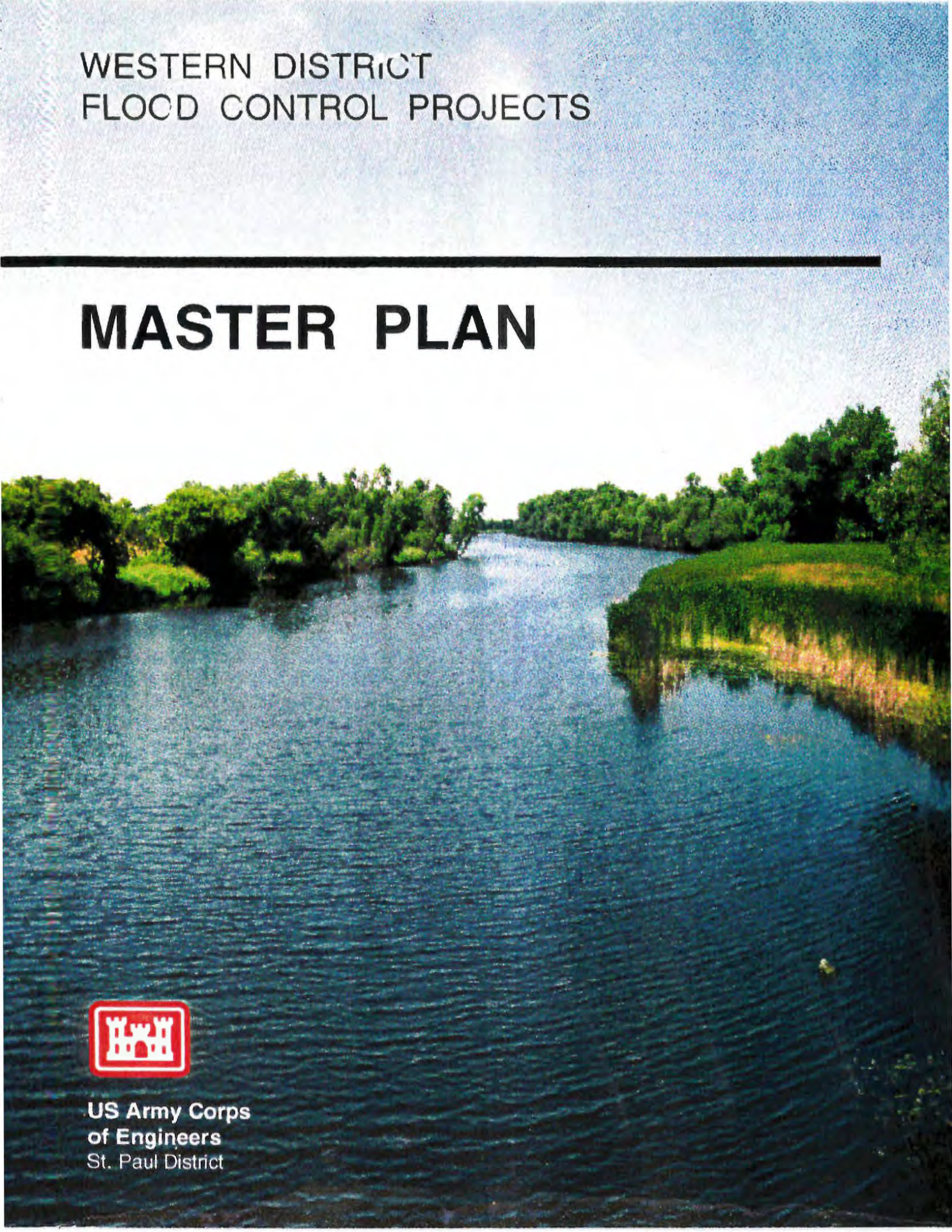
WESTERN DISTRICT
FLOCD CONTROL PROJECTS

MASTER PLAN



US Army Corps
of Engineers
St. Paul District

CEMVP-PE-M 20 July 1998

MEMORANDUM FOR CO-WF/Bertschi

SUBJECT: Master Plans for Lake Traverse, Lake Orwell, Lac qui Parle, and Big Stone Lake - Whetstone River

1. Revised pages for the Master Plans for Lake Traverse, Lake Orwell, Lac qui Parle, and Big Stone Lake - Whetstone River are enclosed for insertion in the draft report, which was previously furnished to you.

2. The submittal memorandum, CENCS-CO-TS, 7 August 1996, and the approval memorandum, CENCD-E-CO, 2 October 1996, for the master plans are provided for insertion at the beginning of the report.

3. The point of contact for this matter is John Blackstone at (651) 290-5429.

CHARLES P. SPITZACK
Chief, Management and Evaluation Branch
Engineering and Planning Division

Encl

Copy Furnished:

CO-TS/Star (w/encl
PE-D/Map files (w/ encl)
PE-D/Fisher (w/o encl)

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL, MN 55101-1638

REPLY TO
ATTENTION OF

20 July, 1998

CEMVP-PE-M

MEMORANDUM FOR Commander, Mississippi Valley Division,
ATTN: CEMVD-ET-C, P.O. Box 80, Vicksburg,
Mississippi 39181-0080

SUBJECT: Master Plans for Lake Traverse, Lake Orwell, Lac qui Parle, and Big Stone Lake - Whetstone River

1. Enclosed are three copies of the Master Plans for Lake Traverse, Lake Orwell, Lac qui Parle, and Big Stone Lake - Whetstone River.

2. Included at the beginning of the report are the submittal memorandum, CENCSCO-TS, 7 August 1996, and the approval memorandum, CENCD-E-CO, 2 October 1996, for the master plans.

3. The point of contact for this matter is John Blackstone at (651) 290-5429.

Encl
(trip)

CHARLES P. SPITZACK
Chief, Management and Evaluation Branch
Engineering and Planning Division

CENCS-CO-TS

AUG 7 1998

MEMORANDUM FOR Commander, North Central Division, ATTN: CENCD-CO-O, Dr. Loesch, 111 North Canal Street, Chicago, IL 60606-7205

SUBJECT: Draft Master Plans for Lake Traverse, Lake Orwell, Lac qui Parle, and Big Stone Lake - Whetstone River

1. Enclosed are 3 copies of the draft Master Plans. They have been prepared in accordance with ER 1130-2-435. The environmental analysis has been limited to documenting those items that will require an Environmental Assessment if and when they are implemented.

2. Due to the geographical proximity of the projects, the Master Plans were combined into one document to avoid duplication of efforts. The Master Plan consists of 7 sections: Section 1 contains those parts of the plan that have regional implications; Sections 2-5 are project specific; Section 6 contains the Technical Appendices, A - H; Section 7 contains the plates. The entire plan (except for the plates) is in digital format. This will facilitate corrections, incorporation of comments, and updates/revisions when they become necessary.

3. Copies of the draft Master Plan will be sent to concerned Federal, state, and local agencies. Concurrently, copies of the draft will be placed at the project offices and in local libraries in towns near the projects for public review and comment. Public notification requirements will be accomplished by placement of announcements in local newspapers. Comments received will be reviewed and included in Appendix B, Recreation Resources and Appendix H, Public Review and Comment.

4. The District will convene an Independent Technical Review (ITR) Team to review and approve the technical aspects of the Master Plan. NCD is requested to review and approve the policy aspects of the Master Plan. Any technical comments NCD may have will be welcomed and considered by the ITR.

CENCS-CO-TS
SUBJECT: Draft Master Plans for Lake Traverse, Lake Orwell, Lac qui Parle, and Big Stone Lake - Whetstone River

5. Please provide your input before 31 August 1996. POC for additional information about the plan contents or preparation process is John Fisher, Landscape Architect, Design Branch, Engineering and Planning Division, (612) 290-5243.

/S/

Encl

DAVID J. HAUMERSEN
Chief, Construction-Operations Division

DEPARTMENT OF THE ARMY
NORTH CENTRAL DIVISION CORPS OF ENGINEERS
111 NORTH CANAL STREET
CHICAGO, ILLINOIS 60606-7205

02 OCT 1996

REPLY TO
ATTENTION OF
CENCD-E-CO

MEMORANDUM FOR Commander, St. Paul District, ATTN: CENCS-CO-TS

SUBJECT: Approval of Western Flood Control Project Master Plan - Lake Traverse, Lake Orwell, Lac qui Parle, and Big Stone Lake-Whetstone River

1. Reference 7 Aug 96 CENCS-CO-TS memorandum, subject: Draft Master Plans for Lake Traverse, Lake Orwell, Lac Qui Parle, and Big Stone - Whetstone River.

2. General Comments - The subject draft plan is well written and the grouping of several different projects into a single plan reduces redundancy and repetition of verbiage.

3. Policy Comments - Recreational fishing is the primary recreational activity at most of the projects discussed in the subject master plan (boat, shoreline, and tailwater fishing). The recently circulated draft Civil Works Recreational Fisheries Resources Conservation Action Plan, when approved, would appear to increase the visibility of recreational fishing and provide us with the authority to increase management efforts in this area. It appears that we may soon be able to give higher priority to the design, renovation, and enhancement of facilities installed to support the fishing public. Authority to treat recreational fishing as a "feature" recreational activity will probably allow us to more actively work with the states and USFWS to provide high quality fishing experiences to our customers. Additional guidance will be provided from higher authority as the plan is finalized and made operational. Final approval of the fisheries management plan may require the revision of certain aspects of the subject master plan, particularly in the design and provision of fisheries related facilities.

4. The following comments are more technical in nature (line between policy and technical has not yet been clearly defined), and thus, are provided for your consideration:

a. Insure that "management units" utilized in the master plan coincide with, or are a subset of the "management units" presently existing within OMPs.

b. Conditions are hazardous for bank fishers in tailrace areas where steep rip-rapped banks exist. In order for fishers to get to a "fishable spot" along the water's edge at

most tailrace areas, they must climb up, down, and over slippery and irregularly shaped rip-rap. Access is difficult for the most able bodied at best, and impossible for older and/or mobility impaired customers. Less hazardous and higher quality facilities should be provided to customers because bank fishing is the "feature" activity that brings them to the projects discused in the subject master plan.

b. Fishing platforms contained in the draft plan are located too far downstream from tailrace areas. Bank fishers will continue to crawl over slippery and dangerous rip-rap to get close to tailrace areas because that is where the fish are located. Facilities must be located where the fish are, or they simply will not be used.

c. Consideration should be given to providing bank fishing access facilities which terrace the banks of tailrace areas. Concrete terraces/ramps can be made to be disability accessible, accessible at a variety of discharge levels, require little maintenance, and accommodate large numbers of fishers. These types of structures would appear to be superior to the traditional platform structure design contained in the plan. A schematic of the concept has already been provided to the district.

d. It appears that tailrace fishing facilities could be created by modifying existing bridges to include fishing platforms. Such a concept may be a long term consideration as states and counties renovate or replace bridges.

e. Suggest that the term NGVD (National Geodetic Vertical Datum), be used in lieu of msl within the plan. It is our understanding that NGVD is now the preferred term.

f. Page 105, Recommendations - Suggest that some statement be placed in this section that calls for the development of public information plans, brochures, interpretive material, etc., which seeks to address the vandalism problem. Such a statement should be placed in chapter 7 of each plan where vandalism is a problem.

g. Page 140 & 223, Recreation and Project Area Signage: Such signs would have to be placed on state or county road right-of-ways and not Corps property. These signs would have to conform with state standards and could only be placed in such locations after getting their approval. Suggest checking with state authorities to verify what is acceptable prior finalizing the plan.

h. Page 159 - The phrase, "under preparation in 1993", is used many times. This should be updated, as the referenced work is probably now complete.

i. Page 186 - The name of the Soil Conservation Service has changed to the National Resources and Conservation Service. Need to change this term throughout the document.

j. Page 192, Section 2., A. Federal Agencies - Mexico should be included as one of the participants in the North American Waterfowl Management Plan.

k. Pages 218 and 219 - Years of 1994 - 1999 need to be updated to 1997 - 2002. Additionally, dates in the first paragraph of page 219 needs to be updated. Similar changes may be needed in other project plan of development sections contained in the master plan.

l. The term OMP is used many times in the document. Within the next year the POP (Project Operations Plan) concept will probably replace the OMP. The POP concept seeks to develop a plan that encompasses all aspects of the operating project (consistent with the Operations Project Manager concept). Under such a scenario the OMP would become a part of the larger POP. Continue to use the term OMP until instructed to otherwise.

m. An attached marked up copy of the draft plan contains several editorial suggestions for your consideration.

5. Three copies of the final master plan should be provided to CENCD-E-CO once public and agency review has been completed. This office will distribute one copy to RE and one to the library.

6. The HQ, NCD, POC is Dr. Michael A. Loesch, CENCD-E-CO, (312) 353-7762.

FOR THE COMMANDER:

ROY J. DEDA, P.E.
Chief, Construction, Operations
and Readiness Division

Western District
Flood Control Projects

MASTER PLAN

June 1997

CENCS-PE-M 11 March 1996

MEMORANDUM FOR RECORD

SUBJECT: Western District Flood Control Projects Master Plan - NEPA Compliance

In accordance with ER 200-2-2 Environmental Quality PROCEDURES FOR IMPLEMENTING NEPA, an Environmental Assessment has not been prepared for this planning document. However, some actions proposed in the Master Plan will require an Environmental Assessment and additional coordination before construction/implementation. They are identified in the following paragraphs:

Lake Traverse Project:

Browns Valley Day Use Area:
Proposed changes at this facility are mainly accessibility issues. As proposed, the changes will not require further environmental evaluation.

Reservation Dam Day Use Area:
Proposed changes at this facility are mainly accessibility issues and the upgrade of existing facilities; i.e., playground equipment, parking, etc. As shown, they will not require further environmental evaluation.

White Rock Dam Day Use Area:
Restructuring the parking lot, as shown, may affect existing wetlands. This design, as proposed, will require additional assessment on possible environmental impacts.

Lake Orwell Project:

Lake Orwell Overlook:
Proposed changes at this facility are mainly accessibility and aesthetic issues. As proposed, they will not require additional environmental evaluation.

Ottertail River Day Use Area:
This recreation area is involved in the dam safety study for Orwell Dam. An Environmental Assessment is being done on the work proposed by the study (September '94). Changes proposed in the master plan at this facility are mainly accessibility issues. As proposed, they will not require further environmental evaluation.

Big Stone Lake - Whetstone River Project:

Highway 75 Overlook:
Proposed changes at this facility are aesthetic and user comfort issues. As proposed, they will not require further environmental evaluation.

Lac qui Parle Project:

East Bank Day Use Area:

Restructuring the parking lot, as shown, may affect existing wetlands and will require additional evaluation on environmental issues.

West Bank Day Use Area:

Restructuring the parking lot, as shown, will require additional assessment on possible environmental impacts. The design would affect wetland areas at the site.

Marsh Lake Day Use Area:

Proposed changes at this facility are aesthetic and accessibility issues. As proposed, they will not require further environmental evaluation.

Due to the conceptual nature of master plans and changing environmental regulations, all master plan actions will be coordinated with PE-M prior to any additional project planning. This will ensure full NEPA compliance and the proper coordination with appropriate state and federal agencies throughout the planning phase and its implementation.

Robert J. Whiting
Chief, Environmental Resources Section
Engineering and Planning Division

Executive Summary

Western District Master Plan

AUTHORIZATION: This Master Plan for Resource Use is submitted under the authority of ER 1130-2-435. It fulfills the requirements of the ER for four flood control projects located in the western portion of the US Army Corps of Engineers St. Paul District.

LOCATION: The study area is in the region where Minnesota, South Dakota, and North Dakota share common borders. The four projects – Lake Orwell, Lac qui Parle, Lake Traverse, and Big Stone Lake/Whetstone River at Highway 75 – share the regional aspects of this study. Although they are connected by corridors of riparian wildlife habitat, because of an ancient physical anomaly, they do not share a common drainage.

PROJECT DESCRIPTION: Lakes Orwell and Traverse comprise a large part of the Red River of the North drainage basin. Lac qui Parle and Big Stone Lake-Whetstone River are part of the Upper Minnesota River watershed. The topography that dictates the regional drainage pattern is the aftermath of prehistoric geological and meteorological events. In recognition of the importance of these occurrences, part of the region around Lake Traverse has been designated a Registered Natural Landmark.

The economy of the study area is almost exclusively agriculture based. The region is experiencing a slow, steady decrease in population. The projects are located amidst miles of farm fields, in moderately remote settings. Each project has small, day use recreation areas, eight in all; the primary recreational pursuits are fishing and hunting. All of the project lakes experience water quality problems and they all have problems with vandalism.

DOCUMENT DESCRIPTION: The planning document includes seven sections: a discussion of regional resources and influences; a section for each project; technical appendices; and plates showing existing and proposed development. The regional section (section 1) includes planning authorization, purpose, and the process used in compiling the document; a description and chronology of the study area; and a discussion of regional and project resources. Each of the project sections (sections 2-5) includes a project description; a description of resources; a discussion of resource and management objectives; a plan of development; a discussion of problems specific to the project; a summary; and recommendations for development. The technical appendices (section 6) contain listings of regional and project specific data; visual assessments of each project; and document support data. The plate section (section 7) depicts current and proposed development. This document is entirely in digital format (excluding the plates) for ease of implementing comments, corrections, and future update.

ENVIRONMENTAL EVALUATION: In accordance with ER 200-2-2, Environmental Quality Procedures for Implementing NEPA, consideration of environmental matters for the Western District Flood Control Projects Master Plan has been limited to identifying those proposed actions that will require an Environmental Assessment and additional coordination before construction or implementation.

Funding for the environmental work will be provided as early in the budget year as possible to allow for completion of the assessment prior to the beginning of plan design and implementation.

CONCLUSIONS: This master plan does not advise changes in project resources. The primary recommendation of the document is focused on small physical modifications that will result in increased personal safety and universal accessibility for each of the public use areas. It also does not rule out further development. If a qualified sponsor could be found to fulfill the cost sharing requirements set forth by law, further recreational development is possible.

The plan recognizes the need for universal accessibility and requires that accessibility inventories be completed for each project. The plan recommends the realignment and paving of parking lots at three of the day use areas to reduce pedestrian/auto conflicts, to maximize the use of the sites, and to reduce accidents and improve sight distances at the entrances.

This planning effort has found that, within the constraints of operating the projects for their primary authorized project purpose (flood control), the Federally administered land and water areas of the lake are also being managed to help fill other regional needs. An examination of Corps administration policies at each of the projects indicates that the current allocation of these lands is providing protection of the resource and accommodating the recreational needs of the public. With some slight modification, the existing recreational development will support the current and projected use.

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Chapter 4 – Project Specific Factors and Resources

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Chapter 2 – Resources and Influencing Factors

Chapter 3 – Project-Wide Resource Objectives

Chapter 4 – Management Unit Objectives

Chapter 5 – Plan of Development and Design Criteria

Chapter 6 – Problems and Constraints

Chapter 7– Summary of Significant Findings and Recommendations

SECTION 3
Lake Orwell Project

Chapter 1 – Project Description

Chapter 2 – Resources and Influencing Factors

Chapter 3 – Project-Wide Resource Objectives

Chapter 4 – Management Unit Objectives

Chapter 7 – Summary of Significant Findings and Recommendations

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Western District Flood Control Projects – Section 1

Master Plan for Resource Use

June 1997

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Chapter 3 – Key Factors and Resources of the Region

Chapter 4 – Project Specific Factors and Resources

Regional Aspects

CHAPTER 1 – INTRODUCTION

GENERAL:

This Master Plan for Resource Use is for the United States Army Corps of Engineers flood control projects: Lac qui Parle; Big Stone Lake-Whetstone River (at Highway 75); Lake Traverse; and Lake Orwell (Figure 1-1). The study area is located in the region where Minnesota, South Dakota, and North Dakota share common borders (see Plate 1). Because of the proximity of the projects (within 80 miles of each other), they share the regional aspects of this study. Although they are connected by corridors of riparian wildlife habitat, because of an ancient physical anomaly, they do not share a common drainage.

Lakes Orwell and Traverse comprise a large part of the Red River of the North drainage basin. Lac qui Parle and Big Stone Lake-Whetstone River are part of the Minnesota River watershed (see Plate 2). The interesting and varied topography that dictates the regional drainage pattern is the aftermath of prehistoric geological and meteorological events. In recognition of the importance of these occurrences, part of the region has been designated a Registered Natural Landmark. This designation is important to the recreation potential of the projects.

AUTHORIZATION:

It is the policy of the Corps of Engineers that Master Plans be developed and kept current for all Civil Works projects for which the Corps has administrative responsibility. The Master Plan for Resource Use (MPRU) is the basic document guiding Corps of Engineers responsibilities pursuant to Federal laws on the use and development of natural and man-made resources of a given project or group of projects. A current, approved Master Plan is necessary before any action can be taken which may restrict the range of future options. All actions by the Corps of Engineers and

outgrantees must be consistent with the Master Plan. Policy and guidance for the preparation of Master Plans are provided in Engineering Regulation (ER) 1130-2-435, 30 December 1987.

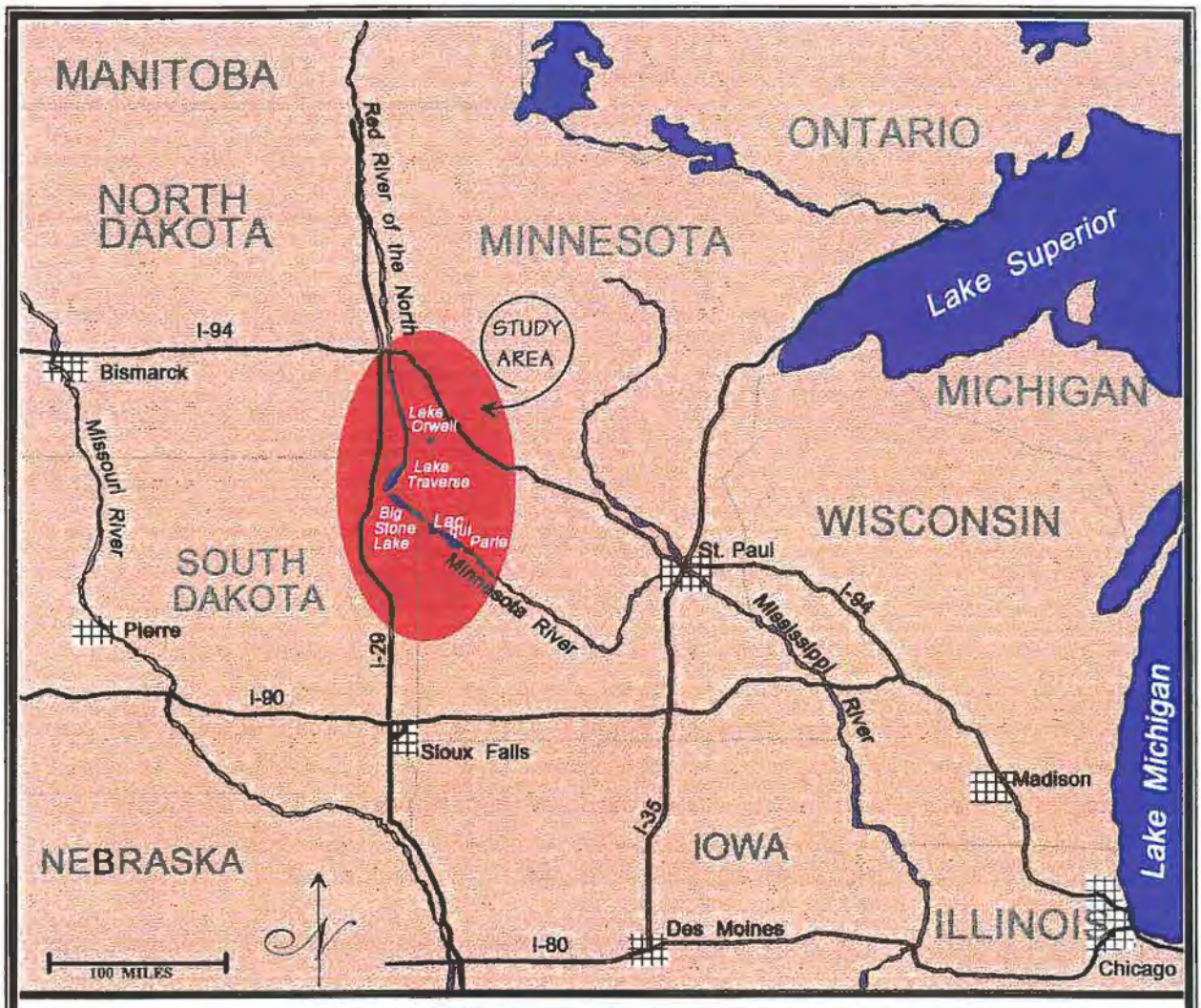

FIGURE 1-1 Western District Study Area – Location Map

PURPOSE:

The purpose of the Master Plan is to quantify and evaluate project resources, and then to commit them toward the needs and interests of the region, providing the best possible combination of responses while keeping within the bounds of the authorized project purposes. The primary goal in the planning process is to prescribe a concept of land and water management, resource objectives, and design and management programs that respond effectively and economically to regional needs, resource capabilities, and public interests. These responses must be consistent with authorized project purposes.

This Master Plan for Resource Use is intended to serve as a working document for planning, design, management, and real estate actions pertaining to tbe lands and resources of these projects. Subsequent decisions pertaining to these projects shall be consonant with the identified land use plans and objectives presented in this document with respect to outgrants, leases, and licenses.

The MPRU presents a concept of best use practices. The implementation of the objectives established by this document is not the purpose of the plan. The Operational Management Plan (OMP) describes in detail how resource objectives and concepts prescribed in the MPRU will be implemented and achieved. Operation and maintenance of the projects are also outside the scope of the Master Plan. The operations manuals for the dams and related structures at each lake present the project operational requirements in detail.

SCOPE:

Within a conceptual framework, the planning process focuses on three primary components: 1) regional needs, 2) project resource capabilities and suitabilities, and 3) expressed public interests. This Master Plan for Resource Use serves as a guide for the use, development, and management of the natural and constructed resources at four western Minnesota flood control projects: Lake Traverse, on the Bois de Sioux River; Orwell Reservoir, on the Ottertail River; Lac qui Parle (Lake That Talks); and Big Stone Lake-Whetstone River on the Minnesota River. They are administered by the U.S. Army Corps of Engineers, St. Paul District. The Resource Use Objectives identified in this study are compatible with the authorized operation of these projects.

FORMAT:

This master plan consists of seven sections under one cover: Section 1 contains those parts of the plan that have regional implications; Sections 2-5 are project specific; Section 6 contains the Technical Appendices, A - H; Section 7 contains the plates. The entire plan (except for the plates) is in digital format. This will facilitate corrections, incorporation of comments, and updates when they become necessary.

Project Operations Plans will identify specific procedures for achieving the Resource Use Objectives and for the development and application of the concepts established by this document.

MASTER PLANNING PROCESS:

The Master Plan study process is designed to identify and evaluate resources that are capable of sustaining public desires and regional needs. This process identifies a lake's general characteristics and establishes objectives to achieve the best uses of its resources, natural and built. The intent is the elimination of unnecessary duplication of activities within the region served by these projects.

A systems analysis approach is used to establish resource capabilities and to determine which lake(s) can best help meet identified needs. A study team examined such factors as scenic,

cultural, recreational, and ecological values and lake resource capabilities. The planning process takes into account the influences and constraints on resource use imposed by the operational requirements of the authorized project purpose, as well as institutional requirements such as State and local land use plans, the Corps cost sharing regulations, and outgrant or lease agreements.

Because of the many studies that have been done in this region (Reservoir Operation Plan Evaluations, water quality studies, dam safety studies, assorted environmental evaluations, etc.) and the limited resources and remote location of the projects, it was assumed that a thorough evaluation and compilation of existing documentation (as required by ER 1130-2-435) would supply much of the needed information. Initial (draft) Resource Use Objectives were established from these documents.

1. **Phase 1** of the master plan study is the gathering and analyzing of data from the entire study area. The study team accomplished this by first reviewing existing documentation and inventorying resource capabilities. Next, key factors which might condition or limit resource use at the project lakes were identified. These include: agency guidelines, Federal and State regulations, funding limitations, and social circumstances. To gather public views on present and future use and management of area resources, copies of the draft Master Plan for Resource Use were placed in area libraries and at Corps field offices. This was for the purpose of eliciting comments that would establish the needs and desires of the area users of the project facilities. The study team analyzed this information to determine preliminary project development and resource management actions. Synthesis of the information and conclusions from the previous steps produced the final regional objectives which could most suitably meet the needs expressed by the public.

2. **Phase 2** of the master plan study is the application of regional objectives to suitable areas of land at each of the project lakes. The initial step in Phase 2 will be to establish management units and to delineate areas for which specific development of management actions can take place. Sets of potential resource uses will be selected for each management unit. They reflect alternatives for meeting previously identified regional needs (Phase 1) within inventoried project resource capabilities. Selected resource use options will indicate the range of potential uses that can occur throughout each project. Alternative land use plans will consist of different combinations of these options for use, development, and management of individual units at each lake. A trade-off analysis will refine the range of choices among the identified alternatives. This analysis will allow selection of the final land use plans and Resource Use Objectives for each lake which then again will be submitted for public and agency comments. After considering all relevant input, the study process calls for development and management measures which define the specific actions necessary to achieve the established Resource Use Objectives. The final steps in the second phase will consist of formulating design criteria, specifying the design element needed to meet the proposed development, and outlining managing measures.

PUBLIC INVOLVEMENT STRATEGY:

Public involvement is required by law and is an essential part of understanding, and fulfilling, the needs of the region. The strategy for public involvement was formulated under three considerations. **1).** Regulations require that every effort be made to insure that this study be as cost effective as possible. **2).** All of the projects in the study are existing and well documented. Many other studies (Reservoir Operation Plan Evaluations, prior Master Plans, etc.) have been prepared previous to this. As a result, the concerned public of the region is already familiar with the projects. **3).** This study is not recommending any major changes. Considering these three factors, the Public Involvement Strategy for this study is not as involved as it would be for a new project, or for a study that was recommending major (or numerous) changes.

Public involvement for this Master Plan for Resource Use will be a two-step process: 1). All existing documentation will be garnered for information that is pertinent to the study and incorporated into the plan; a technical review by the Corps will provide revisions to the plan; draft copies of the plan will be sent to local libraries and Corps field offices; notices will be posted in local newspapers. 2). Public comments will be addressed and reviewed for possible incorporation into the final plan. All correspondence received by the Corps concerning this Master Plan for Resource Use will be answered by the study manager or another qualified source.

AGENCY COORDINATION:

Early in the study process, other agencies involved with the projects were informed of the study. Notification was mailed to the U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, North Dakota Parks and Recreation, North Dakota Game and Fish Department, and South Dakota Department of Game, Fish, and Parks. Agencies that responded to this notification will be mailed a copy of the draft plan for review and comments. The study manager or another qualified source will review and respond to any comments received.

CHAPTER 2 – REGIONAL DESCRIPTION

LOCATION AND SETTING:

The study area, shown on Figure 1-2, is roughly 160 by 288-kilometers centered (approximately) on the corners of North Dakota, South Dakota, and Minnesota, with its long axis aligned along the Minnesota border. Historically, this is the north-eastern edge of the great plains of North America; a seemly endless expanse of rolling, grass covered hills inhabited by semi-nomadic Native American tribes. Today the region is part of the mid-western farm belt, the "Bread Basket of America." It is a sparsely populated area – a rural landscape that stretches across the center of the continent for hundreds of miles. The northern part of the study area (Lake Orwell) is in a vegetative transition zone where, as one travels north, naturally occurring, rolling grassland changes to northern forest dotted with thousands of lakes and streams.

The projects are connected topographically by a series of river valleys; they do not all share common watersheds. The unusual ground forms within the study region are the result of the glaciation of this part of the continent during several periods popularly known as "Ice Ages." The glaciation that last affected this area was the "Des Moines lobe of the Mankato phase of the Wisconsin Ice Stage" occurring about 12,000 years ago.

These vast sheets of ice were formed as the climate of the earth cooled, and, as a result, weather patterns changed. As the planet slowly chilled, winters became longer and precipitation in the form of snow and ice accumulated in the northern areas of the continent. Eventually, over hundreds of years, this accumulation resulted in glaciers thousands of feet high. There is geological evidence that the weight of the ice was so great that the crust of the earth bent under the pressure.

As the glaciers grew higher, the tremendous weight of the ice pushed the edges of the glaciers southward, away from the center. This immense amount of frozen water generated incredible amounts of energy.

As the glaciers expanded, moving through the ancient landscape, they gouged enormous amounts of soil from the surface of the earth, pushing it ahead of the moving ice, then scraping and etching the very bedrock of the region. This abrasive action created vast quantities of small rock particles (drift) that were suspended within the ice. The soils that the ice pushed ahead of this flow formed large hill-like formations called terminal moraines. They mark(ed) the outer edges of the ice sheet and can be hundreds of feet in elevation.

A glacier's size fluctuates according to the weather cycles. A glacier can advance (grow in height and flow outward) and retreat (melt) many times during its existence. Each time the ice advanced

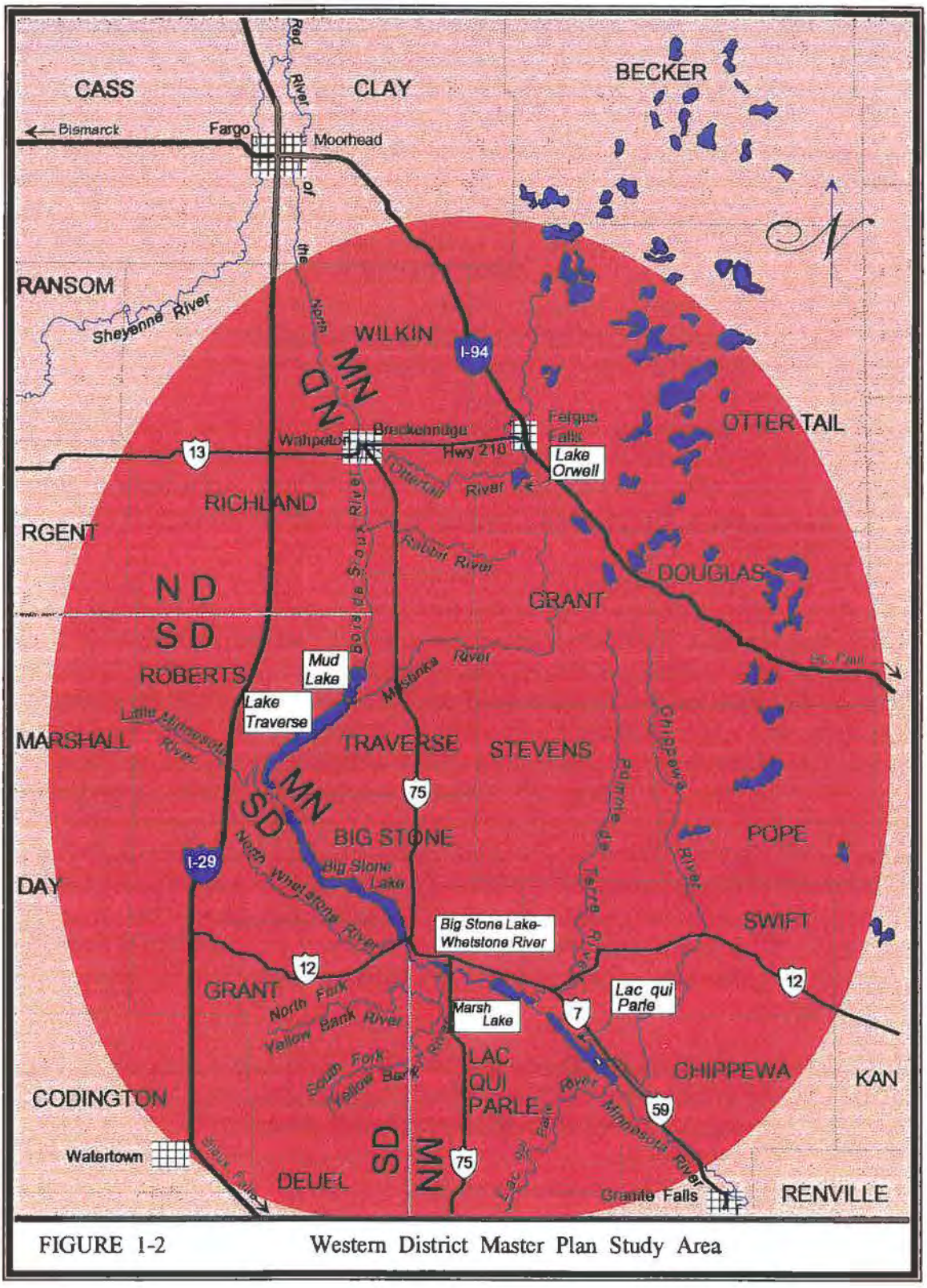

FIGURE 1-2 Western District Master Plan Study Area

and retreated, it left moraines of assorted geological debris: boulders (some as big as houses, thus the names Big Stone and White Rock), rocks, gravel, sand, and soil. The farthest advances of the ice were marked by the great terminal moraines that delineate many of our modern watersheds.

Over many years, the climate cycle slowly warmed and the ice sheets began a slow retreat northward. As the glaciers melted, great rivers flowed underneath them and the rock particles that were suspended in the ice were released and deposited in layers of sand and gravel (glacial drift), in some places hundreds of feet deep. Great chunks of the glacier broke off and were buried in this glacial drift. In time, they too melted; this formed the many kettle and pothole lakes that are common in this landscape. As the last glacier in this region slowly withdrew to the north, the water from its meltdown, contained by the remaining ice of the glacier to the north and the Big Stone Moraine to the south, formed Glacial Lake Agassiz (see Figure 1-3).

This vast body of water occupied most of northwestern Minnesota, a portion of eastern North Dakota, and extended northward into Manitoba, Saskatchewan, and Ontario. Eventually, it covered an area of about 200,000 square miles (322 000 k^2) with a maximum depth of about 400 feet (122 m). In comparison, Lake Superior, the largest freshwater lake on earth, is roughly 51,200 square kilometers.

Fed by the waters of the melting glaciers, the lake level rose. Eventually overtopping the moraine, Lake Agassiz began to drain. While the initial outflow was to the south (for about 80 kilometers), the general direction was southeast due to the flatiron-shaped plateau known as the Coteau des Prairies, the remains of an ancient mountain range, now a ridge extending from South Dakota in a southeasterly direction across Minnesota and into Iowa. The crest of this ridge is nearly 2,000 feet (600 m) above sea level. As the tremendous outflow from Lake Agassiz increased, so did the erosion into the drift. The modern testimony to these tremendous natural forces is now known as the Minnesota River Valley. Over its length of 330 miles (530 km), from Big Stone Lake to its confluence with the Mississippi River near St. Paul, Minnesota, this ancient river ranged in width from 1 to 3 miles (2-5 km) and in depth to 200 feet (60 m). During periods of lake stability, its estimated outflow averaged over 130,000 ft^3/sec (3 700 m^3) with peak flows estimated at over 3.2 million ft^3/sec (91 000 m^3) (Matsch, 1972). From the lower end of the lake outlet at Browns Valley, Minnesota, to the vicinity of Lac qui Parle, the erosion eventually carried down to the Precambrian bedrock.

The prehistoric river that created the Minnesota River Valley was named the Ancient (or Glacial) River Warren in honor of General G.K. Warren, who first explained the origin of the valley in his report on the Examination and Survey of the Minnesota River published as Ex. Doc. # 76, Forty-third Congress, Second Session, 1866-67. General Warren's surveys, maps, descriptions, and discussions were considered a valuable contribution to science.

As the ice sheet continued its retreat to the north, lower elevations thawed and drainage outlets to Hudson Bay opened. The lake's water level fell in several stages, evidenced by beach strand lines

at elevations: 1060, 1040, 1020, and 980 feet National Geodetic Vertical Datum (NGVD) and corresponding terraces in the river valley. Eventually the southern outlet through the Big Stone Moraine was blocked at Browns Valley by the alluvial fan of the Little Minnesota River. This deposition, in effect, beheaded the Glacial River Warren and it ceased to function as a drainage channel for the glacial lake.

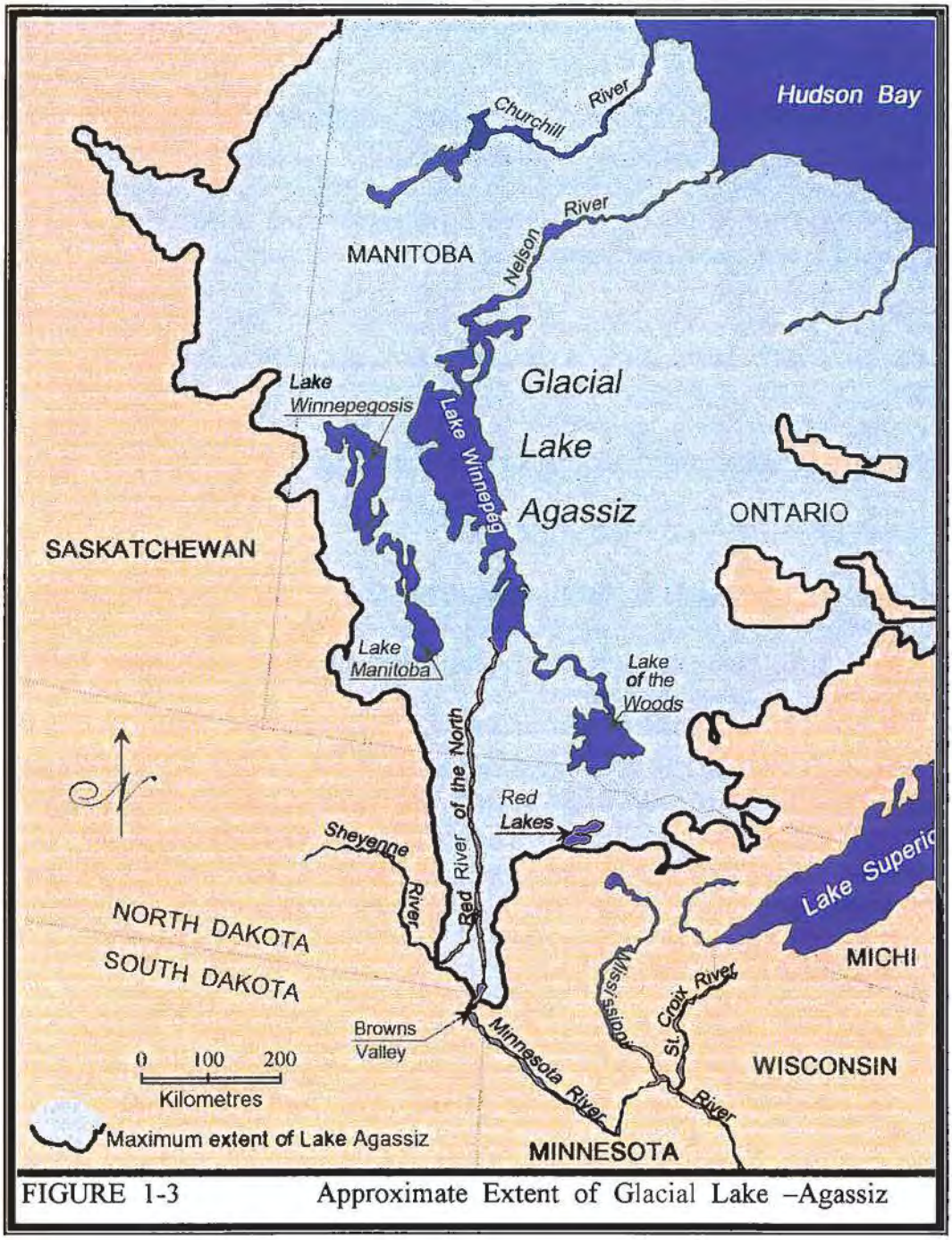

FIGURE 1-3 Approximate Extent of Glacial Lake –Agassiz

After drainage from Lake Agassiz was blocked, siltation of the main channel of the river began. Tributary streams created alluvial fans where they entered the main stem, and these fans formed a series of river lakes: Big Stone Lake, Marsh Lake, and Lac qui Parle. Erosion of these tributary river valleys did not reach the Archean rock as it did in the main channel. Erosion stopped at depths of 12.2 to 15.2 meters below the present drift on a moraine of an earlier ice age, composed of granite, syenite, and gneiss.

The huge lake continued draining to the north, its declining levels in tune to the retreat-advance-retreat stages of the slowly melting glacier. At each stage of the lake's drawdown, successive beach ridges were formed at the lake edge. Eventually the glacier melted completely, and Glacial Lake Agassiz, no longer fed by the melting ice, drained away to the point that it ceased to exist as a single, large body of water.

In Minnesota, major remnants of the prehistoric lake include the Red Lakes, Rainy Lake, and Lake of the Woods, all major lakes. Other remnants include Lakes Winnipeg, Winnipegosis, and Manitoba, in Canada. A part of the bed of this ancient lake is known as the Red River (of the North) Valley which lies on the Minnesota-North Dakota border. The highly modified landscape of glacial drift (moraines, beach ridges, and terminal moraines), the ancient lake bed, and the bed of the great river that drained it, all modified by natural aging and weathering processes, comprise the unusual topography and geology of the study area.

The alluvial fan of the Little Minnesota River, within the course of the Ancient River Warren, forms a part of the continental divide. Lake Traverse flows northward, eventually into Hudson Bay. Within sight of Lake Traverse – only a few miles away – Big Stone Lake drains south to the Gulf of Mexico via the Minnesota River.

Under the provisions of The Historic Sites Act of August 21, 1935, the upper channel of the Ancient River Warren was designated a Registered Natural Landmark (possessing exceptional value illustrating the natural history of the United States) in 1969. The area designated includes Lake Traverse, Mud Lake, and Big Stone Lake. Like the majority of the rivers and lakes of the glaciated prairie States, these waters are hidden in the landscape. Lying deep in the abandoned channel of the great river, these waters can not be seen as one crosses the rolling plain. They are not visible until the bluffs of the valley are attained.

This region comprises the eastern edge of the Northern Great Plains, and the native biota are both wet and dry prairie dwelling species. Historically, vegetation consisted of grasses, sedges and wildflowers on the vast level areas, and occasional patches of northern floodplain forest along the streambanks and in the gullies. As the prairies were periodically swept by tremendous fires, the only woody plants in the area were those that survived them. As a natural consequence, stands of native trees and brush were few and widely scattered, found only on the streambanks or in naturally protected areas.

The study area lies on the western edge of one of the major North American waterfowl migration routes, the Mississippi Flyway, and includes the "Prairie Pothole Region," an important breeding and nesting area. Aside from the vast flocks of birds, other migratory animals included tremendous herds of bison, elk and deer, and the predators and scavengers that accompanied them. Native Americans lived in this area for thousands of years, and many archaeological sites are scattered along the banks of the streams and lakes of the region.

European settlers colonized this area in the 1800's; they found fertile soil, with rich habitat and diverse animal and plant populations.

Since that time, much has changed. The landscape has been converted to farmland and the native, prairie dwelling human and animal populations suppressed. Many foreign species of plants and animals have been introduced, some of which are very harmful to the ecology of this area.

CHRONOLOGY OF THE REGION:

Climate variations have wrought dramatic changes in the character of the entire region in the last 13,000 years, or since the last great glacier began its final retreat northward into Canada. During that time, the Minnesota River lowland, which initially contained an early meltwater stream and proglacial lakes, was converted, by the tremendous outflows of Glacial Lake Agassiz, into the wide, deep trench that is the Minnesota River Valley of today. After the glacial lake began using other outlets, about 9,200 years ago, the much smaller Minnesota River flowed through the oversized valley of the Glacial River Warren. Tributary streams deposited alluvial fans across the valley floor, forming a string of river lakes, joined together by the Minnesota River.

In addition to the retreat of the ice, vegetation varied in response to the climate. As the glaciers melted in response to the global warming trend, tundra vegetation became established in the ice margin areas. About 12,000 years ago, boreal (spruce) forest moved into the study area. As the climate continued to warm, the boreal vegetation was replaced, first with mixed deciduous forest then, about 9,000 years ago, with prairie vegetation. Despite later climate fluctuations, tall and mixed grass prairie remained the principal biome until the onset of modern farming practices, about 1860.

Early Prehistory, c. 7000 B.C.:

Evidence of early nomadic big game hunters, referred to by archaeologists as Paleo-Indians, has been found near Lake Traverse and Browns Valley. Excavated materials consist of a human skeleton, Browns Valley Man, in association with distinctive stone knives and projectile points that date to about 7000 B.C. This is one of only a few sites, and the only burial site in Minnesota, that has been definitely attributed to these earliest inhabitants of North America.

Following the climatic change to more moderate temperatures, a number of new food resources became available to prehistoric people. Communities appear to have been less nomadic, and subsistence patterns were based on exploiting locally available foods. The archaeological record indicates greater cultural diversity resulting from adaptations to different local environments. These adaptations to local resources are considered part of a widespread cultural pattern known as the Archaic tradition, which dates from about 6000 B.C. to 1000 B.C. Notched and stemmed spear and dart points became common and groundstone plant-processing tools made their first appearance at this time. During this period, the use of copper for fashioning weapons, tools and ornaments originated in the Upper Great Lakes region and spread to the Red River Valley. A number of Archaic sites are known to exist along the former beaches of glacial Lake Agassiz. It is likely that similar Archaic sites exist in the study area.

The next cultural tradition, known as the Woodland (ca. 1000 B.C. to A.D. 1000), is distinguished from the Archaic by the appearance of pottery and the construction of burial mounds. The use of copper became less common and bone and antler tools are often found. A number of burial sites of this time, including the Round Mound, Fire Mound, K-group Mounds, Wilson Mound, and Shady Dell site on the eastern side of Lake Traverse and the De Spiegler site near Big Stone Lake, were excavated by archaeologists 40 to 100 years ago. Several of these sites contain components of the Arvilla Complex which seems to have spread from Wisconsin across central Minnesota and along the Red River Valley during the period A.D. 500 to A.D. 900.

Late Prehistory, ca. A.D. 1000 :

At the start of the Late Prehistoric Period, about A.D. 1,000, the Woodland tradition was replaced in western Minnesota by the Cambria Complex The Cambria Complex was strongly influenced by the Oneota and Middle Mississippian cultures, which developed and spread along the Mississippi River and its tributaries to the east, and by the Middle Missouri tradition, which developed in the Missouri River Valley to the west. Oneota and Middle Mississippian influence is evident at the Round Mound site which has a second occupation dated at about A.D. 1300. The Late Prehistoric Period is distinguished by the intensive cultivation of maize in southern Minnesota and by the use of wild rice in northern Minnesota, which made sedentary villages possible. The bow and arrow came into widespread use during this period.

The Cheyenne Indians reportedly lived in the Lake Traverse area as village dwelling agriculturalists. With the introduction of the horse and the displacement of Indian groups from the east, the Cheyenne moved onto the plains of what is now North and South Dakota and dramatically changed their lifestyle to that of nomadic buffalo hunters. The Teton, Yanktonai, Sisseton and Wahpeton tribes of the Sioux (Dakota) Nation also occupied historic villages along the upper Minnesota River. The Sisseton and Wahpeton still live on the reservation immediately west of Lake Traverse. The government Indian agency building was located about 15 miles west of Browns Valley.

Modern History, A.D. 1800:

There were active fur trading operations in the Lake Traverse area beginning in the late 1790s. The first such trading post on Lake Traverse was established around 1800 by Robert Dickson for the British Northwest Fur Company. Dickson had been appointed superintendent of the western Indians for the British government. His influence was such that he led several groups of the Dakota against United States forces at Prairie du Chien (Wisconsin) during the War of 1812. His post was located near the southeast shore of Lake Traverse about 6 miles from Browns Valley and consisted of several buildings. In 1823, the Columbia Fur Company, founded by Joseph Renville, established a post known as Fort Washington in the same area. The American Fur Company established a post in 1824 with Henry Fisher in charge. In 1844, the American Fur Company established another post on Big Stone Lake.

Following the Sioux Uprising in 1862, the United States Government decided to build a fort near the Indian reservation west of Lake Traverse. The fort was originally called Fort Wadsworth, but the name was later changed to Fort Sisseton. It was located about 24 miles west of the present town of Sisseton, South Dakota. From the time the fort was built in 1864, until 1871 when the railroad reached Morris, Minnesota, the Wadsworth Trail was used for transporting supplies to the fort and reservation. This trail passed from St. Cloud to Sauk Centre, to Glencoe, Gager's Station, Frisky's Grove, Tocqua, Browns Valley, the Indian agency, Buffalo Spring, and Fort Wadsworth. There is a historical monument between Browns Valley and Lake Traverse commemorating this trail.

One of the central figures in the development of southwestern Minnesota was Joseph R. Brown. He served as administrator of Indian affairs at Fort Wadsworth. In 1866, he moved his house from the fort to a site which became the first post office at Lake Traverse. In 1871, his son, Samuel Brown, moved this post office to its present location in Memorial State Park and named the new location Browns Valley. That same year, the non-reservation area adjacent to Lake Traverse and Mud Lake was opened up by the government for settlement. Non-allotted lands of the Sisseton Reservation on the South Dakota side of Lake Traverse and Mud Lake were opened up for homesteading in 1892.

Although wheat farming was the main occupation in the region, various communities were established in the area by the late 1800s, including the towns of Diamond and Travare, South Dakota, and Dakomin and Maudada, Minnesota. Between 1900 and 1920, numerous tow and tug boats and barges operated on Lake Traverse, transporting grain between the elevators at Diamond, Jensen's Island, and Dakomin and the railroad at Browns Valley. The boats also transported people and freight between the various communities on the lake. A series of poor crop years, the expansion of the railroad in the early 1920s, and a government drainage program which significantly lowered Lake Traverse water levels, marked the end of the thriving grain trade

on the lake. For additional information about the area's cultural history, see individual project Historic Properties Management Plans.

CHRONOLOGY OF PROJECT DEVELOPMENT:

Lake Traverse:

Initial interest in Lake Traverse and the Bois de Sioux River was related to navigation, but with settlement and the eventual development of the area, the problem of flooding arose. Flood damage began to occur as cities and towns grew and as the floodplain was developed for agriculture.

In 1922, the Department of Agriculture published a report which discussed corrective measures related to drainage and prevention of overflow in the valley of the Red River of the North. In 1933, the Public Works Administration requested the Chief of Engineers to report on an application for flood control works on Lake Traverse and the Bois de Sioux River, based on the plan proposed by the Department of Agriculture in 1922. At that time, the District Engineer held that the proposed plan for the improvements set forth in the application was adequate in its engineering aspects and was economically justified in view of the benefits to be derived. He noted, however, that because of State law, none of the States involved could legally undertake construction, operation, and maintenance of the proposed project. At that time, no Federal interest was authorized to undertake the project.

Enactment of the 1936 Flood Control Act and formation of the Tri-State Waters Commission by the States of Minnesota, North Dakota, and South Dakota (accomplishing the local cooperation) made Federal participation in the project possible.

The Flood Control Act of June 28, 1938 relieved local interests of responsibility for acquisition of lands and payment of damages in connection with the project, and made maintenance and operation responsibilities of the Federal Government.

Construction of the project began in the latter part of 1939 and was completed by the end of 1941. At that time, no survey report or design memorandum was prepared. Therefore, reports following project authorization have been limited to annual reports to the Chief of Engineers on improvements of civil works in the St. Paul District. A Master Plan for Public Use Development and Resource Management was approved in 1979.

Lake Orwell:

The Orwell Dam is part of a comprehensive plan for the Red River of the North basin authorized by Flood Control Acts approved on June 30, 1948, and May 17, 1950. The portion of the 1948 act that authorizes this project follows:

> The comprehensive plan for flood control and other purposes in the Red River of the North drainage basin, North Dakota, South Dakota, and Minnesota as set forth in the report of the Chief of Engineers dated May 24, 1948, is approved and there is hereby authorized the sum of $2,000,000 for the partial accomplishment of that plan.

Supplemental authorization is in the 1950 act:

> In addition to previous authorizations, there is hereby authorized the completion of the plan approved in the Flood Control Act of June 30, 1948, in accordance with the report of the Chief of Engineers contained in House Document Numbered 185, 81st Congress, for the Red River of the North Basin, at an estimated cost of $8,000,000.

Construction of the dam began in May 1951, and operation began in spring 1953. A contract for additional recreation facilities was completed in August 1971.

No local cooperation is required for the existing Orwell Dam project, including operation and maintenance.

Big Stone Lake-Whetstone River:

The Big Stone Lake-Whetstone River project at Highway 75 was authorized by the October 27, 1965, Flood Control Act (Public Law 89-298), to be constructed substantially as recommended by the Chief of Engineers in House Document No. 579, 87th Congress, 2nd session. House Document No. 193, 88th Congress, 2nd Session, contains Supplementing information relating to land acquisition for the National Wildlife Refuge System.

In addition, the 1965 Public Law 89-72 added recreation as a specific purpose to be considered at all Federal reservoir projects.

The dam at Highway 75 is 3 miles upstream from the Lac qui Parle project; it was completed in 1974. The dam and reservoir provide measures to reduce downstream flood damages, provide more desirable levels on Big Stone Lake, and preserve fish and wildlife resources. During periods of flooding on the upper Minnesota River, the reservoir is designed to provide up to 45,300 acre-feet of storage above the normal conservation pool.

The original Big Stone Lake-Whetstone River project on the Minnesota River at the outlet of Big Stone Lake was constructed in 1937 by the State of Minnesota. That project was designed to restore a desirable conservation level on Big Stone Lake, to provide downstream flood protection, and to provide low flows during drought conditions. Undesirable high lake levels, acceleration of silt deposits in the lower end of the lake, and aggravation of downstream flood damages have justified additional improvements since 1937. The present Federal Big Stone Lake-Whetstone River project downstream from the outlet of Big Stone Lake provides for the

reduction of damages to downstream areas and sustains open-water areas for waterfowl use in the national wildlife refuge that was established as part of the project.

Lac qui Parle:

Before damming, Lac qui Parle and Marsh Lake were widenings of the Minnesota River created by the alluvial depositions of tributaries, the Lac qui Parle and the Pomme de Terre Rivers, respectively. Marsh Lake was an area of potholes and sloughs, and Lac qui Parle Lake had a much smaller open-water area.

A project for flood control at Lac qui Parle Lake was first proposed by the State of Minnesota in the first Biennial Report of the Commissioner of Drainage and Waters in 1921, after years of flooding in the Minnesota River Valley and a severe flood in June 1919. Additional data were given in the Second Biennial Report of the Commissioner, dated 1923. On 1 March, 1934 the St. Paul District U.S. Army Corps of Engineers (then United States Engineer Office) submitted a brief report on the Minnesota River which contained a description and cost estimate for the Lac qui Parle flood control project based on the two previous biennial reports. In 1923 the Minnesota Game and Fish Commission constructed a low-head dam about 1.3 miles above the present dam. This structure was removed prior to completion of the existing dam in 1939. Construction of Lac qui Parle Dam was initiated early in 1936 as a Works Progress Administration project sponsored by the State of Minnesota prior to its authorization by the Flood Control Act approved 22 June 1936. The Corps constructed its portion of the project, including Marsh Lake Dam, between 1941 and 1951. On 7 September 1950, operation of the project was transferred from the State of Minnesota to the Corps of Engineers. The Corps completed land acquisition during March 1961.

Listing of Prior and Proposed Design Memorandums:

There is a proposed Design Memorandum, Dam Safety Assurance Program, April 1994 for Lake Orwell. There are no other Design Memorandums.

CHAPTER 3 – KEY FACTORS AND RESOURCES OF THE REGION

WATER RESOURCES:

Seasonal Regulation Periods:

PROJECT NAME	PROJECT DAM	STAGE feet msl.	WATER LEVEL PER MONTH J F M A M J J A S O N D
Lake Orwell	* Orwell	1080 1075 1070 1065 1060 1055 1050	
Lake Traverse	Reservation * White Rock	990 985 980 975 970 965	
Big Stone Lake- Whetstone River	** Highway 75	960 955 950 945 940	
Lac qui Parle	Marsh Lake Lac qui Parle	945 940 935 930 925	J F M A M J J A S O N D

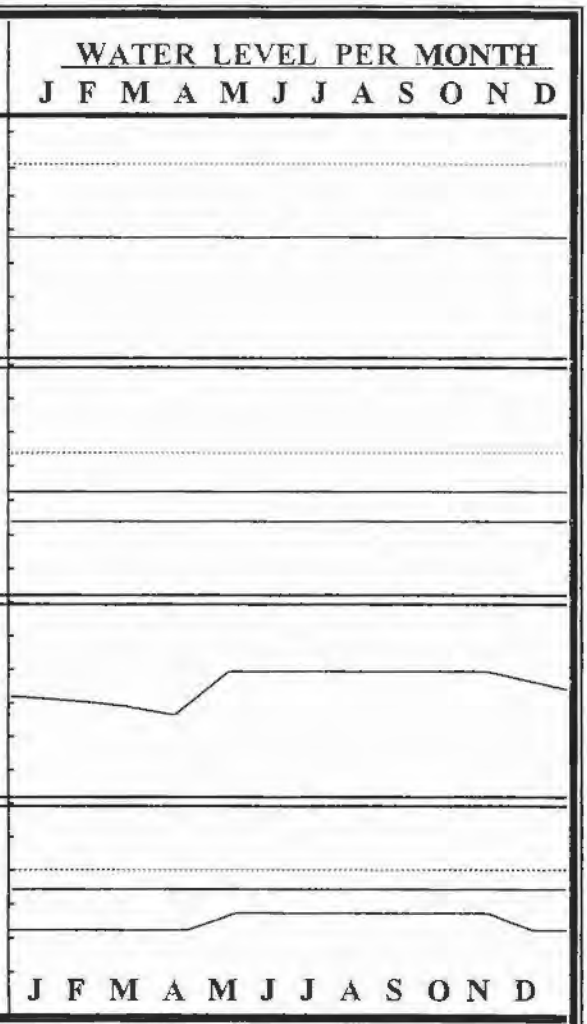

FIGURE 1-4 Seasonal Regulation Periods

* Operated in response to snowpack or precipitation.

** May be adjusted according to U.S. Fish and Wildlife Sevice directive.

---- Maximum design pool

CLIMATE:

The climate is midcontinental: hot summers and cold winters. Temperatures average about 43 degrees F (6° C); highs in late July of more than 90 degrees F (32° C) are common, but rarely exceed 100 degrees F (38° C). Average lows occur in mid-January; winter lows below 0 degrees F (-18° C) occur frequently, and lows of -20 degrees F (-29° C) or less usually occur yearly. The frost-free period is 130 to 140 days. Precipitation averages about 26 inches yearly, but total precipitation may vary 3 inches within the study area, being less in the west than in the east. Approximately 65 percent of the annual precipitation falls from May to September. Annual snowfall averages about 34 inches. Seasonal regulation periods, as shown in Figure 4, reflect the seasonal variations of rainfall in relationship to pool levels at all four projects during a normal year.

RECREATION SUPPLY AND DEMAND – INTRODUCTION:

The basis for Recreation Supply and Demand estimates is formulated by:

- the project recreational "market area," the region from which the majority of project visitors come, this to include all pertinent, available information affecting recreation participation;
- the supply and usage of outdoor recreation facilities for the market area;
- visitation data for the project recreation facilities;
- information from market area residents.

All of the projects in this Master Plan, with the exception of Lake Orwell, are modified natural lakes. Lake Orwell was formed when the Ottertail River was dammed and real estate purchased specifically for inundation with no flowage easements. Natural (existing) lakes are regulated for flood control storage with very little property under fee title. Properties that are inundated periodically or occasionally are under flowage easements, where the Corps only regulatory function is the restriction of permanent structures.

Engineering Regulation 1165-2-400, paragraph 5.c., states "Consistent with the Federal interest and the philosophy that direct beneficiaries should share in the recreation costs at Federal projects, Corps participation is limited to sharing the development costs of the recreation opportunities created by its projects. If a recreation feature does not take advantage of an opportunity created by the project, then the facility should be provided by others. Since appropriate recreation developments of this type may enhance the public's ability to enjoy the inherent features of the resource, consideration of development of these facilities should not be precluded. However the Corps should not participate in their development.... In the absence of a willing qualified non-Federal cost sharing sponsor, minimum facilities for public health and safety will be provided in accordance with paragraph 7.c."

Recreation Market Area:

The 1990 Statewide Comprehensive Outdoor Recreation Plan (SCORP) for Minnesota states that 73 percent of all recreation activities are accomplished within one-half hour of home. This figure is undoubtedly influenced by the disproportional percentage of the State's populace that resides in the Twin Cities metropolitan area (± 50 percent). This is further skewed by the fact that, in the metro area, the average half-hour trip does not cover the same distance as identical driving times in the less congested rural parts of the State or that there are many more recreation facilities in a given area. Considering the rural nature of the study region, a market area of one hour's travel (50-mile radius) has been assumed. The SCORP indicates that this includes 78 percent of all recreation time statewide.

Although Interstate 29 parallels the study region, and I-94 runs through Fergus Falls, near Lake Orwell, there are no major population centers within a 2-hour drive of the study area. In the area directly north of I-94, there is an abundance of prime recreation facilities, with (literally) thousands of clearwater lakes, many with forested campgrounds and full service resorts.

Socioeconomic Factors:

Outdoor recreation participation grew rapidly in the period 1954-1981, while the amount of available leisure time increased only slightly (Robinson, 1986). This increase could be a factor of our culture, or it could be that technological advances make the outdoors a more engaging recreational experience for more people; i.e.; personal sized watercraft, snowmobiles, rollerblades, mountain bikes, etc. The assumption is that the reason for the increase is a combination of these factors and others, including:

1. **Age:**

Minnesota SCORP studies indicate that age is a factor in total recreation hours. The SCORP presents figures that indicate that, on the average, older persons recreate less. From a high of 345 hours per capita (ages 7-14 years), there is a decrease to 160 hours per capita (age 65+). Graphed, this shows a sharp and expected drop from this youngest age group, then a small increase to age group 25-34 (to 230 hours annually), then a slow, steady decline to the oldest age group. (see Figure 1-5)

Age is also significant in that persons of different age groups tend to seek out different forms of recreation. With that in mind, determining the age structure of the study population will help to determine recreation trends. Graphs of projected change (years 1985-2000) by age group in the SCORP show a distinct bulge in the 35-59 year old ranges, with the most marked rate of change occurring in the 40-54 groupings, the "Boomers." Other age groups show modest increases, with some younger groups actually decreasing. This is simply an illustration that depicts that a large segment of the population is approaching middle age.

2. Education:

According to the SCORP, people with more education tend, on the average, to recreate more than those with less education.

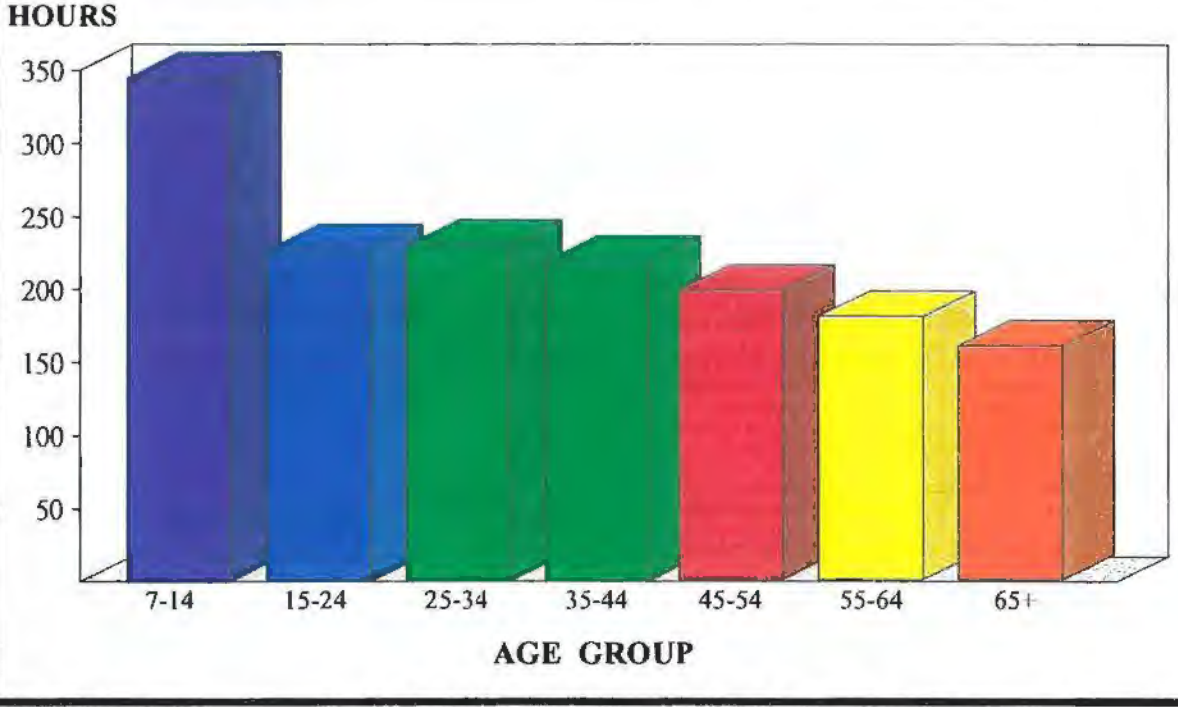

FIGURE 1-5 Outdoor Recreation Hours Per Capita, By Age

3. Income:

The SCORP also suggests that recreation hours also increase as income increases. Assuming that income potential varies according to education, further discussion will treat education and income as a single factor.

The figures presented in the SCORP indicate that the most vigorous segment of outdoor recreation enthusiasts is a function of age, education, and income. Furthering this assumption, this group of persons would be in the 25-34 age group, with some secondary schooling, earning $30-40 thousand a year. Seemingly, they are educated enough to earn an income that lets them afford the recreation pursuits, young enough to be affected by the latest cultural directives, but not so old that physical abilities are diminished. Again, this data reflects the large percentage of people living in the urban areas of the State (see Figure 1-6).

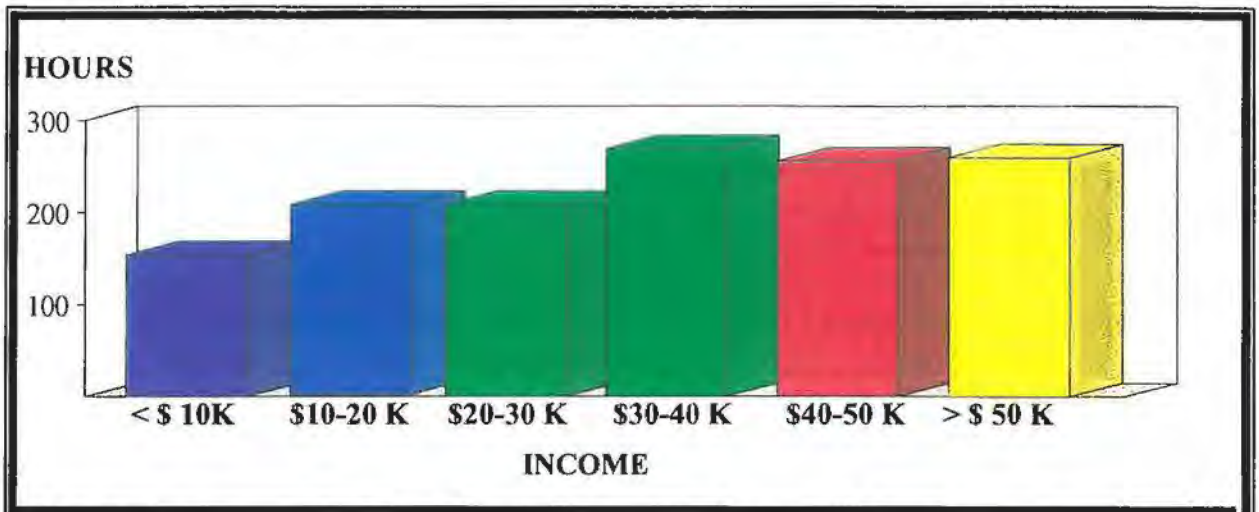

FIGURE 1-6 Outdoor Recreation Hours Per Capita, By Income

Regional Demographics:

For additional information on population, age, income and recreation, see Appendix B, Recreation Resources.

1. Population:

Data from the 1990 U.S. Census and from the Minnesota State Planning Agency tables indicate that the 19 Minnesota counties in the study area contain 8.08 percent of the total 1990 State population; the 1980 population percentage was 9.14 percent. The average percent of population change within the 19-county study area for the period 1980-1990 was -5.2 percent. This is 12.0 percentage points lower than the State average.

2. Age and Income:

Data from the 1990 U.S. Census indicates that the average age within the study area is increasing faster than the State average, 3.5 years versus 3.3 years, respectively. It also shows that the adjusted income within the study area has risen faster than the State average, 39.2 percent versus 25.2 percent, respectively.

3. Recreation Facility Availability and Usage:

There are no National Parks or National Forests in the study area. For purposes of simplification, in this document the Wildlife Management Area designator includes all areas managed for wildlife including: Wildlife Refuges, Scientific and Natural Areas, Waterfowl Production Areas and Wildlife Reserves. Public Recreation Information Maps from the Minnesota Department of Natural Resources indicate over 250 Wildlife Management Areas in the study area totaling over 250,000 acres (these numbers have not been verified).

Visitor Attendance at Project Lakes:

Visitation is based on Visitor Hours per Fiscal Year (FY); one Visitor Hour equals 1 person engaged in a recreational activity for 1 hour. Visitation rates for Lake Orwell and Big Stone Lake-Whetstone River Impoundment visitation are heavily influenced by sightseers; Lake Traverse and Lac qui Parle are heavily weighted by the numbers of persons fishing the lakes. Because of the minimal amenities (the lack of boat ramps, docking facilities, etc.) provided by the Corps, many users of these lakes, especially boaters, do not use Corps facilities, thus are not accounted for in the visitation numbers. Visitor counts at the projects may not reflect the true use patterns that are occurring on tbe lakes. During FY 1995 the Dispersed Use Method of counting, where users of the entire lake are counted/estimated has been instituted. This has resulted in much higher visitation numbers in some cases, but also makes comparisons of FY 1995 to other years impossible. For additional information on project visitation, see Appendix B, Recreation Resources.

1. **Lake Traverse:** Total visitation for FY 1994 was 317,100. Approximately 42 percent of visitation was for fishing based recreation. Percent of change, 1988-1994, is -59 percent.

2. **Lake Orwell:** Total visitation for FY 1994 was 42,100. About 60 percent of the visitation was for sightseeing; only 30 percent were anglers. Percent of change, 1988-1994, is -49 percent.

3. **Big Stone Lake-Whetstone River:** Visitation for FY 1994 was 22,800. A recreation activity breakdown was not available for this project. Percent of change, 1988-1994, is -39 percent.

4. **Lac qui Parle:** FY 1994 visitation was 192,700, with 70 percent of visitation based on fishing. Percent of change, 1988 - 1994, is -66 percent.

1994 Annual Outdoor Activities:

A breakdown of recreational activity by percentage of total visitation is available for each project in Appendix B, Recreation Resources.

Projected Recreation Demand:

Survey data from the Minnesota SCORP which, as previously discussed, is heavily weighted by data from the Twin Cities metropolitan area indicates that increased total recreation hours is a statewide trend. This increase is projected to be at a slightly lower rate than the population increase due to the increase in average age (i.e., older persons recreate less, per capita). This projected change in age structure will also affect the activity participation rates. Those activities

more attractive to older participants, such as walking, golfing, and nature study, will show the greatest increase. Activities that are popular across a broader span of age classes, such as fishing, hunting, and camping, will increase at about the same rate as the general population. Activities popular with younger people such as biking and downhill skiing will experience the smallest increase. This prediction is based on the assumption that the State population will continue to increase; this is not the case within the study area.

Data from the Minnesota State Planning Agency indicates that the population of the 19 Minnesota counties in the study area is decreasing. From 1980 to 1990, the average decrease was 5.2 percent, with some counties decreasing by as much as 19.5 percent. Data from the U.S. Census (1980-1990) shows that the average age within the study area population is increasing faster and that the average age is also older than the State average (4.0 years vs. 3.3 years, and 3.7 years older, respectively). According to the SCORP (total recreation hours vary according to population and decrease with age), this would indicate that total recreation hours by study area residents will decrease markedly.

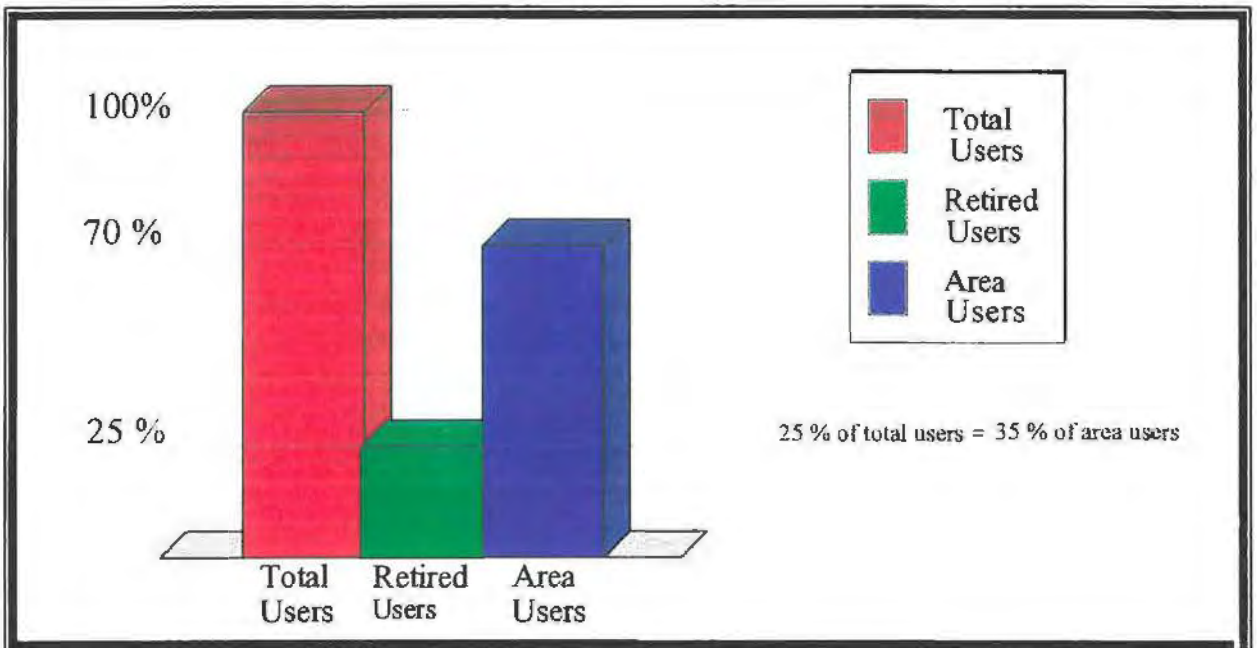

Figure 1-7 Area Participation Comparison

This does not necessarily hold true for the less homogeneous population of this region. The study area economy is based (heavily) on agriculture. Agricultural pursuits are extremely active (12 to 16 hours a day) during the second and third quarters of the calendar year. This coincides exactly with the prime fishing period. This would seem to indicate that those people from the study area fishing the project lakes are probably not involved with agriculture. According to Corps visitation

information, fishing is, by far, the most popular recreational activity at the project lakes, overall. Over 70 percent of the fishers are from the study area and about ¼ of the total are over 55 years old (Minnesota Department of Natural Resources creel surveys for Lac qui Parle and Traverse). If the 25 percent over 55 (retired farmers, etc.) are part of the 70 percent from the study area, as high as 35 percent of the study area fishers could be over 55 years of age (see Figure 1-7).

