also been common catches (Table 8). The most successful fishing for crappie and bluegills appears to be in the winter. The heaviest and most walleye and sauger fishing appears to be in the spring at the tail waters of the locks and dams.

D. EXISTING MUSSEL RESOURCE

Presently over 50 bivalve (naiad mollusks) species native to the Upper Mississippi River system are known to exist (Fuller, 1978). Table 9 lists these species. The indigenous bivalves of the area are

Table 8. Summary of All Creel Data for Pools 4, 5, 7 for Creel Periods 62-63; 67-68; 72-73; and Ice Fishery Creel Data for Pools 9 and 10.

Area and/or Pool	Acres	Dates	Total Fish Caught	Total Pounds Fish Caught	Pressure Man-hours per Acre	Yield Pounds/ Acre	Success Fish/ Hour
4 *	38,800	1962-63	340,304	298,858	10.93	7.70	0.802
5 *	12,600	1962-63	105,620	122,899	12.46	9.75	1.245
7 *	13,600	1962-63	444,943	208,473	22.70	15.33	1.441
4 **	38,800	1967-68	377,925	387,291	13.68	9.98	0.712
5 **	12,600	1967-68	134,081	131,239	14.74	10.74	0.722
7 **	13,600	1967-68	258,634	166,893	17.81	12.27	1.068
4 ***	34,268	1972-73	312,071	303,079	13.94	8.84	0.653
5 ***	9,706	1972-73	168,937	171,199	25.69	17.64	0.678
7 ***	11,031	1972-73	327,493	166,949	19.80	15.13	1.482
Pool 9 **** Big Lake	782.1	1975-76	34,115	10,681	15.7	13.7	2.90
Pool 9 **** Winneshiek Bottoms	845.0	1975-76	3,755	1,194	8.3	2.5	0.90
Pool 10 **** Sny Magill	274.6	1975-76	9,998	3,333	20.1	12.2	2.50
Pool 10 **** Bussey Lake	213.0	1975-76	4,844	1,568	16.3	7.4	1.44

* = Nord, 1964

** = Wright, 1970

*** = Fleener, 1975

**** = Ackerman, 1976

Table 9. Freshwater Mussels of the Upper Mssissippi River.

	Common Name	Scientific Name (from Fuller, 1978)	(alternative name from Stansbery, unpublished)
1.	Fingernail Clam	Sphaeriidae sp.	
2.	Asiatic Clam	Corbicula leana	
3.	Spectacle Case	Cumberlandia monodonta	
4.	Monkeyface	Quadrula metanevra	
5.	Mapleleaf	Quadrula quadrula	
6.	Wartyback	Quadrula nodulata	
7.	Pimpleback	Quadrula pustulosa	
8.	Buckhorn	Tritogonia verrucosa	
9.	Purple Pimpleback	Cyclonaias tuberculata	
10.	Pigtoe	Fusconaia flava	
11.	Ebony Shell	Fusconaia ebena	
12.	Washboard *	Megalonaias gigantea	M. nervosa
13.	Threeridge *	Amblema plicata	A. p. plicata
14.	Bullhead	Plethobasus cyphyus	
15.	Pondhorn	Uniomerus tetralasmus	
16.	Ohio River Pigtoe	Pleurobema cordatum	P. coccineum
17.	Elephant Ear	Elliptio crassidens	E. c. crassidens
18.	Spike	Elliptio dilatata	
19.	Threehorn	Obliquaria reflexa	
20.	Pink Heelsplitter	Proptera alata	Potamilus alatus
21.	Pink Papershell	Proptera laevissima	Potamilus laevissimus
22.	Purple Pocketbook	Proptera purpurata	Potamilus purpuratus

* commercially important species

		(from Fuller, 1978)	(alternative name from Stansbery, unpublished)
23.	Fat Pocketbook	Proptera capax	Potamilus capax
24.	Fragile Papershell	Leptodea fragilis	
25.	Narrow Papershell	Leptodea leptodon	
26.	Butterfly	Ellipsaria lineolata	Plagiola lineolata
27.	Deertoe	Truncilla truncata	
28.	Fawnfoot	Truncilla donaciformis	
29.	Hickorynut	Obovaria olivaria	
30.	Mucket	Actinonaias carinata	A. ligamentina carinata
31.	Ellipse	Actinonaias ellipsiformis	
32.	Black Sandshell	Ligumia recta	
33.	Western Pondmussel	Ligumia subrostrata	
34.	Lilliput	Carunculina parva	Toxolasma parvus
35.	Yellow Sandshell	Lampsilis teres	L. t. form teres
36.	Higgins' Eye	Lampsilis higginsi	
37.	Fat Mucket	Lampsilis radiata siliquoidea	L. r. luteola
38.	Pocketbook	Lampsilis ovata ventricosa	L. ventricosa
39.	Snuffbox	Dysnomia triquetra	Epioblasma triquetra
40.	Rockshell	Arcidens confragosus	
41.	White Heelsplitter	Lasmigona complanata	
42.	Fluted Shell	Lasmigona costata	
43.	Creek Heelsplitter	Lasmigona compressa	
44.	Elktoe	Alasmidonta marginata	
45.	Slippershell	Alasmidonta calceola	A. viridis
46.	Salamander Mussel	Simpsoniconcha ambigua	Simpsonaias ambigua
47.	Cylinder	Anodontoides ferussacianus	
48.	Flat Floater	Anodonta suborbiculata	
49.	Paper Floater	Anodonta imbecillis	
50.	Giant Floater	Anodonta grandis	A. g. corpulenta
51.	Strange Floater	Strophitus undulatus	S. u. undulatus

included in two distinct groups (taxonomic families): the Sphaeriidae or fingernail, pea, and pill clams which seldom exceed ½ inch in length, and the Unionidae (mussels), most of which are much larger specimens at maturity.

Sphaeriid clams generally are associated with backwaters. These forms often are eaten by a variety of fish, including gizzard shad, buffalo, suckers, and perch (Anderson, et al., 1978). Fingernail clams are also an important source of food for migratory waterfowl, particularly scaup and canvas-back (Anderson, et al., 1978). In favorable situations, over 5,000 clams per square meter may be found (Gale, 1969).

The unionid group has many more species than has the sphaeriidae. Mussels occupy a range of habitats from the backwaters to the main channel and generally are associated with stable substrates of sand, gravel, mud, or clay.

Presently the Fawnfoot and Threeridge are the most abundant mussel species throughout the study area (Fuller, 1978; Havlik, 1978). The Higgins' Eye (Figure 40) and Fat Pocketbook have undergone drastic population declines in recent years and are listed by the Federal Government as endangered species. Numerous other species have been noted as rare and may be facing extinction in the Upper Mississippi River. Among these are the Buckhorn, Elephant Ear, Spectacle Case, and Bullhead. A specimen of the Flat Floater was collected alive in Wisconsin waters in 1977. It had never been collected alive upstream of Fairport, Iowa, prior to this (Havlik, 1979).

The Asiatic Clam (Corbiculidae), *Corbicula leana* (Brime), an introduced exotic in the United States, has been found in the Upper Mississippi since 1975 (Eckblad, 1975). It has been found in the effluent channel near the power plant at Lansing, Iowa (Eckblad, 1975), and in the St. Croix River near Hudson, Wisconsin (Fuller, 1978). Like the Sphaeriidae and unlike the Unionidae, this species does not have a parasitic larva.

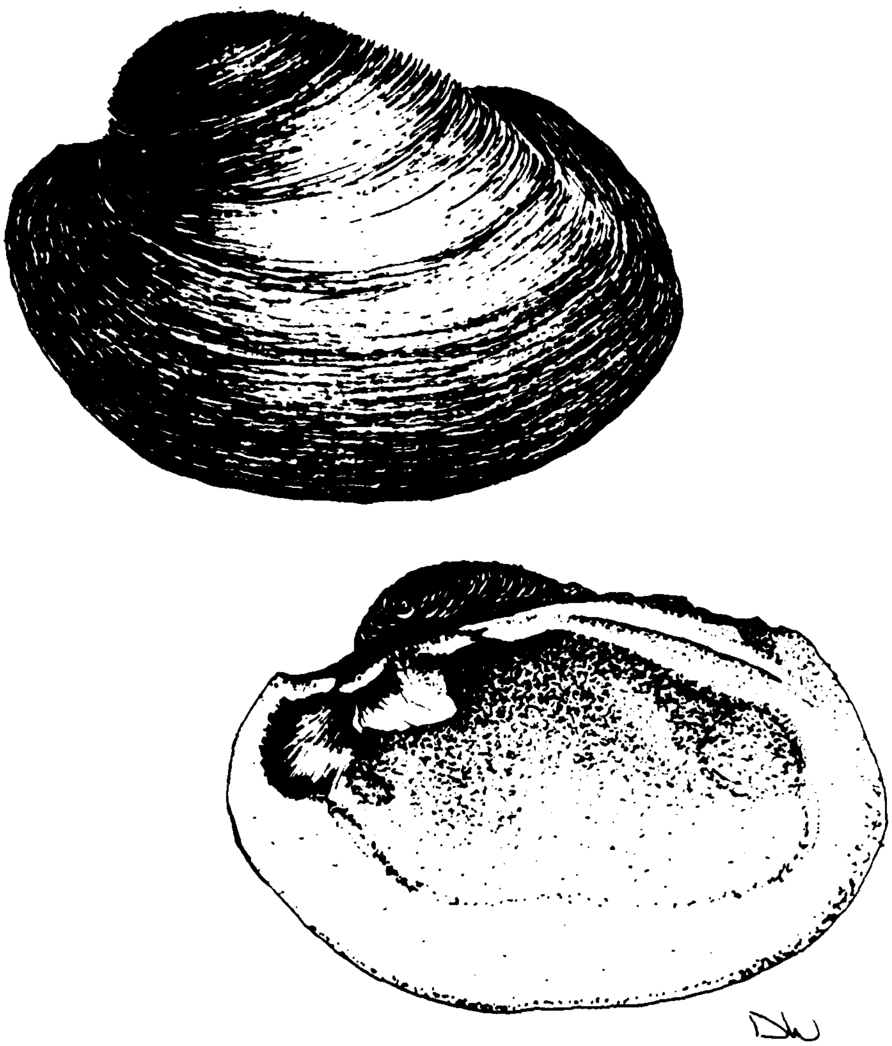

Figure 40. The Higgin's Eye clam (Lampsilis higginsi) which survives in the Upper Mississippi River, is listed as an endangered species by the Federal Government. A dredging project at Prairie du Chien, Wisconsin, in 1976 disturbed a clam bed containing over 100 Higgin's Eye which resulted in a comprehensive clam survey of the study area (Fuller, 1978). (Drawing by Diane Whiting).

Corbicula has caused considerable problems in other rivers of the southern United States by blocking water intake pipes of power plants (Sinclair, 1971). It may be crowding out the native bivalve species in some waterways (Gardner, *et al*, 1976), but not the Upper Mississippi River at present.

The freshwater mussel resource of the Upper Mississippi River has changed considerably during the 20th century. Although the variety of mussel species in the river remains large, the abundance of most is declining (Fuller, 1978).

The decline in mussel populations is caused by several factors. The development of the 9-Foot Channel Navigation Project has had distinct impacts upon mussels. The unionids, which usually must spend the larval stage as an attached parasite (the larva or glochidium) upon a vertebrate, usually fish, have been adversely affected by the reduced migration of some fish species. For example, the inhibition of the migration of the skipjack, the main host for the larva of the Ebony Shell, by the construction of navigation locks and dams has all but exterminated this clam in the Upper Mississippi River (Carlander, 1954). Further an effect of the navigation dams is to slow the current, thus allowing silt to accumulate, converting many of the formerly productive mussel beds to other kinds of aquatic habitat. Clam populations in Lake Pepin, for example, have been almost eliminated. Sludge deposits caused by agricultural runoff and upstream industrial pollution have contributed significantly to the reduction of the mussel beds of previous years.

It is commonly thought that the decline of some mussel species was greatly accelerated by overharvest by commercial clammers working in the pearl button industry. The commercial harvesting of clams for this industry was a "boom to bust" affair from the 1890's to 1930's. Some mussel populations were reduced to the extent that reproduction may

not be able to offset mortality (Carlander, 1954).

E. COMMERCIAL MUSSEL FISHERIES

Commercially, Washboards and Threeridge are the two most important species on the Upper Mississippi River (Larsen and Holzer, 1978). They represented 49.9 and 48.7 percent, respectively, of the 1977-78 commercial catch. Mapleleafs, Pimplebacks, and Pigtoes represented less than 2 percent of their catch (Holzer, Thiel, Talbot, 1979). Even though Washboards and Threeridges were taken in about equal numbers, the Washboards are more massive, and therefore, accounted for a larger proportion of the total tonnage.

Only one commercial clam buyer operates in the Wisconsin boundary waters. In 1977 and 1978, he purchased 150 and 127 tons, respectively (personal communications with Donald Lessard). To be acceptable to the commercial clam buyer, Washboards must be 4 inches (10.2 cm) and Threeridges 2.75 inches (7.0 cm) in the smallest dimension.

In 1977, 98 percent of the clams were taken from Iowa backwaters in pool 10 and the remainder came from pollywoggers working in the shallows near Prairie du Chien (Larsen and Holzer, 1978). Due to low-water conditions during 1977, clam bars were not commercially used; the river current was too slow to allow the "mule"[1] driven boats to drift downstream. Diving rigs were the only gear used in 1977. A maximum of 12 diving rigs were in operation at one time.

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(1) "Mules" used by clammers on the Mississippi River are canvas tarps which are used as underwater sails to help drag clamming bars over the river bottom.

Clams were collected from both Wisconsin and Iowa waters during 1978, with 69 percent taken from Iowa and 31 percent from Wisconsin (Larsen and Holzer, 1978). Pools 9 and 10 were clammed in 1978. Nine brailing boats were leased during summer 1978. Two diving rigs were used during August and September to collect clams.

The average length (the greatest dimension) of Washboards subsampled from the commercial clammers pile was 6.1 inches (15.4 cm). Threeridges had an average length of 3.8 inches (9.6 cm). If the size requirement by the cultured pearl industry remains as it is now, which is larger than the Wisconsin legal limit, the sale of sexually immature clams will be prevented.

Chapter VII

EXISTING WILDLIFE RESOURCES AND USES

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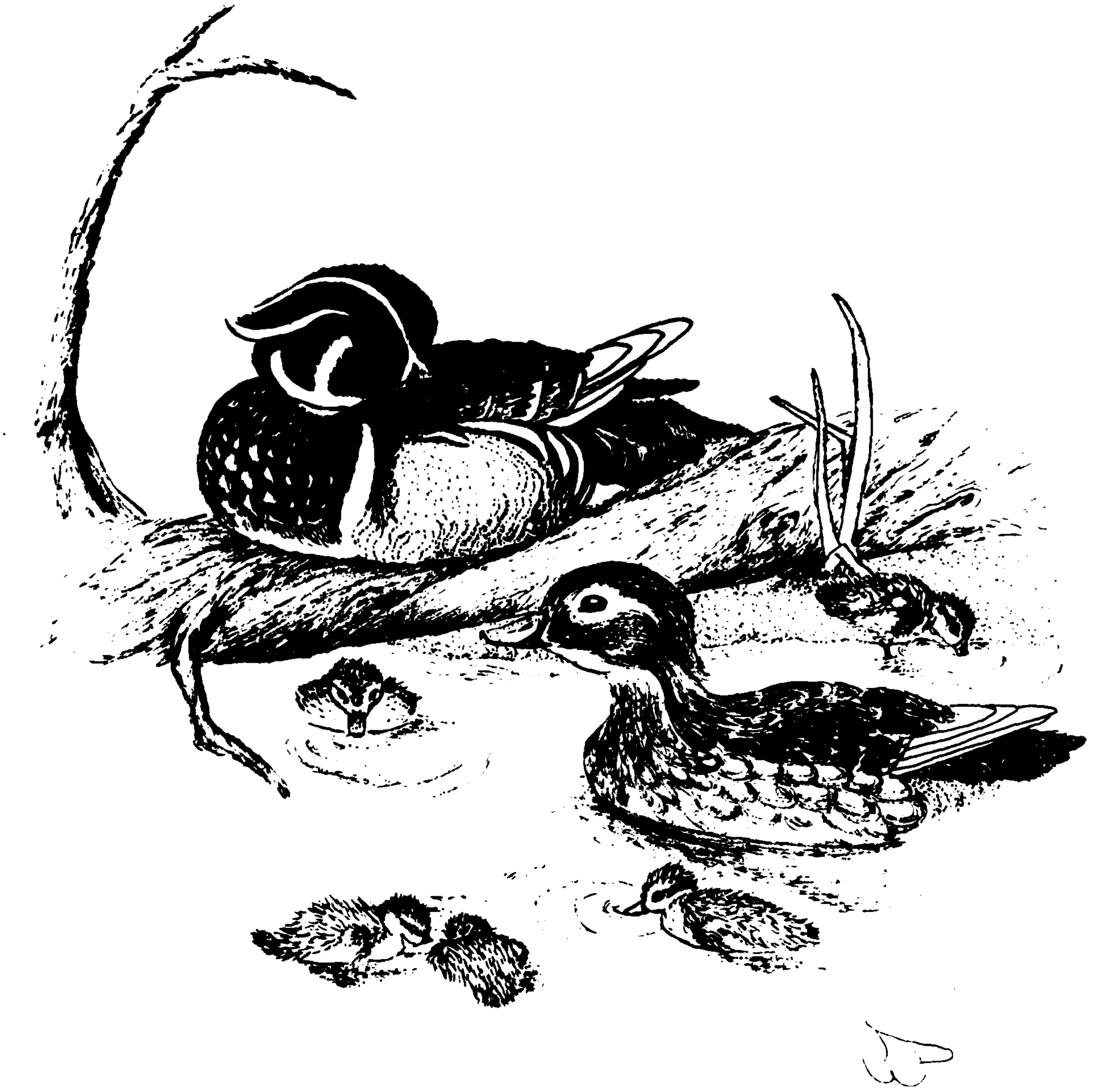

Figure 41. The backwaters and floodplain forests of the Upper Mississippi River are excellent nesting and rearing habitat for Wood Ducks (Aix sponsa). Though adult male Wood Ducks and females with broods are not commonly seen together, as pictured here, both are common sights in the backwater sloughs and ponds through the summer and fall till the opening day of hunting season (Drawing by Diane Whiting).

A. THE RESOURCE

The Upper Mississippi River corridor has one of the greatest ecological communities in terms of wildlife species abundance and variety on the entire North American continent (U.S. Army Corps of Engineers, 1974). The diversity of wildlife species is due to the diverse habitat present in the river corridor. The Mississippi River not only supports an exceptionally varied wildlife population but also an exceptional number of these animals. However, a problem is developing in certain areas of the river. Habitat diversity is decreasing and the numbers and types of species are beginning to decline.

These simpler systems are much less stable than the diverse systems which have existed historically. These ecologically monotypic communities are very susceptible to large and sweeping changes in short periods of time. Rapid changes generally result in habitat which is undesirable to both wildlife and man.

The following wildlife species descriptions are intended to represent the extremely rich and varied wildlife community that is the Upper Mississippi River. It describes a community having great inherent stability because of its present diversity. Yet the Upper Mississippi River is showing distinct symptoms of regression to a simpler form, a community with greatly reduced diversity and greatly reduced ecological stability.

The Fish and Wildlife Work Group is very concerned that the river will reach a threshold of susceptibility within the next generation if action is not taken to avoid such potential for disaster. The locks and dams increased diversity and numbers on the river when first built (Green, 1960). But, as is the case with all midwestern reservoir systems, the habitat created is quickly being destroyed by the effects of the very dams that originally enhanced the system. As the backwaters of the pools on the Upper Mississippi continue to fill with sediment, the remarkable wildlife resource described in this section will decline.