Assuming that a high percentage of the area participants are from this group, the aging trend of the regional population would indicate that, in spite of the decreasing population averages, certain recreational pursuits would not behave as the SCORP forecasts. It is possible under these assumptions that, while the population declines, and the average age increases (a situation that, according to the SCORP, would result in decreased recreation hours), the demand for fishing related recreation facilities within the region could increase as more of the area population reaches retirement age. The gist of this argument is that: a significant portion of the area's population is employed by agriculture related industries; persons working in these fields do not have time to fish during the regular season; assuming that a large percentage of the fishers from the area are over 55 years old (retired, or partially so) means that as tbe regional population (average) gets older there will be more fishers, not less, as the declining total population figures would suggest.

Another factor that affects recreation visitation is the fishing success ratio. Lakes tend to get "hot," meaning that fishers are having exceptional success. This tends to draw recreationists away from other areas, and results in heavy fishing pressure on that particular lake, and reduced pressure on neighboring lakes. Eventually the catch ratio drops, and often, due to the reduced fishing pressure or other factors, one of the other area lakes gets "hot" and the cycle is repeated at a different lake. The period of this cycle is usually several years, and due to the high ratio of fishing recreationists at these project lakes (60 to 70 percent), it can have a severe impact on total visitation numbers. If the fishing is good, visitation goes up (Lac qui Parle visitation increased 15.4 percent, 1988-1991); if the fishing is poor, visitation can decrease (Lake Traverse visitation dropped 9.1 percent for the same period). Due to the many variables that can affect fishing success (water quality and quantity fluctuations, breeding success, stocking programs, predator cycles, etc.), it is impossible to predict this cycle and its effects. In 1992, Lac qui Parle and Big Stone Lake were "hot," Lake Traverse was not; during 1994-1995, Lake Traverse was also "hot".

Another factor that will undoubtedly affect future recreation demand is water quality. The State of Minnesota has undertaken a major water quality study on the entire Minnesota River watershed (for additional information, see Section 4, Lac qui Parle, Chapter 5 , Problems and Constraints). Regional water quality is poor and, among other things, promotes algae blooms. Some of the late summer events are large enough that, even on lakes as large as Lac qui Parle and Traverse, the condition of the water and the accompanying smell affect both water and land based recreation. In addition, there are thousands of clean, clearwater lakes within a 3-hour driving time. The effects of water quality on recreation have not been quantified at the projects. Assuming that poor water quality has deleterious effects on recreation, efforts to provide cleaner water will surely result in a lessening of these effects, and benefit the recreational aspects of the projects.

The projects are important fisheries for this region and offer superlative waterfowl hunting. Efforts to improve and expand wildlife areas, and restore habitat, are ongoing at each project. Although there is an abundance of recreation lakes to the northeast of the study area, there is very little waterbased recreation to the south and west. As the walleye fishing has been "fantastic" (Minnesota Department of Natural Resources creel survey) at Big Stone Lake and Lac qui Parle during the early '90's, and at Lake Traverse in recent years, these lakes will continue to attract users from these areas as well as from the immediate region.

Because the Corps recreation facilities in the study area are so small and isolated, there is little firm data from which to draw an accurate conclusion on projected demand. Considering the data and opinions presented by the SCORP along with census figures and field data, there is no solid basis for assuming that the current recreation visitation figures will change to any great extent. The current assumption is that visitation will remain about the same. The cyclic variations associated with the fisheries, discussed previously, will continue.

The Minnesota SCORP identifies the types of recreation that will show the greatest increases statewide as those types associated with an older population base; i.e., walking, nature study, golf, etc. This would also hold true for the study area.

Recreation Needs:

The data that is presented in the previous paragraphs leads to the assumption that the types of recreation that are attractive to older persons (e.g., walking, sightseeing, fishing, etc.) will become more popular. A logical extrapolation of this assumption is that the types of recreation provided will need to be accessible to persons with limited physical abilities, especially those with restricted personal mobility, a condition which tends to become more common as the average age increases (indicating more people in the older age groups).

Projections of Participation in Outdoor Recreation:

A forecast of outdoor recreation participation for this region must concentrate on those types of recreation associated with an older population base. Taking into account the particular needs of the region, it is expected that fishing will remain a major attraction within the study area. With the cyclic nature of the sport, it is expected that the rate of participation on the various lakes, linked to the fishing success ratio of the lakes, will rise and fall within the region. It is expected that, on the average, the numbers of people fishing will increase.

Along with the national concerns over wetland protection and restoration, there are programs in place along the Minnesota and Red Rivers and in the Prairie Pothole region aimed at restoring waterfowl habitat. Restoration of habitat will result in an increase in waterfowl, and increased opportunities for waterfowl based recreation. As all of the project lakes already experience large

numbers of waterfowl, it is expected that they will show a significant increase, both in the numbers of birds and in the visitation numbers that are waterfowl related.

The Minnesota SCORP identifies a need for additional trails within the State (walking is also one of the recreation pastimes tied to an older population). The Outdoor Recreation Facility Adequacy Survey (1988, Minnesota Department of Natural Resources) indicates that walking paths, bicycling paths, and nature study areas all placed in the top five percentages of the "Need More" category of the survey, for this region and for the State. If public input should indicate the need for a trail or system of trails in this area, fulfilling this need should receive serious consideration from the Corps of Engineers. Although there is limited usable land area for other types of recreation, the linear configuration of the lakes of the projects, and the many wildlife areas associated with the lakes, are ideal for these types of recreation.

WILDLIFE, HABITAT AND SPECIES:

Habitat Type and Availability:
All of the lakes are connected by strips or corridors of riparian type habitat and/or water. For additional information on species, see Appendix C.

1. Lake Traverse:

The Lake Traverse Project lies at the northwestern tip of the Minnesota River corridor described below. Although it is a different watershed, not part of the Minnesota River drainage, it lies in the same ancient riverbed as Big Stone Lake and Lac qui Parle, described in Section 1, Chapter 2, Description. Near Browns Valley, the continental divide runs along the south shore of the lake. A two-lane highway separates the watersheds, with Lake Traverse on the north side, and the Little Minnesota River on the south. The Minnesota River habitat corridor is contiguous along the length of the valley, but is only about 3/4 mile wide at this point. Along the course of Lake Traverse, the topography starts to change; the valley widens as the landscape transitions from river valley to lake bed. This was the headwaters of the Ancient River Warren and the bed of Lake Agassiz. Here the bluffs are farther apart.

At White Rock Dam, the valley terraces are several miles apart; the Bois de Sioux River flows north from the dam, through the flat croplands, and the bluffs fade away into the horizon. Trees and other forms of habitat are lacking along the river edge. The channelization of the Bois de Sioux River destroyed the natural habitat; the marshes and oxbow lakes have been converted to cropland. The river channel runs through the farmland, straight and narrow, flanked by spoil banks and a few willows and cottonwoods. Although this is a sterile landscape in terms of wildlife habitat, it is the historical movement corridor and still possesses the water and forage that wildlife depend on. An additional attraction is that this is floodplain and is sparsely populated. As such, it remains an area through which wildlife can travel with relative ease and safety.

2. Lake Orwell:

Lake Orwell lies on the Ottertail River, roughly 40 miles from its confluence with the Bois de Sioux River at Wahpeton-Breckenridge where the rivers form the Red River of the North. The lake is part of the 2,000-acre Orwell Wildlife Management Area. Like the Bois de Sioux River, long reaches of the Ottertail River have been channelized, and spoil piles line its banks. The Ottertail River is dotted with strips and patches of habitat, interspersed through the surrounding farmlands. Near Breckenridge, the river flows through the Sunnyside Township State Game Refuge.

3. Lac qui Parle:

Most of Lac qui Parle and Marsh Lakes lie within the Lac qui Parle Wildlife Management Area administered by the Minnesota Department of Natural Resources. The unit is about 25 miles long, 1 to 3 miles wide, and includes 32,000 acres under State administration. Lowland marsh, floodplain forest and shrublands, and upland areas with grassland and cropland characterize it. Immediately upstream, the Big Stone National Wildlife Refuge is administered by the U.S. Fish and Wildlife Service. These wildlife areas, combined with other patches of wildlife habitat along the Minnesota River Valley floodplain form a linear strip, or corridor, of wildlife habitat traversing the region from northwest to southeast. This corridor offers excellent opportunities for all forms of wildlife based recreation.

4. Big Stone Lake-Whetstone River:

The Big Stone Lake-Whetstone River Impoundment is part of the Big Stone National Wildlife Refuge and is managed by the U.S. Fish and Wildlife Service.

Species:

1. Mammals:

Since European colonization of this area, the number of species of mammals found in the vicinity has changed. Bison, pronghorn antelope, elk, mule deer, eastern timber wolves and an occasional grizzly bear were a part of pre-settlement prairie fauna. Cultivation, fencing, and uncontrolled hunting were responsible for the reduction in numbers, and in many cases, the complete elimination of some mammal species from the vicinity.

Fifty-two mammal species are known to, or probably, occur in the area (see list in Appendix C, Environmental Resources, Wildlife). Moose, mule deer, and pronghorn antelope are casual visitors. Mammals from the grassland, deciduous forest, and northern coniferous forest biomes contribute to the diversity of the area. Eastern cottontail, jackrabbit, gray squirrel, fox squirrel, raccoon, and white-tailed deer are hunted with firearms during authorized hunting seasons. Beaver, muskrat, mink, and raccoon are trapped for fur. Coyote, red fox, and gray fox are also

hunted and trapped during the late fall and winter. During the same period, badgers, weasels, and skunks, all unprotected, are trapped.

Currently, the largest mammal commonly in the area is the white-tailed deer. Historically, the Minnesota River Valley has been a deer wintering area. Prairie white-tailed deer traditionally spend the warmer months in the upland prairies as far as 30 miles from their wintering grounds. The local deer herd has grown in response to hunting season modifications instituted by the Minnesota Department of Natural Resources. There are specified deer hunting seasons for modern firearms, archery and muzzleloaders.

2. Upland Birds:

Both the ring-necked pheasant, *phasianus colchicus*, and gray, or Hungarian partridge, *perdix perdix*, nest in the area. Neither is native to North America.

Pheasant population levels in the northern States are strongly associated with wetland acreage because of its importance as nesting cover. Wetlands provide the major source of winter cover also, but dependence is on more specific vegetation types and much smaller acreage than are required for nesting.

Gray partridge prefer open, active agricultural areas, and are better adapted to deep snow and subzero temperatures than pheasants. According to the Department of Natural Resources August roadside count results in west-central Minnesota, the pheasant population for 1984-1989 mean average was 48.1 per 100 miles and the partridge mean was 20.3 per 100 miles.

3. Raptors:

The area hosts a great number of hawks, falcons, and owls. In addition, as the area is a major flyway, a great number of migrating raptors, including the bald eagle, fly through the project during the migratory seasons.

4. Nongame Birds:

A list of birds known to, or that probably, occur in the area was compiled from available literature, a list and breeding bird census (Anderson, 1975), personal lists furnished by Robert Janssen of the Minnesota Ornithologists Union, and lists from the Lac qui Parle Wildlife Management Area and the Big Stone National Wildlife Refuge staffs. This list is presented in Appendix C, Environmental Resources, Wildlife, Table C-8.

A total of 253 species are likely to occur in the vicinity. Migrants and winter visitors account for 148 species, and 6 species have been observed only casually. Of particular note is an island in Marsh Lake that has a breeding colony of white pelicans. Breeding colonies in this area of the United States are considered rare.

A heron rookery exists in the east pool at Highway 75 Dam. Species nesting in the rookery include double-crested cormorants, great blue herons, great egrets, and black-crowned night herons.

5. Amphibians and Reptiles:

Frogs, toads, turtles, and garter snakes are the most common amphibians and reptiles of the 17 known species. The red-bellied snake is a typical woodland species. Salamanders are common to wetlands. The western hognose snake, bull snake, and great plains toad are typical prairie species. A seldom seen species is the western spiny soft-shell turtle.

6. Threatened and Endangered Species:

The bald eagle, *Haliaeetus leucocephalus*, uses Big Stone National Wildlife Refuge occasionally during migration. No eagle nesting is known to occur in the area. Migration use occurs on the Lac qui Parle Wildlife Management Area. The peregrine falcon occasionally migrates through this area. The range of the trumpeter swan may also be expanded into the area in the near future.

Waterfowl:

All of the projects lie on a portion of the "Mississippi Flyway," a major migration route for North American waterfowl. Waterfowl hunting has a positive economic impact within the region. Because of this, in economic terms, waterfowl species are the most important wildlife species within the area. During the migratory season, it is not uncommon to have over 50,000 waterfowl of various types on a lake at one time. Approximately 60 types of birds have been identified in the project area.

Waterfowl hunting, in particular goose hunting, accounts for the largest share of the total hunting activity of the area. All of the project lakes have significant waterfowl concentrations during migration periods (tbe October 24, 1993 Minneapolis Star Tribune reported that there were an estimated 84,000 geese on the Lac qui Parle Wildlife Management Area). The region lies within one of the most heavily traveled duck migration corridors in the United States. Most migrants originate from Alberta, Manitoba, North Dakota, and Minnesota, but others come from subarctic and Arctic nesting grounds in western Canada and Alaska. The mallard is the most abundant migrant species. In addition to hunting, the Wildlife Management Areas in and around the study area offer excellent opportunities for observation and photography.

FISHERIES:

Fish Species in the Region:

Sixty-four species of fish are known to occur within the area, including 13 types of game fish and six varieties of rough fish that are commercially harvested at Lac qui Parle and the Lake Traverse Project (for management purposes).

Fishing activity occurs throughout the year. The predominant species sought are crappies, walleye, bullhead, and northern pike. Fishing activity peaks occur in late spring and fall. For additional information, see Appendix C, Environmental Resources, Wildlife, Table C-14.

VEGETATION:

Characteristic Plant Species:

1. Vegetation Communities:

A Characteristic Plant Species list for this region is in Appendix C, Environmental Resources, Vegetation, Tables C1 to C5.

The study area is located in the region historically known as the Great Plains of North America. The native grasslands, or plains, of the mid-American continent are called prairie. Native prairie is comprised of an interlocking series of complex and interdependent communities of plants, bacteria, insects, and small burrowing animals. Species diversity has a wide variance that is dependent on soils, climate, and available groundwater. Upland prairie on sandy soils is very dry, with low growing plants. Lowland areas with more water and good drainage had vegetation (grasses, flowers, etc.) that could be taller than a person on a horse. Areas classified as wetlands have a variety of plants with a great diversity of sizes. Many small wetlands, formed by the actions of the glaciers, dotted this region. This type of wetland is known as a "pothole" and is a major contributor to waterfowl habitat along the Mississippi flyway. The original plant communities were mostly tall grass prairie with riparian communities of assorted floodplain woody plants along the streambanks. The potholes are interspersed through the region at random intervals. The potholes and other marshlands are vegetated with water loving grasses, sedges, and emergent vegetation such as cattail and bulrush. Much of the Federal land within the project area is predominantly marsh habitat.

Grass fires are a major part of the prairie ecological cycle. They consume the various dead plant material, and the nutrients are returned to the soil in the ashes. At the same time, fire destroys those plants that have not adapted to this cycle, while providing a reproductive advantage to those that have. As a result of this natural sequence, trees and shrubs were extremely sparse in this native landscape when the first Europeans arrived. Riparian edges, and the few areas that were naturally protected from the tremendous fires that periodically swept the plains, were the only places where trees and shrubs were to be found.

With the European settlements came the expansion of the agriculture industry. The prairie was plowed and converted to croplands. Many of the wetlands in the region have disappeared, either from natural processes or by deliberate drainage programs to create farmlands. Today the predominant vegetation is cultivated crop plants such as corn and soybeans. Forested areas can

still be found along the rivers. Most of the wetlands remaining are either in public ownership and held for wildlife purposes or in areas with severe agricultural limitations.

Recent years have seen vastly increased interest in retaining existing wetlands and even restoring some of those areas that bave been drained. This is mostly because of increased awareness of the important role that wetlands play within the ecological system; i.e., groundwater recharge, flood prevention, wildlife habitat, water quality, etc.

2. Forest and Shrublands:

Originally, forested areas existed only as riparian vegetation or as Floodplain Forest species which covered much of the floodplain of the river. Many of these woodlands and much of the woody and herbaceous cover that was originally present have been converted to cropland. These actions have eliminated or reduced the various forest type habitats available for wildlife resources, and degraded the habitat quality of those areas that remain.

1. Floodplain Forest: Floodplain forests are wetlands with mature hardwood trees dominant, growing on the banks, or floodplains, of riverine systems. These forested areas are commonly flooded, but are usually (somewhat) well drained for much of the growing season. The dominant tree species in this river bottom forest community are silver maple, green ash, box elder and American elm, with basswood, and cottonwood being secondary species. The herbaceous layer is composed of typical deciduous forest species, prairie grasses and forbs. Shrubs found in the community include wood nettle, common chokecherry, Juneberry, Virginia creeper, Missouri gooseberry, western snowberry, riverbank grape, and common prickly ash.

Floodplain forests have a great diversity of plant and animal species and are extremely important as wildlife habitat. In this area, where almost all of the land is cultivated, these forested areas serve as corridors that provide food, cover, and concealment to migrating wildlife.

2. Prairie Thicket (or Shrub Carr): This community is composed of tall, deciduous shrubs growing on saturated to seasonally flooded soils. They develop on north facing slopes and in drainage ravines which receive extra moisture from runoff or surface springs. Dominant species of this community are willows and dogwoods. The understory vegetation is often Kentucky bluegrass or smooth brome; it may also be similar to the river bottom community. Areas that have been disturbed (drained, pastured, etc.) also have non-native species such as honeysuckle and buckthorn.

3. Grasslands:

The original native prairie of the Great Plains was composed of innumerable plant communities that had evolved over millions of years. Today, prairie typology is determined by the habitat available to the plant community and is, of necessity, extremely broad. In describing habitat, the amount of soil moisture and the type of soil on which the plants are growing are the most

important determinants. Prairie is commonly divided into 5 types, based on soil moisture: Wet Prairie; Wet-Mesic Prairie; Mesic Prairie; Mesic-Dry Prairie; Dry Prairie.

These divisions are evident going from the East to the West across the grasslands of the mid-North American continent. All of these classifications, however, can be present in the Midwest prairie. One hillock of glacial drift can extend from dry upland to wet lowland moisture conditions. Most prairie plants can survive in any of the soil moisture conditions common to the plains but any particular species will only achieve optimum growth and reproductive advantage under the conditions for which it is best adapted. (e.g., big bluestem is found in Short Grass (Dry) Prairies and may be considerably taller than 3 feet but much shorter than its maximum height; in a Tall Grass (Wet/Wet-Mesic) Prairie, big bluestem can grow to 9 feet tall.)

This wide variability makes prairie classification difficult. In this document, in order to further simplify prairie types, they are grouped by the approximate and average height of the plant community. Plant height is an extremely broad categorization but is used here because that is the most immediate and noticeable difference between prairie types. Tall Grass Prairie, (Wet/Wet-Mesic) averages from 4 to 8 feet tall; Mixed Grass Prairie (Mesic conditions) averages 3 to 5 feet in height; Short Grass Prairie (Mesic/Dry-Dry) averages less than 3 feet high.

Almost all of the original native prairie grassland in the basin has been converted to agricultural production. That which remains has been altered by heavy grazing of livestock and the introduction of exotic plant species.

1. Short Grass Prairie: Dry Prairie communities are common on the high western plains of the United States and are composed of the shorter, hardier grass species. In the Midwest, they are located on steep slopes and knolls which lose most of their moisture through runoff and wind evaporation. The dominant species of Short Grass Prairie communities are side-oats grama and needle-and-thread. Secondary grasses include: western wheatgrass, prairie Junegrass, plains reedgrass and prairie sandreed. Common low shrubs and forbs associated with high prairie include: prairie cinquefoil, lead plant, silverleaf, American vetch, yarrow, common sagewort, pasture sage, stiff sunflower, prairie ragwort, stiff goldenrod, and prairie rose.

2. Mixed Grass Prairie: Mixed Grass Prairie occupies those level areas and mid slopes where the amount of moisture available approximates that received from precipitation. The dominant species of this prairie plant community are needle-and-thread, little bluestem, blue grama, and western wheatgrass. Important secondary species include bearded wheatgrass, needleleaf sedge, prairie Junegrass, and Kentucky bluegrass (an introduced exotic). Common forbs and shrubs characteristic of this community are: prairie onion, Canada anemone, northwest cinquefoil, lead plant, slender beard tongue, yarrow, white prairie aster, fringed sagewort, hairy golden aster, Canada goldenrod, western snowberry, common chokecherry, American plum, and fireberry hawthorn.

3. Tall Grass Prairie: Tall Grass Prairie communities are generally found on lower slopes that receive moisture from runoff but that have well-drained soils. With the higher moisture content of the low prairie soils, the vegetation of this community resembles that of the open prairie of this region. The dominant plants of the community are big bluestem, little bluestem, porcupine needlegrass, and switchgrass. Common forbs and shrubs associated with this community include pink wild onion, bracted spiderwort, blue-eyed grass, early meadowrue, wild licorice, American vetch, yarrow, fringed sagewort, white field aster, narrow-leaf sunflower, western snowberry, and western wildrose.

4. Marshlands:

The marsh community has developed where there is water in the plant rooting zone for several months each year and is marked by two phases. Wet meadows mark the transition from marsh to grassland.

1. Wet (or Fresh) Meadow: This wetland meadow community is found where the gravitational water remains in the upper soil horizon for at least several weeks during the spring of each year. It occupies the transition zone between the grasslands and the true marshlands. Dominant plant species include woolly sedge, slough sedge, swamp knotweed, reed canarygrass, common spikerush, fowl bluegrass, prairie cordgrass, and American mannagrass. Conspicuous forbs in this community include Canada thistle, sow thistle, and narrow-leaf sunflower. Sandbar willow is a common shrub of this community.

2. Shallow Marsh: Shallow marsh has saturated soils and may have up to 6 inches of standing water throughout the growing season. Dominant plant species include slough sedge, three-square, American mannagrass, and whitetop rivergrass. Associated forbs are waterparsnip, rough bugleweed, wild mint, swamp betony, European water plantain, and arrowhead. Common reed, alkali bulrush, and giant burreed are also common in the shallow marsh.

3. Deep Marsh: Deep marsh plant communities require standing water depths of between 6 inches and 3 feet or more for most of the growing season. Dominants include tule bulrush, softstem bulrush, and both common and narrowleaf cattail. Submerged plants in the deep marsh community include sago pondweed, small pondweed, clasping leaf pondweed, coontail, watermilfoil, common bladderwort, and stiffleaf buttercup.

5. Disturbed Areas:

Disturbed prairie results in a temporary change in the dominant species. Following disturbance, Kentucky bluegrass and smooth brome are the dominant plant species. If a natural cycle follows the disturbance, native grasses and forbs will eventually reclaim the area; the type of plants will depend on the soil type and availability of water. Due to the disturbed ecological cycles of today (especially fire suppression), adventitious trees such as box elder, Siberian elm, and eastern red cedar will eventually dominate areas that have been disturbed.

Recommended Plant List:

Plants used for landscape projects should be native to the region and matched to the expected growing conditions. Federal regulations and planting specifications require use of the native plant materials. A listing source is supplied in Appendix C, Environmental Resources, Vegetation. Tables C-1 to C-5.

CHAPTER 4. PROJECT SPECIFIC FACTORS AND RESOURCES

VISUAL AND CULTURAL RESOURCES:

Visual Quality Evaluation:

Visual quality is based on several factors, formed from many components, all of which are subjective: "Beauty is in the eye of the beholder." The evaluations presented here were done by persons trained in scenic evaluation. For additional information concerning visual quality, see Section 1, Appendix D, Resources and Influences.

Visual quality is based on factors such as variety, interest, and views. These factors are comprised of color, texture, form, and line, and influenced by elements such as space, light, the senses of the observer (smell, feel, hear), and influences (such as scarcity and disturbance). All of these play over the landscape which, in turn, is made up of its own set of components; i.e., land, water, vegetation and structure.

FIGURE 1-8 Lake Traverse: White Rock Dam and Mud Lake

1. Lake Traverse:

Even though the Lake Traverse project lies in a wide, shallow valley, the lack of significant vegetation on the project and the distance to the valley terraces give the day use areas an exposed, wide open feel. White Rock Dam Day Use Area (Figure 8) is located on the dry bed of a very large ancient lake (±200,000 square miles). The large expanse of sky and plain impart to the observer the essence of the true prairie, but the extremely open vista does not have much scenic value. The lake supports a large wildlife management area and an excellent fishery, but water quality problems limit the types of recreation that are available.

Reservation Dam Day Use Area (Figure 1-9) is also extremely open, with a large marsh to the nortb, and the long, open expanse of Lake Traverse to the south. Although the valley is narrower here, the area is near to the middle of the valley and the bluffs are still too far away to have much visual impact. The few trees scattered along the riverbank are insignificant, and there are no other vertical elements to interrupt the vast horizontal line of the lake, the marsh, and the distant bluffs. The area offers few of the visual resources that are associated with successful recreation areas in

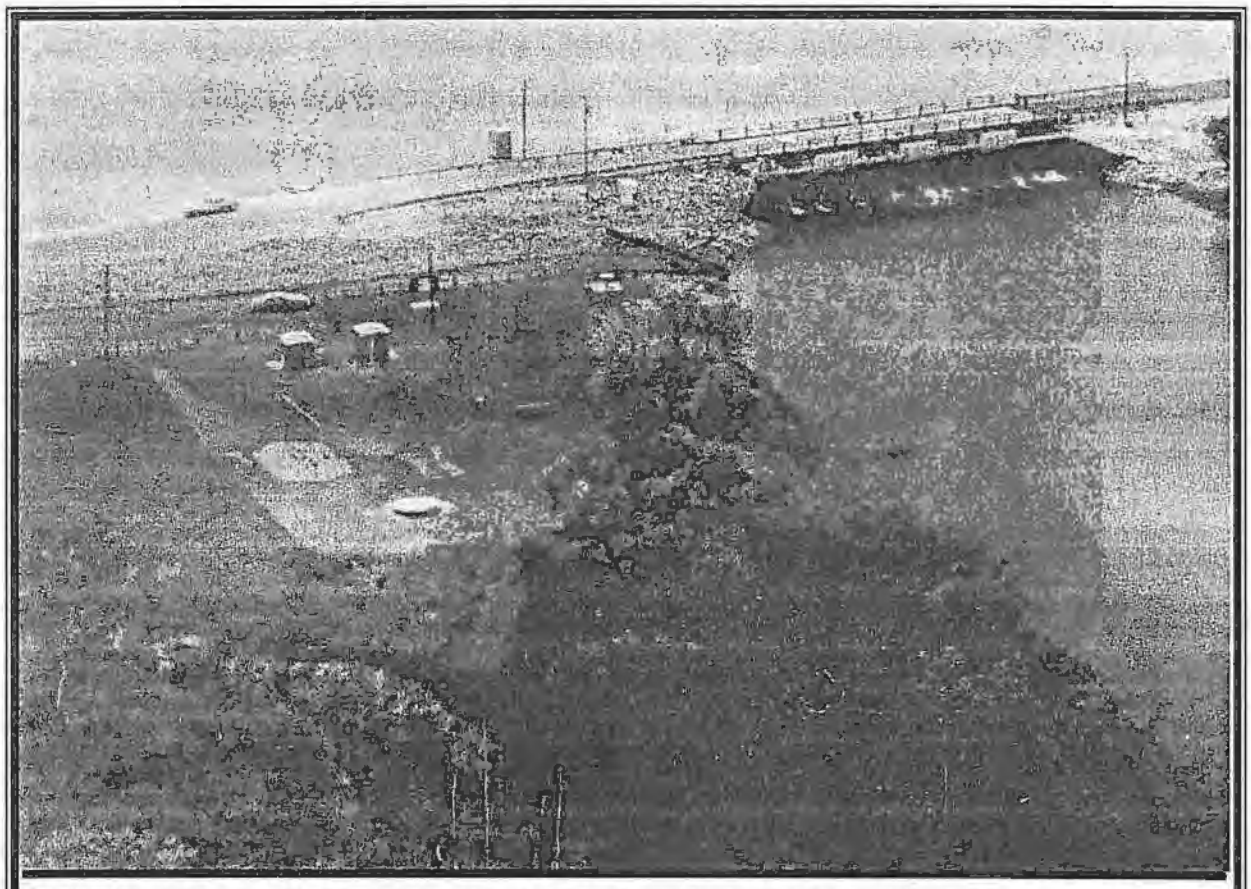

FIGURE 1-9 Lake Traverse: Reservation Dam and Day Use Area

the region; i.e., forests, clean water, etc., as a prairie wetland, however, it represents a prime example of a vanishing habitat that is frequently in the news.

This factor could be exploited with a small interpretive display explaining the water cycle and the valuable role that wetlands play in it. The history and geology of the area are also subjects that might be of interest to the visiting public and could be interpreted.

Browns Valley Day Use Area (Figure 1-10) is located at the head of the Minnesota River valley. This is where Lake Agassiz finally cut through the Bigstone moraine, and the resulting erosion of the tremendous flood formed the valley. The bluffs rise close to the west, more distant to the

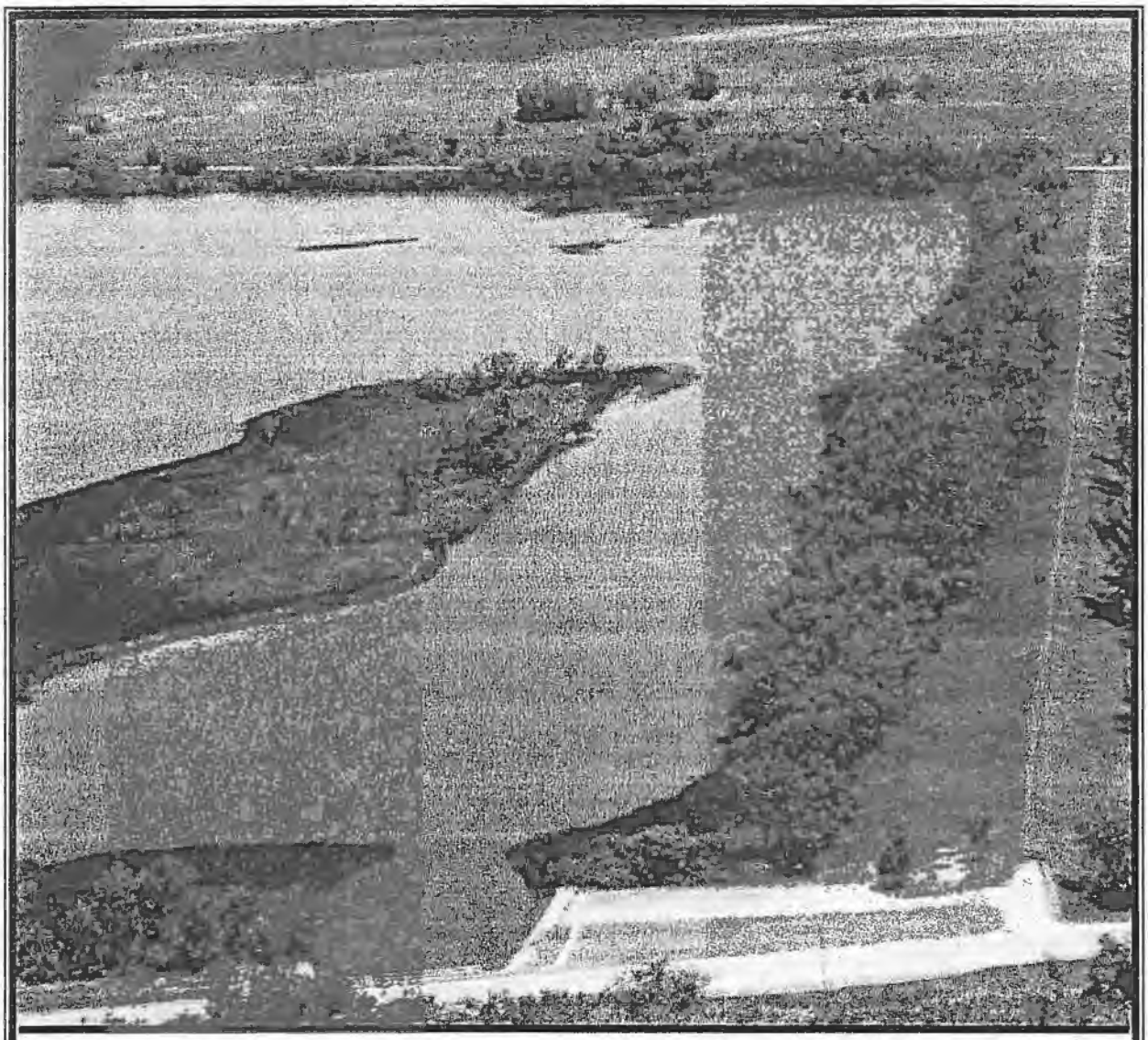

FIGURE 1-10 Lake Traverse: Browns Valley Dike and Day Use Area

east. Again, there are few trees on the site to offer relief from the expansive nature of the project. This area has visual, cultural, and historical features that could be exploited and emphasized though an interpretive display.

This area is a Registered Natural Landmark (possessing exceptional value illustrating the natural history of the United States). The bluffs to the west are close enough to offer a perspective on the size and depth of the River Warren. The continental divide runs through this site. In this area the remains of the "Browns Valley Man" were found, the oldest human remains in the region and some of the oldest in North America. Although the site is visually unassuming, it has much to offer in other, less obvious terms. It is a quiet place, and gives no clue that it sits at the heart of the tremendous geological and meteorological events that shaped much of the northern areas of the North American continent.

2. Lake Orwell:

Orwell Dam was constructed across the valley of the Ottertail River. The resulting reservoir fills the valley. Orwell Lake, with the exception of the tailwater day use area, is generally open with few vertical elements to interrupt the strong horizontal line of the surrounding plain. Colors are

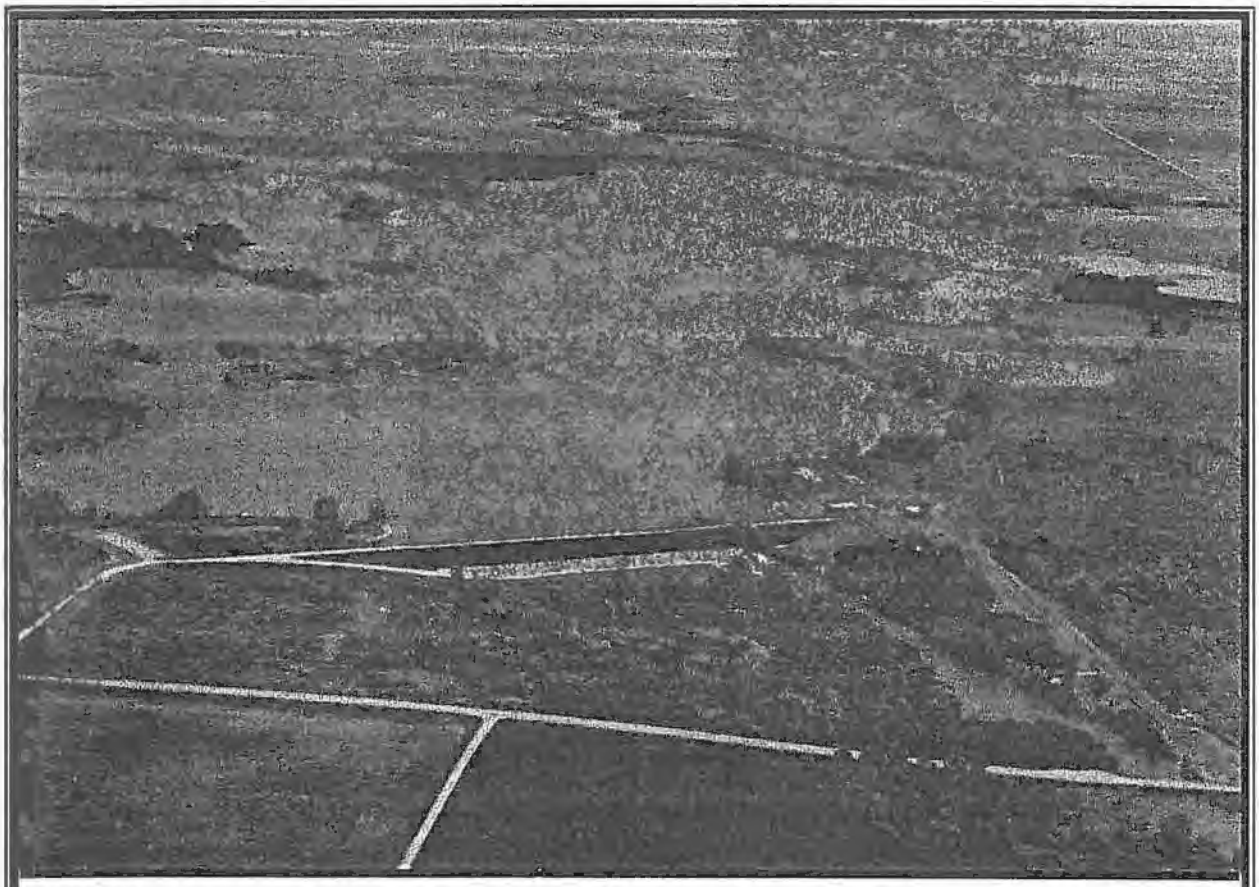

FIGURE 1-11 Lake Orwell: Dam and Reservoir

muted and close to the horizon. Off-site, low hills and shallow valleys offer some visual interest. (see Figure 1-11)

This area is a succession of beach ridges formed as Lake Agassiz receded. To the east, the land rises gently to elevation ±1150 feet NGVD. Toward the west it drops gradually, again about 100 feet, to the ancient lakebed, elevation ±950 feet NGVD. The area is actively and intensively farmed. Because of this monocultural landscape, it offers little visual interest.

The tailwater area below the dam is a small, intimately sized, area that imparts a feeling of enclosure; an ambiance that is a rare occurrence in the vast, open expanses of the Great Plains. The small day use area is set within the confines of the narrow river valley where the trees and close valley terraces give the area a strong sense of enclosure and intimacy. The stream serves as the centerpiece to this setting. This area has high visual and aesthetic appeal.

3. Bigstone Lake, Whetstone River:

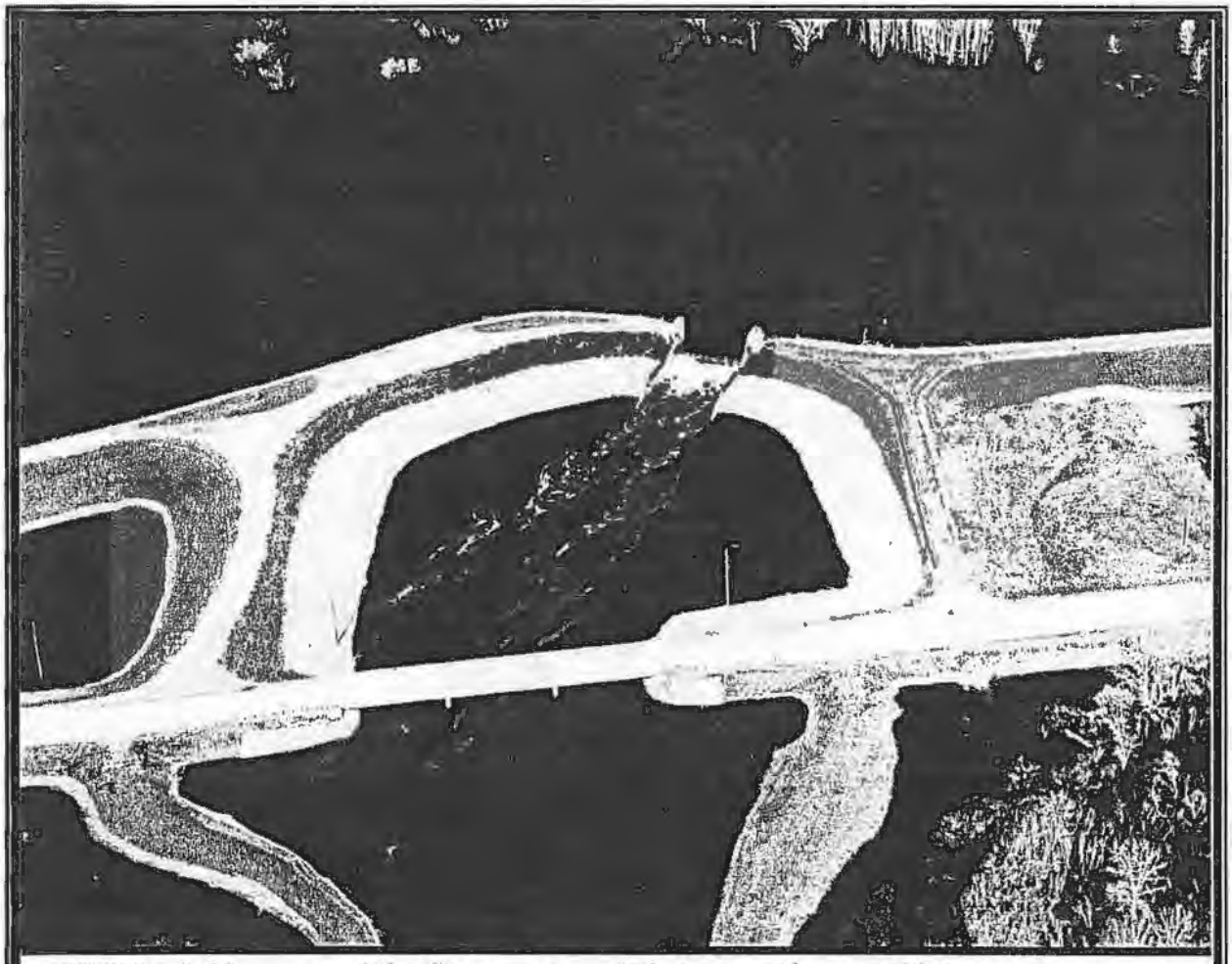

FIGURE 1-12 Big Stone Lake - Whetstone River at Highway 75

This project also lies in the Minnesota River Valley, upstream from the Lac qui Parle project. The project includes the dam and reservoir on the Minnesota River, directly upstream from U.S. Highway 75 (see Figure 1-12). Corps managed lands offer limited amenities. About 10,800 acres of project land is managed by the U.S. Fish and Wildlife Service as the Big Stone National Wildlife Refuge.

The refuge provides a visitor's center, an auto tour, a prairie interpretive hiking trail, and a marsh interpretive hiking trail. A designated canoe trail follows the main channel of the river through the refuge, providing good views of river and marsh natural systems. The refuge also provides public hunting and fishing accesses.

4. Lac qui Parle

Lac qui Parle is a long, narrow natural lake lying in a wide river valley. The shoreline of the lake is classified as floodplain. Lakeside vegetation is riparian in nature, floodplain forest or marsh with little visual appeal to the casual observer. Access to the water is limited. (see Figure 1-13)

There are no Corps sites that provide vantage points from which to view the lake. Taken as a whole, the lake offers few of the visual amenities that are usually associated with scenic value.

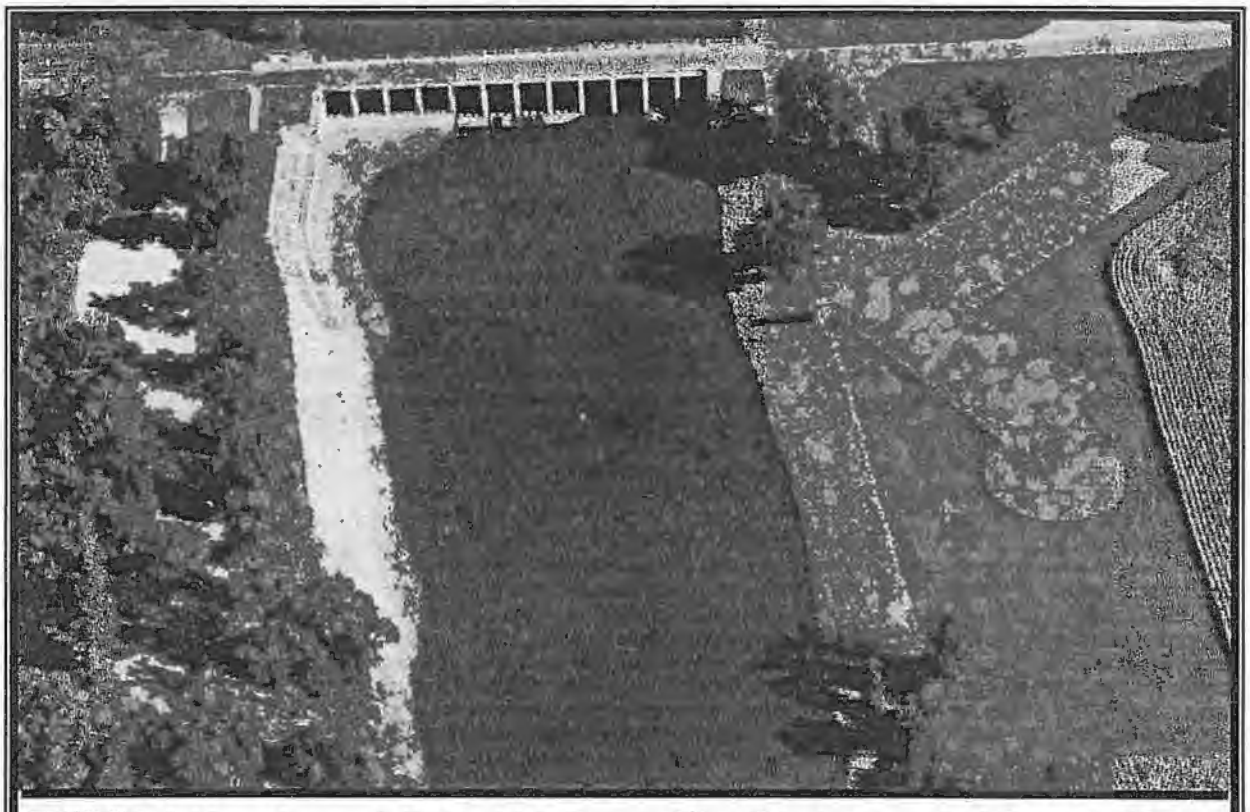

FIGURE 1-13 Lac qui Parle: Main Dam and Day Use Areas on the Minnesota River

5. Marsh Lake:

Marsh Lake, part of the Lac qui Parle project, lies on the Minnesota River between Big Stone Lake and Lac qui Parle (see Figure 1-14). This lake was once a large marsh; it is surrounded by floodplain wetland , managed for wildlife. Like the other lakes, it has few visual resources. The lack of vantage points from which to view the lake limits what visual appeal the area has.

FIGURE 1-14 Lac qui Parle: Marsh Lake Day Use Area

Cultural Resource Evaluation:

1. Lake Traverse:

Fee title lands at the Lake Traverse-Bois de Sioux River Project, including Mud Lake, were inventoried for cultural resources in 1984. Four sites were found on fee title land, including the old Dakomin townsite, a historic farmstead, a prehistoric village, and a prehistoric cultural material scatter. Project flowage easement lands, including islands in Lake Traverse, have not been systematically surveyed for cultural resources and need to be. At present, there are 11

known sites or leads to sites for these easement lands, including three former townsites, a grain elevator, three prehistoric villages, a prehistoric earthwork, and three prehistoric cultural material scatters. Except for some bridges, there are no known sites along the channeled portion of the Bois de Sioux River between White Rock Dam and just south of Breckenridge, Minnesota, and Wahpeton, North Dakota. The National Register of Historic Places eligibility of known sites at Lake Traverse and Mud Lake is undetermined, except for potentially eligible prehistoric village site 21TR35/39R045 located near the Browns Valley Dike, but away from the fluctuating Lake Traverse shoreline. The White Rock Dam, the Reservation Highway Dam, the Browns Valley Dike, and other project related features such as the dam tender's house are considered eligible to the National Register of Historic Places due to the project's association with the Federal Relief Construction during the period 1933 - 1941. The Historic Properties Management Plan for Lake Traverse, currently being compiled, will contain detailed information on the cultural resources of that project. It will be appended to the Operational Management Plan.

2. Lake Orwell:

A literature search and records review of the 19 sections in Otter Tail County containing Orwell Reservoir was conducted in 1981 in conjunction with a Phase I cultural resources reconnaissance survey of fee title land at the reservoir from the waterline (1059.15 feet NGVD) to 1075 feet NGVD plus 50 meters. In 1985, twelve proposed shoreline protection areas were intensively surveyed. Six prehistoric sites (four cultural material scatters, one lithic scatter, and one burial mound complex) were recorded during these surveys. In addition, testing has recently been conducted where bison bones were eroding out of the spillway bank below the dam. No cultural materials were found, so this appears to be a natural versus a cultural event, and as such is not eligible for the National Register of Historic Places. The National Register eligibility of the other six recorded sites has not been determined as of 1993. The 1981 reconnaissance survey may not have covered all the fee title and flowage easement lands at Orwell Reservoir. Additional prehistoric sites as well as historic trails and farmsteads are probably present but unrecorded in those areas. No Historic Properties Management Plan for the Orwell Reservoir has yet been prepared.

3. Big Stone Lake, Whetstone River:

Corps of Engineers fee title lands at the Highway 75 Dam were surveyed for cultural resources during 1993 as part of a contract to inventory Lac qui Parle Project fee title lands for cultural resources. The only site found on fee title lands was the remains of a former farmstead, which was subsequently evaluated as being not eligible to the National Register of Historic Places. Small lithic scatter sites exist in the Big Stone National Wildlife Refuge within 4 miles (upstream) of the dam. The closest known site is lithic scatter site 21BS27, located on a rise within a half mile north of the Minnesota River and west of Highway 75. Information on the cultural resources of the Highway 75 Impoundment fee title lands will be found in the Lac qui Parle historic Properties Management Plan under preparation in 1993. It will be appended to the Operational Management Plan for the project.

4. Lac qui Parle

Fee title lands at the Lac qui Parle Project were surveyed for cultural resources during 1993. An isolated chipped stone flake and an isolated mammal bone fragment were found on fee title lands near the Lac qui Parle Dam area. A surface scatter of 20th century bottle and glass fragments was found on fee title land along the Watson Sag Dike. Neither is eligible to the National Register. No prehistoric or archeological sites were found in the Marsh Lake Dam fee title lands. The Lac qui Parle Dam, Marsh Lake Dam, Chippewa River Diversion Works, Watson Sag Dike, and any associated project features are eligible to the National Register of Historic Places based on the Project's association with the Federal Relief Construction during the period 1933 - 1941. The Minnesota State Historic Preservation Office recently inventoried Lac qui Parle State Park which is on project flowage easement lands just above the Lac qui Parle dam. Burial mound sites, prehistoric village sites, prehistoric and historic habitation sites, historic roads and trails, and historic Works Progress Administration (WPA) constructed buildings were recorded in the State Park and nearby vicinity and are included in the Lac qui Parle Historic District and/or the Lac qui Parle WPA/Rustic State Historic District. The historically significant Lac qui Parle Mission and Fort Renville are in the immediate vicinity of Lac qui Parle Dam, but on State lands just outside the project boundaries. Other project flowage easement lands were surveyed in 1993 and 1994. The former WPA staff cabin sites, several abandoned former farmsteads with and without buildings, two historic artifact scatters, and nine prehistoric lithic scatters were recorded. A cultural resources inventory is eventually needed for all project flowage easement lands. Details of the cultural resources at the Lac qui Parle Project can be found appended to the OMP in the 1993 (draft) Lac qui Parle Historic Properties Management Plan.

Lake Traverse

Western District Flood Control Projects – Section 2

Project Master Plan

June 1997

Contents

SECTION 2
Lake Traverse Project

Chapter 1 – Project Description

Lake Traverse

CHAPTER 1 – PROJECT DESCRIPTION

GENERAL

The Lake Traverse Flood Control Project lies west-northwest of St. Paul, Minnesota, on the boundaries of Minnesota and North and South Dakota. The project consists of two reservoirs: Lake Traverse, a modified natural lake, and Mud Lake (see Figure 2-1).

Project structures and features include:

- 3,700 feet of dike and three culverts at Browns Valley, Minnesota. This is the southernmost structure in tbe project. There is a small day use area here.
- Reservation Highway Dam (Reservation Dam), the dam and control structure controlling Lake Traverse. The structure is 16.5 miles north of the Browns Valley culvert. Lake Traverse is the main conservation reservoir. A small day use area is located at this dam.
- White Rock Dam, across the Bois de Sioux River channel, creates Mud Lake. Located 7.5 miles north of Lake Traverse, White Rock Dam is the main flood control structure for the project. There is also a small day use area here.
- 24 miles of channelization of the Bois de Sioux River. The upper end of the project is at Browns Valley, Minnesota, and the lower end is about 6 miles south of Breckenridge, Minnesota, and Wahpeton, North Dakota, with a total length of over 48 miles. At Wahpeton-Breckenridge, the Bois de Sioux River joins the Ottertail River to form the Red River of the North.

The project was constructed in 1939-1941 for flood control and water conservation purposes. It was placed in operation on December 1, 1941. It is designed to provide 137,000 acre-feet of

storage above the conservation levels of Lake Traverse during flood periods. At conservation levels, the project provides 112,500 acre-feet of storage. Low-water flow on the river is improved for agriculture, recreation, fish and wildlife conservation, and dilution of sewage effluent on the Bois de Sioux River and the Red River of the North.

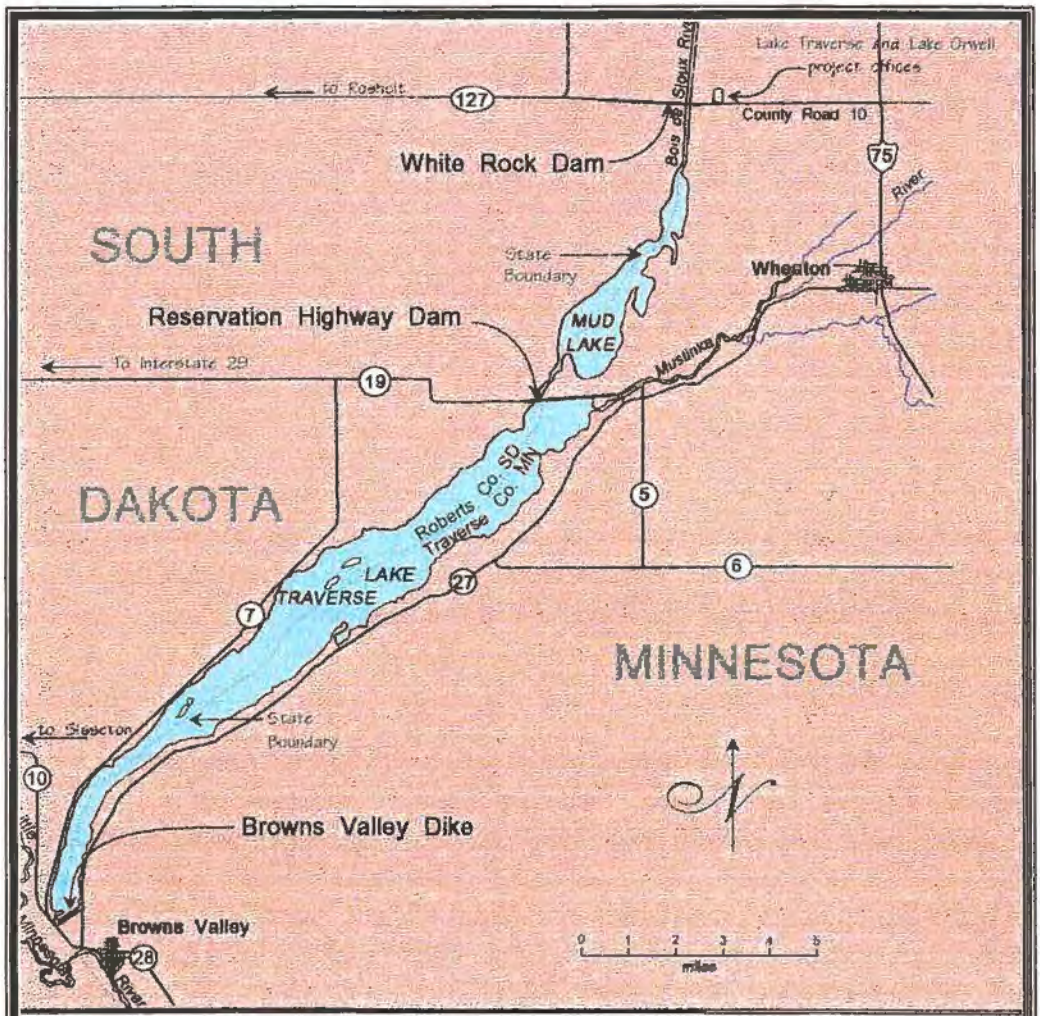

FIGURE 2-1 Lake Traverse Flood Control Project

The watershed of this project is roughly circular and constitutes the southern limit of the Red River of the North drainage basin (see Plate 2). With an area of approximately 2,340 square miles (1.5 million acres), it is one of the largest watersheds in the Red River system. It drains portions of the North Dakota county of Richland, the South Dakota county of Roberts, and the Minnesota counties of Traverse, Big Stone, Stevens, Grant, Otter Tail, and Wilkin.

AUTHORIZATION AND PURPOSE:
Authorization for Federal participation in the Lake Traverse-Bois de Sioux River Flood Control Project was provided by PL 74-738, the Flood Control and Water Conservation Act of 22 June 1936, and by the formation of the Tri-State Waters Commission, which provides for local cooperation by Minnesota, North Dakota, and South Dakota.

The Lake Traverse-Bois de Sioux River project is a multiple purpose project designed primarily for the control of floods on reaches of the Bois de Sioux River and the lower Red River Valley. The Browns Valley dike at the head of Lake Traverse prevents the lake from overflowing southward, down the Little Minnesota River into Big Stone Lake and thence into the Minnesota River. The secondary purpose of this reservoir is to store water for conservation purposes and the preservation of fish and wildlife. The improvement of the Bois de Sioux River channel for about 24 miles downstream is to provide adequate capacity when lowering the reservoir to project conservation levels.

LOCATION AND SETTING:
The Lake Traverse Flood Control Project is in west central Minnesota, about 190 miles northwest of St. Paul (see Figure 1-1). It lies on the juncture of the Minnesota, South Dakota, North Dakota borders. Parts of the project are in Traverse and Wilkin Counties, Minnesota, Roberts County, South Dakota, and Richland County, North Dakota (see Figure 1-2).

Lake Traverse is 1.5 miles wide (average) and 16 miles long with an average depth of 10 feet. Reservation Control Structure controls the water level of Lake Traverse. Mud Lake, immediately downstream, is controlled by White Rock Dam. The lake is 7.5 miles long and shallow, with a depth of 2 to 4 feet; flow is from south to north. Much of the lake is covered with dense areas of cattails and bulrushes.

The flat, dry bed of Glacial Lake Agassiz constitutes the eastern portion of the basin. Gently rolling glaciated uplands characterize the western side. Separating the ancient lake bed and the gently rounded hills is a series of beach ridges, formed as the ancient lake retreated. Most of the basin is heavily farmed and, with the exception of the Lake Traverse and Cottonwood Slough areas, almost devoid of woody vegetation. As a result of the agricultural activity in the area, almost all of the native prairie vegetation that once dominated the region has been converted to farm fields and pastures. The edges of the lakes are bordered by stands of cottonwood, willow and marsh type vegetation. Both lakes lie on a generally northeasterly bearing in the bed of what was the head of a very large and deep glacial river. The lakes are not evident until the edges of the enclosing bluffs are reached; the almost flat prairie farmland gives no evidence that a considerable body of water is in the area.

The dominant water features of the basin are Lake Traverse, Mud Lake, and the Bois de Sioux, Mustinka, and Rabbit Rivers. Lake Traverse is a long, narrow, open water lake lying in the

abandoned channel of the glacial River Warren (for additional information, see Section 1, Project Description). The old channel is a steep sided valley, from 3/4 of a mile to 3 miles wide, contained by the low bluffs that were created by the river's erosion of the Big Stone Moraine.

The Mustinka River is the main inflow to the project. It is a small meandering tributary, typical of a plains river. It forms in the morainic hills in the northeast portion of the basin and joins Lake Traverse directly above (south of) Reservation Dam which controls the level of the lake. Important tributaries to the Mustinka River include Five Mile, Twelve Mile and Eighteen Mile Creeks.

Mud Lake, at the wide end of the valley (north end), is normally a large marsh almost entirely covered by wetland vegetation. Here the ancient river channel opens into the dry lake bed of Glacial Lake Agassiz. Mud Lake levels are controlled by White Rock Dam.

The project is the source of the Bois de Sioux River which flows north from this structure into the Red River Valley. The river forms the boundary between South Dakota and Minnesota, and further north, North Dakota and Minnesota. It flows northward to the Wahpeton-Breckenridge area across the very nearly flat, dry lake bed. The original Bois de Sioux River was meandering and shallow, with long reaches of rushes and grass. It was straightened and cleared as part of the Lake Traverse project in 1941. There have been problems since then with sedimentation and beaver dams along its length. About 12 miles south (upstream) of Breckenridge, the Bois de Sioux River is joined by the Rabbit River, another small river flowing from the east.

PROJECT LANDS:

Total land for the Lake Traverse project is 7,316.38 acres with 1,144.13 acres in fee and 6,172.25 in easement. An additional 865.87 acres have been formed by reliction. No land is excess to project needs. For additional information on Corps administered Federal land and project lands, see this section, Chapter 2, Administrative and Policy Factors: Project Land Status, Appendix E, Land Use Classification, and Plates 21, 22 and 23.

Project Land Allocations:

In accordance with ER 1130-2-435, Project Operation, Preparation of Master Plans, all lands will be allocated in accordance with the authorized purposes for which they were, or are to be, acquired. Allocated project lands will be further classified to provide for development and resource management consistent with authorized project purposes and the provisions of the National Environmental Policy Act (NEPA) and other Federal laws. The classification process further refines land allocations to maximize use of project lands. The process must also consider public desires, legislative authority, regional and project specific resource requirements, and suitability.

All project lands at the Lake Traverse Project were acquired for project operations. Additional information on land allocation/classification is available in: Chapter 2, Administrative and Policy Factors: Project Land Status; Appendix E, Land Use Classification; Plates 21, 22 and 23.

Land designated for project operations may be used for other purposes where these uses are compatible with operational requirements. These uses may include wildlife habitat management, recreation, or agriculture. This practice assures maximum use of project resources.

When it can be done safely, hunting, trapping and fishing may be allowed on operations land. Restricted areas will be adequately posted as such. Licenses, easements, outgrants, or permits will be issued only for those uses that do not interfere with project operations.

PROJECT ACCESS AND USAGE:

Lake Traverse lies on the western border of Minnesota, the eastern edge of the Great Plains. The area is rural and sparsely populated, remote from any population centers of any size. East of the lake are thousands of lakes and streams, while to the west, surface water becomes an uncommon occurrence. Recreation use on the lake (boating, fishing, etc.) is regulated by the States involved, South Dakota and Minnesota.

Recreation Use:

1. Boating:

Water-based recreation opportunities become markedly fewer west and south of the Minnesota River. Due to its size and shape, Lake Traverse is ideal for all types of boating activities and helps to fill regional boating needs, especially for persons from the western parts of the area. Boating enjoyment is severely affected by algae blooms during the late summer. The poor water quality and the foul odor produced by the algae tend to keep many recreational boaters away.

2. Day Use:

For the Lake Traverse project recreation areas from 1988 to 1992, the yearly average annual visitation was approximately 339,900 visitors. In 1991, the visitation was 322,200 compared to 309,100 visitors in 1981. Visitation depends heavily on water levels, water quality, weather conditions and fishing success; it may vary drastically from year to year, or even from month to month. Because of this, percentages of use given in the following text are an approximate average of use. Additional information concerning visitation is available in Appendix B.

- White Rock Dam Recreation Area – This day use activity area had a five year average visitation of approximately 19,800 visitors. In 1991, there were 20,000 visitors compared to 1981 visitation of 17,400.
- Reservation Dam Recreation Area – This day use area had an average five year visitation of 23,900. Annual visitation in 1991 was 25,800 compared to 18,300 visitors in 1981.
- Browns Valley Recreation Area – The average five year visitation for this day use area was 17,000. Annual visitation in 1991 was 15,400 versus 28,900 in 1981.

3. Fishing:

Fishing is an important recreation for the study area. Visitation numbers indicate that 60 percent of Lake Traverse visitors participate in some form of fishing activity. Fishers contribute substantially to the area economy, purchasing bait, supplies, fuel, and lodging in the area.

4. Hunting:

Hunting accounts for 30 percent of total visitation hours, and is also an important contributor to the area economy. Waterfowl hunting is, in economic terms, the most important recreation activity at the project.

5. Nature Study:

There are several large wildlife management areas on and around the project; however, the lack of trails and access limits the availability of this important resource.

6. Sightseeing:

This activity accounts for only 10 percent of total visitation. Although the lakes are the product of an interesting natural phenomenon, views and perspectives are not available from Corps managed land, this tends to reduce interest levels.

Adjacent Land Usage:

Almost all shoreline is non-Federal land around this project. Private recreation areas, businesses and many summer cabins are along both sides of Lake Traverse upstream from the Reservation Highway Dam. The lands around Mud Lake and those behind the shoreline lands at Lake Traverse are almost entirely used for agricultural purposes. In general, land use in west-central Minnesota is predominantly agricultural. Approximately 87 percent of the area surrounding the Lake Traverse project is in croplands.

Project Accessibility:

Lake Traverse lies on the western border of Minnesota, about 190 miles west-northwest of St. Paul. Access is good using the Federal and State highway systems.

A. Major Access Routes:

Although the project is a considerable distance from any major population center, it is easily accessed from Interstate 29. The lake lies roughly parallel to the freeway, 10-15 miles east of it. East of the lake, Minnesota State Highway 75, a major north-south road, also parallels the lake at some distance.

B. Project Access:

The Lake Traverse project can be accessed from the Dakotas via I-29: from North Dakota by State Highway 11 (which crosses the Bois de Sioux River) and from South Dakota by State

Highways 127 and 10 (both access the lake). Access from Minnesota is by State Highways 27, 28, and 55 which all connect to U.S. Highway 75.

C. Local Arterials:

White Rock Dam and the Project Headquarters are 3.5 miles west of U.S. Highway 75, on Traverse County Road 10 which is about 4 miles north of Wheaton, Minnesota. South Dakota access is 15 miles east of I-29 on South Dakota State Highway 127.

Reservation Dam can also be accessed from Wheaton, via Minnesota State Highway 27 south, then west on Minnesota State Highway 117. Access from South Dakota is 8 miles east of I-29 exit 242 on Roberts County Road 23. Turn right at the stop sign, go south 1 mile. Turn left onto Roberts County Road 19 for 5 miles.

Browns Valley Recreation area is accessed from Minnesota State Highway 27, west on State Highway 28 at Browns Valley. From I-29 South Dakota, exit 232 – east on State Highway 10 for 11 miles.

D. Seaplane:

Regulations governing seaplanes at Lake Traverse have not been established. While airborne, all civilian aircraft are subject to the general aviation rules and operating regulations established by the Federal Aviation Administration and the applicable State agency, e.g., Minnesota Department of Transportation. When on the water, seaplanes are subject to the marine "rules of the road" as established by the Minnesota Department of Natural Resources and the South Dakota Department of Game, Fish, and Parks. They may operate on any Corps lake, except those where powerboats are prohibited, and are subject to the specific boating prohibitions and restrictions for each project or lake. In addition, seaplanes may only be operated on the lakes between sunrise and sunset.

Dams, Control Structures, and Dikes:

A. Reservation Highway Dam:

The Reservation Dam is coincident with the highway, crossing the narrows between Lake Traverse proper and that portion of the project known as Mud Lake. State Highway 117 on the Minnesota side was built up to elevation 980.0 to provide additional spillway capacity during maximum floods. The built-up portion is about 9,100 feet long and is riprapped on the side slopes and blacktopped. The portion of County Highway 19 on the South Dakota side was raised to elevation 983.0, 1-foot above the maximum flood of record. Approximately 1,100 feet of fill to this elevation was required before meeting higher natural ground. This rolled earth fill contains about 188,000 cubic yards. The original bridge connecting these two highways was of timber construction but was replaced by a steel and concrete structure at the upstream side of the control structure.

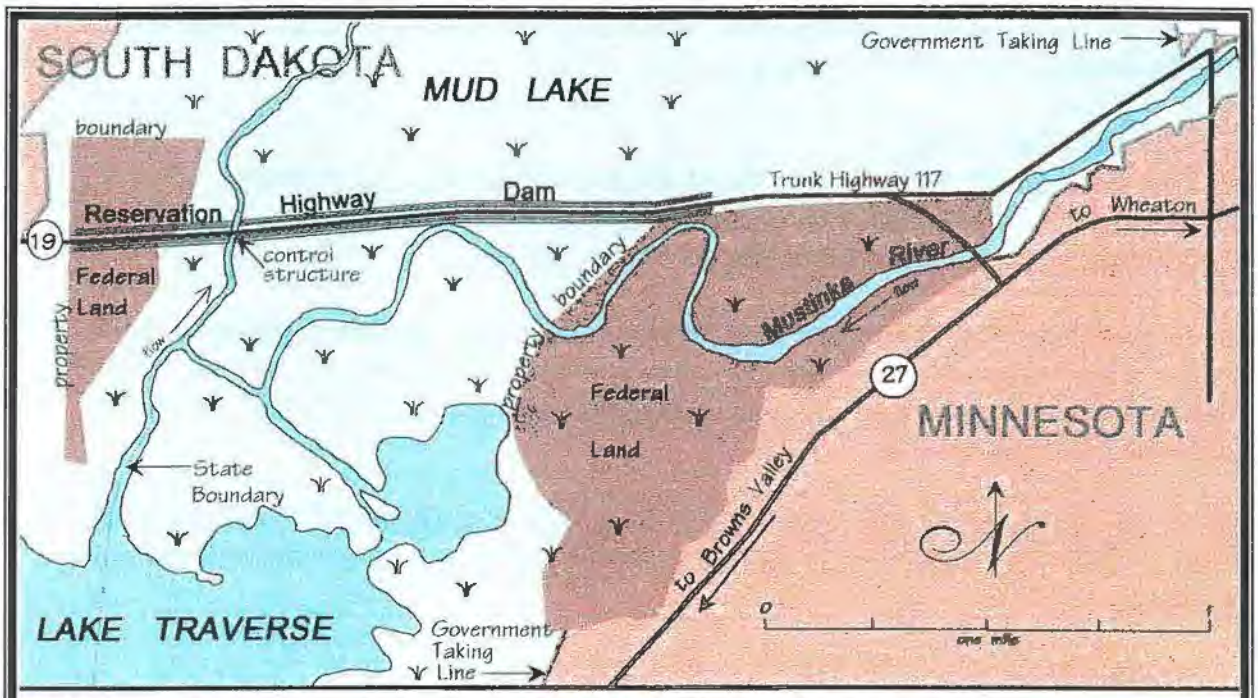

FIGURE 2-2 Lake Traverse Project: Reservation Dam

Reservation Control Structure:

The control structure is a grouted riprap weir to elevation 974.0, with steel sheet piling 15 feet long for the cutoff. The abutments are formed of 20-foot lengths of steel sheet piling. There are 17 stop log sections across the top of the spillway, each separated by 8-inch "H" columns 20 feet long. These columns form the support for a walkway over the spillway and provide the means of handling the stop logs. Two metal culverts 24 inches in diameter and 14 feet long

FIGURE 2-3 Lake Traverse: Reservation Dam Control Structure

with slide gates were placed under the spillway for low water control. The inverts were set at elevation 970.0. These culverts are no longer operative. The slide gates have been removed and removable plugs inserted in the inlets. Riprap has been placed to prevent the plugs from coming out. In an emergency, the riprap and plugs can be removed. Two feet of stop logs maintain the lake at conservation elevation of 976.0. To prevent loss of water due to wind action, stop logs are placed to elevation 977.0 during dry seasons. The spillway is made up of 18-inch derrickstone; the top 9 inches are filled with concrete, the bottom 9 inches are filled with gravel. The downstream face of the weir has a slope of 1V (vertical) on 2½H (horizontal). The total length of the spillway is 27 feet 6 inches with maximum width of 150 feet (see Figure 2-3).

B. White Rock Dam:

White Rock Dam is the main flood control dam for the project, controlling water levels in both Lake Traverse and Mud Lake during times of high water. White Rock Dam is located at the north (downstream) end of Mud Lake (see Figure 2-4). It carries a roadway connecting Traverse County Road 10 to South Dakota Highway 127.

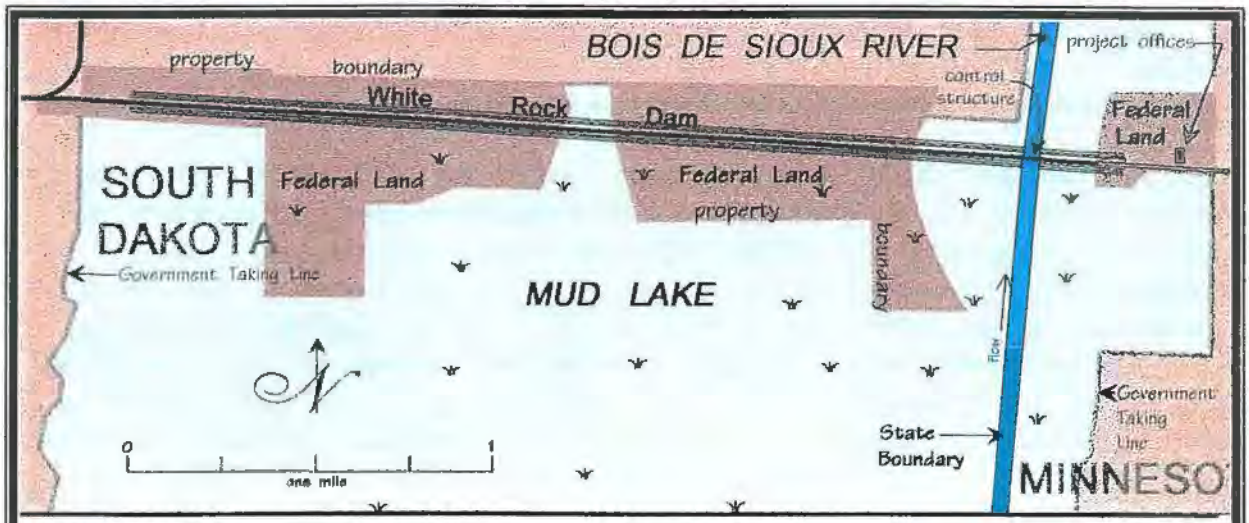

FIGURE 2-4 Lake Traverse Project: White Rock Dam

This dam is rolled earth fill, 14,400 feet long from high ground on the Minnesota side to high ground on the South Dakota side. This total length includes the concrete control structure length of 47 feet. Top elevation is 986.0 feet. Total volume of earth fill is 329,200 cubic yards. The upstream slope is 1V on 2½H with a 6-inch gravel blanket topped with 12-inch riprap near the base. The downstream slope is 1V on 2H with 12-inch riprap near the base. Top width of the dam is 26 feet. Additional information is listed under Appendix A, Tabular Data of Project Dams and Reservoirs, Table A-1.

D. White Rock Control Structure:

FIGURE 2-5 Lake Traverse: White Rock Dam Control Structure

The control structure is a reinforced concrete section topped with a bridge deck, as shown on Figure 2-5. There are three reversed tainter gates of welded construction, 13 feet wide by 16 feet high with a stilling basin. Gate sills are at elevation 965.0. The distance between the abutments is 47 feet. The capacity of the structure at maximum pool elevation of 981.0 is 4,000 second feet and 5,600 second feet if the pool reaches 982.0. It is estimated that the maximum possible flood can be passed without exceeding the latter pool elevation. Stop logs are provided for emergencies and used during the winter so the gates will not be frozen during periods of zero flow. Flood discharges are regulated by the three tainter gates supported on trunnions between two 4-foot-wide piers and the two abutments. In the closed position, the top of the gates are at normal maximum pool elevation of 981.0, or 9.0 feet above normal conservation level of 972.0. The gate operating machinery is located on top of each pier. The machinery is worm gear with speed reducer with a 42 to 1 reduction. Hoists are operated manually. The stilling basin is 34.07 feet long and 47 feet wide. It is designed to produce a hydraulic jump for the dissipation of energy. The floor of the stilling basin is at elevation 960.0. Baffles with a top elevation of 964.0 feet are arranged in two rows approximately 8 feet apart and extend across the entire width of the basin. A stepped sill, top elevation of 963.0, is provided at the downstream end of the basin to stabilize the jump. The discharge channel elevation is also 963.0. Flared wing walls are provided at the downstream end of the stilling basin. The approach channel to the control structure was approximately 2 miles long with a bottom elevation of 967.0. The channel was dredged to provide a free flow from Mud Lake proper to the dam. The Mud Lake Management Group dredged, cleaned, and established a channel with bottom elevation of 966.0 from White

Rock Dam to Reservation Dam. The dredged materials were used to construct 10 1-acre islands and many loafing islands. Additional information is listed under Appendix A, Tabular Data of Project Dams and Reservoirs, Table A-1.

D. Browns Valley Dike:

The dike is located at the far south end of Lake Traverse. The associated culvert structure carries a roadway that connects Minnesota State Highway 28 with South Dakota State Highway 10. (see Figure 2-6) This is the continental divide. This dike was built to prevent pooled water in Lake Traverse from overflowing across the divide into the basin of the Little Minnesota River and to divert high flows from the river into Lake Traverse, thus preventing flood damage in Browns Valley, Minnesota.