B. MAMMALS

Fifty-nine mammal species have been documented as occurring along the Upper Mississippi River or have known ranges which include all or part of the area (Table 10). As with other wildlife species, a variety of mammal species are found in transitional zones of major vegetation communities. Mammal species occupy virtually every habitat type present on the river. Table 10 also provides notation as to the occurrence or abundance of the species in the study area.

1. Aquatic Mammals

The lock and dam system greatly increased aquatic habitat in most areas of the Upper Mississippi River, with a subsequent increase in aquatic-oriented mammals. Increased regulation of the harvest and elimination of winter drawdown have also benefited aquatic mammals. Muskrats flourish in backwaters. They are highly sought after for their fur, especially during periods of high fur prices. Beaver, whose numbers were once reduced to alarmingly low levels by heavy trapping, have rebounded and are now abundant in most of the river. Beaver play a significant role in maintaining wetland habitat in the upper reaches of most pools.

River otter populations were also severely reduced by trapping at the turn of the century. Although the number of otter have increased through recent times, their numbers are relatively low, and they are only occasionally seen.

Mink are common, though local populations may fluctuate widely because of movement and reproductive success. Long-tailed weasel have been documented along the river, though they are considered rare. The range of the short-tailed weasel includes

TABLE 10

Mammals Occurring on the Upper Mississippi River and Their Relative Abundance

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE
Opossum	*Didelphis marsupialis*	common
Masked Shrew	*Sorex cinereus*	common
Short-tailed Shrew	*Blarina brevicauda*	common
Least Shrew	*Cryptotis parva*	rare
Northern Water Shrew	*Sorex polustus*	rare
Pygmy Shrew	*Microsorex hoyi*	rare
Eastern Mole	*Scalopus aquaticus*	common
Star-nosed Mole	*Condplura cristata*	rare
Little Brown Bat	*Myotis lucifugus*	common
Keen Myotis	*Myotis keenii*	common
Indiana Bat	*Myotis sodalis*	rare
Eastern Pipistrel	*Pipistrellus subflavus*	rare
Big Brown Bat	*Eptesicus fuscus*	common
Red Bat	*Lasiurus borealis*	common
Hoary Bat	*Lasiurus cinereus*	rare
Silver-haired Bat	*Lasionycteris noctivagans*	rare
White-tailed Jackrabbit	*Lepus townsendii*	rare
Eastern Cottontail	*Sylvilagus floridanus*	common
Woodchuck	*Marmota monax*	common
Thirteen-lined Ground Squirrel	*Citellus tridecemlineatus*	common
Franklin Ground Squirrel	*Citellus franklinii*	rare
Eastern Chipmunk	*Tamias striatus*	common

TABLE 10 (cont.)

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE
Least Chipmunk	*Eutamias minimus*	common
Eastern Gray Squirrel	*Sciurus carolinensis*	common
Eastern Fox Squirrel	*Sciurus niger*	common
Red Squirrel	*Tamiasciurus hudsonicus*	rare
Southern Flying Squirrel	*Glaucomys volans*	common
Northern Flying Squirrel	*Glaucomys sabrinus*	common
Plains Pocket Squirrel	*Geomys bursarius*	common
Beaver	*Castor canadensis*	common
Western Harvest Mouse	*Reithrodontomys megalotis*	rare
Deer Mouse	*Peromyscus maniculatus*	common
White-footed Mouse	*Peromyscus leucopus*	common
Meadow Vole	*Microtus pennsylvanicus*	common
Prairie Vole	*Microtus ochrogaster*	common
Pine Vole	*Pitymys pinetorum*	rare
Boreal Redback Vole	*Clethrionomys gopperi*	rare
Southern Bog Lemming	*Synaptomys cooperi*	common
Plains Pocket Mouse	*Perognathus flavescens*	rare
Meadow Jumping Mouse	*Zapus hudsonius*	common
Muskrat	*Ondatra zibethicus*	common
Norway Rat	*Rattus novegicus*	common
House Mouse	*Mus musculus*	common
Nutria	*Myocaster coypus*	rare
Coyote	*Canis latrans*	common

TABLE 10 (cont.)

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE
Red Fox	Vulpes fulva	common
Grey Fox	Urocyon cinereoargenteus	common
Raccoon	Procyon lotor	common
Least Weasel	Mustela rixosa	rare
Short-tailed Weasel	Mustela eiminea	common
Long-tailed Weasel	Mustela frenata	rare
Mink	Mustela vison	common
Badger	Taxidea taxus	rare
Spotted Skunk	Spilogale putorius	rare
Striped Skunk	Mephitis mephitis	common
River Otter	Lutra canadensis	rare
Lynx	Lynx canadensis	rare
Bobcat	Lynx rufus	rare
White-tailed Deer	Odocoileus virginianus	common

the northern portion of the Upper Mississippi River. Though they are not documented in the area, their habits and records from adjacent areas suggest they are present in small numbers.

Raccoon are abundant along all of the Upper Mississippi River.

Several small mammal species are typically associated with various moist soil communities along the river. They include masked shrew, northern water shrew, star-nosed mole, meadow vole and bog lemming.

2. Upland Mammals

White-tailed deer are common although much of their habitat is not considered prime because of the advanced successional stage. This condition results in a lack of forage for deer.

Red fox are common throughout the Upper Mississippi River. Grey fox are more frequently seen in the southern portion of the area. Coyote and bobcat occur in most areas. The coyote population is increasing; however, the bobcat is rare. Lynx have been documented as occurring on the river, but these are migrants from the north. Least weasel occur throughout the area, but are considered uncommon. Badger are uncommon in the river valley, occurring primarily on scattered elevated areas and dikes.

Five squirrel species occur in the area. Eastern fox squirrel and eastern gray squirrel are most common. Red squirrel are seen infrequently. Southern flying squirrel are present in variable numbers throughout the area. Northern flying squirrel occur along the northern portions of the Upper Mississippi River.

Striped skunk are common along the entire area. Spotted skunk are also present areawide, but are rare.

Eastern cottontail are abundant where preferred habitat occurs throughout the area. White-tailed jackrabbit occur from northern Iowa northward, but are considered rare.

Eight bat species have been documented or have ranges which include all or part of the Upper Mississippi River valley. The little brown myotis, keen myotis, big brown bat, and red bat are most common. Eastern pipistrel and hoary bat are uncommon or rare. No known documentation exists on the Upper Mississippi River for the endangered Indiana bat or the hoary bat; however, their ranges are wide and they probably occur in small numbers in the study area.

3. Introduced Mammal Species

Nutria, a South American water-dwelling rodent, are occasionally reported. Only two nutria have been trapped on the river, one in pool 6, another in pool 3.

4. Pest Species

Most wildlife species have the capability of becoming pests if they disrupt human activity. How bad a pest the species becomes depends on the number of animals involved and the tolerance of the humans affected.

The Norway rat is very common along the river, usually associated with human habitations, old fields, or fence rows. Generally, it is not a major pest problem unless the humans affected make no effort to prevent population increases around their homes and farm buildings. Beaver are occasionally a pest species when their tree cutting or water control activities directly interfere with agriculture or wildlife management. Deer are also occasionally pests to farmers in the river corridor because they sometimes forage on corn or soybeans.

C. BIRDS

The Upper Mississippi River is between the deciduous forests of eastern North America, the western prairies, the oak hickory of the south and the coniferous forests of the north. The area provides a large number of diverse habitats, each with its corresponding bird species. The variety of bird life is indicated by the number of species observed. Nearly 300 species of birds are known to frequent the area; 100 species nest here. Table 11 lists the birds which can be found along the Upper Mississippi River; notations are provided which indicate seasonal abundance and local nesters. This is approximately 60 percent of the bird species recorded for the contiguous United States. The diversity is attributed to the location of the study area along the Mississippi Flyway and within a region where the eastern and western ornithological ranges overlap.

The bird life of the area provides several public benefits including hunting, bird watching, nature photography, scavenging, control of insect and rodent pests, and enhancement of the general aesthetic setting. Since many of the birds using the river corridor are migratory, the area is of national and international significance.

1. Waterfowl

The Upper Mississippi River provides important migration habitat for waterfowl in the Mississippi Flyway. The flyway draws from the breeding grounds that reach north to the Mackenzie River Delta and Alaska in the west and to Hudson Bay and Baffin Island in the east (U.S. Department of the Interior, 1964). It includes the productive prairie pothole region of the northwestern states and provinces of Canada. Birds funnel from these breeding grounds to the flyway. Figure 42 displays this characteristic. The Mississippi River is the center of the migratory activity as a result of an abundance of food, water, and sanctuary (areas closed to hunting).

TABLE 11

Birds Observed on the Upper Mississippi River Wild Life and Fish Refuge and Their Relative Abundance (from the U.S. Fish and Wildlife Service, 1975).

Key:

a - abundant (present in large numbers)

c - common (certain to be seen but seldom in large numbers)

u - uncommon (present in smaller numbers or not always seen)

o - occasional (seldom seen, present in most years)

r - rare (present only in some years)

* - nests on the Upper Mississippi River

BIRDS	SPRING	SUMMER	FALL	WINTER
Common Loon	r		r	
Red-necked Grebe	r		r	
Horned Grebe	r		r	
Pied-billed Grebe*	c	c	c	
White Pelican	o		o	
Double-crested Cormorant*	c	c	c	
Great Blue Heron*	c	c	c	r
Green Heron*	c	c	c	
Little Blue Heron		r		
Cattle Egret	u		r	
Great Egret (Common Egret)*	c	c	o	
Snowy Egret	r	r		
Black-crowned Night Heron*	c	c	c	
Yellow-crowned Night Heron*	u	u	u	
Least Bittern*	o	o	o	
American Bittern*	c	c	c	

Note: Double lines in Table 11 denote divisions of major family groups.

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Whistling Swan	c		c	
Canada Goose*	c	o	c	o
White-fronted Goose	r		r	
Snow Goose (White Morph)	u		u	
Snow Goose (Blue Morph)	u		u	
Mallard*	a	c	a	c
Black Duck*	c	o	c	o
Gadwall	c		c	
Pintail	a	r	a	r
Green-winged Teal*	c	r	c	r
Blue-winged Teal*	a	u	a	
American Widgeon	a		a	
Northern Shoveler	c		c	
Wood Duck*	c	c	c	
Redhead	c	o	c	r
Ring-necked Duck	a		a	r
Canvasback	c		c	
Greater Scaup	a		a	
Lesser Scaup	a	r	a	r
Common Goldeneye	c		c	o
Bufflehead	o		o	r
Oldsquaw	r		r	r
White-winged Scoter	r		r	r
Black Scoter (Common Scoter)			r	r

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Surf Scoter	r		r	
Ruddy Duck	c	r	c	
Hooded Merganser*	c	o	c	
Common Merganser	c		c	
Red-breasted Merganser	r		r	r
Turkey Vulture	o	o	o	r
Goshawk				o
Sharp-shinned Hawk	u	u	u	o
Cooper's Hawk	u	u	u	o
Red-tailed Hawk*	c	c	c	c
Red-shouldered Hawk*	o	o	o	u
Swainson's Hawk			r	
Broad-winged Hawk*	o	o		
Rough-legged Hawk			o	o
Golden Eagle	r		r	r
Bald Eagle*	o	o	o	c
Marsh Hawk*	c	c	c	o
Osprey	o	o	o	o
Peregrine Falcon	r	r	r	
Merlin (Pigeon Hawk)	r		r	
American Kestrel (Sparrow Hawk)*	o	o	o	r
Ruffed Grouse*	c	c	c	c

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Bobwhite*	o	o	o	o
Ring-necked Pheasant*	c	c	c	c
Gray Partridge*	o	o	o	o
Turkey	o	o	o	o
King Rail*	u	u		
Virginia Rail*	u	u	o	
Sora*	a	a	c	
Common Gallinule*	r	r		
American Coot*	a	c	a	r
Semipalmated Plover	c	o	c	
Killdeer*	c	c	c	n
Piping Plover				
American Golden Plover	o		u	
Snowy Plover				
Black-bellied Plover	o		o	
Black Turnstone				
Ruddy Turnstone	r			
American Woodcock*	r	r	r	
Common Snipe	c	o	c	r
Long-billed Curlew	c	o	c	r
Upland Sandpiper (Upland Plover)*	o	o		
Buff-breasted Sandpiper				
Spotted Sandpiper*	c	c	c	
Curlew Sandpiper				
Solitary Sandpiper	c		c	
Western Sandpiper				
Willet	r		r	
Greater Yellowlegs	u		u	

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Lesser Yellowlegs	a	o	a	
Red Knot				
Pectoral Sandpiper	o	o	o	
White-rumped Sandpiper	o		o	
Baird's Sandpiper	o	o	o	
Least Sandpiper	c	o	c	
Dunlin	o	o	o	
Ruff				
Short-billed Dowitcher	u	u	u	
Long-billed Dowitcher	o		o	
Stilt Sandpiper	o	o	o	
Semipalmated Sandpiper	c	c	c	
Marbled Godwit	r			
Wimbrel	r			
Hudsonian Godwit	r			
Sanderling	o	o	o	
Black-necked Stilt				
Avocet	r	r		
Red Phalarope				
Wilson's Phalarope	o	o	o	
Northern Phalarope	o		o	
Herring Gull	c	o	c	u
Ring-billed Gull	c	o	c	u
Franklin's Gull	o		o	
Bonaparte's Gull	u		u	
Forster's Tern	c	o	c	
Common Tern	c	o	c	

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Caspian Tern	o		o	
Black Tern	c	c	o	
Rock Dove*	c	c	c	c
Mourning Dove*	c	c	c	o
Yellow-billed Cuckoo*	c	c		
Black-billed Cuckoo*	c	c		
Screech Owl*	c	c	c	c
Great Horned Owl*	c	c	c	c
Snowy Owl				o
Barred Owl*	c	c	c	c
Long-eared Owl*	u	u	u	u
Short-eared Owl	u	u	u	u
Saw-whet Owl*	u	u	u	u
Whippoorwill*	c	c		
Common Nighthawk*	a	a	o	
Chimney Swift*	a	a		
Ruby-throated Hummingbird*	c	c		
Belted Kingfisher*	c	c	o	u
Common Flicker (Yellow-shafted)*	c	c	c	u
Pileated Woodpecker*	o	o	o	o
Red-bellied Woodpecker*	c	c	c	c
Red-headed Woodpecker*	c	c	c	r
Yellow-bellied Sapsucker*	c		c	
Hairy Woodpecker*	c	c	c	c
Downy Woodpecker*	c	c	c	c

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Eastern Kingbird*	a			
Great Crested Flycatcher*	c	c		
Eastern Phoebe*	c	c	o	
Yellow-bellied Flycatcher	u	u	u	
Acadian Flycatcher	o	o		
Alder Flycatcher (Traill's)	c	c	o	
Willow Flycatcher (Traill's)*	c	c	u	
Least Flycatcher*	a	a	u	
Eastern Wood Peewee *	c	c	u	
Olive-sided Flycatcher	o	o		
Horned Lark*	c	c	c	o
Tree Swallow*	a	a	u	
Bank Swallow*	c	c	u	
Rough-winged Swallow*	o	o		
Barn Swallow*	a	a	u	
Cliff Swallow*	o	o	u	
Purple Martin*	a	a	u	
Blue Jay*	c	c	c	c
Common Crow*	a	a	a	o
Black-capped Chickadee*	c	c	c	c
Tufted Titmouse*	c	c	c	c
White-breasted Nuthatch*	c	c	c	c
Red-breasted Nuthatch				r
Brown Creeper	c		c	c

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
House Wren*	a	a	o	
Winter Wren	o		o	
Bewick's Wren	o		o	
Carolina Wren	o	r	o	
Long-billed Marsh Wren*	c	c		
Short-billed Marsh Wren*	o	o		
Mockingbird	r	r		
Grey Catbird*	c	c	o	
Brown Thrasher*	c	c	o	
American Robin*	c	c	c	r
Wood Thrush*	c	c	c	
Hermit Thrush	c		c	
Swainson's Thrush	c		c	
Gray-cheeked Thrush	c		c	
Veery	c		c	
Eastern Bluebird*	c	c	c	r
Blue-gray Gnatcatcher*	u	u		
Golden-crowned Kinglet	o		o	o
Ruby-crowned Kinglet	c		c	
Water Pipit	u		u	
Bohemian Waxwing				o
Cedar Waxwing*	c	c	c	o

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Northern Shrike	r		o	o
Loggerhead Shrike*	c	c	c	
Starling*	a	a	a	a
White-eyed Vireo	c	c		
Bell's Vireo*	u	u		
Yellow-throated Vireo*	c	c	c	
Solitary Vireo	o		o	
Red-eyed Vireo*	c	c	o	
Philadelphia Vireo	u		u	
Warbling Vireo	a	a	a	
Black-and-white Warbler	c		c	
Prothonotary Warbler*	c	c		
Blue-winged Warbler*	o	o		
Golden-winged Warbler	o	o	u	
Tennessee Warbler	c		c	
Orange-crowned Warbler	o		o	
Nashville Warbler	o		o	
Northern Parula	u		u	
Yellow Warbler*	a	a	o	
Magnolia Warbler	c		c	

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Cape May Warbler	o		o	
Black-throated Blue Warbler	o		o	
Yellow-rumped Warbler (Myrtle)	a		a	
Black-throated Green Warbler	c		c	
Cerulean Warbler*	r			
Blackburnian Warbler	c		c	
Chestnut-sided Warbler	o		o	
Bay-breasted Warbler	o		o	
Black-poll Warbler	c		c	
Pine Warbler	o		o	
Palm Warbler	c		c	
Ovenbird*	o	o	o	
Northern Waterthrush	c		c	
Louisiana Waterthrust*	o	o	o	
Kentucky Warbler*	r	r		
Connecticut Warbler	r		r	
Mourning Warbler	o		o	
Common Yellowthroat*	a	a	o	
Yellow-breasted Chat*	r	r		
Hooded Warbler	r	r		
Wilson's Warbler	c		c	
Canada Warbler	c		c	
American Redstart*	a	a	a	
House Sparrow*	a	a	a	a

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Bobolink*	o	o	o	
Eastern Meadowlark*	c	c	c	o
Western Meadowlark*	o	o	o	o
Yellow-headed Blackbird*	o	o	o	
Red-winged Blackbird*	a	a	a	a
Orchard Oriole*	u	u		
Northern Oriole (Baltimore)*	c	c		
Rusty Blackbird	c		c	o
Brewer's Blackbird*	u	o	u	r
Common Grackle*	a	a	a	u
Brown-headed Cowbird*	a	a	u	r
Scarlet Tanager*	o	o	o	
Cardinal*	c	c	c	c
Rose-breasted Grosbeak*	c	c		
Indigo Bunting*	c	c	o	
Dickcissel*	c	c		
Evening Grosbeak				o
Purple Finch	o		o	o
Pine Grosbeak			r	r
Hoary Redpoll				r
Common Redpoll				u
Pine Siskin	o		o	o
American Goldfinch*	a	a	a	c
Red Crossbill				r
White-winged Crossbill	r			r
Rufous-sided Towhee*	a	a	a	c

TABLE 11 (cont.)

BIRDS	SPRING	SUMMER	FALL	WINTER
Savannah Sparrow*	o	o	o	
Grasshopper Sparrow*	o	o	o	
Henslow's Sparrow*	r	r	u	
Le Conte's Sparrow	u	u	u	
Vesper Sparrow*	o	o		
Lark Sparrow*	o	o		
Dark-eyed Junco (Slate-colored, Oregon)	c		c	c
Tree Sparrow	c		a	a
Chipping Sparrow*	a	a	a	
Clay-colored Sparrow	u	u	u	
Field Sparrow*	c	c	c	r
Harris' Sparrow	c		c	
White-crowned Sparrow	o		o	r
White-throated Sparrow	a		a	r
Fox Sparrow	o		o	
Lincoln's Sparrow	c		c	
Swamp Sparrow*	c	c	o	
Song Sparrow*	a	a	c	r
Lapland Longspur	o		o	o
Snow Bunting				u

Peak numbers of spring and fall migrating ducks on the Upper Mississippi River Wild Life and Fish Refuge generally range from 160,000 to 230,000. However, as many as 350,000 were observed in fall 1976. More than 23 million use days by ducks were recorded during the period from July, 1975, to June, 1976 (U.S. Fish and Wildlife Service, unpublished data).