The dike extends for 3,700 feet between the junction of South Dakota State Highway 10 and Minnesota State Highway 28 and Minnesota State Highway 27 (see Figure 2-7). With a maximum height of 16 feet, the dike has a freeboard of 5 feet above design flood, with a crest elevation of 987.0. The dike is constructed of rolled earth fill with a top width of 10 feet and slopes of 1V to 4H on both sides above elevation 981.0. On the lake side below elevation 981.0, the slope is 1V to 15H. A raised section of South Dakota Highway 10 and Minnesota

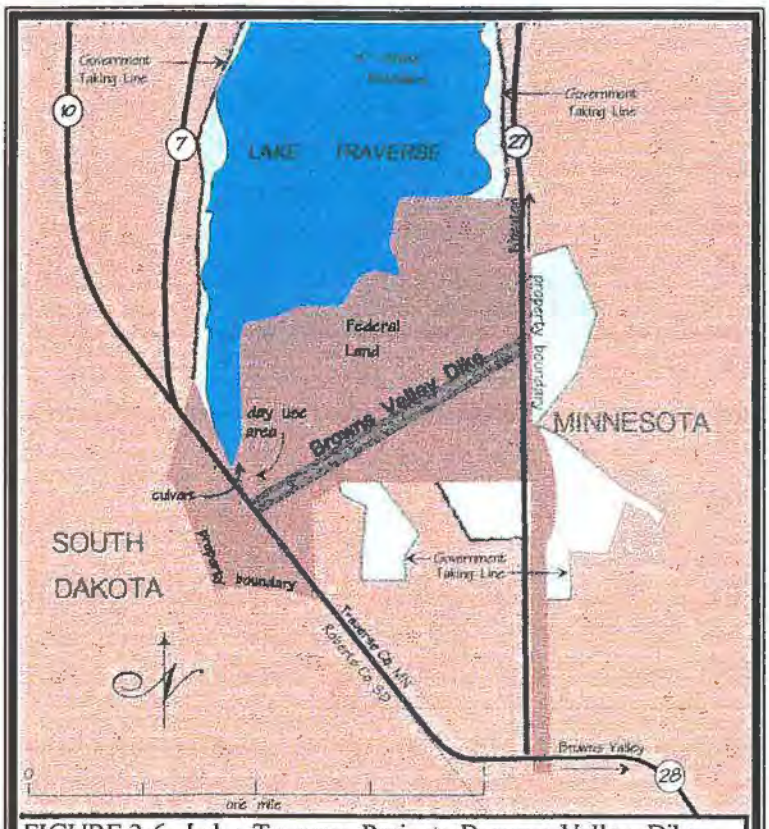

FIGURE 2-6 Lake Traverse Project: Browns Valley Dike

State Highway 28, along with a concrete box culvert, funnels overbank flows from the Little Minnesota River into Lake Traverse to prevent flooding of Browns Valley.

F. Browns Valley Culvert:

The culvert is under South Dakota State Highway 10 and is a concrete bay type with three 6- by 9-foot openings. It is 68.75 feet in length with invert elevations of 971.0 on the lake end and 974.0 on the river end. Additional information is listed under Appendix A, Tabular Data of Western District Projects.

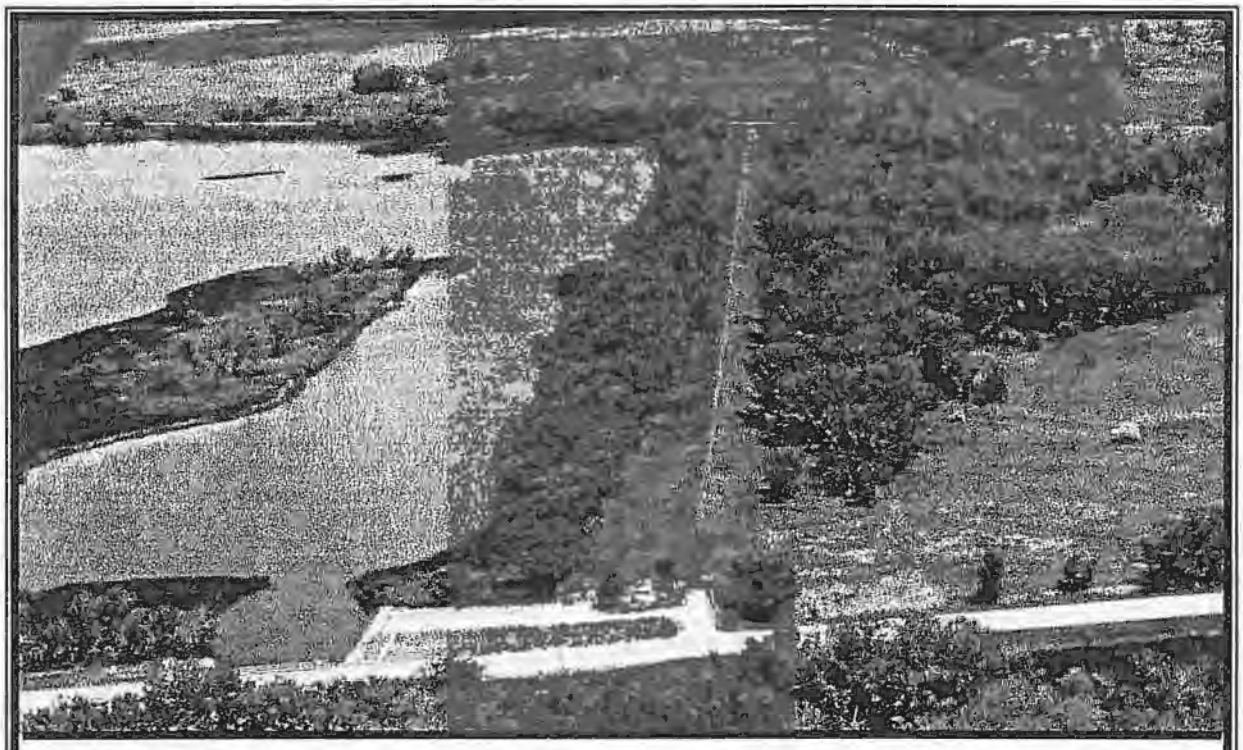

FIGURE 2-7 Lake Traverse: Browns Valley Dike and Culvert

Project Buildings:

A. Project Office:

The project office is approximately one-half mile east of White Rock Dam on Traverse County Road 10 (see Figure 2-4). The office is located on 7.5 acres and is combined with a maintenance garage for project vehicles, boats and special equipment. This is the only maintenance facility for the project. During the winter, this facility is used for making signs for the St. Paul District. The sign making machines take up much of the space in the maintenance building. There is a small (120 sq. ft.) paint and equipment storage building and a new (1992) garage for vehicle and equipment storage. There is paved parking for 10 cars.

B. Resource Manager's House:

The dwelling is a 1,453 square foot, two story wooden house (1st floor: 29'x 41', 2nd floor: 22'x 12'), built in 1941, with a two car metal garage (20'x 24'), built in 1958. The dwelling is in the process of being moved.

C. White Rock Dam:

There is an accessible toilet (vault) facility and a water stage recorder at White Rock Dam day use area.

D. Reservation Dam:

There are two metal privies and a water stage recorder at Reservation Dam. These structures are not constructed to current standards of accessibility. They are scheduled for upgrading in the spring of 1996 and will meet current accessibility standards.

E. Browns Valley:

There are two metal privies at the day use area. These structures are not constructed to current standards of accessibility.

Project Roads and Access:

There are no project roads. All project features can be accessed from the local road system as previously described. There are 9 outgrants for roads on, or through, the Lake Traverse project.

Public Use Facilities:

Corps managed public day use facilities at the Lake Traverse project are limited to three areas: White Rock Dam Recreation Area, Reservation Highway Recreation Area, and Browns Valley Dike Recreation Area. One other public use facility, Mustinka Park, is leased to Traverse County.

FIGURE 2-8 Lake Traverse: White Rock Dam Day Use Area

A. White Rock Dam:

This recreation area is located directly north of the dam, adjacent to Corps managed wildlife areas. With an area of approximately 3 acres, it sits astride the Bois de Sioux River and the State boundaries, as shown on Figure 2-8. There is a graveled parking lot on the east (Minnesota) side of the river that will accommodate approximately 35 vehicles. It is used for shoreline fishing, hunting access and wildlife observation and serves as overflow parking for the west bank area. All other facilities are on the west (South Dakota) side of the river. There is no safe pedestrian link between the two areas, and one must cross the control structure on the highway to reach the other side of the river.

The recreation area on the west side of the Bois de Sioux River has a graveled parking area that will accommodate approximately 20 vehicles. Site facilities include: accessible vaulted restrooms, designated parking space for disabled persons; potable water supply; picnic shelter, picnic area with grills, benches, and a playground; information kiosk; and a fish cleaning area. Recreational uses vary with the seasons and include: picnicking, bank fishing (rod and reel and bow and arrow), sightseeing, and wildlife observation. The site is also used as a hunting access to the nearby Wildlife Management Areas. This area is the tailwater access to the dam.

B. Reservation Dam:

FIGURE 2-9 Lake Traverse: Reservation Dam Day Use Area

This recreation area, shown on Figure 2-9, is about 2 acres in size, and is surrounded by Corps managed wildlife lands. The recreation area is located on the downstream side of the dam, adjacent to the control structure which forms the main conservation reservoir of the Lake Traverse project. The recreation area has an open view of the distant bluffs. The graveled parking area accommodates approximately 16 vehicles. There is a picnic area with grills,

benches, (non-accessible) vaulted restrooms, and a playground. A fish cleaning area and public information kiosk are also available.

Recreational uses vary with the seasons. Picnicking, sightseeing, wildlife observation, hunting access, and bank fishing are popular warm weather uses. There is a boat access to Mud Lake that is used for waterfowl hunting and for fishing. This area is the tailwater access to the dam. Bank fishing is done along both sides of the downstream channel of the dam. A catwalk located on the downstream side of the dam structure is also a popular area to fish from. Many people park along and on the dam structure/highway to fish on the upstream side of Reservation Dam into Lake Traverse.

C. Browns Valley:

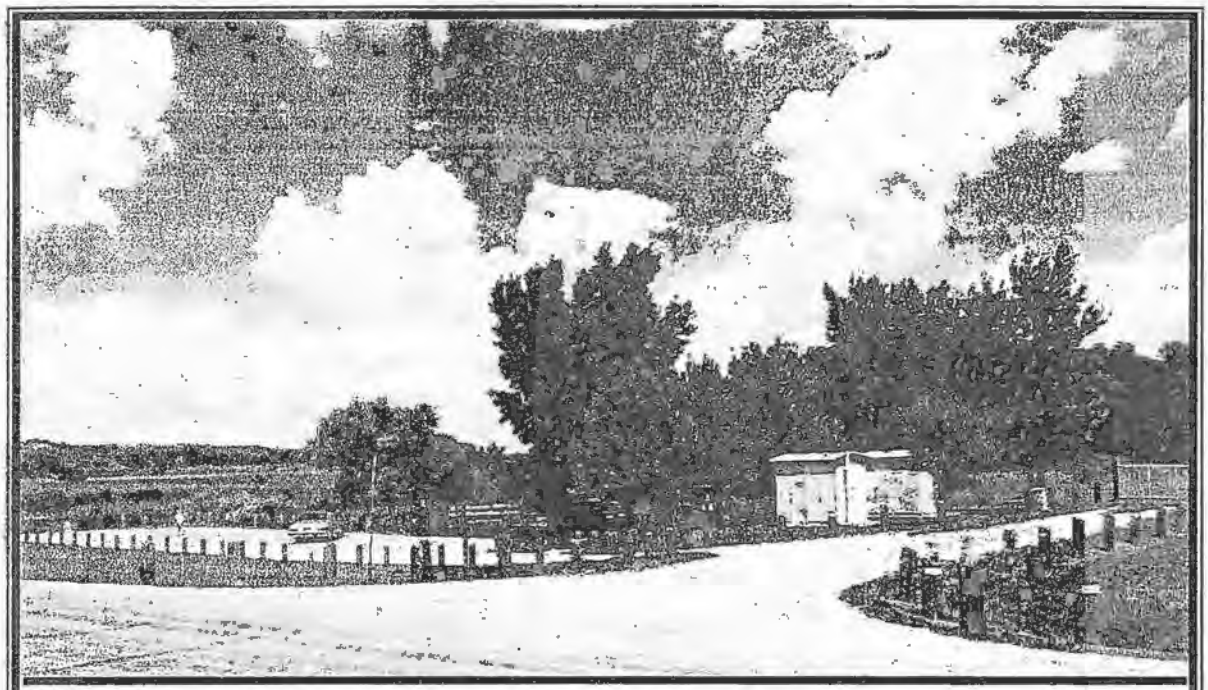

FIGURE 2-10 Lake Traverse: Browns Valley Day Use Facility

This recreation area, shown on Figure 2-10, is approximately one acre in size. It has a graveled parking lot which accommodates 15 vehicles. There is a picnic area with grills, (non-accessible) vaulted restrooms and a kiosk for public information. The Continental Divide, elevation 977 feet, is located at this recreation area. Recreational uses are picnicking, bank fishing, sightseeing, wildlife observation and access to hunting areas.

D. Boat Launch Facilities:

There is no Corps administered public boat launching facility at the Lake Traverse project.

- There is a gravel boat ramp at the public park on the Mustinka River. This is land (9.6 acres) that the Corps leases to Traverse County. There is also a small dock and a large graveled parking lot.
- There is a gravel ramp in the public park located on Minnesota State Highway 27.
- There are two public boat accesses on the South Dakota side of Lake Traverse, and three on the Minnesota side

RESERVOIRS AND RIVERS:

Description:

A. Lake Traverse:

Lake Traverse pool is about 16.5 miles long measured from the Reservation Control Dam to the dike at Browns Valley. It averages about 1.25 miles in width with an average depth of 10 feet. At project conservation pool, elevation 976.0, the capacity is 106,000 acre-feet. At full pool, elevation 981.0, the capacity is 164,500 acre-feet.

B. White Rock Pool:

White Rock pool (Mud Lake) is about 7.5 miles long measured from White Rock Dam to Reservation Dam. Conservation pool, at elevation 972.0, has a maximum width of 2.5 miles, an average depth of 1.7 feet, and storage capacity of 6,500 acre-feet. At full pool, elevation 981.0, the capacity is 85,500 acre-feet. Combined flood storage capacity of both reservoirs is 137,500 acre-feet. Additional reservoir information is listed under Appendix A, Tabular Data of Project Dams and Reservoirs, Table A-1.

FIGURE 2-11 Lake Traverse: Bois de Sioux River

C. Bois de Sioux River:

The Bois de Sioux River channel was straightened and enlarged in 1941. The work was accomplished by dragline. Total length of the modification was approximately 24 miles, from White Rock Dam to 6 miles south of Breckenridge, Minnesota and Wahpeton, North Dakota (see Figure 2-11).

The modified channel bottom was 60 feet wide with side slopes of 1V to 3 H. The longitudinal slope from White Rock Dam to the mouth of Rabbit River is 1V on 10,000H. This section is designed to carry 1,100 second-feet with a 1-foot freeboard. From the Rabbit River to the end of the project, the longitudinal slope is 14V on 100,000H with a capacity of 2,000 second-feet. During the summer, water levels in the river are minimal; the river has been known to dry up completely during prolonged dry spells.

D. Mustinka River:

Improvement of the Mustinka River drainage has been completed with 20.6 miles of channel straightening and deepening to increase the capacity from 830 second feet to 2,140 second feet. Similar improvements of Twelve Mile Creek to increase the discharge capacity from 1,420 second-feet to 1,615 second-feet and County Ditch No. 42 from 385 second-feet to 400 second-feet have been completed. These channel improvements are expected to provide for floods to 10-year frequency with minimum freeboard of 1 foot.

Reservoir Operations:

In accordance with the authorized project purpose, the project reservoirs operate as a single flood control unit. The Reservoir Operations section describes the operating procedure for the project as such; it is not broken down by pool. For details on specific operating procedures, see the Lake Traverse Operational Management Plan.

A. Flood Control:

White Rock Dam is the main flood control structure for the project; above water levels of 977.0 (msl), both pools are controlled by this dam. As drainage for this basin is to the north, the spring breakup occurs later on the Red River of the North (downstream) than in the Lake Traverse watershed. Therefore, to avoid increasing downstream flood heights, flood storage from White Rock Dam is not released until conditions are favorable, usually about the first of May. When such releases are made, emergency conditions downstream govern the rate of discharge except during emergency conditions in the reservoir.

Spring Runoff: The Lake Traverse project stores all flood runoff during and after the spring breakup which usually occurs during March and April. Inflow is stored and held up to reservoir elevation 981.0. If it becomes evident the current flood will exceed reservoir capacity, White Rock Dam is opened to pass the inflow into the river and to maintain elevation 981.0. With the gates wide open and a pool elevation of 982.0, the discharge will be about 5,600

second-feet. When the inflow begins to decrease and the pool level drops to 981.0, the outflow is reduced to the inflow to maintain the pool at 981.0 until the outflow has been reduced to the channel capacity or flow that will not exceed flood stage at Wahpeton-Breckenridge.

Summer Floods: When floods occur in the basin, the reservoir is operated to minimize damage in and below the area. Operation is similar to spring floods except drawdown to conservation levels is accomplished as rapidly as downstream conditions permit.

Emergency Operation Conditions: If normal communication facilities fail, the dam tender will make every effort to maintain contact with the District office by any means available including radio, telegraph, or sending a messenger to the nearest point where communications are available. In such circumstances, the primary objective is to insure the safety of the structure and to provide the most effective operation of the project by following the regulation schedule. During such emergency operation, the schedule will be followed until contact with the District office is re-established. The dam tender will need to keep informed of the effects of any reservoir releases on downstream damage centers.

B. Water Storage Strategy:

There is no operation for low-water control or release of storage water once conservation levels have been reached except for extreme emergency conditions.

Conservation levels are maintained in both pools as nearly as possible by keeping both control structures closed during periods of little or no inflow. Inflow into the reservoir is usually balanced by evaporation losses until the late summer and fall when little or no inflow and high evaporation losses cause a drop in the reservoir levels. This loss is usually much greater in White Rock pool, which is shallower than the Reservation pool and has no apparent inflow source. Should extreme drought conditions occur, it is doubtful the reservoir level would be high enough to release any storage, even for emergency purposes, under present conditions.

CHAPTER 2 – RESOURCES AND INFLUENCING FACTORS

This chapter presents the factors that most influence the use, development, and management of the land and water resources at the Lake Traverse Flood Control Project. This includes factors that are conducive to development, and factors that act as constraints. The elements that are presented here fall into three broad classifications: natural resources, social and cultural resources, and administrative and policy considerations. Using the needs and desires of the region as the final determinant, these factors are used to decide the most appropriate development of the project resources.

PHYSICAL AND ENVIRONMENTAL RESOURCES:

Physical and environmental resources include geology, water, vegetation, wildlife, fisheries, visual quality, and cultural and recreational resources.

Geophysical Features:

The Lake Traverse project lies at the head of the abandoned channel of the Ancient River Warren, the prehistoric river that was the primary drainage channel for Glacial Lake Agassiz (see Section 1, Regional Description). The bluffs that parallel the lake were once the banks of the huge river. They rise approximately 120 feet above the lake and provide the informed observer with an idea of the actual size of the ancient flood. The area is designated a Registered National Landmark.

1. Soil Types:

Soils of the Lake Traverse project area are of 19 soil series in six soil associations. They range from alluvial, very poorly-drained types in lowland areas to deep, well-drained loams on the uplands.

The area soils range from productive soils conducive to intensive agriculture, through stony soil and rock outcrops, to poorly drained or frequently flooded soils. The characteristic soil associations in the area are generally delineated by topography. In the river bottoms, the alluvial soils are frequently flooded. Rising from the floodplain is the valley escarpment having easily eroded and droughty soils. At the crest of the terrace, the gently rolling uplands stretch to the farthest horizon – the Great Plains of North America. The soils on these uplands are variable and may be stony, poorly drained, or highly suited to agriculture. These soils are generally fertile and are heavily cultivated where limitations are absent or where drainage and stone removal are economically feasible.

2. Topography:

The project lies in the outlet of a prehistoric lake and is roughly in the shape of a narrow, elongated "V" with its apex to the south. Part of the project lies in the abandoned bed of the

large river that drained the immense lake. This riverbed is now the Minnesota River Valley and the project lies in the upper, or nortbern, end of it. This valley is the result of the erosive forces of the river flowing across glacial till from 100 to 300 feet thick. Although the river eventually cut to bedrock, thousands of years of sedimentation have raised the floor of the valley to within approximately 100 feet of the upland.

On the south, Browns Valley, end of the project the valley is about 3/4 mile wide, and the bluffs formed by the ancient river rise close to the lake. While the uplands are intensively farmed, the steep slopes here restrict the types of activities and/or development this land is suitable for; much of the shoreline of the lake is residential. These slopes require permanent cover to prevent rapid, severe erosion. Farther north, on the east side, the side slopes of the bluffs are not as steep and are suitable for grazing and some farming.

To the north, in the Mud Lake area, the channel widens into the dry bed of Lake Agassiz; it is much flatter close to the project and the bluffs are much less noticeable. The valley is about 3 miles wide here. Agricultural lands are much closer to the shores of the lake. Federal land around the north end of the Lake Traverse project is best described as floodplain. Contained by the distant bluffs, the land is low and flat, without noticeable relief and subject to periodic flooding.

Water Resources:

1. Principal Tributaries:

The principal tributary stream is the Mustinka River with a drainage area of 869 square miles or 75 percent of the watershed. The Mustinka River rises in the southern part of Otter Tail County, Minnesota, and flows south through the middle of Grant County until it turns westward into Traverse County. In Traverse County, it is joined by two tributary streams, 5-Mile Creek and 12-Mile Creek. It then flows southwesterly toward Lake Traverse where it enters the reservoir just upstream from the Reservation Dam.

2. Drainage Basin:

Lake Traverse above White Rock Dam has a drainage area of 1,160 square miles. For additional information, see Appendix A, Tabular of Project Dams and Reservoirs.

3. Effects of Reservoir Operations:

During periods of higher flows, fish in the Bois de Sioux River are attracted to the White Rock Dam. A significant recreational fishery for walleye and northern pike develops in the tailwater area during these higher flow periods. As the flow recedes, the fish apparently move downstream and find suitable holding areas. The distance they have to move most likely varies with the flow. The lower the flow gets, the farther downstream they probably have to move to find suitable holding areas.

The minimum discharge from Lake Traverse should be maintained year-round, but winter releases should not jeopardize the fishery in Lake Traverse by reducing oxygen levels to dangerous levels. Lower pool levels on Lake Traverse reduce the water volume and thus the available dissolved oxygen.

4. Water Quality:

A. Reservoirs:

Water quality of the project lakes is deteriorating. The eutrophication in Lake Traverse and Mud Lake has advanced to the point where algae blooms occur in summer and early fall. Causative factors include: nutrients in runoff from surrounding farmland; sewage waste from municipalities and private residences; cattle wastes from the Mustinka River; runoff from adjacent cattle yards; and direct access to the lake by cattle. Toxic algae blooms are a possibility and a potential threat to the health of domestic animals and man. Fishing quality has begun to decrease significantly, and water contact sports in shallow water areas are no longer advised due to poor water quality.

Because they are shallow, the two lakes suffer from high turbidities generated by wind and wave action. Both lakes experience decreased dissolved oxygen concentrations during the winter, when there is high fertility, shallowness, and restricted inflows in Lake Traverse; and shallowness, combined with accumulated organic muds, thickness of ice and near absence of water conduction in Mud Lake.

Winter dissolved oxygen levels is one of the critical limiting factors on Lake Traverse fishery. The winter dissolved oxygen problem is of particular concern when considering alternative lower fall pool drawdown targets to increase flood control storage for the following spring.

B. Rivers:

Bois de Sioux: As the Bois de Sioux River water comes from Lake Traverse, it suffers from the same problems as the lake.

Mustinka: The Mustinka River is the major contributor to the water quality problems the project experiences; specifically, the transportation of sewage effluent and cattle wastes by the Mustinka River into Lake Traverse.

Vegetation Communities:

An inventory and analysis of habitat type and existing vegetation in the Lake Traverse area is presented in Section 1, Chapter 3, Key Factors and Resources: Vegetation and in Appendix C, Environmental Resources, Vegetation. Plant communities are shown in Tables C-1 to C-4.

Lake Traverse is located in the area known as the Great Plains of North America. The original plant communities were mixed and tall grass prairie with riparian communities of assorted floodplain woody plants. Trees and shrubs were extremely sparse in the native landscape.

1. Forests and Shrublands:

Originally, forested areas only existed as riparian vegetation in this area. Many of the woodlands, and much of the woody and herbaceous cover, that were originally present have been converted to cropland. These actions have eliminated or reduced the various forest type habitats available for wildlife resources, and degraded the quality of those areas that remain.

2. Grasslands:

Almost all of the native prairie in the basin has been converted to agricultural production or altered by heavy grazing of livestock and the introduction of exotic plant species.

3. Marshlands:

A. Lake Traverse:

Prior to project construction, Lake Traverse and Mud Lake supported a vast marsh. Since project completion, a large portion of the marsh has deteriorated. Fluctuation of lake level, water turbidity caused by winds, and shallow lake levels have contributed to the loss. Wetland losses caused by draining, filling, burning, plowing, and siltation are major problems for migratory birds and resident fauna. As a result, hunting quality and activities have decreased. Through management of leased lands, the Minnesota Department of Natural Resources, and cooperating private organizations, have begun to reverse the changes in habitat.

B. Mud Lake:

The preservation of existing habitat and the creation of potholes in Mud Lake marsh areas have improved habitat conditions. Recent channelization of Mud Lake, to provide additional control over the conditions favorable to desired habitat, has been completed. Additional measures to restore and improve habitat are necessary if the wildlife population and resulting hunting are to be significantly improved.

C. Bois de Sioux:

The original stream was a typical Great Plains river. Above the confluence with the Rabbit River, it was shallow and meandering, with many oxbow lakes, sand bars, and large areas of marsh habitat. During dry cycles the stream had been known to dry up completely. The upper reaches of the Bois de Sioux River were channelized as part of the project construction in 1941. This destroyed the existing marsh and riparian habitat.

4. Disturbed Areas:

The channelization of the Bois de Sioux River resulted in the deposition of spoil piles, composed of material dredged from the river during the channelization, on the riverbanks.

5. Nuisance Plants:

Poison ivy, *Rhus radicans*, is common throughout the project area. Because the day use areas are small, poison ivy is easily controlled in high use areas. Of special concern to this project are the aquatic plants purple loosestrife and Eurasian milfoil.

Purple loosestrife, *Lythrum salicaria*, is an exotic wetland plant. Introduced from Europe and Asia in the 1800s, it has invaded 40 States and all of the Canadian border provinces. This plant is extremely invasive to wetlands and will crowd out native plant species. It is unsuitable for nesting, cover, or feeding habitat for most native wetland animal species and has no naturally occurring predators in the United States.

Eurasian milfoil, *Myriophyllum spicatum*, is also an exotic wetland plant from Europe. In shallow, nutrient rich lakes, such as Lac qui Parle, it forms an impenetrable mat of vegetation on the lake surface supported by thick underwater stands of tangled stems. This plant has had serious negative impact to water-based recreation in lakes where it has become established.

Both of these plant species are very hardy and are able to reproduce from root pieces and broken stems.

Both purple loosestrife and leafy spurge have been declared noxious weeds in Minnesota. As a noxious weed, control (defined as preventing its spread by seed or other propagating parts) is warranted. The Corps has been involved since 1975 in an effort to control noxious weeds on project lands.

Wildlife, Species and Habitat:

In general, the area in and around the Lake Traverse project is known as a superior wildlife area. The lakes receive heavy use from migrating waterfowl and provide excellent hunting opportunities. The adjacent lowlands of Mud Lake provide excellent cover for white-tailed deer, ring-necked pheasants, and other wildlife typical of the area.

Limiting factors to wildlife populations at Lake Traverse are the large amounts of land under intensive cultivation adjacent to the project, a general lack of dense nesting cover, the distance of the Mud Lake lowlands from available food sources, and the lack of adequate shoreline vegetation around the project due to fluctuating water levels.

For additional information on wildlife, see Section 1, Regional Resources and Influences, Chapter 3, Key Factors and Resources, WILDLIFE HABIT AND SPECIES; there is a tabular listing of wildlife species provided in Appendix D.

1. Mammals:

The white-tailed deer is the primary big game species in the project area. Project personnel have noted a general increase in the numbers of deer observed during normal working hours and at other times in the area (Salberg; personal communication). Data for Roberts and Traverse Counties indicate that the deer herd in the project area is improving. Regional trends are much the same and indicate that the herd is increasing, This situation could result in crop depredations and should be closely monitored.

Other mammals found in the Lake Traverse project area range from the tiny shrew to the coyote. The area's grassland and riparian habitats support a large variety of the smaller mammals. Moose, mule deer and pronghorn antelope are casual visitors to the project area. Cottontail rabbit, jackrabbit, red squirrel, fox squirrel, raccoon, and white-tailed deer are hunted with firearms during Minnesota DNR authorized seasons. Beaver, muskrat, mink, and raccoon are trapped for fur. Coyote, red and gray fox, badgers, weasels, and skunks, are also hunted and/or trapped during the late fall and winter.

2. Upland Birds:

The ring-necked pheasant is the most common upland game bird in the project area. Present populations are very low. Although Lake Traverse has a limited amount of habitat, the Mud Lake area provides excellent winter cover and protection for pheasants. To maintain a high pheasant population in the project area, dense cover and an abundant food supply are necessary.

High pheasant population levels in the northern states are strongly associated with large wetland acreages. The species' habitat requirements include ground cover that is heavy enough to hide and nest in and is undisturbed throughout the nesting season (through August 15). This requirement is only related to feeding habitat in that nesting cover must be within the feeding range of the brooding bird. Wetlands, surrounded by agricultural lands, fulfill these requirements. Wetlands also provide the major source of winter cover for pheasants, but here, dependence is on more specific vegetation types and much smaller acreages than are required for nesting.

Hungarian partridge are at stable population levels and use the agricultural fields in the area for both food and cover. Gray partridge prefer open, active, agricultural areas and are better adapted to deep snow and subzero temperatures than pheasants. A slight increase in the population would be expected if habitat improves.

3. Waterfowl:

Historically, the Lake Traverse project area has been recognized as a premier waterfowl hunting area. The project lakes serve as resting areas for migratory birds and as a loafing area for local breeding birds. Mud Lake has excellent potential as a waterfowl production area with its vast acreage of emergent vegetation intermingled with open water. Mallard, pintail, blue-winged teal,

gadwall, lesser scaup, northern shoveller, redhead, ruddy duck, and common coots are known to nest in the project area.

Canada geese were reestablished by Traverse County Sportsman's Club and the Minnesota DNR in 1990. The local sportsman's club transplanted giant Canada geese to the Mud Lake area to establish a resident flock and also to attract migrating geese.

4. Nongame Birds:

Two-hundred twelve species of birds have been found or observed in the Lake Traverse project area. Breeding birds are represented by 122 species recorded in the area. The most visible non-game bird in the area is the white pelican, which uses the lakes as a feeding and loafing area, but is not known to nest in the project area. The double-crested cormorant breeds on several islands in Lake Traverse, but is not found in large numbers. Several species of blackbird are very abundant in the marsh, shoreline, and grassland habitats surrounding the lakes. Swallows (barn, bank, tree, cliff, and rough-winged) are also very abundant and can be seen flying along the shoreline and open areas of the lake.

5. Amphibians and Reptiles:

There are 16 known species of herptofauna in the project area of which frogs, toads, turtles, and garter snakes are the most common. Salamanders are common to wetlands. The western hognose snake, bull snake, and great plains toad are typical prairie species. A seldom seen species is the western spiny soft-shell turtle.

6. Threatened and Endangered Species/Habitats:

No threatened or endangered plant species are known to exist in the project area. The U.S. Department of the Interior, however, has given special status to the following animal species that have been reported within the general area of the project:

- Arctic peregrine falcon, *Falco peregrinus tundrius,* listed as Federally Endangered;
- Bald eagle, *Haliaeetus leucocephalus*, listed as Endangered in South Dakota and Federally, listed as Threatened in Minnesota.
- River otter, *Lutra canadensis interior,* listed as Threatened in South Dakota;
- Spiny softshell turtle, *Trionys spiniferas,* listed as Threatened in South Dakota.

During late fall and early winter, bald eagles are reported regularly within the Lake Traverse project area, where they have been observed feeding on crippled waterfowl remaining from the hunting season. The project area lies within the traditional migration range of the peregrine falcon.

7. **Special Programs:**

A. Federal Agencies:

Corps of Engineers: Under Corps management, grain for wildlife is planted in low-lying bottomlands, lands that are not otherwise conducive to recreation. Hay meadows are also maintained to supplement the natural habitat areas. In addition, approximately 5,000 trees have been planted in the period 1987-1992, on both low-density recreation and wildlife management areas.

U.S. Fish and Wildlife Service: The North American Waterfowl Management Plan (NAWMP) is an international agreement between the U.S., Mexico, and Canada for the restoration of lost waterfowl habitat. Federal, State, private, and Provincial agencies cooperated under this plan for the conservation, development, and management of habitat for waterfowl and associated wetland species. On January 23, 1989, the Corps of Engineers and the U.S. Fish and Wildlife Service (FWS) signed a Cooperative Agreement which defined the goals, responsibilities, and procedures by which these two agencies will work together to further the efforts of the NAWMP. This agreement was in effect for three years from the date signed. The Corps agreed to identify opportunities at operating projects and coordinate management efforts with the FWS.

B. State Agencies:

The Minnesota Department of Natural Resources (MN DNR) leases approximately 872.4 acres from the U.S. Army Corps of Engineers at Reservation Dam. This area is used for public access and use. The area contains cover attractive to wintering wildlife. To provide a winter food source, a large feeder-crib holding approximately 150 bushels of ear-corn will be maintained for use by wintering animals.

The Minnesota DNR and South Dakota Department of Game, Fish, and Parks cooperates with several local farmers to leave unharvested crops as a winter food source.

C. Local and Private Organizations:

Several local sportsman's clubs, the Mud Lake Management Group, the Lake Traverse Lake Association, the Bois de Sioux Watershed, and local resort owners maintain an active interest in the project operations and activities.

Fisheries:

Due to high nutrient inflows, Lake Traverse is a highly productive lake with abundant populations of fish. These elevated nutrient levels often lead to heavy algae blooms, particularly during the mid-summer months. The young of abundant non-game fish provide forage adequate to support good populations of predators such as walleye, northern pike and yellow perch; fair

populations of black crappie, white crappie and bluegill; periodically, white bass are also abundant.

Because of its status as a boundary water, Lake Traverse receives considerable early fishing pressure and provides valuable local fishing for Minnesotans and South Dakotans. Fishing is best in spring and fall when it is possible to avoid the summer algae blooms. Fishing is considered "good" for white bass, crappie, and bullheads and "fair to poor" for walleye and northern pike.

Fishing is an important activity at Lake Traverse. Because Lake Traverse is a border water between Minnesota and South Dakota, the fishing season for walleye and northern pike on Lake Traverse opens about two weeks earlier than on inland Minnesota lakes. In addition, fishing is often better in the spring before the young forage fish have been produced for the year and while water temperatures are still cool. This results in heavy fishing pressure on lake resources.

The 1992 Lake Traverse Creel Survey, conducted by the Minnesota Department of Natural Resources, states: "The total estimated pressure for the winter and summer creel surveys combined was 29,006 angler hours. This corresponds to 2.5 angler hours per acre which is low compared to the statewide average of 8.6 for other similar sized lakes... The low angler use for Lake Traverse was apparently due to a combination of two factors. First, anglers described fishing as "pretty slow" during the survey year... Second, and probably more significant was the fantastic walleye fishing that occurred at nearby Big Stone Lake from October 1991 through September of 1992, and angler trips that normally would have been made to Traverse Lake were made to Big Stone Lake instead." Fishing success since this creel survey has improved. Current fisher success is described as good (Salberg; personal communication).

During the mid-summer months, predatory fish find ample forage and become reluctant to bite. During this period, algae blooms generally affect all water based recreation. In the fall, fish begin to feed more heavily and algae begins to die back, resulting in higher fishing pressure again.

For additional information on fishing, see Section 1, Appendix C, Environmental Resources, Table C-14.

1. Habitat Conditions:

Lake and stream environments for aquatic biota are being degraded through siltation resulting from wind erosion on nearly all lands and from wind and water erosion on slopes. Water quality problems in Lake Traverse and Mud Lake are adversely affecting aquatic habitats and biota. Winterkills occur periodically in these two lakes as a result of depressed oxygen levels. This results in the natural selection of rough fish. Poor water quality due to algae blooms, and lake turbidity caused by wave and wind action tend to limit habitat and suitable spawning sites for game and pan fish. Intermittent streamflows and low dissolved oxygen levels in the Bois de Sioux River are also affecting aquatic populations. The States of Minnesota and South Dakota participate in a program that removes rough fish and stocks walleye, northern pike and crappie,

but until water quality is upgraded, habitat conditions cannot be expected to improve. Rough fish will remain predominant.

2. Species:

The lake is very productive and contains a large population of rough fish, predominantly carp, buffalo fish, bullheads and sheepshead. Fishing is best in spring and fall when the summer algae blooms can be avoided. Fishing is considered good for white bass, crappie, bullheads, walleye and northern pike. For additional information, see Appendix C, Appendix C, Environmental Resources, Table C-14.

Open Space and Visual Quality:

The Lake Traverse Project, is long and narrow, lying at the bottom of what, at first glance, is a wide, sballow valley. Interest is piqued by the knowledge that this is the bed of a once great river and very large lake (For additional information, see Section 1, Regional, Chapter 1, Description).

Federal land around this project is classified as floodplain. The majority of land is low and subject to flooding. Much of the land is wet and consists of marsh and bottomland hardwood vegetation. Sections of land that appear to be dry are open, lack significant vegetation, and are not visually pleasing. Soils in general are wet and subject to erosion. The lack of substantial vegetation and the resulting open character of the land discourages recreation development. The area is exposed to the wind and sun and lacks many of the aesthetic qualities that are associated with recreation in this region; i.e., trees, clean water, and a sense of enclosure.

Visual Resource Evaluations for the White Rock Dam, Reservation Dam, and Browns Valley recreation areas are presented in Section 1, Appendix D, Visual and Cultural Resources. The Lake Traverse project areas rated less than average for the Western Minnesota Flood Control Projects.

1. Lake Traverse:

The character of the lake is extremely open. The bluffs that are evident at the south (Browns Valley) end are farther away at Reservation Dam and even less apparent at White Rock Dam. There is little vertical relief, and the lack of significant vegetation contributes to the subdued colors and the open and exposed nature of the landscape. There are no vantage points on Corps regulated lands from which to attain any sort of perspective of the lake's true size. Because of its shape (±1 mile wide by 17 miles long), the lake is perceived as a series of separate places. This feature means that the lake can be used in many different ways. Land uses that normally would be in conflict (i.e., wildlife viewing and an intensive use recreation area) are amenable here.

Privately owned portions of the lake edge are wooded, with steep, high banks on the southwest side. Other parts of the shoreline are flat and heavily cultivated with little visual interest. Many areas of the lake are wetland, with large tracts of cattails and other moisture loving plants. These areas offer the greatest visual interest, with narrow waterways winding through the brilliant green

vegetation. This is prime habitat, and many types of animals and fowl can be observed in these watery byways. In the autumn, the cattails turn a golden brown and the water can be covered (literally) by many thousands of migrating ducks and geese.

2. Mud Lake:

Mud Lake is even more open than Lake Traverse. The low bluffs to the east are shrouded by large cottonwood trees and other riparian vegetation. The bluffs to the west are too distant, and the topography too subtle, to be noticeable. There are a few trees along the river edge below the dam. Adjacent land use is mostly agricultural with some wildlife management areas. The strongest visual impression is the tremendous expanse of sky. The view to the north is of the Red River Valley (the dry bed of Glacial Lake Agassiz); it extends to the distant horizon without relief.

Mud Lake is aptly named. For most of the year, the lake is a shallow marsh (type 3 wetland), with many acres of cattails. This lake was once prime waterfowl habitat, but siltation has decreased water levels to the point that the marsh has few areas of open water; the vegetation is almost impenetrable. Trapping of muskrats, which feed on cattails, is not restricted. The cattails provide momentary visual interest in the same way that tall grasses do, but there is nothing to hold the eye and interest quickly fades.

Cultural Resources:

The Lake Traverse project area has high value as an archeological and historical resource. It lies on a major travel corridor for both the indigenous peoples of North America and the European immigrants that displaced them.

The area has been used by various human groups from about 8000 B.C. The early users were nomadic hunting groups. Climatic changes brought about varying uses (or non-uses) of the area. Evidence of the users is found only in habitation and burial sites. Our knowledge of these early peoples is very limited.

In the more recent history of the area, the Sioux (Dakota) Indians lived a semi-nomadic hunting and gathering life in the vicinity of Lake Traverse before European colonization. The channel of the Ancient River Warren (including the Minnesota River Valley) was almost certainly a focal point of the eastern plains Indians. The abundance of game, shelter from prairie winds, and the availability of firewood, a rare commodity on the plains, made the valley a desirable area for winter encampments. In addition, Big Stone Lake, headwaters of the Minnesota River, is only a few miles from the continental divide at Lake Traverse (see Section 1, Regional Description). From this locale, it is possible to access either Hudson Bay (via the Bois de Sioux, Red River of the North, etc.) or the Gulf of Mexico (Minnesota River to the Mississippi, etc.) by relatively easy water travel. This would indicate that this area was extremely important to the region as a trade and travel corridor.

White settlement, which began after the Dakota ceded lands at the Treaty at Traverse de Sioux in 1851 was disrupted by the uprising of 1862. Immigrants of European heritage first settled near the rivers and overland transportation routes. Again, the timber of the floodplain forests and the availability of relatively easy waterborne transportation proved to be the major attraction of the area. Steamboats were used on some of the area lakes, but the rivers proved to be too unreliable for large boat operations. In the 1870's, wheat farming became a major industry because of the region's fertile soils. The expansion of agriculture as the major industry in the region was the driving force behind the drainage of most of the region's many marshes and sloughs, and their subsequent conversion to cropland. The demise of the tremendous bison herds and other major animals native to the plains meant that areas that were unsuitable for cropping could be used for cattle grazing, especially the drier western parts of the region, the often flooded river bottoms, and those areas with untillable, rocky soil.

On the basis of current information about cultural resources, it can be anticipated that a wide variety of significant prehistoric, historic and geologic features occur in the Lake Traverse area. Though their potential is yet to be realized, it seems likely that many sites may be suitable for public interpretation.

In 1966, the Ancient River Warren Channel was formally recognized as a Registered Natural Landmark. Both Minnesota and South Dakota have erected highway markers to commemorate this geological feature. Regulations require that any Corps project in the vicinity of the Ancient River Warren be evaluated in terms of its impacts on this natural landmark.

1. Inventory of Known Sites:

Known prehistoric sites in the Lake Traverse vicinity, but not necessarily on Corps fee title or project related flowage easement lands, include petroglyphs, burial mounds, rock cairns, earthworks, and habitation sites. The historic sites are trading posts, established by the fur traders, the Sisseton Sioux Indian Agency, a major military trail, military forts, and settlements. These sites have been identified from early survey records, settlers reports, and artifacts which appeared when the ground was disturbed by agricultural and construction activity.

Many of the sites have not had their reported field locations verified. As systematic surveys of flowage easement lands are completed, the scientific and educational potential of the cultural resource base will be assessed and procedures will be established for its protection and development.

For additional information on cultural resources, see Section 1, Regional Aspects, Chapter 2, Description.

ADMINISTRATIVE AND POLICY FACTORS:

Administrative and policy factors involve Corps of Engineers responsibilities, regulations and restrictions for the overall management of Lake Traverse. Also included are regulations,

programs, and goals of other public agencies or private groups whose responsibilities overlap with those of the Corps. Key administrative and policy factors in planning for resource use at Lake Traverse include: the status of project lands, Corps land stewardship responsibilities, and local sponsorship requirements for fish and wildlife enhancement or recreation development.

Project Land Status:

The status of project lands is discussed briefly in this section, Chapter 1, Project Description: Project Lands and is illustrated on Plates 21, 22, and 23. Additional information is available in Appendix E, Land Use Classification. The following paragraphs discuss the influences and constraints placed on resource use, management and development by project land status.

1. Fee Acquired Lands:

Project lands owned in fee by the Federal Government at Lake Traverse total 1,144.13 acres. The Corps of Engineers has management authority and responsibility for all fee acquired lands. Initial land acquisition was 1,348.13 acres for construction and operation of the Lake Traverse project; 204 acres were later declared surplus and sold.

2. Flowage Easements:

The Corps has acquired flowage easement rights on 6,172.25 acres. The only interest or privilege the Corps has in these lands is the right to periodically inundate them during controlled flood events and to restrict the building of permanent structures on them.

3. Outgrants:

There are currently 16 active outgrants of project lands to other agencies, entities or individuals, to be managed for uses that are consistent and compatible with authorized project purposes. These outgrants convey varying rights and responsibilities for management of project resources to the outgrantees. The greatest number of outgrants are roads and utility rights-of-way. They generally allow the outgrantee the right to construct, use, operate and maintain roadways and utilities crossing project lands. In addition, there are a number of outgrants to other agencies for wildlife management purposes.

A. Roads:

There are nine outgrants for roads on or through the Lake Traverse project.

B. Utilities:

There are five utility outgrants on the project: one telephone, two electrical, one cable television, and one water main.

C. Wildlife Management:

There are 879.6 acres outgranted to the Minnesota Department of Natural Resources for wildlife management purposes. License number DACW22-3-86-5010 is effective 1 January 1986 to 31 December 2010. It is managed primarily to ensure public use of the land. Parking space and an

access for fishing are provided. There are no structures; this land is frequently flooded. The latest Annual Management Plan is dated 26 February 1990. There is no charge to the State for this land; no visitation records are kept.

D. Recreation:

Traverse County is granted 9.6 acres under lease for intensive recreation purposes. License number DACW22-1-85-5002, effective 1 May 1984 to 30 April 2004, is for a public use area on the Mustinka River. The park has two privies, a graveled boat ramp, a small dock, and parking. This is a primitive type park with no fees, no concessions, and no water systems.

4. Excess Project Lands:

All real property and interests are required for project purposes and are recommended for retention.

Resource Management Responsibilities:

The Corps of Engineers is responsible for the management of the cultural and natural resources of the Lake Traverse project. A number of general authorizing laws and regulations set forth the responsibilities of the Corps for initiating progressive resource management programs. These public laws and regulations are summarized in Appendix E. These laws direct that natural resource management be integrated with other project resources and activities under a concept of multiple resource use. Regulations (ER 1130-2-400) direct that, whenever the opportunity exists, management techniques to improve vegetative conditions for wildlife, recreation, scenic value, cultural resources, fire prevention, pest control, and watershed protection be properly implemented. Specific management objectives are to be based upon the land use designations that are introduced in this Master Plan. Subsequent refinement and definition of these concepts will be found in the Operational Management Plan.

Programs supporting State and local involvement in natural resource management have been developed by the Corps in keeping with good land stewardship responsibilities.

Under Title 36, Chapter III, Section 327, Code of Federal Regulations: to ensure the health, safety and welfare of the public, Corps employees have the authority to issue citations enforcing those regulations; however, they do not engage in actual law enforcement. Local law enforcement authorities (county and State police) retain statutory authority and the responsibility to enforce all other laws. Corps employees coordinate with them and contact them in the event of a major disturbance.

1. Project Personnel:

The office and maintenance facilities for Lake Traverse are located near White Rock Dam. Project personnel are responsible for the operation and maintenance of the project. They also coordinate and implement the Federal and non-Federal resource management programs.

The Lake Traverse Resource Manager is responsible for all aspects of the management and administration of the resources of the project. These responsibilities include: range management, fish and wildlife management, soil erosion control, educational and interpretive programs, law enforcement, pest control, administration and inspection of public use areas and other project lands, and visitor and employee safety programs. Other duties include, but are not limited to, supervision of project employees, public relations, and inspection of outgrants, as required. The Resource Manager also supervises the Lake Orwell project.

The Resource Manager and a maintenance worker are the only permanent full-time employees at the project. There is also one permanent seasonal maintenance worker and one permanent seasonal part-time office clerk.

CHAPTER 3 – PROJECT-WIDE RESOURCE OBJECTIVES

This chapter presents the Resource Objectives for the Lake Traverse Flood Control Project. These Resource Objectives are in support, and a refinement, of the Regional Resource Objectives identified in Section 1 of this document. Project Resource Objectives reflect the specific resources, capabilities and restraints of the Lake Traverse project. They specify how those resources are to be managed in response to the current and projected public needs and desires that have been identified.

PROJECT OPERATIONS:

1. Objective:

To continue to operate the Lake Traverse Flood Control Project with safe, efficient, cost effective procedures that provide the level of flood control and downstream flow regulation authorized by Congress.

2. Rationale:

The Lake Traverse project is authorized by Congress for flood control and regulation of downstream flows of the Bois de Sioux River and the Red River of the North. In addition to operating for these mandatory purposes, the Corps is directed in general legislation to manage the other lake resources including water quality, fish and wildlife, and recreation. Achieving these secondary purposes must be incidental to the authorized project purposes and may not conflict with them.

Seasonal water levels are governed by regulation periods established as part of the operating plan for the project (see Section 1-3). This plan is a function of seasonal precipitation and runoff patterns and indicates the desired flood control and storage requirements during the year. Operation of the Lake Traverse Project according to the operating plan has been assumed during the formulation of the Resource Objectives presented in this Master Plan.

RECREATION, LOW DENSITY:

1. Objective:

To provide high quality recreation opportunities that are consistent with the authorized project purposes.

2. Rationale:

Fishing is a popular pastime at Lake Traverse, and occurs year-round. The project is renowned for its high quality waterfowl hunting. Both of these recreation activities are important to the area economy, and important providers of popular regional recreation opportunities.

RECREATION, INTENSIVE AND DAY USE:

1. Objective:

Improve existing facilities by making them safer and more accessible to all persons for the purpose of providing fully accessible, quality day-use recreational opportunities that will help meet the existing and projected recreational needs of the region.

2. Rationale:

The project currently provides opportunities for hunting, fishing, picnicking, and other day-use activities. These opportunities should continue to be provided. Changes in the existing allocation of project resources would not significantly increase the benefits derived from the project; therefore the existing management policies should continue in effect. Efforts should be made to protect the ability of the resources to provide day-use recreational opportunities.

The project does not meet current accessibility standards. Wherever necessary, facilities should be modified or constructed to provide or improve accessibility and reduce existing or potential health and safety problems. Examples include traffic circulation problems at the recreation areas during high use periods, and the lack of accessible sanitary facilities at all sites. Improving accessibility to these areas in general will also make the areas less congested and safer for all users of these sites.

Results of a statewide recreation survey conducted by the Minnesota Department of Natural Resources indicate a need for increased fisheries management and public fishing accesses in the region. There is also an expressed need to develop additional swimming, bicycling, camping, and hiking facilities. The State Comprehensive Outdoor Recreation Plan (SCORP) recommends that State and Federal agencies expand their programs to provide increased hunting opportunities.

FISHERIES:

Game Fish:

1. Objective:

To continue to cooperate with other agencies to maintain a high quality, productive fishery on project lakes.

2. Rationale:

Fishing is an important recreation resource for this project. About 60 percent of the total visitation participates in fishing related recreation. Anglers are important contributors to the area economy.

Game fish in the lake include walleye, northern pike, crappie, bluegill, channel catfish, and white bass; walleye is the most sought after species.

Non-game Fish:

1. Objective:
In cooperation with the Minnesota Department of Natural Resources, continue management methods and techniques to limit reproduction of rough fish species.

2. Rationale:
Rough fish harvesting by private contractors is regulated by the Minnesota Department of Natural Resources. Actions of rough fish contribute to highly turbid water conditions in the lake by disturbing bottom sediments. These resuspended bottom sediments contribute to the high turbidity levels of the lakes. In addition, large populations of rough fish can out-compete the lake game fish for available resources and space.

WATERFOWL:

1. Objective:
Continue to cooperate with private and State agencies to restore habitat and improve conditions for waterfowl.

2. Rationale:
Lake Traverse is located on one of the major North American flyways for waterfowl. Because of this, waterfowl, in economic terms, are the most important wildlife species within the area. Waterfowl hunting, in particular goose hunting, accounts for the largest share of the total hunting activity of the area. As such, waterfowl hunting has a positive economic impact within the area. In addition to hunting, the project offers excellent opportunities for observation and photography.

WATER QUALITY:

1. Objective:
To continue to work to improve the water quality of Lake Traverse and the Mustinka River, in cooperation with Federal, State, local, and private agencies.

2. Rationale:
Improving the water quality of Lake Traverse and the Mustinka River will also improve water-based recreation opportunities and the quality of wildlife habitat and fisheries. As a "Warmwater Game Fish Lake," Lake Traverse has a positive impact on the area economy. The lake has a history of winter fish-kill due to oxygen depletion. It also experiences massive blue-green algae blooms due to excessive (tributary and internal) nutrient flux. High turbidity

limits the growth of desirable submerged vegetation. All of these are the result of poor water quality, and all of these water quality related problems stress the lake fishery, lowering sport fish populations and the fishing success ratio.

These water quality problems also affect other forms of recreation on and about the lakes. The appearance and foul odor affect such activities as: all types of recreational boating, swimming and other water contact recreation, picnicking, nature observation, and sightseeing.

CHAPTER 4 – MANAGEMENT UNIT OBJECTIVES

Management Unit Resource Objectives are the site specific applications of the Project Resource Objectives which, in turn, are a refinement of the Regional Resource Objectives. Implementation of these unit objectives will help satisfy the regional needs and the expressed desires of the public and of other agencies, within the limits and capabilities of the resource base and according to the authorized project purpose.

Unit Description:
A brief description of the unit with a focus on the cultural and natural resources that affect resource use. The description will include:

A. Size and Shape:

B. Location and Access:

C. Existing Site Use:

D. Adjacent Land Use:

E. Soils and Topography: Soil Descriptions are from The United States Department of the Interior, National Resource Conservation Service (USDA NRCS)

F. Vegetation:

G. Wildlife Species and Habitat Availability:

H. Cultural Resources:

I. Limitations and Hazards:

Land Use Classification:
The current classification of the unit.

Resource Objectives:
Identifies and describes the unit objectives. Each unit may have several Resource Objectives.

Rationale:
Discusses the need for, and the intent of, the identified unit Resource Objectives and the management strategy and development concepts recommended to implement them.

Federal facilities are obligated by law to meet the requirements of the Rehabilitation Act of 1973 (amended 1975) Title V, Section 504 (Title V). If a site is noted as non-accessible (Unit Description: 3. Existing Site Use:), Title V is assumed as the rationale for meeting current accessibility standards.

Implementation Plan:
A summary description of the techniques that could be undertaken to implement the unit objectives. The concepts presented here are not intended to be all inclusive. They simply convey an understanding of the range of development and management strategies that could serve as a means to implement the objectives. The concepts presented here will be presented in detail in subsequent planning and design documents. This includes Project Operations Plans, Feature Design Memorandum, and Plans and Specifications. The actual methods that are used will be decided on by the Resource Manager, staff from other Corps elements, and other agencies where it is appropriate.

Constraints:
A summary of factors that may influence implementation of the Unit Resource Objectives. These factors may be regional, administrative, site specific or a combination of these sources.

UNIT A, WHITE ROCK DAM DAY USE AREA:

Unit Description:

A. Size and Shape: This recreation facility is a Day Use Area (DUA); the site is roughly rectangular, with an area of approximately 3 acres (see plate 3).

B. Location and Access: This recreation area straddles the Bois de Sioux River (the state boundaries) directly below the dam. It is accessed by Traverse County Road 10 and South Dakota State Highway 127.

C. Existing Site Use: A graveled parking lot on the east (Minnesota) side of the river will accommodate approximately 35 vehicles. It is used for shoreline fishing, hunting access and wildlife observation and serves as overflow parking for the west bank area. All other facilities are on the west side of the river. They include a graveled parking lot (for about 20 vehicles) with designated parking space for disabled persons, a children's play area, accessible vaulted restrooms, potable water supply, a picnic shelter, a picnic area with grills, benches, information kiosk and a fish cleaning area.

Recreational uses vary with the seasons and include: picnicking, bank fishing (rod and reel and bow and arrow), sightseeing, and wildlife observation. The site is also used as a hunting access to the nearby Wildlife Management Areas.

D. Adjacent Land Use: This site is adjacent to large Corps managed wildlife areas to the west, north and south, and to agricultural land to the east.

E. Soils and Topography: The Day Use Area is on a built-up area that extends into low-lying wetlands. There are low bluffs directly to the east; they are the only topography of substance within sight. This region in general is an ancient lakebed and is extremely flat.

Soils in this area are in the Arvilla-Hubbard-Dorset series. They are formed mainly in outwash sediments and can be in glacial drift overlying outwash sediments (USDA NRCS).

F. Vegetation: Wetland vegetation, mostly cattails, surrounds the site. The site proper has a few planted trees and turf grass. There are adventitious cottonwood trees growing from the spoil banks along both sides of the river.

G. Wildlife Species and Habitat Availability: Although the site offers little wildlife habitat, the proximity of a major Wildlife Management Area (Upper Lake Traverse State Wildlife Management Area and also Mud Lake) ensures a variety of wildlife. For a listing of wildlife species of the area, see Appendix C, Environmental Resources, Wildlife.

H. Cultural Resources: The Lake Traverse project fee title lands were surveyed in 1984. No cultural resources were found in the day use area west of the river. Prehistoric site 21TR35 is located east of the parking area on the east side of the river, Its National Register of Historic Places eligibility status has not been determined..

I. Limitations and Hazards: Development of this site is limited by the available land area. The surrounding wetlands are protected under Federal and State laws.

The site is located on a high speed highway. Access from the overflow parking (east side) to the Day Use Area is on this roadway, over the dam. This presents a hazard for pedestrians, especially during peak recreation periods when vehicles are parked on the roadway, restricting the traffic flow and sight lines.

The entrance to the Day Use Area is adjacent to the dam. The slope of the driveway from the roadway to the parking lot is steep, with poor sight/distance visibility.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational activities by the visiting public, ..."

Resource Objectives:
Provide safe public access for low to moderate levels of river-based recreation use, including fishing, picnicking, and wildlife viewing.

Eliminate accessibility deficits. Develop facilities that will provide tailwater fishing opportunities to persons with limited personal mobility.

Continue with improvements that will increase the comfort, safety, and enjoyment levels of the users of this area.

Rationale:
White Rock Dam Day Use Area is currently managed as a high-density recreation area, providing managed public access to the tailwaters of White Rock Dam and the Bois de Sioux River. There are few river-based recreation areas in the vicinity. As such, this site fills a need for public river access. This site is easily adaptable for an accessible fishing area.

Implementation Plan:
Site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

Constraints:
No constraints to the stated resource objectives have been identified.

UNIT B, MUD LAKE:

Unit Description:

A. Size and Shape: Mud Lake (White Rock pool) is about 7.5 miles long measured from White Rock Dam to Reservation Dam. Conservation pool, at elevation 972.0, has a maximum width of 2.5 miles, an average depth of 1.7 feet, and storage capacity of 6,500 acre-feet. At full pool, elevation 981.0, capacity is 85,500 acre-feet. Because of limited inflow and high evaporation rates, much of the time the "pool" is a large cattail marsh.

B. Location and Access: The lake can be accessed from two Corps recreation areas, one on each end of the lake. Reservation Dam Day Use Area is located on the downstream side of Reservation Dam, adjacent to the control structure. It is accessed via Minnesota State Highway 117, and Roberts County (S. Dak.) Road 23. White Rock Dam Day Use Area is located directly below the White Rock Dam and is accessed by Traverse County Road 10 and South Dakota State Highway 127.

C. Existing Site Use: Most of the year Mud Lake is a large marsh. It is used as a flood water storage facility during periods of high water on Lake Traverse; it is frequently inundated. The lake is a Wildlife Management Area managed primarily for waterfowl.

D. Adjacent Land Use: Adjoining lands are agricultural.

E. Soils and Topography: This area is floodplain marsh. It is extremely flat.

Soils in the area are in the Arvilla-Dorset-Hubbard series. These are soils formed mainly in sediments of outwash or in glacial drift that is overlying outwash material (USDA NRCS).

F. Vegetation: The "lake" is mostly marsh, and is covered with a dense growth of cattails and other wetland vegetation.

G. Wildlife Species and Habitat Availability: This is a Wildlife Management Area, primarily wetland habitat.

H. Cultural Resources: The Lake Traverse project fee title lands were surveyed in 1984. Project flowage easement lands have not been surveyed for cultural resources. Historically, the lake is the center of a very large marsh; cultural resources sites probably exist along the edges of the marsh and may exist on areas of higher ground within the marsh. Both White Rock Dam and Reservation Highway Dam are eligible to the National Register of Historic Places.

I. Limitations and Hazards: As wetland, the lake is protected by Federal and State laws.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Multiple Resource Management; "Lands managed for one or more ... activities ... compatible with the primary allocation...."

Resource Objectives:
To continue to promote wildlife species diversity and provide opportunities for low density, wildlife based recreation activities.

Continue to cooperate with local interests in the restoration of wetland habitat.

Rationale:
Mud Lake contains the best waterfowl habitat at the Lake Traverse project and is ideal for wildlife management. The existing area is capable of sustaining a large population of various waterfowl, and also many other types of wetland dwelling species. Wildlife based recreation contributes substantially to the area economy.

Implementation Plan:
Area improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of

the recommended objectives, implementation will be done in the course of normal maintenance schedules.

Constraints:
No constraints to the implementation of the unit resource objectives have been identified.

UNIT C, RESERVATION DAM DAY USE AREA:

Unit Description:

A. Size and Shape: This recreation facility is a Day Use Area; it is about 2 acres in size, and is surrounded by Corps managed wildlife lands (See Plate 4).

B. Location and Access: The recreation area is located on the downstream side of Reservation Dam, adjacent to the control structure. It is accessed via Minnesota State Highway 117, and Roberts County (S.D.) Road 23.

C. Existing Site Use: The graveled parking area accommodates approximately 16 vehicles. There is a picnic area with grills, benches, vaulted restrooms, and a playground. A fish cleaning area and public information kiosk are also available. Recreational uses vary with the seasons. Picnicking, sightseeing, wildlife observation, hunting access, and bank fishing are popular uses. There is a boat access to Mud Lake that is used for waterfowl hunting and for fishing. Bank fishing is done along both sides of the downstream channel of the dam. A catwalk located on the downstream side of the dam structure is also a popular area to fish from. Many sportsmen park on the dam structure/highway to fish on the upstream side of Reservation Dam (Lake Traverse).

This area does not meet current standards for accessibility.

D. Adjacent Land Use: Land surrounding this site is managed for wildlife.

E. Soils and Topography: This site is located on the floodplain of Mud Lake. As such, it lacks vertical relief and is frequently inundated.

Soils in the area are in the Arvilla-Dorset-Hubbard series. These are soils formed mainly in sediments of outwash or in glacial drift that is overlying outwash material (USDA NRCS).

F. Vegetation: There are a few scrub trees and a small area of mown grass on the site. It is surrounded by marsh vegetation and/or water.

G. Wildlife Species and Habitat Availability: Although the site proper is lacking in habitat, cover or concealment, the proximity of the associated Wildlife Management Area insures plentiful species variety and availability.

H. Cultural Resource: The Lake Traverse project fee title lands were surveyed in 1984. No cultural or historic sites were found in this area. Historically, this site was in the center of a very large marsh; because of this, it is unlikely that anything significant exists here.

I. Limitations and Hazards: Development of this site is limited by the available dry land area. The surrounding wetlands are protected under Federal and State laws.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational activities by the visiting public, ..."

Resource Objectives:
Provide safe public access for low to moderate levels of river-based recreation use, including fishing, picnicking, and wildlife viewing.

Eliminate accessibility deficits. Develop facilities that will provide tailwater fishing opportunities to persons with limited personal mobility.

Continue with improvements that will increase the comfort, safety, and enjoyment levels of the users of this area.

Rationale:
Reservation Dam Day Use Area is currently managed as a high-density recreation area, providing managed public access to the tailwaters of Reservation Dam (Bois de Sioux River). There are few river-based recreation areas in the vicinity. As such, this site fills a need for public river access. With its flat topography, this site is easily adaptable for an accessible fishing area.

Implementation Plan:
Site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

Constraints:
No constraints to the stated resource objectives have been identified.

UNIT D, LAKE TRAVERSE:

Unit Description:

A. Size and Shape: Lake Traverse pool is about 16.5 miles long measured from the Reservation Control Dam to the dike at Browns Valley. It averages about 1.25 miles in width with an average depth of 10 feet. At project conservation pool, elevation 976.0, the capacity is 106,000 acre-feet and at full pool, elevation 981.0, the capacity is 164,500 acre-feet.

B. Location and Access: Lake Traverse can be accessed from two Corps Day Use Areas: Browns Valley is on Minnesota State Highway 28 and South Dakota State Highway 10; it is on the border. Reservation Dam is on Minnesota State Highway 117, and Roberts County (S.Dak.) Road 23, also on the border. There are also numerous areas, both public and private, that provide access on both sides of the lake.

C. Existing Site Use: Lake Traverse is the main conservation pool of the project. It enjoys a reputation within the State as a premier fishing lake. The lake supports several small private resorts.

D. Adjacent Land Use: There is a variety of land use around Lake Traverse. Much of the adjacent land is under intense agricultural use. There are many private homes and cabins along the shoreline and several small private resorts.

E. Soils and Topography: Federal land around the lake is generally floodplain, flat and subject to frequent inundation. The southwest portion of the lake (the Browns Valley end) rises rather steeply from the water and is privately owned.

Soils in the area are in the Arvilla-Dorset-Hubbard series. These are soils formed mainly in sediments of outwash or in glacial drift that is overlying outwash material (USDA NRCS).

F. Vegetation: There is some wetland vegetation along portions of the shoreline. Most of the shoreline is cultivated.

G. Wildlife Species and Habitat Availability: There are Wildlife Management Areas at the north end of the lake. The wooded bluff areas and adjacent farmlands also provide habitat for upland species of wildlife.

H. Cultural Resources: The Lake Traverse Project fee title lands were surveyed in 1984. Two sites were found on fee title land at Lake Traverse, including the now inundated old Dakomin townsite, and a historic farmstead at the Reservation Highway Dam embankment. Both the Reservation Highway Dam and the Browns Valley Dike are eligible to the National

Register of Historic Places. Project flowage easement lands, including islands in Lake Traverse, have not been systematically surveyed for cultural resources. There are several known burial mound sites, prehistoric villages, and former townsites on flowage easement lands at Lake traverse. Additional cultural resources sites are highly probable.

Land Use Classification:
In accordance with ER 1130-2-435, this unit is classified as Multiple Resource Management: Wildlife Management General.

Resource Objectives:
To maintain the Lake Traverse fishery as a highly productive recreation unit of the project.

Rationale:
Fishing is an important activity at Lake Traverse. Because of its status as a boundary water, the lake receives early fishing pressure, providing valuable local fishing opportunities for area residents of both States. These anglers make a considerable contribution to the local economy.

Implementation Plan:
Area improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

Constraints:
No constraints to the stated resource objectives have been identified.

UNIT E, BROWNS VALLEY DAY USE AREA:

Unit Description:

A. Size and Shape: This recreation area is in the shape of an "L" and is approximately one acre in size (See Plate 5).

B. Location and Access: Browns Valley Day Use Area is on the southern tip of the Lake Traverse Project, on the Minnesota/South Dakota border. It is accessed via Minnesota State Highway 28 and South Dakota State Highway 10.

C. Existing Site Use: There is a graveled parking lot which accommodates 15 vehicles. There is a picnic area with grills, vaulted restrooms and a kiosk for public information. The Continental Divide, elevation 977 feet NGVD, runs through this recreation area. Recreational uses are picnicking, bank fishing, sightseeing, wildlife observation and access to hunting areas.

This site does not meet current standards for accessibility.

D. Adjacent Land Use: Lands adjacent to the site are agricultural.

E. Soils and Topography: The site is very small, with little vertical relief. Soils of this area are in the Formdale-Aazdahl-Flom series; they are soils formed mostly in calcareous glacial till (USDA NRCS).

F. Vegetation: There is wetland vegetation along portions of the shoreline.

G. Wildlife Species and Habitat Availability: There are Wildlife Management Areas at the north end of the lake. The wooded bluff areas and adjacent farmlands also provide habitat for upland species of wildlife.

H. Cultural Resources: The Lake Traverse Project fee title lands were surveyed for cultural resources in 1984. No sites were found at this location. Prehistoric site 39RO45/21TR35 is located south of Browns Valley Dike. Browns Valley Dike is eligible to the National Register of Historic Places.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational activities by the visiting public, ..."

Resource Objectives:
Continue with improvements that will increase the comfort, safety, and enjoyment levels of the users of this area.

Eliminate accessibility deficits.

Implementation Plan:
Site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

Constraints:
No constraints to the stated resource objectives have been identified.

UNIT F, BOIS DE SIOUX RIVER:

Unit Description:

A. Size and Shape: This is a linear strip, encompassing the river and riverbanks, approximately 100-200 feet wide and about 30 miles long. The river starts at White Rock Dam and flows north to Wahpeton-Breckenridge, where it joins the Ottertail River to form the Red River of the North.

B. Location and Access: The river can be accessed from the White Rock Dam Day Use Area. This Day Use Area is on the South Dakota-Minnesota border, on Traverse County Road 10 and South Dakota State Highway 127.

C. Existing Site Use: This was a natural river that has been straightened and widened by the Corps as part of the flood control efforts authorized by Congress. The river serves as the boundary between the Dakotas and Minnesota.

D. Adjacent Land Use: Lands surrounding the river corridor are mostly agricultural, with some wildlife management areas.

E. Soils and Topography: The land in this area is an ancient lake bed, extremely flat. There are spoil piles on the riverbanks; they consist of the material dredged from the river when it was straightened and widened.

Soils in the area are in the Arvilla-Dorset-Hubbard series. These are soils formed mainly in sediments of outwash or in glacial drift that is overlying outwash material (USDA NRCS).

F. Vegetation: There are cottonwood trees growing on the spoil piles, and wetland plants (mostly cattails) growing within the banks of the river.

G. Wildlife Species and Habitat Availability: Historically, the river was a typical great plains river, winding and shallow, with many areas of marsh and other wetland types of habitat. It has been known to dry up completely during long periods of dry weather. The river served as a movement corridor for area wildlife, providing cover and concealment. Widening and straightening the river destroyed much of this habitat. Most of the river meanders were removed and the land was converted to farmland; despite this, the river corridor still serves wildlife, connecting the wildlife management areas and the remaining patches of habitat.

H. Cultural Resources:
Several bridges, two lithic scatter sites, and an historic archeological site have been recorded between White Rock Dam and just south of Wahpeton/Breckenridge. The channelized portion

of the Bois de Sioux River has never been systematically surveyed for cultural resources; additional sites may be present.

Land Use Classification:
This unit is classified as a Multiple Resource Management area.

Resource Objectives:
Work toward re-establishing wildlife habitat along the river corridor.

Rationale:
Additional habitat will benefit the waterfowl and other wildlife that already use the corridor. This, in turn will enhance the wildlife based recreation potential of the region.

Implementation Plan:
Area improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

Constraints:
No constraints to the stated resource objectives have been identified.

CHAPTER 5 – PLAN OF DEVELOPMENT AND DESIGN CRITERIA

This chapter introduces the recommended development for the Lake Traverse project. It presents a conceptual plan of physical development through the modification or expansion of existing facilities. These concepts are to be used as a guide in implementing the specific Resource Objectives and management and development concepts presented in Chapter 4. It also provides guidelines to planners and designers for facility design. This includes: architectural styles, landscaping, trails, signing and other features. These concepts are referenced to a specific management unit, or units, in which the proposed development(s) should occur illustrated conceptual plans for these units are provided.

GENERAL:
All developmental concepts discussed in this chapter are presented with the expectation that the guidelines of the Americans With Disabilities Act will be adhered to. All design guidelines provided here are to conform to the Uniform Federal Accessibility Standards.

The three day use areas of the Lake Traverse project are similar in character and facilities. The land form of each of the sites is considered floodplain. They are all low, lacking in vertical relief, and are bordered by marsh or open water. There are few trees on them and a definite lack of a sense of enclosure. The size and surroundings of the sites limit their development potential. All of the sites are located on high speed roads, and have badly sited (dangerous) and inadequate parking lots.

Development Phases:

To promote the orderly development of the project resources, these concepts are presented in two phases: The Initial Development Phase and The Ultimate Development Phase. The priorities for these development phases are based upon projected regional needs, and expressed local desires, and on requirements for protecting project resources. Actual development schedules may vary depending on the capabilities and policies of the Corps of Engineers. Detailed cost estimates are beyond the scope of this Master Plan. All costs associated with specific developments and management actions will have to be fully evaluated and justified, according to current Corps policy, prior to initiation.

A. Initial:
This development phase is projected to occur over the next five years, 1994 - 1999. Existing facilities at the project are expected to meet visitor demand for this period. The emphasis during this period will be to replace and/or upgrade the existing project facilities so that they will continue to provide quality recreation experiences and an even distribution of use over all of the project's recreational facilities.

Special emphasis will be placed on promoting a diversity of recreational experiences that are accessible to all persons. Each site will have an accessibility inventory completed before any changes are implemented. All subsequent design and construction will prioritize elimination of accessibility deficits.

B. Ultimate:

The ultimate development phase will occur from about 1999 to 2009. Emphasis during this period will be on improving site circulation and safety. The long term development will focus on relocating site entrances, improving vehicular circulation within each site, and reducing pedestrian /vehicle conflicts.

CONCEPTUAL PLAN OF DEVELOPMENT:

White Rock Dam Day Use Area: (see Plate 6)

A. Initial:

Accessibility deficits should eliminated as a first priority. Additional trees should be planted around the periphery of the site (including the east parking lot), this would help to give the site some sense of enclosure and identity and would also provide shade. An accessible fishing area should be provided for the tailwaters. This could be a fishing platform or simply a flat area next to the water with a path, bench and shade.

B. Ultimate:

Realign the parking lot so that it parallels the road. This will open the center of the site for use and reduce pedestrian hazards from automobile traffic. Relocate the entrance farther west, graded so that the slope is reduced and visibility is increased. This will reduce traffic congestion on the dam and increase sight/distance lines. Paving and striping the parking lot will reduce congestion because parking will be maximized (and organized). The dam also serves as a pedestrian crossing for the Bois de Sioux River. These measures will reduce the congestion in that area and increase safety considerably.

Part of the current parking lot will be used for the play area, which would be relocated for the new parking configuration. If needed, additional picnic facilities could be located north of the creek.

Reservation Dam Day Use Area: (see Plate 7)

A. Initial:

Accessibility deficits should be eliminated as a first priority. Additional tree plantings would contribute greatly to site comfort levels (aesthetics, shade, enclosure, etc.). Improve playground facilities to current standards.

B. Ultimate:

Expand and pave the parking lot and redesign it to eliminate the dead end and maximize efficiency. Move the entrance farther east while reducing the slope of the entrance to improve sight lines and safety.

Browns Valley Day Use Area: (see Plate 8)

A. Initial:

Improve accessibility to all areas of the site. Initiate an approved planting plan to enhance the aesthetics of the site. Construct an informational kiosk that explains the significance of this area (River Warren, Lake Agassiz, etc.).

B. Ultimate:

Redesign and pave the parking lot to eliminate the dead end and increase capacity. Introduce a potable water supply to the site. Design and construct a picnic area.

The Bois de Sioux River:

A. Initial:

Initiate a program to re-establish wildlife habitat along the river corridor.

B. Ultimate:

Use Lake Traverse facilities as a support system (restrooms, parking, accesses, etc.) to complement a regional trail along the corridor that connects to other trails.

CONCEPTUAL DESIGN CRITERIA:

The remainder of this chapter identifies general design criteria for project recreational development. This criteria should be used as a guide by planners, designers, and developers for facility design, styles, themes, and materials.

Accessibility:

Accessibility for all persons, regardless of the level of their physical abilities, shall be a basis for all facility design.

Facility Siting:

All future facilities at Lake Traverse should be compatible with existing natural and man-made features. Detailed site analyses should be completed prior to design implementation.

Architectural:
All architectural elements shall conform to the most current design guidelines for accessibility. A consistent architectural theme and color scheme should be developed for the entire project. All future structures and modifications should be designed to be in harmony with their setting and should not be conspicuous. Where possible, natural materials and unobtrusive earthtone colors should be used. All structures should minimize construction costs, but design criteria should be adhered to. Structures should be designed for minimal maintenance and should be as vandal resistant as possible.

Roads:
There are no project roads.

Parking:
The conceptual development plans call for expanding and reconfiguring the existing parking lots. An adequate number of parking spaces should be provided to satisfy normal parking requirements during peak recreation periods.

Parking Lots:
Visually and aesthetically, large expanses of gravel or asphalt have a negative impact on natural areas. This impact can be softened or even eliminated with careful landscaping; wherever possible, the parking areas should be accented with shaded "islands" and edges. Parking lots should offer obvious, unrestricted traffic patterns with no dead ends. Because of the high speed access roads, entrances should have maximum obtainable sight distances.

Trails:
Because almost all the Federally owned property is marsh and wetland and the region and the immediate area are rural, there are no plans for any trails at this time. Should public response indicate that a trail is desirable, and if a qualified sponsor is available, a multi-purpose trail should be designed and constructed.

Landscaping:
Areas requiring site work should be landscaped upon completion of the work. Other areas disturbed through construction or other management activities should be landscaped. Landscaping should always be considered as the final stage of the activity.

1. **General:**

All planting described within this report, and all subsequent planting, should be coordinated between the field and tbe District Office. Utilizing the appropriate disciplines (landscape architects, foresters, botanists, resource managers, etc.) will ensure appropriate species selection and maximize the design potential of the planting.

The Lake Traverse Operational Management Plan will provide detailed instructions for planting and maintaining native plant species. Native plant communities and individual plant species for the area are listed in Appendix C, Environmental Resources, Vegetation, Tables C1 to C5. These are native plants and, in accordance with Corps policy, should be used wherever possible.

2. Landscape Plantings:

Landscape plantings for the Lake Traverse project should attempt to emphasize natural plant communities. Native plant materials should be used to maintain the character of the surrounding natural landscape. Straight rows and lines should be avoided Loose, informal groupings of native trees and shrubs should be used to screen, emphasize, frame or shade.

Dutch elm disease and oak wilt have claimed many trees in the past few years, and these losses will continue. Diseased trees on Corps property should continue to be removed and properly disposed of as part of the ongoing maintenance program. Trees that are removed should be replaced with native species that provide the same values as those trees that are lost.

Utilities:

The existing utility systems on the project are adequate to meet current and projected facility requirements.

1. Water Systems:

A water supply for the Browns Valley Day Use Area should be installed.

Signage and Other Informational Devices:

Project signage should communicate information effectively, and should complement, whenever possible, the surrounding environment. Project signs must be designed in accordance with the criteria prescribed in the Corps of Engineers Sign Standards Manual (EP 310-1-6a).

1. Special Considerations:

A. The consistency of overall signage within the project.

B. Entrance sign visibility. Entrance signs should stand alone and apart from other signage. They should not compete for visitor attention.

C. The resistance of sign material to vandalism and weathering.

D. Maintenance and removal procedures. The maintenance, removal, rehabilitation, and replacement of signs should be accomplished as quickly as possible.

2. Information Requirements:

Signs communicate information to project visitors and should be placed so that they are obvious to the uninitiated. Signs are required at (or for):

- Park entries.
- Park recreation facilities:

  picnic areas

  parking areas

  boat moorage/docks/launching facilities

  comfort stations/shower and dressing rooms

  sewage and trash disposal areas

  campgrounds

  swimming beaches

  interpretive centers

- Other project facilities:

  operations and maintenance compounds

  visitor information

  telephones

  first aid stations/information

  fire fighting equipment

  water safety equipment

- Other activity areas:

  hunting areas/safety zones

fishing areas

viewpoints/overlooks

trails

- Regulations:

  boating

  hunting/trapping

  fishing

  Title 36, C.F.R.