The principal waterfowl nester on the Upper Mississippi River is the tree cavity-nesting wood duck. It produces from 7,000 to 12,000 young annually in the refuge. Significant numbers of mallards also nest in the corridor and spend much of the spring, summer, and fall on the river. Blue-winged teal, hooded merganser and black ducks also nest in the river corridor, but generally not in great numbers.

Canvasback duck populations declined so drastically during the 1960's that they are now protected from hunting during their migration on the Upper Mississippi River. The canvasback uses the Mississippi River valley in the fall as a concentrating area on the way to wintering grounds in the Gulf Coast states and the Chesapeake Bay. Although breeding habitat is continuing to decline in the prairie pothole region, peak migratory populations on the Upper Mississippi River have been rising the last 5 years. In 1977, during a one-day census, 180,000 canvasbacks were observed within the Upper Mississippi River Wild Life and Fish Refuge, primarily on Lake Onalaska in pool 7.

Whistling swans and snow, blue and Canada geese also use the Upper Mississippi River as a migratory corridor. Peak numbers of 10,000 swans and 5,000 geese occur on the refuge during their migrations. Geese use major backwaters such as Lansing Big Lake, Weaver Bottoms, Wisconsin Islands and Lake Onalaska. Large numbers of swans are seen on the Weaver Bottoms each year.

Figure 42. Migratory waterfowl flight paths of Central North America displaying the funnelling of birds from the breeding grounds to the Mississippi Flyway (drawing by Bob Hines; in Waterfowl Tomorrow, 1974, Bureau of Sport Fisheries and Wildlife, U.S. Department of Interior).

Geese using the river are predominately of the eastern prairie population which overwinter in Missouri. However, increasing breeding populations of the once believed extinct giant Canada goose (Branta canadensis/maxima) are occurring along the Upper Mississippi River. Limited nesting of Canada geese occurs throughout the area.

Overwintering of waterfowl occurs in several areas along the river where open water is present year round. Open water is usually associated with power generating stations or the locks and dams. Mallards, black ducks, and golden eye are typical wintering ducks in the area.

Of particular interest is the increasing use of urban areas by waterfowl. Casual bird counts indicate that many mallards and wood ducks use the St. Anthony Falls pools and pools 1 and 2 in the Minneapolis-St. Paul metropolitan area. Several river reaches within the Twin Cities have open water throughout the winter.

2. Game Birds

The Upper Mississippi River floodplain has limited production and maintenance habitats for ring-necked pheasants, ruffed grouse, bobwhite quail and wild turkeys. Associated upland habitats are much more desirable for these species. Correspondingly good to moderate populations are found where individual habitat needs are met.

The study area has a greater abundance of habitat for low-land game birds (Table 11). Populations of woodcock, sora, king and Virginia rails, common snipe and mourning dove inhabit the area (There is no hunting season on mourning dove and kingrail). Ruffed grouse, while not occurring in any great numbers because of limited habitat in the river bottoms, maintain good populations

on the wooded bluffs and adjacent uplands.

The ring-necked pheasant, an introduced species, has shown a generally steady decline over much of its former range as a result of habitat losses, although there does seem to be a slight increase in its ability to occupy secondary habitats near urban areas. Limited sitings of the Hungarian partridge have been made in Minnesota in the Wabasha area. Bobwhite quail are at or near the northern limit of their range in the study area; however, remnant populations do occur. When climatic and habitat conditions improve for an extended period of time, its range notably expands to the north. A corresponding reduction in range and populations occurs much faster as climatic conditions become less favorable.

The wild turkey has been reintroduced into much of its former geographic range. Stocking with trapped wild birds has occurred in the adjacent uplands of southeastern Minnesota, southwestern Wisconsin and northeastern Iowa. Populations appear to be increasing moderately well and sitings of wild turkeys by the general public are fairly common. A limited hunting season restricted to surplus adult males has been initiated in Minnesota and Iowa.

Woodcock were an abundant and commonly hunted upland game bird on the Upper Mississippi River prior to the construction of the locks and dams (VanDyke, 1892). However, the locks and dams changed the primary habitat on the river and reduced the habitat suitable for woodcock.

3. Birds of Prey (Raptors)

Numerous species of raptors use the study area of the Upper Mississippi as some segment of their habitat as shown in Table 11. Many of the species nest in the area, while others use the Upper Mississippi corridor as a migration route in the spring and fall.

The river provides wintering habitat for eagles and owls particularly in the area immediately downstream of Lake Pepin and below several of the dams. These areas provide open water fishing areas for the raptors in the otherwise frozen-over river. Concentrations of bald eagles are so consistent near the outlet of Lake Pepin in the winter that the area has begun to draw large numbers of birdwatchers during January and February.

The bluffs along the Wisconsin shore of Lake Pepin are being used for a peregrine falcon (*Falco peregrinus*) nesting and rearing habitat experiment. This activity is a cooperative effort of the Fish and Wildlife Service and the University of Minnesota to reintroduce the peregrine falcon (Figure 43), an endangered species, to its former range. The Service and the University are hopeful that, by carefully developing artificial rearing methods, breeding pairs of falcons wil return to the Upper Mississippi River bluffs each spring. If the experiment proves successful, other sites in the study area will be used for reintroduction of the peregrine falcon.

4. Shorebirds

Thirty-two species of shorebirds occur along the Upper Mississippi River. Similar to other species groups, shorebirds are important members of the ecological community of the area. Abundant habitat is available for which shorebirds are extremely well adapted. Sandy shorelines and mudflats are typical shorebird habitat types.

Shorebirds along the Upper Mississippi River have not been extensively studied. The records that do exist have been compiled by ornithological groups and State and Federal resource managers.

Figure 43. The Peregrine Falcon is listed as endangered by the Federal government and all three states. However, reintroduction programs are underway on the bluffs of Lake Pepin (Photo by Patrice Wagner).

5. Colonial Water Birds

Seven species of herons, egrets, terns and cormorants commonly nest within the floodplain of the Upper Mississippi River (Table 11). A study of water bird colonies by David Thompson for the Corps of Engineers (1978) indicates that 18 nesting colonies of herons, egrets, or cormorants exist within the GREAT I study area. The river corridor north of lock and dam 10 at Guttenberg appears to provide good nesting and rearing habitat for these species although populations appear to be declining. Figure 43 indicates that, as the river becomes progressively more confined and controlled going downstream toward St. Louis, the habitat for colonial water birds declines drastically.

Thompson noted that most heron and egret rookeries were within a few miles downstream of a lock and dam. It is reasoned that the water birds use these areas because they have been the least changed by the locks and dams and still retain extensive stands of deciduous trees. The birds usually avoid areas of urban or industrial development. However, there are exceptions; a large colony of great blue herons, black-crowned night herons, egrets, and green herons is located on an island amid the urban-industrial complex just south of St. Paul at Pig's Eye Lake.

D. REPTILES AND AMPHIBIANS

The Upper Mississippi River provides all the various habitat requirements for diverse amphibian and reptilian fauna. Table 12 shows the occurrence and abundance of reptiles and amphibians including those species which have been documented as only occasionally occurring on the Upper Mississippi River and those species whose known ranges include all or some portion of the area. The list includes 9 turtle, 3 lizard, 16 snake, 5 newt and salamander, 9 frog and one toad species.

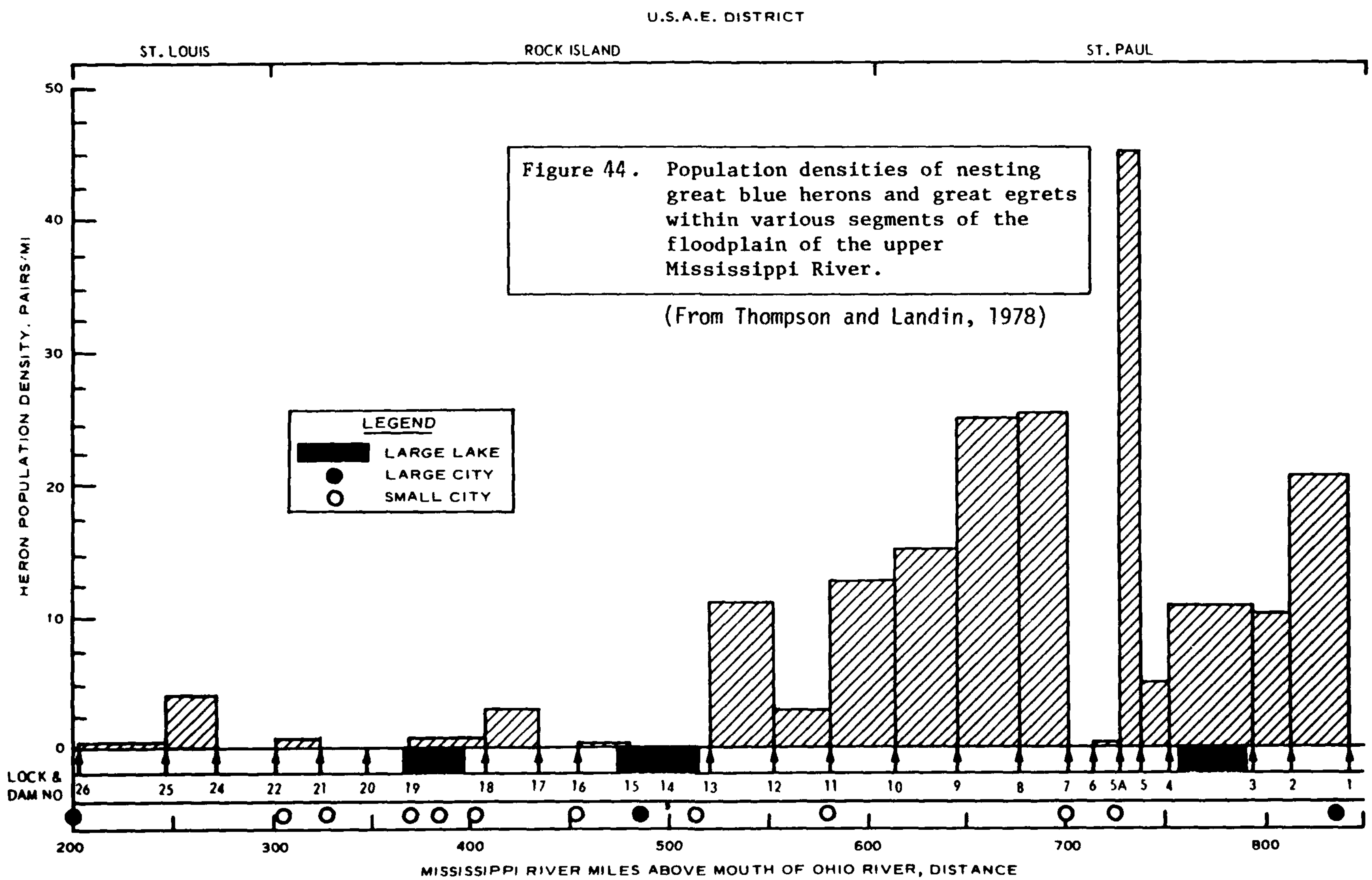

Figure 44. Population densities of nesting great blue herons and great egrets within various segments of the floodplain of the upper Mississippi River.

(From Thompson and Landin, 1978)

TABLE 12

Reptiles and Amphibians Occurring on the Upper Mississippi River and their Relative Abundance

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE
REPTILES		
TURTLES		
Stinkpot	Sternothaerus odoratus	rare
Snapping Turtle	Chelydra serpentina	common
Wood Turtle	Clemmys insculpta	rare
Map Turtle	Graptemys geographica	common
False Map Turtle	Graptemys pseudogeographica	common
Painted Turtle	Chrysemys picta	very common
Blanding's Turtle	Emydoidea blandingi	varied
Smooth Softshell	Trionyx muticus	common
Spiny Softshell	Trionyx spinifer	common
LIZARDS		
Prairie Skink	Eumeces septentrionalis	rare
Five-lined Skink	Eumeces fasciatus	rare
Six-lined Race Runner	Cnemidophorus sexlineatus	common
SNAKES		
Ribbon Snake	Thamnophis sauritus	rare
Smooth Green Snake	Opheodrys vernalis	rare
Plains Garter Snake	Thamnophis radix	rare
Northern Water Snake	Natrix sipedon sipedon	common
Brown (DeKay's) Snake	Storeria dekayi	uncommon

TABLE 12 (cont.)

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE
SNAKES (cont.)		
Red-bellied Snake	Storeria occipitomaculata	uncommon
Eastern Garter Snake	Thamnophis sirtalis sirtalis	abundant
Eastern Hognose Snake	Heterdon platyrhinos	occasional
Ringneck Snake	Diadophis punctatus	occasional
Blue Racer	Coluber constrictor foxi	common
Fox Snake	Elaphe vulpina	occasional
Black Rat Snake	Elaphne obsoleta obsoleta	occasional
Bull Snake	Pituophis melanoleucus sayi	common
Eastern Milk Snake	Lampropeltis doliata triangulum	occasional
Massasauga (Swamp Rattle Snake)	Sistrurus catenatus	rare
Timber Rattlesnake	Crotalus horridus horridus	uncommon
AMPHIBIANS		
SALAMANDERS		
Mud Puppy	Necturus maculosus	common
Eastern Tiger	Ambystoma tigrinum tigrinum	common
Blue-Spotted	Ambystoma laterale	rare
Four-toed	Hemidactylium scutatum	rare
Central Newt	Notophthalmus viridescens	rare
TOADS		
American Toad	Bufo americanus	common

TABLE 12 (cont.)

COMMON NAME	SCIENTIFIC NAME	OCCURRENCE
FROGS		
Blanchard's Cricket	Acris crepitans blanchardi	common
Spring Peeper	Hyla crucifer	abundant
Gray Tree Frog	Hyla versicolor	common
Western Chorus Frog	Pseudacris triseriata triseriata	common
Bullfrog	Rana clamitans	common
Green Frog	Rana damitans melanota	common
Leopard Frog	Rana pipiens	common
Pickerel Frog	Rana palustris	rare
Wood Frog	Rana sylvatica	uncommon

1. Turtles

Snapping turtles are abundant in all mud-bottomed channels and pools. They are harvested commercially in some areas and sold for human consumption. They are aggressive predators of most other small vertebrates. Smooth softshell and spiny softshell turtles are common, usually frequenting sandy beach areas and sandy bottom water. Dredged material placement sites are heavily used by softshell turtles as nesting areas (McMahon and Eckblad, 1975). Softshells are also sought after by commercial trappers, although the market demand for them is variable.

Other common turtles include map, false map, painted, and Blanding's turtles. Blanding's turtle, noted as a rare species in some areas, is common on the Upper Mississippi River, particularly in pool 5 where an abundant population exists. The wood turtle is rare on the Upper Mississippi River because it is much more adapted to relatively dry, terrestrial habitats.

The Mississippi River is the western boundary of the stinkpot turtle's range. It has been recorded as occurring in Grant and Trempealeau counties, Wisconsin, though never in the Mississippi River corridor. It is likely that it occurs along the river, but is probably quite rare.

2. Lizards

The most common lizard is the six-lined race runner which inhabits dry bluff slopes and dikes. The other two species in the area are the prairie skink and five-lined skink. These species are at the periphery of their ranges and are rarely encountered.

3. Snakes

Two venomous snakes occur along the Upper Mississippi River. Massasaugas (or swamp rattlesnakes) once ranged throughout

the river valley, but are now confined primarily to localized areas where they are abundant. They prefer bottomland habitat and are notably found in Black River bottoms in pool 7 and the Nelson-Trevino area of pool 4. Timber rattlesnakes inhabit rocky outcroppings, upper bluff slopes, and wooded upland areas.

The most common snake of aquatic habitat is the northern water-snake which is noted for its extreme aggressiveness. Other common snakes include eastern garter snake, blue racer, hognose and bull snake.

4. Frogs

Spring peeper, gray tree frog, western chorus frog, and leopard frog are the most common species area wide. Other regionally abundant species include Blanchard's cricket frog, bullfrog, and green frog. The wood frog occurs primarily in the northern portions of the area. The pickerel frog occurs from southeastern Minnesota southward.

E. WILDLIFE - CONSUMPTIVE USE

The hunting of migratory waterfowl, primarily ducks, is the most popular consumptive use of wildlife in the study area. Records of the Trempealeau, La Crosse and Lansing districts of the Upper Mississippi River Wild Life and Fish Refuge show that during the waterfowl hunting season (October - November) in 1977 over 180,000 hunting hours took place from 45,740 hunter visits (U.S. Fish and Wildlife Service, unpublished data).

Recent harvest data obtained by Nicklaus (1978) in a cooperative hunter bag check effort with the Wisconsin Department of Natural Resources and the Upper Mississippi River Wild Life and Fish Refuge in pools 4-11 showed that, on the average, 78,000 ducks were harvested annually by

77,000 hunter visits. The harvest ranged from 100,000 in 1974 to 53,000 in 1977. These harvest data are not entirely representative of the GREAT I study area since pool 11 is in the GREAT II study reach and pools 2 and 3 were not included in the bag check. However, the data illustrate the importance of waterfowl hunting on the Upper Mississippi River.

Other migratory waterfowl including coots and geese are also hunted, but to a much lesser extent. Migratory game birds including sora rails, snipe and woodcock are usually taken incidentally while hunting other species.

As a result of the limited amount of upland habitat in the river bottoms, the hunting of small game (rabbits and squirrels) and upland game (ruffed grouse, pheasants and quail) is restricted. For example, public use output reports of the Upper Mississippi River Wild Life and Fish Refuge in 1975-1976 for pools 4-9 show a total of 230 and 1,000 visitor days, respectively, for upland and small game hunting. Most of the hunting for these species takes place in the uplands adjacent to the river bottoms.

Next to hunting waterfowl, the hunting of deer with firearms and/or bow and arrow is the most popular type of hunting, with 1,400 firearm deer hunter visits and 700 bow and arrow deer hunter visit reported for pools 4-9 (Upper Mississippi River Wild Life and Fish Refuge, unpublished data). As with small game and upland game species, the majority of the deer habitat and hunting is found out of the river bottoms. It is estimated by resource managers that approximately 100-200 deer are harvested annually in the study area.

The trapping of furbearers for recreation and economic gains has historically been an important use of the wildlife resources on the river. Because of recent increases in the value of furs, primarily muskrats, the number of trappers has increased significantly. Fur harvest data for the years 1971-1972 through 1977-1978 (Upper Mississippi River Wild Life and Fish Refuge, unpublished data) shows that trapper

AD-A127 211 GREAT I STUDY OF THE UPPER MISSISSIPPI RIVER TECHNICAL APPENDIXES VOLUME 5 FISH AND WILDLIFE(U) GREAT RIVER ENVIRONMENTAL ACTION TEAM M J VANDERFORD SEP 80 4/4

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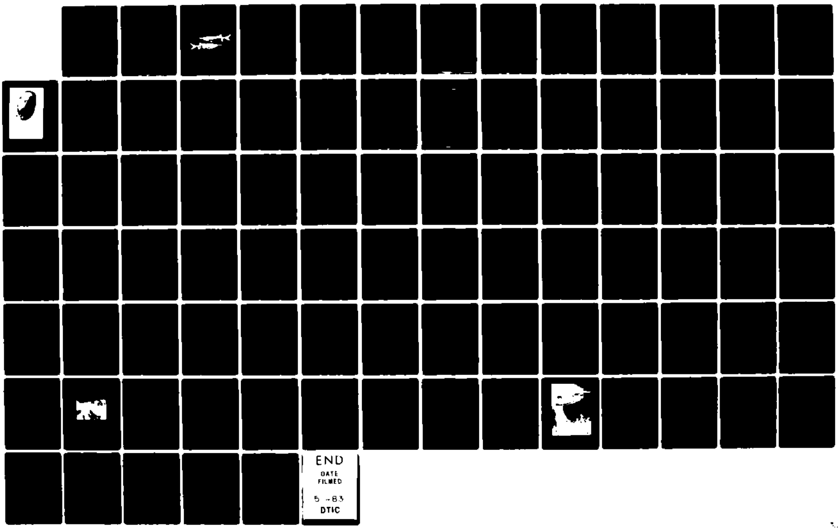

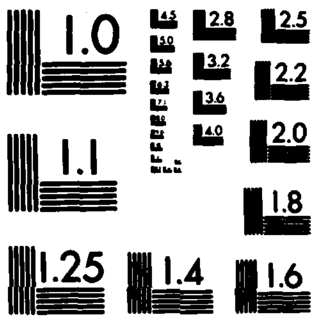

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

numbers have more than doubled, from 710 to 1,458, in pools 4-10. This was brought about by a 350 to 400 percent increase in the value of raw muskrat pelts. The total value of all furs taken in pools 4-10 during the 1977-1978 trapping seasons exceeded $496,000, the highest ever recorded. Again this recorded harvest is without consideration of the fur take in pools 2 and 3. It is estimated that the total dollar value was above $500,000. Obviously, furbearers represent an important consumptive use.