- Restricted activities or objects:

  off-road vehicles/snowmobiles

  horses

  hunting/trapping

  fires

  access

  firearms

- Personal or situational hazards:

  swimming/diving/wading
  - undertow/dangerous currents
  - hidden obstructions
  - deep water drop-off

  thin ice

  dangerous slopes and areas

automobile traffic

- Ecological Warnings:

  Eurasian milfoil

  zebra mussels

  purple loosestrife

  bait restrictions

3. Recreation and Project Area Signage:

On all project and recreation unit entrance signs: **"Lake Traverse "** should dominate the sign, with the park or unit name, and the administering agency, plainly visible but clearly subservient to the project name. Each entry sign should be preceded by a warning sign, 1,000 feet distant, that informs motorists they are approaching a Federal recreation area.

4. Site Information Centers:

Each developed recreation site should include an informational kiosk or, at a minimum, a bulletin board. These information centers should include: a map and descriptive legend of the Lake Traverse project, showing the relative location of project areas and facilities and the location of telephones and primary first aid facilities, a list of park rules and regulations, and an area for posting notices and other information.

The design of these information centers should be standardized for the project. They should be designed in such a manner that they can be prefabricated at the project and assembled on each site. They should be constructed so that they resist vandalism and weathering and are easily repairable.

5. Directional and Informational Signing:

Whenever possible, directional and informational signing should incorporate the Federally accepted graphic symbols for signs. They should be used on signage systems for both traffic control and recreation. All project signs should be located so that they are plainly visible from an adequate distance, and in such a manner as to avoid confusion or doubt in the mind of the first-time visitor.

Picnic Units:

Picnic units should be sparsely clustered with an average minimum spacing of 44 feet. This wide interval will reduce the usage impact on the immediate area (grass and other vegetation, soil compaction, etc.) and will result in less social conflict. Tables should be sited, whenever

possible, with a view of an area of interest. This is usually a view that includes a water feature, but may simply be an unobstructed view of the playground. Tables should be easily accessible, whenever possible, and should have a trash receptacle nearby. Each area shall have sites that are accessible to persons of limited physical mobility, and all tables should be usable by disabled persons.

Camping:

There are no camping sites at the Lake Traverse project. Due to the unavailability of suitable areas for camping, none are planned at this time.

CHAPTER 6 – PROBLEMS AND CONSTRAINTS

PROBLEMS:

Water Quality:

The water quality of Lake Traverse and the Mustinka River affects all aspects of water-based recreation and also the quality of wildlife habitat and fisheries.

The lake has a history of winter fish-kill due to oxygen depletion. High turbidity, the result of carp activity, wind resuspension of sediments, and inflow conditions, limits the growth of desirable submerged vegetation. The lake experiences nuisance blue-green algae blooms due to excessive tributary and internal nutrient flux. All of these are the result of poor water quality, and all of these water quality related problems stress the lake fishery, lowering sport fish populations and the fishing success ratio.

Massive algae blooms during the summer recreation season affect all other forms of recreation on and about the lakes. The appearance and odor detract from the enjoyment of such activities as recreational boating, swimming, and other water contact recreation, picnicking, nature observation, and sightseeing.

Vandalism:

Problems at this project, as with all of the projects in this master plan, are mainly centered around vandalism. The remote location of the site and the lack of on-site personnel combine to provide the ideal environment for the casual vandal. Under these conditions, "vandal-proof" is not an attainable objective. Gates are torn down using powerful four-wheel drive trucks; signage and other facilities are riddled by gunshot; graffito done at will. Repairing damaged facilities and structures is a large portion of the project operating budget.

CONSTRAINTS:

The major constraint for recreation development at the Lake Traverse project is directly related to the remote location of the project. All population concentrations of consequence are a considerable distance to the east. This means that sponsors able to afford a significant cost-sharing responsibility are few. In addition, innumerable recreation opportunities are situated closer to these heavily populated areas than the Lake Traverse project. Most of these "competing" recreation sources also tend to offer a greater variety of recreation types and a considerable array of amenities.

While this situation tends to act as a constraint on recreation development – due to the paucity of developed recreational opportunities in the immediate area – it also makes the limited facilities at the project more valuable to the local populace.

CHAPTER 7 – SUMMARY OF SIGNIFICANT FINDINGS AND RECOMMENDATIONS

SUMMARY OF SIGNIFICANT FINDINGS:

Within the constraints of operating the Lake Traverse project for its primary authorized project purpose of flood control, the Federally administered land and water areas of the lake can also be managed to help fill other regional resource needs. An examination of Corps administration policies at the Lake Traverse project indicates that the current allocation of these lands is providing protection of the resource and accommodating the recreational needs of the public. With some modification the existing recreational development will support the current and projected use.

In recent years there has been a steady growth in different types of low density recreation; i.e., hiking, biking, wildlife observation, etc. The 1990 Minnesota SCORP identifies the need for additional low density recreation facilities. This project supplies some of these needs. At present the project provides opportunities for hunting, fishing, picnicking, and other day-use activities.

RECOMMENDATIONS:

The existing facilities should be modified to meet existing accessibility regulations for users with disabilities and to provide for increased visitor safety and facilitate ease of operation. The present management policies should continue and efforts made to protect the recreational resources of the project.

Initiate a public information campaign with the objective of reducing the vandalism of project facilities.

Lake Orwell

Western District Flood Control Projects – Section 3

Project Master Plan

June 1997

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SECTION 3
Lake Orwell Project

Chapter 1 – Project Description

Chapter 2 – Resources and Influencing Factors

Chapter 3 – Project-Wide Resource Objectives

Chapter 4 – Management Unit Objectives

Lake Orwell

CHAPTER 1 – PROJECT DESCRIPTION

GENERAL:

Lake Orwell is a Federal flood control project on the Ottertail River in west central Minnesota, approximately 190 miles northwest of St. Paul. It consists of the dam, an earth-fill structure approximately 47 feet high and 1,355 feet long, the associated control structure, and two 10-foot-high perimeter dikes with a combined length of 1,140 feet. The project is designed to provide 11,000 acre-feet of flood storage above conservation pool levels of Lake Orwell; the conservation pool holds 1,000 acre-feet of water. The project is situated in a geographical transition zone, between the rolling hills of the uplands to the north and east and lowland plains to the west.

AUTHORIZATION AND PURPOSE:

The Orwell Dam is part of a comprehensive flood control plan for the Red River of the North drainage basin authorized by PL 81-516, the Flood Control Act of June 30, 1948, supplemented on May 17, 1950 – PL 85-624, Fish and Wildlife Conservation and Water Resource Developments-Coordination. Construction of the dam began in May 1951, and operations commenced in the spring of 1953. Additional recreation facilities were contracted for in August, 1971. Recreation is considered an incidental benefit under PL 78-634. No local cooperation is required for this project.

The original objectives of the project were to reduce seasonal flood damage to downstream areas and communities and to supplement natural flows, as required, for water supply and pollution

abatement. Communities directly affected by the project are Breckenridge, Minnesota, and Wahpeton, North Dakota.

LOCATION AND SETTING:

Orwell Dam is on the Ottertail River, approximately 6 miles southwest of Fergus Falls, population 12,362 – 1990 census, 190 miles northwest of St. Paul in west-central Minnesota (see Figure 1-2). It is 38.6 miles from the mouth of the river, situated between the rolling hills of the uplands to the north and lowland plains to the west. The landform here is comprised of a series of large beach ridges that were formed by the wave action of Glacial Lake Agassiz as the lake retreated (see Section 1, Regional Resources and Influences, Chapter 2, Description, Location and Setting); the lowland to the west is the abandoned bed of the huge lake.

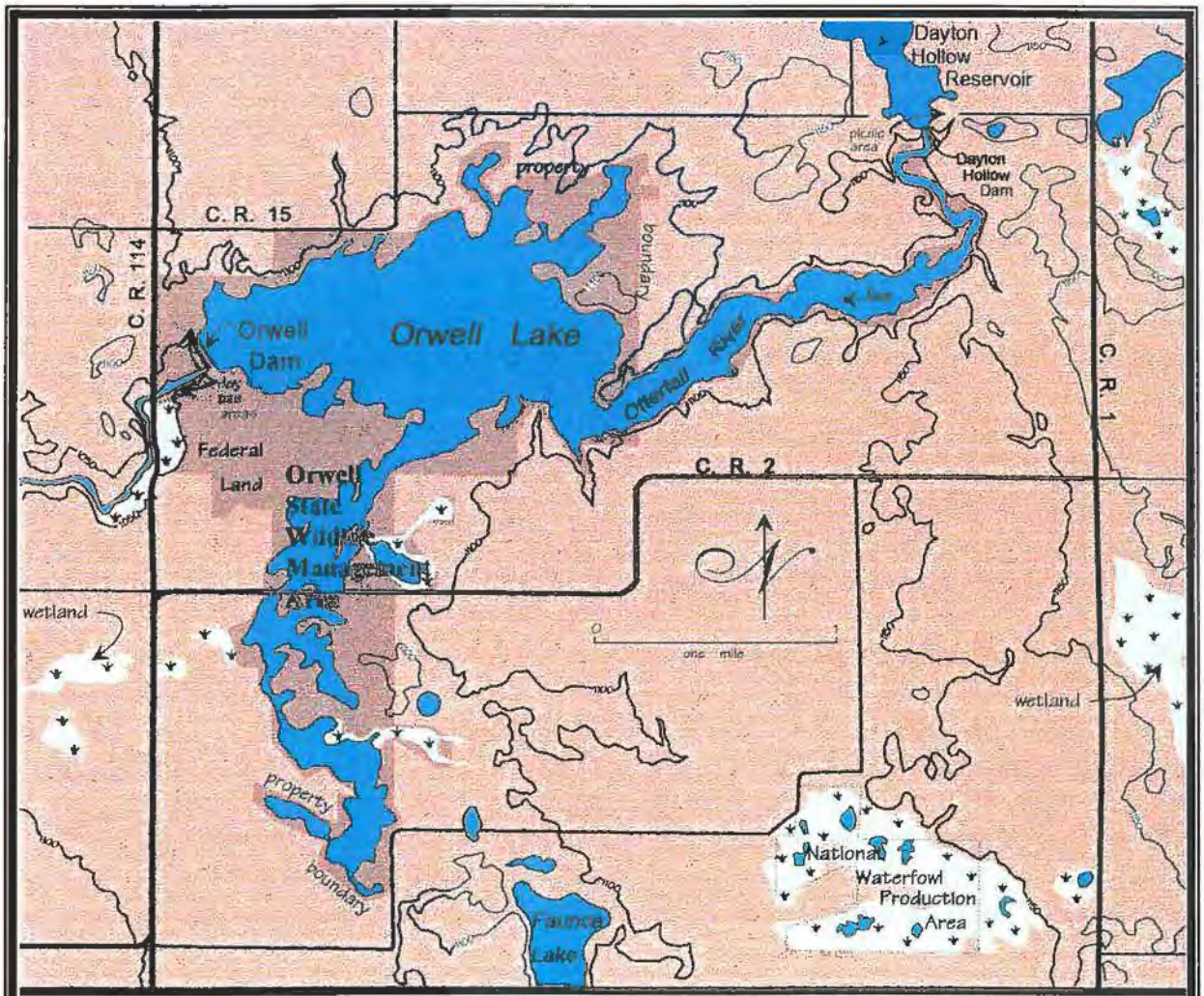


FIGURE 3-1 Lake Orwell Flood Control Project

The source of the Ottertail River is north of Fergus Falls, Minnesota. The river winds in a southerly direction through a series of lakes until it reaches Ottertail Lake. From there it flows to the southwest to Lake Orwell. It then flows west, joining the Bois de Sioux River at Breckenridge-Wahpeton on the Minnesota-North Dakota border. At the confluence of the rivers their combined waters form the Red River of the North which flows north into Canada.

The watershed of the Ottertail River has a drainage area of 1,820 square miles and contains more than 1,100 lakes; they cover more than 15 percent of the basin's area. An additional 6 percent is covered by bogs and marshes.

The principal project features are the homogeneous rolled earth-fill embankment, combined spillway and outlet structure, and two low perimeter dikes.

PROJECT LANDS:

Federal lands at Orwell Dam and reservoir total 2,019.83 acres, all in fee. Of this area, approximately 1,150 acres are inundated (see Figure 3-1). The project boundary is approximately 19 miles and is administered by the Corps of Engineers. For additional information, see Chapter 2, Administrative and Policy Factors: Project Land Status and Appendix E, Land Use Classification.

Allocations:

In accordance with ER 1130-2-435, Project Operation, Preparation of Master Plans, all lands will be allocated in accordance with the authorized purposes for which they were, or are to be, acquired. Allocated project lands will be further classified to provide for development and resource management consistent with authorized project purposes and the provisions of the National Environmental Policy Act (NEPA) and other Federal laws. The classification process further refines land allocations to maximize use of project lands. The process must also consider public desires, legislative authority, regional and project specific resource requirements, and suitability.

All project lands at the Lake Orwell Project were acquired for project operations. Additional information on land allocation/classification is available in: Chapter 2, Administrative and Policy Factors: Project Land Status; Appendix E, Land Use Classification; Plate 24.

Land designated for project operations may be used for other purposes where these uses are compatible with operational requirements. These uses may include wildlife habitat management, recreation, or agriculture. This practice assures maximum use of project resources.

When it can be done safely, hunting, trapping and fishing may be allowed on operations land. Restricted areas will be adequately posted as such. Licenses, easements, outgrants, or permits will be issued only for those uses that do not interfere with project operations.

Project Accessibility:

Lake Orwell lies in far west-central Minnesota, about 190 miles northwest of St. Paul and about 6 miles southwest of Fergus Falls, Minnesota, (population ± 12,000). Access is good using the Federal and State highway systems.

1. Major Access Routes:

Lake Orwell can be accessed via Interstate 94 (from St. Paul to Fergus Falls) to Otter Tail County Road 1, then to County Road 2.

2. Project Roads:

Other than the two entrance roads, project roads are for access to the wildlife management areas and are maintained by the Minnesota Department of Natural Resources.

3. Sea Plane:

Regulations governing seaplanes at Orwell Lake have not been established. While airborne, all civilian aircraft are subject to the general aviation rules and operating regulations established by the Federal Aviation Administration and the Minnesota Department of Transportation. When on the water, seaplanes are subject to the marine "rules of the road" as established by the Minnesota Department of Natural Resources. They may operate on any Corps lake, except those where powerboats are prohibited, and are subject to the specific boating prohibitions and restrictions for each project or lake. In addition, seaplanes may only be operated on the lakes between sunrise and sunset.

FACILITIES AND STRUCTURES:

See Appendix A for a tabular listing of dam and reservoir data.

Dam, Control Structures and Dikes:

1. Orwell Dam:

The embankment (see Figures 3-2 and 3-3) was designed and constructed using a homogeneous section. It has a cutoff trench (10-foot maximum depth) to minimize seepage through the upper sand and gravel foundation layer. A 3-foot-thick horizontal drain (pervious drainage blanket) intercepts any through seepage and underseepage. Slope protection includes 12 to 18-inch riprap. The top has a 6-inch stabilized aggregate surfacing. The embankment crest length is 1,355 feet, and the maximum height from embankment crest to toe is 47 feet. Average height of the main embankment is 40 feet. The embankment and structures are founded on glacial drift that overlies

bedrock. The maximum pool elevation (spillway design flood) of 1075.0 will develop a head of 35 feet on the downstream toe of the embankment

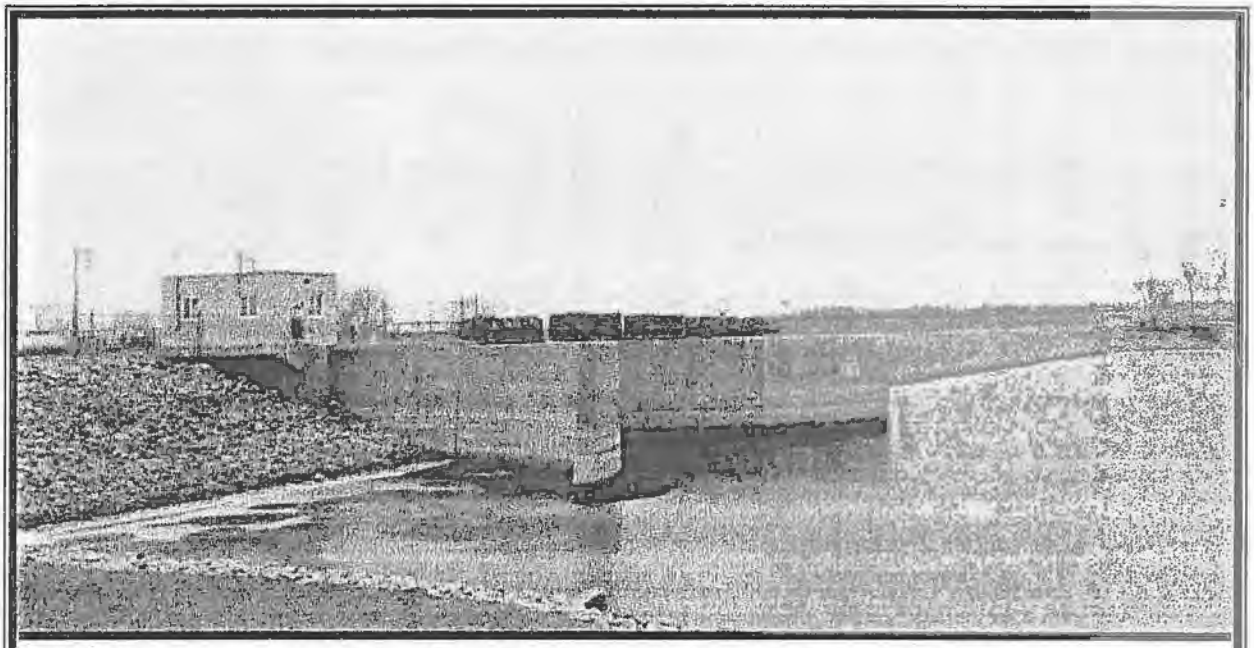


FIGURE 3-2 Lake Orwell: Dam and Control Structure Intake

The embankment is founded on a 2 to 10-foot-thick layer of pervious sand and gravel that overlies a 6-1/2 to 40 feet thick layer of cohesive soils consisting of lean clay, silty clay, clayey silt, and silt, with some sand and gravel lenses. These formations are underlain by fine to medium sands of undetermined depth. The groundwater table in the upper pervious sand and gravel layer was found at or near the ground surface when preconstruction borings were done at the damsite. The same borings revealed artesian water in the underlying sands with sufficient pressure to raise the water to the ground surface. Materials at both abutments are primarily 25 to 30 feet of lean clays with some lenses of sand and gravel overlying 15 to 30 feet of clayey silts and silts. Fine to medium sands of undetermined depth underlie the clay and silt materials. The spillway and outlet structure are founded on 19 feet of dense, inorganic silt, and 7-1/2 feet of clayey soil, the latter extending to the sand layer, which is found at depths of 22 to 50 feet below the valley floor.

2. Orwell Control Structure:

The reinforced concrete spillway, shown on Figure 3-3, can be divided into five structural components: the upstream approach wingwalls, the ogee crest and abutment section, the trapezoidal chute, the trapezoidal stilling basin, and the downstream wing walls.

The ogee crest and abutment section is designed to act integrally as a rigid monolithic reinforced concrete gravity structure. Thickness of the ogee section varies from 9 to 17 feet, and thickness of the wall is 8 feet minimum at the top. Maximum wall height is 50 feet. The chute and stilling basin sections are also monolithic structures having floor slabs with integral walls, but they are not designed as rigid structures. Floor width varies from 40 to 80 feet, and slab thickness varies from 4 to 6 feet, except for the transition to the ogee crest at the upstream end. The upstream approach and downstream wing walls are inverted "T" cantilever retaining walls. Chute and stilling basin floor slab drainage is provided by a 6-inch gravel blanket under the slab and a system of 4-inch screened floor drain weepholes. Drainage for the wall section is provided by pervious backfill with filter gravel surrounding a perforated 8-inch P.V.C. drain system that discharges through the chute and stilling basin walls.

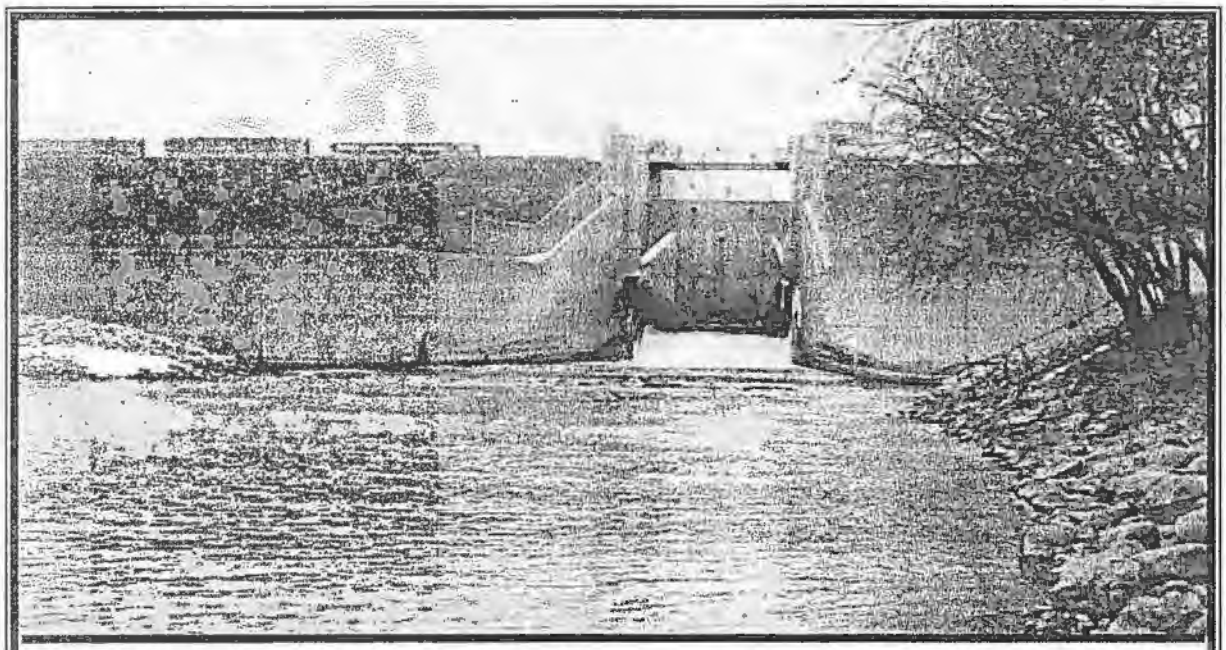


FIGURE 3-3 Orwell Dam Control Structure

Spillway discharges are controlled by the single 33-foot-long by 27½-foot-high welded structural carbon steel tainter gate. The tainter gate is electrically operated by means of duplicate, independent driving units on each abutment wall. An emergency generating unit provides power in the event of commercial power failure. A nine section emergency bulkhead and a pickup boom are provided for emergency closure of the spillway. The bulkheads are fabricated of aluminum alloy to permit handling and installation by truck crane.

There are two 24-inch gated low-flow conduits in the ogee crest abutments. Flow through these conduits is controlled by 24-inch sluice gates with inverts at elevation 1040.0. Bulkhead recesses are provided in the intakes to the gate valves for emergency closure.

3. Project Dikes:

The two dikes were designed and constructed using a homogeneous section. They have a maximum height of 10 feet and a combined length of 1,140 feet.

Project Buildings:

1. Project Office:

The project office and Resource Manager for Orwell Reservoir are located at Lake Traverse (White Rock Dam).

2. Dam tender's House:

The damtender's house and garage were disposed of in October 1992.

3. Miscellaneous Structures:

A maintenance building (1,200 sq. ft.), a warehouse (1,920 sq. ft.), a paint storage shed, a small generator building, and two privies, located in the recreation area on the entrance road..

Roads and Access:

There are no project roads. All project features can be accessed from the local road system. The main access, which services the river day use area (see Figure 3-4), the dam, and the maintenance building is paved. The access to the lake overlook is graveled.

Public Use Facilities:

Corps managed public day use facilities at the Lake Orwell Flood Control Project are limited to two areas: Lake Orwell overlook, and a picnic area and tailwater facility, located on the entrance road. There are no Corps administered public boat launch facilities at this project. The Minnesota Department of Natural Resources operates a graveled ramp on the lake, located east of the dam. Areas zoned for hunting, fishing, and trapping shall be pursuant to all applicable local, State, and Federal regulations.

1. Ottertail River Day Use Area:

This area is accessed from the main project entrance driveway. Public use facilities include a paved 14 vehicle parking lot, picnic shelter, potable water, tables and grills, playground equipment, and privies. The tailwater fishing access is located here. This area is not fully accessible for persons with limited personal mobility.

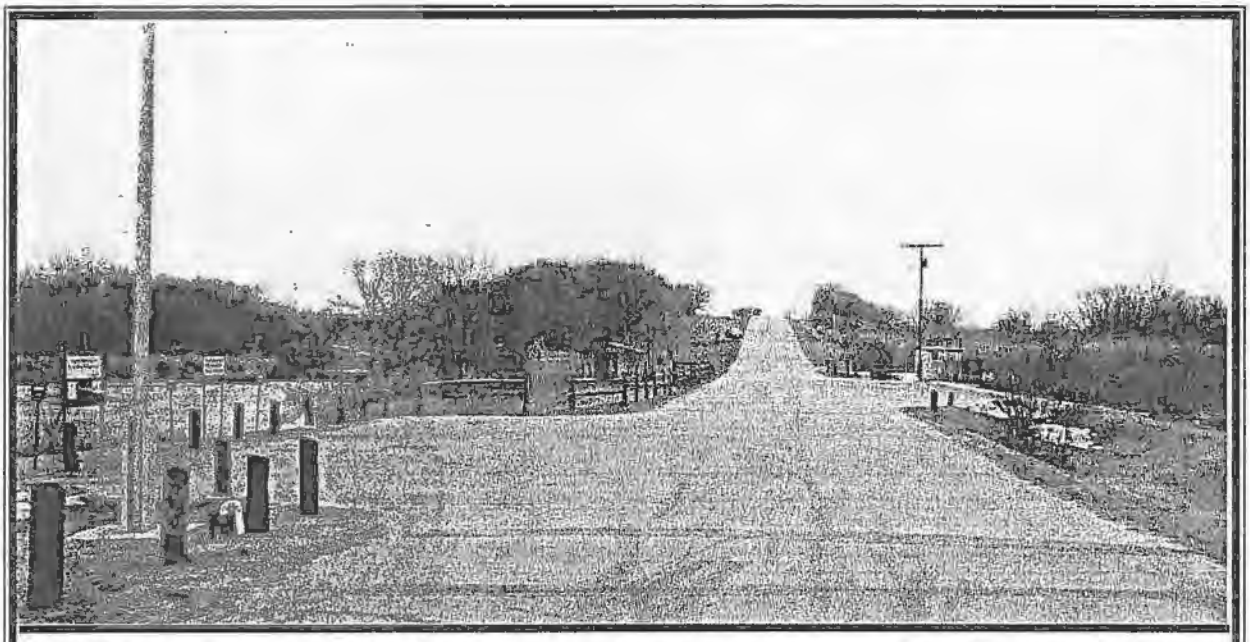


FIGURE 3-4 Lake Orwell: Entrance and Parking for Ottertail River Day Use Area

2. Dam Overlook:

There is an overlook across the dam from the maintenance building. This is a popular vantage point for sightseers, especially during the autumn waterfowl migration periods. It features a 30 car graveled parking lot, and picnic shelter. This area is not fully accessible for persons with limited personal mobility.

Modifications:

A potentially serious condition that developed during the first winter of operation involved an icing problem that froze the tainter gate in a partially opened position and resulted in loss of reservoir regulation. The condition was corrected in 1957 by installing a corrugated aluminum tainter gate housing connected to two L.P. gas-fired, forced hot-air heating systems.

The 1970 periodic inspection revealed potential problems with artesian pressures. In 1973 and again in 1976, seepage repair was done to alleviate a wet condition along the downstream toe of the dam. In 1979, relief wells were installed along the right channel bank.

ORWELL RESERVOIR:

Description:

The total reservoir storage capacity is 14,100 acre-feet at full pool (elevation 1070.0) with a surface area of 1,110 acres. It is limited by the lie of the natural land surface surrounding the pool and the normal tailwater elevation of the Dayton Hollow hydroelectric dam directly upstream. The reservoir is approximately 4 miles long and 1 mile wide at full pool level. Reservoir capacity at normal full pool elevation of 1064.0 feet msl. is 8,600 acre-feet. At normal low (conservation) pool, elevation 1048.0 feet msl, capacity is 1,000 acre-feet.

Reservoir Operations:

The Ottertail River is a major tributary to the Red River of the North which flows north. This means that the upstream areas thaw before the downstream areas during spring break-up. This can result in major floods and ice jams on the upper reaches of the Red River. To avoid increasing downstream flood heights, the release of flood storage from Lake Orwell Dam is not made until conditions are favorable, usually about the first of May. When such releases are made, emergency conditions downstream govern the rate of discharge, except during emergency conditions in the reservoir.

Since the construction of Orwell Dam, the National Weather Service has updated the generalized estimates of the Project Maximum Precipitation (PMP) for areas east of the 105th meridian. The PMP estimates were published in Hydrometeorological Report No. 51 and are the basis for the Project Maximum Flood (PMF). Revised unit hydrographs based on more complete flow records in conjunction with the updated PMP estimates resulted in the current PMF with a peak discharge of 26,200 cubic feet per second (cfs). Standard Project Flood (SPF) is approximately 45 percent of the PMF. The SPF peak discharge is 11,800 cfs.

1. Flood Control:

Orwell Reservoir is operated in response to seasonal precipitation rates and existing snowpack. The reservoir water level is held at 1064.0 feet msl year-round and is lowered if the seasonal snowpack indicates that additional storage is needed. The amount it is lowered is proportional to the projected demand.

2. Operational and Design Modifications

a.) In 1954 and in 1955, the Ottertail River channel was cleaned, enlarged, and straightened by the Corps of Engineers between river miles 9.7 and 21.1. The design discharge of the channelization project is 900 cfs, plus freeboard. The channel modification has a design bottom width of 30 feet between miles 21.1 and 16.0, and 50 feet between miles 16.0 and 9.7.

The material removed from the channel was placed in banks no more than 8 feet high along the river. These banks are discontinuous at intersections with the old channel or natural watercourses to provide side drainage into the channel. The St. Paul District completed an operation and maintenance manual for the project in April, 1960. The non-Federal sponsor and contact for the project is the Wilkin County Drainage and Conservancy District No. 1 in Breckenridge, Minnesota.

b.) The reservoir routings computed for the reconnaissance report published in April, 1985 show that the maximum PMF pool elevation was 1078.8 feet NGVD 1929. The freeboard with the top of dam at 1080 National Geodetic Vertical Datum NGVD for these previous routings is 1.2 feet, assuming the single gate can be raised clear of the water surface. Subsequent to the submission of the reconnaissance report, the District tested the gate and found that the maximum gate opening under current operating conditions is 23.7 feet. The reduced gate opening does not allow the bottom of the gate to clear the water surface during the discharges greater than 20,400 cfs (78 percent of PMF). The reservoir routings for this report were revised using the current maximum gate opening. The result is a PMF pool elevation of 1081 NGVD, 1 foot over the top of dam at 1080 feet NGVD. The revised PMF routings are summarized below:

Peak inflow	Peak outflow	Maximum pool elevation
26,200 cfs	24,200 cfs	1081.0 feet NGVD

Modifying the gate operating machinery so that the gate bottom would clear the water surface for the PMF results in a maximum pool elevation of 1078.8 feet NGVD with 1.2 feet of freeboard. The amount of freeboard is not adequate for the safe operation of a high-hazard dam because it could be readily depleted if the spillway were blocked by debris or if the gate malfunctioned.

CHAPTER 2 – RESOURCES AND INFLUENCING FACTORS

This chapter presents the factors that most influence the use, development, and management of the land and water resources at the Lake Orwell Flood Control Project. This includes factors that are conducive to development, and factors that act as constraints. The elements that are presented here fall into three broad classifications: natural resources, social and cultural resources, and administrative and policy considerations. Using the needs and desires of the region as the final determinant, these factors are used to decide the most appropriate development of the project resources.

PHYSICAL AND ENVIRONMENTAL RESOURCES:

Physical and environmental resources include geology, water, vegetation, wildlife, fisheries, visual quality, and cultural and recreational resources. A brief geological history of the region is in Section 1, Chapter 2, Description.

Geophysical Features:

The Ottertail River basin contains two distinct geological landforms, separated by a narrow transitional zone. Above river mile 40.0, the river flows through a landscape of rolling hills. The hills are glacial moraines, and are composed of drift that was deposited during the last period of glaciation. Below river mile 22.0, the river flows through the Red River Valley. This is the bed of Glacial Lake Agassiz and is extremely flat. The transitional region between river miles 22 and 40 is a series of beach ridges left by Glacial Lake Agassiz. During the retreat of the lake waters, the lake fell in several stages, over a period of many years. This is evidenced by beach strand lines at elevations: 1060, 1040, 1020, and 980 (feet msl.). The Orwell Dam is located near the upper limit of these glacial lake beaches. The glacial drift at the site is 400 to 500 feet deep, underlain by Cretaceous or Precambrian bedrock.

Set amid low rolling hills, historically, the reservoir area was a small river valley. The Ottertail River is a typical great plains river, shallow and winding, with many sandbars, oxbows and marshy areas.

1. Soil Types:

The Soil Conservation Service has classified the soils of the project area in the Formdale-Aazdahl-Flom, and the Lohnes-Flaming-Arveson Soil Associations.These soils range from productive soils conducive to intensive agriculture, through stony soil and rock outcrops, to poorly drained or frequently flooded soils. The characteristic soil associations in the area are generally delineated by topography.

In the river bottoms, the alluvial soils are frequently flooded. Rising from the floodplain, the valley escarpment has easily eroded and droughty soils. At the top of the terrace are the gently

rolling uplands, stretching to the far horizon – the Great Plains of North America. The soils on these uplands are variable and may be stony, poorly drained, or highly suited to agriculture. These soils are generally fertile and are heavily cultivated where limitations are absent or where drainage and stone removal are economically feasible. These soils range from alluvial, very poorly drained types in lowland areas to deep, well drained loams on the uplands.

2. Topography:

The surrounding lands are low, rolling hills comprised of glacial drift.The general slope of the region is from the east to the west, with the upland areas to the east about 100 feet higher than the reservoir. The Red River Valley, to the west, is about 100 feet lower.

Vegetation Communities:

An inventory and analysis of habitat type and existing vegetation in the Lake Orwell area is presented in Section 1, Chapter 3, Key Factors and Resources: Vegetation and in Appendix C, Environmental Resources, Vegetation. Plant communities are shown in Tables C-1 to C-4.

Orwell Lake is located on the northeastern edge of the area that is known as the Great Plains of North America. The original plant communities here were tall and mixed grass prairie with riparian communities of assorted floodplain woody plants.

1. Forests and Shrublands:

Originally, forested areas only existed as riparian vegetation in this area. Many of the woodlands and much of the woody and herbaceous cover that were originally present have been converted to cropland. These actions have eliminated or reduced the various forest type habitats available for wildlife resources and degraded the quality of those areas that remain.

2. Grasslands:

Almost all of the native prairie in the basin has been converted to agricultural production or altered by heavy grazing of livestock and the introduction of many exotic plant species.

3. Marshlands:

Prior to project construction, the Ottertail River wound its way through a wide, marshy valley. Upon project completion, this marsh habitat was entirely inundated by Orwell Lake. In accordance with the original operating plan, flood control measures resulted in an annual drawdown of over 25 feet. This extreme variance in the lake water levels caused severe shoreline erosion and precluded the re-establishment of marsh vegetation, even though there was (is) land of a suitable inclination on the project. Changes in the operating plan and the construction of a drop structure under County Road 15 have resulted in the formation of marsh habitat, suitable for waterfowl, and the establishment of a littoral zone around the lake edge. The marshland acreage is under lease to the Minnesota Department of Natural Resources as a Wildlife Management Area.

4. Disturbed Areas:

In 1954 and in 1955, the Ottertail River channel was cleaned, enlarged, and straightened by the Corps of Engineers between river miles 9.7 and 21.1. The material removed from the channel was placed in banks no more than 8 feet high along the river. These banks are discontinuous at intersections with the old channel or natural watercourses to provide side drainage into the channel.

Disturbed areas include much of the shoreline of Orwell Lake. Excessive drawdown levels (see Marshlands, above) have resulted in large areas of bank erosion. Recent (1992) attempts by the Waterways Experiment Station (WES) and the St. Paul District to stabilize the shoreline, using bio-technical engineering techniques, have yet to be evaluated.

5. Rare and Endangered Species:

See Appendix C for plant, animal and fish, rare and endangered species or habitat list.

6. Nuisance Plants:

Poison ivy, *Rhus radicans,* is common throughout the project area. Because the day use areas are small, poison ivy is easily controlled in high use areas. Of special concern to this project are the aquatic plants purple loosestrife and Eurasian milfoil. Although these plants have not as yet been sigbted at Lake Orwell, because of their extremely invasive nature, special concern is warranted.

Purple loosestrife, *Lythrum salicaria,* is an exotic wetland plant. Introduced from Europe and Asia in the 1800s, it has invaded 40 States and all of the Canadian border provinces. This plant is extremely invasive to wetlands and will crowd out native plant species. It is unsuitable for nesting, cover, or feeding habitat for most native wetland animal species and has no naturally occurring predators in the United States.

Eurasian milfoil, *Myriophyllum spicatum,* is also an exotic wetland plant from Europe. In shallow, nutrient rich lakes, such as Lake Orwell, it forms an impenetrable mat of vegetation on the lake surface supported by thick underwater stands of tangled stems. This plant has had serious negative impact to water-based recreation in lakes where it has become established.

Both of these plant species are very hardy and are able to reproduce from root pieces and broken stems.

Lake Orwell project land is experiencing problems with the exotic weed, leafy spurge, *Euphorbia sesula.* Its aggressive nature combined with a lack of natural controls enables it to out-compete native vegetative species. This hardy perennial reduces grassland quality by reducing species diversity. Leafy spurge has been declared a noxious weed in Minnesota. As a noxious weed its

control, defined as preventing its spread by seed or other propagating parts, is warranted. The Corps has been involved since 1975 in an effort to control noxious weeds on project lands.

Wildlife, Species and Habitat:
The Ottertail River valley in the vicinity of Orwell Reservoir provides a variety of high-quality wildlife habitats in a region that is intensively farmed. The project is near the intersection of three major vegetation zones: coniferous forest, hardwood forest, and prairie. The diversity of wildlife at the project is due in part to the variety of vegetation types – grasslands, forest, shrub, wetland – and the open-water areas at the reservoir.

Within the Lake Orwell project, 1,992 acres are outgranted to the Minnesota Department of Natural Resources (DNR) for wildlife management purposes. About two-thirds of this land is open for public hunting and other compatible recreational uses.

The DNR observed 83 species of birds and 14 species of mammals in the Ottertail River valley during a recent survey (Hanson et al., 1984). Many additional species are known to be present. Orwell Reservoir and the connected and adjacent wetland areas provide waterfowl habitat. Mallards, shovelers, and blue-winged teal use the wetlands for nesting, particularly the south arm of tbe reservoir (Falk et al., 1975). Numerous waterfowl species use the reservoir during migration. The DNR has designated about one-third of the reservoir as wildlife sanctuary, primarily to protect migrating waterfowl. Non-game bird species of interest that may occur at the reservoir include the bald eagle, osprey, white pelican, sandhill crane, and common loon.

The upland areas of the Wildlife Management Area are managed by the DNR primarily for pheasants and white-tailed deer. The DNR has seeded grassland areas, has planted 45 acres of shelterbelts, and plants 20 to 30 acres of food plots annually.

White-tailed deer is the only big-game animal in the project area. Ring-necked pheasants, ruffed grouse, and cottontail rabbit are the most important small game species. Muskrat, beaver, mink, raccoon, skunk, river otter, red fox, and coyote are the furbearers that occur near Orwell Reservoir.

A detailed inventory and analysis of existing wildlife in the Lake Orwell area is presented in Section 1, Regional Resources and Influences, Chapter 3, Key Factors and Resources: Wildlife, Habitat and Species, and Appendix C, Environmental Resources,Wildlife.

1. Threatened and Endangered Species/Habitats:
There is a tabular listing of endangered animal species in Appendix C.

2. Special Programs:

The DNR personnel plant wildlife food plots and also lease land to others for crop shares. They control weeds and maintain approximately 3½ miles of roads and trails and 6-public parking areas on these lands. Under Corps management, grain for wildlife is planted in low-lying bottomlands, lands that are not otherwise conducive to recreation. Hay meadows are also maintained to supplement the natural habitat areas.

Fisheries:

1. Habitat Conditions:

In the past, water level fluctuations have resulted in the siltation of gravel spawning beds; this favors the natural selection of rough fish. Stabilization of the reservoir levels is expected to have a positive impact on fish habitat and spawning grounds for the more desirable game fish species.

2. Species:

The fish assemblage in the reservoir is dominated by carp, buffalo, and bullheads. Some game and panfish species such as walleye, northern pike, and black crappie are present in low numbers.

The amount of river between Orwell Reservoir and the Dayton Hollow Dam ranges from 0.5 mile to 2.0 miles, depending on pool levels in Orwell Reservoir. The fish assemblage in this reach of the Ottertail River is dominated by carp, redhorse, and suckers. Walleye appear to be the most common game fish, with northern pike, largemouth bass, and crappie also present.

Open Space and Visual Quality:

The reservoir has been in operation for only 30 years. During that time, the lake has been subject to an operating plan that called for large water level fluctuations. These large fluctuations precluded the establishment of litoral vegetation and were found to be the cause of the severe erosion the shoreline has experienced since initial inundation.

The lake is set amid rolling hills. The areas adjacent to the lake are reserved for wildlife management and associated activities. Farther from the lake agricultural lands dominate the landscape. The visual quality of the project is limited because of the lack of significant vegetation. The lake is small (1 x 4 miles) and the eye is able to grasp the entire panorama at a single glance; thus, it can hold no mystery or adventure that might stir the onlooker into further exploration.

The tailwater Day Use Area is set within the confines of the narrow river valley below the dam. The trees and close valley terraces give the area a strong sense of enclosure and intimacy. This area has strong visual and aesthetic appeal (see Appendix D for additional information concerning the visual resources of the project).

Cultural Resources:

1. Inventory of Known Sites:

A shoreline survey to 1075' msl. for cultural resources was conducted in 1981. It probably did not cover all project lands at Lake Orwell. In 1985, twelve proposed shoreline protection areas were intensively surveyed. Six prehistoric sites (four cultural material scatters, one lithic scatter, and one burial mound complex) were recorded during these surveys. The National Register eligibility of these six recorded sites has not been determined as of 1993. Bison bone eroding out below the dam is apparently not cultural in origin. Additional prehistoric sites as well as historic trails and farmsteads are probably present but unrecorded.

ADMINISTRATIVE AND POLICY FACTORS:

Administrative and policy factors involve Corps of Engineers responsibilities, regulations and restrictions for the overall management of Orwell Lake. Also included are regulations, programs, and goals of other public agencies or private groups whose responsibilities overlap with those of the Corps. Key administrative and policy factors in planning for resource use at Orwell Lake include: the status of project lands, Corps land stewardship responsibilities, and local sponsorship requirements for fish and wildlife enhancement or recreation development.

Resource Management Responsibilities:

The Corps of Engineers is responsible for the management of the cultural and natural resources of the Orwell Lake project. A number of general authorizing laws and regulations set forth the Corps responsibilities for initiating progressive resource management programs. These public laws and regulations are summarized in Appendix E. These laws direct that natural resource management be integrated with other project resources and activities under a concept of multiple resource use. Regulations (ER 1130-2-400) direct that whenever the opportunity exists, management techniques to improve vegetative conditions for wildlife, recreation, scenic value, cultural resources, fire prevention, pest control, and watershed protection be properly implemented. Specific management objectives are to be based upon the land use designations that are introduced in this Master Plan. Subsequent refinement and definition of these concepts will be found in the Operational Management Plan.

Programs supporting State and local involvement in natural resource management have been developed by the Corps in keeping with good land stewardship responsibilities.

Under Title 36, Chapter III, Section 327, Code of Federal Regulations: to ensure the health, safety and welfare of the public, Corps employees have the autbority to issue citations enforcing those regulations; however, they do not engage in actual law enforcement. Local law enforcement authorities (County and State police) retain statutory authority and the responsibility

to enforce all other laws. Corps employees coordinate with them and contact them in the event of a major disturbance.

1. Project Personnel:

The Resource Manager for the Lake Orwell project is located at Lake Traverse project headquarters (near Wheaton, Minnesota); there is one permanent maintenance worker stationed at Lake Orwell. Lake Traverse project personnel and the permanent maintenance worker at Lake Orwell are responsible for the operation and maintenance of the project. They also coordinate and implement the Federal and non-Federal resource management programs.

The Resource Manager is responsible for all aspects of management and administration of resources for the Lake Traverse and Orwell Lake projects. These responsibilities include: range management, fish and wildlife management, soil erosion control, educational and interpretive programs, law enforcement, pest control, administration and inspection of public use areas and other project lands, and visitor and employee safety programs. Other duties include, but are not limited to, supervision of project employees, public relations, and inspection of outgrants, as required.

CHAPTER 3 – PROJECT-WIDE RESOURCE OBJECTIVES

This chapter presents the Resource Objectives for the Lake Orwell Flood Control Project. These Resource Objectives are in support, and a refinement, of the Regional Resource Objectives identified in Section 1 of this document. Project Resource Objectives reflect the specific resources, capabilities and restraints of the Lake Orwell project. They specify how those resources are to be managed in response to the current and projected public needs and desires that have been identified.

PROJECT OPERATIONS:

1. Objective:

To continue to operate the Lake Orwell Flood Control Project with safe, efficient, cost effective procedures that provide the level of flood control and downstream flow regulation authorized by Congress.

2. Rationale:

The Lake Orwell project is authorized by Congress for flood control and regulation of downstream flows of the Ottertail River and the Red River of the North. In addition to operating for these mandatory purposes, the Corps is directed in general legislation to manage the other lake resources including water quality, fish and wildlife, and recreation. Achieving these secondary purposes must be incidental to the authorized project purposes and may not conflict with them.

Seasonal water levels are governed by regulation periods established as part of the operating plan for the project (see Section 1-3). This plan is a function of seasonal precipitation and runoff patterns and indicates the desired flood control and storage requirements during the year. Operation of the Lake Orwell Project according to the present operating plan has been assumed during the formulation of the Resource Objectives presented in this Master Plan.

RECREATION, LOW DENSITY:

1. Objective:

To provide high quality recreation opportunities that are consistent with the authorized project purposes.

2. Rationale:

Fishing is a popular pastime at Lake Orwell, and occurs year-round. The project is renowned for its high quality waterfowl hunting which is important to the area economy. These recreation activities provide important recreational opportunities for area residents.

RECREATION, INTENSIVE AND DAY USE:

1. Objective:

To provide quality day-use recreational opportunities that will help meet the existing and projected recreational needs of the region and to improve existing facilities by making them safer and more accessible to all persons.

2. Rationale:

The project currently provides opportunities for hunting, fishing, picnicking, and other day-use activities. These opportunities should continue to be provided. Changes in the existing allocation of project resources would not significantly increase the benefits derived from the project; therefore, the existing management policies should continue in effect. Efforts should be made to protect the ability of the resources to provide day-use recreational opportunities.

Wherever necessary, facilities should be modified or constructed to improve accessibility and reduce existing or potential health and safety problems. Examples include accessibility deficiencies at the tailwater recreation area, and the lack of sanitary facilities at the overlook recreation area. Improving accessibility to both of these areas will also make the areas less congested and safer for all users of these sites.

Results of a statewide recreation survey conducted by the Minnesota Department of Natural Resources indicate a need for increased fisheries management and public fishing accesses in the region. There is also an expressed need to develop additional swimming, bicycling, camping, and hiking facilities. The State Comprehensive Outdoor Recreation Plan (SCORP) recommends tbat State and Federal agencies expand their programs to provide increased hunting opportunities.

FISHERIES:

1. Objective:

To maintain the lake in its present state of production.

2. Rationale:

Lake Orwell fish populations are dominated by carp, buffalo, and bullhead; gamefish are present only in low numbers. Because of the small size of the lake and the limited access to it, fishing on the lake is considered of little importance. The presence of a hydro-electric dam ± 2-miles upstream, the small size of the lake, its highly eroded banks, and its isolation are all factors in this consideration.

WATERFOWL:

1. Objective:

In cooperation with the Minnesota Department of Natural Resources, the U.S. Fish and Wildlife Service, and other private organizations, work to maintain Lake Orwell as productive waterfowl habitat.

2. Rationale:

Lake Orwell is on one of the major North American flyways for waterfowl. Because of this, waterfowl, in economic terms, are the most important wildlife species within the area. Waterfowl hunting, in particular goose hunting, accounts for the largest share of the total hunting activity of the area. As such, waterfowl hunting has a positive economic impact within the area. In addition to hunting, the project offers excellent opportunities for observation and photography.

CHAPTER 4 – MANAGEMENT UNIT OBJECTIVES:

In this chapter, the Resource Objectives for each of the management units that make up the Lake Orwell project area are presented. Management Unit Resource Objectives are the site specific applications of the Project Resource Objectives which, in turn, are a refinement of the Regional Resource Objectives. Implementation of these unit objectives will help satisfy the regional needs and the expressed desires of the public and of other agencies, within the limits and capabilities of the resource base and according to the authorized project purpose.

Unit Description:
A brief description of the unit with a focus on the cultural and natural resources that affect resource use. The description will include:

A. Size and shape:

B. Location and access:

C. Existing site use:

D. Adjacent land use:

E. Soils and topography:

F. Vegetation:

G. Wildlife species and habitat availability:

H. Cultural resources:

Land Use Classification
Allocated project lands are further classified to provide for development and resource managment within the authorized project purposes.

Resource Objectives:
Identifies and describes the unit objectives. Each unit may have several Resource Objectives.

Rationale:
Discusses the need for, and the intent of, the identified Unit Resource Objectives and the management strategy and development concepts recommended to implement them.

Federal facilities are obligated by law to meet the requirements of the Rehabilitation Act of 1973 (amended 1975) Title V, Section 504 (Title V). If a site is noted as non-accessible (Unit Description: c. Existing Site Use:) Title V is assumed as the Rationale for meeting current accessibility standards.

Implementation Plan:
A summary description of the techniques that could be undertaken to implement the unit objectives. The concepts presented here are not intended to be all inclusive. They simply convey an understanding of the range of development and management strategies that could serve as a means to implement the objectives. The concepts presented here will be presented in detail in subsequent planning and design documents. This includes the Operational Management Plan (OMP), Feature Design Memorandum, and Plans and Specifications. The actual methods that are used will be decided on by the Resource Manager, staff from other Corps elements, and other agencies where it is appropriate.

Constraints:
A summary of factors that may influence implementation of the Unit Resource Objectives. These factors may be regional, administrative, site specific or a combination of these sources.

UNIT A, ORWELL RESERVOIR:

Unit Description:

A. Size and Shape: Lake Orwell is a small, irregularly shaped man-made lake, about 1 mile wide and 4 miles long.

B. Location and Access: The lake is about 6 miles southwest of Fergus Falls, Minnesota, accessed on Otter Tail County Road 2.

C. Existing Site Use: The lake is managed primarily for flood control in downstream areas and for wildlife management purposes.

D. Adjacent Land Use: The lands surrounding the lake are Federal land leased to the State of Minnesota for wildlife management purposes. Land use outside of Federal boundaries is agricultural.

E. Soils and Topography: The lake is situated in gently rolling farmlands.

F. Vegetation: Adjacent to the lake, the shores are badly eroded by wave and freeze-thaw action. Because of this, there is very little littoral vegetation. Areas farther from the shore are managed for wildlife, with a wide variety of habitats.

G. Wildlife Species and Habitat Availability: There is a wide variety of wildlife and habitats around the lake. Species are listed in the Appendix C, Environmental Resources, under the appropriate heading, i.e.; Vegetation, Wildlife, Fisheries.

H. Cultural Resources: Six prehistoric sites have been recorded: four cultural material scatters, one lithic scatter, and one burial mound complex. All project lands have probably not been surveyed for cultural resources; additional sites may be expected.

I. Limitations and Hazards: Reservoir banks are eroded and steep – overland access to these areas should continue to be restricted.

Land Use Classification:
The lake is classified as Multiple Resource Management; Wildlife Management General.

Resource Objectives:
To continue to promote wildlife species diversity and provide opportunities for low density, wildlife based recreation activities.

Continue to cooperate with local interests in the restoration of wetland habitat.

Rationale:
The Lake Orwell project contains excellent waterfowl habitat and is ideal for wildlife management. The existing area is capable of attracting large populations of various waterfowl, and also many other types of wetland dwelling species. Wildlife based recreation contributes substantially to the area economy

Implementation Plan:
This is a continuation of currently implemented management policy.

Constraints:
The reservoir is surrounded by wildlife management area administered by the MNDNR. Any actions that would affect these controlled areas shall be in full concurrence with their policies concerning these lands

UNIT B, OTTERTAIL RIVER DAY USE AREA:

Unit Description:

A. Size and Shape: This area is a narrow, linear strip of land, of approximately 6 acres.

B. Location and Access: This Day Use Area is adjacent to the main entrance road, lying between the main entrance road and the Ottertail River.

C. Existing Site Use: The paved parking area accommodates approximately 10 vehicles. There is a picnic area with grills, benches, vaulted restrooms, picnic shelter, and a playground. A public information kiosk is also available. Recreational uses vary with the seasons. Picnicking, sightseeing, wildlife observation, and hunting access are provided. This area provides access to the tailwater of the dam, and bank fishing is a popular pastime here.

This area does not meet current standards of accessibility.

D. Adjacent Land Use: The lands adjacent to this area are managed for wildlife.

E. Soils and Topography: This Day Use Area lies in a small river valley. It is quite narrow, with steeply sloping sides.

Soils of this area are of the Waukon-Gonvick-Flom series which are formed mainly in calcareous loamy glacial till.

F. Vegetation: Typically, vegetation on this site is riparian. The upstream portion of the site is wooded, predominantly with adventitious ash. The downstream end is a picnic area with mown turf grasses and wetland type shrubs along the riverbank.

G. Wildlife Species and Habitat Availability: The lands adjacent to this area are wildlife management areas with a wide variety of wildlife and habitats. Species are listed in Appendix C, Environmental Resources under the appropriate heading; i.e., Vegetation, Wildlife, Fisheries.

H. Cultural Resources: No sites of cultural significance have been identified in this area

I. Limitations and Hazards: The lands surrounding this area are managed for wildlife and protected by State law; there are restrictions on the use of these lands.

Land Use Classifications
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational use by the visiting public..."

Resource Objectives:
Eliminate accessibility deficits.

Develop facilities that will provide tailwater fishing opportunities to persons with limited personal mobility.

Provide safe public access for low to moderate levels of river-based recreation use, including fishing, picnicking, and wildlife viewing (See Plate 9).

Rationale:
The Ottertail River Day Use Area is currently managed as a high-density recreation area, providing managed public access to the tailwaters of Orwell Dam. There are few river-based recreation areas in the vicinity. As such, this site fills a need for public river access. Considering the topography, this site is easily adaptable for an accessible fishing area.

Implementation Plan:
A fishing access for the tailwaters is planned as part of the Orwell Design Memorandum, Orwell Dam Safety Project. It will be meet, or exceed, all Federal and State accessibility standards

Other site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation of the other Resource Objectives will be done in the course of normal maintenance schedules.

UNIT C, ORWELL LAKE OVERLOOK: RESOURCE OBJECTIVES

Unit Description:

A. Size and Shape: This Day Use Area is roughly rectangular, about 2 acres in size (See Plate 10).

B. Location and Access: The site is located on the north side of the dam, accessed from Otter Tail County Road 15. It is sited near the lakeshore, about ¼ to ½ mile from the road.

C. Existing Site Use: This area is used for picnicking, sightseeing, hunting access, and bank fishing.

D. Adjacent Land Use: Surrounding land is used for wildlife management purposes and agriculture.

E. Soils and Topography: The site is on a low hill overlooking the lake. There is very little vertical relief.

Soils of this area are of the Waukon-Gonvick-Flom series which are formed mainly in calcareous loamy glacial till.

F. Vegetation: Vegetation is limited to mown turf grass and several adventitious cottonwood trees.

G. Wildlife Species and Habitat Availability: The lands adjacent to this area are wildlife management areas with a wide variety of wildlife and habitats. Species are listed in Appendice C, Environmental Resources, under the appropriate heading; i.e., Vegetation, Wildlife, Fisheries.

H. Cultural Resources: No sites have been identified in this area.

I. Limitations and Hazards: The lands surrounding this area are managed for wildlife and protected by State law; there are restrictions on their use.

Land Use Classifications
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational use by the visiting public..."

Resource Objectives:
Provide safe public access for low to moderate levels of recreation use, including fishing, picnicking, and wildlife viewing (see Plate 9).

Eliminate accessibility deficits.

Rationale:
The Orwell Lake Overlook is currently managed as a high-density recreation area. This is a popular vantage point for sightseers, especially during the autumn waterfowl migration periods.

Implementation Plan:
Site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

CHAPTER 5 – PLAN OF DEVELOPMENT AND DESIGN CRITERIA

This chapter introduces the recommended development for the Lake Orwell project. It presents a conceptual plan of physical development through the modification or expansion of existing facilities. These concepts are to be used as a guide in implementing the specific Resource Objectives and development concepts presented. It also provides guidelines to planners and designers for facility design including architectural styles, landscaping, trails, signing and other features. These concepts are referenced to a specific management unit, or units, in which the proposed development(s) should occur. Illustrated conceptual plans for these units are provided.

General:

All developmental concepts discussed in this chapter are presented with due consideration to the Americans With Disabilities Act of 1990. All design guidelines provided here are to conform to the Uniform Federal Accessibility Standards.

Development Phases:

To promote the orderly development of the project resources, these concepts are presented in two phases: The Initial Development Phase and The Ultimate Development Phase. The priorities for these development phases are based upon projected regional needs, and expressed local desires, and on requirements for protecting project resources. Actual development schedules may vary depending on the capabilities and policies of the Corps of Engineers. Detailed cost estimates are beyond the scope of this Master Plan. All costs associated with specific developments and management actions will have to be fully evaluated and justified, according to current Corps policy, prior to initiation.

A. Initial:

This development phase is projected to occur over the next five years, 1994 – 1999. Existing facilities at the project are expected to meet visitor demand for this period. The emphasis during this period will be to replace and/or upgrade the existing project facilities so that they will continue to provide quality recreation experiences and an even distribution of use over all of the project's recreational facilities.

Special emphasis will be placed on promoting a diversity of recreational experiences that are accessible to all persons. Each site will have an accessibility inventory completed before any changes are implemented. All subsequent design and construction will prioritize elimination of accessibility deficits.

B. Ultimate:

The ultimate development phase will occur from about 1999 to 2009. Emphasis during this period will be on improving site circulation and safety. The long-term development will focus on improving vehicular circulation within each site and reducing pedestrian /vehicle conflicts.

CONCEPTUAL PLAN OF DEVELOPMENT:

Corps of Engineers Sites:

1. Ottertail River Day Use Area: (see Plate 11)

This area has a linear configuration and lies parallel to the river. The downstream end has the playground, picnic shelter, parking and privies. The upstream part is more isolated. It lies well below the level of the road and is screened by trees. It is accessed by a path through the trees from the downstream area. Picnic facilities are also available here and the tailwaters are accessed here.

This area will be heavily affected by the implementation of the Dam Safety Study recommendations. A loss of part of the upstream area is a possibility, with aesthetic impact a virtual certainty. A new and comprehensive design for this recreation area should be implemented if this work eliminates any of the existing recreation features.

A. Initial:

Implementation of accessibility standards is a priority. Additional tree plantings along the road will improve the entrance and shade the parking areas. Architectural standards should be approved and applied.

B. Ultimate:

Design and install accessible fishing area for tailwaters. Pave paths to improve accessibility and reduce maintenance.

2. Overlook Day Use Area: (see Plate 12)

This site is a small picnic facility that overlooks the lake. It has a large graveled parking lot that also provides access for hunters.

A. Initial:

Initiate accessibility standards and a tree planting plan. Design and install improved road (entrance) sign.

B. Ultimate:

Pave parking facilities and the path to improve accessibility and reduce maintenance.

DESIGN CRITERIA:

The remainder of this chapter identifies general design criteria for project recreational development. These criteria should be used as a guide by planners, designers, and developers for facility design, styles, themes, and materials.

Accessibility:

Accessibility for all persons, regardless of the level of their physical abilities, shall be a basis for all facility design.

Facility Siting:

All future facilities at Lake Owell should be compatible with existing natural and man-made features. Detailed site analyses should be completed prior to design implementation.

Architectural:

All architectural elements shall conform to the most current design guidelines for accessibility. A consistent architectural theme and color scheme should be developed for the entire project. All future structures and modifications should be designed to be in harmony with their setting and should not be conspicuous. Where possible, natural materials and unobtrusive earthtone colors should be used. All structures should minimize construction costs, but design criteria should be adhered to. Structures should be designed for minimal maintenance and should be as vandal resistant as possible.

Roads:

Because of the small size and availibility of facilities, project roads, other than maintenance and access roads, are not needed.

Parking:

An adequate number of parking spaces should be provided to satisfy normal parking requirements during peak recreation periods.

Parking Lots:

Visually and aesthetically, large expanses of gravel or asphalt have a negative impact on natural areas. This impact can be softened or even eliminated with careful landscaping; wherever possible, the parking areas should be accented with shaded "islands" and edges.

Trails:
Because much of the Corps owned property is marsh and wetland, or is very steeply sloped, and the region and the area are rural, there are no plans for any trails at this time.

Landscaping:
Areas requiring site work should be landscaped upon completion of the work. Other areas disturbed through construction or other management activities should be landscaped. Landscaping should always be considered as the final stage of the activity.

1. General:
All planting described within this report, and all subsequent planting, should be coordinated between the field and the District Office. Utilizing the appropriate disciplines (landscape architects, foresters, botanists, resource managers, etc.) will ensure appropriate species selection and maximize the design potential of the planting.

The Lake Orwell Project Operations Plan will provide detailed instructions for planting and maintaining native plant species. Native plant communities and individual plant species for the Orwell Lake area are listed in Appendix C, Environmental Resources, Vegetation. The plants in this section are native to this area and, in accordance with Corps policy, should be used wherever possible.

2. Landscape Plantings:
Landscape plantings for the Lake Orwell project should attempt to emphasize natural plant communities. Native plant materials should be used to maintain the character of the surrounding natural landscape. Straight rows and lines should be avoided. Loose, informal groupings of native trees and shrubs should be used to screen, emphasize, frame or shade.

Dutch elm disease and oak wilt have claimed many trees in the past few years, and these losses will continue. Diseased trees on Corps property should continue to he removed and properly disposed of as part of the ongoing maintenance program. Trees that are removed should be replaced with native species that provide the same values as those trees that are lost.

Utilities:
The existing utility systems on the project are adequate to meet current and projected facility requirements.

Signage and Other Informational Devices:
Project signage should communicate information effectively, and should complement, whenever possible, the surrounding environment. Project signs must be designed in accordance with the criteria prescribed in the Corps of Engineers Sign Standards Manual (EP 310-1-6a).

1. Special Considerations:

The consistency of overall signage within the project. Entrance sign visibility. Entrance signs should stand alone and apart from other signage. They should not compete for visitor attention. The resistance of sign material to vandalism and weathering. Maintenance and removal procedures. The maintenance, removal, rehabilitation, and replacement of signs should be accomplished as quickly as possible.Should public response indicate that a trail is desirable, and if a qualified sponsor is available, a multi-purpose trail should be designed and constructed.

2. Information Requirements:

Signs communicate information to project visitors and should be placed so that they are obvious to the uninitiated. Signs are required at (or for):

- Park entries
- Park recreation facilities:

  parking areas

  picnic areas

  boat moorage/docks/launching facilities

  comfort stations/shower and dressing rooms

  sewage and trash disposal areas

  campgrounds

  swimming beaches

  interpretive centers
- Other project facilities:

  operations and maintenance compounds

  visitor information

  telephones

  first aid stations/information

  fire fighting equipment

water safety equipment

- Other activity areas:

  hunting areas/safety zones

  fishing areas

  trails

  viewpoints/overlooks

- Regulations:

  boating

  hunting/trapping

  fishing

  Title 36, C.F.R.

- Restricted activities or objects:

  off-road vehicles/snowmobiles

  horses

  hunting/trapping

  fires

  access

  firearms

- Personal or situational hazards:

  swimming/diving/wading

- undertow/dangerous currents
- hidden obstructions
- deep water drop-off

  thin ice

dangerous slopes and areas

automobile traffic

- Ecological Warnings:

Erasian milfoil

zebra mussels

purple loosestrife

bait restrictions

3. Recreation and Project Area Signage:

On all project and recreation unit entrance signs: **"Lake Orwell "** should dominate the sign, with the park or unit name, and the administering agency, plainly visible but clearly subservient to the project name. Each entry sign should be preceded by a warning sign, 1,000 feet distant, that informs motorists they are approaching a park.

4. Site Information Centers:

Each developed recreation site should include an informational kiosk or, at a minimum, a bulletin board. These information centers should include: a map and descriptive legend of the Lake Orwell project, showing the relative location of project areas and facilities and the location of telephones and primary first aid facilities, a list of park rules and regulations, and an area for posting notices and other information.

The design of these information centers should be standardized for the project. They should be designed in such a manner that they can be prefabricated at the project and assembled on each site. They should be constructed so that they resist vandalism and weathering and are easily repairable.

5. Directional and Informational Signing:

Whenever possible, directional and informational signing should incorporate the Federally accepted graphic symbols for signs. They should be used on signage systems for both traffic control and recreation. All project signs should be located so that they are plainly visible from an adequate distance, and in such a manner as to avoid confusion or doubt in the mind of the first-time visitor.

Picnic Units:
Picnic units should be sparsely clustered with an average minimum spacing of 44 feet. This wide interval will reduce the usage impact on the immediate area (grass and other vegetation, soil compaction, etc.) and will result in less social conflict. Tables should be sited, whenever possible, with a view of an area of interest. This is usually a view that includes a water feature, but may simply be an unobstructed view of the playground. Tables should be easily accessible, whenever possible, and should have a trash receptacle nearby. Each area shall have sites that are accessible to persons of limited physical mobility, and all tables should be usable by disabled persons.

Camping:
There are no camping facilities at Lake Orwell.

CHAPTER 6 – PROBLEMS AND CONSTRAINTS

PROBLEMS:

Problems at this project, as with all of the projects in this master plan, are mainly centered around vandalism. The remote location of the site and the lack of on-site personnel combine to provide the ideal environment for the casual vandal. Under these conditions, "vandal-proof" is not an attainable objective.

CONSTRAINTS:

The major constraint for recreation development at the Lake Orwell project is also related to the remote location of the project. All population concentrations of consequence are a considerable distance to the southeast. This means that sponsors able to afford a significant cost-sharing responsibility are few. In addition, there are innumerable recreation opportunities situated closer to these heavily populated areas than to the Lake Orwell project. Most of these "competing" recreation sources also tend to offer a greater variety of recreation types and a considerable array of amenities. While this situation tends to act as a constraint on recreation development, due to the paucity of developed recreational opportunities in the immediate area, it also makes these limited facilities more valuable to the local populace.

CHAPTER 7 – SUMMARY OF SIGNIFICANT FINDINGS AND RECOMMENDATIONS

SUMMARY OF SIGNIFICANT FINDINGS:

Within the constraints of operating the Lake Orwell Flood Control Project for its primary authorized project purpose of flood control, the Federally administered land and water areas of the lake can also be managed to help fill other regional resource needs. An examination of Corps administration policies at the Lake Orwell project indicates that the current allocation of project lands is providing protection of the resource and accommodating the recreational needs of the public. With some modification, the existing recreational development will support the current and projected use.

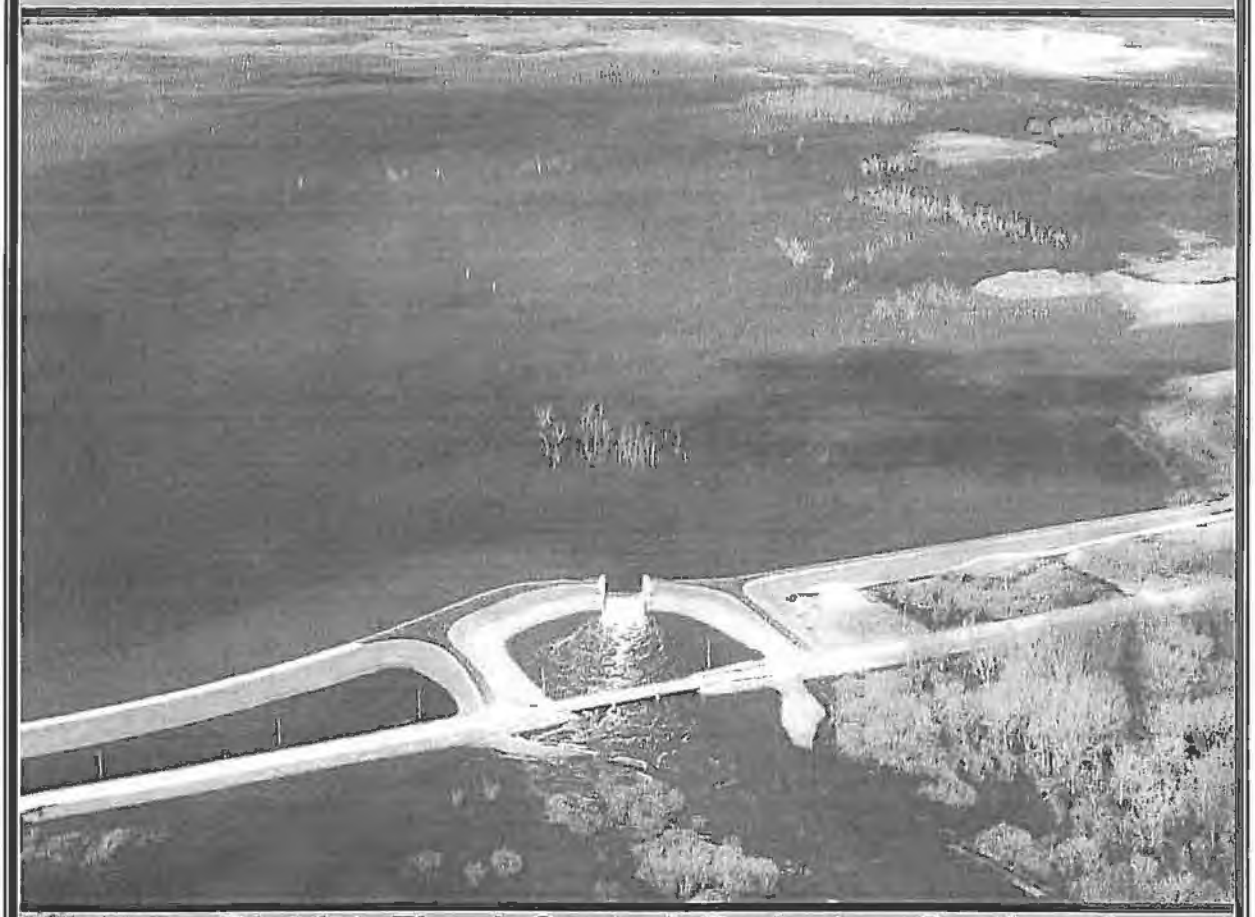
Since the completion of this project (1953) there has been a steady growth in different types of low density recreation; i.e., hiking, hiking, wildlife observation, etc. The 1990 Minnesota SCORP identifies the need for additional low density recreation facilities; this project supplies some of these needs. At present, the project provides opportunities for hunting, fishing, picnicking, and other day-use activities.

RECOMMENDATIONS:

The existing facilities should be modified to meet existing regulations for handicapped accessibility and to provide for increased visitor safety and facilitate ease of operation. The present management policies should continue and efforts should be made to protect the recreational resources of the project.

These needs have been identified as including recreation, wildlife management, habitat restoration and enhancement, fisheries augmentation, cultural resource preservation, and reinforcement of aesthetic qualities.

Big Stone Lake, Whetstone River



Western District Flood Control Projects – Section 4

Project Master Plan

June 1997

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Chapter 6 – Summary of Significant Findings and Recommendations

Big Stone Lake - Whetstone River

CHAPTER 1 – PROJECT DESCRIPTION

GENERAL:

The Big Stone Lake-Whetstone River project is upstream of the Lac qui Parle project and downstream of Big Stone Lake (see Figure 4-1). The project includes the dam and reservoir on the Minnesota River upstream of U.S. Highway 75, acquisition of about 1,600 acres of land bordering the reservoir for wildlife conservation and development, modifications of the upstream Big Stone Lake outlet control dam and silt barrier, bank stabilization on the lower 6-mile reach of the Whetstone River, and 3 miles of channel improvement below the Big Stone Lake outlet control dam. It was completed in 1974. Approximately 10,800 acres of project land and water are managed by the U.S. Fish and Wildlife Service as the Big Stone National Wildlife Refuge under cooperative agreement with the Corps of Engineers.

The Yellow Bank, Little Minnesota and Whetstone Rivers drain portions of eastern South Dakota through the project. Big Stone Lake, Lac qui Parle, Marsh Lake, and the Minnesota River are the most prominent water features in the region.

AUTHORIZATION AND PURPOSE:

The project was authorized by the October 27, 1965, Flood Control Act (Public Law [PL] 89-298), to be constructed substantially as recommended by the Chief of Engineers in House Document No. 579, 87th Congress, 2nd Session. House Document No. 193, 88th Congress, 2nd Session, contains Supplementing information related to land acquisition for the National Wildlife Refuge System.

PL 89-72 (1965) added recreation as a specific purpose to be considered at all Federal reservoir projects.

The original Big Stone Lake project at the outlet of Big Stone Lake (about 8 miles upsteam – see Figure 1-2) was constructed in 1937 by the State of Minnesota. The original project was designed to restore a desirable conservation level on Big Stone Lake to provide downstream flood protection, and to provide low flows during drought conditions. Undesirable (high) lake levels, acceleration of silt deposit in the lower end of the lake, and aggravation of downstream flood damages since 1937 have justified additional improvements downstream from the outlet of Big Stone Lake.

The Federally constructed dam and reservoir at Highway 75 provides measures to reduce flood damages, provide more desirable levels on Big Stone Lake, and enhance fish and wildlife resources. During periods of flooding on the upper Minnesota River, the reservoir is designed to provide up to 45,300 acre-feet of storage above the normal conservation pool, elevation 952.3 (All elevations are referenced to 1929 U.S. Geological Survey datum). This storage provides for the reduction of damages to downstream areas and sustained open-water areas for waterfowl use in the national wildlife refuge established as part of the project.

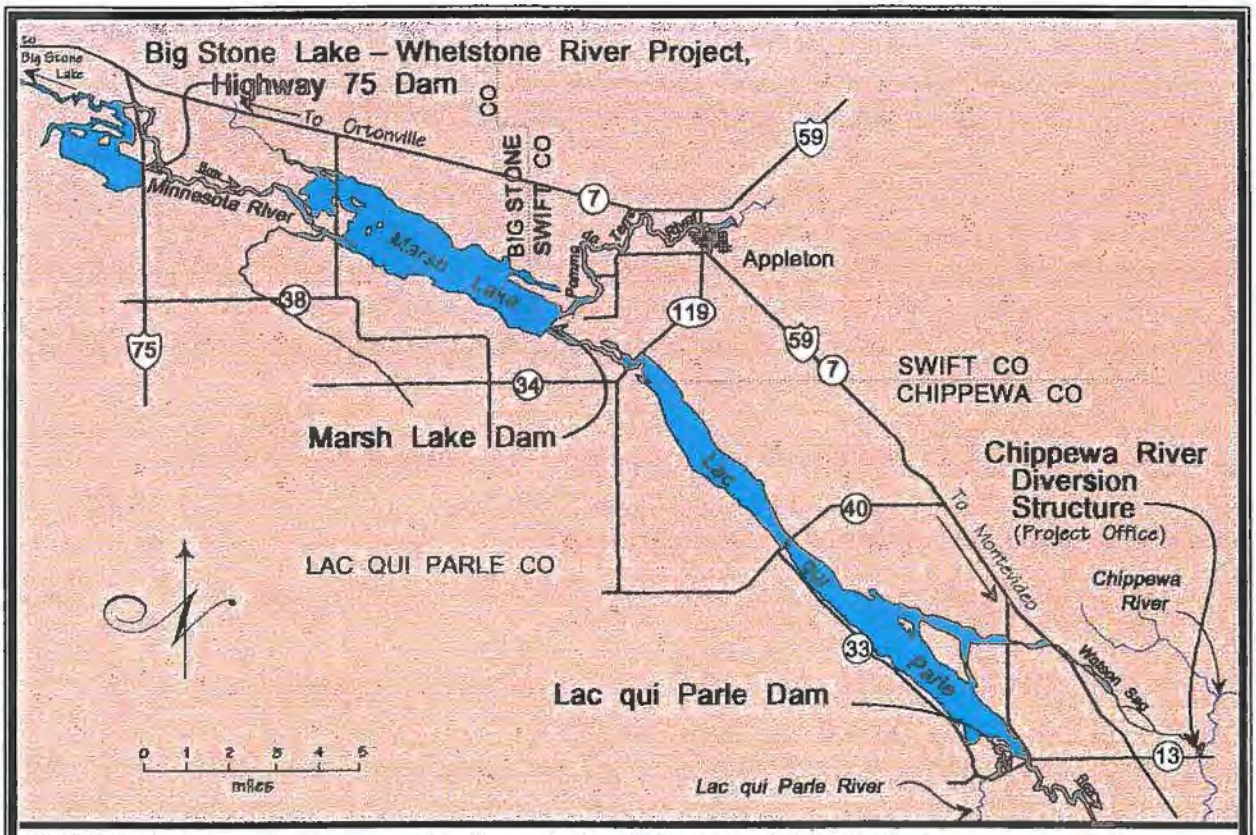


FIGURE 4-1 Big Stone Lake - Whetstone River Project

To avoid confusion between the State constructed Big Stone Lake structures and the Federally constructed Big Stone Lake-Whetstone River Project, the Federally constructed project will be referred to in this document by the location of the dam; i.e., Highway 75

Corps of Engineers Design Manual No. 4, June 1973, Big Stone Lake-Whetstone River, Master Plan for Resource Management, page A-2, states "Flood control comprises 18 percent of the derived benefits of the project and general recreation and wildlife conservation make up the remaining 82 percent."