F. WILDLIFE - NONCONSUMPTIVE USE

Nonconsumptive uses of the wildlife resource include wildlife observation and photography. Species or groups of special interest are eagles, whistling swans, pelicans, canvasbacks and heron/egret rookeries. A great variety of songbirds and shorebirds migrate through the area also and provide excellent bird-watching opportunities. The public use output reports for pools 4-9 (Upper Mississippi River Wild Life and Fish Refuge, unpublished data) indicate that nearly 54,000 visits were made for wildlife observation and photography.

Chapter VIII

ENDANGERED AND THREATENED SPECIES

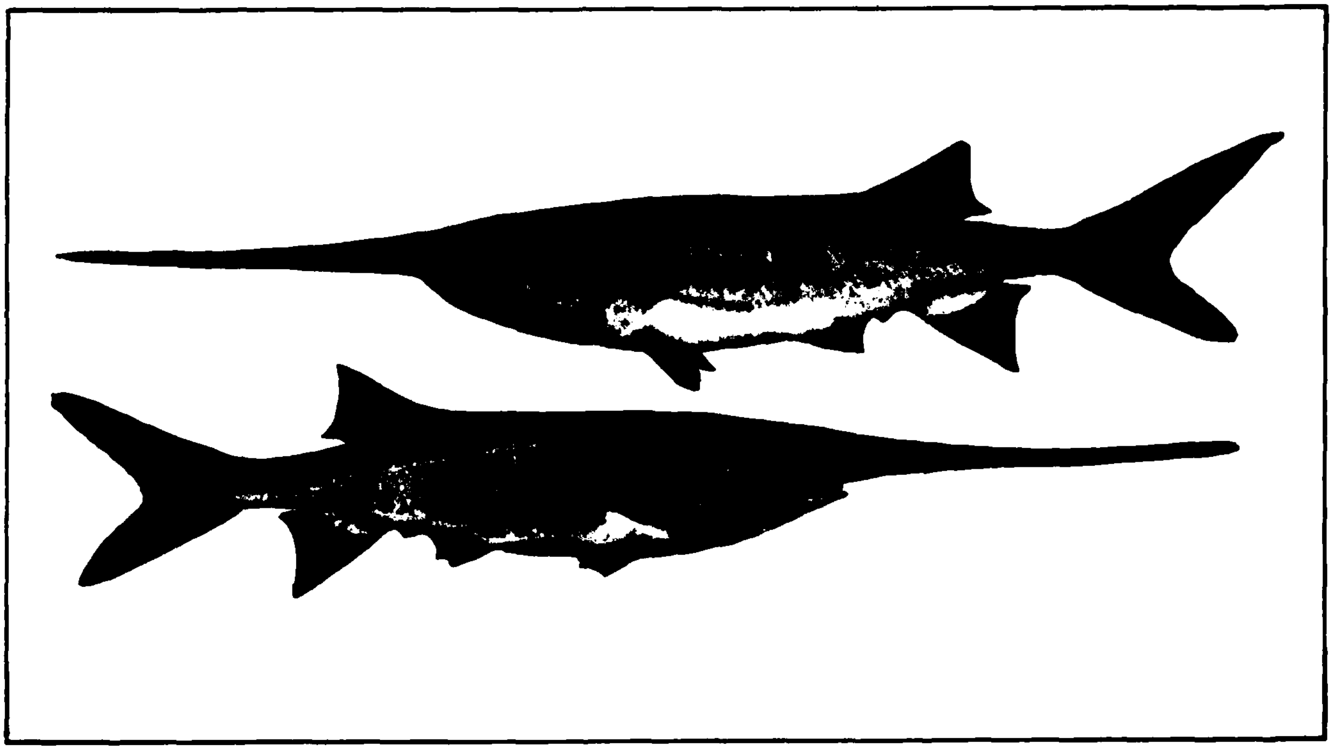

Figure 45. Paddlefish (*Polyodon spathula*) were once very abundant in the Upper Mississippi River. The 9-foot channel project and heavy fishing pressure have brought the population to a threatened status. Despite the numerous habitat changes on the river numerous endangered and threatened species, such as the paddlefish, still survive here (photo from Carlander, 1954).

ENDANGERED AND THREATENED SPECIES

A. INTRODUCTION

The GREAT I study area is within the range of two freshwater mussels, three raptors, and one medicinal herb which are classified as endangered or threatened species by the U.S. Fish and Wildlife Service. The mussels are the Fat Pocketbook Pearly Mussel (*Potamilus capax*) and the Higgin's Eye Pearly Mussel (*Lampsilis higginsii*).

The raptors are the Bald Eagle (*Aaliaeetus leucocephalus*) and the American and Arctic Peregrine Falcons (*Falco peregrinus anatum* and *Falco peregrinus tundrius*). The herb is the Northern Monkshood (*Aconitum noveboracense*).

The Fat Pocketbook Pearly Mussel

This large mussel was listed by the U.S. Fish and Wildlife Service as an endangered species in June of 1976. The species has historically been collected in large rivers with moderate velocities down to 8 feet of depth in both sandy and muddy areas. It has not been collected in the study area for many years despite several mussel surveys during the last several years. The Fat Pocketbook Pearly Mussel is believed to be extirpated in the study area. There should be no adverse impact on this species from either the channel maintenance plan or the projects recommended by the GREAT I.

The Higgin's Eye Pearly Mussel

This mussel was listed by the U.S. Fish and Wildlife Service as an endangered species in June 1976. The Higgin's Eye has historically been collected in large rivers but other habitat characteristics have not been consistent. The clam has been found in the study area on numerous occasions during several different scientific surveys of the river's side channels and main channel border. Over 100 specimens of Higgin's Eye mussel have been collected from a spoil pile resulting from a dredging project at Prairie du Chien in 1976. It is believed that these specimens were live prior to the dredging activity.

The Section 7 process ensures that there will be no adverse impacts on this species from either the channel maintenance plan or the projects recommended by the GREAT I. The overall project recommended by the GREAT I will enhance the species ability to survive and recover due to improved channel maintenance practices and habitat improvement.

The Bald Eagle

The bald eagle was listed by the U.S. Fish and Wildlife Service as an endangered species in February 1978, except in Minnesota, Wisconsin, Michigan, Oregon, and Washington. In these States the bald eagle is listed as threatened. Many eagles use the study area as a wintering area, roosting in riparian trees and feeding in the open water areas below Lake Pepin and the locks and dams. Nesting and rearing also takes place in the study area. Sightings of bald eagles have historically been and continue to be very common in the study area from fall through spring. There will be some adverse impacts on the eagles wintering habitat from the channel maintenance plan recommended by the GREAT I. However, the GREAT I channel maintenance plan will provide the eagle increased protection in the future.

The American Peregrine Falcon

The peregrine falcon has been extirpated from the study area for more than 20 years. Previously the falcon nested and reared young along the bluffs of the Mississippi River from Lake Pepin south. No breeding birds have been observed in this range for several decades. However, scientists from the University of Minnesota and the U.S. Fish and Wildlife Service have made several attempts at reestablishing breeding falcons along Lake Pepin. Results are still uncertain.

The GREAT I recommended program should have no significant impact on the status of this species.

The Arctic Peregrine Falcon

This subspecies of peregrine falcon is classified as endangered by the

U.S. Fish and Wildlife Service. The bird passes through the study area on its migration from Alaska and Canada to the gulf coast of the United States. Sightings of the bird are rare.

To our knowledge, the GREAT I recommended program will have no significant impact on the status of this species.

The Northern Monkshood

This medicinal herb is a threatened species classified as endangered in the States of Iowa and Wisconsin. It is found in the understory of dense deciduous forests and in shaded pockets of steep bluffs. The monkshood has been found in the southern most reaches of the study area along both the Iowa and Wisconsin bluffs.

Although the GREAT I recommended program may enhance the herbs chances of survival, site-by-site inspection of newly recommended disposal sites will be necessary to assure that an unknown population is not lost inadvertently.

Other species that may be discovered or listed in the future would also have to be considered as required by the Endangered Species Act.

B. THE UPPER MISSISSIPPI RIVER BIVALVES RECOVERY TEAM

The U.S. Fish and Wildlife Service officially created an endangered species recovery team for Upper Mississippi River mollusks in April 1980. The purpose of this team is to:

a/ determine the current status of endangered or threatened bivalve species in the river,

b/ determine what should be done to restore these species to self-sustaining populations, and

c/ describe which agencies should take the recommended recovery actions and how much money should be budgeted for these actions.

The recovery team is composed of:

Edward Stern, Leader, Univ. of Wisconsin-Stevens Point
Emanuel Worth, Comm. Clammer, Maiden Rock, Wis.
James Mick, Ill. Dept. of Cons., Springfield
Michael J. Vanderford, U.S. Fish & Wildlife Service, St. Paul, MN
Robert Whiting, U.S. Army Corps of Engineers, St. Paul, MN
Howard Krosch, Minn. Dept. of Nat. Res., St. Paul, MN

However, consultation with several other scientists and clammers is expected throughout the program.

The initial work of the team is to be completed in June of 1981,with a report submitted to the U.S. Fish and Wildlife Service shortly afterward. As information is obtained from the studies recommended in the initial recovery plan, the team will revise the plan to take new or additional actions. The Recovery Team will continue until the endangered mussels have become re-established at stable population levels, and they can be removed from the endangered species list.

C. FEDERAL LAW

Several Federal laws protect endangered and threatened species. Those laws are listed below.

The Federal Endangered Species Act of 1973 (PL 93-205) recognizes that certain species of fish, wildlife, and plants have become extinct or so depleted in numbers that they are endangered or threatened with extinction as a result of economic growth and development untempered by adequate concern and conservation. This act also recognizes the aesthetic, ecological, educational, historical, recreational and scientific value of these species to the Nation. Therefore, the Nation is pledged to conserve to the extent practicable the various species of fish, wildlife, and plants facing extinction.

The purpose of this act is to provide a program of protection so that such species and the ecosystems upon which they depend are conserved and to take steps to achieve the protection afforded by international treaties and conventions established for that purpose. The Federal Government, through financial assistance and other incentives, has encouraged the States and other interested parties to develop and maintain conservation programs to meet these national and international commitments and to better safeguard the Nation's fish, wildlife, and plant resources.

The Lacey Act (PL 7-72) was originally passed on May 25, 1900, and has been amended to transfer the functions of the Secretary of Agriculture relating to the conservation of wildlife, game, and migratory birds to the Secretary of the Interior. This amendment gives the Department of the Interior the power to preserve, distribute, introduce, and restore game birds and other wild birds in those parts of the Nation where they have become scarce or extinct.

The Bald Eagle Protection Act (PL 92-535, 1972) protects bald and golden

eagles. The act provides criminal and civil penalties for violations of the law. Protection covers dead or live specimens, portions of specimens, nests, and eggs. To coordinate the actions of other Federal agencies and their impacts on endangered and threatened species, as of January 4, 1978, procedural regulations governing interagency consultation under Section 7 of the Endangered Species Act of 1973 were established. All Federal agencies are required to consult with the Fish and Wildlife Service and the National Marine Fisheries Service to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of an endangered or threatened species or result in the adverse modification or destruction of their critical habitat.

The most recent listing of Federal Endangered and Threatened Wildlife and Plants was compiled in the July 14, 1977, Federal Register. A list of the most recent Federal or State designated endangered and threatened species found within the GREAT study area follows this narrative (Table 13).

D. IOWA LAW

The State of Iowa, on June 3, 1975, passed a bill entitled "Management and Protection of Endangered Plants and Wildlife" (State Law 66GA-109A). This act provides for investigations to determine management measures necessary for endangered or threatened fish, plants, and wildlife to sustain themselves successfully. Also, programs including acquisition of land or aquatic habitat can be established for the management of the endangered or threatened species.

E. MINNESOTA LAW

The Minnesota Endangered Species Act (MSA 97.488), passed in 1974, grants the Commissioner of Natural Resources authority to designate endangered or threatened species of wildlife, conduct studies, undertake management programs aimed at increasing or maintaining

their numbers, and enforce laws pertaining to these species.

The Conservation of Certain Wild Flowers act of Minnesota (MS 17.23), 1925 and 1935, also known as the Minnesota State Wild Flower Law, prohibits the sale of various wild flowers, including the American lotus (Nelumbo), which is a common aquatic plant on the Upper Mississippi River. In addition they may not be dug, cut, plucked, pulled, or gathered from any public land. This law is administered by the Minnesota Department of Agriculture.

In October 1975, the Minnesota Department of Natural Resources published a booklet entitled "The Uncommon Ones", a discussion of the biological status (1975) of some of the Minnesota plants and animals in need of special management consideration. Those Minnesota threatened and endangered species potentially occurring in the study area are included in Table 13.

F. WISCONSIN LAW

The State of Wisconsin established protection for those species of animals designated as endangered through the passage of State law, Chap. 29.415, the Wisconsin Endangered Species Act in 1972. According to this statute, endangered animals are "species or subspecies that are in trouble. Their continued existence as a part of the State's wild fauna is in jeopardy, and without help they may become extirpated." The endangered species program for animals is not only providing for the protection of those species endangered but also is involved with continuous determination of the status and distribution of endangered and other scarce species, restoration and management of habitat, reintroduction of native species and preservation of natural areas.

Because initial efforts at Federal and State levels had been primarily directed for preservation of endangered and threatened animals, legislation for endangered and threatened plants became necessary. Wisconsin has

recently introduced a bill, the Nongame and Endangered Species Conservation Act, AB 864, to repeal the current law (29.415) pertaining to endangered and threatened species. This bill will allow the first detailed identification and documentation of native, higher plants in Wisconsin believed to be threatened, endangered, or extirpated. This status of plants will be determined according to known occurrence or past occurrence in the State regardless of a particular species rarity or commonness in other states and the Nation and in essence is a refinement of national endangered species restoration efforts.

Because inventories of endangered, threatened, watched, and extirpated flora and fauna species are being reviewed in Wisconsin, the listing of these plants and animals is subject to a final revision which should be completed by 1979. The most recent list was completed in October, 1975, and in May, 1978, was revised. The list presented here will include those recent revisions.

Table 13. Endangered and Threatened Species of the GREAT I Study Area.

Status
E - endangered
T - threatened
U - unknown

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal IA	MN	WI	FED
MAMMALS							
* Pine Marten	*Martes americana*	Unknown	Entire			E	
* Canada Lynx	*Lynx canadensis*	Throughout study area	Entire			E	
* Eastern Timber Wolf	*Canis lupus lycaon*	Throughout study area	Entire			E	
Keen Myotis	*Myotis keenii*	Southern Iowa	Entire	T			
Indiana Bat	*Myotis sodalis*	Throughout study area	Entire	E			E
Woodland Vole	*Microtus pinetorum*	Northeast Iowa	Entire	E			
Ermine	*Musleta erminia*	Northern Iowa	Entire	U			
River Otter	*Lutra canadensis*	Mississippi River	Entire	T			
Bobcat	*Lynx rufus*	Throughout study area	Entire	T			
BIRDS							
Double-Crested Cormorant	*Phalacrocorax auritus*	Throughout study area	Entire			E	
Bald Eagle	*Haliaetus leucocephalus*	Throughout study area	Entire	E		E	E
Osprey	*Pandion haliaetus*	Throughout study area	Entire			E	
American Peregrine Falcon	*Falco peregrinus*	Throughout study area	Entire	E	E	E	E
Artic Peregrine Falcon	*Falco peregrinus tuudrius*	Throughout study area	Entire				E
Cooper's Hawk	*Accipiter cooperii*	Throughout study area	Entire	T		T	
Red-Shouldered Hawk	*Butea lineatus*	Throughout study area	Entire	E		T	
Yellow Rail	*Coturnicops noveboracensis*	Unknown	Entire			T	
Sharp-Shinned Hawk	*Accipiter striatus*	Throughout study area	Entire	E			

* The Upper Mississippi River in the GREAT I area is out of these species' range.

Table 13 (continued)

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal IA	MN	WI	FED
Bobwhite Quail	Colinus virginianus	Throughout study area	Entire		T		
Broad-winged Hawk	Buteo platypterus	Throughout study area	Entire	T			
Long-eared Owl	Asro otus	Throughout study area	Entire	T			
Blue-Winged Warbler	Vermivora pinus	Eastern Iowa	Entire	T			
REPTILES							
Ornate Box Turtle	Terrapene ornata	Throughout study area	Entire			E	
Queen Snake	Natrix septemvittata	Throughout study area	Entire			E	
Massasauga	Sistrurus catenatus	Throughout study area	Entire		T	E	
Wood Turtle	Clemmys insculpta	Northern counties of study area	Entire			E	
Pickerel Frog	Rana palustris	Throughout study area	Entire			T	
Burns Leopard Frog	Rana pipiens burnsii	Unknown	Entire			T	
Five-lined skink	Eumeces fasciatus	Northeast Iowa	Entire	T			
Black Rat Snake	Elaphe obsoleta	Eastern Iowa	Entire	T			
Blanding's Turtle	Emydoidea blandingi	Northern Iowa	Entire	T			
Cricket frog	Aeris crepitans	Southern Minnesota	Entire		T		
MUSSELS							
Higgins' Eye Pearly Mussel	Lampsilis higginsii	Throughout study area	Entire			E	E
FISH							
Paddlefish	Polyodon spathula	Throughout study area	Entire			T	
Blue Sucker	Cycleptus elongatus	Throughout study area	Entire			T	
River Redhorse	Moxostoma carinatum	Unknown	Entire			T	
Gilt Darter	Perlina evides	Throughout study area	Entire			T	
Goldeye	Hiodon alosides	Unknown	Entire			T	
Pallid Shiner	Notropis amnis	Unknown	Entire			T	
Weed Shiner	Notropis texanus	Southern Wisconsin	Entire	T		T	
Ozark Minnow	Dionda nubila	Throughout study area	Entire			E	
Pugnose Shiner	Notropis anogenus	Unknown	Entire			E	
Greater Redhorse	Moxostoma valenciennesi	Unknown	Entire			E	

Figure 46. The Higgins' Eye Pearly Mussel is listed as an endangered species by both the Federal government and by Wisconsin. Other mussels may be classified endangered as we learn more about the bivalve species (photo by Patrice Wagner).

Table 13 (continued)

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal IA	MN	WI	FED
Crystal Darter	*Ammocrypta asprella*	Throughout study area	Entire			T	
Mud Darter	*Etheostoma asprigene*	Throughout study area	Entire	T		T	
Chestnut Lamprey	*Ichthyomyzon castaneus*	Mississippi River	Entire	T			
Lake Sturgeon	*Acipenser fulvescens*	Mississippi River	Entire	T			
Black Redhorse	*Moxostoma dugesnei*	Upper reaches of Turkey River	Entire	E			
Western Sand Darter	*Ammocrypta clara*	Mississippi River	Entire	T			
Bluntnose Darter	*Etheostoma chlorosimum*	Mississippi River	Entire	T			
Least Darter	*Etheostoma microperca*	Mississippi River	Entire	E			
Pirate Perch	*Aphredoderus sayanus*	Mississippi River	Entire	U			
PLANTS							
Monkshood	*Aconitum noveboracense*	Throughout study area	Entire	E		E	E
Moschatel	*Adoxa moschatellina L.*	Southwest Wisconsin	Entire			E	
Purple Milkweed	*Asclepias purpurascens L.*	Unknown	Entire			E	
Prairie Milkweed	*Asclepias sullivanti*	Unknown	Entire			E	
Forked Aster	*Aster furcatus burgess*	Throughout study area	Entire			E	
Small Grape Fern	*Botrychium simplex E.*	Throughout study area	Entire			E	
Great Indian-Plantain	*Cacalia muhlenbergii*	Unknown	Entire			E	
Wild Hyacinth	*Camassia scilloides*	Unknown	Entire			E	
Sedge	*Carex careyana*	Southwest Wisconsin	Entire			E	
Sedge	*Carex cumulata*	Southwest Wisconsin	Entire			E	
Minnesota Trout Lily	*Erythronium propullaus*	Southeast Minnesota	Entire		E		
Yellow Giant Hyssop	*Agastache nepetoides*	Southern Wisconsin	Entire			T	
Prairie Dandelion	*Agoselis cuspidata*	Pierce, Southern Wisconsin	Entire			T	
Carolina Anemone	*Anemone caroliniana*	Unknown	Entire			T	
Dragon Sagewort	*Artemisia dracunculus L.*	Unknown	Entire			T	
Prairie Sagewort	*Artemsia frigida*	Throughout study area	Entire			T	

Table 13 (continued)

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal IA	MN	WI	FED
Woolly Milkweed	*Asclepias lanuginosa*	Unknown	Entire			T	
Maidenhair Spleenwort	*Asplenium trichomanes*	Unknown	Entire			T	
Ground Plum	*Astragalus crassicarpus*	Pierce County, WI	Entire			T	
Narrow-Leaved Spleenwort	*Athyrium pycnocalpon*	Unknown	Entire			T	
Screwstem	*Bartonia virginica*	Unknown	Entire			T	
Prairie Indian-Plantain	*Cacalia tuberosa*	Southern Wisconsin	Entire			T	
Poppy Mallow	*Callirhoe*	Throughout study area	Entire			T	
Water Starwort	*Callitriche heterophylla*	Unknown	Entire			T	
Sedge	*Carex backii*	Throughout study area	Entire			T	
Sedge	*Carex longii*	La Crosse County, WI	Entire			E	
Sedge	*Carex meadia*	Grant Co., WI, IA bluffs	Entire	E		E	
Sedge	*Carex straminea*	La Crosse County, WI	Entire			E	
Sedge	*Carex torreyi*	Tremp.,St. Croix Cos., WI	Entire			E	
Brook Grass	*Cata brosa aquatica*	St. Croix County, WI	Entire			E	
White Lady's Slipper	*Cypripedium candioum*	Southern Wisconsin	Entire			E	
Mullein Foxglove	*Dasistoma macrophylla*	Grant County, WI	Entire			E	
Sundew	*Drosera linearis*	Polk, St. Croix Cos., WI	Entire			E	
Fragrant Fern	*Dryopteris fragrans*	Polk, St. Crois Cos., WI	Entire			E	
Yerba De Tajo	*Eclipta alba*	Crawford, Grant Cos., WI	Entire			E	
Waterwort	*Elatine triandra*	Unknown	Entire			E	
Pale False Foxglove	*Gerardia skinneriana*	Unknown	Entire			E	
Tall White Bog Orchid	*Habenaria dilatata*	Throughout study area	Entire			E	
Prairie White Fringed Orchid	*Habenaria leucophaea*	Unknown	Entire			E	
Bluets	*Houstonia caerulea*	Throughout study area	Entire			E	
Twin Leaf	*Jeffersonia diphylla*	Throughout study area	Entire			E	

Table 13 (continued)

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal IA	MN	WI	FED
Violet Bush Clover	Lespedeza violacea	Throughout study area	Entire			E	
Dotted Blazing Star	Liatris punctata	St. Croix, Pierce Cos., WI	Entire			E	
Wild Quine	Parthenium integrifolium	Unknown	Entire			E	
Purple Cliff Brake	Pellaea atropurpurea	Driftless Area, WI, Iowa Bluffs	Entire	E		E	
Prairie Parsley	Polytaenia nuttauii	Throughout study area	Entire			E	
Spotted Pondweed	Potamogeton pulcher	Throughout study area	Entire			E	
Rough White Lettuce	Prenanthes aspera	Southern Wisconsin	Entire			E	
Fragrant Sumac	Rhus aromatica	Southern Wisconsin	Entire			E	
Silky Willow	Salix sericea	Throughout study area	Entire			E	
Low Calamint	Satureja clabella	Vernon County, WI	Entire			E	
Small Skullcap	Scutellaria paruula	Pierce, St. Croix Cos., WI	Entire			E	
Snow Trillium	Trillium nivale riddell	Pierce, St. Croix Cos., WI	Entire			E	
Nodding Pogonia, Three Birds Orchid	Triphora trianthophora	Southern Wisconsin	Entire			E	
Purple Bladderwort	Utricolaria purpurea	Unknown	Entire			E	
Small Purple Bladderwort	Utricularia resupinata	Unknown	Entire			E	
Oregon Woodsia	Woodsia oregana	Polk County, WI	Entire			E	
Sedge	Carex richardsonii	Unknown	Entire			T	
Wild Chervil	Chaerophyllon procumbens	Grant County, WI	Entire			T	
Hill's Thistle	Cirsium hillii	Unknown	Entire			T	
Hair Grass	Deschampsia cespitosa	Throughout study area	Entire			T	
Water Purslane	Didiplis diandra	Throughout study area	Entire			T	
Jewelled Shooting Star	Dodecatheon amethystinom	Throughout study area	Entire			T	

Table 13 (continued)

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal IA	MN	WI	FED
Purple Coneflower	Echinacea pallida	Grant County, WI	Entire			T	
Willow Herb	Epilobium strictum	Throughout study area	Entire			T	
Marsh Horsetail	Equisetum palustre L.	Trempealeau Co., WI	Entire			T	
Upland Boneset	Eupatorium sessilifolium	Vernon County, WI	Entire			T	
White Prairie Gentian	Gentiana alba	Southern Wisconsin	Entire			T	
Licorice	Glycyrrhiza lepidota	St. Croix, Pepin Cos.,WI	Entire			T	
Kentucky Coffee Tree	Gymnoclaous dioica L.	Southern Wisconsin	Entire			T	
Tuberculed Orchid	Habenaria flava L.	Southern Wisconsin	Entire			T	
Hooker's Orchid	Habenaria hookeri	Throughout study area	Entire			T	
Golden Seal	Hydrastic canadensis L.	Southern Wisconsin	Entire			T	
Violet Bush Clover	Lespedeza violacea L.	Throughout study area	Entire			T	
Broad-Leaved Puccoon	Lithospermum latifolium	Southern Wisconsin	Entire			T	
Meadow Parsnip	Thaspium triboliatum	Southern Wisconsin	Entire			T	
Broad Beech Fern	The Lypteris hexagonoptera	Southern Wisconsin	Entire			T	
Red Trillium Wake-Rogin	Trillium recurvatum	Southern Wisconsin	Entire			T	
Violet	Viola septentrionaus	Southern Wisconsin	Entire			T	
Glade Mallow	Napaea dioica L.	Throughout study area	Entire			T	
Toothed-Leaved Evening Primrose	Oenothera serrulatta	Northern Wisconsin	Entire			T	
Marbleseed	Onosmodium Molle Michx.	Southern Wisconsin	Entire			T	
Brittle Prickly Pear	Opuntia fragilis	Southern Wisconsin	Entire			T	
Ginseng	Panax quinquefolius L.	Unknown	Entire			T	
Hairy Beard Tongue	Penstemon	Throughout study area	Entire			T	
Pale Beard Tongue	Hirsutus penstemon pallidus	Throughout study area	Entire			T	

Table 13 (continued)

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal: IA	MN	WI	FED
Villous Prairie Clover	Petalostemom villosum	Throughout study area	Entire			T	
Sycamore	Platanus occidentalis L.	Grant, Crawford Cos.WI	Entire			T	
Vasey's Pondweed	Potamogeton vaseyi	La Crosse County, WI	Entire			T	
Bird's Eye Primrose	Primula mistassinica	Throughout study area	Entire			T	
Pomme De Prairie	Psoralea esculenta	Throughout study area	Entire			T	
Lance-Leaved Buckthorn	Rhamnus lanceolata	Grant County, WI	Entire			T	
Meadow Beauty	Rhexia virginica L.	Southern Wisconsin	Entire			T	
Saxifrage	Saxifraga forbesii	Throughout study area	Entire			T	
White or Snowy Campion	Silene nivea	Pepin County, WI	Entire			T	
Cliff Goldenrod	Solidago sciaphila	Throughout study area	Entire			T	
Sullivantia	Sullivantia renifolia	Throughout study area	Entire			T	
Glandular Wood Fern	Dryopteris intermedia	Iowa Bluffs	Entire	E			
Rock Clubmoss	Lycopodium porophilum	Allamakee & Clayton Cos., IA	Entire	E			
Twinflower	Linnaea borealis	Clayton County, IA	Entire	E			
Bunchberry	Cornus canadensis	Clayton County, IA	Entire	E			
Prince's Pine	Chimaphila umbellata	Allamakee County, IA	Entire	E			
Shinleaf	Pyrola secunda	Allamakee County, IA	Entire	E			
Low Sweet Blueberry	Vaccinium angustifolium	Iowa Bluffs	Entire	E			
Velvet-Leaf Blueberry	Vaccinium myrtilloides	Iowa Bluffs	Entire	E			
Swamp Loosestrife	Decodon verticillatus	Allamakee County, IA	Entire	E			
Purple Milkwort	Polygala polygama	Allamakee County, IA	Entire	E			
Fameflower	Talinum rugospermum	Allamakee County, IA	Entire	E			
Golden Saxifrage	Chrysoplenium lowense	Allamakee, Clayton, Dubuque Cos., IA	Entire	E			
Summer Grape	Vitis aestivalis	Clayton County, IA	Entire	E			

Table 13 (continued)

Common Name	Scientific Name	Known Distribution	Range Where Threatened or Endangered	Status, State and Federal			
				IA	MN	WI	FED
Deep Green Sedge	*Carex tonsa*	Allamakee County, IA	Entire	E			
Rosy Twisted Stalk	*Streptopus roseus*	Allamakee and Clayton Cos., IA	Entire	E			
Nodding Onion	*Allium cernuum*	Allamakee Co., IA	Entire	E			
Showy Lady Slipper	*Cypripedium reginae*	Allamakee and Clayton Cos., IA	Entire	E			
Rice Grass	*Oryzopsis pungens*	Iowa Bluffs	Entire	E			

Chapter IX

EXISTING RESOURCE MANAGEMENT
ORGANIZATION, FUNCTION, AND AUTHORITIES

A. FEDERAL AND INTERSTATE

1. ORGANIZATION AND FUNCTION

a. U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service is the primary Federal agency charged with fish and wildlife resource management on the Upper Mississippi River in the GREAT I area. Most of the Service's functions in this area (Minnesota, Wisconsin, and the Mississippi River corridor of Iowa) are coordinated by the Twin Cities Area Office in Saint Paul, Minnesota. Within the study area, this office administers the Upper Mississippi River Wild Life and Fish Refuge, the national fish hatchery at Genoa, Wisconsin, and the coordinated regulatory functions with the U.S. Army Corps of Engineers. Additional service activities within the study area are administered by the Great Lakes Regional Office located at Fort Snelling, Minnesota. The Service's responsibilities within the study area are: indirect regulation of filling, draining, or polluting of wetlands and navigable waters; wildlife refuge and fish hatchery management; Federal aid; planning and assistance; law enforcement; animal population control; regulation and inspection of foreign fish and wildlife imports at the Minneapolis/St. Paul International Airport under the Endangered Species Act; and administrative and technical assistance to State and local governments.

Upper Mississippi Wild Life and Fish Refuge

The Upper Mississippi River Wild Life and Fish Refuge was established by Congress in 1924. It stretches 284 miles through the river corridor from Wabasha, Minnesota, to Rock Island, Illinois. The refuge is composed of five districts with headquarters at Trempealeau, La Crosse, and Cassville, Wisconsin; Lansing, Iowa; and Savanna, Illinois. The entire refuge is administered through central headquarters at Winona, Minnesota.

The refuge consists of approximately 195,000 acres of wooded islands

and river banks, sandbars, and open water marshes. The refuge is maintained to provide resting and feeding habitat for migratory waterfowl species, wintering habitat for eagles and other raptors, year-round habitat for fish and furbearers, and summer habitat for colonial water birds. Actual physical management of the refuge has been limited in the past because of its massive size, the general lack of means for making such alterations, and the problem of all waters within the refuge being part of the navigable waters of the United States. Most management emphasis on the refuge has, therefore, been placed on controlling uses of refuge lands and setting regulations for taking of waterfowl and furbearers.

Trempealeau National Wildlife Refuge

Trempealeau National Wildlife Refuge is an independent refuge facility surrounded by the Upper Mississippi Refuge on the Wisconsin side of the river between Winona and Trempealeau. It was authorized in 1934 as a migratory bird refuge to preserve and protect the rich waterfowl values of the area. However, only 700 acres were acquired at that time. The remaining 5,700 acres was part of the privately owned Delta Fish and Fur Farm and was not acquired until recently (the purchase agreement for this property was signed on March 9, 1979).

The Delta Fish and Fur Farm is a unique area of bottomland marsh and hardwoods. This acquisition will afford an opportunity to physically manage an area of the river valley for fish and wildlife. The area is isolated from the river by a substantial dike, and water levels within the dike can be controlled by two existing culverts. A management plan for the area has not been developed; however, it is certain that the acquisition of this area will provide the Service with a better opportunity to fulfill the original objectives of the refuge.

Genoa National Fish Hatchery

The Service's fish hatchery at Genoa, Wisconsin, uses the river as a source of spawning and rearing stock. Fish are collected during

the ebb of the spring floods in the fashion of the State fish rescue teams that operated all through the river in the early 1900's. Historically, the river has not needed stocking because spawning habitat and stock have apparently been adequate to maintain healthy populations of desirable fishes. Although fish habitat has declined in recent years as a result of human activity and accelerated sedimentation, there has been no critical sign of major fish population declines in the study area of the river. Fish from the Genoa Hatchery are distributed to many research laboratories, federal water projects, and State managed programs throughout the country, but particularly within the Great Lakes States.

Wetland Protection

The Service cooperates with the Corps of Engineers in regulating the filling, draining, or alteration of wetlands within the river corridor. These regulatory authorities were established by the Rivers and Harbors Act of 1899 and Clean Water Act of 1977. The Service is responsible for providing the Corps with biological expertise and consultation on all permit applications to alter wetlands and/or navigable waters on the Mississippi River. This function is provided by the St. Paul Field Office of the Service, which is an ecological services division of the Twin Cities Area Office.

Federal Aid Programs

The Minnesota, Wisconsin, and Iowa State Departments of Natural Resources all conduct fish and wildlife improvement and rehabilitation projects on the river which are federally funded through the Dingle-Johnson and Pittman-Robertson Acts. The States develop their own proposals for projects on a yearly basis and work through the Service's Regional Office at Fort Snelling (Twin Cities), Minnesota, to obtain funds. The Federal Aid Office at Fort Snelling evaluates State proposals, grants funding, and monitors the work being done. Numerous fish and wildlife

restoration projects on the river have been conducted through this program over the years.

Mississippi River Flyway Council

Another of the functions of the Fish and Wildlife Service is to provide technical assistance to the Mississippi Flyway Council regarding waterfowl management. Through this office, technical assistance and participation has been provided on inventories of waterfowl and raptors using the river corridor and evaluation of habitat in the corridor.

b. U.S. Army Corps of Engineers

The Corps of Engineers is indirectly involved with fish and wildlife management through several functions. A large portion of the Upper Mississippi Wild Life and Fish Refuge is owned by the Corps, which has granted rights to the Service to manage the land as part of the refuge. The Corps regulatory authorities on the river have also made it possible to protect many acres of wetland habitat important to fish and wildlife on the river. Recently, the Corps used its authorities and equipment to cooperate with the Service and the States in rehabilitating backwater habitat through side channel modifications and culvert construction.

c. Upper Mississippi River Basin Commission

The Upper Mississippi River Basin Commission facilities planning coordination between State and Federal agencies within the Upper Mississippi River basin. The Commission has 6 State and 10 Federal members. Its primary duties are to:

1. Coordinate all Federal, State, local and private planning in water and related land resources.

2. Prepare and regularly update a comprehensive, coordinated joint plan for managing these resources.

3. Conduct special studies, as required, to provide more informed bases for decision-making in selected areas of concern.

The Commission was the forum used for creating and guiding the GREAT I program. All products from the GREAT I program are handled through the Commission and the Corps of Engineers. The Commission and the Corps will be responsible for evaluating the GREAT I final report and carrying the report and its recommended programs to the executive and legislative branches of the Federal Government.

d. Upper Mississippi River Conservation Committee (UMRCC)

The UMRCC was organized on December 15, 1943, as a result of an interagency meeting held for the general purpose of:

> ". . . securing recognition of wildlife and recreational use of the river, together with navigation and other public uses, in proportion to the related public benefits."

The Committee was sponsored by the States of Minnesota, Wisconsin, Illinois, Iowa, and Missouri with the encouragement of the Fish and Wildlife Service and Corps of Engineers. The primary objective of the UMRCC is to coordinate the resource management activities of the five States bordering the Upper Mississippi River. The Upper Mississippi River is defined as the area of land and water within the floodplain of the Mississippi River between the Ohio River on the south and the St. Croix River on the north. The UMRCC has adopted the following four objectives as part of its constitution:

1. Promote the preservation, development, and wise use of the natural and recreational resources of the Upper Mississippi River bordering the states of Minnesota,

Wisconsin, Iowa, Illinois, and Missouri.

2. Formulate policies, plans, and programs for carrying on cooperative surveys and studies for the above-stated purposes.

3. Keep necessary records and publish and distribute reports.

4. Recommend to the governing State bodies the furtherance of the objectives of the Committee.

The decision-making body of the UMRCC is the Executive Board. It is composed of five voting delegates, each of which is a representative of the five cooperating State conservation agencies. The Executive Board also includes the chairmen of the five technical sections of committees (Fish, Wildlife, Recreation and Water Use, Law Enforcement, and Water Quality) and the coordinator (a full-time employee of the U.S. Fish and Wildlife Service) who is a non-voting member.

The UMRCC has played a significant role in the preservation and orderly development of Upper Mississippi River resources. Among other things, its publications have contributed significantly to the assessment and documentation of fish and wildlife resources, the classification of habitat, the assessment of recreational use, the establishment of dredged material disposal criteria, and the initiation and subsequent authorization of the Great River Study.

e. Minnesota - Wisconsin Boundary Area Commission

In 1965, Minnesota and Wisconsin enacted a special interstate compact which established the Minnesota-Wisconsin Boundary Area Commission. This Commission has 10 members (5 from each State) which are appointed by the governors and confirmed by the senates. The Commission is pledged to work for the wise use, protection, and development in the

public interest of the boundary roads, river valleys, and waters comprising the interstate border. The purpose of the Commission is to assist the States in the cooperative joint efforts by conducting studies and making recommendations on plans, policies, development proposals, public management, uniform laws, conservation efforts and use of river corridor waters and lands. It is also responsible for directly assisting the States and their local subdivisions in coordinating their programs, planning, and projects with one another and aiding them in their participation in the many special Federal programs which exist on the St. Croix and Mississippi Rivers.

f. Mississippi Flyway Council

The Mississippi Flyway Council was established on January 24, 1952. The council is an organization of resource managers whose attention is focused on waterfowl management. Since waterfowl roam the length and breadth of the North American continent, they require a high level of cooperative management, both internationally and intranationally. Directors of conservation departments of the member States and Provinces in the flyway, or their designated representatives constitute the official voting members of the council. The States and Provinces in the Mississippi Flyway are Alabama, Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Manitoba, Michigan, Minnesota, Mississippi, Missouri, Ohio, Ontario, Saskatchewan, Tennessee, and Wisconsin. Canadian delegates participate fully, but customarily do not vote on recommendations for regulations in the United States. The council meets twice each year (March and August) to hear the reports of their committees and those of their Technical Section and to make decisions on matters of common concern. Council bylaws provide that the chairman, cochairman, and their alternates will serve for one year, alternating from the northern half to the southern half of the flyway. The standing committees of the Council are the Executive, Planning, Habitat, Research, Information and Education and Enforcement. Except for executive sessions the meetings are open to the public. All issues are settled by a majority vote, with each official member having one vote.