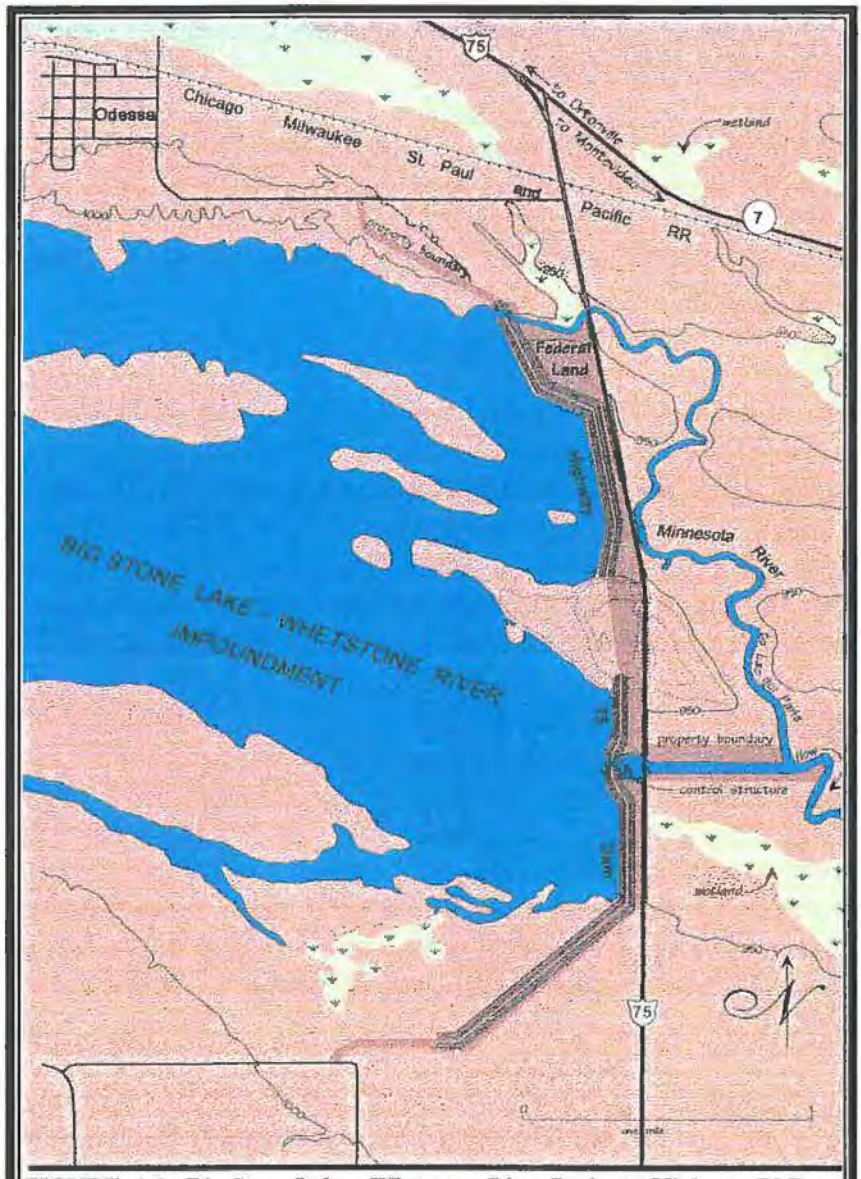


FIGURE 4-2 Big Stone Lake - Whetstone River Project... Highway 75 Dam

LOCATION AND SETTING:

The Big Stone Lake-Whetstone River project is located in far west-central Minnesota, approximately 140 miles west of St. Paul, Minnesota, near the South Dakota border (see Figure 1-1). The entire project lies in the abandoned channel of the Ancient River Warren (see Section 1, Regional Aspects, Description).

The Minnesota River rises in Big Stone Lake, a body of water which is about 26 miles long and varies in width from 0.5 to 1.5 miles and is located on the boundary between Minnesota and South Dakota. From Big Stone Lake at Ortonville, the river flows generally eastward about 330 miles to join the Mississippi River near St. Paul.

The impoundment created by the dam at Highway 75 is located on the Minnesota River below Ortonville, Minnesota, in Big Stone and Lac qui Parle Counties. The dam site is about 9 miles downstream from Big Stone Lake and is located near Odessa, Minnesota, and Big Stone City, South Dakota. It lies just upstream from, and parallel to, U.S. 75.

PROJECT LANDS:

The Corps of Engineers acquired 10,794.63 acres of land for the project. In accordance with authorizing legislation, 10,540.43 fee acres were transferred to the Department of the Interior for refuge purposes on March 31, 1975. The Corps retained 254.2 acres of land for project operations (see Figure 4-2). In addition, there are flowage rights on 104.84 acres; parcels of land scattered around the lake in the lower elevations. For additional information on Corps administered Federal land and project lands, see this section, Chapter 2, Administrative and Policy Factors: Project Land Status and Appendix E, Land Use Classification, and Plate 27.

Project Land Allocations:

In accordance with ER 1130-2-435, Project Operation, Preparation of Master Plans, all lands will be allocated in accordance with the authorized purposes for which they were, or are to be, acquired. Allocated project lands will be further classified to provide for development and resource management consistent with authorized project purposes and the provisions of the National Environmental Policy Act (NEPA) and other Federal laws. The classification process further refines land allocations to maximize use of project lands. The process must also consider public desires, legislative authority, regional and project specific resource requirements, and suitability.

All project lands at the Big Stone Lake-Whetstone River Project that were retained are allocated for project operations. Additional information on land allocation/classification is available in: Chapter 2, Administrative and Policy Factors: Project Land Status; Appendix E, Land Use Classification; Plate 27.

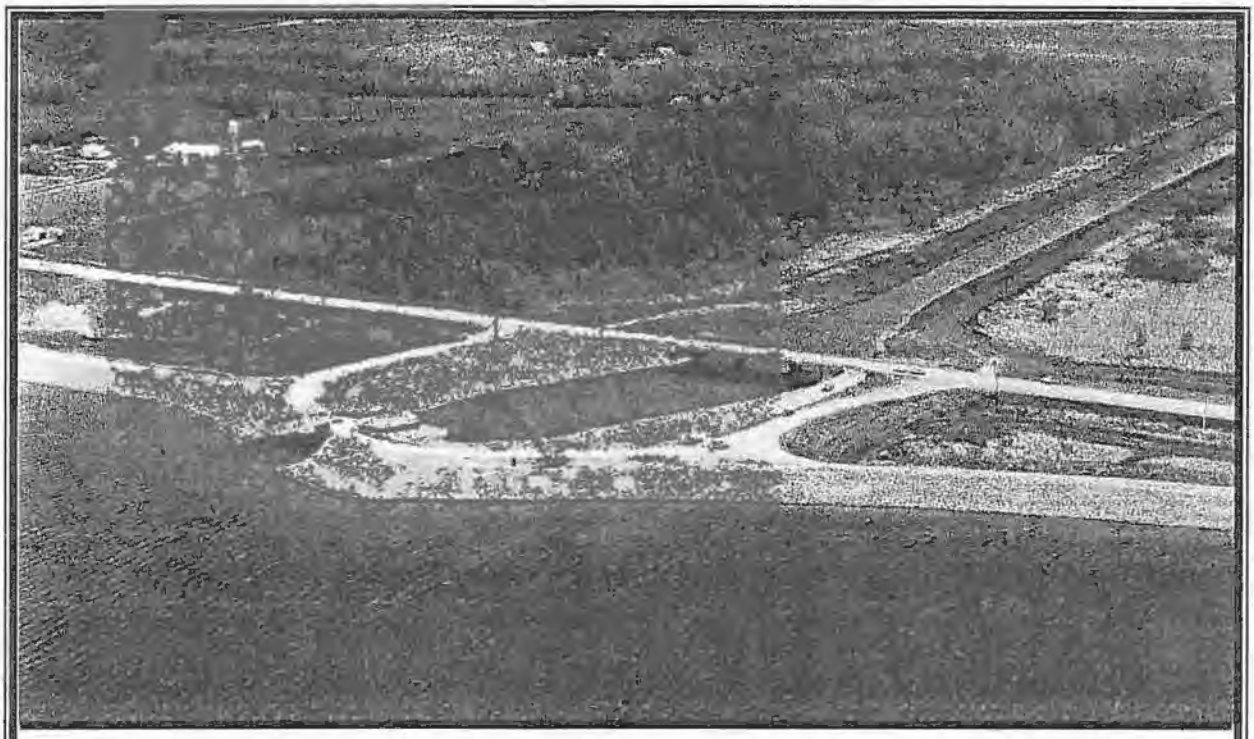


FIGURE 4-3 Big Stone Lake - Whetstone River: Highway 75 Dam

DAMS, CONTROL STRUCTURES AND DIKES:

1. Project Dam at Highway 75:

The dam is two sections of compacted impervious earth fill, separated by about 2,000 feet of high ground (see Figures 4-2 and 4-3). Turnouts to provide parking space for wildlife observation are located at intervals along the upstream side of the dam. The downstream face of the dam is covered with 6 inches of topsoil and seeded except where a layer of riprap and bedding sand are placed on the exit face of the underdrain. The upstream face of the embankment is protected by 18 inches of riprap overlaying 9 inches of bedding material. The top of the dam consists of a 6-inch layer of stabilized tar and aggregate to facilitate the use of the dam as a roadway for maintenance and inspection purposes for operating personnel. The embankment is approximately 16,250 feet long, has a maximum height of about 25 feet, and a top width of 20 feet, with side slopes of 1 vertical (V) on 3 horizontal (H) on the downstream face and 1V on 2½ H on the upstream face, and a crest elevation of 964.5 (msl). The dam provides 12.2 feet of freeboard above the conservation pool (elevation 952.3), 6.0 feet of freeboard above the emergency spillway design flood (elevation 958.5), and 3.1 feet of freeboard above the standard project flood (elevation 961.4).

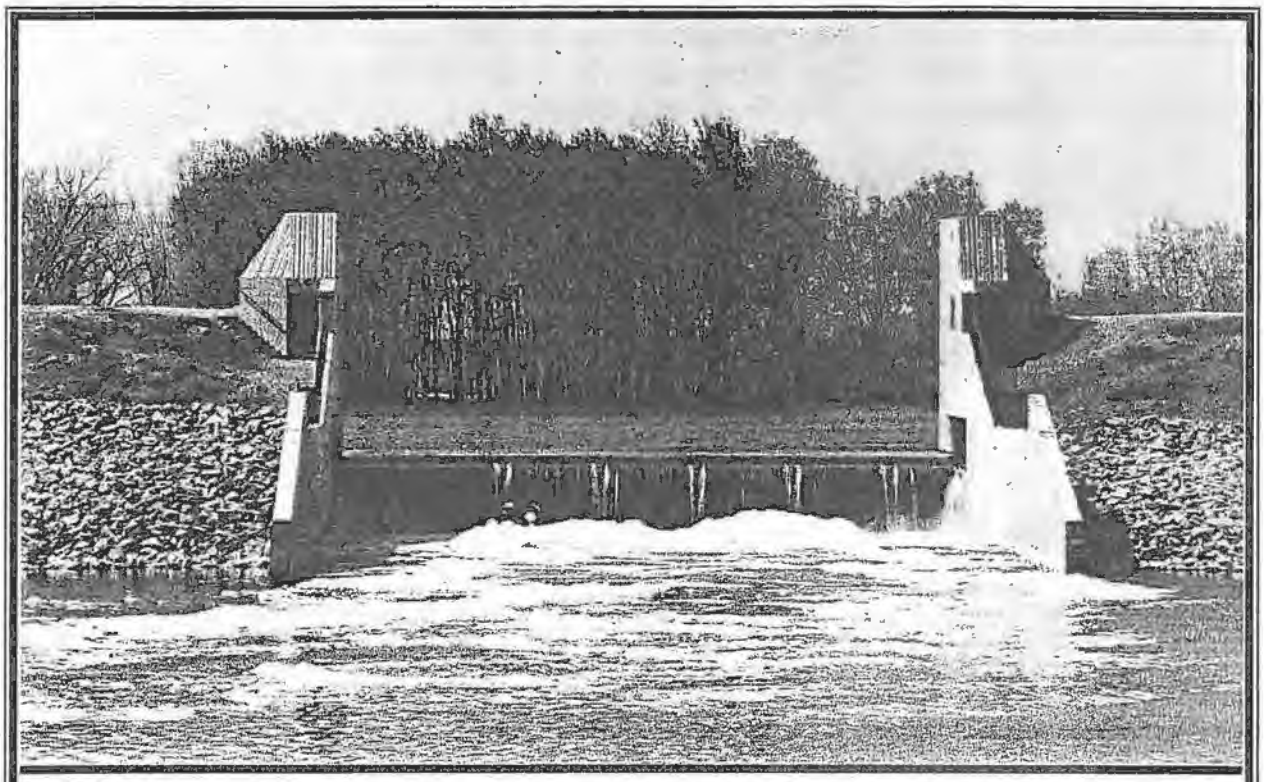


FIGURE 4-4 Big Stone Lake - Whetstone River: Highway 75 Control Structure

2. Highway 75 Control Structure:

The service spillway, located near the south end of the dam, is a reinforced-concrete gravity weir 65 feet long. An electrically operated hydraulic, hinged Bascule leaf gate that can be raised to normal conservation pool is provided. A stilling basin, 68 feet long with the top of concrete slab at elevation 934.0, together with five baffle blocks with top surface elevation 938.58 and an end sill with a top elevation of 936.9, complete the spillway (Figure 4-4).

A 715-foot-long emergency spillway, located between the service spillway and the low flow outlet, was excavated though a wide section of existing high ground. Training dikes are riprapped on both sides to resist erosion and safely direct the spillway discharges away from the earth dam embankment.

The low-flow outlet consists of a 42-inch-diameter reinforced concrete pipe conduit and is placed through the embankment near the north end of the dam. The flow in the conduit is controlled by a service sluice gate. An emergency sluice gate is also provided for use in the event of failure of the service gate. The control structure of the low flow outlet includes a trash rack and provisions for the placement of stop logs so that the sluice gates may be dewatered for inspection or repair. To aid in computing low flows, a weir was constructed in the discharge channel however, obstruction in the channel has resulted in the cessation of use of the weir for this purpose.

Project Buildings:
The only building on the project is a 24-foot by 32-foot metal maintenance building.

Roads and Access:
The project is accessed from Highway 75, west of Odessa, Minnesota.

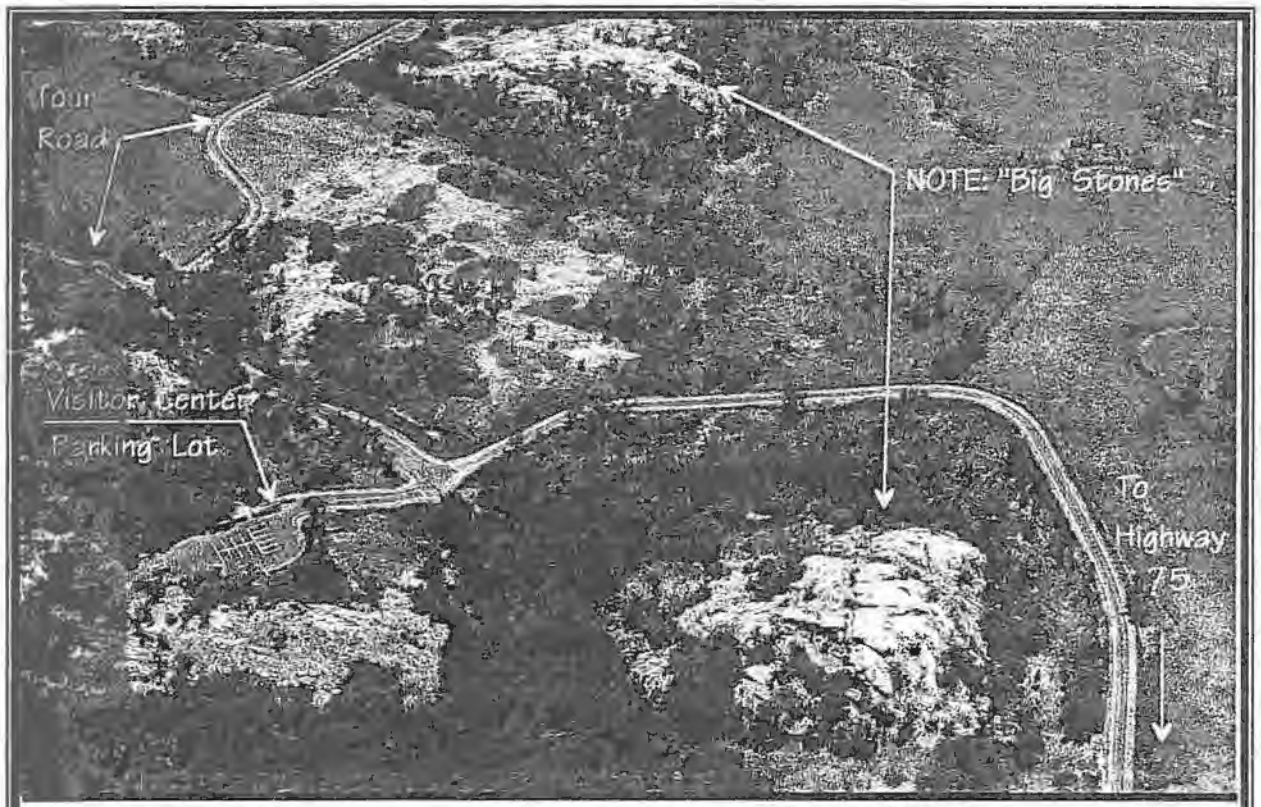


FIGURE 4-5 Big Stone Lake - Whetstone River: Big Stone Wildlife Management Area

Public Use Facilities:

1. Corps of Engineers:
A parking lot for fishing and hunting access and a scenic overlook to view the impoundment are the only public facilities provided. Interpretive signage at the overlook is provided by the U.S. Fish and Wildlife Service.

2. U.S. Fish and Wildlife Service:
In addition to the initial facilities constructed by the Corps of Engineers, the U.S. Fish and Wildlife Service has provided various public use facilities (see Figure 4-5). Facilities constructed as of August 1, 1979 include a visitor contact station, an interpretive walking trail with signage, a

canoe trail on the Minnesota River, and an auto tour road. These facilities are part of the Big Stone Wildlife Refuge and are accessed from Highway 75 south of Ortonville, Minnesota.

RESERVOIR:

Description:

Normal conservation level of 952.3 results in a 2,800 acre pool. The normal flat pool extends upstream for about 7.5 miles. It is not continuous over this reach because of areas of higher ground within the perimeter on the reservoir. The shoreline of the reservoir, including these islands, is about 23 miles. A standard project flood would result in a pool of approximately 87,000 acre-feet.

Reservoir Operations:

1. Flood Control:

The Highway 75 structure is operated in accordance with a July 16, 1975, Memorandum of Understanding with the U.S. Fish and Wildlife Service. A copy of this memorandum is in the Reservoir Regulation Manual, Highway 75 Dam and Reservoir, Appendix B. The Highway 75 Reservoir and surrounding lands are part of a National Wildlife Refuge.

During the critical waterfowl use period, May through October, the Highway 75 Dam gates are operated to maintain the reservoir pool at the conservation pool elevation of 952.3. If heavy flows occur during this period, the service spillway Bascule gate is lowered at the rate required to control the level within a half-foot range above or below elevation 952.3. During low flow periods small releases, as required, are made through the gated low flow conduit provided in the dam.

Spring Runoff: Prior to spring runoff, the pool is lowered to elevation 947.3, providing 5 feet of flood storage below conservation levels.

Summer Floods: If a summer flood should occur during the period when the pool is at normal conservation pool level, the spillway gate shall be lowered as necessary to maintain the pool within the range of 0.5 foot above or below elevation 952.3.

2. Water Storage Strategy:

A. Highway 75:

Under normal conditions, the pool at the Highway 75 Dam will be maintained at conservation pool level, elevation 952.3, during late spring, summer, and early winter, with drawdown to elevation 947.3 in late fall or early winter. As long as Big Stone Lake maintains a minimum discharge of 2 cfs, the same minimum shall be discharged at the Highway 75 Dam. The total

inflow into the Highway 75 Reservoir is the sum of the flows of the Minnesota River at Ortonville and the Yellow Bank River near Odessa.

B. Big Stone Lake Outlet Control:

The present plan of operation provides for maintaining a minimum downstream flow of 2 cfs and diversion of water from the Whetstone River into Big Stone Lake whenever the lake is below the conservation pool elevation of 964.7. The former stop log control structure was replaced with vertical slide gates in 1986. Flood control for Big Stone Lake is performed by passing the maximum flow through the structure to the Highway 75 Reservoir during flood periods.

The Upper Minnesota River Watershed District is the local sponsor that cost shared with the Federal Government in the recent modifications involving Big Stone Lake. The Watershed District will assume operation and maintenance responsibilities of the Big Stone Lake outlet control once the operation and maintenance manual is completed by the Corps of Engineers and approved by the Watershed District. In the interim, Big Stone Lake outlet control is being operated by the Corps of Engineers park manager from the Lac qui Parle project office.

The Watershed District must operate Big Stone Lake under the broad guidelines specified above and subject to any further, or more specific, limitations that might be imposed by the South Dakota-Minnesota Boundary Area Commission. This Commission has been empowered by the States of Minnesota and South Dakota to determine the most desirable levels for boundary waters and to prescribe a plan for controlling and regulating water levels.

Highway 75 Impoundment, Unit Description:

1. Size and Shape:

Highway 75 Dam consists of a 16,250 foot-long embankment about 25 feet high and 20 feet wide. The service spillway is located near the south end of the dam and the low flow outlet near the north end. The 715 foot-long emergency spillway is located between the two structures (See Plate 19).

2. Location and Access:

This unit is located approximately 3 miles south of Odessa, on U.S. Highway 75.

3. Existing Site Use:

This unit contains the Highway 75 dam and spillways. An unheated storage building for storage of supplies and equipment is also located along the dam. The parking area is the only area used hy the public, and no visitor records are kept for it.

4. Adjacent Land Use:

This site is part of the Big Stone Wildlife Management Area. Other area land use is almost exclusively agricultural.

5. Vegetation:

This area is a combination of wetlands: marsh vegetation interspersed with hardwood floodplain forest.

6. Wildlife Species and Habitat Availability:

This unit is part of a designated wildlife management area; as such, it is managed specifically for wildlife/habitat. For a listing of wildlife inhabiting this area, see Appendix C, Environmental Resources, Wildlife.

7. Cultural Resources:

The Big Stone Lake area has high value as an archeological and historical resource. It lies on a major travel corridor for both the indigenous peoples of North America and the European immigrants that displaced them.

The area has been used by various human groups from about 8000 BC; the early users were nomadic hunting groups. Climatic changes brought about varying uses (or non-uses) of the area. Evidence of the users is found only in habitation and burial sites. Our knowledge of these early peoples is very limited.

In the more recent history of the area, the Dakota Indians lived a semi-nomadic hunting and gathering life in the vicinity of Big Stone Lake before European colonization. The Minnesota River Valley was almost certainly a focal point of the eastern plains Indians. The abundance of game, shelter from prairie winds, and the availability of firewood, a rare commodity on the plains, made the valley a desirable area for winter encampments. In addition, the Big Stone Lake area is only a few miles (by canoe) from the continental divide at Lake Traverse (see Section 1, Regional Resources and Influences, Chapter 2, Description). From this locale, it is possible to access either Hudson Bay (via Lake Traverse, Red River of the North, etc.) or the Gulf of Mexico (downstream to the Mississippi River) by relatively easy water travel.

On the basis of current information about cultural resources, a wide variety of significant prehistoric, historic and geologic features occur in the Big Stone Lake area. Though their potential is yet to be realized, it seems likely that many sites may be suitable for public interpretation.

8. Limitations and Hazards:

The unit is part of a designated wildlife management area; as such, development is limited to those practices that are acceptable to the administrating agency, in this case the U.S. Fish and Wildlife Service.

CHAPTER 2 – RESOURCES AND INFLUENCING FACTORS

This chapter presents the factors that most influence the use, development, and management of the land and water resources at the Big Stone Lake-Whetstone River Flood Control Project. This includes factors that are conducive to development, and factors that act as constraints. The elements presented here fall into three broad classifications: natural resources, social and cultural resources, and administrative and policy considerations. Considering the needs and desires of the region as the final determinant, these factors are used to decide the most appropriate development of project resources, in accordance with the authorized project purposes.

PHYSICAL AND ENVIRONMENTAL RESOURCES:

Physical and environmental resources include geology, water, vegetation, wildlife, fisheries, visual quality, and cultural and recreational resources.

Geophysical Features:

The project lies in the Minnesota River Valley which is the abandoned channel of the Ancient River Warren (see Section 1, Regional Resources and Influences, Chapter 2, Description). The valley escarpments were once the banks of the huge river. They rise approximately 100 feet above the lake and provide the informed observer with an idea of the actual size of the ancient stream. The original valley was about 100 feet deeper than it is today; it has silted in during the 9,000 years since the demise of the great prehistoric river.

1. Soil Types:

The Soil Conservation Service has classified the soils of the project area in the Nearly Level Flood Plain group, Chaska-Dorchester-Oshawa Rocky Benches Association. This group appears along the course of the Minnesota River throughout this region. This area shows the evidence of a very long period of erosion by the Glacial River Warren, and subsequent sedimentation by the Minnesota River and its tributaries. Soils of the project are generally very light and often range to sand and gravel. Desirable land uses are pasture, wildlife habitat, and recreation. Only a very small portion of project lands are suitable for cultivation.

The area soils range from poorly drained and/or frequently flooded soils, through stony soils and rock outcrops, to productive soils conducive to intensive agriculture. The characteristic soil associations in the area are generally delineated by topography.

On the floor of the river valley (the Minnesota River bottoms), the alluvial soils are frequently flooded. Rising from the floodplain is the valley escarpment, having steep slopes with easily eroded and droughty soils. Above the escarpment, soils occur on a gently rolling plain. Because of the recent glacial activity, these soils vary greatly and may be stony and/or poorly drained, or

highly suited to agriculture. Regional soils are generally fertile and have been cultivated where limitations are absent or where drainage and stone removal are economically feasible. Much of the region is quite rocky, with some steep slopes (especially the valley terraces) with occasional ravines running through. To prevent rapid and severe erosion, this land requires permanent cover.

2. Topography:

The project lies in the Minnesota River Valley within the floodplain of the river. Within the steep bluffs that contain the valley, the land is generally level, although there is some variability along the shorelines. Vegetation ranges from dense stands of cattail to sparse stands of grasses and sedges to dense stands of hardwood floodplain forest. The shorelines slope gradually, with dense vegetation up to the water's edge. The shorelines include smooth mud-sand or sand and coarse gravel beaches as well as areas with large, scattered boulders. Bottoms are sandy-mud or silt in shallows and become muck in deeper areas. Shoreline erosion is not a problem.

Water Resources:

The Minnesota River from the Lac qui Parle Dam east (downstream) to Franklin, Minnesota, is part of the Minnesota Wild and Scenic Rivers System. This 95.5-mile stretch of the river has been designated as Scenic and Recreational under provisions of the Minnesota Wild and Scenic Rivers Act. The river is the major water feature in the region. With only two dams below Lac qui Parle and many miles of scenic vistas, the river corridor has the potential to be a major recreation resource along its entire length.

1. Principal Tributaries:

The total contributing drainage area of the Minnesota River at the Highway 75 Dam includes the Whetstone River and Yellow Bank River subbasins. Both streams rise in South Dakota with the Whetstone River joining the Minnesota River at the outlet of Big Stone Lake and the Yellow Bank River entering the reservoir just upstream of the Highway 75 Dam.

2. Drainage Basin:

The two streams drain areas of about equal size, with the Whetstone and Yellow Bank Rivers draining areas of about 395 and 404 square miles, respectively. The secondary drainage area contributing inflow to the reservoir includes the Big Stone Lake drainage basin which covers about 1,160 square miles.

3. Water Quality:

The surface waters are relatively high in dissolved ions, but are useful for nearly all purposes. Minnesota River water, if properly treated, is suitable for domestic use.

Human activities in the watershed contribute heavily to the degradation of the lakes and streams. Chemicals from cropland runoff degrade water quality and promote eutrophication of the lakes. Fecal materials from livestock operations as well as from municipal wastes are indicated by high coliform counts. These substances are either assimilated by the lake biota or flow out of the

lakes, contributing to the serious water quality problems the downstream reaches of the Minnesota River experience.

The water quality of the area wetlands has not been examined. The bottoms are soft muck, high in organic matter, and are easily disturbed by rough fish, cattle, or high winds. Disturbance of sediments and high planktonic populations create turbidity. Agricultural chemicals and animal wastes enter the wetlands through farming operations. Some of this material is removed from the water by the filtering action of the wetland plants, some of it reaches the surface waters of the area, and some of it infiltrates the subterranean aquifers from which many inhabitants of the region draw their water.

Most groundwater is still acceptable for domestic, industrial, and agricultural uses. The water from these aquifers is extremely hard, and levels of total dissolved solids, iron, manganese, and sulfate may exceed Minnesota Pollution Control Agency limits (1973) for Class 1-A domestic water supplies. Well water must be treated extensively to be fit for human consumption; even after treatment, the water retains a harsh mineral taste. Surface sand and gravel aquifers occur irregularly and have high recharge capacity, but are more easily contaminated.

Vegetation Communities:

An inventory and analysis of habitat type and existing vegetation in the Big Stone Lake area is presented in Section 1, Chapter 3, Key Factors and Resources: Vegetation and in Appendix C, Environmental Resources, Vegetation. Plant communities are shown in Tables C-1 to C-4.

Project vegetation is almost exclusively riparian or marsh (for additional information, see Section 1, Chapter 3, Floodplain Forest, and Marshlands)

1. Rare and Endangered Species and Habitats:

The project is located within what is known as the Prairie Pothole Region of the United States. This region was created when glaciers advanced through the Dakotas, eastern Montana, Minnesota, and north-central Iowa leaving freshwater depressions and marshes called "prairie potholes." These are small wetlands that depend on precipitation and groundwater levels for their water supply. In addition to the small potholes scattered throughout the area, there are many stream and spring fed marsh areas. All wetland habitat in this region is crucial to the production of waterfowl. The North American Waterfowl Management Plan identified 34 areas of major concern for waterfowl habitat in the United States and Canada. Of these 34 major areas, five of the most critical areas were further identified as Priority Habitat Range. The Prairie Pothole Region is one of these ranges.

2. Nuisance Plants:

Poison ivy, *Rhus radicans*, is common throughout the project area. Because the day use areas are small, poison ivy is easily controlled in high use areas. Of special concern to this project are the aquatic plants purple loosestrife and Eurasian milfoil.

Purple loosestrife, *Lythrum salicaria,* is an exotic wetland plant. Introduced from Europe and Asia in the 1800s, it has invaded 40 States and all of the Canadian border provinces. This plant is extremely invasive to wetlands and will crowd out native plant species. It is unsuitable for nesting, cover, or feeding habitat for most native wetland animal species and has no naturally occurring predators in the United States.

Eurasian milfoil, *Myriophyllum spicatum,* is also an exotic wetland plant from Europe. In shallow, nutrient rich lakes, such as Lac qui Parle, it forms an impenetrable mat of vegetation on the lake surface supported by thick underwater stands of tangled stems. This plant has had serious negative impact to water-based recreation in lakes where it has become established.

Both of these plant species are very hardy and are able to reproduce from root pieces and broken stems.

Project land is experiencing problems with the exotic weed, leafy spurge, *Euphorbia sesula.* Its aggressive nature combined with a lack of natural controls enables it to out-compete native vegetative species. This hardy perennial reduces grassland quality by reducing species diversity. Leafy spurge has been declared a noxious weed in Minnesota. As a noxious weed its control, defined as preventing its spread by seed or other propagating parts, is warranted. The Corps has been involved since 1975 in an effort to control noxious weeds on project lands.

Wildlife, Species and Habitat:

Most of Lac qui Parle and Marsh Lake, directly downstream from the Highway 75 impoundment, lie within the Lac qui Parle Wildlife Management Area administered by the Minnesota Department of Natural Resources. The unit is about 25 miles long, 1 to 3 miles wide, and includes 32,000 acres under State administration. Marshland, forest, brushlands, and uplands of grassland and cropland characterize the area. Immediately upstream from the dam, the Big Stone National Wildlife Refuge is administered by the U.S. Fish and Wildlife Service. These wildlife areas and other undeveloped areas in the Minnesota River Valley form a natural habitat corridor traversing the region from northwest to southeast. This corridor offers excellent opportunities for wildlife based recreation.

For additional information on species, see Section 1, Chapter 3, Regional Resources and Influences, Key Factors and Resources: Habitat and Species. A species list is available in Appendix C, Environmental Resources, Wildlife.

1. Threatened and Endangered Species:

The bald eagle, *Haliaeetus leucocephalus*, uses the Big Stone National Wildlife Refuge occasionally during migration. No eagle nesting is known to occur in that area. Primary migration use occurs on the refuge and the Lac qui Parle Wildlife Management Area.

See Appendix C, Environmental Resources, for plant, animal and fish, rare and endangered species or habitat list.

2. Special Programs:

The North American Waterfowl Management Plan (NAWMP) is an international agreement between the United States and Canada for the restoration of lost waterfowl habitat. Federal, State, private, and Provincial agencies are cooperating under this plan for the conservation, development, and management of habitat for waterfowl and associated wetland species. On January 23, 1989, the Corps of Engineers and the U.S. Fish and Wildlife Service signed a Cooperative Agreement which defined the goals, responsibilities, and procedures by which these two agencies will work together to further the efforts of the NAWMP. This agreement was in effect for 3 years from the date signed. The Corps agreed to identify opportunities at operating projects and to coordinate management efforts with the U.S. Fish and Wildlife Service.

Fisheries:

Please refer to Section 5, Lac qui Parle project for information on the fishery of the Big Stone Lake-Whetstone River project.

Cultural Resources:

1. Overview:

Corps fee title lands at the Highway 75 Dam were surveyed for cultural resources during 1993 as part of the contract to survey the Lac qui Parle project. One historic archeological site was found.

2. Inventory of Known Sites:

The former farmstead site at the dam has been evaluated as not eligible to the National Register of Historic Places. Small lithic scatter sites exist in the Big Stone National Wildlife Refuge within 4-miles of the dam. The closest known lithic scatter site is located on a rise, ½ mile north of the Minnesota River, and west of Highway 75. Information on the cultural resources of the Big Stone Lake-Highway 75 project fee title lands will be found in the Lac qui Parle Historic Properties Management Plan, under preparation in 1993.

Resource Management Responsibilities:

The resource manager for the Lac qui Parle project is responsible for the management duties of the Big Stone Lake-Whetstone River project. For additional information, see Section 4, Lac qui Parle.

CHAPTER 3 – RESOURCE OBJECTIVES:

An examination of Corps administered land at the Big Stone Lake-Highway 75 project indicates that the current allocation of these lands is providing protection of the resource and accommodating the recreational needs of the public. With some modification, the existing recreational development will support the current and projected use. The existing facilities should be modified to meet existing regulations for handicapped accessibility, and to provide for increased visitor safety and ease of operation.

RECREATION, INTENSIVE AND DAY USE:

Resource Objectives:
Operate the Highway 75 Impoundment to safely and efficiently meet the authorized project purposes.

To help fill regional needs by maximizing the recreational potential of the project within the limitations of the site.

Rationale:
Since the completion of this project (1975) there has been a steady growth in different types of low density recreation; i.e., hiking, biking, wildlife observation, etc. The 1990 Minnesota State Comprehensive Outdoor Recreation Plan identifies the need for additional low density recreation facilities. This project could supply some of these needs. At present, the project provides opportunities for hunting, fishing, picnicking, and other day-use activities. Changes in the existing allocation of project resources would not result in any significant increase in the benefits derived from this project. Because of this, the present management policies should continue, and efforts should be made to protect the recreational resources of the project.

CHAPTER 4 – PLAN OF DEVELOPMENT AND DESIGN CRITERIA :

CONCEPTUAL PLAN OF DEVELOPMENT:

General: Implementation Plan:
Retain the unit to facilitate the most efficient possible operation and maintenance of the Big Stone Lake-Whetstone River project.

To maximize efficiency, re-examine those areas that require high levels of maintenance with a specified goal of reducing maintenance costs.

Upgrade access to the site. This will be the first step toward realizing the recreation potential of this unit.

Highway 75 Dam:
Construct an information kiosk. Upgrade the existing maintenance building so that the facility is secure, and supplied with electricity and heat for additional storage capability. Initiate a planting program in low-intensity public use areas to add to the comfort and enjoyment of the users and to increase the level of aesthetics of the project. Investigate the need for sanitary facilities at this site. A portable accessible restroom should be provided near the tailwater parking lot for public health and safety reasons. This would be monitored, and a determination can be made about providing a permanent structure. Construct walkways to sanitary facilities and designate parking stalls that are accessible for disabled persons (see Plate 20).

CHAPTER 5 – PROBLEMS AND CONSTRAINTS

PROBLEMS:

Problems at this project, as with all of the projects in this master plan, are mainly centered around vandalism. The remote location of the site and the lack of on-site personnel combine to provide the ideal environment for the casual vandal. Under these conditions, "vandal-proof" is not an attainable objective. Gates are torn down using four-wheel drive trucks; signage and other facilities are riddled by gunshot; graffito done at will. Repairing damaged facilities and structures is a large portion of the project operating budget.

CONSTRAINTS:

The major constraint for recreation development at the Big Stone Lake-Whetstone River project is also related to the remote location of the project. All population concentrations of consequence are a considerable distance to the east. This means that sponsors able to afford a significant cost-sharing responsibility are few. In addition, innumerable recreation opportunities are situated closer to these heavily populated areas than is the Big Stone Lake-Whetstone River project. Most of these "competing" recreation sources also tend to offer a greater variety of recreation types and a considerable array of amenities. While this situation tends to act as a constraint on recreation development, due to the paucity of developed recreational opportunities in the immediate area, it also makes these limited facilities more valuable to the local populace.

CHAPTER 6 – SUMMARY OF SIGNIFICANT FINDINGS AND RECOMMENDATIONS

SUMMARY OF SIGNIFICANT FINDINGS:

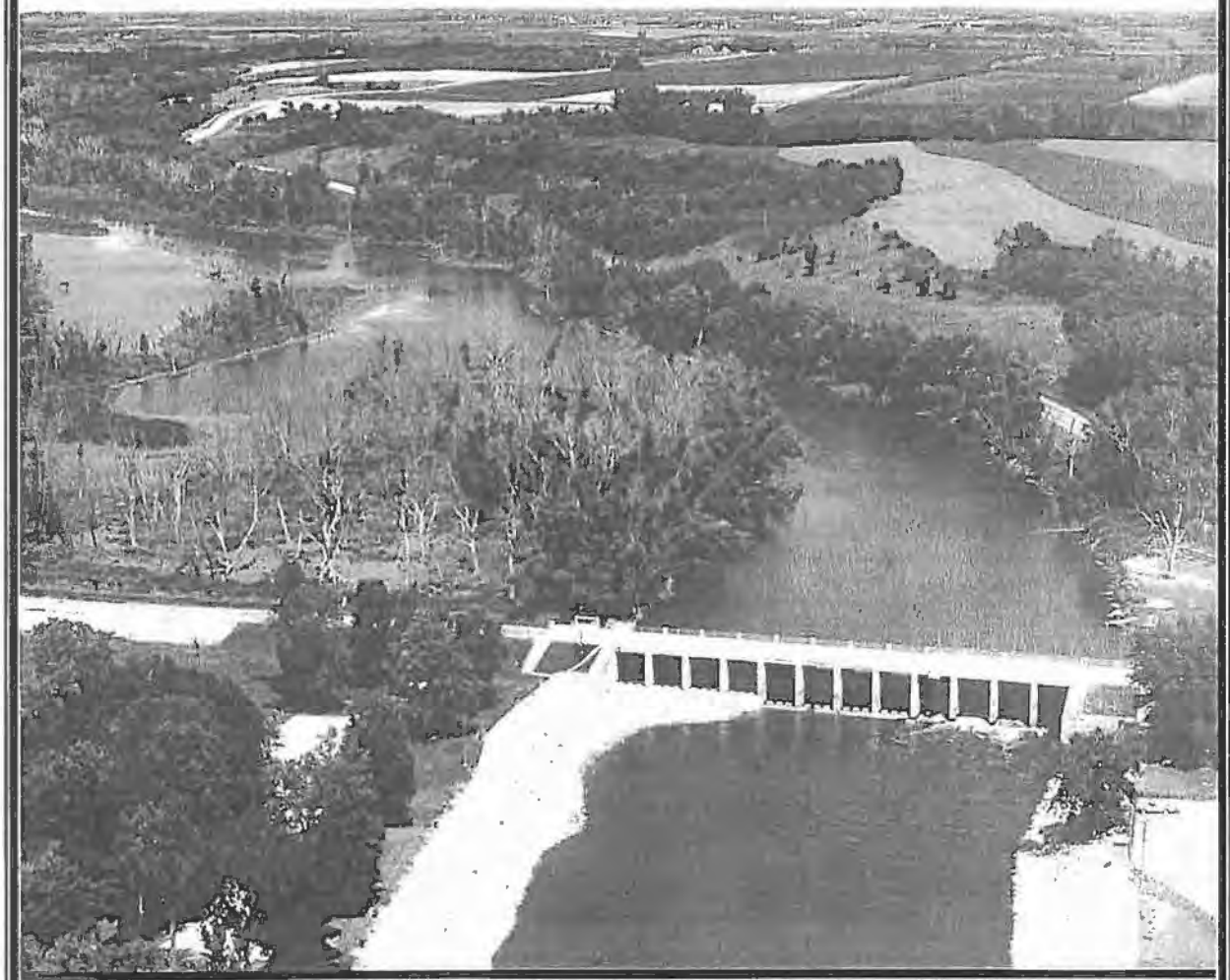
Within the constraints of operating the Big Stone Lake-Whetstone River project for its primary authorized project purpose of flood control, the Federally administered land and water areas of the lake can also be managed to help fill other regional resource needs. An examination of Corps administration policies at the Big Stone Lake-Whetstone River project indicates that the current allocation of these lands is providing protection of the resource and accommodating the recreational needs of the public. With small modification, the existing recreational development will support the current and projected use.

Since the completion of this project (1975) there has been a steady growth in different types of low density recreation; i.e., hiking, biking, wildlife observation, etc. The 1990 Minnesota State Comprehensive Outdoor Recreation Plan identifies the need for additional low density recreation facilities. This project supplies some of these needs. At present the project provides opportunities for hunting, fishing, picnicking, and other day-use activities.

RECOMMENDATIONS:

The existing facilities should be modified to meet existing regulations for handicapped accessibility and to provide for increased visitor safety and facilitate ease of operation. The present management policies should continue and efforts should be made to protect the recreational resources of the project.

Lac qui Parle



Western District Flood Control Projects – Section 5

Project Master Plan

June 1997

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Chapter 2 – Resources and Influencing Factors

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Lac qui Parle

CHAPTER 1 – PROJECT DESCRIPTION

GENERAL:

Lac qui Parle Flood Control Project is a Federal flood control and water conservation project on the upper Minnesota River in western Minnesota near the South Dakota border (see Figure 1-2). It consists of the main dam at Lac qui Parle (Lake that Talks), a dam at Marsh Lake, and a dam and diversion channel on the Chippewa River (the Watson Sag Weir) near Watson, Minnesota (see Figure 5-1).

Lac qui Parle is a multipurpose water resource project. It is designed to provide 116,500 acre-feet of storage above the normal conservation levels of Lac qui Parle and Marsh Lake during flood periods. This storage is for the reduction of damages to downstream areas. At conservation levels, there is 41,750 acre-feet of storage; low-water flow is improved for agriculture, recreation, fish and wildlife conservation, hydropower, and dilution of sewage effluent at Granite Falls and Montevideo, Minnesota. Conservation levels are regulated to sustain open-water areas for waterfowl use in the wildlife refuge established as a part of the project.

The Chippewa structure is used to reduce downstream flows at Montevideo by diverting a portion of Chippewa River floodwaters into the Lac qui Parle Reservoir.

The entire project lies in the abandoned bed of the prehistoric Glacial River Warren, within a few miles of the head of the ancient river (see Section 1, Regional Resources and Influences, Chapter 2, Regional Description). Channel clearing and snagging activities are done to Granite Falls, Minnesota, about 40 miles downstream from the main dam.

Watersheds contributing to the project are: Big Stone Lake via the Minnesota River, Whetstone River, Pomme de Terre River, Yellow Bank River, Lac qui Parle River, and Chippewa River. Runoff from 4,050 square miles passes through the Lac qui Parle Dam. Water from a portion of the 2,050-square-mile Chippewa River watershed is also diverted, at times, to Lac qui Parle for flood control. Big Stone Lake, Lac qui Parle, Marsh Lake and the Minnesota River are the most prominent water features in the area.

AUTHORIZATION AND PURPOSE:

The Lac qui Parle Flood Control Project was authorized as a Federal project by the Flood Control Act of 1936.

Section 4 of the Flood Control Act of 1944, as amended, provided the Corps of Engineers with the basic authority to develop recreation facilities at this project. Additional authority was given by Section 209 of the Flood Control Act of 1954, Section 207 of the Flood Control Act of 1962, and in 1965 by the Land and Water Conservation Fund Act and the Federal Water Project Recreation Act. These Acts further defined the role of the Corps of Engineers in providing recreation at reservoir and non-reservoir projects. Public Law 89-72 established the requirements for cost-sharing non-Federal sponsorship of recreation developments at Federal water projects.

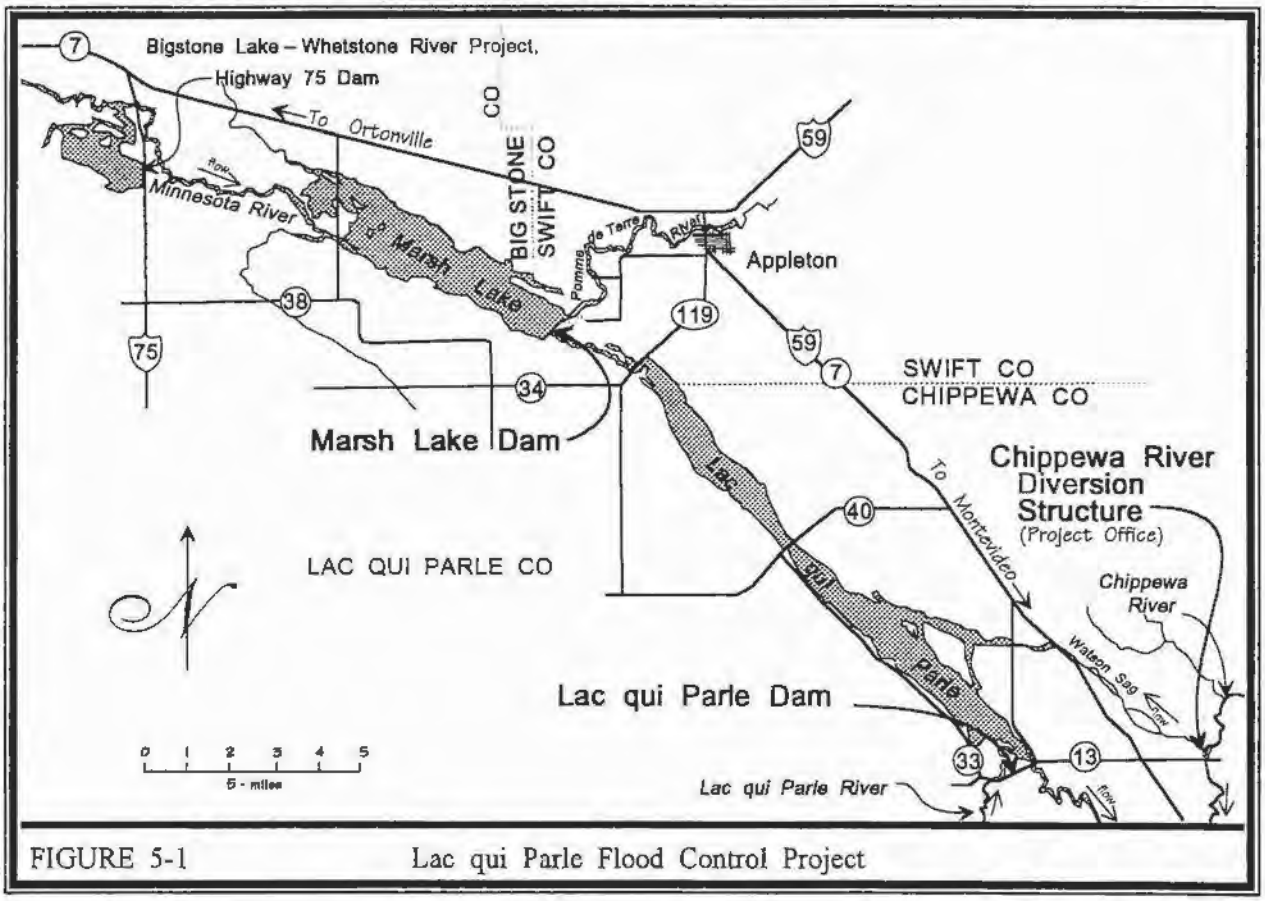

FIGURE 5-1 Lac qui Parle Flood Control Project

LOCATION AND SETTING:

The Lac qui Parle Flood Control Project includes Lac qui Parle, Marsh Lake, the Chippewa River diversion, and the Minnesota River between the head of Marsh Lake and Granite Falls. It is located in far west-central Minnesota, approximately 140 miles west of St. Paul, Minnesota, near the South Dakota border (see Figure 1-1). The project forms the northeastern boundary of Lac qui Parle County and the southwesterly boundaries of Chippewa, Swift, and Big Stone Counties (see Figure 5-1). The Lac qui Parle Dam is approximately 7 miles northwest of Montevideo, and 288.1 river miles above the mouth of the Minnesota River. Marsh Lake Dam is upstream at river mile 303.5. At normal or conservation pool level, the two impoundments extend upstream for a total distance of about 27 miles from the Lac qui Parle Dam.

Both Lac qui Parle and Marsh Lake are virtually within the boundaries of the Minnesota State Lac qui Parle Wildlife Management Area, and the Lac qui Parle State Recreation Area borders Lac qui Parle (lake). Both of these facilities are administered by the Minnesota Department of Natural Resources. The Minnesota River from Lac qui Parle Dam to Granite Falls is part of a segment of the State of Minnesota Wild and Scenic Rivers program (see this section, Chapter 2, Resources and Influencing Factors, Water Based Recreation).

PROJECT LANDS:

Total land for the Lac qui Parle project is 20,437.19 acres. Of this, 517.62 acres are in fee; 19,859.47 acres are under flowage easement; the project includes 60.10 acres of public domain, for a canoe trail. Disposition of the fee acreage is: Chippewa River (Watson Sag Weir) – 193.01 acres (see Figure 5-6); Lac qui Parle Dam – 56.25 acres (see Figure 5-2); Marsh Lake Dam – 261.56 (see Figure 5-4); downstream channel improvements – 56.25 acres.

Project Land Allocations:

In accordance with ER 1130-2-435, Project Operation, Preparation of Master Plans, all lands will be allocated in accordance with the authorized purposes for which they were, or are to be, acquired. Allocated project lands will be further classified to provide for development and resource management consistent with authorized project purposes and the provisions of the National Environmental Policy Act (NEPA) and other Federal laws. The classification process further refines land allocations to maximize use of project lands. The process must also consider public desires, legislative authority, regional and project specific resource requirements and suitability.

All project lands at the Lac qui Parle Project were acquired for project operations. Additional information on land allocation/classification is available in: Chapter 2, Administrative and Policy Factors: Project Land Status; Appendix E, Land Use Classification; Plates 25 and 26.

Land designated for project operations may be used for other purposes where these uses are compatible with operational requirements. These uses may include wildlife habitat management, recreation, or agriculture. This practice assures maximum use of project resources.

When it can be done safely, hunting, trapping and fishing may be allowed on operations land. Restricted areas will be adequately posted as such. Licenses, easements, outgrants, or permits will be issued only for those uses that do not interfere with project operations.

PROJECT ACCESS AND USEAGE:

Adjacent Land Usage:

Land use in west-central Minnesota is almost exclusively related to agriculture; approximately 78 percent of the five counties surrounding Lac qui Parle are in croplands. As discussed, most of the lands adjacent to the project are managed by other agencies for wildlife management purposes.

Project Accessibility:

The project is located about 140 miles west of Minneapolis-St. Paul, Minnesota, and about 120 miles north of Sioux Falls, South Dakota, and the same distance south from Fargo-Moorhead (see Plate 1). Access to the project from these metropolitan areas is good via the Federal and State highway systems.

1. Major Access Routes:

The major highway to the project from the Twin Cities is Minnesota State Highway 7 west. From Sioux Falls and Fargo-Moorhead: Interstate Highway 29 (north and south, respectively) to Watertown, South Dakota, then U.S. Highway 212 east to Minnesota State Highway 7 west.

A. Local Arterials:

Neither Federal nor State highways provide direct access to the project areas. U.S. Highway 59/Minnesota State Highway 7 parallels both Marsh Lake and Lac qui Parle (see Figure 5-1) and passes through Montevideo, Watson, and Appleton.

- Lac qui Parle: Lac qui Parle Dam is located on Lac qui Parle County Road 33/Chippewa County Road 13 (see Figure 5-2) north of Watson, Minnesota, approximately 3½ miles west of U.S. Highway 7.

- Chippewa Diversion Structure: This structure and the project headquarters are located on County Road 13 northeast of Watson, approximately 1½ miles east of the junction with U.S. Highway 7.

- Marsh Lake: The Marsh Lake recreation area is accessed via U.S. Highway 7 onto County Road 51 and then by township road, southwest of Appleton, Minnesota.

There are four access points to the Minnesota River between the Lac qui Parle Dam and Granite Falls; this portion of the river is a designated segment of the State Wild and Scenic Rivers System. The public accesses are maintained by the Minnesota Department of Natural Resources.

Seaplane:

Regulations governing seaplanes at Lac qui Parle have not been established. While airborne, all civilian aircraft are subject to the general aviation rules and operating regulations established by the Federal Aviation Administration and the Minnesota Department of Transportation. When on the water, seaplanes are subject to the marine "rules of the road" as established by the Minnesota Department of Natural Resources. They may operate on any Corps lake except those where powerboats are prohibited and are subject to the specific boating prohibitions and restrictions for each project. In addition, seaplanes may only be operated on the lakes between sunrise and sunset.

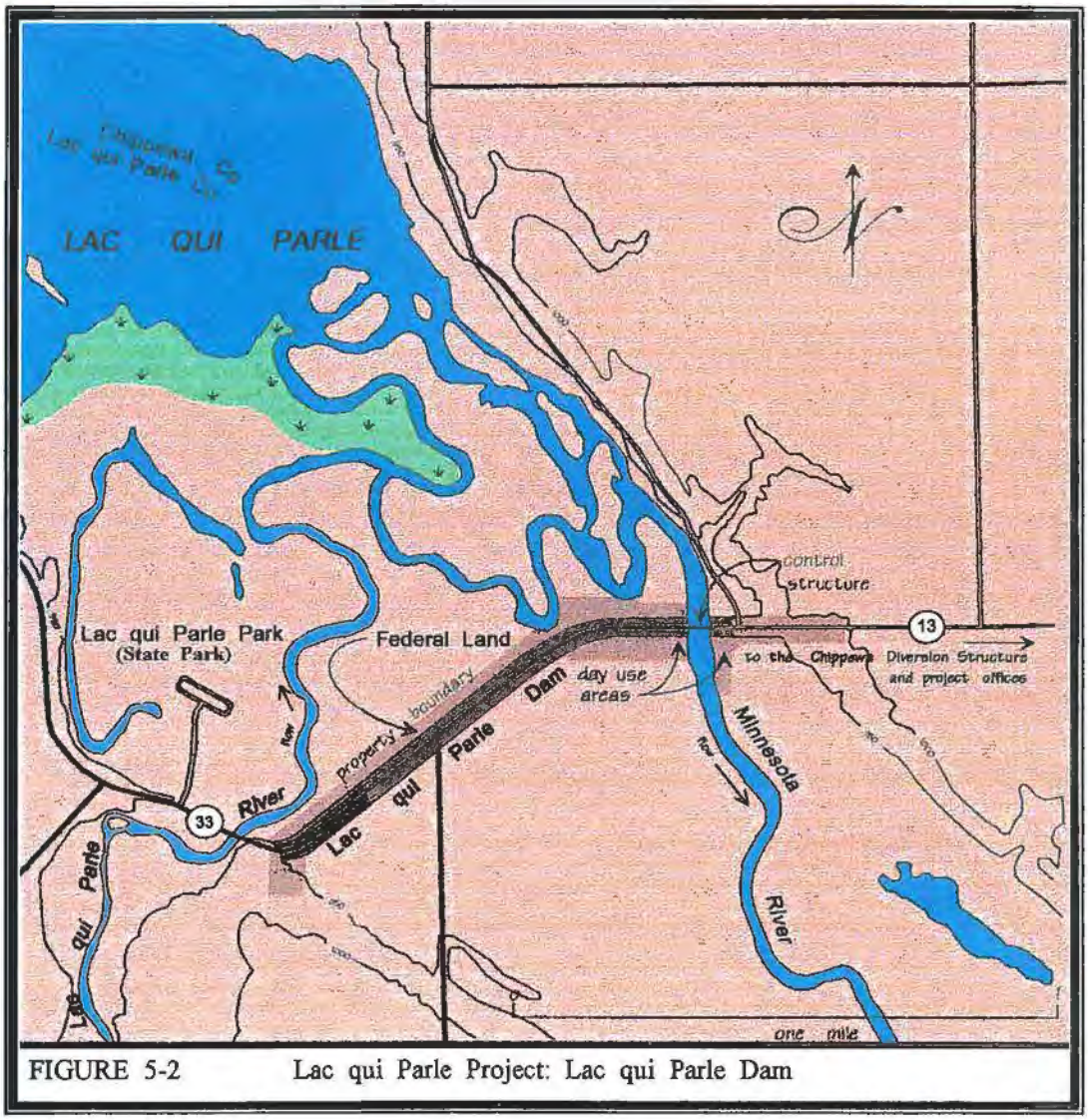

FIGURE 5-2 Lac qui Parle Project: Lac qui Parle Dam

Dams, Control Structures, and Dikes:

1. Lac qui Parle Dam:

Lac qui Parle Dam is the main dam in the project; it supports a county road (see Figure 5-2). The left bank section is earth fill from the control structure to high ground. It is about 200 feet in length with a top width of 32 feet. The right bank section, also earth fill, extends from the control structure for about 250 feet to the emergency spillway section, which is 2,500 feet in length with a crown elevation of 941.1 feet msl. Beyond the spillway section, the dam rises gradually for about 1,000 feet to elevation 950.5, then about 700 feet farther to higher ground.

The emergency spillway section is capped with soil cement and a bituminous surfaced roadway with a top width of 23 feet. A concrete core wall is keyed 3 feet into natural ground at the upstream edge of the spillway with an average top elevation of 940.7. The downstream slope of the spillway is 1V (vertical) to 2H (horizontal) and is armored with 1 foot of grouted riprap with at least 6 feet of horizontal paving at the toe of the fill. The upstream slope is 1V to 3H and seeded. Total length of the dam, including the control structure and emergency spillway, is approximately 4,100 feet.

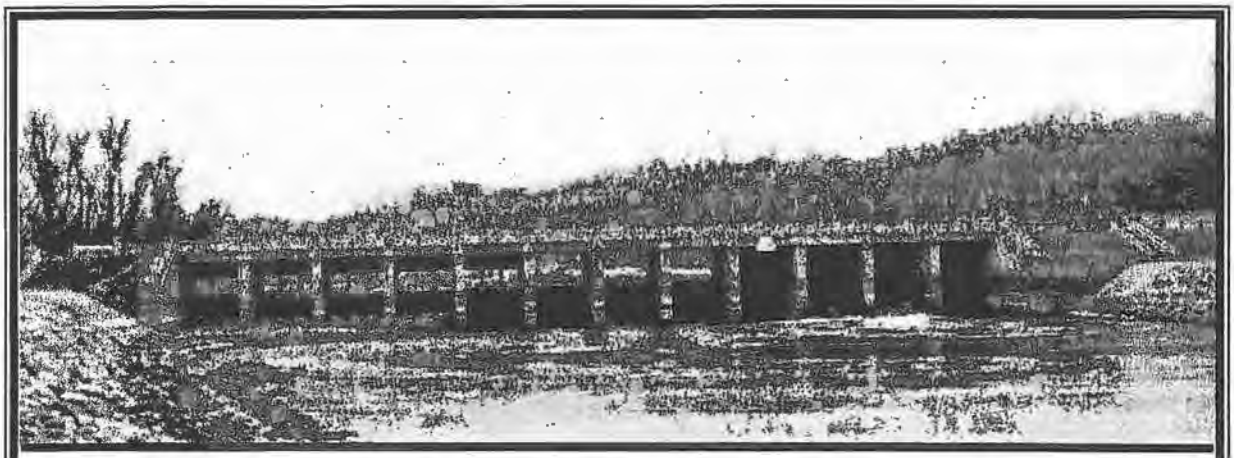

FIGURE 5-3 Lac qui Parle: Main Control Structure

2. Lac qui Parle Control Structure:

The control structure consists of a concrete curtain wall section and a fixed concrete spillway section (see Figure 5-3). The curtain wall section is divided into four bays, numbered 1 through 4 from the left bank. The spillway section is divided into eight bays, numbered 5 through 12. All bays have a span of 17 feet, and all piers are 3 feet wide. The piers support a bridge over the control structure; deck elevation is 946.2.

Bays 1, 3, and 4 have two 6.0-foot by 8.0-foot vertical lift gates. The stilling basin is at elevation 914.2, with baffle wall top elevation of 920.2. Bay 2 has three 4.0-foot by 4.0-foot vertical lift gates with sill elevation 915.2. These gates are equipped with trash racks and are used for low-flow regulation. Bays 5, 6, and 7 are uncontrolled. The nine movable gates in the curtain wall section are numbered 1 through 9 beginning in bay 1.

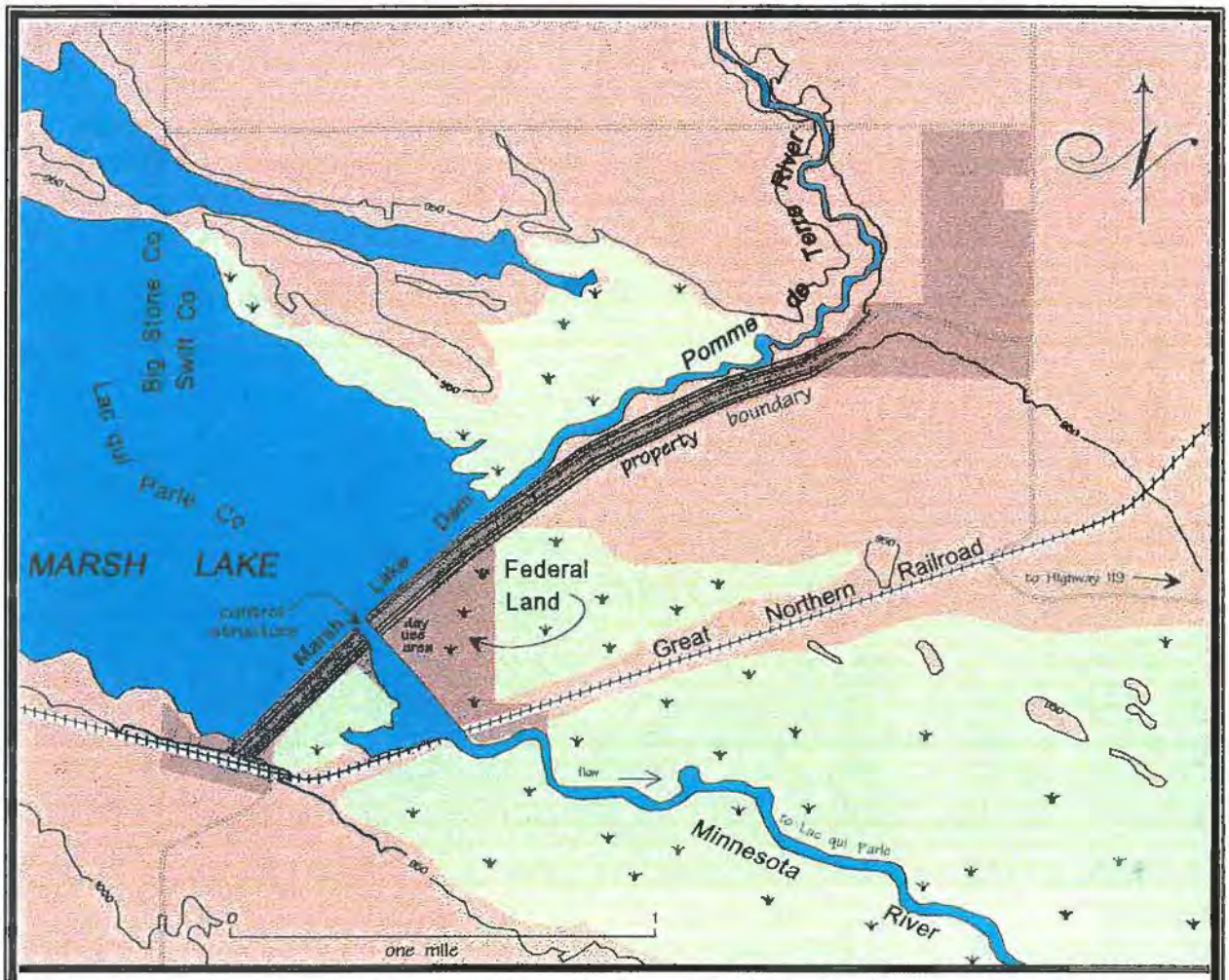

FIGURE 5-4 Lac qui Parle Project: Marsh Lake Dam

In the spillway section, the crest elevation is 934.2. In bays 4 through 7, the stilling basin elevation is 918.7. In bays 8 through 12, the stilling basin elevation is 923.2. These bays each have three sections of movable steel bulkheads with top elevation 940.7 in the sealed position. These bulkheads are used for flood control operations. They are raised prior to winter freeze-up and are lowered on May 1 if operation is routine. If a flood is in progress on May 1, the bulkheads should be lowered if the pool is below spillway crest elevation 934.2. If, on May 1, if

a flood is occurring, the bulkheads may be placed in operation as soon as the reservoir level drops below the crest of the emergency overflow spillway, elevation 941.1.

3. Marsh Lake Dam:

Marsh Lake Dam is a dredged earth fill dam in two sections with a total length of approximately 11,800 feet (see Figure 5-4). It has a fixed concrete spillway section 112 feet long, and an auxiliary overflow section 90 feet in length adjacent to the concrete section. The auxiliary spillway has a crest elevation of 940.0 with both the upstream and downstream slopes armored with 12 inches of grouted riprap.

The earth fill portion of the dam has a top width of 10 feet with 1V to 3H side slopes on both sides. On the downstream side, the slope extends to an elevation 5 feet below the top of the dike, where the slope changes to 1V to 4H natural ground. Maximum height of this dam is about 19.5 feet with the top elevation varying between 948.6 and 952.6.

FIGURE 5-5 . Lac qui Parle: Marsh Lake Dam Outlet Structure

4. Marsh Lake Outlet Structure:

The Marsh Lake outlet structure is a concrete fixed crest overflow section with an auxiliary spillway (Figure 5-5). The concrete fixed crest overflow section is 112 feet in length, with a crest elevation of 937.6. Discharge is into a bucket type stilling basin at elevation 934.6, then into the main discharge channel at elevation 929.6. The channel extends for about 1,500 feet downstream from the spillway. The channel is contained on both sides by dikes with top elevations of 938.0 and side slopes of 1V to 2H. It has a bottom width of 25 feet. During low water periods, when the water level is below the crest of the dam, the discharge is regulated by a 2-foot sluice gate in

the main spillway. The gate, with a sill at elevation 932.6, discharges through a 24-inch conduit into the stilling basin.

The auxiliary spillway has a crest elevation of 940.0 with both upstream and downstream slopes paved with 12 inches of grouted riprap.

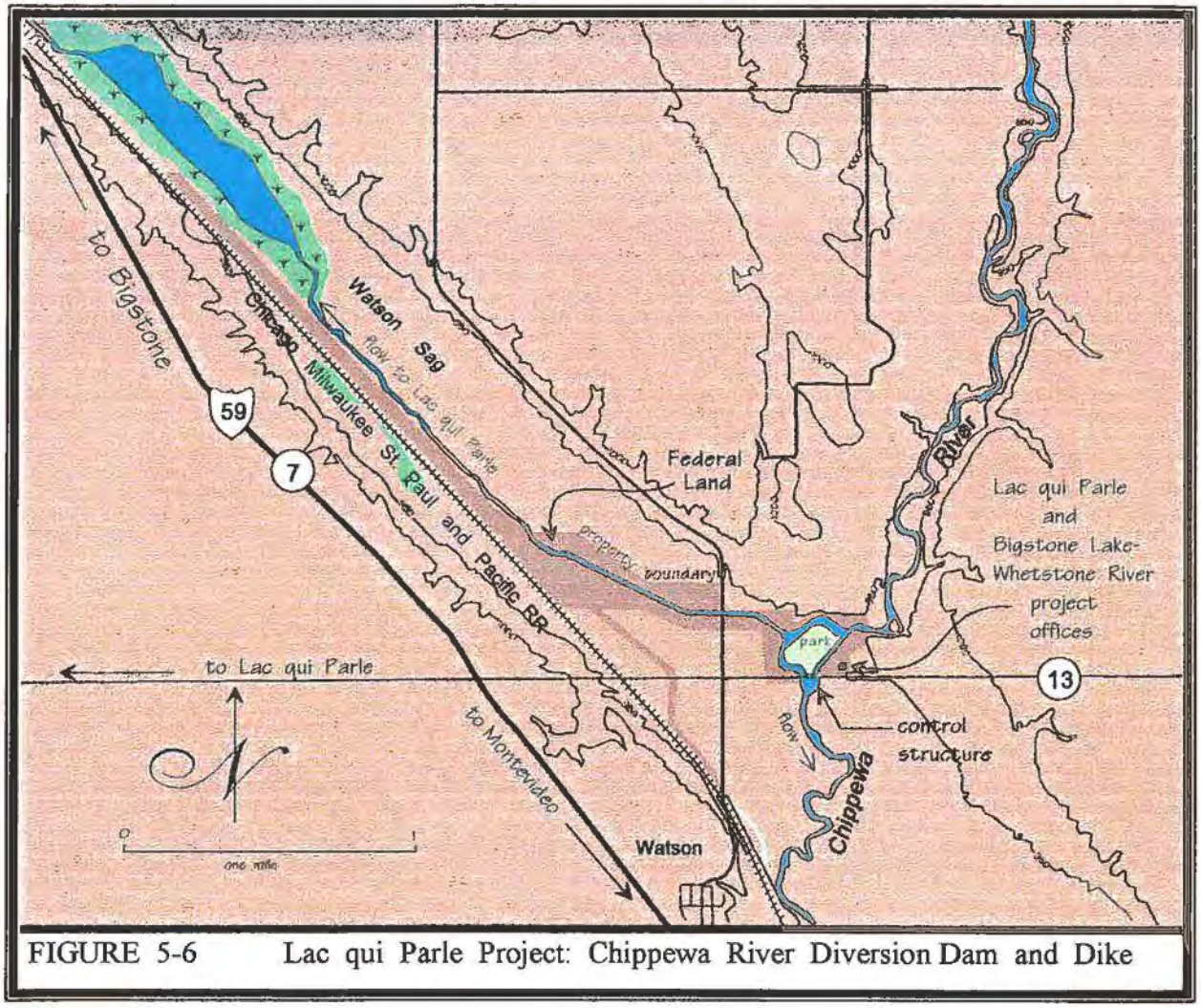

FIGURE 5-6 Lac qui Parle Project: Chippewa River Diversion Dam and Dike

5. Chippewa River Diversion Dam and Weir:

The dam is constructed of rolled earth fill and carries a 32-foot-wide highway across the Chippewa River (see Figure 5-6). Total length of the dam, which includes the main control structure and a low water control culvert, is about 1,900 feet. Side slopes are 1V to 3H on the upstream side and 1V to 4H on the downstream side. A revised approach channel is excavated with a 40-foot bottom width and side slopes of 1V to 2H. A 1,200-foot dike on the left bank of the approach channel has a minimum top width of 10 feet and side slopes of 1V to 3H.

The main control structure is a five-span combination highway bridge and dam. Bays 1, 2, 4, and 5 have a fixed crest spillway, elevation 942.3. Discharge is onto a concrete apron with a dentate end baffle. Bay 3 provides the discharge control by means of a 27-foot tainter gate. Discharge through the gate is onto a concrete bay with an end baffle. The tainter gate is powered by an electric gate operator but can also be operated by hand. About 300 feet west of the right abutment of the control structure is a low water control culvert which was used prior to the installation of the tainter gate in 1941. This culvert is a 4-foot by 4-foot by 90.4-foot concrete box type through the earth dike. The inlet is controlled by a 4-foot by 4-foot vertical lift gate protected by a trash rack. The entrance invert is at elevation 933.3 and the exit invert elevation is 932.8.

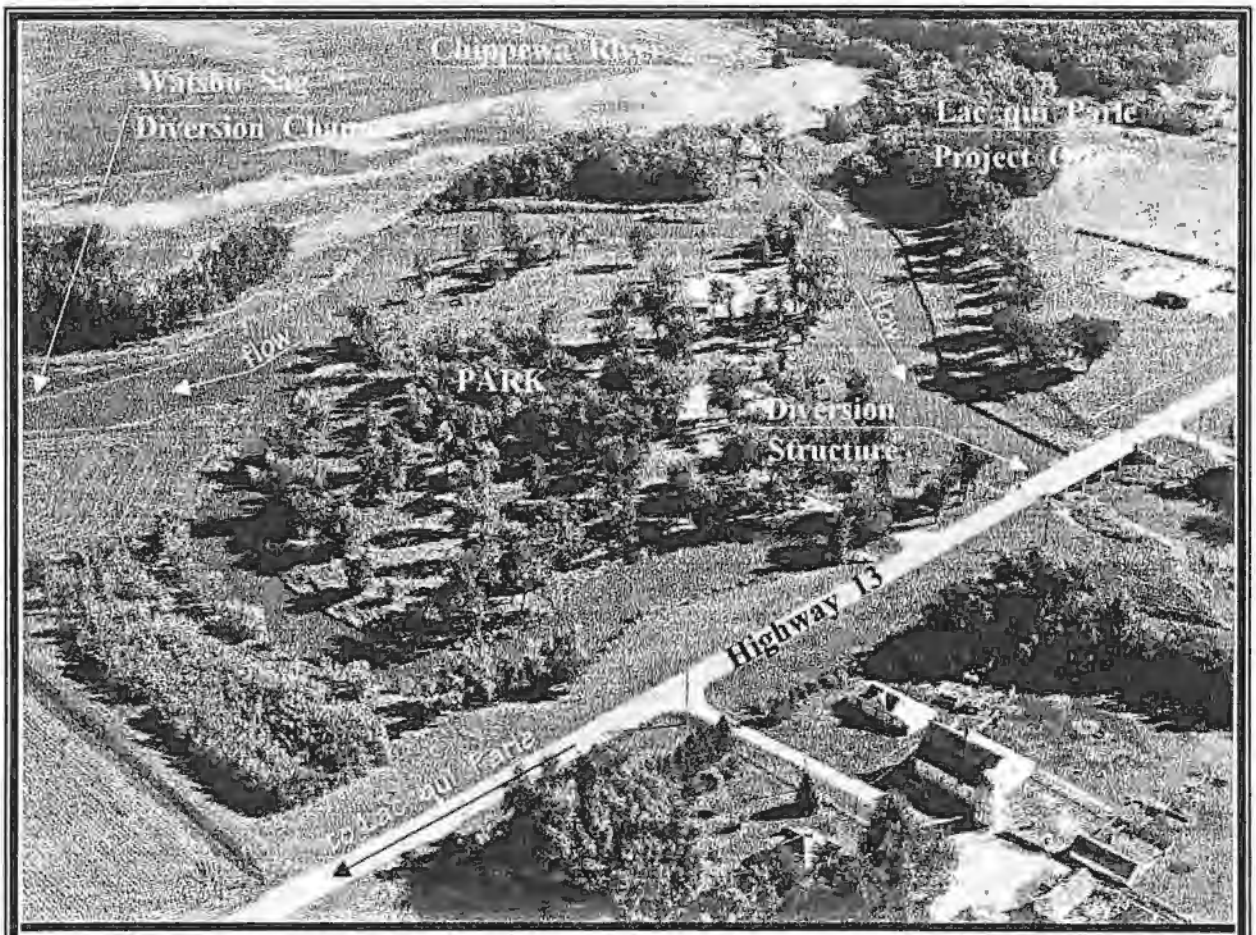

FIGURE 5-7 Lac qui Parle: Chippewa River Diversion Structure and Project Offices

The diversion channel is an excavated channel about 3,500 feet in length with a bottom width of about 160 feet and side slopes of 1V to 3H. The channel lies in the Watson Sag, a part of the glacial river channel; the "sag" is a side channel, where the glacial river flowed on either side of naturally occurring high ground. A six-span combination highway bridge and spillway near the

point of diversion controls the flood flows of the Chippewa River into the channel (see Figure 5-7). A rolled earth dike on the left bank of the channel is an extension from the Chippewa River Diversion Dam and serves to protect the railroad tracks adjacent to the channel from being flooded. The dike has a 10-foot top width and side slopes of 1V to 3H on the channel side and 1V to 4H on the landward side.

The spillway crest discharges into a concrete bay with dentate end baffle. When the stage in the Lac qui Parle Reservoir is high enough, and no flood flows are coming down the Chippewa River, the flow in the diversion channel will reverse and pass through the Chippewa River Dam and down the Chippewa River channel.

Project Buildings:

1. Project Office:

The project office and maintenance facility were combined in a 4,000 ft^2 building built in 1976. The building has a paved parking lot, and a secured compound for equipment storage (see Figure 5-7). The Chippewa Dam and the project headquarters are located on County Road 13 northeast of Watson, approximately one and one-half miles east of the junction with U.S. Highway 7, about 4 miles east of the main dam.

2. Lac qui Parle:

There is an accessible privy at the west recreation area and a water gage station at the east day use area at the dam site.

3. Marsh Lake:

There is a privy and a water gage station at the day use area at the dam site. The privy is not considered accessible for persons with limited personal mobility.

4. Chippewa River:

There is one water gage station at the Chippewa River diversion structure.

Project Roads and Access:

There is one project road, a graveled access road into Marsh Lake dam and the day use area. It is about 3.5 miles long, and is maintained under a contract with a local business.

Public Use Facilities:

Corps managed public use facilities at the Lac qui Parle Flood Control Project are limited to three areas. Lac qui Parle Dam has two day use areas for tailwater access, one on each side of the river; Marsh Lake Dam Recreation Area is located at the dam site, also providing tailwater access. Other public use areas on or near the project include Lac qui Parle State Park managed by the Minnesota Department of Natural Resources and the Big Stone National Wildlife Refuge managed by the U.S. Fish and Wildlife Service.

1. Day Use Areas:

A. Lac qui Parle:

Developed recreation sites are located on both sides of the river, directly downstream of the dam.