The Technical Section is a working adjunct of the Council which conducts studies assigned by the Council and reports its recommendations. Membership includes one voting member for each state and province and any other waterfowl technician willing to pay dues and participate in the work of the Section.

The Fish and Wildlife Service (USFWS) provides each council with a flyway representative. The flyway representative's job is to aid the Council chairman, help coordinate technical section activities, and represent the council views to the Director of the Fish and Wildlife Service. USFWS and Canadian Wildlife Service (CWS) personnel serve on council and technical section committees in an ex-officio capacity.

2. FEDERAL AND INTERSTATE AUTHORITIES

a. The Great River Environmental Action Team

Section 117 of the Water Resource Development Act of 1976 (Public Law 94-587) authorized the Secretary of the Army to investigate and study in cooperation with interested State and Federal agencies, through the Upper Mississippi River Basin Commission, the development of a river system management plan in the format of the "GREAT River Study" for the Mississippi River from the mouth of the Ohio River to the head of navigation at Minneapolis. The GREAT I study, which applies to the Mississippi River between Guttenberg and Minneapolis, proposed to incorporate the total river resource requirements including, but not limited to, navigation, the effects of increased barge traffic, fish and wildlife, recreation, watershed management, and water quality.

The GREAT I study effort to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands of the Upper Mississippi River complies with Executive Order 11990 dealing with the protection of wetlands. In addition, the GREAT I study effort complies with Executive Order 11988 in that the reduction of flood losses; minimization of flood impacts on human

safety, health, and welfare; and restoration and preservation of the natural and beneficial values of floodplains have been taken into account.

The policies of the National Environmental Policy Act of 1969 have been used in the GREAT I study. These policies of the Federal Government, in cooperation with State and local governments and other concerned public and private organizations, involve the use of all practicable means and measures to foster and promote the general welfare, creation and maintenance of conditions under which man and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations.

b. U.S. Fish and Wildlife Service

The Fish and Wildlife Service is the primary Federal agency charged with responsibility for the publicly owned fish and wildlife resources in the GREAT I study area.

The Upper Mississippi River Wild Life and Fish Refuge was established by an act of Congress on June 7, 1924. Original acreages were acquired through purchase, session, and donation and by withdrawal from the public domain under executive order. The area was later enlarged by additional land acquisitions of the Corps of Engineers for navigational improvements. These additional tracts became part of the refuge under a general plan and cooperative agreement.

The refuge was established and maintained to serve as a refuge and breeding place for (1) migratory birds; (2) other wild birds, game animals, fur bearing animals, and for the conservation of wild flowers and aquatic plants; and (3) fish and other aquatic life.

On August 12, 1958, the Fish and Wildlife Coordination Act of 1934 was amended to provide for more effective integration of fish and wildlife conservation with Federal water-resource developments and

for other purposes.

Relating to the Fish and Wildlife Coordination Act, in 1963, general plans were formulated for the use of lands and waters of the navigation channel project for wildlife conservation and management. These plans were approved by the Secretary of the Army; the Secretary of the Interior; and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.

Title 50 of the Code of Federal Regulations, parts 20 - 35, contains regulations of the refuge pertaining to hunting, sport fishing, public entry and use, prohibited acts, enforcement, land use management, wildlife species management, refuge revenue sharing with counties, and wilderness preservation and management.

c. Corps of Engineers

The Corps of Engineers contributes to the management of the Mississippi River by virtue of three authorities with which it has been entrusted.

The first authority relates to the operation and maintenance of the 9-foot navigation channel for commercial traffic. The River and Harbor Act of January 21, 1927 authorized the initial survey of the feasibility of the 9-foot channel project. In 1930, an act (46 Stat 918) was passed which established a 9-foot channel depth at low water with widths suitable for long-haul common carrier service. A report containing a more detailed study with thorough discussion of the analysis and recommendations was published in House Document No. 13F dated December 9, 1931.

The second authority comes from section 10 of the Rivers and Harbors Act of 1899. This section deals with the issuance of permits for structures which could obstruct navigation.

The third authority stems from section 404 of the Clean Water Act

of 1977, as amended, and concerns the issuance of permits involving the placement of fill or dredged material in wetlands.

d. Upper Mississippi River Basin Commission

The Upper Mississippi River Basin Commission (UMRBC) was established by presidential order on March 22, 1972. The Commission's functions are to enhance communications and coordination between State and Federal agencies. It has no specific authority to manage fish and wildlife.

e. Minnesota-Wisconsin Boundary Area Commission

The commission's authority is advisory and no recommendation, plan, or finding shall have the force of law or be binding or limit the powers of any party, State or its departments, agencies or municipalities (Source: Minnesota-Wisconsin Boundary Area Commission Biennial Report for 1975 - 1976).

f. Mississippi Flyway Council

Resolution 10 of the International Association of Game, Fish and Conservation Commissioners adopted on September 11, 1951, created the National Waterfowl Council and the four Flyway Councils. This organization is a cooperative program between the participant agencies and has no regulatory or management authority of its own.

g. St. Croix River: Wild and Scenic Rivers Act

In 1968, Congress enacted the Wild and Scenic Rivers Act. This act authorized a national system of wild and scenic rivers, specifically including several rivers in the system. The St. Croix River above Taylors Falls and its major tributary, the Namekagon, were two of these rivers. The act also listed 27 other rivers, including the St. Croix River from Taylors Falls to its confluence with the Mississippi River, which were to be studied to determine whether they were

suitable for inclusion in the system.

On October 25, 1972, Public Law 92-560 was passed. This act amended the Wild and Scenic River Act by designating the Lower St. Croix River as a component of the national system. It provided that the Secretary of the Interior administer the upper 27 miles of the Lower St. Croix River and designate the remaining 25 miles for inclusion upon application by the Governors of Minnesota and Wisconsin; and that the Secretary of the Interior, jointly with the States, establish detailed boundaries and prepare a plan for necessary developments. On January 3, 1975, Public Law 93-621 was signed by the President, amending the act by increasing the appropriation from $7,225,000 to $19,000,000. To comply with these provisions, the States of Minnesota and Wisconsin and the Department of the Interior have jointly prepared the master plan evaluated by an environmental impact statement.

h. Upper Iowa River: Wild and Scenic Rivers Act

Although a portion of the Upper Iowa River has been designated as a wild and scenic river, that portion of the river in the Mississippi River corridor has been channelized and is not included in the designation.

i. Minnesota Valley National Wildlife Refuge

The Minnesota Valley National Wildlife Refuge was established with passage of Public Law 94-466 in 1977. The refuge is along the lower Minnesota River and consists of numerous units of relatively undisturbed marshlands lying between areas of industrial development. The Long Meadow Lake unit of the refuge, which consists of approximately 2,100 acres, is within the GREAT I study area. The refuge was established to preserve, protect, and manage the remaining natural resource so that habitat for migratory waterfowl, fish and other wildlife species will not be lost and at the same time provide environmental

education, interpretive programs, and outdoor recreation to the nearly 2 million people in the surrounding metropolitan area.

j. Wilderness Act

The Wilderness Act of September 3, 1964 (Public Law 88-577), required that the Secretary of the Interior review every roadless area of 5,000 contiguous acres or more and every roadless island, regardless of size, within the National Wildlife Refuge System within 10 years after the effective date of the act and report to the President his recommendations as to the suitability of each such area or island for preservation as wilderness. A recommendation of the President for designation as wilderness would not become effective unless provided by an act of Congress.

Sections 4(a) and (b) of the Wilderness Act provided that: (1) the act is to be within and supplemental to the purposes for which National Wildlife Refuges are established and (2) wilderness areas shall be administered to preserve their wilderness character and devoted to the public purposes of recreational, scenic, scientific, educational, conservation and historical use insofar as primary refuge objectives permit. Wilderness designation does not remove or alter an area's status as a National Wildlife Refuge.

In fulfilling this responsibility, a study was made of the Upper Mississippi River Wild Life and Fish Refuge during the early 1970's. In 1974, the President declared the refuge lands unsuitable for inclusion in the National Wilderness Preservation System. At that time, the President directed "that a wilderness reevaluation be conducted at such time as management prerogatives and other prospective uses of the area are better defined."

This reevaluation included all lands administered by the Fish and Wildlife Service as a part of the Upper Mississippi Refuge. Both

Fish and Wildlife Service and Corps of Engineers fee lands were included.

A mutual conclusion was reached by the Fish and Wildlife Service and the Corps of Engineers that wilderness designation of any significant parcel of those lands administered as the Upper Mississippi River Wild Life and Fish Refuge would adversely affect the capabilities of either agency to carry out their congressional mandates. Therefore, it was recommended to the Secretary of the Interior and the Secretary of the Army that no lands of the refuge were suitable for wilderness classification as defined under the Wilderness Act of 1964 (since expired)[(1)]. However, the Secretary of the Interior stayed final judgement on the appropriateness of wilderness within the Upper Mississippi Refuge until the GREAT I and GREAT II final reports have been concluded and evaluated. GREAT I made a formal request for such action.

k. <u>General Federal Laws Affecting the Upper Mississippi River.</u>

Numerous additional Federal laws directly pertain to fish and wildlife administration management and recreation in the GREAT I study area. These laws can be grouped into two main categories: laws designed to provide direct funding and laws designed to administer and regulate. Thirty-six of these laws are described in Table 14.

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(1) Sources: (1) Upper Mississippi River Wilderness Study Summary, Upper Mississippi River Wild Life and Fish Refuge USDI, Bureau of Sport Fisheries and Wildlife. (2) U.S. Fish and Wildlife Service Environmental Assessment - Wilderness Study for the Upper Mississippi Wildlife and Fish Refuge. August 1977.

TABLE 14

FEDERAL LAWS PERTAINING TO FISH AND WILDLIFE RESOURCES**

NAME	DESCRIPTION	ADMINISTERING AGENCY
*Bald Eagle Protection Act	Regulations protecting bald and golden eagles. Provides penalties and cooperation management agreements with States.	Department of the Interior Fish and Wildlife Service
*Black Bass Act	Regulations for interstate transportation of sport caught fish. Provides penalties.	Department of the Interior Fish and Wildlife Service
*Commercial Fisheries Research and Development Act of 1964	Provides means of funding for State research and development in commercial fisheries. Encourages interstate commercial fisheries compacts.	Department of Commerece National Oceanic and Atmospheric Administration - National Marine Fisheries Service
*Conservation Facilities at Water Projects of Corps of Engineers (Flood Control	Authorizes Corps to construct, maintain, and operate public park and recreation facilities at water development projects	Corps of Engineers

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
Act of 1944).	and provides permitting system for local interests (State and local) to do the same (grant leases to them).	
*Conservation at Military Reservations	Provides mechanism for cooperative planning for fish and wildlife conservation on military reservations. Also provides for recreation planning.	Secretaries of Defense and the Interior
Department of Transportation Act	National policy that, in highway planning and construction, special effort be made to preserve natural beauty of country, public parks, recreation lands, wildlife refuges, and historical sites. Provides for cooperation and consultation with the Secretary of Housing and Urban Development, the Interior, and Agriculture and with States.	Secretary of Transportation

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
*Federal Aid in Fish Restoration Act (Dingle-Johnson Act) 1950	Provides policy, regulations, and funding for Federal-State cooperation in wildlife conservation and management. Funding for investigations, projects, and their administration.	Secretary of the Interior
*Migratory Bird Hunting Stamp Act (Duck Stamp Act) (Wetland Acquisition Act)	Provides for sale of duck stamp (permit for hunting migratory birds). Furnishes funds to be used for acquisition of refuges and waterfowl production areas (wetlands).	Secretary of the Interior Fish and Wildlife Service
*Protection of Migratory Game and Insectivorous Birds	Regulations for preservation of migratory and insectivorous birds. Provides penalties.	Secretary of the Interior Fish and Wildlife Service

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
*Migratory Bird Treaty Act	Provides for cooperation with Canada and Mexico in the preservation of migratory birds and international transport of these birds or parts thereof. Provides penalties.	Secretary of the Interior
*Endangered Species Conservation Act of 1969	Policy and purpose of protection of fish and wildlife threatened with extinction. Cooperation with States. Provides procedures for land acquisition. Provides penalties for taking.	Secretary of the Interior Fish and Wildlife Service
*Environmental Education Act	Established Office of Environmental Education. Provides grants and technical assistance to institutions, agencies and organizations.	Secretary of Health, Education, and Welfare Office of Education

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
Environmental Quality Improvement Act of 1970	Set up Office on Environmental Quality. Provides staffing for Council of Environmental Quality. Provides policy and technical assistance to Council and Federal agencies.	Council on Environmental Quality
National Environmental Policy Act of 1969	Provides national policy to encourage harmony between man and his environment. Prevents damage to environment and enriches the understanding of the environment. Requires all Federal agencies to prepare Environmental Impact Statements.	Council on Environmental Quality
*Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act)	Provides policy, regulations, and funding for Federal-State cooperation. Provides funding for investigations, projects, and their administrations.	Secretary of the Interior Fish and Wildlife Service

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
Federal Environmental Pesticide Control Act of 1972	Regulation and control of pesticides and their use.	Environmental Protection Agency
Federal Power Act	Regulations and control of hydroelectric power generation, all power transmission, and oil and gas transmission. Must consider fish and wildlife.	Federal Power Commission
*Federal Water Pollution Control Act and Amendments of 1972	Provides policy, goals, regulations, and funding for Federal, State, and local cooperation in improving and maintaining the quality of the Nation's water resources. Provides penalties.	Environmental Protection Agency

NAME	DESCRIPTION	ADMINISTERING AGENCY
Federal Water Project Recreation Act	Provides for consideration and enhancement of fish and wildlife and recreation in the planning and construction of any water development project. Encourages non-Federal administration of project lands for such purposes. Other projects purposes must be coordinated with these.	Secretary of the Interior Fish and Wildlife Service Heritage Conservation and Recreation Service
*Fish and Game Sanctuary Act	Provides authorization for acquisition and formation of fish and game refuges, production areas, etc.	Secretary of the Interior Fish and Wildlife Service
*Fish and Wildlife Act of 1956	Established the recent and present organization of Fish and Wildlife Service. Provides coordination with States. Provides mechanism for commercial fisheries loans (recently	Secretary of Commerce National Oceanic and Atmospheric Administration - National Marine Fisheries Service

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
	commercial fisheries were split off and given to Department of Commerce).	
Fish and Wildlife Coordination Act	Requires water development planning and permitting agencies to coordinate with Fish and Wildlife Service and States to insure that fish and wildlife will receive equal consideration with other project purposes.	Secretary of the Interior Fish and Wildlife Service
*Inter-Governmental Cooperation Act of 1968	Provides Congressional supervision and regulations governing grants-in-aid to State and local governments.	Congress, President, and Office of Management and Budget

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
Lacey Act	Provides authority to preserve, distribute, introduce and restore game birds and other wild birds in those parts of the United States where they have become scarce or extinct.	Secretary of the Interior Fish and Wildlife Service
*Land and Water Conservation Fund Act of 1965	Provides mechanism for grants-in-aid to be used by State and Federal agencies for acquisition and development of outdoor recreation land.	Secretary of the Interior Heritage Conservation and Recreation Service

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
*Lower St. Croix River Act of 1972	Authorizes designation, acquisition and development of lower 52 miles of the St. Croix River under the Wild and Scenic River Act. Provides agreement between Department of the Interior and States of Wisconsin and Minnesota for development.	Secretary of the Interior Heritage Conservation and Recreation Service
*National Trails System Act	Provides mechanism for planning and acquiring a National Trail System--primarily near urban centers. Designates criteria for recreation, scenic, historic, natural and cultural trails.	Secretaries of the Interior and Agriculture, Heritage Conservation and Recreation Service, and Fish and Wildlife Service
*National Wildlife Refuge System Administration Act of 1966	Consolidates authority for acquisition and development of lands administered as refuges and production areas for the protection and conservation of fish and wildlife. Provides for public use. Provides regulations and penalties.	Secretary of the Interior Fish and Wildlife Service

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
*Predator Control Program	Provides for research and control of named animals to protect domestic stock, suppress rabies and tularemia, and protect agriculture, horticulture, and forestry.	Secretary of the Interior Fish and Wildlife Service
Recreational Use of Fish and Wildlife Conservation Areas Act	Provides recreational opportunity on or adjacent to fish and wildlife lands, provided the recreation is consistent with the primary purpose of the lands. Can accept gifts of land.	Secretary of the Interior Fish and Wildlife Service
Refuse Act of 1899 and Prohibition of Obstructions in Navigable Waters. (River and Harbors Appropriation Act of 1899)	Prohibits dumping of refuse in navigable waters and placing of structures in navigable waters. Provides a permitting system for both. Provides coordination with other Federal and State agencies.	Corps of Engineers (for construction), Environmental Protection Agency (for refuse) (authorized change by executive order)

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
*Refuge Revenue-Sharing Act (amended to Migratory Bird Treaty Act)	Provides for revenue sharing between National Wildlife Refuge system and State and local governments. Revenues come from sale of animals, timber, hay, grass, soil minerals, sand, or gravel or from leases for grazing, public accommodations, or facilities.	Secretary of the Interior Fish and Wildlife Service
*Rural Development Act of 1972	This series provides mechanisms for soil conservation with provisions for considering and protecting fish and wildlife. Erosion control and flood prevention, water conservation, and land use planning are primary purposes. Provides coordination with Federal, State and local agencies and private interests.	Secretary of Agriculture Soil Conservation Service

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
*State and Local Fiscal Assistance Act of 1972	Provides a trust fund to be allocated to State and local governments--to be used for priority expenditures--ordinary and necessary operating and maintenance expenses of public safety, environmental protection, public transportation, health, recreation, libraries, social services, etc. Stipulates that funds cannot be used where laws require State or local matching funds.	Secretary of the Treasury

Continuation Table 14

Name	Description	Administering Agency
Upper Mississippi River Wild Life and Fish Refuge Act (1924)	Authorize the Secretary of the Interior to acquire areas of land and/or water located between Rock Island, Illinois, and Wabasha, Minnesota, in the Mississippi River for the purpose of A) establishing and maintaining a refuge and breeding place for migratory birds, B) prescribing such lands as a breeding place and refuge for other wild birds, game animals, furbearing animals and the conservation of wild flowers and aquatic plants and C) prescribing such lands as a refuge and breeding place for fish and other aquatic animal life.	Secretary of the Interior Fish and Wildlife Service

Continuation Table 14

Name	Description	Administrative Agency
*Water Bank Act	Provides monetary incentives to farmers to preserve, restore, and improve wetlands and reduce water runoff and soil erosion. Requires a conservation agreement to receive funds. Also provides for consultation with Secretary of the Interior for harmony with Interior programs. (Program inactive due to fund impoundment).	Secretary of Agriculture Soil Conservation Service
*Water Resources Planning Act 1965	Sets up the Water Resources Council. Provides policy to encourage the conservation, development, and use of water and related land resources on a comprehensive and coordinated basis. Objectives are to enhance regional and national economic development, quality of the environment, and well-being of the people. Established mechanisms for developing principles, standards, and procedures for preparation of regional and river basin plans.	Water Resources Council

Continuation Table 14

NAME	DESCRIPTION	ADMINISTERING AGENCY
*Wild and Scenic Rivers Act of 1968	Provides policy, criteria, and methods through which selected rivers which possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other values are to be preserved in a free-flowing state. Rivers shall be protected for benefit of present and future generations. Provides that other components may be added. Prescribes State participation and methods of funding for acquisition and development. (See lower St. Croix River Act).	Secretaries of the Interior and Agriculture, National Park Service and Forest Service

*Direct funding provided

**Taken from: A compilation of Federal Laws Relating to Conservation and Development of Our Nation's Fish and Wildlife Resources, Environmental Quality, and Oceanography. January 1973

B. STATE OF IOWA

1. ORGANIZATION AND FUNCTION

The Iowa Conservation Commission operates as a part-time commission, with seven commissioners appointed by the governor contingent upon a two-thirds vote of approval by the State Senate. The commissioners in turn employ the State Conservation Director, who is responsible for the execution of its policies. The powers and duties of the commission are delegated by the State legislature, sections 107.23 and 107.24, Code of Iowa.

The three divisions of the Iowa Conservation Commission are: (1) Lands and Waters, (2) Fish and Game, and (3) Administration. Each division is headed by a chief. The Fish and Game Division has three operating sections: (1) Fisheries, (2) Law Enforcement, and (3) Wildlife, each with a section superintendent.

The field staff operates out of four district offices located in each quarter of the State. The northeast district headquarters is located at Manchester, Iowa. Each of the operating sections has a district supervisor. The Wildlife Section has 20 wildlife management units statewide with 5 units to each district. The Upper Iowa Wildlife Management Unit located in Decorah, Iowa, has four counties, two of which (Allamakee and Clayton) border the Mississippi River. These two counties encompass the full reach of the GREAT I study area in Iowa.

Major emphasis of current wildlife management practices and programs is on habitat improvement, maintenance and support services, wildlife census, and land acquisition programs.

The management unit strives to manipulate land and water areas to provide optimum wildlife habitats for the production of wildlife species and their use for human recreation. It provides direct manage-

ment activities on about 13,000 acres of State-owned lands and provides technical assistance to other cooperating land management agencies and private individuals.

A portion of the unit's time is spent in wildlife habitat maintenance and support services which also provide benefits to the put and take trout fishing program. This activity includes the establishment of roads and trails for hunters and fishermen, fencing, streambank plantings, watershed improvements, timber harvest and off-road parking facilities.

Considerable emphasis is placed on wildlife census activities and wildlife surveys including species composition and diversity, habitat conditions, and public use of the resource. This information is used to establish the annual hunting and trapping regulations.

Land acquisition in northeast Iowa has received considerable emphasis the past few years. Some ongoing programs are: (1) including the Upper Iowa River as part of a State Scenic River system (it has also been submitted for inclusion in the National Scenic and Wild Rivers Act), (2) continued acquisition of clear cold water streams and their watersheds as part of the put and take trout fishing program, (3) trust fund acquisition of public hunting areas, (4) continued acquisition of land and water areas that are unique under the "Open Spaces" act, and (5) continued acquisition of lands that are of unique natural and/or historical significance under the State Preserves Board System.

Coordination efforts and technical assistance are provided to cooperating Federal, State and private agencies along the river.

Funding for management efforts within the State of Iowa consists of a variety of funds including the sale of hunting and fishing licenses, waterfowl and trout stamps, Pittman-Robertson and Dingle-Johnson

Act funds, Open Spaces funding by the state legislature, Nature Conservency funding, and from private donations.

(No descriptions of the State's Fisheries Section organization or function was provided.)

2. STATE OF IOWA AUTHORITIES

The statutes of Iowa pertaining to management of fish and wildlife resources of the Upper Mississippi River are in The Code of Iowa under the following sections: Chapter 1, Sovereignty and Jurisdiction of the State; Chapter 107, the State Conservation Commission; Chapter 109, Fish and Game Conservation; Chapter 109A, Endangered Species; Chapter 110, Fish and Game Licenses and Contraband Articles, and Guns; Chapter 111, Conservation and Public Parks; and Chapter 111D, Conservation Easements.

Chapter 1 establishes that the State has sovereignty over all lands of the State, subject to the discretion of the Federal Government in relation to public lands or establishments of the national Government. The chapter further gives the Federal Government approval for purchase of lands within the State of Iowa for the establishment of the Upper Mississippi River Wild Life and Fish Refuge.

Chapter 107 establishes the Conservation Commission and describes its powers. The commission is empowered to expend funds from the fish and game protection fund and acquire lands for the purposes of fostering hunting, fishing, and trapping. The commission is also empowered to control pest wildlife, propagate fish and game, and enforce regulations protecting fish and game.

Ch ɔter 109 gives the State ownership of and regulatory power over all fish, game, and nongame wildlife in public waters and all lands of the State except for special fish or game farms. The chapter details

what activities relating to fish and wildlife resources are not permitted. It further states that hunters and fishermen of bordering States may use Iowa portions of waters forming the boundaries between the States and that Iowa sportsmen may use the other State's portions of these waters for hunting or fishing. The chapter also describes regulations for handling, taking, and rearing of fish and game within Iowa.

Chapter 109A provides for the designation and protection of endangered animals and plants within the State.

Chapter 110 established the requirement of a State-issued license to take any fish, game, or nongame animal of value to the State, within Iowa. It describes in detail the conditions for obtaining a license and penalties for not complying with the statute. Chapter 110B further requires that an additional State licensing stamp be obtained to hunt waterfowl in the State.

Chapter 111 establishes that the State Conservation Commission shall identify and protect places in Iowa that are ". . . rich in natural history, forest reserves, archeological specimens, and geological deposits. . ." for the purpose of ". . . promoting forestry and maintaining and preserving animal and bird life and the conservation of the natural resources of the state." Chapter 111D gives the State the right to acquire (by means other than eminent domain) conservation easements for the purpose of preserving and protecting fish and wild-life resources.

C. STATE OF MINNESOTA

1. ORGANIZATION AND FUNCTION

The Minnesota Department of Natural Resources (DNR) operates under a one-man commissioner system, the commissioner being appointed by the

governor. Powers and responsibilities of the commissioner are delegated by the State legislature as specified in Minnesota statutes.

The DNR is divided into six divisions, each with a director at its head who is responsible to the commissioner's office. The Division of Fish and Wildlife is included here.

The State is also divided into six regions, with each of the various disciplines (i.e., Fish and Wildlife, Enforcement, etc.) represented by a regional supervisor. In the case of the GREAT I study area, two regions are represented - Region V with headquarters at Rochester (includes Goodhue, Wabasha, Winona and Houston Counties) and Region VI with headquarters at St. Paul (includes Dakota, Hennepin, Ramsey, Washington, and Scott Counties).

Field personnel (area offices) operating in these counties are directly responsible to their particular regional supervisor. Area wildlife offices are located at Winona, Rochester and Minneapolis, while area fisheries offices are located at Lake City and St. Paul.

Ongoing Wildlife Management Practices and Programs:

a) Major emphasis is placed on land acquisition, habitat improvement and censuses and surveys.

The land acquisition program is designed to provide public hunting and trapping areas, and to preserve and manage wildlife habitat. Parts or all of five wildlife management areas totalling approximately 34,500 acres are located within the boundaries of the GREAT I study. In addition, three other potential wildlife management areas located in or adjacent to pool 4 have been approved for acquisition. Completion of these three new projects would provide an additional 1,800 acres of wildlife lands for public use.

Improvement and maintenance of wildlife habitat on both public and

private lands is an important function designed to maintain desirable population levels of both game and nongame species. Practices include providing food plots, establishing cover plantings, controlled burns, timber harvests, fencing, and construction of waterfowl dugouts. Some practices, such as constructing access roads and parking areas, are designed to provide public use facilities.

Considerable emphasis is also placed on conducting various wildlife censuses and surveys. The data obtained provide the basis for establishing annual hunting and trapping seasons and provide the public with up-to-date information on hunting and trapping season prospects.

One additional item worthy of mention is the recent addition of the wild turkey as a game bird. Since the original releases of wild birds into the Whitewater Wildlife Management Area in 1965 and Houston County in 1971-72, the population has expanded to cover approximately 700 square miles. The first hunting season was held in spring 1978. Efforts will continue to expand the population range by an ongoing trap and transplant program.

b) In addition to the previously mentioned wildlife management areas, the Division of Land and Forestry is acquiring forest lands in southeast Minnesota in the Richard J. Doer Memorial Hardwood Forest. Legislation authorizing this program was passed in 1961 and, since that time, approximately 30,000 acres have been acquired in Goodhue, Dakota, Wabasha, Winona and Houston Counties. Most of the purchases have been outside of the immediate river corridor. However, these are a direct benefit to the Mississippi River in terms of soil erosion controls through the elimination of woodland grazing and construction of retention ponds. The acquired lands are managed on a multiple-use concept, incorporating timber management with various forms of recreation.

Three State parks are located on the bluffs overlooking the Mississippi

River. They are O.L. Kipp State Park near Dakota, John Latsch State Park above lock and dam 5, and Frontenac State Park on Lake Pepin. These areas were established to provide recreational opportunities and preserve sites with special natural features.

c) A considerable amount of effort is expended in coordinating management activities along the river. Some of the agencies and the objectives are:

1. U.S. Fish and Wildlife Service (mainly Upper Mississippi River National Wild Life and Fish Refuge) for the purpose(s) of hunting and trapping season recommendations and regulations, pollution investigations, dredged material disposal, etc.
2. U.S. Army Corps of Engineers for the purpose(s) of dredged material disposal and evaluation of Section 404 permits.
3. Various state agencies both within and outside the Department of Natural resources for purpose(s) such as evaluation of fill and drainage permits, environmental impacts, road construction, etc.

d) Almost without exception, all funds for wildlife management programs are derived from the sale of hunting, fishing and trapping licenses, plus the 11-percent excise tax on firearms and ammunition (Pittman - Robertson Federal Aid Program). Some land acquisition funds are derived from general revenue through the Resource 2000 Program, an accelerated land acquisition program passed by the 1975 State legislature.

<u>Ongoing Fisheries Management Practices and Programs</u>:

Fisheries, unlike the Forestry and Wildlife Section, has no large acquisition program. However, land treatment by Forestry and Wildlife benefits southeastern Minnesota trout streams, warmwater streams, and the Mississippi River fisheries by decreasing flooding, sedimentation, and turbidity.

The fish, invertebrates, aquatic vegetation, and the waters of the

State are owned and managed by the State of Minnesota.

Fish and fish habitat are managed by the Division of Fish and Wildlife by regulating bag, season, and size.

Mussels are managed by licensing, capture method, season, and size limit by the Division of Fish and Wildlife and are restricted to resident fishermen only.

Aquatic vegetation growing in the public waters of the State, insofar as it is capable of being owned, is owned by the state in its sovereign capacity for the benefit of all its people. Permits to harvest or destroy aquatic vegetation or plants are required.

The waters of the State are public regardless of the proprietorship of the underlying, overlying, or surrounding land. The Waters Division of the DNR shall control and supervise, so far as practicable, any activity which changes or which will change the course, current, or cross section of public waters.

The Fisheries Section of the Division of Fish and Wildlife spends much of its time determining sport and commercial harvests, recreational uses, available habitats through surveys and fish use of various habitats with various gear.

It requires large outlays of money to document programs designed to minimize or stop the destruction of fishery habitat. However, sedimentation, direct placement of dredged material in open water and beach nourishment are interfering with dwelling, rearing, spawning, and wintering habitat and direct impacts can be seen.

2. STATE OF MINNESOTA AUTHORITIES

In Minnesota alone there are about 700 pages of statutes pertaining

just to water resources. There are 21 Minnesota laws directly applicable to the administration, management and development of the natural environment and associated fish and wildlife.

Those statutes most applicable to fish and wildlife management in the GREAT I study area are listed below.

Chapter 1.041 - Concurrent Jurisdiction of State and United States Subd. 1. "Rights of state: Except as otherwise expressly provided, the jurisdiction of the United States over any land or other property within this state now owned or hereafter acquired for national purposes is concurrent with and subject to the jurisdiction and right of the state to cause its civil and criminal process to be executed therein, to punish offenses against its laws committed therein, and to protect, regulate, control, and dispose of any property of the state therein."

Chapter 1.044 - Upper Mississippi River Wild Life and Fish Refuge. "Consent of the State of Minnesota is given to the acquisition by the United States by purchase, gift, or lease of such areas of land or water, or both, in this state as the United States may deem necessary for the establishment of the Upper Mississippi River Wild Life and Fish Refuge in accordance with and for the purposes of the act of congress approved June 7, 1924, entitled "An Act To Establish The Upper Mississippi Wild Life and Fish Refuge" reserving to the state full and complete jurisdiction and authority over all such areas not incompatible with the maintenance and control thereof by the United States for the purposes and under the terms of that act of Congress." This act allows the Fish and Wildlife Service to acquire lands for refuge, but the state retains jurisdiction and authorities.

Chapter 84.027 grants powers to the commissioner of natural resources and gives him control over public lands, parks, timber, waters, minerals and wild animals of the state.

Chapter 97.42 provides that the State owns all wild animals and

aquatic vegetation growing in public waters of the state.

Chapter 97.48 gives broad powers to the Commissioner to protect and manage the fish and wildlife of the State. Such powers include but are not limited to protection of wild animals by restricting open seasons or limits, entering into contracts with border states to regulate taking of wild animals and rough fish in boundary waters, manage public waters for wildlife use provided fishing methods or seasons are not restricted, encourage local sportsmen's groups to rear or propagate game fish, posting of lands for a specific wildlife management purpose, improvement of wildlife habitat on private land, and designation and posting of experimental waters for fisheries management.

Chapter 97.488 gives the Commissioner authority to manage habitat and species for improving the status of threatened or endangered species.

The Outdoor Recreation Act of 1975 gives the Commissioner authority to manage fish and wildlife on lands designated as natural parks, state scientific and natural areas, state wilderness areas, state forests and state wildlife management areas.

Chapter 99.25 gives the Commissioner authority to establish game refuges in areas where the state owns more than 50 percent of the area.

Chapter 100 establishes protection of wildlife and seasons and methods for taking protected species.

Chapter 101 establishes legal methods and seasons for taking of fish.

Chapter 102 regulates commercial fishing.

Chapter 102.29 gives the Commissioner direction to prevent hindrance

or interference with licensed commercial fishing operation.

D. STATE OF WISCONSIN

1. ORGANIZATION AND FUNCTION

The Wisconsin Department of Natural Resources is responsible for providing an adequate and flexible system for planning and managing the protection, development, and use of the water, air, forest, fish, wildlife and other plant and wild animal resources of the State and for the control of solid waste and refuse disposal. In addition, the DNR reviews the natural resources programs of other State agencies and makes appropriate recommendations to the governor and legislature.

Natural resources policy is determined by a Natural Resources Board consisting of seven members appointed by the governor with the advice and consent of the Senate. The Board appoints a Secretary who is chief executive officer of the department. The secretary is responsible for the management of the department in accordance with the State statutes and rules and policies of the board. Four divisions of management carry out various responsibilities in departmental affairs.

Division of Environmental Standards

Duties of this division include the planning, supervision, and coordination of water quality standard development and water supply, air, and solid waste management programs.

Division of Enforcement

This division plans and directs a coordinated program of law enforcement encompassing all department enforcement responsibilities, including environmental actions, fish and wildlife violations, water management and zoning matters, air and solid waste management, park and recreation area responsibilities, forestry matters, and others.

Division of Services

Administrative and technical services for the department are handled in this division.

Division of Resource Management

This division plans and coordinates the development, protection, and use of forest, fish, and wildlife resources and outdoor recreational resources of the State.

Department headquarters are located in Madison. The State is geographically divided into six field districts, each operating area offices according to resource demands. Three field districts are in the GREAT I stretch of the Mississippi River. The West Central District has area offices at Eau Claire, Black River Falls, and La Crosse which manage eight counties adjacent to the river (St. Croix, Pierce, Pepin, Buffalo, Trempealeau, La Crosse, Vernon, and Crawford). The Southern District has an area office at Dodgeville and is responsible for Grant County on the Mississippi. Polk County on the St. Croix River is within the Northwest District; however, this area is comparatively inactive in Great River Studies. Each district is operated by a director who is responsible for managing and controlling the field operations of the department.

Fish and wildlife management related responsibilities are a major duty of both the Environmental Standards and Enforcement Divisions of the department; however, the actual resource management on the Mississippi River is a direct responsibility of Resource Management Division personnel. Wild animals are cooperatively managed by habitat improvement, maintenance of species population levels, protection of habitat from numerous forms of degradation, and other means on both State and public lands. State-owned land adjacent to or within the river corridor, including various islands, is managed by the establishment of State parks, wildlife areas and forests. Supervision and management of these areas are directed by park managers and appropriate area office personnel.

Management framework in these areas involves 10-year master planning programs set up to facilitate recreational use and wildlife well-being. Master planning is accomplished through an interdisciplinary team approach for multiple-use management. Included in master planning management of land areas along the Mississippi River are:

Merrick State Park, Buffalo County
Perrot State Park, Trempealeau County
Nelson Dewey State Park, Grant County
Wyalusing State Park, Grant County
Trempealeau County Islands Wildlife Area
Whitman Dam Wildlife Area, Buffalo County
Van Loon Wildlife Area, La Crosse and Trempealeau Counties
Pierce County Islands Wildlife Area
Tiffany Wildlife Area, Buffalo and Pepin Counties

Each area is managed according to constantly changing wildlife resource needs as well as public recreational demands. When both wildlife and public needs are met in an area, a hands-off approach to management is used. This technique is often the most beneficial for preserving wildlife stability, providing recreational demands, and maintaining natural aesthetic values.

Fish and wildlife management on the entire 232 miles of the Mississippi River bordering Wisconsin is the responsibility of the La Crosse area office Mississippi River Work Unit. Activities of the work unit involve the planning and management of sport and commercial fishery programs, special fish and game investigations and evaluation studies, and the coordination of programs with member States of the UMRCC, Federal agencies, and other fish and wildlife management interest groups along the Mississippi River.

2. STATE OF WISCONSIN AUTHORITIES

a. General Author :y

The State of Wisconsin, through its Department of Natural Resources, provides a comprehensive management system "for the protection, development and use of forests, fish and game, lakes, streams, plant life, flowers and other outdoor resources of the State" (Conservation Act, Chapter 23.09). The sovereignty and jurisdiction of the State, including property ownership, extends to all places within its established boundaries. This authority is subject only to such rights of jurisdiction and ownership that have been acquired by the Federal Government. For example, as directed by Congress in 1924 and with State consent, the U.S. Department of the Interior (FWS) may acquire within the State any areas of land and/or water deemed necessary for the establishment of the "Upper Mississippi River Wild Life and Fish Refuge" (Chapter 1.035). The State can reserve rights of jurisdiction and authority in such areas.

In the GREAT I stretch of the Mississippi River, the State shall have concurrent jurisdiction, as on all State boundary waters. Navigable waters of this river shall be forever free as common highways to all United States citizens (State Constitution, Article 10).

b. Fish and Wildlife

For management of the fish and wildlife resources in Wisconsin, the State requires legal authority to properly manage the flora and fauna resource as well as the various habitats in which they survive. It is therefore necessary to include the legal framework of habitat management in this context.

The State provides wildlife areas in which any citizen may hunt, fish or trap animals (Chapter 23.11), but manages such areas in conjunction with other resource objectives. To provide the necessary authority

needed to preserve a balanced wild animal population for all species, the legal title to and the custody and protection of all wild animals within Wisconsin is vested in the State for the purposes of regulating the enjoyment, use, disposition and conservation of those animals (Chapter 29.02). This includes the regulation of hunting, trapping, and fishing through license issuance (Chapter 29.09). Fishing in all interstate boundary waters, outlying waters, and inland waters is managed by such licensing, however commercial operation fishing practices require special licensing that permits within certain limitations the netting, hooking and trapping of fish (Chapter 29.30). No license is required for taking, catching or killing clams or mussels over 1 3/4 inches in size. There are, however, equipment limitations on taking of clams.