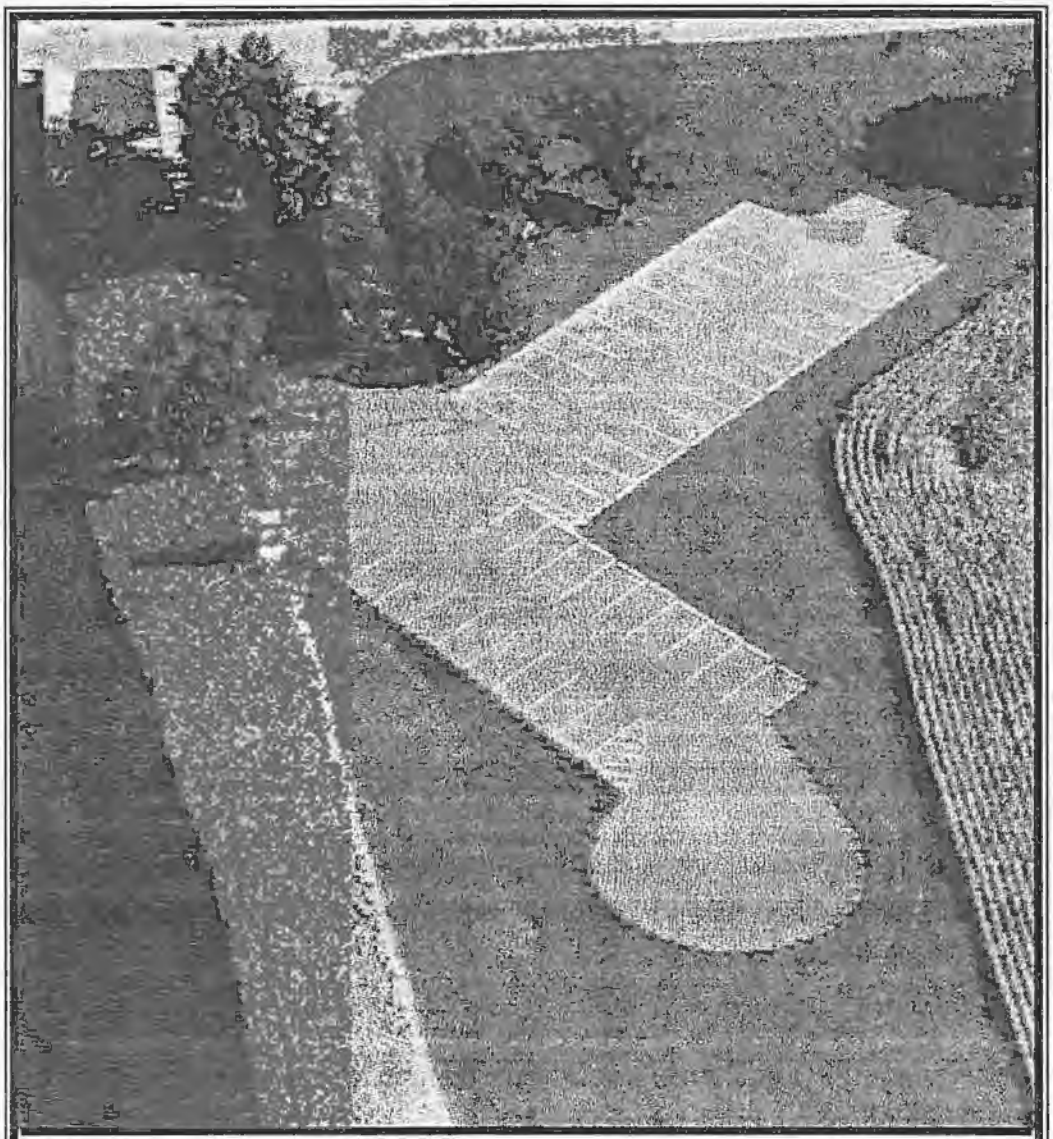

FIGURE 5-8 Lac qui Parle: East Bank Day Use Area

East Bank: The site on the east is small, about 2 acres (see Figure 5-8 and Plate 13); it has small areas of turf, a few benches and an occasional tree. There are 3 oddly shaped, interconnected, paved parking lots with spaces for 52 cars; the site is oriented for

automobiles and is dominated by the parking lots. The principal recreational use of this area is bank fishing.

Immediately to the east, the land is farmed. The boundary between Corps property and the farm fields is abruptly defined by the end of mown grass on Corps property and the beginning of the field crops.

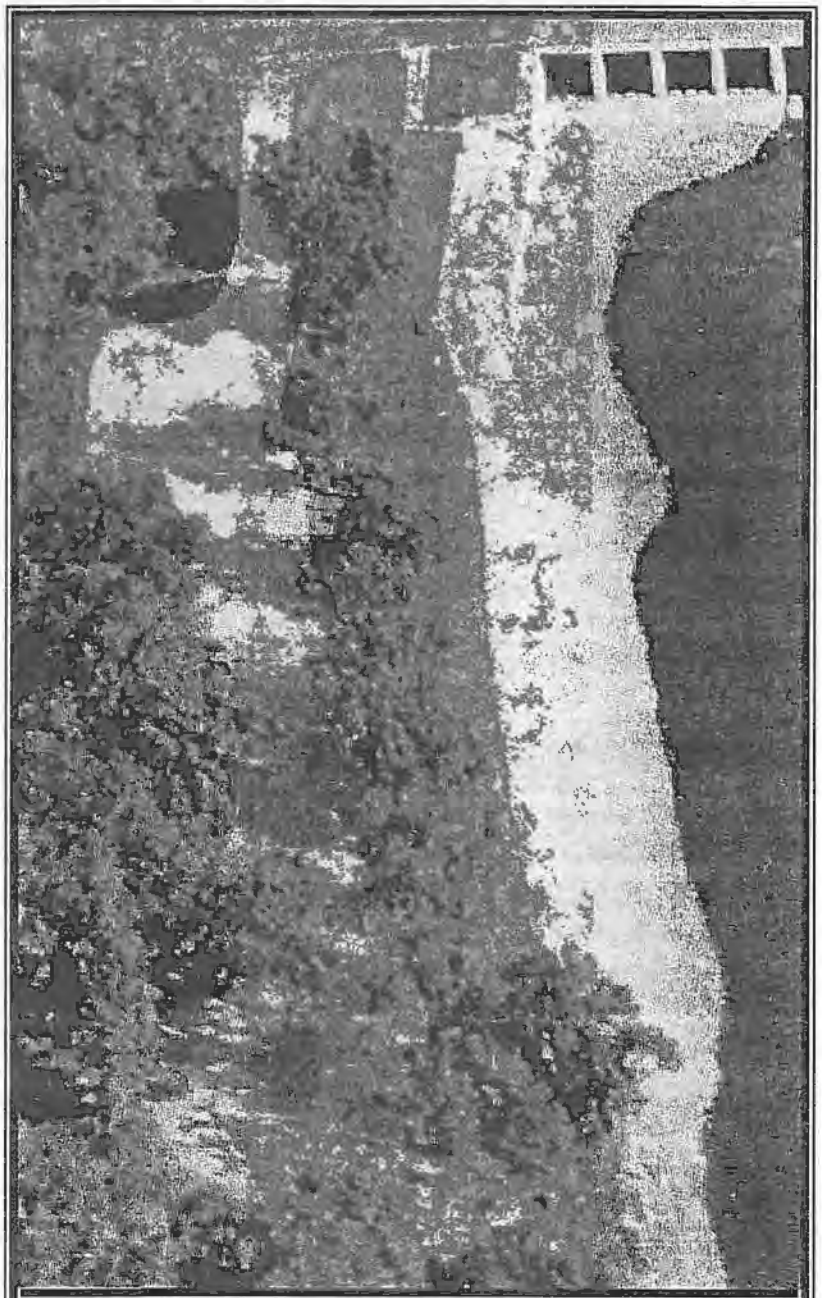

FIGURE 5-9 Lac qui Parle: West Bank Day Use Area

The site, which is nearly level except for the shoreline, is about 10 feet above the tailwater in the vicinity of the dam. The shoreline is riprapped and, although the slope is steep, the riprap stone is not very large, and people can climb down to the water's edge for fishing.

The tailwater fishing area does not meet the requirements of the Rehabilitation Act of 1973 (as amended in 1975), Title V, Section 504, and is not considered accessible for persons with limited personal mobility.

Beyond the limits of the riprap, the riverbank is much lower; paths have developed to the water, creating some areas of easier access. The Minnesota Department of Natural Resources) has developed a canoe portage on this site.

West Bank: · The west bank site, like the east bank, is level, except for the driveway and shoreline, and about 10 feet above the river. This area differs in that much of this site is forested; portions of it have a dense overhead canopy with minimal undergrowth. The entrance drive and parking area are gravel. Facilities include accessible vault restrooms, water, picnic tables, fire grates, benches, play equipment, and a fish-cleaning station. This site is larger (3-4 acres) than the east bank site and has a definite park-like atmosphere.

The west bank site includes a 1.67-acre parcel leased from the Minnesota Department of Natural Resources (see Figure 5-9). The purpose of the lease is to allow greater access to the river and provide space for an auto turnaround. The west bank site shoreline is very similar to the east bank. The upstream half of the armored bank, adjacent to the dam, is protected with hand-placed, grouted riprap. The downstream half of the protected portion of the bank is randomly placed stone. The grouted riprap has a very smooth surface which is difficult to traverse; as a result, access to the water's edge is difficult and potentially dangerous. Direct access to the tailwater is provided by a stairway located on the downstream end of the west abutment. The dam apron follows a stair-step design from the west to the east, and is accessed from the stairway. Using this access, most anglers can get very close to both the water and the gates that are discharging.

Directly downstream of the riprap (off Federal property), the bank is eroded and very nearly vertical, with a sheer (±8 foot) drop to the water. Unlike the east bank, there is no "easy" shoreline access at this site.

This fishing area does not meet the requirements of the Rehabilitation Act of 1973 (as amended in 1975), Title V, Section 504, and is not considered accessible for persons with limited personal mobility.

B. Marsh Lake:

This recreation area is located downstream of the dam, on the east side of the river (see Figure 5-10 and Plate 15) It is considered fully developed. On an area of approximately 3 acres, public

use facilities consist of a gravel parking lot, a vault restroom, and a bulletin board. The primary use of this area is bank fishing. Wildlife observation/sightseeing is also an important activity.

This recreation site is level. The parking area is approximately 5 feet above the tailwater elevation. Mucb of the surrounding land is lower, often wet. The shoreline is riprapped; access to the water is not difficult due to the gradual slope and/or small stone size of the riprap.

Local individuals have expressed a desire to obtain vehicle access to the west side of the dam for fishing. Although the road has been gated in the past, people drove around it and along the dike to get closer to the dam. It is virtually impossible to restrict access to this area. Currently, no facilities on the west side of the dam support recreation.

This area does not meet the requirements of the Rehabilitation Act of 1973 (as amended in 1975), Title V, Section 504, and is not considered accessible for persons with limited personal mobility.

Another problem noted is the occasional "beer party" which results in large amounts of litter and bonfire remnants. The area is remote and therefore very attractive for such parties. There seems to be little that can be done to solve this.

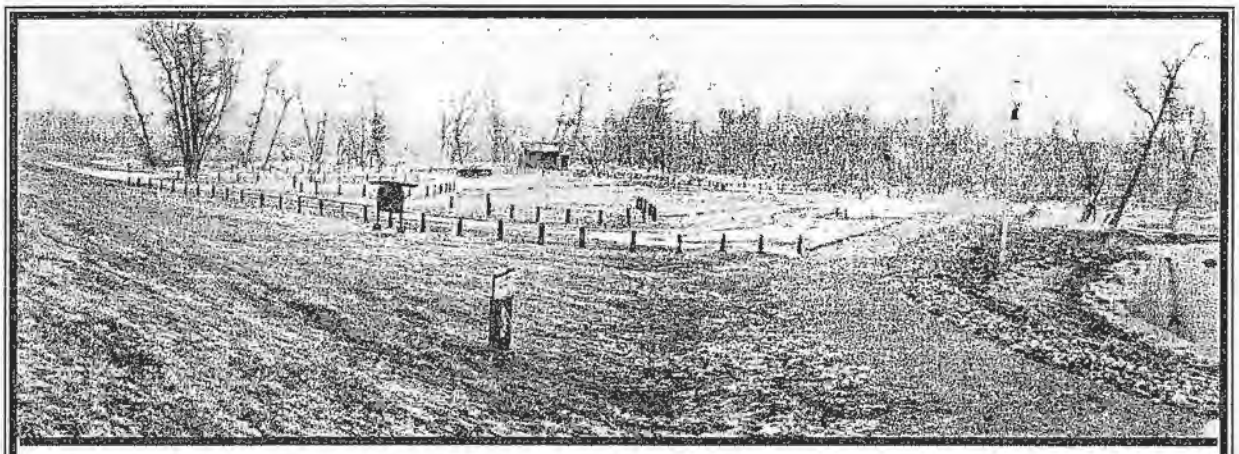

FIGURE 5-10 Lac qui Parle: Marsh Lake Day Use Area

Boat Launch Facilities:

There are no Corps managed boat launch facilities on the Lac qui Parle project.

Lac qui Parle: The Minnesota Department of Natural Resources provides three boat launch ramps on the west side of Lac qui Parle and two more on the east side. It also provides canoe access facilities on both sides of the lake and on the Lac qui Parle and Chippewa Rivers.

Marsh Lake: The Minnesota Department of Natural Resources provides two boat ramps on each side of Marsh Lake and two canoe accesses on the east side of the lake.

Minnesota River: Because this part of the river is designated a "Scenic River," the Minnesota Department of Natural Resources maintains canoe launch facilities along the reaches so designated. Information on these facilities is available from the Minnesota Department of Natural Resources (see Figure 5-11).

RESERVOIRS, RIVERS AND DIVERSIONS:

Description:

1. Lac qui Parle Pool:

Lac qui Parle (Lake that Talks) is a shallow, modified natural lake draining an area of approximately 6,100 square miles (if the Chippewa River drainage is included). It lies in the Minnesota River Valley and was formed in prehistoric times when the Minnesota River was blocked by the alluvial fan of the Chippewa River. The lake extends in a northwesterly direction for about 15.4 miles above the dam.

Lac qui Parle Reservoir capacity at conservation pool is 29,700 acre-feet at surface elevation 931.2 with a surface area of approximately 6,400 acres. Full pool capacity is 122,800 acre-feet at surface elevation of 941.1. Lac qui Parle Lake is considered a "Warm-water Game Fish Lake." It is a long, narrow, shallow, riverine lake, one-half to three-quarters of a mile wide, with a mean depth of 4.6 feet. A State park and wildlife refuge are located on the lake. Migrating waterfowl use the lake as a staging area. The lake supports a popular sport fishery and the commercial harvest of rough fish.

2. Marsh Lake:

Marsh Lake extends about 7 miles northwest (upstream) of Lac qui Parle Lake. The lakes are connected by the Minnesota River. The conservation pool level of elevation 937.6 provides 12,050 acre-feet of storage and covers 5,100 acres. Floodwater storage elevations are the same as for Lac qui Parle. Marsh Lake is classified as a "Warm-water Fish and Waterfowl/Aquatic Furbearer Lake" with maximum and median depths of about 5 feet and 2.5 feet, respectively (Corps of Engineers unpublished lake survey, 1991). Marsh Lake shorelines are gradually sloping with dense vegetation up to the water's edge. The lake supports a large rookery of white pelicans; this is considered rare in this part of the country.

3. Chippewa River:

The Chippewa River diversion structure is designed to divert high water flows from the river into Lac qui Parle via Watson Sag. Flows in excess of 1,000 cubic feet per second (cfs) on the Chippewa River flow through the diversion channel into Lac qui Parle. When the Chippewa River

flow drops to less than 1,000 cfs, water diversion to Lac qui Parle Lake is limited to 3 to 6 cfs through the Watson Sag. This helps minimize stagnant water conditions in the diversion channel.

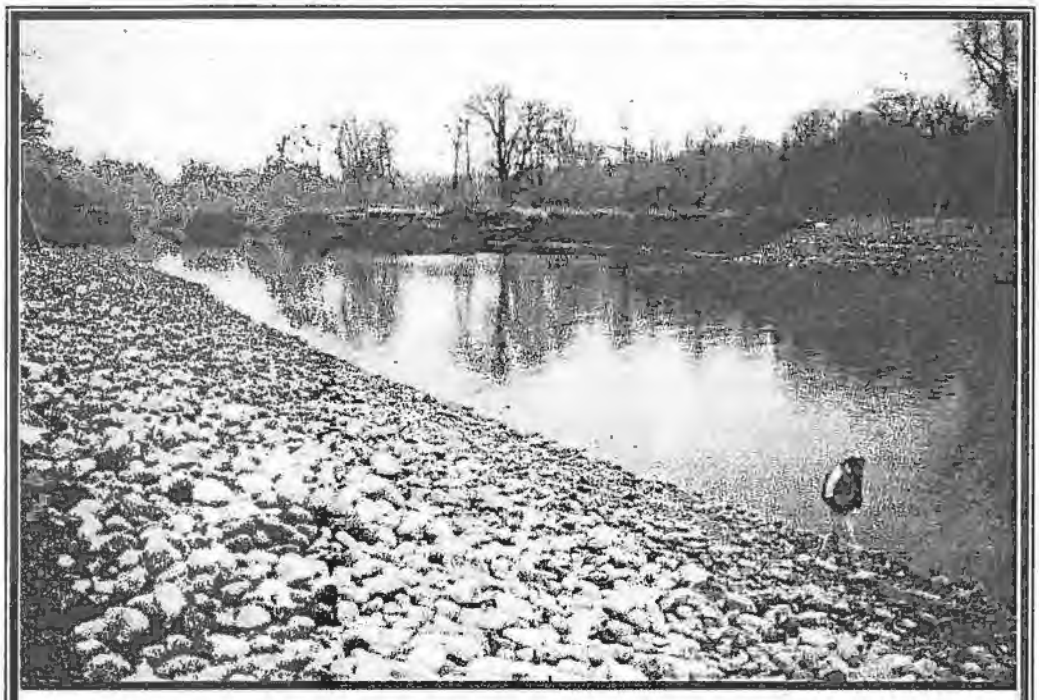

FIGURE 5-11 Lac qui Parle: Minnesota River below Dam

4. Minnesota River:

There are easements for clearing and snagging operations and other channel improvements for 30 miles downstream from the Lac qui Parle Dam.

Reservoir Operations:

1. General:

In accordance with the authorized project purpose, the reservoirs of the project operate as a single flood control unit; the Lac qui Parle Dam is the controlling structure. This section describes the operating procedure for the project as such; it is not broken down by pool. There are three structures in the Lac qui Parle project and only the weir in the Watson Sag has no controlling features. The basic operational objectives are relatively simple: to prevent downstream flooding due to high runoff rates.

Starting in late winter, Lac qui Parle Lake is drawn down. At spring breakup, the reservoir stores the excessive runoff. It is gradually released until the reservoir is at conservation levels. In the event of flooding due to excessive snowmelt or precipitation, the reservoir will store inflows that

are in excess of river capacity. When inflows are reduced, the reservoir is again drawn down to conservation levels. All drawdowns are accomplished as rapidly as is feasible in case of successive flood events.

2. Flood Control:

A. Spring Runoff:

Starting February 15, Lac qui Parle Lake is drawn down to elevation 931.2 or less. This drawdown must be completed by 15 March, and the discharge is not allowed to exceed the downstream Minnesota River capacity of 1,500 cfs. During the spring, inflow usually exceeds 1,500 cfs on the Minnesota River and 1,000 cfs on the Chippewa River. The tainter gate in the Chippewa River Dam is closed, as necessary, so that the discharge does not exceed channel capacity of 1,000 cfs. At this time, water flows are diverted from the Chippewa River via the diversion channel (through Watson Sag) into Lac qui Parle Lake. As Lac qui Parle Lake rises, conservation level elevation 931.2 is maintained by opening the Lac qui Parle Dam gates.

If the water continues to rise, the pool level will reach the fixed crest spillways at elevation 934.2, and more water will be released downstream. When the pool rises above elevation 937.6, the Marsh Lake control structure is submerged, and the Lac qui Parle structure becomes the single controlling element for the project. At elevation 941.2, water flows over the emergency spillway of the main dam, and free river conditions exist. As floodwater subsides, the discharge is reduced to 1,500 cfs and the pool is lowered to conservation level (elevation 933.0). When the Chippewa River flow drops to 1,000 cfs, water diversion to Lac qui Parle Lake is limited to half of the Chippewa River inflow through the Watson Sag.

B. Summer Floods:

Heavy rains may necessitate similar operation of the control system, as described above. Before 1 May, flooding causes little agricultural damage, and inflows are discharged as quickly as possible. Flooding after this date can cause severe agricultural damage; therefore, outflow is reduced at this time and floodwater is stored, elevating the pool above elevation 931.2. At this time, the procedures outlined in the preceding paragraph are followed.

C. Emergency Conditions:

In the event of failure of normal communication facilities, the dam tender will make every effort to maintain contact with the District office by any means available including radio, telegraph, or sending a messenger to the nearest point where communications are available. In such circumstances, the primary objective will be to insure the safety of the structure and to provide the most effective operation of the project by following the regulation schedule. During such emergency operation, the schedule will be followed until contact with the District office is reestablished. It will also be necessary for the dam tender to keep informed of the effects of any reservoir releases on downstream damage centers.

3. Water Storage Strategy:

A. Normal Precipitation:

Flood control practices cause widely and often rapidly fluctuating water levels. The minimum discharge from Lac qui Parle Dam during the open river season is 14 second-feet. Minimum flows from the Chippewa River Diversion Dam will be the natural flow of the Chippewa River.

After spring runoff, the pool will be brougbt to elevation 933.0, maintained until mid-August, then raised to elevation 934.0 and held until commencement of spring drawdown to elevation 931.2 (minimum). This strategy is subject to circumstances of average precipitation conditions or forecasts; it may be adjusted for irregular weather conditions.

The water storage strategy for the project is currently being examined and it is expected that the procedure outlined in the previous paragraphs will be changed in the near future.

Marsh Lake: Marsh Lake Dam has an uncontrolled spillway set at elevation 937.6. Levels above that elevation are controlled at the Lac qui Parle Dam.

Chippewa River: The Chippewa structure is only for the diversion of high flows. During periods of low flow, water diversion to Lac qui Parle Lake is limited to 3 to 6 cfs through the Watson Sag. This helps minimize stagnant water conditions in the diversion channel.

B. Operation for Low Water Control:

The reservoir will be operated during low water periods so as to provide required flows downstream from the dam.

4. Operational and Design Modifications:

- 1936 – Construction began. Reservoir held at elevation 934.2 summer through fall.
- 1946 – State of Minnesota changed reservoir conservation level to elevation 932.0 to increase flood control for farmers. Meetings were held between Sport and Gun Club and concerned farmers. Reservoir levels from elevations 929.0 to 932.0 were discussed, and level 931.2 was agreed upon.
- 1950 – Project transferred to the Corps of Engineers. Regulation held at elevation 931.2 with drawdown for spring floods as needed.
- 1967 – To provide additional winter water depths: start 15 September, raise pool elevation to 934.2 by 15 November. Start drawdown 15 January, to elevation 931.2 or lower, by 15 March.
- 1969 – Change start of winter elevation modification to 1 August.
- 1979 – Elevation of summer pool changed to 933.0, by agreement.

- 1982 – Beginning and ending dates for spring drawdown changed to the third week in February and 10 March, respectively. Letter in 1986 confirmed this practice.

CHAPTER 2 – RESOURCES AND INFLUENCING FACTORS

This chapter presents the factors that most influence the use, development, and management of the land and water resources at the Lac qui Parle Flood Control Project. This includes factors that are conducive to development, and factors that act as constraints. The elements presented here fall into three broad classifications: natural resources, social and cultural resources, and administrative and policy considerations. Considering the needs and desires of the region as the final determinant, these factors are used to decide the most appropriate development of project resources, in accordance with the authorized project purposes.

PHYSICAL AND ENVIRONMENTAL RESOURCES:

Physical and environmental resources include geology, water, vegetation, wildlife, fisheries, visual quality, and cultural and recreational resources.

Geophysical Features:

The Lac qui Parle project lies in the Minnesota River Valley which is the abandoned channel of the Ancient River Warren (see Section 1, Regional Resources and Influences, Chapter 2, Description). The steep valley escarpments were once the banks of the huge river. They rise approximately 100 feet above the lake and provide the informed observer with an idea of the actual size of the ancient stream. The original valley was about 100 feet deeper than it is today; it has silted in during the 9,000 years since the demise of the great prehistoric river (see Figure 5-12).

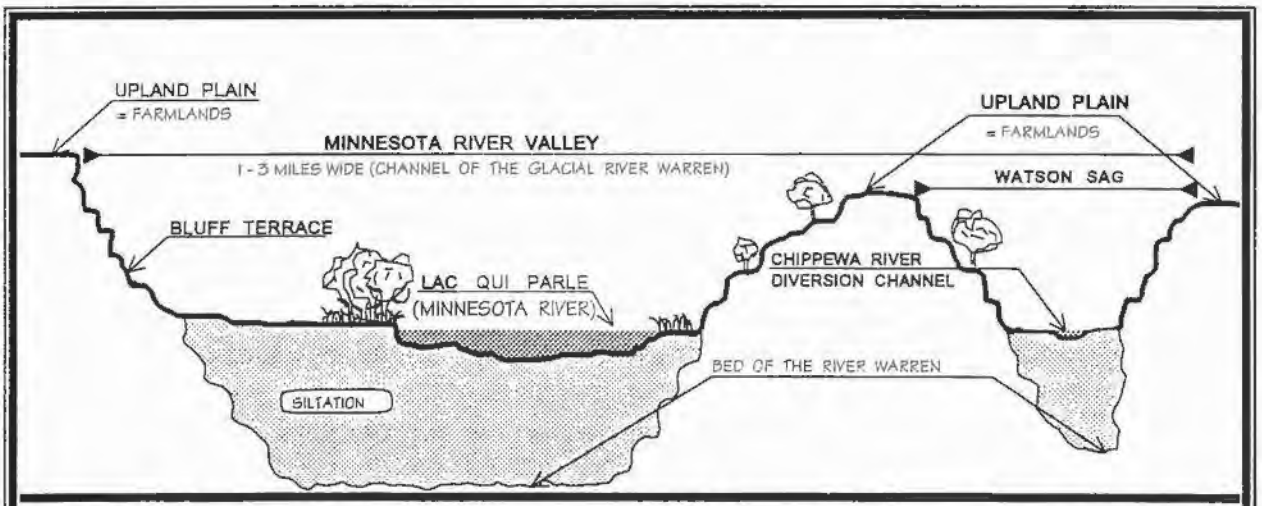

FIGURE 5-12 Lac qui Parle: Illustrative Section.....NOT TO SCALE

1. Soils:

The Soil Conservation Service has classified the soils of the project area in the Nearly Level Flood Plain group, Chaska-Dorchester-Oshawa Rocky Benches Association. This group appears along the course of the Minnesota River throughout this region. This area shows the evidence of a very long period of erosion by the Glacial River Warren, and subsequent sedimentation by the Minnesota River and its tributaries. Soils of the project are generally very light and often range to sand and gravel. Desirable land uses are pasture, wildlife habitat, and recreation. Only a very small portion of the project lands is suitable for cultivation.

The area soils range from poorly drained and/or frequently flooded soils, through stony soils and rock outcrops, to productive soils conducive to intensive agriculture. The characteristic soil associations of this area are generally delineated by topography.

On the floor of the river valley (the Minnesota River bottoms), the alluvial soils are frequently flooded. Rising from the floodplain is the valley escarpment, having steep slopes with easily eroded and droughty soils. Above the escarpment, soils occur on a gently rolling plain. Because of the recent glacial activity, these soils vary greatly and may be stony and/or poorly drained, or highly suited to agriculture. Regional soils are generally fertile and have been cultivated where limitations are absent or where drainage and stone removal are economically feasible. Much of the region is quite rocky, with some steep slopes (especially the valley terraces) with occasional ravines running through. To prevent rapid and severe erosion, this land requires permanent cover.

2. Topography:

The project lies in the Minnesota River Valley within the floodplain of the river. Within the steep bluffs that contain the valley, the land is generally level, although there is some variability along the shorelines. Along Lac qui Parle Lake, shorelines are steep (bluff) to gradually sloping, depending on where the river is on the valley floor. Vegetation ranges from dense stands of cattail to sparse stands of grasses and sedges. Marsh Lake shorelines slope more gradually, with dense vegetation up to the water's edge. The shorelines include smooth mud-sand or sand and coarse gravel beaches as well as areas with large, scattered boulders. Bottoms are sandy-mud or silt in shallows and become muck in deeper areas. Shoreline erosion is not a problem.

Water Resources:

The Minnesota River from the Lac qui Parle Dam east (downstream) to Franklin, Minnesota, is part of the Minnesota Wild and Scenic Rivers System. This 95.5-mile stretch of the river has been designated as Scenic and Recreational under provisions of the Minnesota Wild and Scenic Rivers Act. The intent of the act, passed by the legislature and signed by the Governor in 1973, is to "preserve and protect" the State's rivers and adjacent lands that "possess outstanding scenic, recreational, natural, historical, scientific and similar values." Specifically, the provisions of the act insure that new development is done carefully, with minimum adverse effect on the river. The river is managed by the Minnesota Department of Natural Resources.

1. Principal Tributaries:

The Minnesota River is the principal tributary to the project; the entire lake lies within the river floodplain. The Minnesota River rises in Big Stone Lake, a body of water which is about 26 miles long and varies in width from 0.5 mile to 1.5 miles. It is located on the Minnesota-South Dakota border, about 14 miles upstream from Marsh Lake. From Big Stone Lake at Ortonville, Minnesota, the river flows generally southeastward through Minnesota to Mankato, then turns to the northeast until its confluence with the Mississippi River near St. Paul, a total distance of about 330 miles (see Plates 1 and 2).

Aside from the Minnesota River, there are three major tributaries to Lac qui Parle: the Pomme de Terre, Chippewa and Lac qui Parle Rivers. The Pomme de Terre and Chippewa Rivers flow from the north into the Minnesota River. The confluence with the Pomme de Terre River is at the lower end of Marsh Lake Reservoir, about 2 miles upstream from the upper end of Lac qui Parle Reservoir. The Chippewa River joins below the dam, near Montevideo (for additional information on the Chippewa River, see this section, Chapter 1, Project Description, Reservoirs, Impoundments, and Diversions). The Lac qui Parle River enters the lake from the southwest, just above the main dam.

a.) The Upper Minnesota River subbasins that contribute to the project include: Big Stone Lake, Pomme de Terre River, Yellow Bank River, Whetstone River, and Lac qui Parle River watersheds. Runoff from portions of two States, about 4,050 square miles, passes through the Lac qui Parle Dam; during periods of high water, the Chippewa River also contributes.

The total contributing drainage area of the Minnesota River at the head of Marsh Lake includes the Whetstone River and Yellow Bank River subbasins. Both streams rise in South Dakota, with the Whetstone River joining the Minnesota River at the outlet of Big Stone Lake and the Yellow Bank River entering the main stem just upstream of the Highway 75 Dam (for additional information on the Highway 75 project, see Chapter 5, Big Stone Lake). The secondary drainage area contributing inflow to the reservoir includes the Big Stone Lake drainage basin which covers about 1,160 square miles.

b.) Tributary streams entering from the south have their origin in the Coteau des Prairies, a morainic ridge extending southeasterly from South Dakota, across southwest Minnesota into Iowa. The elevation of the crest of this ridge is nearly 2,000 feet above sea level, and these streams descend rather rapidly from the upland areas. The Lac qui Parle River drops 790 feet in a 66 mile reach, with the greatest fall (250 feet) occurring in an 8-mile reach near Canby, Minnesota. On the lowland plains, adjacent to the main Minnesota River channel, the gradient is usually less than 2-feet per mile, but in the lower 18 miles the fall is about 14-feet per mile.

Tributaries entering from the north, such as the Pomme de Terre and Chippewa Rivers, are divided by north-south morainic hills which rise less than 75 feet above the watercourses.

Drainage in the upland regions of these streams is rather poorly defined, with small lakes and marshy areas marking the meandering watercourses. Between the Pomme de Terre and Chippewa River mouths are some ancient channels distinct from, but within, the main Minnesota River Valley. These channels were produced by these streams long ago and now carry flows only during periods of extreme floods. One of these dry channels is known as the Watson Sag.

c.) The Pomme de Terre River enters Marsh Lake just above the Marsh Lake Dam, and the Lac qui Parle River joins with the project just upstream of the main dam. Both are important tributaries to the project; their combined discharges contribute more than 30 percent of the average flow through the Lac qui Parle Dam. Three other small streams enter the two lakes, with a total contribution of less than 10 percent of the average river volume.

The Chippewa River drains an area north of Montevideo, Minnesota, in excess of 2,000 square miles. The basin includes most of Swift and Pope Counties, and parts of Chippewa, Kandiyohi, Douglas, and Otter Tail Counties. Excessive flows from this river are diverted, when necessary for flood control purposes, through the Watson Sag to Lac qui Parle Reservoir.

2. Groundwater:

Groundwater in the region is recharged in the uplands and flows toward the river valley. Precipitation infiltrates the soil and moves through the relatively impermeable glacial till. Water flowing toward the valley concentrates in sand and gravel aquifers which occur as surficial deposits or as "lenses" buried up to 150 feet deep in the glacial till.

Wells in the Lac qui Parle vicinity usually tap these sand and gravel aquifers and yield about 15 gallons per minute. These flows are adequate for rural domestic and livestock use. Larger wells yield an average 255 gallons per minute, a low to moderate supply for municipal, industrial, and irrigation uses.

3. Water Quality:

Minnesota River water, if properly treated, is suitable for domestic use. Fecal coliform counts from the Pomme de Terre River were above the Minnesota Pollution Control Agency standards for safe swimming. Coliform counts in the Lac qui Parle River were also high. The biological assessment done for the Minnesota River Assessment Project (MRAP) contains a discussion of the water quality of the Minnesota River and Lac qui Parle.

Lac qui Parle and Marsh Lakes are moderately productive, warm-water lakes. High total phosphate levels, high alkalinity, and moderate nitrate concentrations support blue-green algae blooms which occur in midsummer.

Water temperatures up to 27° C (81° F) occur in July. Dissolved oxygen is adequate for fish through most of the summer but may decrease to levels stressful to some fish in certain locations if winds are calm for long periods. Winterkills of fish may occur under ice and heavy snow cover. Prevailing winds usually create enough wave action during open water periods to keep

oxygen, temperature, and nutrient levels constant at all depths. The same wind and wave conditions, combined with actions of rough fish, also create highly turbid water by disturbing loose sediments.

Human activities in the watershed contribute heavily to the degradation of the lakes and streams. Chemicals from cropland runoff degrade water quality and promote eutrophication of the lakes. Fecal materials from livestock operations as well as from municipal wastes are indicated by high coliform counts. These substances are either assimilated by the lake biota or flow out of the lakes, contributing to the serious water quality problems the downstream reaches of the Minnesota River experience.

The water quality of the area wetlands has not been examined. The bottoms are soft muck, high in organic matter, and are easily disturbed by rough fish, cattle, or high winds. Disturbance of sediments and high planktonic populations create turbidity. Agricultural chemicals and animal wastes enter the wetlands through farming operations. Some of this material is removed from the water by the filtering action of the wetland plants, some of it reaches the surface waters of the area, and some of it infiltrates the subterranean aquifers from which many inhabitants of the region draw their water.

Most groundwater is still acceptable for domestic, industrial, and agricultural uses. The water from these aquifers is extremely hard, and levels of total dissolved solids, iron, manganese, and sulfate may exceed Minnesota Pollution Control Agency limits (1973) for Class 1-A domestic water supplies. Well water must be treated extensively to be fit for human consumption; even after treatment, the water retains a harsh mineral taste. Surface sand and gravel aquifers occur irregularly and have high recharge capacity, but are more easily contaminated.

The St. Paul District, Corps of Engineers, began a water quality monitoring program for Lac qui Parle Reservoir in November 1987. The purpose of the program is to track the patterns of certain water quality variables (dissolved oxygen, pH, temperature, and conductivity) and attempt to identify causal relationships among those patterns and natural and man-controlled phenomenon. The Water Quality Unit, organized within Hydrology Section, is responsible for the water quality management program.

For more information concerning the quality of project waters, refer to the Water Quality Management Strategy Report in the Lac qui Parle Operational Management Plan.

4. Water Based Recreation:

The Minnesota River through Lac qui Parle is designated as a State of Minnesota Canoe Route. The Rivers Section of the Minnesota Department of Natural Resources (MN DNR) provides river information from Ortonville to Fort Snelling. There is a canoe portage at Lac qui Parle Dam, at Marsh Lake Dam and at the low flow structure at Highway 75 Dam.

Vegetation Communities:
An inventory and analysis of habitat type and existing vegetation in the Lac qui Parle area is presented in Section 1, Chapter 3, Key Factors and Resources: Vegetation and in Appendix C, Environmental Resources, Vegetation. Plant communities are shown in Tables C-1 to C-4.

Because Lac qui Parle was an existing lake that the Corps modified for flood control purposes, project fee title land is limited to the average high water line. As a result, project vegetation is almost exclusively riparian or marsh (for additional information, see Section 1, Regional Resources and Influences, Chapter 3, Key Factors and Resources, Vegetation: Floodplain Forest, and Marshlands).

1. Rare and Endangered Species and Habitats:
Lac qui Parle is located within what is known as the Prairie Pothole Region of the United States. This region was created when glaciers advanced through the Dakotas, eastern Montana, Minnesota, and north-central Iowa leaving freshwater depressions and marshes called "prairie potholes." These are small wetlands that depend on precipitation and groundwater levels for their water supply. In addition to the small potholes scattered throughout the area, there are many stream and spring fed marsh areas. All wetland habitat in this region is crucial to the production of waterfowl. The North American Waterfowl Management Plan identified 34 areas of major concern for waterfowl habitat in the United States and Canada. Of these 34 major areas, five of the most critical areas were further identified as Priority Habitat Range. The Prairie Pothole Region is one of these ranges.

2. Nuisance Plants:
Poison ivy is common throughout the project area. Because the day use areas are small, poison ivy is easily controlled in high use areas. Of special concern to this project are the aquatic plants purple loosestrife and Eurasian milfoil.

Purple loosestrife, *Lythrum salicaria,* is an exotic wetland plant. Introduced from Europe and Asia in the 1800s, it has invaded 40 States and all of the Canadian border provinces. This plant is extremely invasive to wetlands and will crowd out native plant species. It is unsuitable for nesting, cover, or feeding habitat for most native wetland animal species and has no naturally occurring predators in the United States.

Eurasian milfoil, *Myriophyllum spicatum,* is also an exotic wetland plant from Europe. In shallow, nutrient rich lakes, such as Lac qui Parle, it forms an impenetrable mat of vegetation on the lake surface supported by thick underwater stands of tangled stems. This plant has had serious negative impact to water-based recreation in lakes where it has become established.

Both purple loosestrife and Eurasian milfoil are very hardy and are able to reproduce from root pieces and broken stems.

Lac qui Parle project land is experiencing problems with the exotic weed, leafy spurge (Euphorbia sesula). Its aggressive nature combined with a lack of natural controls enables it to out-compete native vegetative species. This hardy perennial reduces grassland quality by reducing species diversity. Leafy spurge has been declared a noxious weed in Minnesota. As a noxious weed its control, defined as preventing its spread by seed or other propagating parts, is warranted. The Corps has been involved since 1975 in an effort to control noxious weeds on project lands.

Minnesota Department of Natural Resources Programs:

Most of Lac qui Parle and Marsh Lake lie within the Lac qui Parle Wildlife Management Area (WMA) administered by the Minnesota Department of Natural Resources. The Lac qui Parle WMA is part of the Mississippi Flyway and has significant waterfowl concentrations during migration periods. The preservation and restoration of habitat for waterfowl and other animals through the planting and/or protection of specific vegetative communities is an important consideration.

1. Private Organizations:

The Nature Conservancy is a private organization whose primary objective is the preservation of natural areas. The Nature Conservancy owns two areas (abutting the Lac qui Parle WMA) in Chippewa and Swift Counties. The 729-acre Chippewa Prairie is in Chippewa and Swift Counties about 3 miles west-northwest of Milan; the 360-acre Sleeping Bison Prairie is in Swift County 3 miles west of Appleton. These areas may be used for nature appreciation, observation, and photography. In addition, areas are managed by Minnesota Department of Natural Resources Section of Wildlife personnel, in conjunction with prairie management on the Lac qui Parle Wildlife Management Area.

Wildlife, Species and Habitat:

Most of Lac qui Parle and Marsh Lake lie within the Lac qui Parle Wildlife Management Area administered by the Minnesota Department of Natural Resources. The unit is about 25 miles long, 1 to 3 miles wide, and includes 32,000 acres under State administration. Marsh, forest, brushlands and uplands with grassland and cropland characterize tbe area. Immediately upstream, the Big Stone National Wildlife Refuge is administered by the U.S. Fish and Wildlife Service. These wildlife areas and other undeveloped areas in the Minnesota River Valley form a natural corridor traversing the region from northwest to southeast. This corridor offers excellent cover and concealment for wildlife.

For additional information on species, see Section 1, Regional Resources and Influences, Chapter 3, Key Factors and Resources: Wildlife, Habitat and Species, and Appendix C, Environmental Resources.

1. Threatened and Endangered Species:

The bald eagle, *Haliaeetus leucocephalus*, uses the Big Stone National Wildlife Refuge occasionally during migration. No eagle nesting is known to occur in that area. Primary

migration use occurs on the Lac qui Parle Wildlife Management Area. The peregrine falcon occasionally migrates throughthis area. The range of the trumpeter swan may also be expanded into the area in the near future.

There is a tabular listing of rare, threatened, and endangered species in Appendix C, Environmental Resources.

2. Special Programs:

A. Federal Agencies:

The North American Waterfowl Management Plan (NAWMP) is an international agreement between the United States and Canada for the restoration of lost waterfowl habitat. Federal, State, private, and provincial agencies are cooperating under this plan for the conservation, development, and management of habitat for waterfowl and associated wetland species. On January 23, 1989, the Corps of Engineers and the U.S. Fish and Wildlife Service signed a Cooperative Agreement which defined the goals, responsibilities, and procedures by which these two agencies would work together to further the efforts of the NAWMP. This agreement was in effect for 3 years from the date signed. The Corps agreed to identify opportunities at operating projects and to coordinate management efforts with the U.S. Fish and Wildlife Service.

Corps of Engineers: The Corps of Engineers has allocated 139 acres for wildlife management and low density recreation. Over 347 acres are under lease agreements with other agencies for wildlife management.

U.S. Fish and Wildlife Service: There are no U.S. Fish and Wildlife Service facilities at Lac qui Parle; however, the U.S. Fish and Wildlife Service does operates the Big Stone National Wildlife Refuge. This 10,790-acre refuge is adjacent to the Lac qui Parle Wildlife Management Area and was opened in 1974. For more information, see Section 5, Big Stone Lake Master Plan for Resource Use.

B. State Agencies:

Minnesota Department of Natural Resources: A breeding flock of giant Canada geese was re-established by the Minnesota Department of Natural Resources. Giant Canada geese were transplanted to the Lac qui Parle Wildlife Management Area to establish a resident flock and to attract migrating geese. The first transplant was from the Tamarac National Wildlife Refuge in 1958. The first nests were found in 1961. Currently, the resident flock of 200 adults produces fledged young each year, and the fall migrant population is approximately 350,000 geese.

The numbers of migrating Canada geese have increased steadily since the re-establishment of the resident flock. The migratory Canada geese are mostly from flocks which nest near Hudson Bay and winter in the southerly midwest States.

C. Local Governments:

Portions of the Lac qui Parle and Highway 75 Dam projects lie within Chippewa, Swift, Lac qui Parle, and Big Stone Counties. County extension and resource agents are available in each county to provide information to Corps personnel about natural resource management.

D. Local and Private Organizations:

Several local rod and gun clubs, the Lac qui Parle Watershed Project, the Lac qui Parle Lake Association, local resort owners, and the general public maintain an interest in the project operations and activities.

The Lac qui Parle Lake Association is a non-profit corporation. The purposes of the corporation are to build a better community through the preservation, improvement, and restoration of Lac qui Parle; to protect wildlife habitat; to stock and raise and to assist others to stock and raise fish and wildlife; to encourage and promote the prevention, control and abatement of water pollution; and to generally promote the preservation of the natural environment.

The mission statement of the Lac qui Parle Watershed Project includes statements that the project shall:

- Lead a concerted effort to preserve Lac qui Parle as a natural resource for this area;
- Promote soil and water conservation in the Lac qui Parle watershed;
- Raise public awareness of the financial impact of Lac qui Parle to the communities in the area;
- Promote the recreational opportunities of the Lac qui Parle area;
- Promote the stocking of game fish in Lac qui Parle to enhance the sport of fishing;
- Preserve the water supply in a safe manner for future generations;
- Coordinate with Federal and State agencies for the improvement of water quality in the Lac qui Parle watershed.

Fisheries:

The Minnesota Department of Natural Resources manages fisheries in Lac qui Parle and Marsh Lakes. The area Fisheries Office is located in Ortonville, Minnesota. The St. Paul District will cooperate with the MN DNR in such areas as providing water quality data, coordinating fisheries enhancement efforts, and controlling water levels.

Lac qui Parle Lake and its fishery provide the primary feature for Lac qui Parle Wildlife Management Area, Lac qui Parle State Park, and several resorts and bait shops, as well as an important recreational attraction for Montevideo, Watson, Milan, and other surrounding communities. Local anglers report that fishing pressure has increased recently; they attribute this to the reputation the lake is enjoying as a producer of trophy walleye (1992 MN DNR creel

survey). The fishery of the lake has the potential to contribute substantially to the local and State economy.

1. Habitat Conditions:

Lac qui Parle Lake is considered a "Warmwater Game Fish Lake" and has maximum and median depths of about 14 and 8 feet, respectively (MN DNR unpublished lake survey 1957). Marsh Lake is classified as a "Warmwater Fish and Waterfowl/Aquatic Furbearer Lake" with maximum and median depths of about 5 and 2.5 feet, respectively (MN DNR unpublished lake survey 1968).

Periodic winterkills are common in Marsh Lake because of shallowness. A complete winterkill occurred in 1940-41. Large populations of non-game fish are a problem, but control is limited to removal by commercial fishermen. Chemical treatment is not possible since the project is part of the Minnesota River system.

Agricultural, domestic and municipal pollution has degraded fisheries habitat, reduced recreational opportunities, reduced the aesthetic quality of the lake and increased the likelihood of direct effects to the fisheries in the form of fish kills. An abundance of under-utilized, non-game fish species compete with more desirable species for available food and space.

2. Species:

Sixty-four species of fish are known to occur within the project area, including 13 types of game fish and six varieties of rough fish that are commercially harvested (for management purposes). For additional information, see Section 1, Regional Resources and Influences, Chapter 3, Key Factors and Resources: Wildlife, Habitat and Species, and Appendix C, Environmental Resource.

Fishing activity occurs on both lakes throughout the year. The predominant species sought are crappies, walleye, catfish, and northern pike. Fishing activity peaks occur in late spring and fall. Most of the fishing activity occurs below the Marsh Lake Dam, at the Milan Beach Bridge, and below the Lac qui Parle Dam.

3. Minnesota Department of Natural Resources Management Programs:

The lake is managed for warmwater game fish. The lake is stocked every 2 years with 300 walleye fry per surface acre to augment natural reproduction. When available, winter rescued northern pike are also stocked. Rough fish harvesting by private contractors is regulated by the Minnesota Department of Natural Resources. During the winter of 1974-75, 150 tons of carp, buffalofish, and bullheads were harvested.

The Minnesota Department of Natural Resources operates a fish rearing pond on the west side of Marsh Lake Dam; this land is leased to the MN DNR for fish and wildlife management purposes.

The fishery of Lac qui Parle Lake has historically been managed primarily for walleye, with a secondary emphasis on northern pike, black crappie, and channel catfish. At times, management for bluegill, smallmouth bass and flathead catfish has been attempted. Management activities have consisted of enforcement of Minnesota State fishing regulations, stocking activities, commercial fishing, efforts to improve water quality, and water level management.

Since 1971, Lac qui Parle Lake has been stocked with walleye fingerlings, channel catfish fingerlings, bluegill fingerlings, and smallmouth bass fingerlings. Black crappies and northern pike have also been stocked. Fish are not stocked in Marsh Lake because of frequent winter fish mortality.

Following is a list of fisheries management activities conducted in the State of Minnesota. The list is taken from the draft copy of the new fisheries management policy and was provided by Douglas Kingsley, Area Fisheries Manager for the MN DNR at Ortonville, Minnesota.

- Conduct lake and stream surveys for chemical, biological and physical characteristics.
- Evaluate fishing and other user activities.
- Evaluate fishery management activities and programs.
- Investigate the status of fish populations and reproduction.
- Develope lake and stream management plans.
- Develope regulations for the protection and taking of fish.
- Provide and obtain information from the public and other agencies on fishery management and address concerns about fisheries management and the aquatic environment.
- .Assist with research efforts aimed at problem identification and problem solving.
- Evaluate and make recommendations on the issuing of various permits.
- Make recommendations on development projects affecting the fishery.
- Acquire, develope and manage fish spawning areas and trout stream easements.
- Maintain and operate fisheries headquarters, equipment, fish hatcheries, rearing ponds and related facilities.
- Request and evaluate hatchery produced coldwater and coolwater species for stocking programs.
- Transport and stock fish in suitable waters.
- Lake and stream improvement, including lake rehabilitation, control of undesirable fishes, and habitat alteration.
- Involvement in aquatic plant management activities.
- Supervise commercial fishing operations.
- Develope and manage budgets.

Open Space and Visual Quality:

The visual character of Lac qui Parle from project lands is limited. At Lac qui Parle the day use areas are very small and have an unattractive industrial look and feel about them due to the proximity of the concrete control structure and the rip rapped banks. At Marsh Lake the public

use area is low-lying and difficult to access. There are no Corps sites that provide vantage points from which to view the lake. Lakeside vegetation is riparian in nature, floodplain forest or wetland with little visual appeal to the casual observer. Taken as a whole, the lake offers few of the visual amenities that are usually associated with scenic value.

Visual Quality Evaluations for Lac qui Parle and Marsh Lake recreation areas are presented in Appendix D.

Cultural Resources:

The Lac qui Parle area has high value as an archeological and historical resource. It lies on a major travel corridor for both the indigenous peoples of North America and the European immigrants that displaced them.

The area has been used by various human groups from about 8000 B.C. The early users were nomadic hunting groups. Climatic changes brought about varying uses (or non-uses) of the area. Evidence of the users is found only in habitation and burial sites. Our knowledge of these early peoples is very limited.

In the more recent history of the area, the Dakota Indians lived a semi-nomadic hunting and gathering life in the vicinity of Lac qui Parle before European colonization. The Minnesota River Valley was almost certainly a focal point of the eastern plains Indians. The abundance of game, shelter from prairie winds, and the availability of firewood, a rare commodity on the plains, made the valley a desirable area for winter encampments. In addition, the Lac qui Parle area is only a few days (by canoe) from the continental divide at Lake Traverse (see Section 1, Regional Resources and Influences, Chapter 2, Description). From this locale, it is possible to access either Hudson Bay (via Lake Traverse, Red River of the North, etc.) or the Gulf of Mexico (downstream to the Mississippi River) by relatively easy water travel.

White settlement expanded rapidly after the Dakota were subjugated and confined to reservations following the Great Sioux Uprising of 1862. Immigrants of European heritage first settled near the rivers and overland transportation routes. Again, the timber of the floodplain forests and the availability of relatively easy waterborne transportation proved to be the major attraction of the area. Steamboats were used on some of the area lakes, but the rivers proved to be too unreliable for large boat operations. In the 1870's, wheat farming became a major industry because of the region's fertile soils. The expansion of agriculture as the major industry in the region was the driving force behind the drainage of most of the region's many marshes and sloughs, and their subsequent conversion to cropland. The near extinction of the tremendous bison herds and other major animals that were native to the plains meant that those areas that were unsuitable for cropping could be used for cattle grazing, especially the drier western parts of the region, the often flooded river bottoms, and those areas with untillable, rocky soil.

1. Overview:

On the basis of current information about cultural resources, a wide variety of significant prehistoric, historic and geologic features occur in the vicinity of the Lac qui Parle Project. Though their potential is yet to be realized, it seems likely that many sites may be suitable for public interpretation.

The artifacts and site materials which are the tangible cultural resource base of an area are significant in two major ways. First: the Corps of Engineers is explicitly responsible for the protection, preservation, and enhancement of cultural resources located within those areas that are under its jurisdiction, and/or, are affected by its operations. Second: cultural resources can be an asset with development potential. Attending to the first responsibility will often be the first step toward realizing the development potential of the resource base.

2. Inventory of Known Sites:

At present, an isolated chipped stone flake and an isolated mammal bone found at the Lac qui Parle Dam, and a surface scatter of historic bottles and fragments at Watson Sag Dike constitute the only known prehistoric or historic archaeological sites on the Lac qui Parle Project fee title lands. Numerous archaeological sites exist in the vicinity of the project in both Lac qui Parle and Chippewa Counties. The majority of these sites are mounds or mound groups located on the bluffs overlooking the river. The Lac qui Parle State Park has two identified burial mound sites and several prehistoric village and habitation sites. Because of the long history of use of the river corridor by the Dakota people, it is anticipated that more sites will eventually be discovered.

A number of significant historic sites have been located at and near the project. The Lac qui Parle Dam, Marsh Lake Dam, Chippewa Diversion Works, and Watson Sag Dike are all considered eligible to the National Register of Historic Places. The Lac qui Parle (Dakota) Mission, established in 1835, and the site of Fort Renville, established in 1826, are both managed by the Minnesota Historical Society and are within ½ mile of the Lac qui Parle Dam. Both are listed on, or eligible to, the National Register of Historic Places (NRHP). Other NRHP sites in the area include the WPA-constructed buildings in Lac qui Parle State Park, the Upper Sioux Agency in the vicinity of Granite Falls, and numerous historic residences and public buildings in Montevideo and Granite Falls.

The Lac qui Parle Mission was a Protestant mission to the Dakota, established in 1835 at the request of fur trader Joseph Renville. It became the nucleus of one of the earliest and most colorful centers of white settlement in the Minnesota River Valley. At this remote station, the valley's first school and church were founded; the first church bell pealed and cloth was woven for the first time in what would be the State of Minnesota. It was here that the missionaries devised a written alphabet for the Dakota language and translated the Bible.

A replica of the mission church was completed by the Chippewa County Historical Society and the Works Progress Administration in 1942. Sites of the original structures are marked. This replica is located about 500 feet north of the Lac qui Parle Dam.

Fort Renville was a stockaded log fort built by Joseph Renville in 1826. One of Minnesota's most prominent and influential pre-statehood citizens, he was the son of a Dakota woman and a French fur trader. At this wilderness settlement, he extended hospitality to area travelers and explorers.

The Lac qui Parle Mission was one of the first contact points between white and native cultures in western Minnesota. The Treaty of Traverse des Sioux in 1851 opened western Minnesota to white settlement pressures from the east. A 10-mile strip along both sides of the Minnesota River from Fort Ridgely to Big Stone Lake was retained by the Dakota as hunting grounds. Sales and encroachments reduced the Indian holding to small areas near Granite Falls and Morton. Subsequently, the Dakota rebelled against this authority in 1862. The aftermath of the uprising saw the area's Dakota peoples confined to reservations by the United States Government; the leaders of the rebellion were hanged at Fort Snelling.

During the rebellion, between August and October, isolated battles between the European settlers and the Dakota were fought all along the river. Many heroic, and conversely despicable, acts were performed by participants of both sides. The Battle of Wood Lake (in eastern Yellow Medicine County) was the last major battle along the Minnesota River. It was a decisive victory for the white soldiers led by Colonel Henry Sibley. Three days later, Sibley led his troops into the Indian camp and demanded that all white captives be released to him. The Dakotas immediately released 241 prisoners. Those released were brought to Sibley's camp which became known as Camp Release, located near Montevideo where a monument was erected to commemorate the event.

ADMINISTRATIVE AND POLICY FACTORS:

Administrative and policy factors involve Corps of Engineers responsibilities, regulations and restrictions for the overall management of Lac qui Parle. Also included are regulations, programs, and goals of other public agencies or private groups whose responsibilities overlap with those of the Corps. Key administrative and policy factors in planning for resource use at Lac qui Parle include: the status of project lands, Corps land stewardship responsibilities, and local sponsorship requirements for fish and wildlife enhancement or recreation development.

Project Land Status:

The classification of project lands is discussed briefly in this section, Chapter 1, Project Lands. The following paragraphs discuss the influences and constraints placed on resource use, management and development by project land status.

1. Fee Acquired Lands:

Because Lac qui Parle is an existing natural lake, modified for flood control storage, very little land is under fee title. Project lands owned in fee by the Federal Government at Lac qui Parle total 517.62 acres. The Corps of Engineers has management authority and responsibility for all fee acquired lands. This was the initial land acquisition for the Lac qui Parle project and was required for construction and operation of the project. This project is approximately 12 percent monumented as required by ER 1130-2-400.

2. Flowage Easements:

The Corps has acquired flowage easement rights on 19,859.47 acres. Within the project area, the only interest or privilege the Corps has in these lands is the right to periodically inundate them during controlled flood events and to restrict the building of permanent structures by the owners of the property. There are 60.1 acres of land designated public domain within the Lac qui Parle flowage easement.

3. Outgrants:

A. Roads:

There is one easement for a road on project land to Chippewa County, number DACW22-2-79-5186. This lease is for a county road east of Lac qui Parle Dam. The lease is dated 6 September 1979 to an indefinite date.

B. Utilities

As of 1 October 1991, there are 3 right-of-way easements at the project for utilities. All are to Minnesota Valley Cooperative Light and Power Association:

- Number DACW37-2-90-0056. Use of Government owned land for an electric power transmission line across the Chippewa Control Structure site, Lac qui Parle Flood Control Project. Dated 14 May 1990, expiring 25 April 2015.
- Number DACW22-2-78-5112. Electrical power transmission line, Lac qui Parle Reservoir, Chippewa County, Minnesota. Dated 26 May 1978, expiring 16 May 2003.
- Number DACW22-2-79-5054. Electric power transmission line across Government Tracts 2, 3, 343, and 345, Lac qui Parle Reservoir, Minnesota River. Dated 13 March 1979, expiring 12 March 2004.

C. Wildlife Management:

The State of Minnesota has three licenses covering 463.75 acres for wildlife management purposes:

- Department of Natural Resources, number DACW22-3-83-5120. Dated 1 October 1983, expiring 30 September 2008; 118.35 acres for Lac qui Parle Wildlife Management Area.

- Department of Natural Resources, number DACW22-3-85-5056. Dated 1 July 1985, expiring 30 June 2010; 335 acres for Lac qui Parle Wildlife Management Area.
- Department of Conservation, number DACW33-3-87-5097. Dated 15 April 1987, expiring 14 April 2012; 10.4 acres for a fish rearing pond at Marsh Lake Dam site.

D. Recreation:

Minnesota Department of Natural Resources, Division of Trails and Waterways, Regional Trails Coordinator, New Ulm, Minnesota, number DACW37-3-88-5113. Dated 8 June 1988, 2.18 acres, more or less, for public use trail for canoe access and navigation signs at the Lac qui Parle Dam site.

4. Excess Project Lands:

All real property and interests are required for project purposes and are recommended for retention.

Resource Management Responsibilities:

The Corps of Engineers is responsible for the management of the cultural and natural resources of the Lac qui Parle project. Numerous laws and regulations (See Appendix E) set forth, in detail, the responsibilities of the Corps for progressive resource management programs. These laws are explicit in their direction that natural resource management be integrated with other project resources and activities under a concept of multiple resource use. Regulations (ER 1130-2-400) direct that whenever the opportunity exists, management techniques to improve vegetative conditions for wildlife, recreation, scenic value, cultural resources, fire prevention, pest control, and watershed protection be properly implemented.

Specific management objectives are to be based upon the land use designations that are introduced in this Master Plan. Subsequent refinement and definition of these concepts will be found in the Lac qui Parle Operational Management Plan.

Programs supporting other Federal agencies, State, and local involvement in natural resource management have been developed by the Corps in keeping with good land stewardship responsibilities.

Under Title 36, Chapter III, Section 327, Code of Federal Regulations: to ensure the health, safety and welfare of the public, Corps employees have the authority to issue citations enforcing those regulations; however, they do not engage in actual law enforcement. Local law enforcement authorities (County and State police) retain statutory authority and the responsibility to enforce all other laws. Corps employees coordinate with them and contact them in the event of a major disturbance.

Project Personnel:

The office and maintenance facilities for the project are located on County Road 13, approximately 5 miles east of Lac qui Parle Dam. Project personnel are responsible for the operation and maintenance of the project. They also coordinate and implement the Federal and non-Federal resource management programs.

The Lac qui Parle Resource Manager is responsible for all aspects of the management and administration of the project resources. These responsibilities include: range management, fish and wildlife management, soil erosion control, educational and interpretive programs, law enforcement, pest control, administration and inspection of public use areas and other project lands, and visitor and employee safety programs. Other duties include, but are not limited to, supervision of project employees, various public relations duties, and inspection of outgrants, as required.

The Resource Manager and one maintenance worker are the only permanent full-time employees at the project. There are also two permanent full-time seasonal maintenance workers and one permanent full-time seasonal office clerk.

CHAPTER 3 – RESOURCE OBJECTIVES

This chapter presents the Resource Objectives for the Lac qui Parle Flood Control Project. These Resource Objectives are in support, and a refinement, of the regional Resource Objectives identified in Section 1 of this document. Project Resource Objectives reflect the specific resources, capabilities and restraints of the Lac qui Parle project. They specify how those resources are to be managed in response to the current and projected public needs and desires that have been identified. Resource Objectives for individual management units are presented in Chapter 4.

PROJECT OPERATIONS:

A. Objective:

To continue to operate the Lac qui Parle Flood Control Project with safe, efficient, cost effective procedures that provide the level of flood control and downstream flow regulation authorized hy Congress.

B. Rationale:

The Lac qui Parle project is authorized by Congress for flood control and regulation of downstream flows of the Minnesota River. In addition to operating for these mandatory purposes, the Corps is directed in general legislation to manage the other lake resources including water quality, fish and wildlife, and recreation. Achieving these secondary purposes must he incidental to the authorized project puposes and may not conflict with them.

Seasonal water levels are governed by regulation periods established as part of the operating plan for the project (see Section 1-3). This plan is a function of seasonal precipitation and runoff patterns and indicates the desired flood control and storage requirements during the year.

Recreation, Low Density:

A. Objective:

To provide high quality recreation opportuniies that are consistent with the authorized project purposes.

B. Rationale:

Fishing is a popular pastime at Lac qui Parle, and occurs year-round. The project is renowned for its high quality waterfowl hunting. Both of these types of recreation are important to the area economy, and important providers of popular regional recreation opportunities.

Recreation, Intensive and Day Use:

A. Objective:

To provide fully accessible day-use recreational opportunities of the highest attainable quality that will safely meet the existing and projected recreational needs of the region.

B. Rationale:

The project currently provides opportunities for hunting, fishing, picnicking, and other day-use activities. Because land in this region is almost exclusively reserved for agriculture and there is an established pattern of use indicating a need for this type of recreational facility, it is felt that tbe existing opportunities should continue to be provided. Changes in the existing allocation of project resources would not significantly increase the benefits derived from the project; therefore, the existing management policies should continue in effect.

Boating:

There are no boat-launching ramps on Corps property, although canoe portages are provided around the dams. The Minnesota Department of Natural Resources maintains four boat ramps and two canoe launch sites on Marsh Lake and six boat ramps and four canoe launch areas on Lac qui Parle.

Day Use:

Three public use areas are located at the project. There are two developed, intensive use recreation sites located on both sides of the river, directly downstream of Lac qui Parle Dam, and one site on the east side of Marsh Lake Dam. These recreation areas have day-use facilities for picnicking and fishing, and provide informational bulletin boards.

Fishing:

Fishing activity occurs on hoth lakes throughout the year. Peak fishing activity occurs in the late spring and again in the fall. Most of the warm weather fishing activity occurs below the Marsh Lake Dam, at the Milan Beach Bridge, and below the Lac qui Parle Dam. Winter ice fishing starts when solid ice is formed and continues through the winter. Ice houses (small structures, or shacks, positioned over a hole drilled in the ice) are commonly used for this sport, and may remain on the ice throughout the season. They are required to be removed from the lakes by spring breakup.

Hunting:

Waterfowl hunting, in particular goose hunting, accounts for the largest share of the total hunting activity of the area. Other types of hunting activities include: hunting and trapping of a number of furbearers (fox, muskrat, squirrel) and hunting and viewing of white-tailed deer. Deer hunting, by both firearm and archery, accounts for 20 percent of the hunting activity in the area, while pheasant hunting accounts for about 12 percent.

Nature Study:

Lac qui Parle and the Minnesota River Valley offer many diverse habitats for a wide variety of animal life. These different types of habitat provide for the needs of over 250 species of birds, more than 50 species of mammals and many types of amphibians and reptiles. When coupled with the scarcity of water-based resources in the regions west of the project, this abundance of wildlife makes nature study an important resource potential for Lac qui Parle. Improved access to project lands for low-density activities would help to realize this potential.

Camping:

The Lac qui Parle project area has no Corps administered camping facilities. There are State administered campgrounds at Lac qui Parle State Park, a few miles west of the main dam.

Lac qui Parle State Park, administered by the Minnesota Department of Natural Resources, consists of 530 acres. It is the southern gateway to Lac qui Parle Lake. An estimated 50,000 to 60,000 people visit the park each year. Facilities include 56 semi-modern campsites (22 with electricity), showers and flush toilets, 50 primitive group camps, horseback riders group camp with an open shelter, 33 picnic sites, swimming beach, boat launch, 6 miles of hiking trail, 6 miles of horseback riding trail, 5 miles of ski trail, trailer sanitation dump station, canoe access to the Lac qui Parle River, and public telephones.

Hiking/Walking:

There are no Corps maintained walking paths in the Lac qui Parle project.

Fisheries:

1. **Game Fish:**

A. Objective:

In cooperation with the Minnesota Department of Natural Resources, develop and maintain a high quality fishery for warmwater game fish, and continue stocking programs to provide superior recreational fishing opportunities.

B. Rationale:

Fishing is an important recreation resource for this project. About 70 percent of the total visitation participates in fishing related recreation. Anglers are important contributors to the area economy.

Gamefish in the lake include walleye, northern pike, crappie, bluegill, channel catfish, and white bass; walleye is the most sought after species.

2. Non-game Fish:

A. Objective:

In cooperation with the Minnesota Department of Natural Resources, continue management methods and techniques to limit reproduction of rough fish species.

B. Rationale:

Rough fish harvesting by private contractors is regulated by the Minnesota Department of Natural Resources (during the winter of 1974-75, 150 tons of carp, buffalo, and bullheads were harvested). Actions of rough fish contribute to highly turbid water conditions in the lake by disturbing bottom sediments. These resuspended bottom sediments contribute to the high turbidity levels of the Minnesota River, where pollution levels in the lower reaches often exceed Federally mandated water safety standards. In addition, large populations of rough fish can out-compete the lake game fish for available resources and space.

Waterfowl:

A. Objective:

In cooperation with the Minnesota Department of Natural Resources, the U.S. Fish and Wildlife Service, and other private organizations, work to maintain Lac qui Parle as productive waterfowl habitat.

B. Rationale:

Lac qui Parle is on one of the major North American flyways for waterfowl and enjoys a reputation as one of the premier waterfowl hunting areas in the region. Because of this, waterfowl, in economic terms, are the most important wildlife species within the area. Waterfowl hunting, in particular goose hunting, accounts for the largest share of the total hunting activity of the area. As such, waterfowl hunting has a positive economic impact within the area. In addition to hunting, the project offers excellent opportunities for observation and photography.

Water Quality:

A. Objective:

To continue to work to improve the water quality of the Minnesota River, in cooperation with Federal, State, local, and private agencies.

B. Rationale:

Improving the water quality of Lac qui Parle and the Minnesota River will also improve water-based recreation opportunities and the quality of wildlife habitat and fisheries. As a "Warmwater Game Fish Lake" Lac qui Parle has a positive impact on the area economy. The

lakes have a history of winter fish-kill due to oxygen depletion. They also experience nuisance blue-green algae blooms due to excessive (tributary and internal) nutrient flux. High turbidity limits the growth of desirable submerged vegetation. All of these are the result of poor water quality, and all of these water quality related problems stress the lake fishery, lowering sport fish populations, with an end result of reduced fishing success. It would seem to follow that a less productive fishery would affect the local economy.

CHAPTER 4 – MANAGEMENT UNIT OBJECTIVES

Management Unit Resource Objectives are the site specific applications of the Project Resource Objectives which, in turn, are a refinement of the Regional Resource Objectives. Implementation of these unit objectives will help satisfy the regional needs and the expressed desires of the public and of other agencies, within the limits and capabilities of the resource base and according to the authorized project purpose.

UNIT DESCRIPTION:

A brief description of the unit with a focus on the cultural and natural resources that affect resource use. The description will include:

A. Size and Shape

B. Location and Access

C. Existing Site Use

D. Adjacent Land Use

E. Soils and Topography: soil descriptions are from the United States Department of the Interior, National Resources and Conservation Service (USDA NRCS).

F. Vegetation

G. Wildlife Species and Habitat Availability

H. Cultural Resources

I. Limitations and Hazards

Land Use Classifications
The current classification of the unit.

Resource Objectives:
Identifies and describes the unit objectives. A unit may have several Resource Objectives.

Rationale:
Discusses the need for, and the intent of, the identified unit Resource Objectives and the management strategy and development concepts recommended to implement them.

Federal facilities are obligated by law to meet the requirements of the Rehabilitation Act of 1973 (amended 1975) Title V, Section 504 (Title V). If a site is noted as non-accessible (Unit Description: 3. Existing Site Use), Title V is assumed as the rationale for meeting current accessibility standards.

Implementation Plan:
A summary description of the techniques that could be undertaken to implement the unit objectives. The concepts presented here are not intended to be all inclusive. They simply convey an understanding of the range of development and management strategies that could serve as a means to implement the objectives. The concepts presented here will be presented in detail in subsequent planning and design documents. This includes the Project Operations Plan, Feature Design Memorandum, and Plans and Specifications. The actual methods that are used will be decided on by the Resource Manager, staff from other Corps elements, and other agencies where it is appropriate.

Constraints:
A summary of factors that may influence implementation of the Unit Resource Objectives. These factors may be regional, administrative, site specific or a combination of these sources.

UNIT A, EAST BANK DAY USE AREA:

Unit Description:

A. Size and Shape: Approximately 2 acres. It is roughly rectangular (see Plate 13).

B. Location and Access: The unit lies on the south end of the lake, directly downstream of the dam on the east (Chippewa County) bank of the Minnesota River. Lac qui Parle County Road 33 accesses the site from the west, Chippewa County Road 13 from the east. This road (Lac qui Parle County Road 33/Chippewa County Road 13 [see Figure 5-2]) crosses the river on the dam. The entrance drive to the site is adjacent to the dam, on the east side.

C. Existing Site Use: This unit contains a 50 (+) car, paved overflow parking area. This site provides tailwater fishing access and downstream riverbank access. This area is not in accordance with Title V; it is not accessible to persons with limited personal mobility.

D. Adjacent Land Use: The privately owned lands immediately east and south of this unit that are used for agricultural purposes. Lands to the north are preserved as historical properties (see this section, Chapter 2, Resource and Influencing Factors, Cultural Resources); to the west are wildlife management lands.

E. Soils and Topography: Site topography is flat (except for the dam embankment); the river lies approximately 10 feet below ground level. The riverbanks are armored and are very steep.

Soils of the area are of the Coland-Storden-Swanlake series. These soils are formed mainly in clayey to sandy alluvial sediments (USDA SCS).

F. Vegetation: The site has a few mature trees and mown turf grasses.

G. Wildlife Species and Habitat Availability: There is a major Wildlife Management Area directly off site. Although the site proper is lacking in habitat, cover or concealment, the proximity of the associated Wildlife Management Area insures plentiful species variety and availability.

H. Cultural Resources: Lac qui Parle Project fee title lands were surveyed in 1993. No cultural resources were found at this location. Lac qui Parle Dam is eligible to the National Register of Historic Places. The reconstructed Lac qui Parle Mission is on state land within ½ mile of the dam.

I. Limitations and Hazards: The major limitation of this unit is the small size of the site. Most of the available land is used for parking, leaving little room for recreation or other considerations. The entrance drive to this day use area is adjacent to (the east side of) the dam. Vehicles turning into the site cause congestion on the roadway which is 32 feet wide here. The parking congestion on peak weekends also contributes to hazardous driving/pedestrian situations.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational activities by the visiting public, ..."

Resource Objectives:
Provide safe public access for low to moderate levels of river-based recreation use, including fishing, picnicking, and wildlife viewing.

Provide a fully accessible site to all persons.

Rationale:
Lac qui Parle Dam East Bank Day Use Area is currently managed as a high density recreation area providing public access to the dam tailwater and the Minnesota River. Since there are few easily attainable public accesses to the river, this site is an important regional recreation resource.

Implementation Plan:
Site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in tbe course of normal maintenance schedules.

To maximize efficiency, re-examine those areas that require high levels of maintenance with a specified goal of reducing maintenance costs.

Redesign the entrances to the site parking facilities to maximize the distance from the bridge to the vehicle turning areas. This will provide safer vehicular access to each parking lot. The roadway on the bridge is in an extremely bad state of repair. To minimize costs, this redesign should be accomplished when the repairs to the roadway are done.

Providing shade for the east parking lots and visually screening the adjacent farmland to the east would be a significant contribution to the visual quality of this site. A comprehensive planting program, supervised and designed by a landscape professional ,should be implemented. The possibility of volunteer assistance with this program should be investigated. Care shall be taken to ensure that any plantings do not shade working farmland.

Constraints:
There have heen prohlems with vandalism in the past. This should be a consideration in any plans for this site.

UNIT B, WEST BANK DAY USE AREA:

Unit Description:

A. Size and Shape: Approximately 3-4 acres. It is roughly rectangular (see Plate 14).

B. Location and Access: The unit lies on the south end of the lake, directly downstream of the dam on the west (Lac qui Parle County) bank of the Minnesota River. Lac qui Parle County Road 33 accesses the site from the west , Chippewa County Road 13 from the east. This road (Lac qui Parle County Road 33/Chippewa County Road 13 [see Figure 5-2]) crosses the river on the dam. Tbe entrance drive to the site is adjacent to the dam, on the west side.

C. Existing Site Use: This unit contains parking for ± 40 vehicles. The parking area is gravel; this results in uncontrolled parking and subsequent confusion. This site has accessible restrooms, water, picnic tables, trash containers and a playground;. It provides tailwater fishing access and downstream riverbank access. This area is not in accordance with Title V; it is not fully accessible to persons with limited personal mobility.

D. Adjacent Land Use: The area adjacent to this site is managed for wildlife by the Minnesota Department of Natural Resources.

E. Soils and Topography: Site topography is flat (except for the dam embankment); the river lies approximately 10 feet below ground level. The riverbanks are armored and are very steep.

Soils of the area are of the Coland-Storden-Swanlake series. These soils are formed mainly in clayey to sandy alluvial sediments (USDA NRCS).

F. Vegetation: The site has good tree cover (± 60%, ash and boxelder), with mown turf grasses.

G. Wildlife Species and Habitat Availability: There is a major Wildlife Management Area directly off site. Although the site proper is lacking in habitat, the proximity of the associated Wildlife Management Area insures plentiful species variety and availability.

H. Cultural Resources: Lac qui Parle Project fee title lands were surveyed in 1993. No cultural resources were found at this location. Lac qui Parle Dam is eligible to the National Register of Historic Places. The reconstructed Lac qui Parle Mission is on state land within ½ mile of the dam.

I. Limitations and Hazards: The major limitation of this unit is the small size of the site. The site is well used, with a variety of recreation activities available. The parking configuration tends to cause vehicle/pedestrian conflict. The entrance drive to this day use area is adjacent to (the west side of) the dam. Vehicles turning into the site cause congestion on the roadway which is 32 feet wide here. The parking congestion on peak weekends also contributes to hazardous vehicle/pedestrian situations.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational activities by the visiting public, ..."

Resource Objectives:
Provide safe public access for low to moderate levels of river-based recreation use, including fishing, picnicking, and wildlife viewing.

Provide a fully accessible site to all persons.

Rationale:
Lac qui Parle Dam West Bank Day Use Area is currently managed as a high density recreation area providing public access to the dam tailwater and the Minnesota River. Since there are few easily attainable public accesses to the river, this site is an important regional recreation resource.

Implementation Plan:
Site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

To maximize efficiency, re-examine those areas that require high levels of maintenance with a specified goal of reducing maintenance costs.

Redesign the entrances to the site parking facilities to maximize the distance from the bridge to the vehicle turning areas. This will provide safer vehicular access to each parking lot. The roadway on the bridge is in an extremely bad state of repair. To minimize costs, this redesign should be accomplished when the repairs to the roadway are done.

The trees on this site are old growth. This means that they are past their prime, in a state of decline due to age. A comprehensive planting program, supervised and designed by a landscape professional should be implemented. The possibility of volunteer assistance with this program should be investigated.

Constraints:
There have been problems with vandalism in the past. This should be a consideration in any plans for this site.

UNIT C, MARSH LAKE DAY USE AREA:

Unit Description:

A. Size and Shape: Approximately 3 acres in size; the site is rectangular (see Plate 15).

B. Location and Access: The unit lies on the south end of the lake on the east side of the river, and encompasses the property and structures immediately downstream of the dam. The site lies southwest of Appleton and can be accessed from State Highway 119 to the gravel access road, then about 3 miles following this road.

C. Existing Site Use: Public use facilities consist of a gravel parking lot of 40-50 vehicle capacity, a vault restroom, and a bulletin board. The primary use of this area is bank fishing; wildlife observation and sightseeing are also important activities.

This site does not meet the requirements of Title V: it is not accessible to all persons.

D. Adjacent Land Use: The site is surrounded by the Lac qui Parle Wildlife Management Area.

E. Soils and Topography: The land on this site, with the exception of the dam embankment, is very flat. The river lies less than 5 feet below ground level, with gently sloping banks.

Soils of the area are of the Coland-Storden-Swanlake series. These soils are formed mainly in clayey to sandy alluvial sediments (USDA NRCS).

F. Vegetation: This unit is almost exclusively short varieties of native grasses. Directly off site, wetland vegetative communities dominate.

G. Wildlife Species and Habitat Availability: Although the site proper is lacking in habitat, cover or concealment, the proximity of the associated Wildlife Management Area insures plentiful species variety and availability.

H. Cultural Resources: Lac qui Parle Project fee title lands were surveyed in 1993. No cultural resources were found at this location. Lac qui Parle Dam is eligible to the National Register of Historic Places. The reconstructed Lac qui Parle Mission is on state land within ½ mile of the dam.

I. Limitations and Hazards: The major limitation of this unit is the small size of the site; it is also a remote location. Most of the available land is used for parking, leaving little room for recreation or other considerations.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Recreation; "Land developed for intensive recreational activities by the visiting public, ..."