To restrict the harvest of animals for population regulation, the State establishes open and closed seasons and certain daily conditions (Chapter 29.174) to assure good hunting and fishing while conserving the State's game supply. Refuges and game farms are established through State cooperation to further manage wildlife (Chapters 1.036 and 29.527). Endangered and threatened species of wild animals are under special scrutiny by State authorities (Chapter 29.415), in cooperation with Federal standards, to protect them from extirpation.

Wisconsin can further protect the fish and wildlife habitat resource by:

- -- Acquiring and establishing State parks, forests, fish refuges, hatcheries, scientific areas and designating "wild rivers" to preserve the environmental quality and aesthetic value in such areas for the continuous improvement of fish and wildlife (Chapter 23 and 30).

- -- Controlling excessive high water related problems which may affect habitat by inundation, water quality, deposition and

erosion through zoning practices (Chapter 87), alterations of river watercourses (Chapter 24, 87, 30.195), pool level and flow regulation rights (Chapter 31), and by allowing the erection of dams, locks, dikes, and other flood control measures by the Federal Government (Chapter 1 and 31).

-- Prohibiting placement or deposit of refuse or other solid waste into any State waters (Chapters 29.288, 29.29 and 144).

-- Protecting spawning grounds from encroachment, controlling land use, and preserving shore cover and natural beauty (Chapter 144.26).

C. Water Quality

Continued pollution of State waters, including the Mississippi, has threatened public health and the general welfare of fish and wildlife as well. In order to rectify this problem, Chapters 144 and 147 and specifically section 144.025 provide guidelines to form a comprehensive action program directed at correcting all present and potential sources of water pollution.

State water quality standards have been adopted in accordance with the Federal Water Pollution Control Act (WPCA) of 1965. These standards are designed for achieving, maintaining, upgrading, and documenting the quality of water to allow use of all State water resources for multiple-purposes including aesthetic, agricultural, aquatic and wildlife, industry, potable water supply, hydropower, navigation, and recreation.

The Wisconsin Pollution Discharge Elimination System (WPDES) is a three part goal aimed at abating pollution of State waters (Chapter 147) which would:

1) Eliminate the discharge of pollutants into State waters by 1985.
2) Attempt to attain a quality of water which would provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water by 1983.
3) Prohibit discharge of toxic pollutants in toxic amounts.

The means by which the State is accomplishing the WPDES goal is through issuing of permits following and not exceeding Federal guidelines established by the WPCA amendments of 1972 (P.L. 92-500).

d. Air Quality Management

Section 144.36 of the Wisconsin statutes directs the DNR to organize a comprehensive program to enhance the quality, management, and protection of the State's air resources. This program also stresses the role of county governments in establishing local air pollution control programs in cooperation with the DNR. The objectives of the air quality plan are to maintain standards at a level which will provide adequate protection to public health and welfare and prevent detrimental effects on property and the environment.

It shall be the policy of the State to seek reasonable uniformity among local air pollution control ordinances to make air control programs most effective and least complicated for all persons concerned.

e. Solid Waste Management

The high level of production required to meet the varied needs of an expanding population and high standard of living has resulted in a sharp rise in the amount of waste materials discarded annually. Inefficient and improper methods of waste disposal have increased pollution of vital air, water and land resources thereby threatening

the quality of the environment. Improper waste disposal endangers public health, safety and welfare; creates public nuisances; results in scenic blight; and adversely affects land values (Chapter 144).

Wisconsin's solid waste management program provides for the handling, processing, and ultimate disposal of solid waste in the most efficient, nuisance free, environmentally acceptable manner. To carry out this program, minimum standards have been adopted to regulate the location, design, construction, sanitation, operation and maintenance of solid waste disposal sites and facilities. Such facilities are annually licensed by the DNR if they comply with these standards.

f. Navigable Waters Protection Management

To maintain the State waterways for navigation and preserve their environmental quality, State policy dictates enforcement by permit issuance of certain interferences with navigable waterways. The following list of activities are restricted unless a permit has been authorized (Chapter 30):

-- To construct, dredge or do any work with respect to any artificial waterway, canal, channel, or ditch where the purpose is ultimate connection with an existing navigable water, or where any part of such artificial waterway is located within 500 feet of the ordinary high-water mark of an existing navigable waterway (with exceptions for road maintenance and agriculture).

-- To grade or otherwise remove topsoil from the bank of any navigable waterway where the area exposed by such grading will exceed 10,000 square feet.

-- To obstruct any navigable water thereby impairing free navigation.

-- To deposit any material or to place any structure upon the bed of any navigable water.

-- To remove any material from the bed of any navigable water unless properly zoned for that purpose by the State.

-- To change the course of or straighten a navigable stream or waterway.

Of particular importance to GREAT in this matter have been the dredged material disposal practices of the Corps of Engineers. Wisconsin law (Chapter 30) regulates the disposal of dredged material in wetland areas below the ordinary high-water level (generally areas between the railroad tracks adjacent to both sides of the river). Any placement of fill, dredging, or construction in such wetland areas must have permit approval from the Wisconsin DNR. By such regulation, the State can and does protect from encroachment the waters and wetland areas that are essential to resource productivity.

Summary

The legal framework dictating use and protection of resources in Wisconsin has been developed to provide continued, multiple-activity enjoyment and benefit to its citizens while preserving the environmental balance in nature. Without such laws, management efforts would be futile. New legislation is constantly necessary as demands on resource use increase.

Policy and project recommendations from each State agency are thoroughly examined by means of detailed environmental impact analysis (Chapter 1.11) so that protection of the environment is assured while providing the public needs of the State. DNR recommendations are channelled by their seven-member Natural Resources Board to the governor and legislature so that legal framework can incorporate those changes which are necessary for successful management of resources.

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Figure 47. Much of the research work conducted for the GREAT I was done by or under the leadership of these three professors. Pictured (from left to right) are Dr. Daryl Simons of Colorado State University, Dr. Calvin Fremling of Winona State University, and Dr. David McConville of Saint Mary's College. Here the three researchers are inspecting portions of Fountain City Bay (pool 5A) prior to developing final recommendations on building the partial blocking dam at Devil's Cut.

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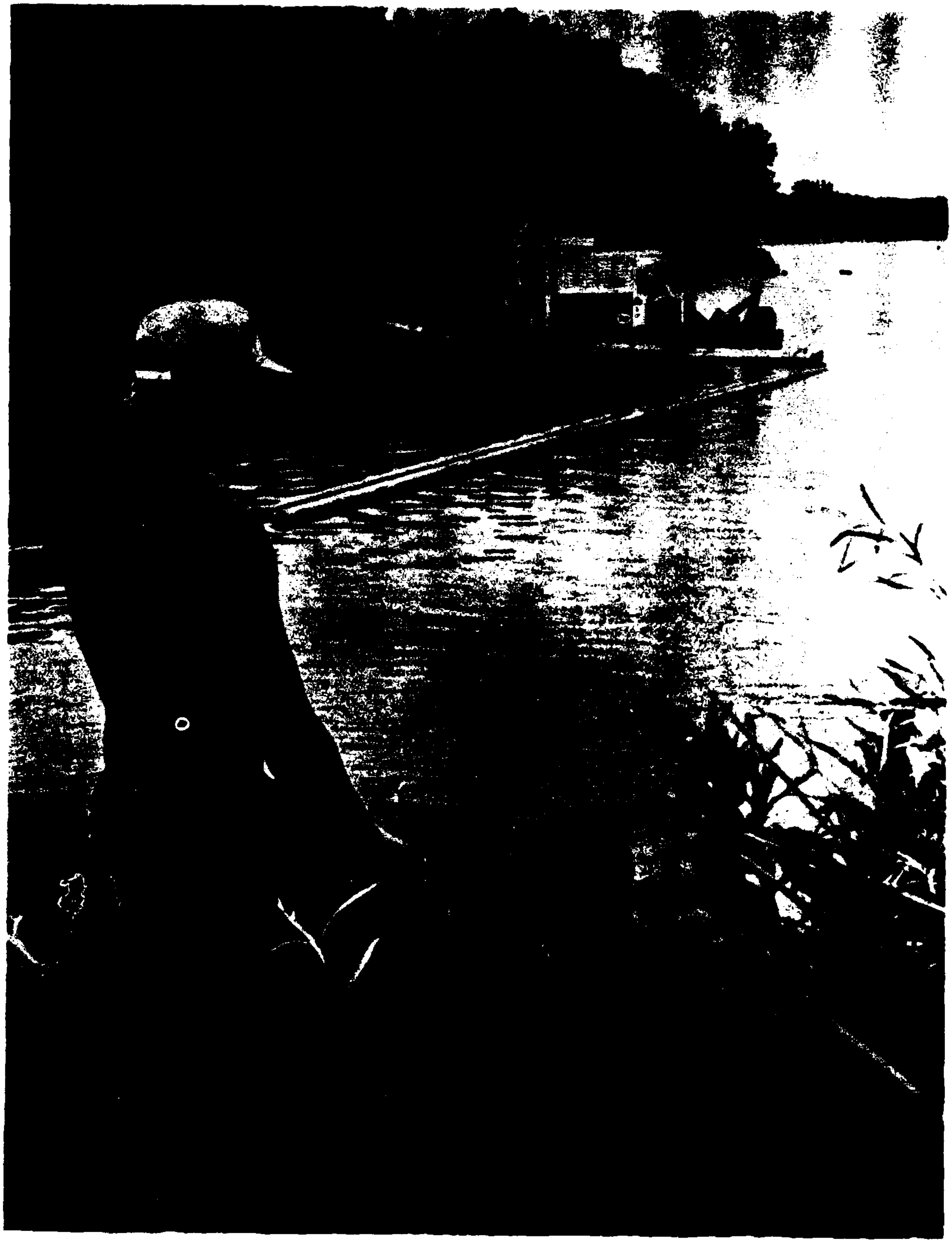

Figure 48. Projects such as the side channel openings tried by the Side Channel Work Group need to become part of the total river management program. New approaches, new equipment and cooperation can turn the trends on the river around (Photo courtesy of National Car Rentals).

THE PROBLEM AND THE PROGRAM

The Upper Mississippi River from Minneapolis to Rock Island is managed for both commercial barge traffic and fish and wildlife. Although some of the effects of the barge channel projects on the river have been beneficial to fish and wildlife, the projects have also had many effects adverse to the natural resources, and these adverse effects are becoming critical. The two most critical effects are the direct and secondary destruction of fish and wildlife habitat caused by placement of dredged material in wetlands and open water, and the accelerated sedimentation rates in the backwater areas caused by increasing upland soil erosion and the construction of the locks and dams.

The Great River Environmental Action Team I (GREAT I) was created in 1974 to attempt to solve the problems that existed between the different interests on the river. The problems related to fish and wildlife were delegated to the Side Channel Work Group and the Fish and Wildlife Management Work Group (later combined to form the Fish and Wildlife Work Group (FWWG)). The FWWG attempted to find solutions to the adverse effects of the navigation channel project on fish and wildlife by participating in the development of environmentally sound dredged material disposal methods and investigating means for managing backwater areas for improved habitat.

The basic conclusions and recommendations resulting from the work of the FWWG follow. The detail of these conclusions and recommendations can be found in Chapters III, IV, and V.

CONCLUSIONS SUMMARY

FWMWG Conclusion 1:
The Fish and Wildlife Management Work Group successfully fulfilled nearly all of its responsibilities within the GREAT.

FWMWG Conclusion 2:

Partial closing dams, which are specifically designed to enhance fish and wildlife, can be used successfully to reduce sediment influx to the backwaters while maintaining adequate water flow resulting in good habitat maintenance.

FWMWG Conclusion 3:

Well designed, gated culverts constructed through the dikes of the locks and dams can greatly enhance the fish and wildlife habitat quality and diversity of the backwater areas for several miles downstream of a dike.

FWMWG Conclusion 4:

Small side channel openings can be very beneficial to backwater habitat diversity and quality if they are well designed to avoid additional sediment transport into the backwater.

FWMWG Conclusion 5:

Rehabilitation of major backwater areas is possible if the problems are well investigated and recommended remedial measures are well designed.

FWMWG Conclusion 6:

State and/or Federal regulations may preclude the implementation of any major backwater rehabilitation on the Upper Mississippi River.

FWMWG Conclusion 7:

The regressions simulation model (Claflin, et al, 1977) is a usable and reasonably accurate predictive model, capable of predicting the benthos and rooted aquatic macrophyte response to physical changes proposed for backwaters in the GREAT I study area. The model should be used in backwater project planning.

FWMWG Conclusion 8:

The concept of "logical predictive capability" is generally sound when applied to the fish and wildlife resources of the Mississippi backwaters.

FWMWG Conclusion 9:

The vegetative inventory (Meyer, et al, 1977) is a valid and usable base for establishing a fish and wildlife habitat inventory of the Upper Mississippi, with the exception of some aspects of fish and wildlife habitat requirements.

FWMWG Conclusion 10:

There is a need for a submergent vegetation inventory in order to establish fish and wildlife habitat definition on the river.

FWMWG Conclusion 11:

The vegetative inventory needs to be redone periodically, possibly every 10 years, in order to continue as a valid base for a habitat inventory of the river.

FWMWG Conclusion 12:

The On-Site Inspection Team process has increased cooperation between the Corps of Engineers and the natural resources agencies, resulted in more environmentally sound dredged material placement, and should be continued.

FWMWG Conclusion 13:

Increased use of land treatment programs in the upland agricultural areas could substantially reduce fine sediment deposition in the backwater downstream of Lake Pepin.

FWMWG Conclusion 14:

There is a need for establishing what fish and/or wildlife species specific areas of the river are to be managed for.

SCWG Conclusion 1:

The Side Channel Work Group was partially successful in fulfilling its

Recommendation 8* - Provide the land control and authority necessary for development and management of the Upper Mississippi River Wild Life and Fish Refuge as a fully effective component of the National Wildlife Refuge System in meeting national needs for fish and wildlife restoration, protection, and use.

Recommendation 9 - The Fish and Wildlife Service in consultation with the states should develop and implement a comprehensive plan for the management of the Upper Mississippi River Wild Life and Fish Refuge that considers all the fish resources and wildlife resources of the area and consists of the necessary strategic and operational components to make explicit the background, authorities, and justification for the refuge, and objectives, policies, coordination measures, and procedures by which it will be operated.

Recommendation 10 - Implement administrative policy and procedures on General Plan and Fish and Wildlife Service fee lands of the Upper Mississippi River Wild Life and Fish Refuge to eliminate the vesting of exclusive private or commercially advantageous rights to public lands and waters in individuals or commercial enterprises by permits, where those activities or rights are detrimental to fish and wildlife values or management purposes.

Recommendation 11** - The U.S. Army Corps of Engineers should be provided authority and means to modify backwater areas for fish and wildlife and recreation management purposes as recommended by the Interagency Coordinating Committee.

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*work group divided on procedure for this recommendation

**The work group was divided on this recommendation.

Recommendations to Gain Additional Information

Recommendation 12 - Implement Phase II of the Weaver Bottoms rehabilitation and conduct the Phase III study.

Recommendation 13 - Provide means to map the distribution of submerged aquatic vegetation, invertebrates (including clams), bottom types and depths, and submerged physical features of the river.

Recommendation 14 - Continue monitoring program at Kruger Slough and Island 42 to document effects of opening side channels.

Recommendation 15 - Investigate the potential of using the "Finger Lakes" at the dike of Lock and Dam 4 as a "physical model" for backwater management techniques which have been and may be proposed for the future.

Recommendation 16 - Provide means to conduct life history studies of the fishes of the Upper Mississippi River.

Recommendation 17 - Conduct an investigation to assess the potential environmental impact of late fall and early winter barging and navigation practices on waterfowl, furbearers, and fishes of the river. And further, investigate the economic impact of restricting fall navigation.

Recommendation 18 - Develop a program to evaluate dredging and island creation in backwater areas for restoration purposes.

Recommendation 19 - Provide means to determine the most beneficial procedures for bottomland hardwood timbers management for wildlife enhancement on the Upper Mississippi River.

responsibilities within the GREAT.

SCWG Conclusion 2:
Side channel openings can enhance boat access to the river for many years.

SCWG Conclusion 3:
Side channel openings accomplished for improved boat access may be detrimental to fish and wildlife resources.

RECOMMENDATIONS SUMMARY

Recommendations to Change Management Policies

Recommendation 1 - The U.S. Army Corps of Engineers should institute a new dredging and spoil disposal policy which assures that fish and wildlife habitat will be protected during dredging or the placement of dredged material. To accomplish this the Corps should be provided the needed authority and means to establish fish and wildlife as project purposes of the 9-foot channel.

Recommendation 2 - An "Interagency Coordinating Committee" should be formed to provide direction and guidelines regarding fish and wildlif matters associated with main channel dredging, spoil disposal, physical river modifications, and river management studies and investigations. The interagency coordinating committee would be comprised of representatives of the U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, the Iowa Conservation Commission, and U.S. Army Corps of Engineers.

Recommendation 3 - Establish and maintain an interagency On-Site Inspection Team for dredging and channel maintenance activities to

eliminate environmentally adverse consequences.

Recommendation 4 - Development of an agreement between the Corps, the Fish and Wildlife Service and the States to manage pool levels to benefit fish and wildlife. The management decisions should be coordinated through the Interagency Coordinating Committee and should be evaluated by the Committee according to probable effects on the whole of the GREAT I area.

Recommendation 5 - Implement and use fully the programs administered by USDA agencies, including SCS and ASCS, and similar state programs, to effect reduction in fine sediments reaching the Upper Mississippi River and its backwaters and to maintain and restore wetlands in sediment and runoff-contributing watersheds. Congress and the state legislatures are urged to continue supporting these soil conservation measures authorized for implementation by their executive agencies.

Recommendation 6*- Provide the organization, authority, and funds necessary to manage the Upper Mississippi River and its backwaters as a biological unit, maintaining suitable habitat for all fish and wildlife on the river.

Recommendation 7 - Because present state and federal funding and management for fish and wildlife resources on the river are inadequate, it is recommended that objectives and budgets of the respective agencies be realigned such that potential fish and wildlife resource benefits on the UMR system are realized.

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*work group divided on procedure for this recommendation

Recommendations to Implement Specific Projects

Recommendation 20 - The Corps of Engineers should continue restoring and establishing shoreline protection on a yearly basis following the design and priority list provided by the Fish and Wildlife Management Work Group until completion.

Recommendation 21 - Construct a gated culvert through the dike of Lock and Dam 10 to provide a water supply to the waterfowl ponds in pool 11.

Recommendation 22 - Investigate the impact of altering the cuts between the islands separating Lake Onalaska from the main channel of the Mississippi. Initiate structural measures if the results of the investigation determine that the alterations would benefit Lake Onalaska.

Recommendation 23 - Place a set of two gated culverts at the dike of Lock and Dam 4.

Recommendation 24 - Determine and implement the best means for reducing fine sediment flow into Big Slough (RM 670.5, Iowa) while keeping the slough open to fishing boats.

Recommendation 25 - Develop agreement between the Corps, the Service, Vernon County (Wis.), and the Wisconsin DNR for placing culverts and opening side channels at Blackhawk County Park near Victory in Pool 9.

Recommendation 26 - Construct a dike along the channel side of Spring Lake in pool 2 in order to return the lake to a productive fish and wildlife habitat and provide recreational facilities.

The Fish and Wildlife Work group of the GREAT I believes that implementing the recommendations that we have developed would make the management of the Upper Mississippi River sound and responsible. The rich resource that is the river depends on the intent of these recommendations for survival into posterity. The success of these recommendations and the GREAT I program will not only foster more constructive and cooperative work by the river management agencies, but will greatly enhance the river's chances of maintaining the many qualities that nature gave it and that man demands of it.

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