Resource Objectives:
Provide public shoreline access for low levels of river based recreation use such as fishing, picnicking, and wildlife observation.

To provide a fully accessible site to all persons.

Rationale:
Marsh Lake Dam recreation area is currently managed as a high density recreation area providing public access to the dam tailwater and the Minnesota River. Since there are few easily attainable public accesses to the river, this site is an important regional recreation resource.

Implementation Plan:
This unit does not meet the minimum requirements of either Section 504 of the Rehabilitation Act of 1973 as amended, or the Americans with Disabilities Act of 1990. A concerted effort should be made to provide equal services and opportunities as provided under these laws.

Site improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

A few trees on this site would be a tremendous improvement. A planting program, designed and supervised by a landscape professional, should be implemented.

Constraints:
There have been problems with vandalism in the past. This should be a consideration in any plans for this site.

UNIT D, WATSON SAG WEIR:

Unit Description:

A. Size and Shape: This unit is primarily levee, about 3 miles long.

B. Location and Access: The Chippewa Dam and low flow structure and the Watson Sag weir are located west of the office/maintenance building along County Road 13 (see Figure 5-6).

C. Existing Site Use: Local residents fish off the bridge. The 3 miles of dike are restricted to vehicles, but visitors use the area for wildlife viewing, hiking, and hunting.

D. Adjacent Land Use: This unit is surrounded by farmland.

E. Soils and Topography: The topography of the area is generally open. The "sag" is a wide, shallow valley.

Soils of the area are of the Coland-Storden-Swanlake series. These soils are formed mainly in clayey to sandy alluvial sediments (USDA SCS).

F. Vegetation: The dike area is planted with native plants to reduce maintenance costs and to enhance area habitat.

G. Wildlife Species and Habitat Availability: The rural nature of the area and the available cover and other types of favorable habitat combine to make this a very good area for wildlife. The dike provides area residents with accessible, quality wildlife oriented recreation opportunities.

H. Cultural Resources: Lac qui Parle Project fee title lands were surveyed in 1993. A surface scatter of historic bottles and fragments was found along the Watson Sag Dike. This historic archeological site is not eligible to the National Register of Historic Places. The Watson Sag Dike and the Chippewa Diversion Works and associated project features are eligible to the National Register of Historic Places as part of the WPA constructed Lac qui Parle Project.

I. Limitations and Hazards: The narrow linear shape of this unit precludes any further development.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Multiple Resource Management; "Lands managed for one or more ... activities ... compatible with the primary allocation...."

Resource Objectives:
To continue to promote wildlife species diversity by improving wildlife habitat, for the purpose of increased low density, wildlife based, recreation opportunities.

Rationale:
The proximity of this unit to large wildlife management areas affords an opportunity to provide an accessible area for wildlife related recreation at very low cost to the Corps.

Implementation Plan:
Examine inexpensive ways to attract wildlife to this unit. This could include planting additional food and cover vegetation and creating nesting opportunities. The use of volunteers to assist in this program should be investigated.

UNIT E, MINNESOTA RIVER:

Unit Description:
The Minnesota River channel between Lac qui Parle Dam and Granite Falls, Minnesota.

A. Size and Shape: 43.1 miles long and the width of the river channel.

B. Location and Access: From Lac qui Parle, the river meanders (within the river valley) in a southeasterly direction, across southwestern and south-central Minnesota. Federal responsibility extends to Granite Falls.

C. Existing Site Use: This is a portion of a State designated wild and scenic river. Aside from its obvious use as a major drainage channel, it is used extensively for fishing and hunting. Non-consumptive uses of the river include: canoeing and other boating, wildlife observation and wildlife and waterfowl management. The river is the major visual resource for this region.

D. Adjacent Land Use: Most of the land around the river is agricultural.

E. Soils and Topography: The Minnesota River lies in the valley of a much larger prehistoric river, the Glacial River Warren. The valley varies from about 1 to 3 miles wide; it is approximately 100 feet deep, with steep to gently sloping terraces.

Soils in the valley along this reach of the river are classified as belonging to the Coland-Storden-Swanlake series; soils formed mainly in sandy to clayey alluvial sediments (USDA SCS).

F. Vegetation: In the areas that are not under cultivation, the vegetation is floodplain hardwood forest or marsh (for additional information, see Appendix E, Vegetation).

G. Wildlife Species and Habitat Availability: Historically, this was a major wildlife movement corridor; it is a part of the Mississippi Flyway. Efforts today are toward protecting those areas of remaining habitat and restoring habitat in other areas. A listing of species within the region is available in Appendix C, Environmental Resources.

H. Cultural Resources: The banks of the Minnesota River, between the Lac qui Parle Dam and the City of Granite Falls, have not been systematically surveyed for cultural resources. Burial mound sites and prehistoric villages are known to exist along this stretch of the river valley and adjacent uplands. Historic sites identified for this portion of the river include several bridges, historic trails, and the Granite Falls Mill. Because of the importance of the river corridor to the Native Americans and Euro-American fur traders and settlers, there are probably many more cultural sites along the river valley than have been presently identified.

I. Limitations and Hazards: Any improvements or changes in management policies must meet current environmental standards.

Land Use Classification:
In accordance with ER 1130-2-435, this area is classified as Multiple Resource Management; "Lands managed for one or more ... activities ... compatible with the primary allocation...."

Resource Objectives:
To continue to promote wildlife species diversity by improving wildlife habitat, for the purpose of increased low density, wildlife based, recreation opportunities.

Rationale:
The Minnesota River corridor is a major recreation resource of the region. The stated Resource Objectives will add to the recreational experience.

Implementation Plan:
Improvements will be accomplished as funding and personnel become available. Because the management area is already established and deemed functional, and due to the small size of the recommended objectives, implementation will be done in the course of normal maintenance schedules.

CHAPTER 5 – PLAN OF DEVELOPMENT AND DESIGN CRITERIA

This chapter introduces the recommended development for the Lac qui Parle project. It presents a conceptual plan of physical development through the modification or expansion of existing facilities. These concepts are to be used as a guide in implementing the specific Resource Objectives and management and development concepts presented in Chapter 4. It also provides guidelines to planners and designers for facility design. This includes architectural styles, landscaping, trails, signing and other features. These concepts are referenced to a specific management unit, or units, in which the proposed development should occur. Illustrative conceptual plans for these units are provided.

GENERAL:

All developmental concepts discussed in this chapter are presented with due consideration to the Americans With Disabilities Act of 1990. All design guidelines provided here are to conform to the Uniform Federal Accessibility Standards.

Development Phases:

To promote the orderly development of the project resources, these concepts are presented in two phases: The Initial Development Phase and The Ultimate Development Phase. The priorities for these development phases are based upon projected regional needs, and expressed local desires, and on requirements for protecting project resources. Actual development schedules may vary depending on the capabilities and policies of the Corps of Engineers. Detailed cost estimates are beyond the scope of this Master Plan. All costs associated with specific developments and management actions will have to be fully evaluated and justified, according to current Corps policy, prior to initiation.

A. Initial:

This development phase is projected to occur over the next five years, 1997 - 2002. Existing facilities at the project are expected to meet visitor demand for this period. The emphasis during this period will be to replace and/or upgrade the existing project facilities so that they will continue to provide quality recreation experiences and an even distribution of use over all of the project's recreational facilities.

Special emphasis will be placed on promoting a diversity of recreational experiences that are accessible to all persons. Each site will have an accessibility inventory completed before any changes are implemented. All subsequent design and construction will prioritize elimination of accessibility deficits.

B. Ultimate:
The ultimate development phase will occur from about 1999 to 2009. Emphasis during this period will be on improving site circulation and safety. Long term development will focus on relocating site entrances, improving vehicular circulation within each site, and reducing pedestrian /vehicle conflicts.

CONCEPTUAL PLAN OF DEVELOPMENT:

East Bank Day Use Area:

A. Initial: Construct an information center. Concrete pads are to be built for the picnic tables to reduce wear on the surrounding area and improve accessibility. Initiate a planting program that will provide shade for the site and will create a visual buffer between this area and the adjacent farmland. Care shall be taken not to shade the adjacent fields (See Plate 16).

B. Ultimate: Redesign the parking lot to improve entrance and circulation; add designated parking spaces for the disabled. Investigate the need for sanitary facilities at this site; a portable accessible restroom should be provided for public health and safety reasons. Use should be monitored, and a determination can be made about providing a permanent structure.

West Bank Day Use Area:

A. Initial: Concrete pads are to be built for the picnic tables. Update information center. Replace the fence on the west side. Improve accessibility within the site in general by regrading and resurfacing the paths.

B. Ultimate: Redesign and pave the parking lot to improve entrance, circulation, and organization and add designated parking for the disabled. Upgrade the sanitary facilities by installing a sink and adding running water to the restrooms. Upgrade park and playground equipment. Upgrade the fish cleaning station and site sanitation in general by enclosing and installing a water line to the fish cleaning station. Construct a fishing access to the river that is accessible to all persons. This could be in the form of a pathway, or a fishing pier (see Plate 17).

Marsh Lake:

A. Initial: Install grab rails in the restrooms. Construct an information center.

B. Ultimate: Place granite fines to improve the walkway to the restrooms from the parking lot and reduce the slope of it to meet accessibility standards. Initiate a planting plan to establish trees and shrubs on this site to improve site aesthetics and provide shade for the users and the parking lot. Add accessible picnic facilities, benches and an accessible fishing platform.

Develop a small parking area with a turnaround on the west side of the dam. This parking lot will have a space designated for the disabled. The existing roadway may need upgrading to allow for safe public access. This would require a joint cost sharing agreement (See Plate 18).

Project Office:

A. Initial: Construct additional storage behind the compound for secure storage of equipment.

B. Ultimate: A planting program should be initiated to improve site aesthetics and provide shade for the building and parking.

Chippewa Control Structure and Watson Sag Weir:

A. Initial: Design and build an information center.

B. Ultimate: With no dedicated use areas, the site is complete.

CONCEPTUAL DESIGN CRITERIA:

The remainder of this chapter identifies general design criteria for project recreational development. This criteria should be used as a guide by planners, designers, and developers for facility design, styles, themes, and materials.

Accessibility:
Accessibility for all persons, regardless of the level of their physical abilities, shall be a basis for all facility design.

Facility Siting:
All future facilities at Lac qui Parle should be compatible with existing natural and man-made features. Detailed site analyses should be completed prior to design implementation.

Architectural:
All architectural elements shall conform to the most current design guidelines for accessibility. A consistent architectural theme and color scheme should be developed for the entire project. All future structures and modifications should be designed to be in harmony with their setting and should not be conspicuous. Where possible, natural materials and unobtrusive earthtone colors should be used. All structures should minimize construction costs, but design criteria should be adhered to. Structures should be designed for minimal maintenance and should be as vandal resistant as possible.

Parking and Parking Lots:
The conceptual development plans call for expanding and reconfiguring the existing parking lots. An adequate number of parking spaces should be provided to satisfy normal parking requirements during peak recreation periods. Visually and aesthetically, large expanses of gravel or asphalt have a negative impact on natural areas. This impact can be softened or even eliminated with careful landscaping; wherever possible, the parking areas should be accented with shaded "islands" and edges. Parking lots should offer obvious, unrestricted traffic patterns with no dead ends. Because of the high speed access roads, entrances should have maximum available sight distances.

Trails:
Because almost all of the Federally owned property is marsh and wetland and the region and the immediate area are rural, there are no plans for any trails at this time. Should public response indicate that a trail is desirable, and if a qualified sponsor is available, a multi-purpose trail should be designed and constructed.

Landscaping:
Areas requiring site work should be landscaped upon completion of the work. Other areas disturbed through construction or other management activities should be landscaped. Landscaping should always be considered as the final stage of the activity.

1. General:
All planting described within this report, and all subsequent planting, should be coordinated between the field and the District Office. Utilizing the appropriate disciplines (landscape architects, foresters, botanists, resource managers, etc.) will ensure appropriate species selection and maximize the design potential of the planting.

The Lac qui Parle Operational Management Plan will provide detailed instructions for planting and maintaining native plant species. Native plant communities and individual plant species for the area are listed in the Appendices. In accordance with Corps policy, native plants should be used wherever possible.

2. Landscape Plantings:
Landscape plantings for the Lac qui Parle project should attempt to emphasize natural plant communities. Native plant materials should be used to maintain the character of the surrounding natural landscape. Straight rows and lines should be avoided. Loose, informal groupings of native trees and shrubs should be used to screen, emphasize, frame or shade.

Dutch elm disease and oak wilt have claimed many trees in the past few years, and these losses will continue. Diseased trees on Corps property should continue to be removed and properly disposed of as part of the ongoing maintenance program. Trees that are removed should be replaced with native species that provide the same values as those trees that are lost.

Utilities:
The existing utility systems on the project are adequate to meet current and projected facility requirements.

Signage and Other Informational Devices:
Project signage should communicate information effectively, and should complement, whenever possible, the surrounding environment. Project signs must be designed in accordance with the criteria prescribed in the Corps of Engineers Sign Standards Manual (EP 310-1-6a).

1. **Special Considerations:**

A. The consistency of overall signage within the project.

B. Entrance sign visibility. Entrance signs should stand alone and apart from other signage. They should not compete for visitor attention.

C. The resistance of sign material to vandalism and weathering.

D. Maintenance and removal procedures. The maintenance, removal, rehabilitation, and replacement of signs should be accomplished as quickly as possible.

2. **Information Requirements:**

Signs communicate information to project visitors and should he placed so that they are obvious to the uninitiated. Signs are required at/for:

- Park entries.
- Park recreation facilities:
  - parking areas
  - picnic areas
  - boat moorage/docks/launching facilities
  - comfort stations/shower and dressing rooms
  - sewage and trash disposal areas
  - campgrounds
  - swimming beaches
  - interpretive centers
- Other project facilities:
  - operations and maintenance compounds
  - visitor information
  - telephones
  - first aid stations/information

fire fighting equipment
water safety equipment

- Other activity areas:
  hunting areas/safety zones
  fishing areas
  viewpoints/overlooks
  trails

- Regulations:
  boating
  hunting/trapping
  fishing
  Title 36, C.F.R.

- Restricted activities or objects:
  off road vehicles/snowmobiles
  horses
  hunting/trapping
  fires
  access
  firearms

- Personal or situational hazards:
  swimming/diving/wading
    - undertow/dangerous currents
    - hidden obstructions
    - deep water drop-off
  thin ice
  dangerous slopes and areas
  automobile traffic

- Ecological warnings:
  Eurasian milfoil
  zebra mussel
  purple loosestrife
  bait restrictions

3. Recreation and Project Area Signage:

On all project and recreation unit entrance signs: **"Lac qui Parle"** should dominate the sign, with the park or unit name, and the administering agency, plainly visible but clearly subservient to the project name. Each entry sign should be preceded by a warning sign, 1,000 feet distant, that informs motorists they are approaching a Federal recreation area.

4. Site Information Centers:

Each developed recreation site should include an informational kiosk or, at a minimum, a bulletin board. These information centers should include: a map and descriptive legend of the Lac qui Parle project, showing the relative location of project areas and facilities and the location of telephones and primary first aid facilities, a list of park rules and regulations, and an area for posting notices and other information.

The design of these information centers should be standardized for the project. They should be designed in such a manner that they can be prefabricated at the project and assembled on each site. They should be constructed so that they resist vandalism and weathering and are easily repairable.

5. Directional and Informational Signing:

Whenever possible, directional and informational signing should incorporate the Federally accepted graphic symbols for signs. They should be used on signage systems for both traffic control and recreation. Care should be taken so that all project signs are located so that they are plainly visible from an adequate distance and in such a manner as to avoid confusion or doubt in the mind of the first-time visitor.

Picnic Units:

Picnic units should be sparsely clustered witb an average minimum spacing of 44 feet. This wide interval will reduce the usage impact on the immediate area (grass and other vegetation, soil compaction, etc.) and will result in less social conflict. Tables should be sited, whenever possible with a view of an area of interest. This is usually a view that includes a water feature, but may simply be an unobstructed view of the playground. Tables should be easily accessible, whenever possible, and should have a trash receptacle nearby. Each area shall have sites that are accessible to persons of limited physical mobility, and all tables should be usable by disabled persons.

Camping:

There are no camping sites at the Lac qui Parle project. Due to the unavailability of suitable areas for camping, none are planned at this time.

CHAPTER 6 – PROBLEMS AND CONSTRAINTS

PROBLEMS:

Water Quality:

The Minnesota River has been recognized by the Minnesota Pollution Control Agency (MPCA) as being one of the most polluted rivers in the State of Minnesota. As early as 1975 (the Minnesota Pollution Control Agency Water Quality Managment Basin Plan, Volume 2, June 1975), fecal coliform and turbidity levels were problems in Big Stone Lake, the headwaters of the river. More recently, agricultural land uses and other land management practices have been identified as major sources of pollution. Downriver, water quality decreases to the point that the last 25 miles of the river are frequently in violation of current Federal water quality standards. As of 1992, the MPCA identified the river as a major source of pollution to the Mississippi River.

Water quality studies such as the Minnesota River Assessment Project (MRAP) are in progress, attempting to identify ways to improve water quality over the entire river basin. Poor water quality due to non-point source pollution is the major issue. Associated concerns about threatened species, resources and recreation potential are all dependent, in some degree, on water quality.

Macroinvertebrate assessments early in the MRAP study indicate that Lac qui Parle and the Chippewa River are some of the most severely affected areas in the investigation (Understanding the Minnesota River Assessment Project, Minnesota Department of Natural Resources, undated).

Lac qui Parle has a history of winter fish-kill due to oxygen depletion. Winter dissolved oxygen conditions may at times be influenced by inflow from Marsh Lake. The lake also experiences nuisance blue-green algae blooms due to excessive tributary and internal nutrient flux. High turbidity limits the growth of desirable submerged vegetation. These turbid conditions are the result of carp activity, wind resuspension of sediments, and inflow conditions (that are also determined largely by the operational procedures and other conditions of Marsh Lake; see Chapter 2, Resource and Influencing Factors, Water Resources, Marsh Lake). All of these are the result of poor water quality, and all of these water quality related problems stress the lake fishery – lowering sport fish populations – with an end result of reduced fishing success. As the fishery of the lakes are noted as an important contributer to the area economy, it would seem to follow that a less productive fishery would eventually affect the local economy.

Vandalism:

Problems at this project, as with all of the projects in this master plan, are mainly centered around vandalism. The remote location of the site and the lack of on-site personnel combine to provide the ideal environment for the casual vandal. Under these condition, "vandal-proof" is not an attainable objective. Gates are torn down using four-wheel drive trucks; signage and other

facilities are riddled by gunshot; graffito done at will. Repairing damaged facilities and structures is a large portion of the project operating budget.

CONSTRAINTS:

The major constraint for recreation development at the Lac qui Parle project is directly related to the remote location of the project. All population concentrations of consequence are a considerable distance to the east. This means that sponsors able to afford a significant cost-sharing responsibility are few. In addition, innumerable recreation opportunities are situated closer to these heavily populated areas than the Lac qui Parle project. Most of these "competing" recreation sources also tend to offer a greater variety of recreation types and a considerable array of amenities. While this situation tends to act as a constraint on recreation development, due to the paucity of developed recreational opportunities in the immediate area, it also makes the limited facilities at the project more valuable to the local populace.

CHAPTER 7 – SUMMARY OF SIGNIFICANT FINDINGS AND RECOMMENDATIONS :

SUMMARY OF SIGNIFICANT FINDINGS:

Within the constraints of operating the Lac qui Parle project for its primary authorized project purpose of flood control, the Federally administered land and water areas of the lake can also be managed to help fill other regional resource needs. An examination of Corps administration policies at the Lac qui Parle project indicates that the current allocation of these lands is providing protection of the resource and accommodating the recreational needs of the public. With some slight modification, the existing recreational development will support the current and projected use.

Since the completion of this project, there has been a steady growth in different types of low density recreation; i.e.; hiking, biking, wildlife observation, etc. The 1990 Minnesota State Comprehensive Outdoor Recreation Plan identifies the need for additional low density recreation facilities. This project supplies some of these needs. At present, the project provides opportunities for hunting, fishing, picnicking, and other day-use activities.

RECOMMENDATIONS:

The existing facilities should be modified to meet existing regulations for handicapped accessibility, and to provide for increased visitor safety and facilitate ease of operation. The present management policies should continue, and efforts should continue to be made to protect the recreational resources of the project.

Regional Aspects

Western District Flood Control Projects Master Plan

Technical Appendices

June 1997

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Technical Appendices

Appendix A – Tabular Data of Western District Projects

Appendix B – Recreation Resources

Appendix C – Environmental Resources

Appendix D – Visual Resources

Technical Appendices

Appendix A – Tabular Data

LAKE TRAVERSE:

Mud Lake and White Rock Dam:

Table A-1
PROJECT: Lake Traverse
FACILITY: Mud Lake and White Rock Dam

RESERVOIR	
Flowage rights	to elevation 983.0 NGVD**
Water surface elevation at full pool	981.0 NGVD
Water surface elevation at maximum pool	982.0 NGVD
Capacity at full pool (981.0)	85,000 acre-feet
Capacity at maximum pool (982.0)	95,500 acre-feet
Capacity at conservation pool (972.0)	3,850 acres
Reservoir area at full pool (981.0)	10,550 acres
Reservoir area at maximum pool (982.0)	10,725 acres

Table A-1
PROJECT: Lake Traverse
FACILITY: Mud Lake and White Rock Dam

Reservoir area at maximum pool (982.0)	10,725 acres
Reservoir length at conservation pool	7.5 miles
Maximum reservoir width at conservation pool	2.5 miles
DAM	
Type	Rolled earth fill
Crest elevation	980.0 NGVD
Total length of earth embankment	14,400 feet
Top width (roadway)	26 feet
Maximum height	16 feet
Freeboard above spillway design flood height	4.0 feet
Total volume of earth dam	329,200 cubic yards
SPILLWAY	
Type	Gated concrete sill
Crest Elevation	965.0 NGVD
Elevation top of tainter gates (closed)	981.0 NGVD
Design discharge	5,600 cubic feet per second (cfs)
STILLING BASIN	
Type	Concrete apron with dentated sill
Length	34.07 feet
Maximum width at end sill	47 feet
Elevation of still basin floor	960.0 NGVD

** All elevations are in feet, National Geodetic Vertical Datum (NGVD).

Lake Traverse and Reservation Dam:

Table A-2
PROJECT: Lake Traverse
FACILITY: Lake Traverse and Reservation Dam

RESERVOIR

Flowage rights	to elevation 983.0 NGVD
Water-surface elevation at full pool	981.0 NGVD
Water-surface elevation at design flood	982.0 NGVD
Capacity at full pool (981.0)	164,500 acre-feet
Capacity at maximum pool (982.0)	177,500 acre-feet
Capacity at conservation pool (976.0)	106,000 acre-feet
Reservoir area at conservation pool (976.0)	10,925 acres
Reservoir area at full pool (981.0)	12,425 acres
Reservoir area at maximum pool (982.0)	12,700 acres
Maximum reservoir width at conservation pool	1 ¾ miles
Average depth	13.2 feet

DAM

Type	Rolled earth fill
Crest elevation	980.0 NGVD
Total length of earth embankment (spillway)	9,100 feet
Top width (roadway)	26 feet
Maximum height	14.5 feet
Total volume of earth dam	188,000 cubic yards

Table A-2

PROJECT: Lake Traverse

FACILITY: Lake Traverse and Reservation Dam

SPILLWAY

Type	Grouted riprap weir
Crest elevation	974.0 NGVD
Net length of spillway crest	101.5 feet
Number of stop log sections	17
Width of sections (clear opening)	15 sections - 6 by 2 feet; 2 sections - 5.75 by 2 feet
Elevation top of stop logs	976.0 feet NGVD
Maximum discharge (design flood)	5,600 cfs
Elevation of walkway over spillway	981.0 feet NGVD

OUTLET CONDUITS

Size and length (plugged with removeable plugs)	Two 24-inch by 14-foot
Invert elevation (intake and outfall)	970.0 NGVD
Discharge capacity with pool at conservation level	80 cfs total
Control (inoperative)	Two Calco slide gates

STILLING BASIN

Type	Grouted derrick stone
Length	27.5 feet
Maximum width at end section	150 feet

Browns Valley Dike and Culvert:

Table A-3
PROJECT: Lake Traverse
FACILITY: Browns Valley Dike and Culvert

DIKE

Type	Rolled earth fill
Crest elevation (earth dike section)	987.0 NGVD
Crest elevation (culvert section)	± 986.5 NGVD
Total length of earth embankment	3,700 feet
Top width	10.0 feet
Freeboard above spillway design flood	5.0 feet
Total volume earth dike	approximately 93,000 cubic yards

CULVERT

Type	Concrete bay
Size	Three 6- by 9-foot openings
Length	68.75 feet
Invert elevation (reservoir side)	971.0 NGVD
Invert elevation (Little Minnesota River side)	974.0 NGVD

LAKE ORWELL

Pool and Dam:

Table A-4
PROJECT: Lake Orwell
FACILITY: Lake Orwell and Orwell Dam

DAM

Type	Rolled earth fill
Crest elevation	1080.0 NGVD
Maximum height	47 feet
Top width	20 feet
Length of earth fill	1,355 feet
Embankment side slopes	1 on 3
Total volume of earth fill	168,165 cubic yards
Freeboard above maximum elevation of spillway design flood	5.0 feet

RESERVOIR

Pool elevation at spillway design flood	1075.0 NGVD
Capacity at spillway design flood elevation	14,100 acre feet
Normal full pool elevation	1064.0 NGVD
Capacity at normal full pool	8,600 acre feet
Reservoir area at normal full pool	990 acres
Normal low pool elevation	1048.0 NGVD
Capacity at normal low pool	1,000 acre feet
Reservoir area at normal low pool	210 acres
Fee title to elevation	± 1073 NGVD
Effective storage capacity	11,000 acre feet
Reservoir length at normal full pool	4.0 miles
Reservoir maximum width at normal full pool	1.0 miles

Table A-4

PROJECT: Lake Orwell

FACILITY: Lake Orwell and Orwell Dam

DIKES

Number	2
Crest elevation	1080.0 NGVD
Maximum height	10 feet
Total length	1,140 feet
Total volume of earth fill	9,520 cubic yards

SPILLWAY

Type	Gated ogee and chute
Crest elevation	1044.0 NGVD
Length of spillway crest	33 feet
Elevation top of Tainter gate (closed)	1071.5 NGVD
Design discharge (surcharge 5 feet)	20,400 second feet
Volume of concrete in structure	9,310 cubic yards

LOW WATER CONTROL OUTLET WORKS

Size	2-foot inside diameter
Number	2
Invert elevation	1040.0 NGVD
Discharge capacity (total for both gates) at normal full pool (1070.0)	150 second-feet
Gates	2-hand operated 24-inch AWWA M&H iron body double disc gate valves

Table A-4
PROJECT: Lake Orwell
FACILITY: Lake Orwell and Orwell Dam

STILLING BASIN

Type	Flared
Length	72 feet
Floor elevation	1024.5 NGVD
Elevation of end sill	1032.5 NGVD
Maximum width at end sill	78.5 feet

BIG STONE LAKE - WHETSTONE RIVER

Reservoir and Highway 75 Dam:

Table A-5
PROJECT: Big Stone Lake, Whetstone River
FACILITY: Highway 75 Dam

OUTLET CONTROL STRUCTURE

Top of control structure, abutments elevation	942.7 NGVD
Spillway crest elevation	960.7 NGVD
Conservation pool elevation	964.7 NGVD
Slide gates	8
Size of gates	10 feet-10 inches x 7 feet
Low-flow gated openings	4' x 4' slide gate
Drainage area above damsite	1,160 square miles
Maximum flood (1952), discharge	3,060 cfs
Maximum pool stage (1952) elevation	970.42 NGVD
Top of earth embankment elevation	972.7 to 975.0 NGVD

SILT BARRIER

Type	Steel sheet piling
Length of spillway section	200 feet
Crest elevation of spillway section	964.7 NGVD
Low flow control	Slide gated 18" diameter CMP

Table A-5
PROJECT: Big Stone Lake, Whetstone River
FACILITY: Highway 75 Dam

DEBRIS BARRIER

Type	Steel pilings and wood on floating boom ...

REAL ESTATE

Taking line elevation	959.5 NGVD
Fee acquisition land	10,794.63 acres
Cost	$2,110,314.50
Easement land	104.84 acres
Cost	$4,750.00

LAC QUI PARLE:

Marsh Lake, Pool and Dam:

Table A-6
PROJECT: Lac qui Parle
FACILITY: Marsh Lake and Marsh Lake Dam

GENERAL

River	Minnesota
Dam at river mile	303.5
Drainage area	2,800 square miles
Maximum pool elevation and date (since constr.)	943.78 feet NGVD, 14 April 1952
Conservation pool elevation	937.6 feet NGVD

Table A-6

PROJECT: Lac qui Parle

FACILITY: Marsh Lake and Marsh Lake Dam

Full pool elevation	941.1feet NGVD
Number of times full pool exceeded	4
Capacity at conservation pool	12,050 acre-feet
Capacity at full pool	35,000 acre-feet
Elevation of gage zero's (m.s.l. 1929 Adj.)	900.00

Dam

Type	Rolled earth fill
Length	11,800 feet
Top elevation (varies)	948.6 to 952.6 NGVD
Maximum height	19.5 feet
Top width	10.0 feet

CONTROL STRUCTURE

Type	Concrete gravity overflow
Length	112 feet
Crest elevation	937.6
Low water control	Concrete conduit
Size	2 x 2 feet square
Length	17 feet
Control	2 x 2 feet vertical lift gate
Sill elevation	932.6 NGVD
Stilling basin	Bucket type
Bottom elevation	924.6 NGVD

Table A-6
PROJECT: Lac qui Parle
FACILITY: Marsh Lake and Marsh Lake Dam

EMERGENCY SPILLWAY

Type	Earth fill - grouted riprap
Length	90 feet
Crest elevation	940.0 NGVD

Chippewa Diversion Structure:

Table A-7
PROJECT: Lac qui Parle
FACILITY: Chippewa Diversion Structure

GENERAL

River	Chippewa
Dam at river mile	11.3
Drainage area	2,050 square miles
Maximum pool elevation and date (since constr.)	946.10 NGVD, 9 April 1952
Maximum discharge (approximate)	3,840 sec. feet
Maximum flow diverted into Lac qui Parle (approx.)	3,100 sec. feet
Elevation of gage zero's (m.s.l. 1929 Adj.)	900.00 NGVD

Table A-7

PROJECT: Lac qui Parle

FACILITY: Chippewa Diversion Structure

DAM

Type	Rolled earth fill
Total length (includes dam and all dikes)	17,975 feet
Top elevation	950.3 NGVD
Maximum height	23.3 feet
Top width	32.0 feet

CONTROL STRUCTURE

Type	Concrete, modified ogee
Length between abutments	147 feet
Number of bays	5
Length of each bay	27 feet
Fixed crest elevation (bays 1, 2, 4 and 5)	942.3 NGVD
Tainter gate (bay 3)	.....27.0 feet - Operation by fixed electrical gate lifter
Gate sill elevation	932.8 NGVD
Elevation top of gate (closed)	942.3 NGVD
Stilling basin elevation (bays 1, 2, 4 and 5)	934.3 NGVD
Stilling basin elevation (bay 3)	932.0 NGVD

BRIDGE OVER CONTROL STRUCTURE

Roadway elevation	950.55 NGVD
Roadway width	23.0 feet
Elevation top of abutments	950.3 NGVD

Table A-7
PROJECT: Lac qui Parle
FACILITY: Chippewa Diversion Structure

Elevation top of curb	950.8 NGVD
Elevation low concrete	947.8 NGVD

LOW WATER CONTROL STRUCTURE

Type	Concrete conduit
Size	4 x 4 feet
Length	90.4 feet
Entrance invert	933.3 NGVD
Exit invert	932.8 NGVD
Gate (vertical slide)	4 x 4 feet

DIVERSION CHANNEL

Length	3,500 feet
Bottom width	160 feet
Bottom elevation	934.3 NGVD
Side slopes	1 on 3

DIKES

Location (left or south bank)	Diversion channel
Type	Rolled earth fill
Top elevation (varies)	946.3 - 947.8
Top width	10.0 feet
Side slope (channel side)	1 on 3
Side slope (land side)	1 on 4

Table A-7

PROJECT: Lac qui Parle

FACILITY: Chippewa Diversion Structure

WEIR

Type	Concrete. Modified ogee
Length between abutments	177.0 feet
Number of bays	6
Length of bays	27.0 feet
Fixed crest elevation	938.8 NGVD
Stilling basin elevation	932.3 NGVD
Elevation of gage zero (m.s.l. 1929 Adj.)	900.00 NGVD

BRIDGE OVER WEIR

Roadway elevation	950.00 NGVD
Roadway width	23.0 feet
Elevation top of abutments	949.8
Elevation top of curb	950.25 NGVD
Elevation low concrete	947.25 NGVD

Lac qui Parle, Pool and Dam:

Table A-8

PROJECT: Lac qui Parle

FACILITY: Lac qui Parle and Lac qui Parle Dam

GENERAL

River	Minnesota
Dam at river mile	288.1
Drainage area (excluding Chippewa River)	4,050 square miles
Drainage area (including Chippewa River)	6,100 square miles
Maximum pool elevation and date (since constr.)	941.95, 10 April 1952
Number of times full pool elevation exceeded	2
Maximum discharge of record and year	19,700 cfs, 1952
Elevation of gage zero's (m.s.l. 1929 Adj.)	900.00
Year of first operation (State of Minnesota)	1939
Operation by Corps of Engineers began	8 September 1950
Conservation pool elevation	931.2 NGVD
Full pool elevation	941.1 NGVD
Capacity at conservation pool	29,700 acre-feet
Capacity at full pool	122,800 acre-feet

DAM

Type	Rolled earth fill
Crest elevation	946.0 NGVD
Length (includes emergency spillway section)	4,100(±) feet
Freeboard above full pool	4.9 feet
Upstream slope	1 on 3
Downstream slope	1 on 4

Table A-8

PROJECT: Lac qui Parle

FACILITY: Lac qui Parle and Lac qui Parle Dam

CONTROL STRUCTURE

Type	Concrete
Length between abutments	237.0 feet
Elevation top of abutments	946.7 NGVD
Elevation top of piers	944.28 NGVD

SLUICEWAYS

Number of bays	12
Bays 8-12 incl.	Steel bulkheads
Number bulkhead sections	15
Sill elevation	934.2 NGVD
Elevation top of bulkheads (closed)	940.7 NGVD
Bulkhead size	5.5 x 6.5 feet
Bays 5-7 incl.	Uncontrolled
Crest elevation	934.2 NGVD
Length (each)	17 feet
Bays 1, 3 and 4	Lift gates operated by fixed electrical gate lifters or by hand
Number gates	6
Size	6 x 8 feet
Sill elevation	922.7 NGVD
Bay 2 (low water control)	Lift gate operated by fixed electrical gate lifter or by hand.
Number gates	3

Table A-8

PROJECT: Lac qui Parle

FACILITY: Lac qui Parle and Lac qui Parle Dam

Size	4 x 4 feet
Sill elevation	915.2 NGVD

STILLING BASIN

Type	Concrete
Length (varies)	42 to 60 feet
Width	237 feet
Bays 8-12 incl.	923.2 NGVD
Bays 5-7 incl.	918.7 NGVD
Bays 1-4 incl.	914.2 NGVD
Elevation of gate zero's (m.s.l. 1929 Adj.)	900.00 NGVD

BRIDGE OVER CONTROL STRUCTURE

Elevation of roadway (crown)	946.2 NGVD
Elevation of walkway	946.7 NGVD
Roadway width	23 feet

EMERGENCY SPILLWAY

Type	Earth fill with concrete core wall and bituminous surfaced roadway
Length	2,500 feet
Crest elevation	± 941.1 NGVD
Roadway width	23.0 feet
Upstream embankment slope	1 on 3
Downstream (grouted riprap)	1 on 2

APPENDIX B – RECREATION RESOURCES

REGIONAL INFORMATION:

Population:

Table B-1
REGIONAL POPULATION INFORMATION

COUNTY	1980 POPULATION	1990 POPULATION	PERCENT OF CHANGE
Becker	29,336	27,881	-5.0
Big Stone	7,716	6,285	-18.5
Chippewa	14,971	13,228	-11.5
Clay	49,327	50,422	-2.2
Douglas	27,839	28,674	+3.0
Grant	7,171	6,246	-12.9
Kandiyohi	36,763	38,761	+5.4
Lac qui Parle	10,592	8,924	-15.7
Lincoln	8,207	6,890	-16.0
Lyon	25,207	24,789	-1.7
Ottertail	51,987	50,714	-2.4
Pope	11,657	10,745	-7.8
Redwood	19,341	17,254	-10.8
Renville	20,401	17,673	-13.4
Stevens	11,322	10,634	-6.1
Swift	12,920	10,724	-17.0
Traverse	5,542	4,463	-19.5
Wilkin	8,454	7,516	-11.1
Yellow Medicine	13,653	11,684	-14.4
*Richland (ND)	19,207	18,148	-7.1

Table B-1

REGIONAL POPULATION INFORMATION

COUNTY	1980 POPULATION	1990 POPULATION	PERCENT OF CHANGE
*Grant (SD)	9,013	8,372	-7.1
*Roberts (SD)	10,911	9,914	-9.1
Study Area Totals	411,537	389,941	-5.2
Minnesota State	4,075,970	4,375,099	+6.84

Age and Income:

Table B-2

REGIONAL AGE AND INCOME INFORMATION

COUNTY	MEDIAN AGE			MEDIAN HOUSEHOLD INCOME		PERCENT INCREASE
	1980	1990	CHANGE	1980 – adjusted	1989	
Becker	30.0	35.0	+5.0	15,080 – 20,993	24,994	19.1
Big Stone	36.6	40.4	+3.8	12,318 – 17,148	23,893	39.3
Chippewa	32.8	37.4	+4.6	13,369 – 18,611	27,361	47.0
Clay	25.2	28.9	+3.7	20,139 – 28,036	32,983	17.6
Douglas	31.0	35.2	+4.2	15,900 – 22,134	26,886	21.5
Grant	37.8	40.7	+1.9	12,034 – 16,753	24,616	46.9
Kandiyohi	29.4	33.0	+3.6	17,352 – 24,156	30,629	26.8
Lac qui Parle	35.5	39.4	+3.9	12,676 – 17,646	25,987	47.3
Lincoln	35.5	41.4	+5.9	12,465 – 17,353	26,805	54.5
Lyon	27.8	31.6	+3.8	17,788 – 24,763	30,582	32.5
Ottertail	34.0	37.3	+3.3	12,575 – 17,506	26,805	53.1
Pope	35.1	38.5	+3.4	14,424 – 20,080	24,177	20.4
Redwood	32.7	36.7	+4.0	16,351 – 22,762	27,182	19.4
Renville	32.5	36.7	+4.2	17,198 – 23,941	28,109	17.4
Stevens	27.7	30.5	+2.8	12,552 – 17,474	29,345	67.9

Table B-2

REGIONAL AGE AND INCOME INFORMATION

COUNTY	MEDIAN AGE 1980	1990	CHANGE	MEDIAN HOUSEHOLD INCOME 1980 – adjusted	1989	PERCENT INCREASE
Swift	32.8	37.9	+5.1	11,899 – 16,565	24,434	47.5
Traverse	37.8	41.3	+3.5	12,135 – 16,894	24,830	47.0
Wilkin	30.6	34.5	+3.9	15,463 – 21,527	28,726	33.4
Yellow Medicine	33.3	37.6	+4.3	15,430 – 21,481	27,079	26.1
Richland (ND)	26.9	32.4	+5.5	15,589 – 21,702	24,248	11.7
Grant (SD)	31.2	34.9	+3.7	12,613 – 17,559	23,431	33.4
Roberts (SD)	32.0	35.5	+3.5	10,302 – 14,342	17,480	21.9
Study Area	32.0	35.5	+3.5	14,437 – 18,953	26,390	39.2
Minnesota State	29.2	32.5	+3.3	21,185 – 29,492	36,916	25.2

Recreation Facilities:

Table B-3

REGIONAL RECREATION FACILITIES

RECREATION FACILITIES

1. BOATING	5. CANOEING	9. INTERPRETATION	13. SNOWMOBILING
2. BIKING	6. FISHING	10. PICNICKING	14. SNOWSHOEING
3. CAMPING(primitive)	7. HIKING	11. SAILING	15. SWIMMING
4. CAMPING/(spaces)	8. EQUESTRIAN	12. SKI TOURING	16. WATER SKIING

COUNTY	FACILITY I.D.	ACREAGE	NAME	RECREATION FACILITIES PROVIDED
Becker		205	Chilton County Park	6, 10, 15
		55	Dunton County Park	6, 10
Big Stone		1,118	Big Stone Lake State Park	1, 3, 4/(42), 6, 10, 15

Table B-3

REGIONAL RECREATION FACILITIES

RECREATION FACILITIES

1. BOATING	5. CANOEING	9. INTERPRETATION	13. SNOWMOBILING
2. BIKING	6. FISHING	10. PICNICKING	14. SNOWSHOEING
3. CAMPING(primitive)	7. HIKING	11. SAILING	15. SWIMMING
4. CAMPING/(spaces)	8. EQUESTRIAN	12. SKI TOURING	16. WATER SKIING

COUNTY	FACILITY I.D.	ACREAGE	NAME	RECREATION FACILITIES PROVIDED
		1	Sam Brown State Wayside Park	6
Chippewa		13	Chippewa County Park #1	4, 10
Clay		1,240	Buffalo River State Park	4/(44), 6, 7, 10, 12,15
Douglas		45	Chippewa County Park	10
		5.8	Lake Brophy County Park	10
		1,172	Lake Carlos State Park	4/(125), 6, 7, 8, 10, 13, 12, 15
		180	Runestone County Park	7,10
		6.1	Three Havens County Park	10
		95	Spruce Hill Park	10, 12
Grant				
Hubbard		25	Heartland County Park	6,10
Kandiyohi		15	Kandiyohi County Park	1, 4/(60), 10, 15
		2,142	Sibley State Park	1, 4/(138), 6, 8, 10, 15
Lac qui Parle		234	Dawson County Park	4

Table B-3

REGIONAL RECREATION FACILITIES

RECREATION FACILITIES

1. BOATING	5. CANOEING	9. INTERPRETATION	13. SNOWMOBILING
2. BIKING	6. FISHING	10. PICNICKING	14. SNOWSHOEING
3. CAMPING(primitive)	7. HIKING	11. SAILING	15. SWIMMING
4. CAMPING/(spaces)	8. EQUESTRIAN	12. SKI TOURING	16. WATER SKIING

COUNTY	FACILITY I.D.	ACREAGE	NAME	RECREATION FACILITIES PROVIDED
		751	Lac qui Parle State Park	1, 4/(56), 6, 10, 15
Lincoln				
Lyon				
Ottertail		7,176	Maplewood State Park	4/(61), 5, 6, 7, 8, 10, 12, 13, 15
		2,650	Glendalough State Park	Undeveloped
		82	Inspiration Peak State Wayside	10
Pope		1,452	Glacial Lakes State Park	4/(39), 5, 6, 7, 8, 10, 12, 13
Redwood				
Renville				
Stevens				
Swift		101	Appleton County Park	4, 6, 10, 15
		23	Swift Falls County Park	1, 4, 10

Table B-3

REGIONAL RECREATION FACILITIES

RECREATION FACILITIES

1. BOATING	5. CANOEING	9. INTERPRETATION	13. SNOWMOBILING
2. BIKING	6. FISHING	10. PICNICKING	14. SNOWSHOEING
3. CAMPING(primitive)	7. HIKING	11. SAILING	15. SWIMMING
4. CAMPING/(spaces)	8. EQUESTRIAN	12. SKI TOURING	16. WATER SKIING

COUNTY	FACILITY I.D.	ACREAGE	NAME	RECREATION FACILITIES PROVIDED
		186	Monson Lake State Park	1, 4/(20), 6, 10
Traverse		17	Traverse County Park	4/(N/A), 6, 10
Wilkin				
Yellow Medicine				
Richland (ND)				
Roberts (SD)				
Grant (SD)				

VISITOR ATTENDANCE:

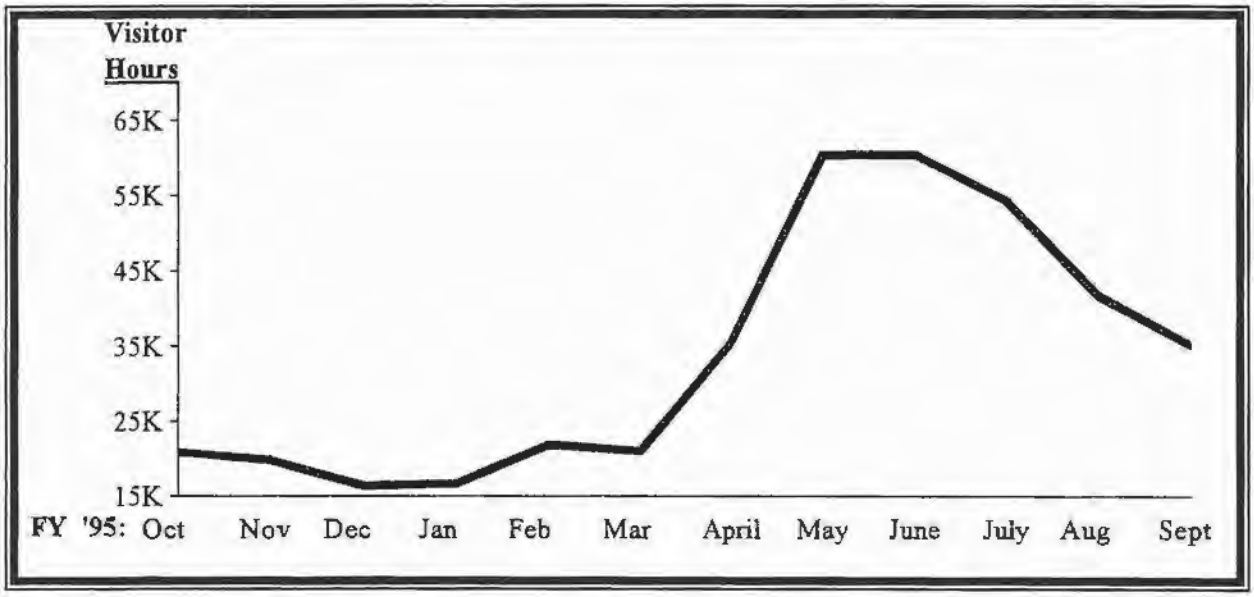
Lake Traverse:

Table B-4
LAKE TRAVERSE VISITATION: TABULAR LISTING AND COMPARISON

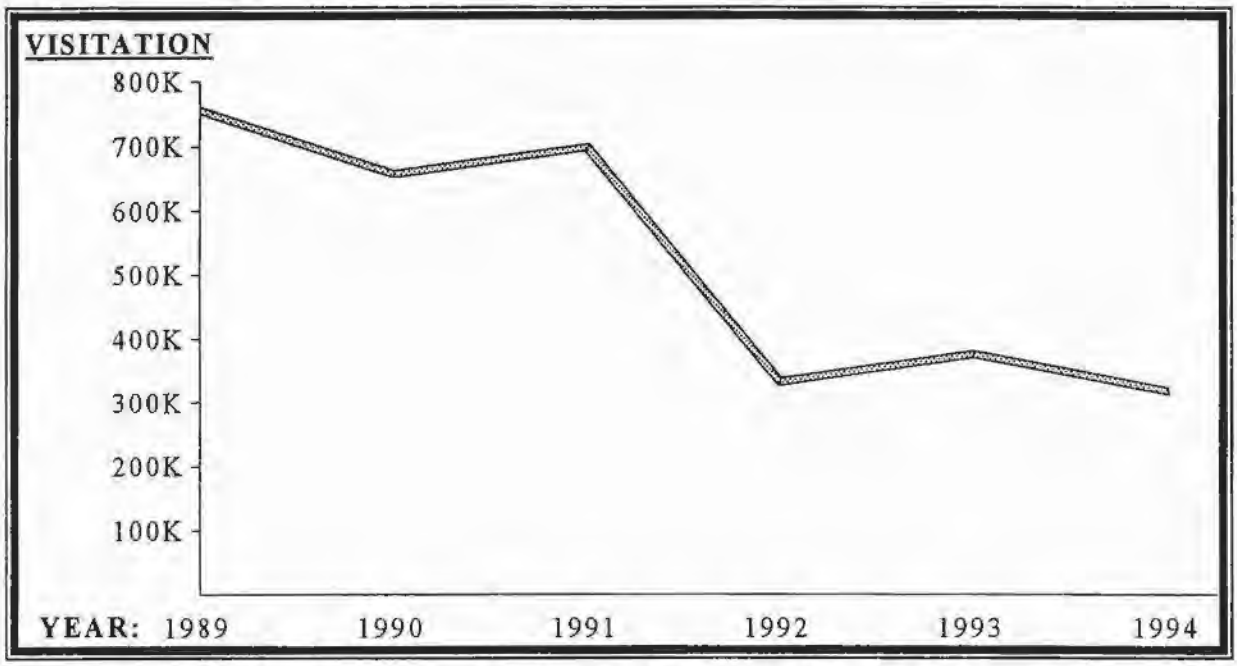
FISCAL YEAR	VISITATION HOURS	CHANGE FROM PREVIOUS YEAR	PERCENT OF CHANGE
1988:	767,800	–	–
1989:	755,600	-12,200	-2%
1990:	657,100	-98,500	-13%
1991:	698,000	40,900	+6%
1992:	331,600	-336,400	-53%
1993:	375,900	44,300	13%
1994:	317,104	-58,796	-16%
*1995:	404,200	Not Applicable (N/A)	N/A
7-year average visitation = 557,500 Visitor Hours annually			

* Dispersed Use Method, i.e., counting total users of the lake rather than users of Corps facilities only.

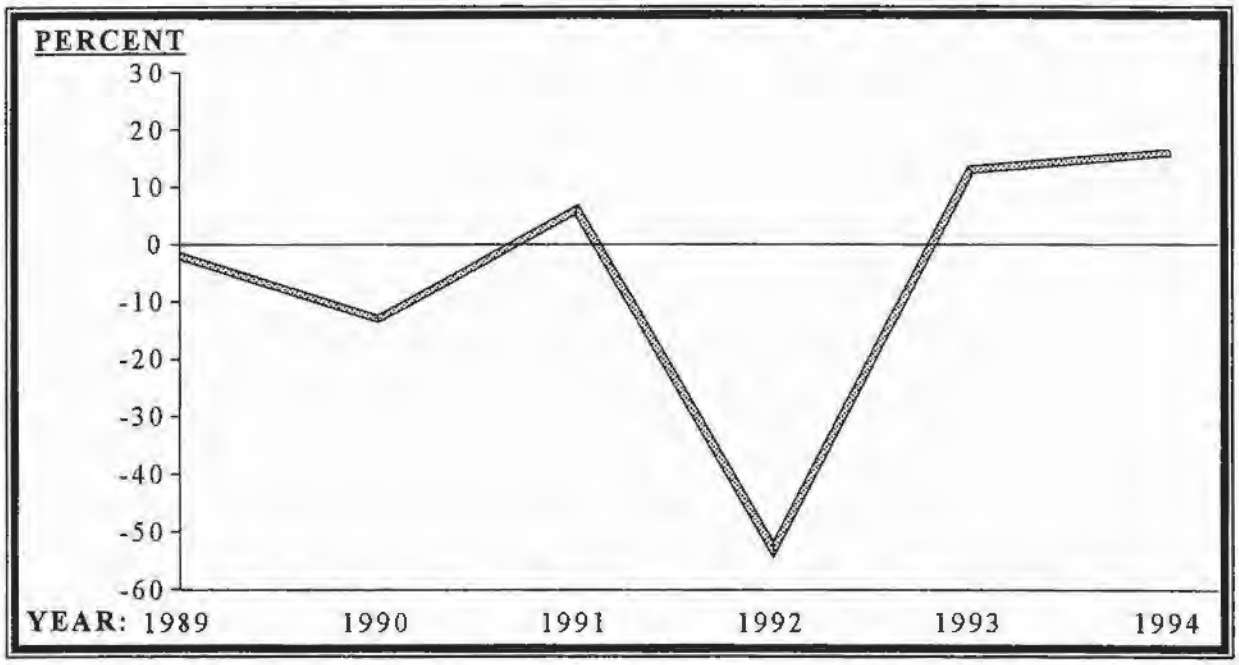
(a) Typical Annual Visitation Pattern for Lake Traverse



(b) Lake Traverse, Graph of Visitation



(c) Lake Traverse, Visitation Rate of Change



Lake Orwell:

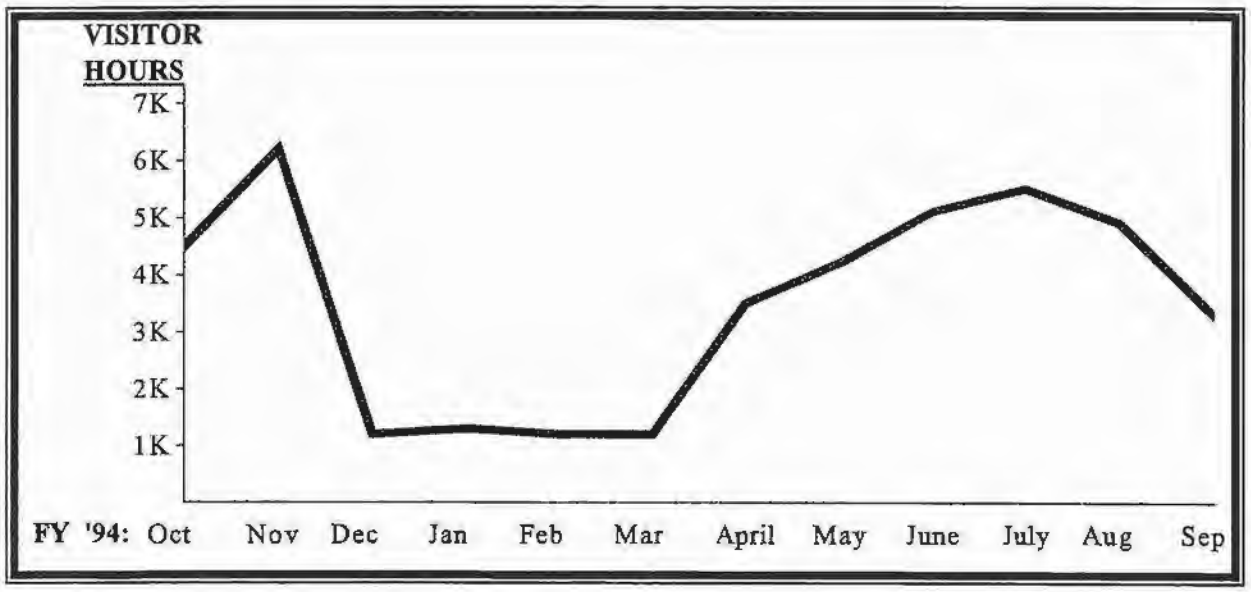
Table B-5
LAKE ORWELL VISITATION: TABULAR LISTING AND COMPARISON

FISCAL YEAR	VISITATION HOURS	CHANGE FROM PREVIOUS YEAR	PERCENT OF CHANGE
1988:	82,200	–	–
1989:	93,700	11,500	+14%
1990:	85,000	-8,700	-9%
1991:	86,600	1,600	+2%
1992:	76,000	-10,600	-12%
1993:	55,000	-21,000	-28%
1994:	42,100	12,900	23%
*1995:	116,100	N/A	N/A

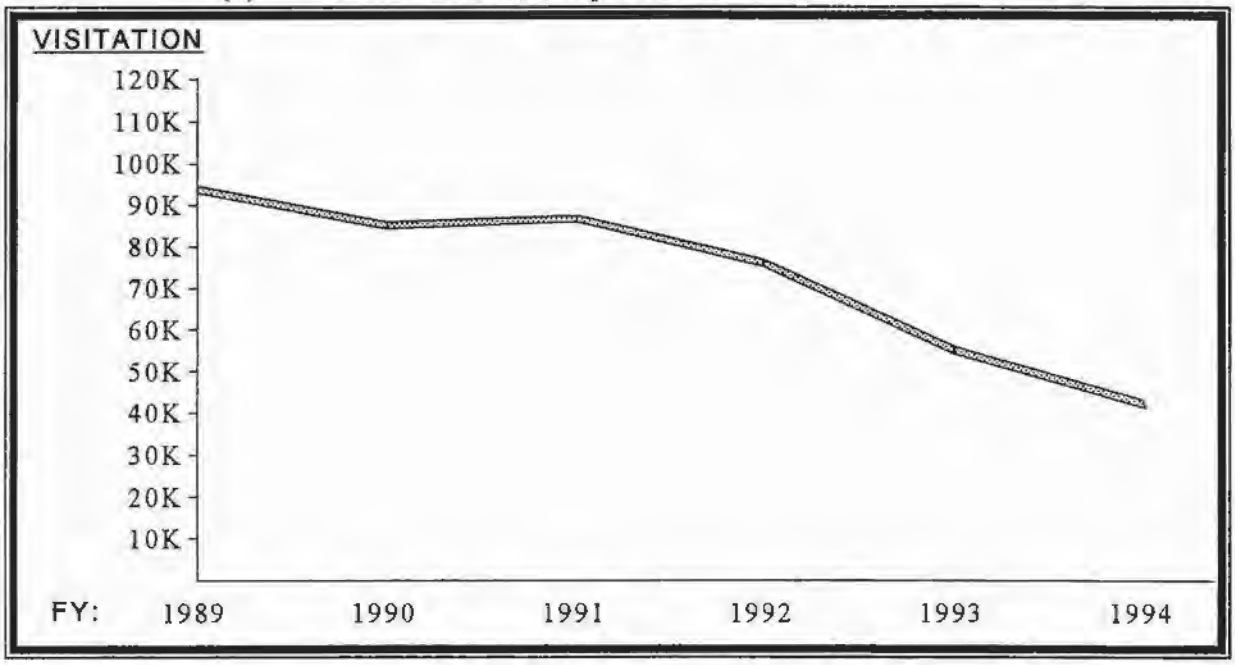
7-year average visitation = 78,700 Visitor Hours annually

* Dispersed Use Method, i.e., counting total users of the lake rather than users of Corps facilities only

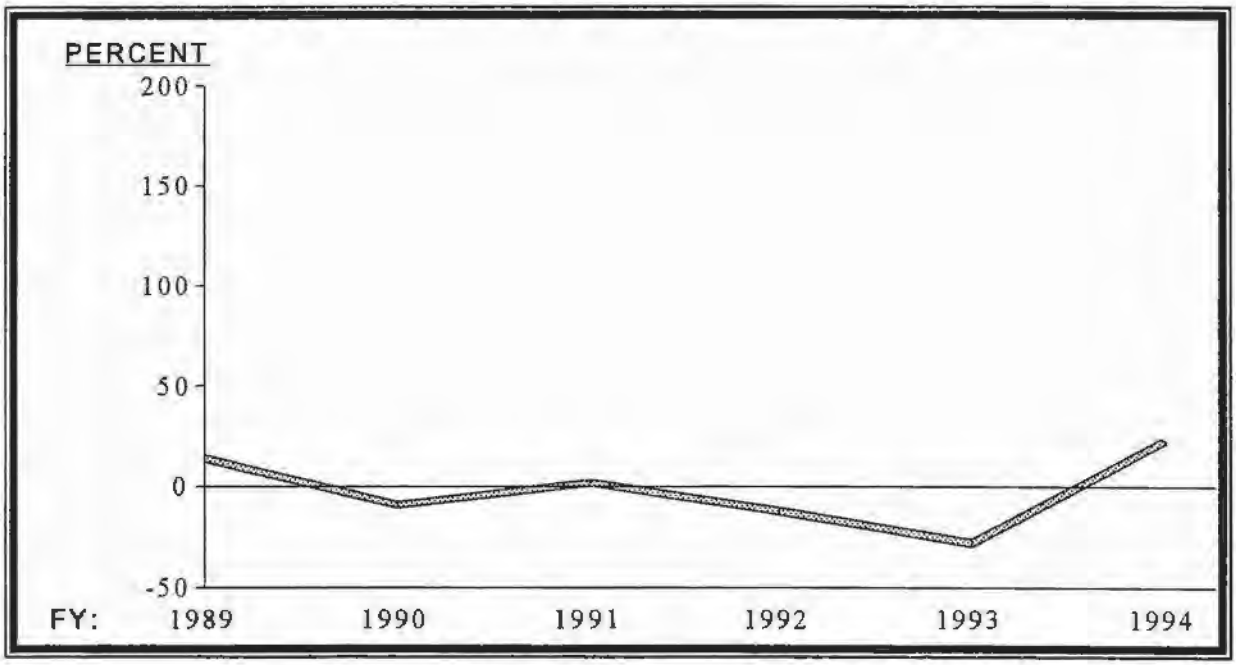
(a) Typical Annual Visitation Pattern for Lake Orwell



(b) Lake Orwell, Graph of Visitation:



(c) Lake Orwell, Visitation Rate of Change:



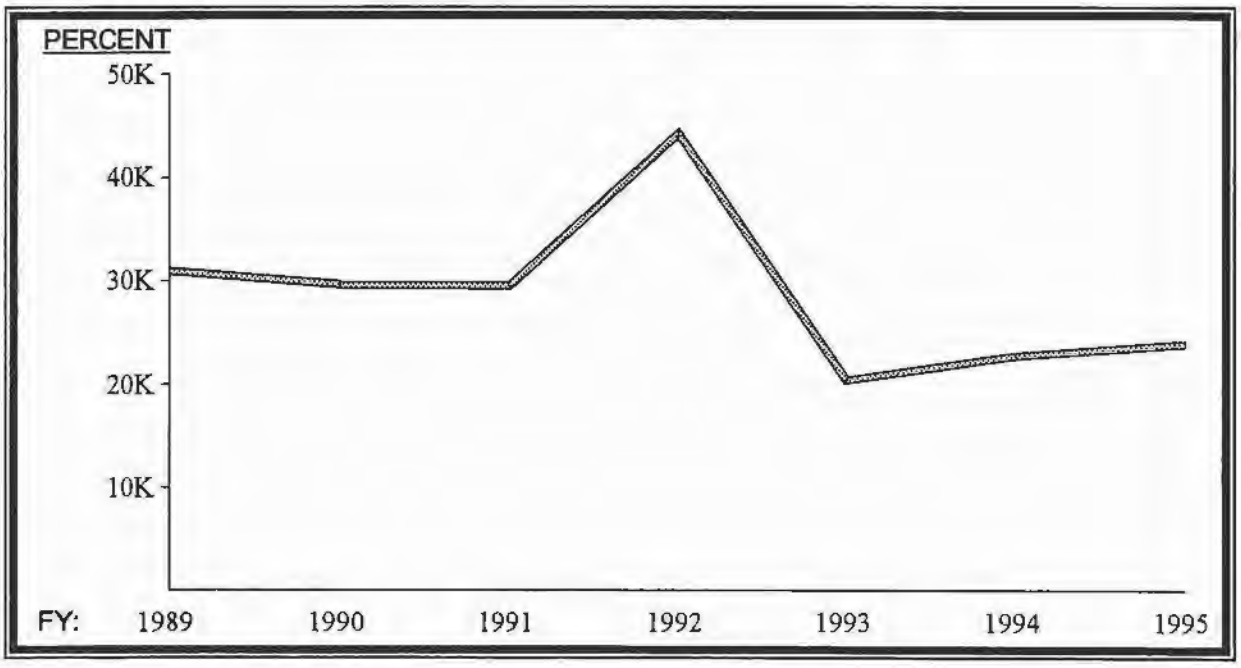
Big Stone Lake - Whetstone River

Table B-6
HIGHWAY 75 VISITATION: TABULAR LISTING AND COMPARISON

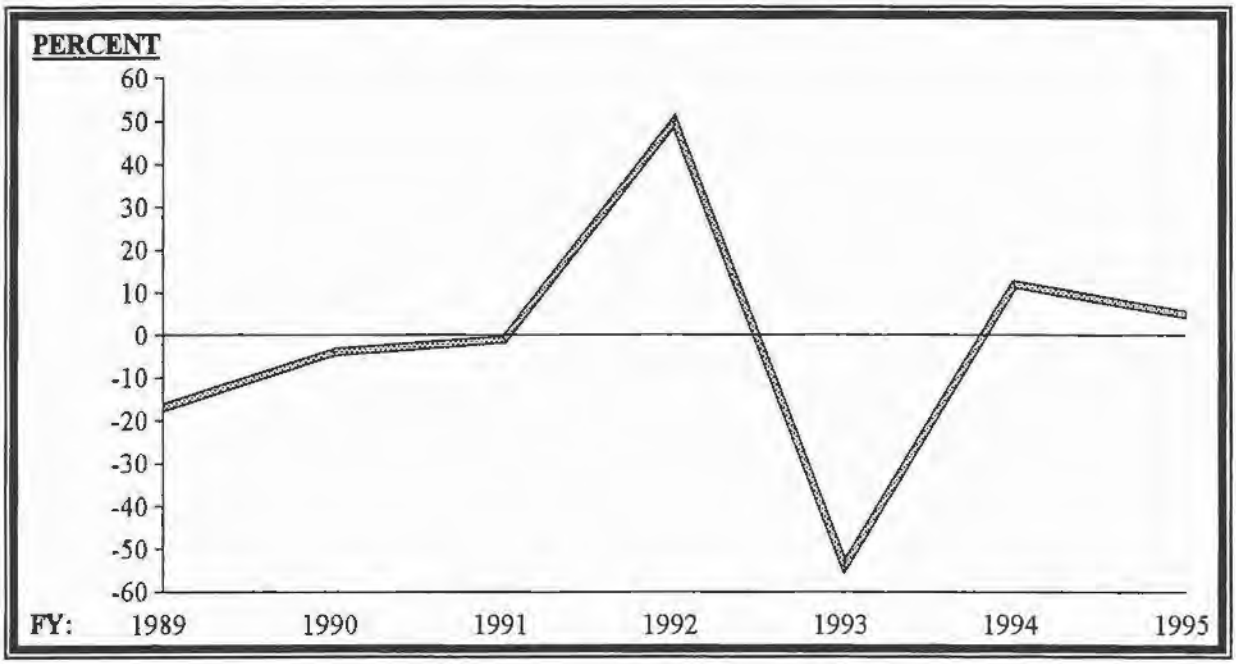
FISCAL YEAR	VISITATION HOURS	CHANGE FROM PREVIOUS YEAR	PERCENT OF CHANGE
1988:	37,400	–	–
1989:	30,900	-6,500	-17%
1990:	29,600	-1,300	-4%
1991:	29,500	-100	-1%
1992:	44,200	14,700	+50%
1993:	20,400	23,800	-54%
1994:	22,800	2,400	+12%
1995:	23,891	1,100	+5%

7-year average visitation = 30,700 Visitor Hours annually

(a) Graph of Visitation for Big Stone Lake - Whetstone River



(b) Big Stone Lake - Whetstone River, Visitation Rate of Change



Lac qui Parle:

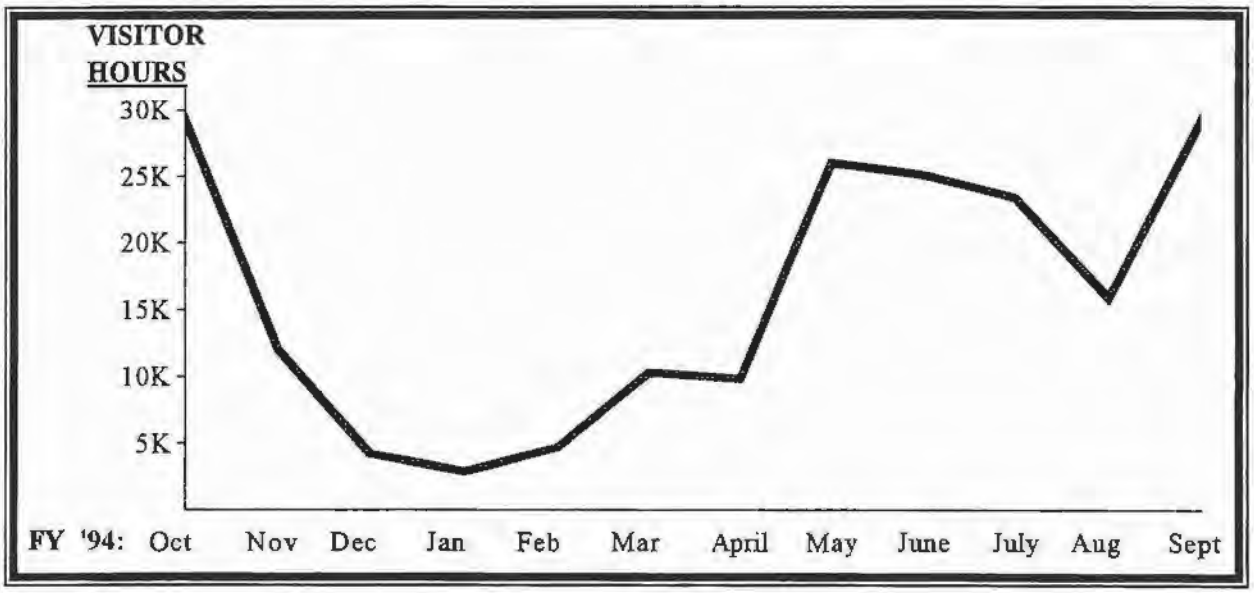
Table B-7
LAC QUI PARLE VISITATION: TABULAR LISTING AND COMPARISON

FISCAL YEAR	VISITATION HOURS	CHANGE FROM PREVIOUS YEAR	PERCENT OF CHANGE
1988:	555,300	–	–
1989:	523,800	-31,500	-6%
1990:	563,900	40,100	+8%
1991:	640,900	77,000	+14%
1992:	410,200	-230,700	-36%
1993:	372,700	37,500	-9%
1994:	192,700	-180,00	-48%
*1995:	226,000	N/A	N/A

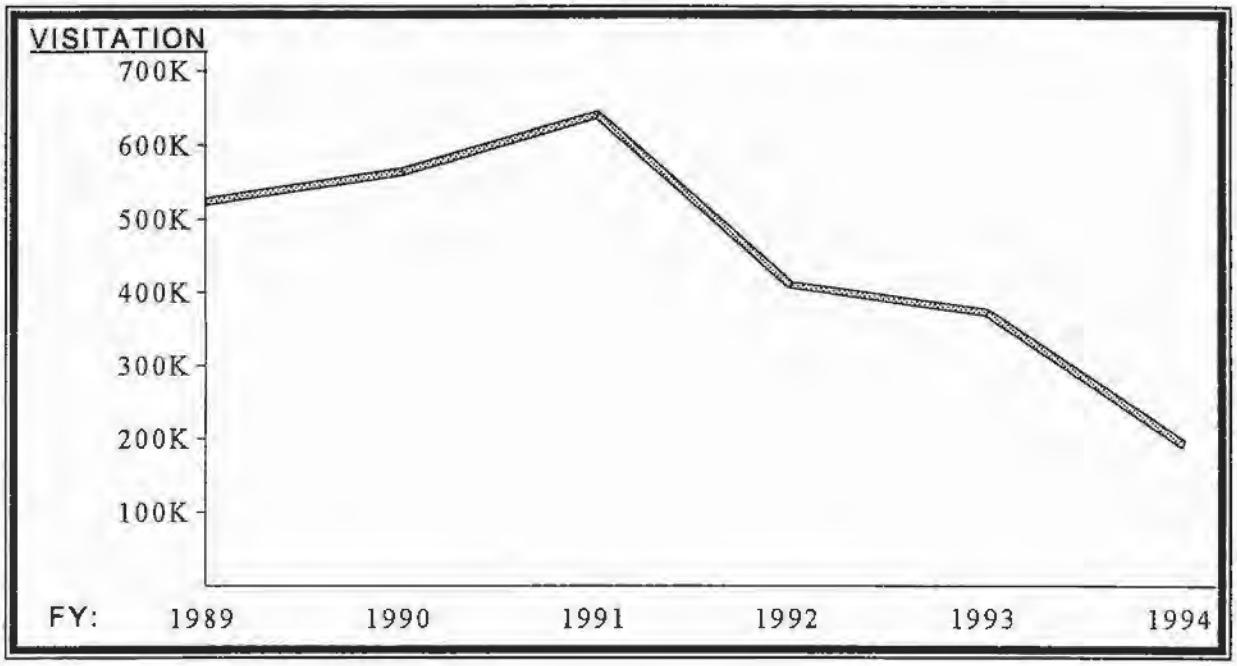
7-year average visitation = 465,600 Visitor Hours annually

* Dispersed Use Method, i.e., counting total users of the lake rather than users of Corps facilities only.

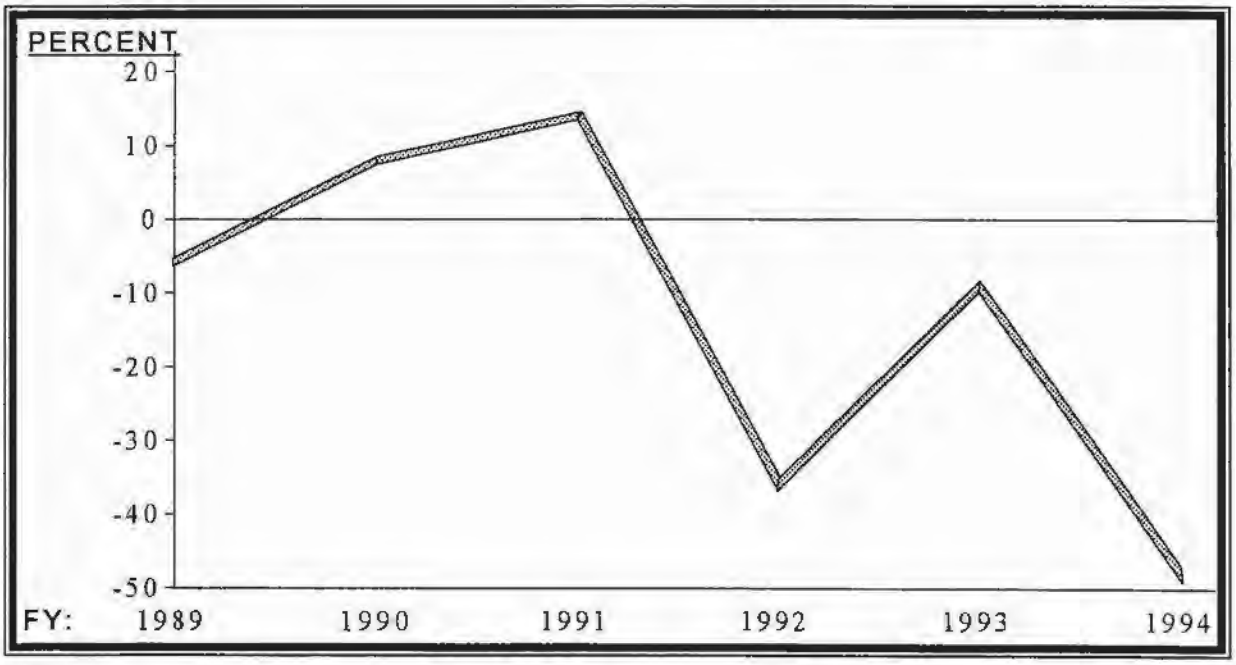
(a) Typical Annual Visitation Pattern for Lac qui Parle



(b) Lac qui Parle, Graph of Visitation:



(c) Lac qui Parle, Visitation Rate of Change:



ANNUAL OUTDOOR ACTIVITIES:

Table B-8
TABULAR LISTING OF PROJECT RECREATION ACTIVITY

YEAR	RECREATION ACTIVITY	PERCENT OF USE			
		TRAVERSE	ORWELL	HIGHWAY 75	LAC QUI PARLE
1994	Picnicking	9	10	Not Available	13
	Camping	1	0		5
	Swimming	12	0		3
	Water Ski	3	0		2
	Boating	10	0		5
	Sightseeing	39	60		38
	Fishing	42	30		46
	Hunting	3	10		12
	Winter	15	11		12
	Other*	20	10		17

* Other includes: hiking, biking, relaxing, restroom use, playgrounds, and birding.

BOAT REGISTRATION AND USAGE:

Table B-9
1992 MINNESOTA BOAT REGISTRATION INFORMATION

County	Boat Type						
	Canoe	Sail	Pontoon	Fishing	Runabout	Other	Total
Becker	1,137	458	1,030	7,915	2,232	491	13,263
Big Stone	91	11	34	755	164	32	1,087
Chippewa	175	2	8	528	71	8	792
Clay	172	12	44	856	188	59	1,331
Douglas	860	290	741	7,019	1,468	346	10,724
Grant	126	24	53	840	113	29	1,185
Kandiyohi	975	263	382	5,560	1,548	273	9,001
Lac qui Parle	122	4	15	851	116	16	1,124

Table B-9
1992 MINNESOTA BOAT REGISTRATION INFORMATION

County	Boat Type						
	Canoe	Sail	Pontoon	Fishing	Runabout	Other	Total
Lincoln	41	14	31	701	164	27	978
Lyon	141	15	20	860	231	43	1,310
Ottertail	2,180	895	1,445	15,272	3,107	657	23,556
Pope	288	89	206	2,353	500	81	3,517
Redwood	147	7	13	534	78	15	794
Renville	116	9	22	513	101	22	783
Stevens	329	13	13	817	100	37	1,309
Swift	132	2	19	603	68	19	843
Traverse	34	5	18	494	41	11	603
Wilkin	68	2	6	79	11	9	175
Yellow Medicine	113	4	6	511	89	17	740
Total boats registered in Minnesota State Counties of the study area							73,115

RECREATION NEEDS, EXPRESSED BY THE PUBLIC:

APPENDIX C – ENVIRONMENTAL RESOURCES

VEGETATION:

Regional Wetland Plant Species:

Corps of Engineers: Regulations (ER 33 CFR 328) define wetlands as: "... those areas inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similiar areas."

The U.S. Fish and Wildlife Service: The definition used in classifying wetlands for the National Wetlands Inventory states: "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following attributes: (1) at least periodically, the land supports predominantly undrained hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year."

Table C–1

COMMON REGIONAL WETLAND PLANT SPECIES

COMMON NAME	*SCIENTIFIC NAME*
American Waterplantain	*Alisma plantago-aquatica*
Beggartick	*Bidens cernua*
Water Shield	*Brasenia schreberi*
Water Arum	*Calla pulustris*
Water Starwort	*Callitriche heterophylla*
Marsh Marigold	*Caltha palustris*
Tall Bellflower	*Campanula americana*
Marsh Bellflower	*Campanula aparinoides*

Table C–1

COMMON REGIONAL WETLAND PLANT SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Sedge	*Carex alopecoidea*
Water Sedge	*Carex aquatilis*
Slough Sedge	*Carex atherodes*
Fescue Sedge	*Carex brevior*
Sedge	*Carex conoidea*
Sedge	*Carex cristatelia*
Sedge	*Carex granularis*
Sedge	*Carex gravida*
Sun Sedge	*Carex heliophila*
Bottlebrush Sedge	*Carex hystericina*
Sedge	*Carex laeviconica*
Woolly Sedge	*Carex lanuginosa*
Mead Sedge	*Carex meadii*
Sartwell Sedge	*Carex sartwellii*
Fox Sedge	*Carex vulpinoidea*
Coontail	*Ceratophyllum demersum*
Red-Rooted Flatsedge	*Cyperus erythrorhizos*
Flatsedge	*Cyperus ferruginescens*
Needle Spikesedge	*Eleocharis acicularis*
Common Spikesedge	*Eleocharis palustris*
Waterpod	*Ellisia nyctelea*
Field Horsetail	*Equisetum arvense*
Swamp Horsetail	*Equisetum fluviatile*
Scouring Rush	*Equisetum hyerele*
Smooth Horsetail	*Equisetum laevigatum*
Virginia Waterleaf	*Hydrophylium virginianum*

Table C–1

COMMON REGIONAL WETLAND PLANT SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Blue Flag	*Iris versicolor*
Baltic Rush	*Juncus balticus*
Toad Rush	*Juncus bufonius*
Dudley Rush	*Juncus dudleyi*
Jointed Rush	*Juncus nodosus*
Torrey Rush	*Juncus torreyi*
Common Duckweed	*Lemna minor*
Star Duckweed	*Lemna trisulca*
Water Milfoil	*Myriophyllum verticillatum*
Bushy Pondweed	*Najas flexilis*
Yellow Lotus	*Nelumbo lutea*
Yellow Waterlily	*Nuphar variegatum*
Water Smartweed	*Polygonum coccineum*
Water Smartweed	*Polygonum natans*
Largeleaf Pondweed	*Potamogeton amplifolius*
Curled Pondweed	*Potamogeton crispus*
Floating-Leaf Pondweed	*Potamogeton natans*
Sago Pondweed	*Potamogeton pectinatus*
Snailseed Pondweed	*Potamogeton spirillus*
Widgeon Grass	*Ruppia occidentalis*
Duckpotato Arrowhead	*Sagittaria cuneata*
Arrowhead	*Sagittaria latifolia*
Stiff Wapato	*Sagittaria rigida*
Hardstem Bulrush	*Scirpus acutus*
Threesquare	*Scirpus americanus*
Green Bulrush	*Scirpus atrovirens*

Table C–1

COMMON REGIONAL WETLAND PLANT SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Wool Grass	*Scirpus cyperinus*
River Bulrush	*Scirpus fluviatilis*
Softstem Bulrush	*Scirpus validus*
Giant Burreed	*Sparganium eurycarpum*
Common Ducksmeat	*Spirodela polyrhiza*
Narrowleaf Cattail	*Typha angustifolia*
Common Cattail	*Typha latifolia*
Common Bladderwort	*Utricularia vulgaris*
Wild Celery	*Vallisnaria americana*

Rare, Threatened, and Endangered Plant Species:

The following plant species have been declared threatened or endangered under Minnesota State law. The following list was supplied by the Minnesota Department of Natural Resources; scientific names follow Gray's Manual of Botany, 8th ed.:

Table C–2

THREATENED OR ENDANGERED VASCULAR PLANTS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
ENDANGERED:	Narrow-leaved Milkweed	*Asclepias stenophylla* Gray
	Kitten-tails	*Besseya bullii* (Eaton) Rydb.
	Sweet-smelling Indianplantain	*Cacalia suaveolens* L.
	Golden Saxifrage	*Chrysosplenium iowense* Rybd.

Table C–2

THREATENED OR ENDANGERED VASCULAR PLANTS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
	James' Polanisia	*Cristatella jamesii* T&G. [*Polanisia jamesii* (T.&G.) Iltis]
	Rams-head Lady's-slipper	*Cypripedium arietinum* R. Br.
	Norwegian Draba	*Draba norvegica* Gunn.
	Wolf's Spike-rush	*Eleocharis wolfii* Gray
	Purple Crowberry	*Empetrum atropurpureum*
ENDANGERED, cont:	Dwarf Trout Lily	*Erythronium propullans* Gray
	Eared Gerardia	*Gerardia auriculata* Michx. [*Agalinis auriculata* (Michx.) Blake]
	Golden-seal	*Hydrastis canadensis* L.
	A species of Quillwort	*Isoetes melanopoda* Gay & Dur.
	Prairie Bush Clover	*Lespedeza leptostachya* Engelm.
	Bladderpod	*Lesquerella ludoviciana* (Nutt.) S. Wats
	American Shore-plantain	*Littorella americana* Fern.
	Bog Adder's-mouth	*Malaxis paludosa* (L.)Sw.
	A species of Purslane	*Montia chamissoi* (Ledeb.) Durand & Jackson
	Glade Mallow	*Napaea dioica* L.
	Indian Ricegrass	*Oryzopsis hymenoides* (R.& S.) Ricker
	Chilean Sweet Cicily	*Osmorhiza chilensis* H.&A.
	Wild Quinine	*Parthenium integrifolium* L.
	Tubercled Rein-orchid	*Platanthera flava* (L.)Lindl. var. *herbiola* (R.Br.) Luer [*Habenaria flava* (l.) R. Br. var. *herviola* (R.Br.) Ames & Correll]

Table C–2

THREATENED OR ENDANGERED VASCULAR PLANTS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
	Bog Bluegrass	*Poa paludigena* Fern. & Wieg.
	Cross milkwort	*Polygala cruciata* L.
	Braun's Holly Fern	*Polystichum braunii* (Spenner) Fee var. *purshii* Fern.
	One-sided Pondweed	*Potamogeton lateralis* Morong
	Wild Petunia	*Ruellia humilis* Nutt.
ENDANGERED, cont:	Knotty Pearlwort	*Sagina nodosa* (L.) Fenzl ssp. *borealis* Crow
	Nodding Saxifrage	*Saxifraga cernua* L. var. *latibracteata* Fern.
	Whorled Nut-rush	*Scleria triglomerata* Michx.
	Leedy's Roseroot	*Sedum integrifolium* ssp leedyi (Rosend. & Moore) Clausen/*Sedum rosea* (L.) Scop. var. *leedyi* Rosend. & Moore]
	Clustered Bur Reed	*Sparganium glomeratum* Laest.
	Awlwort	*Subularia aquatica* L.
	Reniform Sullivantia	*Sullivantia renifolia* Rosend.
	Rough-seeded Fameflower	*Talinum rugospermum* Holzinger
	Small False Asphodel	*Tofeildia pusilla* (Mich.) Pers.
THREATENED:	Wild Onion	*Allium cernuum* Roth
	Beach Grass	*Ammophila breviligulata* Fern.
	Northern Androsace	*Androsace septentrionalis* L. var. *puberulenta* (Rydb.) Knuth
	Holboell's rock-cress	*Arabis holboellii* Hornem. var. *retrofracta* (Graham) Rydb.
	Large-leaved Sandwort	*Arenaria macrophylla* Hook.

Table C–2

THREATENED OR ENDANGERED VASCULAR PLANTS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
THREATENED, cont:	Arnica	*Arnica chionopappa* Fern. [*Arnica lonchophylla* Greens ssp. *chionopappa* (Fern) Maguire]
	Green Milkweed	*Asclepias hirtella* (Pennell) Woodson
	Sullivant's Milkweed	*Asclepias sullivantii* Engelm.
	Maidenhair Spleenwort	*Asplenium trichomanes* L.
	Tuberous Indian-plantain	*Cacalia plantaginea* (RAF.) Shinners [*Cacalia tuberosa* Nutt.]
	Jointed Sedge	*Carex conjuncta* Boott
	Davis' Sedge	*Carex davisii* Schwein & Torr.
	Hall's Sedge	*Carex hallii* Olney
	Pririe Sedge	*Carex praticola* Rydb.
	Sterile Sedge	*Carex sterilis* Willd.
	Illinois Tick-trefoil	*Desmodium illinoense* Gray
	English Sundew	*Drosera anglica* Huds.
	Linear-leaved Sundew	*Drosera linearis* Goldie
	Marginal Shield-fern	*Dryopteris marginalis* (L.) Gray
	Olivaceous Spike-rush	*Eleocharis olivacea* Torr.
	Beaked Spike-rush	*Eleocharis rostellata* Torr.
	Round False Foxglove	*Gerardia gattingeri* Sm.[Agalinis *gattingeri* (Sm.) Sm.]
	Twinleaf	*Jeffersonia diphylla* (L.) Pers.
	Rock Clubmoss	*Lycopodium porophilum* Lloyd & Underwood
	Annual Skeleton-weed	*Lygodesmia rostrata* Gray

Table C--2

THREATENED OR ENDANGERED VASCULAR PLANTS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
THREATENED, cont:	Ball Cactus	*Mamillaria vivipara* (Nutt.) Haw. [*Corypantha vivipara* (Nutt.) Britt. & Rose]
	Three-flowered Melic	*Melica nitens* Nutt.
	Small White Water-lily	*Nymphaea tetragona* Georgi
	Purple Cliff-brake	*Pellaea atropurpurea* (L.) Link
	Slender Plantain	*Plantago elongata* Pursh
	Hair-like Beak-rush	*Rhynchospora capillacea* Torr.
	Cloudberry	*Rubus chamaemorus* L.
	Red Saltwort	*Salicornia rubra* Nelson
	Encrusted Saxifrage	*Saxifraga aizoon* Jacq. var. *neogaea* Butters
	Whorled Nut-rush	*Scleria verticillata* Muhl.
	Alpine Bilberry	*Vaccinium uliginosum* L. var. *alpinum* Bigel
	Valerian	*Valeriana edulis* Nutt. ssp. *ciliata* (T.&B.) Meyer
	Smooth Woodsia	*Woodsia glabella* R.Br.
	Rocky Mountain Woodsia	*Woodsia scopulina* D.C. Eat.
	Twisted Yellow-eyed Grass	*Xyris torta* sm.

Characteristic Plant Species of Western Minnesota:

Additional information, a discussion of plant species by habitat type, is available in Section 1, Chapter 3.9, Vegetation.

1. **Forbs of the Region:**

Table C–3

COMMON FORB REGIONAL SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Western Yarrow	*Achillea millefolium*
Giant Hyssop	*Agastache nepetoides*
Meadow Garlic	*Allium canadense*
Prairie Onion	*Allium stellaturi*
Textile Onion	*Allium textile*
Creeping Pigweed	*Amaranthus graecizans*
Red-Rooted Pigweed	*Amaranthus retroflexus*
Amaranth	*Amaranthus tamariscinus*
Common Ragweed	*Ambrosia artemisiifolia*
Perennial Ragweed	*Ambrosia psilostachya*
Giant Ragweed	*Ambrosia trifida*
Fairy Candelabra	*Androsace occidentalis*
Canada Anemone	*Anemone canadensis*
Spreading Pasque-Flower	*Anemone patens*
Spreading Dogbane	*Apocynum androsaemifolium*
Indian Hemp	*Apocynum cannabinum*
Prairie Dogbane	*Apocynum sibiricum*
Common Burdock	*Arctium minus*
Bluntleaf Sandwort	*Arenaria lateriflora*
Jack-In-The-Pulpit	*Arisaema triphyllum*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Absinth	*Artemisia absinthium*
Biennial Wormwood	*Artemisia biennis*
Green Sagewort	*Artemisia dracunculus*
Fringed Sagewort	*Artemisia frigida*
Louisiana Sagewort	*Artemisia ludoviciana*
Blunt-Leaved Milkweed	*Asclepias amplexicaulis*
Swamp Milkweed	*Asclepias incarnata*
Oval-Leaved Milkweed	*Asclepias ovalifolia*
Showy Milkweed	*Asclepias speciosa*
Common Milkweed	*Asclepias syriaca*
Butterfly Weed	*Asclepias tuberosa*
Whorled Milkweed	*Asclepias verticillata*
Asparagus	*Asparagus officinalis*
Heath Aster	*Aster ericoides*
Aster	*Aster junciformis*
Smooth Aster	*Aster laevis*
New England Aster	*Aster novae-angliae*
Aromatic Aster	*Aster oblongifolius*
Swamp Aster	*Aster puniceus*
Silky Aster	*Aster sericeus*
White Prairie Aster	*Aster simplex*
Flat-Topped Aster	*Aster umbellatus*
Prairie Milkvetch	*Astragalus adsurgens*
Purple Milkvetch	*Astragalus agrestis*
Canada Milkvetch	*Astragalus canadensis*
Ground-Plum Milkvetch	*Astragalus crassicarpus*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Hoary False Alyssum	*Berteroa incana*
Nodding Beggarticks	*Bidens cernua*
Devil's Beggarticks	*Bidens frondosa*
Tall Beggarticks	*Bidens vulgata*
False Aster	*Boltonia asteroides*
Rattlesnake Fern	*Botrychium virginianum*
Field Mustard	*Brassica kaber*
Marsh Marigold	*Caltha palustris*
Shepherd's Purse	*Capsella bursa-pastoris*
Downy Paintbrush	*Castilleja sessiflora*
Prairie Chickweed	*Cerastium arvense*
Lamb's Quarter	*Chenopodium album*
Pitseed Goosefoot	*Chenopodium berlandieri*
Oakleaf Goosefoot	*Chenopodium glaucum*
Mapleleaf Goosefoot	*Chenopodium hybridum*
Red Goosefoot	*Chenopodium rubrum*
Hairy Goldaster	*Chrysopsis villosa*
Bulbous Water Hemlock	*Cicuta bulbifera*
Spotted Water Hemlock	*Cicuta maculata*
Enchanter's Nightshade	*Circaea lutetiana*
Tall Thistle	*Cirsium altissimum*
Canada Thistle	*Cirsium arvense*
Prairie Thistle	*Cirsium flodmanii*
Virgin's Bower	*Clematis virginiana*
Bastard Toadflax	*Comandra pallida*
Field Bindweed	*Convolvulus arvensis*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Wild Morning Glory	*Convolvulus sepium*
Horseweed	*Conyza canadensis*
Golden Corydalis	*Corydalis aurea*
Honewort	*Cryptotaenia canadensis*
Small Prairie Ladyslipper	*Cypripedium candidum*
Plains Larkspur	*Delphinium virescens*
Flixweed Tansy Mustard	*Descurainia sophia*
Canada Tick-Trefoil	*Desmodium canadense*
Yellow Whitlowwort	*Draba nemorosa*
Black Sampson	*Echinacea angustifolia*
Wild Cucumber	*Echinocystis lobata*
Mud-Purslane	*Elatine triandra*
Glandular Willow-Herb	*Epilobium glandulosum*
Willow-Herb	*Epilobium leptophyllum*
Philadelphia Fleabane	*Erigeron philadelphicus*
Fleabane Daisy	*Erigeron strigosus*
Wormseed Mustard	*Erysimuni cheiranthoides*
Joe-Pye Weed	*Eupatorium maculatum*
Boneset	*Eupatorium perfoliatum*
White Snakeroot	*Eupatorium rugosum*
Leafy Spurge	*Euphorbia esula*
Ridge-Seeded Spurge	*Euphorbia glyptosperma*
Thyme-Leaved Spurge	*Euphorbia serpyllifolia*
Virginia Strawberry	*Fragaria virginiana*
Catchweed Bedstraw	*Galium aparine*
Northern Bedstraw	*Galium boreale*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Bedstraw	*Galium obtusum*
Small Bedstraw	*Galium trifidum*
Sweet-Scented Bedstraw	*Galium triflorum*
Scarlet Gaura	*Gaura coccinea*
Bottle Gentian	*Gentiana andrewsii*
Downy Gentian	*Gentiana puberula*
Yellow Avens	*Geum aleppicum*
White Avens	*Geum canadense*
Torch Flower	*Geum triflorum*
American Wild Licorice	*Glycyrrhiza lepidota*
Curlycup Gumweed	*Grindelia squarrosa*
Wood Stickseed	*Hackelia virginianum*
Rough Pennyroyal	*Hedeoma hispida*
Sneezeweed	*Helenium autumnale*
Common Sunflower	*Helianthus annuus*
Maximilian Sunflower	*Helianthus maximiliani*
Prairie Sunflower	*Helianthus petiolaris*
Stiff Sunflower	*Helianthus rigidus*
Jerusalem Artichoke	*Helianthus tuberosus*
False Sunflower	*Heliopsis helianthoides*
Cow Parsnip	*Heracleum lanatum*
Alum Root	*Heuchera richardsonii*
Greater St. John's-Wort	*Hypericum majus*
Yellow Stargrass	*Hypoxis hirsuta*
Spotted Touch-Me-Not	*Impatien biflora*
Marsh Elder	*Iva xanthifolia*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Summer Cypress	*Kochia scoparia*
False Boneset	*Kuhnia eupatorioides*
Blue Wood Lettuce	*Lactuca biennis*
Western Wild Lettuce	*Lactuca ludoviciana*
Wild Blue Lettuce	*Lactuca pulchella*
Wood Nettle	*Laportea canadensis*
European Stickseed	*Lappula echinata*
Marsh Vetchling	*Lathyrus palustris*
Lion's Tail	*Leonurus cardiaca*
Round-Headed Blazing Star	*Liatris aspera*
Rocky Mountain Gayfeather	*Liatris ligulistylis*
Dotted Gayfeather	*Liatris punctata*
Tall Gayfeather	*Liatris pycnostachya*
Wood Lily	*Lilium philadelphicum*
Grooved Flax	*Linum sulcatum*
Hoary Puccoon	*Lithospermum canescens*
Narrow-Leaved Puccoon	*Lithospermum incisum*
Great Blue Lobelia	*Lobelia siphilitica*
Palespike Lobelia	*Lobelia spicata*
Wild Parsley	*Lomatium orientale*
Deervetch	*Lotus purshianus*
Water Hoarhound	*Lycopus americanus*
Bugle-Weed	*Lycopus uniflorus*
Skeleton Weed	*Lygodesmia juncea*
Fringed Loosestrife	*Lysimachia ciliata*
Loosestrife	*Lysimachia hybrida*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Loosestrife	*Lysimachia lanceolata*
Loosestrife	*Lythrum alatum*
Purple Loosestrife	*Lythrum salicaria*
Running Mallow	*Malva rotundifolia*
Black Medic	*Medicago lupulina*
Alfalfa	*Medicago sativa*
White Sweetclover	*Melilotus alba*
Yellow Sweetclover	*Melilotus officinalis*
Wild Mint	*Mentha arvensis*
Yellow Monkeyflower	*Mimulus glabratus*
Monkeyflower	*Mimulus ringens*
Four O'clock	*Mirabilis nyctaginea*
Wild Bergamot	*Monarda fistulosa*
Catnip	*Nepeta cataria*
Common Evening Primrose	*Oenothera bieniiis*
Tooth-Leaved Evening Primrose	*Oenothera serrulata*
False Gromwell	*Onosmodium molle*
Wood Sorrel	*Oxalis dillenii*
Common Yellow Sorrel	*Oxalis stricta*
Violet Wood Sorrel	*Oxalis violacea*
Purple Loco Weed	*Oxytropis lamberti*
Pennsylvania Pellitory	*Parietaria pensylvanica*
Woodbine	*Parthenocissus*
Lousewort	*Pedicularis canadensis*
Swamp Lousewort	*Pedicularis lanceolata*
Slender Penstemon	*Penstemon gracilis*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Large Beardtongue	*Penstemon grandiflorus*
Ditch Stonecrop	*Penthorum sedoides*
White Prairie Clover	*Petalostemum candidum*
Purple Prairie Clover	*Petalostemum purpureum*
Downy Phlox	*Phlox pilosa*
Lopseed	*Phryma leptostachya*
Virginia Ground Cherry	*Physalis virginiana*
Obedient Plant	*Physostegia parviflora*
Clearweed	*Pilea pumila*
Common Plantain	*Plantago major*
Woolly Indianwheat	*Plantago patagonica*
Rugel's Plantain	*Plantago rugelii*
Clammy-Weed	*Polanisia dodecandra*
Whorled Milkwort	*Polygala verticillata*
Small Solomonseal	*Polygonatum biflorum*
Leathery Knotweed	*Polygonum achoreum*
Prostrate Knotweed	*Polygonum aviculare*
Pennsylvania Smartweed	*Polygonum pensylvanicum*
Spotted Ladysthumb	*Polygonum persicaria*
Purslane	*Portulaca oleracea*
Silverweed Cinquefoil	*Potentilla anserina*
Tall Cinquefoil	*Potentilla arguta*
Norwegian Cinquefoil	*Potentilla norvegica*
Bushy Cinquefoil	*Potentilla paradoxa*
Pennsylvania Cinquefoil	*Potentilla pensylvanica*
Brook Cinquefoil	*Potentilla rivalis*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
White Lettuce	*Prenanthes racemosa*
Silverleaf Scurfpea	*Psoralea argophylla*
Indian Breadroot	*Psoralea esculenta*
Mountain Mint	*Pycnanthemum virginianum*
Early Wood Buttercup	*Ranunculus abortivus*
Shore Buttercup	*Ranunculus cymbalaria*
Yellow Water Crowfoot	*Ranunculus flabellaris*
Bristly Buttercup	*Ranunculus pensylvanicus*
White Water Crowfoot	*Ranunculus subrigidus*
Prairie Coneflower	*Ratibida columnifera*
Coneflower	*Ratibida pinnata*
Poison Ivy	*Rhus radicans*
Marsh Yellow Cress	*Rorippa islandica*
Black-Eyed Susan	*Rudbeckia hirta*
Tall Coneflower	*Rudbeckia laciniata*
Curly Dock	*Rumex crispus*
Golden Dock	*Rumex maritimus*
Western Dock	*Rumex occidentalis*
Willow-Leaved Dock	*Rumex salicifolius*
Russian Thistle	*Salsola kali*
Lance-Leaved Sage	*Salvia reflexa*
Black Snakeroot	*Sanicula marilandica*
Lanceleaf Figwort	*Scrophularia lanceolata*
Marsh Skullcap	*Scutellaria galericulata*
Blue Skullcap	*Scutellaria lateriflora*
Ragwort	*Senecio pauperculus*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Cup Plant	*Silphium perfoliatum*
Tumbling Mustard	*Sisymbrium altissinium*
Blue-Eyed Grass	*Sisyrinchium campestre*
Water Parsnip	*Sium suave*
False Solomonseal	*Smilacina stellata*
Carrion Flower Greenbriar	*Smilax herbacea*
Black Nightshade	*Solanum nigrum*
Canada Goldenrod	*Solidago canadensis*
Broad-Leaved Goldenrod	*Solidago flexicaulis*
Giant Goldenrod	*Solidago gigantea*
Narrow-Leaved Goldenrod	*Solidago graminifolia*
Missouri Goldenrod	*Solidago missouriensis*
Gray Goldenrod	*Solidago nemoralis*
Riddell's Goldenrod	*Solidago riddellii*
Stiff Goldenrod	*Solidago rigida*
Perennial Sowthistle	*Sonchus arvensis*
Giant Burreed	*Sparganium eurycarpum*
Meadowsweet Spiraea	*Spiraea alba*
Hedge Nettle	*Stachys palustris*
Chickweed	*Stellaria aquatica*
Dandelion	*Taraxacum officinale*
Germander	*Teucrium canadense*
Purple Meadowrue	*Thalictrum dasycarpum*
Veiny Meadowrue	*Thalictrum venulosum*
Field Pennycress	*Thlaspi arvense*
Bracted Spiderwort	*Tradescantia bracteata*

Table C–3

COMMON REGIONAL FORB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Goatsbeard	*Tragopogon dubius*
Alsike Clover	*Trifolium hybridum*
Red Clover	*Trifolium pratense*
White Clover	*Trifolium repens*
Nettle	*Urtica dioica*
Large Bellwort	*Uvularia grandiflora*
Common Mullen	*Verbascum thapsus*
Bracted Vervain	*Verbena bracteata*
Blue Vervain	*Verbena hastata*
Woolly Verbena	*Verbena stricta*
Nettle-Leaved Vervain	*Verbena urticifolia*
Ironweed	*Vernonia fasciculata*
Purslane Speedwell	*Veronica peregrina*
American Vetch	*Vicia attiericana*
Yellow Wood Violet	*Viola eriocarpa*
Prairie Violet	*Viola pedatifida*
Pink Wood Violet	*Viola rugulosa*
Hairy Blue Violet	*Viola sororia*
Wild Grape	*Vitis riparia*
Cocklebur	*Xanthium strumarium*
Meadow Parsnipmargins	*Zizia aptera*
Meadow Parsnip	*Zizia aurea*
Mountain Deathcamas	*Zygadenus elegans*
White Camas	*Zygadenus glaucus*

2. Grasses of the Region:

Table C–4

COMMON REGIONAL GRASS SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Crested Wheatgrass	*Agropyron desertorum*
Quackgrass	*Agropyron repens*
Western Wheatgrass	*Agropyron smithii*
Slender Wheatgrass	*Agropyron trachycaulum*
Bearded Wheatgrass	*Agropyron subsecundum*
Redtop	*Agrostis stolonifera*
Bentgrass	*Agrostis perennans*
Ticklegrass	*Agrostis scabra*
Bentgrass	*Agrostis stolonifera*
Short-Awn Foxtail	*Aopecurus aequalis*
Big Bluestem	*Andropogon gerardi*
Little Bluestem	*Andropogon scoparius*
Red Three-Awn	*Aristida longiseta*
Oat	*Avena sativa*
American Sloughgrass	*Beckmannia syzigachne*
Sideoats Grama	*Bouteloua curtipendula*
Blue Grama	*Bouteloua gracilis*
Smooth Bromegrass	*Bromus inermis*
Japanese Chess	*Bromus japonicus*
Bluejoint	*Calamagrostis canadensis*
Northern Reedgrass	*Calamagrostis inexpansa*
Prairie Sandreed	*Calamovilfa longifolia*
Inland Saltgrass	*Distichlis stricta*

Table C–4

COMMON REGIONAL GRASS SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Barnyard Grass	*Echinochloa crusgalli*
Canada Wild Rye	*Elymus canadensis*
Slender Wild Rye	*Elymus villosus*
Teal Lovegrass	*Eragrostis hypnoides*
Carolina Lovegrass	*Eragrostis pectinacea*
India Lovegrass	*Eragrostis pilosa*
Lovegrass	*Eragrostis poaeoides*
Meadow Fescue	*Festuca elatior*
Northern Mannagrass	*Glyceria borealis*
Rattlesnake Mannagrass	*Glyceria canadensis*
American Mannagrass	*Glyceria grandis*
Fowl Mannagrass	*Glyceria striata*
Sweetgrass	*Hierochloe odorata*
Foxtail Barley	*Hordeum jubatum*
Bottlebrush	*Hystrix patula*
Prairie Junegrass	*Koeleria cristata*
Rice Cutgrass	*Leersia oryzoides*
Whitegrass	*Leersia virginica*
Alkali Muhly	*Muhlenbergia asperifolia*
Plains Muhly	*Muhlenbergia cuspidata*
Wirestem Muhly	*Muhlenbergia mexicana*
Green Muhly	*Muhlenbergia racemosa*
Mat Muhly	*Muhlenbergia richardsonis*
Witchgrass	*Panicum capillare*
Leiberg Panicum	*Panicum leibergii*
Scribners Panicum	*Panicum oligosanthes*

Table C–4

COMMON REGIONAL GRASS SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Panic Grass	*Panicum perlongum*
Switchgrass	*Panicum virgatum*
Reed Canary Grass	*Phalaris arundinacea*
Timothy	*Phleum pratense*
Common Reed	*Phragmites australis*
Canada Bluegrass	*Poa compressa*
Fowl Bluegrass	*Poa palustris*
Kentucky Bluegrass	*Poa pratensis*
Yellow Bristlegrass	*Setaria lutescens*
Green Bristlegrass	*Setaria viridis*
Indian Grass	*Sorghastrum nutans*
Prairie Cordgrass	*Spartina pectinata*
Prairie Wedgegrass	*Sphenopholis obtusata*
Tall Dropseed	*Sporobolus asper*
Sand Dropseed	*Sporobolus cryptandrus*
Prairie Dropseed	*Sporobolus heterolepis*
Porcupine Grass	*Stipa spartea*
Green Needlegrass	*Stipa viridula*

3. Trees and Shrubs of the Region:

Table C–5

COMMON REGIONAL TREE AND SHRUB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Boxelder	*Acer negundo*
Silver Maple	*Acer saccharinum*
Alderleaf Serviceberry	*Amelanchier alnifolia*
Lead Plant	*Amorpha canescens*
False Indigo	*Amorpha fruticosa*
Dwarf Indigo	*Amorpha nana*
Hackberry	*Celtis occidentalis*
Red-Osier Dogwood	*Cornus stolonifera*
Russian Olive	*Elaeagnus angustifolia*
Green Ash	*Fraxinus pennsylvanica*
Black Walnut	*Juglans nigra*
Eastern Red Cedar	*Juniperus virginiana*
Tatarian Honeysuckle	*Lonicera tatarica*
Jack Pine	*Pinus banksiana*
Cottonwood	*Populus deltoides*
American Wild Plum	*Prunus americana*
Common Chokecherry	*Prunus virginiana*
Bur Oak	*Quercus macrocarpa*
Common Buckthorn	*Rhamnus catharticus*
Smooth Sumac	*Rhus glabra*
American Black Currant	*Ribes americanum*
Missouri Gooseberry	*Ribes missouriense*
Black Locust	*Robinia pseudoacacia*

Table C–5

COMMON REGIONAL
TREE AND SHRUB SPECIES

COMMON NAME	*SCIENTIFIC NAME*
Smooth Wild Rose	*Rosa blanda*
Blackcap Raspberry	*Rubus occidentalis*
Peachleaf Willow	*Salix amygdaloides*
Hoary Willow	*Salix candida*
Sandbar Willow	*Salix exigua*
Shining Willow	*Salix lucida*
Heart-Leaved Willow	*Salix rigida*
Western Snowberry	*Symphoricarpos occidentalis*
Basswood	*Tilia americana*
American Elm	*Ulmus americana*
Siberian Elm	*Ulmus pumila*
Slippery Elm	*Ulmus rubra*
Prickly Ash	*Zanthoxylum americanum*

WILDLIFE

Characteristic Wildlife Species of Western Minnesota:

1. **Mammals of the Region:**

Table C–6

COMMON REGIONAL MAMMAL SPECIES

(1)...possible occurrence
(2)...Rare transient occurrence
(3)...probable occurrence

Common Name	*Scientific Name*
Badger	*Taxidea taxus*
Beaver	*Castor canadensis*
Big Brown Bat	*Eptesicus fuscus*
Bobcat	
Coyote	*Canus latrans*
Deer Mouse	*Peromyscus maniculatus*
Eastern Fox Squirrel	*Sciurus niger*
Eastern Pipistrel	*Pipistrellus subflavus*
Eastern Cottontail	*Sylvilagus floridanus*
Eastern Mole	*Tamias striatus*
Eastern Chipmunk	
Franklin's Ground Squirrel	
Gray Squirrel	
Gray Fox	*Urocyon cinereoargenteus*
Hoary Bat	*Lasiurus cinereus*
House Mouse	
Keen's Myotis (3)	
Least Weasel (3)	

Table C–6

COMMON REGIONAL MAMMAL SPECIES

(1)...possible occurrence
(2)...Rare transient occurrence
(3)...probable occurrence

Common Name	*Scientific Name*
Little Brown Bat	*Myotis lucifugus*
Long-tailed Weasel	*Mustela frenata*
Masked Shrew	*Solex cinereus*
Meadow Jumping Mouse	*Zapus hudsonius*
Meadow Vole	*Microtus pennsylvanicus*
Mink	*Mustela vison*
Moose (2)	
Mule deer (2)	
Muskrat	*Ondatra zibethica*
Northern Grasshopper Mouse	*Onychomys leucogaster*
Norway Rat	
Plains Pocket Gopher	*Geomus bursarius*
Plains Pocket Mouse	*Perognathus flavescens*
Prairie Vole	*Microtus ochrogaster*
Pronghorn Antelope (2)	
Raccoon	*Procyon lotor*
Red Fox	*Vulpes fulva*
Red-backed Vole	
Red Squirrel	*Tamiasciurus hudsonicus*
Red Bat	*Lasiurus borealis*
Richardson Ground Squirrel	*Citellus richardsoni*
River Otter (1)	
Short-tailed Weasel	*Mustela erminea*

Table C–6

COMMON REGIONAL MAMMAL SPECIES

(1)...possible occurrence
(2)...Rare transient occurrence
(3)...probable occurrence

Common Name	*Scientific Name*
Short-tailed Shrew	*Blarina brevicauda*
Silver Haired Bat	*Lasionycterio novtivagans*
Southern Flying Squirrel (3)	
Spotted Skunk	*Spilogale putorius*
Striped Skunk	*Nephitis mephitis*
Thirteen-lined Ground Squirrel	*Citellus tridecem lineatus*
Virginia Oppossum	
Western Harvest Mouse	*Reithrodontomys megalotis*
White-footed Mouse	*Peromysous leucopus*
White-tailed Jackrabbit	*Lepus townsendi*
White-tailed Deer	*Odocoileus virginianus*
Woodchuck	*Marmota monax*

2. Reptiles of the Region:

Table C–7
COMMON REPTILE AND AMPHIBIAN SPECIES OF THE REGION

Common Name	*Scientific Name*
American Toad	*Bufo americanus*
Blue Spotted Salamander	*Ambystoma laterale*
Bluetailed or Five-lined Skink	*Eumeces fasciatus*
Boreal Chorus Frog	*Pseudacris triseriata maculata*
Bull Snake	*Pituophus melanoleucus*
Canadian Toad	*Bufo hemiophrys*
Eastern Tiger Salamander	*Ambystoma tigrinum tigrinum feriarum*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Gray Tree Frog	*Hyla versicolor*
Great Plains Toad	*Bufo cognatus*
Mud Puppy	*Necturus maculosus*
Leopard Frog	*Rana pipens*
Northern Prairie Skink	*Eumeces septentrionalis*
Northern Leopard Frog	*Rana pipiens pipiens parietalis*
Painted Turtle	*Chrysemys pictabelli*
Plains Garter Snake	*Thamnophis radix*
Prairie Skink	*Eumeces septentrionalis*
Red-sided Garter Snake	*Thamnophis sirtalis parietalis*
Red-bellied Snake	*Storeria occipitomaculata sayi septentrionalis*
Smooth Green Snake	*Opheodrys vernalis*
Snapping Turtle	*Chelydra serpentina triseriata*
Tiger Salamander	*Ambystoma tigrinum*
Upland Chorus Frog	*Pseudacris triseriata*
Western Painted Turtle	*Chrysemys picta belli*
Western Spiny Softshell	*Trionyx spinifer hartwegi*

Table C–7
COMMON REPTILE AND AMPHIBIAN SPECIES OF THE REGION

Common Name	*Scientific Name*
Western Hognose Snake	*Heterodon nasicus*
Western Plains Garter Snake	*Thamnophis radix haydeni*
Western Chorus Frog	*Pseudacris triseriata*
Wood Frog	*Rana sylvatica*

3. Birds of the Region:

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
1	Common Loon		U			
4	Horned Grebe	C				
5	Eared Grebe		U	U		
6	Pied-billed Grebe		C	C		
7	Red-necked Grebe		R	R		
8	Western Grebe		C	U		
14	Double-crested Cormorant		C	C		
17	Tundra Swan		C			**
18	Snow Goose		C			*
19	Ross' Goose		Cas			
20	White-fronted Goose		U			*
21	Canada Goose	U	A	A		*
23	American Black Duck		R	R		*
25	Gadwall		C	U		*
26	Mallard	U	A	A		*
27	Northern Pintail		C	C		*
28	American Wigeon		C			*
29	Wood Duck		C	C		*
30	Northern Shoveler		C	C		*
31	Blue-winged Teal		A	A		*
32	Green-winged Teal		A			*

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
33	White-winged Scoter		U			*
34	Surf Scoter		R			*
36	Oldsquaw		R			*
40	Canvasback		C	U		*
41	Redhead		C	U		*
42	Ring-necked Duck		C			*
43	Lesser Scaup		C			*
44	Greater Scaup		U			*
45	Common Goldeneye		C			*
46	Barrow's Goldeneye		Cas			*
47	Bufflehead		C			*
48	Ruddy Duck		C	C		*
49	Common Merganser		C			*
50	Red-breasted Merganser		C			*
51	Hooded Merganser		R			*
52	American Coot		A	A		*
53	Common Gallinule		R			
61	White Pelican		A	C		
68	Glaucous Gull		R			
70	Herring Gull		U			
71	Ring-billed Gull		A			
74	Franklin's Gull		A	C		
76	Bonaparte's Gull		R			

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

AOU Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
80	Caspian Tern		U			
83	Common Tern		C	C		
84	Forster's Tern		C	C		
86	Black Tern		C	C		
88	Great Blue Heron		C	C		
89	Little Blue Heron		Cas			
92	Great Egret		C	C		
93	Snowy Egret		R			
96	Black-crowned Night Heron		C	C		
98	Green Heron		U	U		
99	Least Bittern		U	U		
100	American Bittern		U	U		
102	Sandhill Crane		U			**
104	White-faced Ibis		Cas			
107	Virginia Rail		C	C		*
108	King Rail		R	R		
110	Sora		C	C		*
115	American Avocet		R	R		
116	Black-bellied Plover		C			
117	Lesser Golden Plover		A			
118	Ruddy Turnstone		U			
119	Semipalmated Plover		U			
120	Piping Plover		R			

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common; **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
123	Killdeer		A	A		
124	American Woodcock		U	R		*
125	Common Snipe		C	C		
126	Short-billed Dowitcher		U			
127	Long-billed Dowitcher		U			
127	Red Knot		R			
128	Hudsonian Godwit		U			
129	Marbled Godwit		U	U		
130	Long-billed Curlew		Cas			
132	Willet		Cas			
133	Greater Yellowlegs		C			
134	Lesser Yellowlegs		R			
135	Solitary Sandpiper		A			
136	Sanderling		U			
136	Buff-breasted Sandpiper		R			
137	Upland Sandpiper		C	C		
138	Pectoral Sandpiper		C			
139	Stilt Sandpiper		U			
142	Spotted Sandpiper		C	C		
143	Least Sandpiper		C			
144	Semipalmated Sandpiper		U			
145	Western Sandpiper		C			
146	Baird's Sandpiper		U			

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
147	White-rumped Sandpiper		C			
148	Wilson's Phalarope		C	U		
149	Northern Phalarope		R			
151	Wild Turkey	X				*
153	Ring-necked Pheasant	C				*
159	Gray Partridge	C				*
163	Sharp-shinned Hawk		U			
164	Cooper's Hawk		U	R		
165	Northern Goshawk				R	
166	Northern Harrier		C	C		
167	Red-tailed Hawk		C	C		
168	Swainson's Hawk		C	C		
169	Rough-legged Hawk		U		C	
171	Broad-winged Hawk		C	C		
173	Bald Eagle		C		U	
174	Golden Eagle				R	
175	Osprey		U			
176	Turkey Vulture		U			
179	American Kestrel		C	C		
180	Merlin		R			
181	Peregrine Falcon		R			
182	Gyrfalcon				R	
183	Short-eared Owl	R				

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in tbe wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
184	Common Screech Owl	C				
185	Long-eared Owl		U			
186	Great Horned Owl	C				
187	Barred Owl	U				
190	Snowy Owl				U	
192	Saw-whet Owl	R				
193	Burrowing Owl	R				
195	Mourning Dove		A**	A**		**
196	Rock Dove	A				
197	Yellow-billed Cuckoo		U	U		
198	Black-billed Cuckoo		U	U		
200	Common Nighthawk		C	C		
201	Whip-poor-will			R		
204	Ruby-throated Hummingbird		C	C		
205	Belted Kingfisher		C	C		
206	Red-headed Woodpecker		C	C		
207	Pileated Woodpecker	R				
208	Common Flicker		C	C		
209	Red-bellied Woodpecker		R	R		
211	Yellow-bellied Sapsucker		C	U		
212	Downy Woodpecker	C				
213	Hairy Woodpecker	C				
217	Eastern Kingbird		C	C		

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
218	Western Kingbird		C	C		
220	Great Crested Flycatcher		U	U		
221	Eastern Pewee		U	U		
222	Eastern Phoebe		C	C		
223	Olive-sided Flycatcher		U			
225	Yellow-bellied Flycatcher		U			
226	Least Flycatcher		U	U		
227	Willow Flycatcher		U			
229	Horned Lark	C				
230	Water Pipit		C			
231	Sprague's Pipit		R			
232	Purple Martin		C	C		
233	Cliff Swallow		C	C		
234	Barn Swallow		C	C		
235	Tree Swallow		C	C		
236	Rough-winged Swallow		C	C		
237	Bank Swallow		C	C		
238	Chimney Swift		C	C		
240	American Crow	C				
242	Blue Jay	C				
245	Black-billed Magpie				U	
246	Black-capped Chickadee	C				
250	White-breasted Nuthatch	C				

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
251	Red-breasted Nuthatch		U			
253	Brown Creeper	U	C			
254	House Wren		A	A		
255	Winter Wren		U			
258	Marsh Wren		C	C		
259	Sedge Wren		A	A		
260	Golden-crowned Kinglet		C			
261	Rudy-crowned Kinglet		C			
263	Brown Thrasher		C	C		
264	Gray Catbird		C	C		
265	Northern Mockingbird		C	C		
265	Mountain Bluebird		Cas			
266	Eastern Bluebird		U	U		
267	American Robin		A	A		
269	Gray-cheeked Thrush		U			
270	Swainson's Thrush		C			
271	Hermit Thrush		C			
272	Veery		U	U		
274	Northern Shrike				U	
275	Loggerhead Shrike		U	U	U	
277	Cedar Waxwing		C	U		
278	Red-eyed Vireo		C	C		
280	Warbling Vireo		C	C		

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
281	Philadelphia Vireo		U			
282	Yellow-throated Vireo		U	U		
285	Solitary Vireo		U			
287	Northern Parula Warbler		R			
289	Black-throated Green Warbler		R			
290	Black-and-White Warbler		C			
291	Blackpoll Warbler		C			
292	Black-throated Blue Warbler		R			
294	Nashville Warbler		A			
294	Magnolia Warbler		C			
295	Yellow-rumped Warbler		C			
297	Canada Warbler		U			
298	Cape May Warbler		R			
299	Chestnut-sided Warbler		U			
300	Bay-breasted Warbler		U			
301	Blackburnian Warbler		U			
302	American Redstart		C			
303	Pine Warbler		R			
305	Palm Warbler		A			
307	Yellow Warbler		C	C		
310	Tennessee Warbler		A			
311	Orange-crowned Warbler		C			
312	Wilson's Warbler		C			

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
314	Golden-winged Warbler		U			
316	Connecticut Warbler		C			
317	Mourning Warbler		U			
319	Common Yellowthroat		A	A		
321	Northern Waterthrush		U			
323	Ovenbird		C			
324	Red-winged Blackbird	U	A	A		
325	Yellow-headed Blackbird		A	A		
326	Brown-headed Cowbird		A	A		
327	Rusty Blackbird		C			
328	Brewer's Blackbird		C	C		
329	Common Grackle		A	A		
331	Bobolink		C	C		
333	Western Meadowlark		C	C		
334	European Starling	A				
335	Orchard Oriole		U	U		
337	Northern Oriole		A	A		
340	Scarlet Tanager		R	R		
341	House Sparrow	A				
343	Dickcissel		C	C		
344	Lark Bunting		R	R		
345	Lapland Longspur				C	
346	Chestnut Collared Longspur		U			

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

AOU Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
349	Northern Junco				C	
350	Snow Bunting				C	
351	Cardinal	R				
352	Red Crossbill				U	
354	Common Redpoll				C	
357	Purple Finch				U	
359	Evening Grosbeak				C	
360	American Goldfinch	C				
361	Pine Siskin				C	
363	Indigo Bunting		C	C		
365	Rose-breasted Grosbeak		C	C		
366	Rufous-sided Towhee		U			
367	White-throated Sparrow		A			
368	White-crowned Sparrow		U			
369	Harris' Sparrow		C			
370	Chipping Sparrow		C	C		
371	Field Sparrow		U	U		
372	Swamp Sparrow		U	U		
373	American Tree Sparrow	U		C		
374	Lark Sparrow		R	R		
375	Clay-colored Sparrow		C	C		
376	Grasshopper Sparrow		C	C		
378	Fox Sparrow		U			

Table C–8

REGIONAL BIRD SPECIES

A = abundant; **C** = common: **U** = uncommon
* = gamebird ** = gamebird (Dakotas only) **R** = rare
Cas = casual; **X** = probable; (domestic birds breeding in the wild)

A O U Number	Common Name	Permanent Resident	Migrant	Summer Resident	Winter Visitor	Game Bird
379	Song Sparrow		A	A		
380	Vesper Sparrow		C	C		
381	Lincoln's Sparrow		C			
382	Savannah Sparrow		C	C		
385	Henslow's Sparrow		R	R		
386	Sharp-tailed Sparrow		R			
387	Le Conte's Sparrow		U	U		

Rare and Endangered Species:

The following species have been declared as threatened or endangered under Minnesota State law:

1. **Rare or Endangered Reptiles:**

The following reptile species have been declared threatened or endangered under Minnesota State law. The list was supplied by the Minnesota Department of Natural Resources; scientific and common names follow Standard Common and Current Scientific Names for North American Amphibians and Reptiles, second edition, J.T.Collins et al., 1982:

Table C–9

RARE, THREATENED OR ENDANGERED AMPHIBIANS AND REPTILES

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
ENDANGERED:	Five-lined Skink	*Eumeces fasciatus*
THREATENED:	Wood Turtle	*Clemmys insculpta*
	Blanding's Turtle	*Emydoidea blandingi*
SPECIAL CONCERN:	Northern Cricket Frog [Blanchard's Cricket Frog]	*Acris crepitans*
	Snapping Turtle	*Chelydra serpentina*
	Racer [Blue Racer]	Coluber constrictor
	Timber Rattlesnake	*Crotalus horridus*
	Rat Snake [Black Rat Snake]	*Elaphe obsoleta*
	Fox Snake	*Elaphe vulpina*
	Western Hognose Snake	*Heterodon nasicus*
	Eastern Hognose Snake	*Heterodon platyrhinos*
	Milk Snake	*Lampropeltis triangulum*
	Gopher Snake [Bull Snake]	*Pituophis melanoleucus*
	Massassauga	*Sistrutus catenatus*
	Lined Snake	*Tropidoclonion lineatum*

Table C–9

RARE, THREATENED OR ENDANGERED AMPHIBIANS AND REPTILES

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
	Bullfrog	*Rana catesbeiana*
	Pickerel Frog	*Rana palustris*

2. Rare or Endangered Birds:

The following bird species have been declared threatened or endangered under Minnesota State law. The list was supplied by the Minnesota Department of Natural Resources; scientific and common names follow the American Ornithologists' Union Checklist, 1983:

Table C–10

TABULAR LISTING OF RARE, THREATENED OR ENDANGERED BIRDS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
ENDANGERED:	Sprague's Pipit	*Anthus spragueii*
	Baird's Sparrow	*Ammodramus bairdii*
	Burrowing Owl	*Athene cunicularia*
	Chestnut-collared Longspur	*Calcarius ornatus*
	Piping Plover [Breeding population in Duluth Harbor]	*Charadrius melodus*
	Peregrine Falcon	*Falco peregrinus*
THREATENED:	Piping Plover [Population at Lake of the Woods]	*Charadrius melodus*
	Bald Eagle	*Haliaeetus leucocephalus*
	Loggerhead Shrike	*Lanius ludovicianus*

Table C–10
TABULAR LISTING OF RARE, THREATENED OR ENDANGERED BIRDS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
SPECIAL CONCERN:	Henslow's Sparrow	*Ammodramus henslowii*
	Sharp-tailed Sparrow	*Ammospiza caudacutus*
	Short-eared Owl	*Asio flammeus*
	Upland Sandpiper	*Bartramia longicauda*
	American Bittern	*Botaurus lentiginosus*
	Red-shouldered Hawk	*Buteo lineatus*
	Yellow Rail	*Coturnicops noveboracensis*
	Common Moorhen	*Gallinula chloropus*
	Sandhill Crane	*Grus canadensis*
	Marbled Godwit	*Limosa fedoa*
	Osprey	*Pandion haliaetus*
SPECIAL CONCERN:	American White Pelican	*Pelecanus erythrorhynchos*
	Wilson's Phalarope	*Phalaropus tricolor*
	Horned Grebe	*Podiceps auritus*
	King Rail	*Rallus elegans*
	Louisiana Waterthrush	*Seiurus motacilla*
	Forster's Tern	*Sterna forsteri*
	Common Tern	*Sterna hirundo*
	Greater Prairie-chicken	*Tympanuchus cupido*

3. Rare or Endangered Butterflies:

The following butterfly species have been declared threatened or endangered under Minnesota State law. The list was supplied by the Minnesota Department of Natural Resources; scientific names follow A Catalogue/Checklist of the Butterflies of America North of Mexico, L.D. Miller and S.M. Brown, 1981:

Table C-11
TABULAR LISTING OF RARE, THREATENED OR ENDANGERED BUTTERFLIES

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
ENDANGERED:	Assiniboia Skipper	*Hesperia assiniboia* (Lyman) [*Hesperia comma assiniboia*]
	Uncas Skipper	*Hesperia uncas* (W.H. Edwards)
	Uhler's Arctic	*Oeneis uhleri varuna* (W.H. Edwards)
THREATENED:	Dakota Skipper	*Hesperia dacotae* (Skinner)
	Ottoe Skipper	*Hesperia ottoe* W.H. Edwards
	Karner Blue	*Lycaeides samuelis* Nabakov [*Lycaeides melissa samuelis*]
SPECIAL CONCERN:	Freija Fritillary	*Clossiana freija* (Thunberg)
	Frigga Fritillary	*Clossiana frigga saga* (Staudinger)
	Dorcas Copper	*Epidemia dorcas dorcas* (W.Kirby)
	Bog Copper	*Epidemia epixanthe michiganensis* (Rawson)
	Disa Alpine	*Erebia disa mancinus* Doubleday and Hewitson
	Red-disked Alpine	*Erebia discoidalis discoidalis* (W.Kirby)
	Poweshiek Skipper	*Oarisma poweshiek* (Parker)
	Jutta Arctic	*Oeneis jutta ascerta* Masters and Sorenson
	Bog Fritillary	*Proclossiana eunomia dawsoni* (Barnes and McDunnough)

4. Rare or Endangered Mammals:

The following animal species have been declared threatened or endangered under Minnesota State law. The list was supplied by the Minnesota Department of Natural Resources; scientific names follow the Revised Checklist of North American Mammals North of Mexico, J. K. Jones, et al., 1982:

Table C–12

RARE, THREATENED OR ENDANGERED MAMMALS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
ENDANGERED:	Gray Wolf (North and South Dakota)	*Canis lupus*
THREATENED:	Gray Wolf (Minnesota)	*Canis lupus*
SPECIAL CONCERN:	American Elk	*Cervus elaphus*
	Least Shrew	*Cryptotis parva*
	Mountain Lion	*Felis concolor*
	Wolverine	*Gulo gulo*
	Marten	*Martes americana*
	Rock Vole	*Microtus chrotorrhinus*
	Prairie Vole	*Microtus ochrogaster*
	Woodland Vole	*Microtus pinetorum*
	Keen's Myotis	*Myotis keenii*
	Mule Deer	*Odocoileus hemionus*
	Heather Vole	*Phenacomys intermedius*
	Eastern Pipistrelle	*Pipistrellus subflavus*
	Caribou	*Rangifer tarandus*
	Eastern Spotted Skunk	*Spilogale putorius*
	Northern bog Lemming	*Synaptomys borealis*
	Northern Pocket Gopher	*Thomomys talpoides*

Common Wildlife by Habitat Type:

Table C–13

COMMON REGIONAL ANIMAL SPECIES BY HABITAT PREFERENCE

HABITAT	COMMON NAME	
Shallow Marsh:	Western Chorus Frog	Blue-winged Teal
	Upland Chorus Frog	Green Winged Teal
	Northern Leopard Frog	Great Blue Heron
	Gadwall	Sedge Wren
	Mallard	Marsh Wren
	Northern Pintail	Red-winged Blackbird
	American Wigeon	Yellow-headed Blackbird
	Wood Duck	Common Yellowthroat
	Northern Shoveler	Mink
		Muskrat
Deep Marsh:	Snapping Turtle	Ring-necked Duck
	Western Painted Turtle	Lesser Scaup
	Western Spiny Softshell	Common Goldeneye
	Pied-billed Grebe	Hooded Merganser
	Canvasback	American Coot
	Redhead	Beaver
Open Water:	Common Loon	White Pelican
	Double Crested Cormorant	Herring Gull
	Tundra Swan	Ring-billed Gull
	Snow Goose	Franklin's Gull
	Canada Goose	Mud Puppy

Table C–13

COMMON REGIONAL ANIMAL SPECIES BY HABITAT PREFERENCE

HABITAT	COMMON NAME	
Grasslands:	Common Flicker	Franklin's Ground Squirrel
	Eastern Kingbird	Richardson Ground Squirrel
	Western Kingbird	Thirteen-lined Ground Squirrel
	Eastern Bluebird	Redback Vole
	American Robin	Starnose mole
	Bobolink	Plains Pocket Gopher
	Western Meadowlark	White-tailed Jackrabbit
	White-throated Sparrow	Prairie Vole
	Chipping Sparrow	Meadow Vole
	Song Sparrow	Deer Mouse
	Western Hognose Snake	White-footed Mouse
	Bull Snake	Eastern Mole
	Red-bellied Snake	Masked Shrew
	Western Plains Garter Snake	Badger
	Short-tailed Shrew	Red Fox
	Coyote	Meadow Jumping Mouse
Farmland:	Rock Dove	Virginia Oppossum
	American Crow	Raccoon
	European Starling	Ring-necked Pheasant
	House Sparrow	Gray Partridge
		Mourning Dove
Shrublands:	Woodchuck	Swainson's Hawk
	Eastern Cottontail	American Kestrel
	Short-tailed Weasel	Great Horned Owl
	Least Weasel (3)	House Wren

Table C–13

COMMON REGIONAL ANIMAL SPECIES BY HABITAT PREFERENCE

HABITAT	COMMON NAME	
Shrublands:	Striped Skunk	Brown-headed Cowbird
	Gray Fox	Brown Thrasher
	Northern Harrier	Gray Catbird
	Red-tailed Hawk	American Goldfinch
Forest:	White-tailed Deer	Hairy Woodpecker
	Gray Squirrel	Eastern Phoebe
	Eastern Fox Squirrel	Black-capped Chickadee
	American Woodcock	White-breasted Nuthatch
	Broad-winged Hawk	Cedar Waxwing
	Red-headed Woodpecker	Red-eyed Vireo
	Pileated Woodpecker	Northern Oriole
	Downy Woodpecker	Cardinal
		Rose-breasted Grosbeak

FISHERIES

Fish Species of Western Minnesota:

Table C–14

COMMON FISH SPECIES OF THE REGION

COMMON NAME	*SCIENTIFIC NAME*
American Eel	*Fundulus diaphanus*
Banded Killifish	
Bigmouth Shiner	*Pomoxis nigro maculatus*
Black Crappie	*Ictalurus melas*
Black Bullhead	
Blackside Darter	*Leopomis macrochirus*
Bluegill	*Pimephales notatus*
Bluntnose Minnow	*Amia calva*
Bowfin	
Branded Darter	
Brassy Minnow	*Culaea inconstans*
Brook Stickleback	*Ictalurus nebulosus*
Brown Bullhead	
Carp	
Central Weed Shiner	*Umbra limi*
Central Mudminnow	*Ictalurus punctatus*
Channel Catfish	*Notropis cornutus*
Common Shiner	
Creek Chub	*Notropis atherinoides*
Emerald Shiner	*Cyprinus carpio*
European Carp	
Fantail Darter	*Pimephales promelas*
Flathead Minnow	*Aplodinotus grunniens*

Table C–14

COMMON FISH SPECIES OF THE REGION

COMMON NAME	*SCIENTIFIC NAME*
Freshwater Drum	
Gizzard Shad	
Golden Redhorse	
Golden Shiner	
Goldey	
Green Sunfish	*Hybopsis biguttata*
Hornyhead Chub	*Etheostoma exile*
Iowa Darter	*Etheostoma nigrum*
Johnny Darter	*Micropterus salmoides*
Largemouth Bass	*Ictiobus cypinellus*
Largemouth Buffalofish	
Longnose Gar	
Mimic Shiner	
Mooneye	
Ninespine Sticleback	*Pungitius pungitius*
Northern Pike	*Esox lucius*
Northern Redbelly Dace	
Northern Lake Chub	*Couesius plumbea*
Northern Hogsucker	
Northern Redhorse	*Moxostoma macrolepidotum*
Orange-spotted Sunfish	*Leopomis humilis*
Pearl Dace	
Quillback Carpsucker	*Carpiodes cyprinus*
Rainbow Darter	
River Shiner	
River Carpsucker	

Table C–14

COMMON FISH SPECIES OF THE REGION

COMMON NAME	*SCIENTIFIC NAME*
Rockbass	*Ambloplites rupestris*
Rosyface Shiner	
Sand Shiner	
Sauger	
Shortnose Gar	*Lepisosteus platostomus*
Silver Chub	
Silver Redhorse	
Slenderhead Darter	
Smallmouth Buffalofish	
Smallmouth Bass	*Micropterus dolomieui*
Southern Redbelly Dace	
Speckled Chub	
Spottail Shiner	*Notropis procne*
Stone Roller	
Stonecat	
Tadpole Madtom	
Walleye	*Stizostedion vitreum*
White Bass	*Roccus chrysops*
White Sucker	*Catostomus commersoni*
White Crappie	
Yellow Perch	*Perca flavescens*
Yellow Bullhead	*Ictalurus natalis*

Rare and Endangered Species:

1. **Rare or Endangered Mollusks:**

The following mollusk species have been declared threatened or endangered under Minnesota State law. The list was supplied by the Minnesota Department of Natural Resources; scientific names follow Freshwater Mollusca of Wisconsin, Part II: Pelecypoda, F.C. Collins, 1982:

Table C–15

RARE, THREATENED OR ENDANGERED FRESHWATER MOLLUSKS

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
ENDANGERED:	Higgin's Eye	*Lampsilis higginsi* (Lea)
	Fat Pocketbook	*Proptera capax* (Green)
THREATENED:	None	
SPECIAL CONCERN:	Elephant Ear	*Elliptio crassidens* (Lamarck)
	Ebony Shell	*Fusconaia ebena* (Lea)

2. Rare or Endangered Fish Species:

The following fish species have been declared threatened or endangered under Minnesota State law. The list was supplied by the Minnesota Department of Natural Resources; scientific and common names follow A List of Common and Scientific Names of Fishes from the United States and Canada, third edition, American Fisheries Society, 1979:

Table C–16

RARE, THREATENED OR ENDANGERED FISH

CLASSIFICATION	COMMON NAME	*SCIENTIFIC NAME*
ENDANGERED:	None	
THREATENED:	None	
SPECIAL CONCERN:	Lake Sturgeon	*Acipenser fulvescens*
	Crystal Darter	*Ammocrypta asprella*
	Blue Sucker	*Cycleptus elongatus*
	Bluntnose Darter	*Etheostoma chlorosomum*
	Plains Topminnow	*Fundulus sciadicus*
	Gravel Chub	*Hybopsis x-punctata*
	Blue Catfish	*Ictalurus furcatus*
	American Brook Lamprey	*Lampetra appendix*
	Yellow bass	*Morone mississippiensis*
	Black Redhorse	*Moxostoma duquesnei*
	Pallid Shiner	*Notropis amnis*
	Pugnose Minnow	*Notropis emilae*
	Topeka Shiner	*Notropis topeka*
	Slender Madtom	*Noturus exilis*
	Paddlefish	*Polyodon spathula*
	Shovelnose Sturgeon	*Scaphirhynchus platorynchus*

APPENDIX D – VISUAL RESOURCES

INTRODUCTION:

The visual resources of each project were surveyed and Visual Quality Evaluations were done for each day use area on every project in the Master Plan. For additional information on visual quality see Section 1, Chapter 4, Project Specific Factors and Resources, and/or Chapter 3, Key Factors and Resources of the Region, of the appropriate section.

VISUAL QUALITY EVALUATION, LAKE TRAVERSE PROJECT:

The Lake Traverse Project has three small day use areas (DUA) at White Rock Dam, Reservation Dam, and Browns Valley (north to south, respectively). The entire project lies within a wide

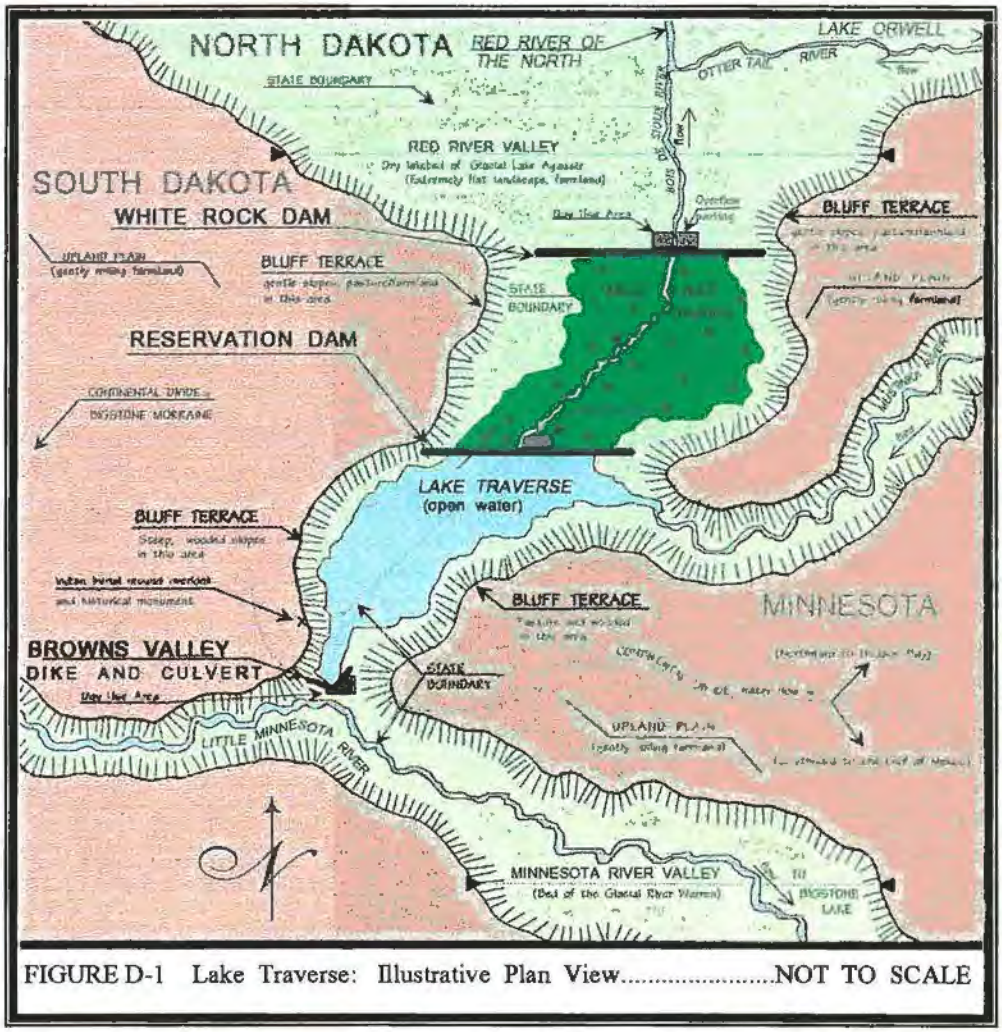


FIGURE D-1 Lake Traverse: Illustrative Plan View.....NOT TO SCALE

shallow valley that in turn, is surrounded by the vast openness of the Great Plains of North America, a region that is almost exclusively devoted to agriculture (illustrated in Figure D-1). The project has two pools, Lake Traverse, the conservation pool, and Mud Lake, the flood control pool. This is the headwaters of the Bois de Sioux River, which flows northward into the Red River Valley of the North. The project includes channelization projects along the length of the river.

White Rock Dam Day Use Area:

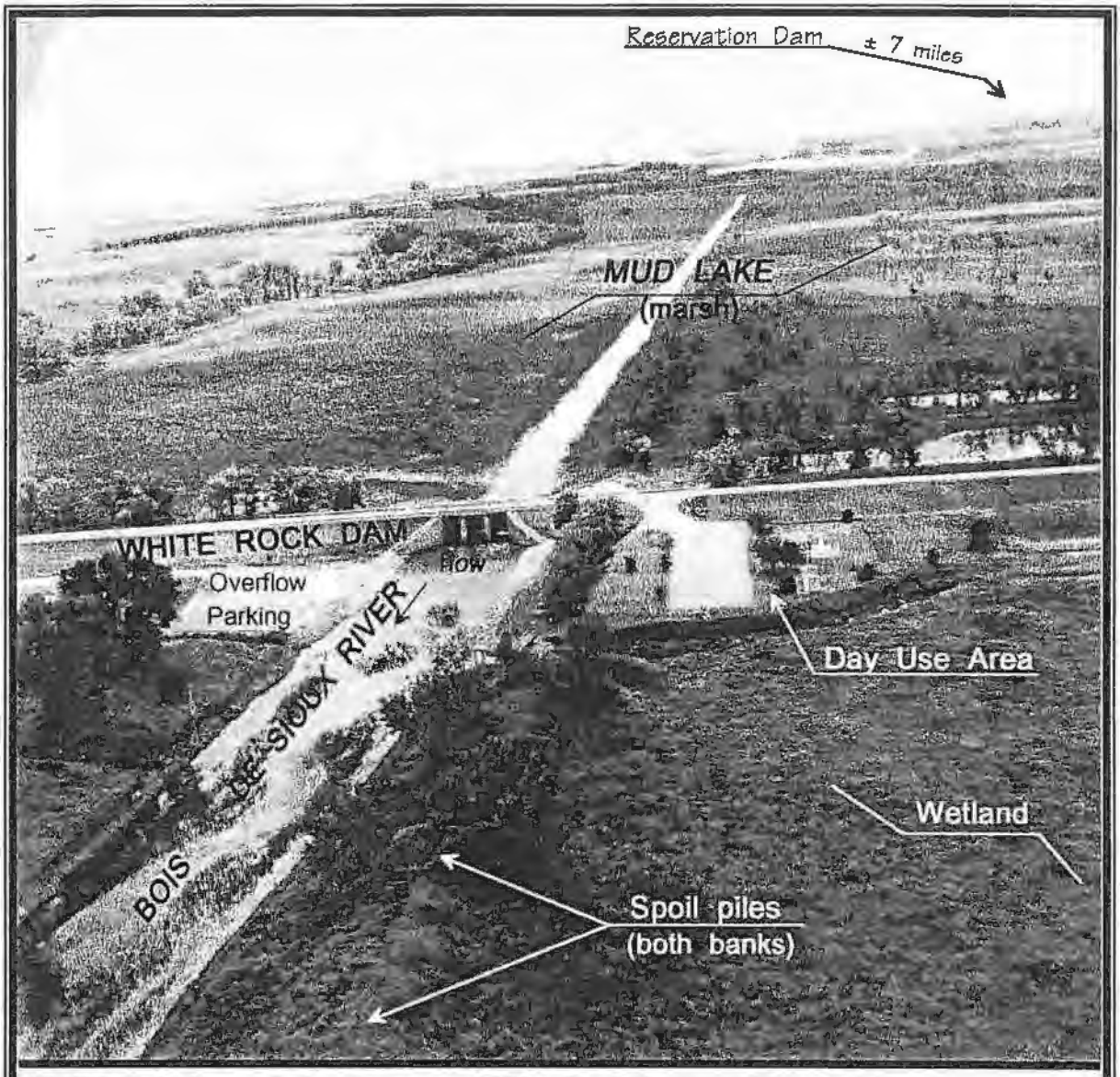


FIGURE D-2 Lake Traverse: White Rock Dam and Mud Lake

White Rock Dam lies on the northernmost, or downstream, end of the lakes. It is the flood control structure for the project, controlling the level of Mud Lake and, during flood events, Lake Traverse (Figures D-2, D-3 and D-4).

FIGURE D-3 Lake Traverse: White Rock Dam Day Use Area

This is the northern tip of the Valley of the Red River of the North; the dry bed of Glacial Lake Agassiz. The valley here is only 2-3 miles wide. Mud Lake is contained by the dam and low bluffs to the east and west.

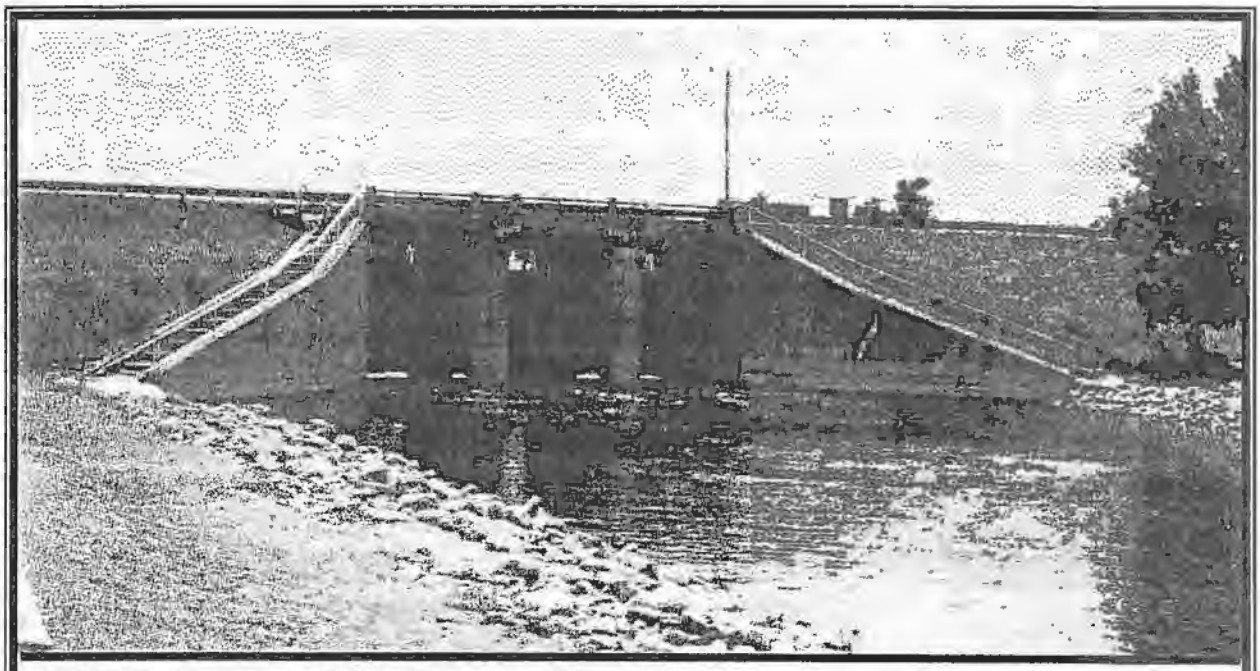


FIGURE D-4 Lake Traverse: White Rock Dam Control Structure

On the Great Plains, the sky is the overwhelmingly dominant feature with the horizon fading into the seemingly limitless distances. This is the Red River Valley, and the plain is extremely flat. This site has a few young maples that are insignificant against this visual dominance. As a whole, the visual quality of this site is low to medium, but has exceptional potential for improvement.

The tailwater facilities are small, human scale. The size of the site and the stream, and the young trees contribute to this. The large, flat plain surrounding the site accentuates it. The visual quality of this area will improve as the trees mature.

FIGURE D-5 Lake Traverse: Channelization of Mud Lake

Mud Lake, through most of the year, is a large (2-3 miles wide, about 7 miles long) wetland dominated by cattails (Figure D-5). This area, with its low population density, is a fine example of the original prairie wetlands of this region that, historically, covered many thousands of additional acres.

This lake and its surrounding wildlife management area, with its low population density, rural setting, and large, relatively undisturbed areas of prime habitat, has high potential as a wildlife based recreation area.

Recent efforts to restore the lake's waterfowl production include channelization and the construction of several loafing islands. The channelization of Mud Lake and of the Bois de Sioux

River, with their arrow straight channels, are strong detractors to the naturalness of this area. As a large prairie wetland however, visual quality is still high. The lake is not accessible and must be viewed from the highway. From this distance, the details of this plant community are not discernible and the many acres of cattails do not hold the casual viewer's interest.

The Bois de Sioux River is a small stream and, historically, has been known to dry up completely during periods of extended drought (Figure D-6). It was a typical river of the plains, winding and shallow, with many oxbow lakes and large areas of wetlands. As a result of the channelization efforts of the project, it is restricted to an unnaturally straight, narrow watercourse and is lined with spoil piles and a few young cottonwood trees.

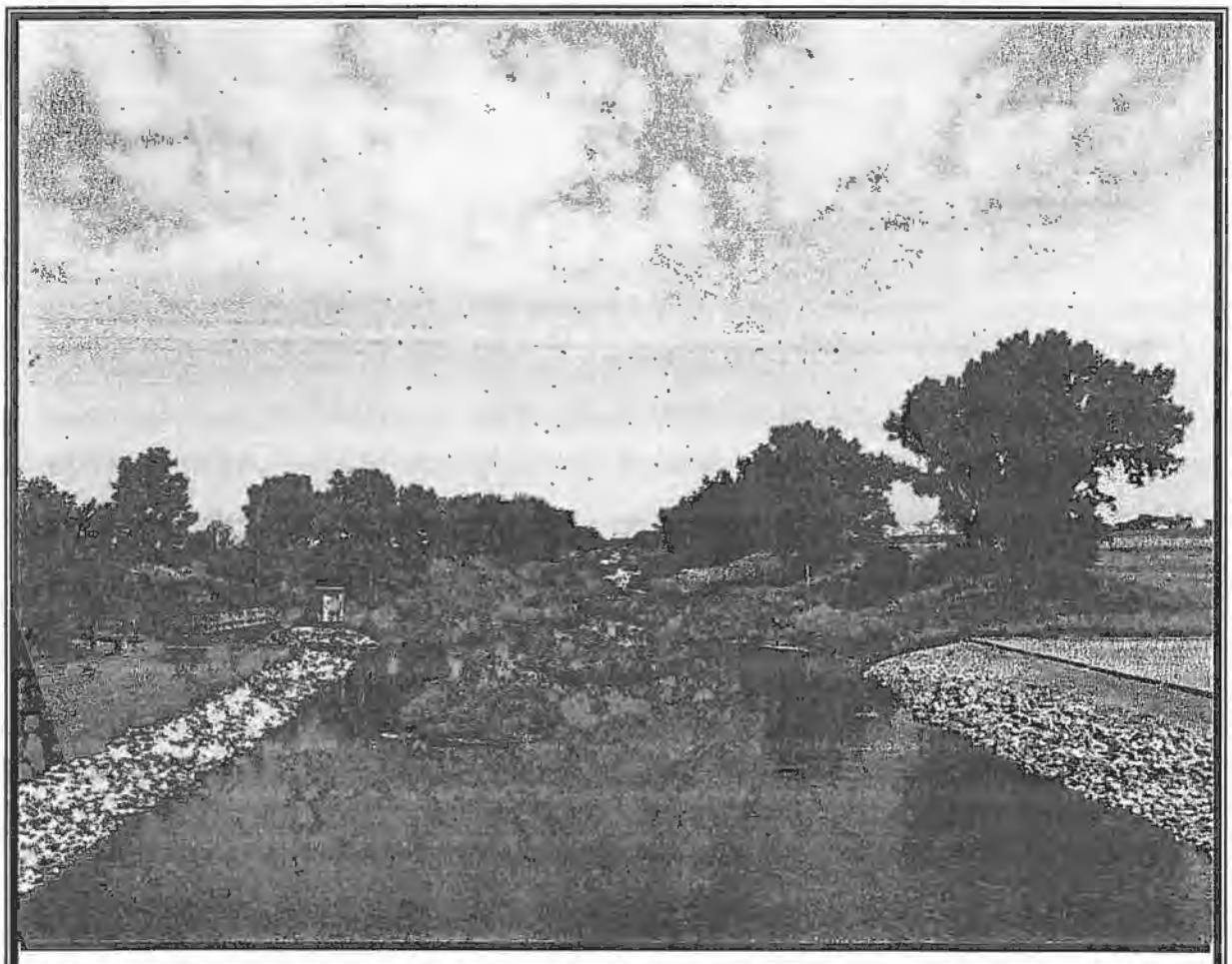


FIGURE D-6 Lake Traverse: Bois de Sioux River

The visual element of the river is strengthened by the endless expanse of the sky and the extreme flatness of the nearly featureless plain. This site promotes the feel of the original native prairie, with very large, flat, endless vistas of empty distance that only the open oceans can compare to. This was a strong part of the metaphorical "sea of grass" that the pioneers used in describing this phenomenon.

Table D-1
Unit Name: White Rock Dam Day Use Area **Physiographic Region:** Bed of large (dry) glacial lake

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Extremely flat to the north and south, essentially featureless farmland or wetland. Low bluffs directly east, and two miles to the west. WATER: Small river (tailwater) draining large wetland.	Wetland (cattails etc.) with distinct riparian edge surrounded by crops. Site is a river bank in middle of the wetland, with a few Silver Maples and turf grass. Farmland is adjacent to the east.	Privies and dam with control structure - industrial strength form, very intrusive.
LINE	Very strong horizon and bluff line. Land/water edge is strong but not very significant.	Maples provide strong vertical but are overpowered by the wide spaces surrounding them.	The structures provide strong geometry, bollards provide short, strong verticals. Road on dam embankment is very strong, contributes to powerful horizontal line.
COLOR	Entirely covered by vegetation. The water has a high algae content, very green.	Little variety, the green of the wetlands fade into the green of the croplands - nice green. Winter vegetation is warm browns.	Brown of privies compliments various greens. Other structures are nondescript - do not contribute.
TEXTURE	Bluffs close in and spoil piles along river are coarse, all else is fine, recedes to infinity.	Trees on site, riparian edge in the immediate viewshed, emergent vegetation on spoil piles is coarse; wetlands and croplands are fine.	Dam, control structure, parking lots and buildings are coarse.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM			1	The openness is very strong but does not hold interest.
VEGETATION			2	Wetland is attractive, but site lacks visual variety.
WATER		2		River is strongest attraction, few resources to the west.
COLOR			1	Sky is dominant.
INFLUENCE		2		Few resources to the west.
SCARCITY		3		W.M.A.
MODIFICATION			0	Spoil piles and parking lots are extremely disruptive.
TOTALS	0	+ 3	+ 8	= 11 **(HIGH > 17 MEDIUM = 12-17 LOW < 12)**

Reservation Dam Day Use Area:

Reservation Dam controls the level of Lake Traverse. As with the White Rock area, the sky dominates the visual resources of the site. The bluffs are more noticeable here but still too distant to affect the visual qualities of the site (Figure D-7).

FIGURE D-7 Lake Traverse: Reservation Dam and Day Use Area

This 3 acre site has very little shade. It is located to provide access to the tailwater of the dam. As with the White Rock DUA, visual quality is low, and the site has great potential for improvement.

The entire day use area is easily viewed with a glance and has no substantial features (Figure D-8). The lack of significant vegetation accentuates the openness of the site. Trees would reduce the impact of the sky, and provide a much needed feeling of shelter and refuge.

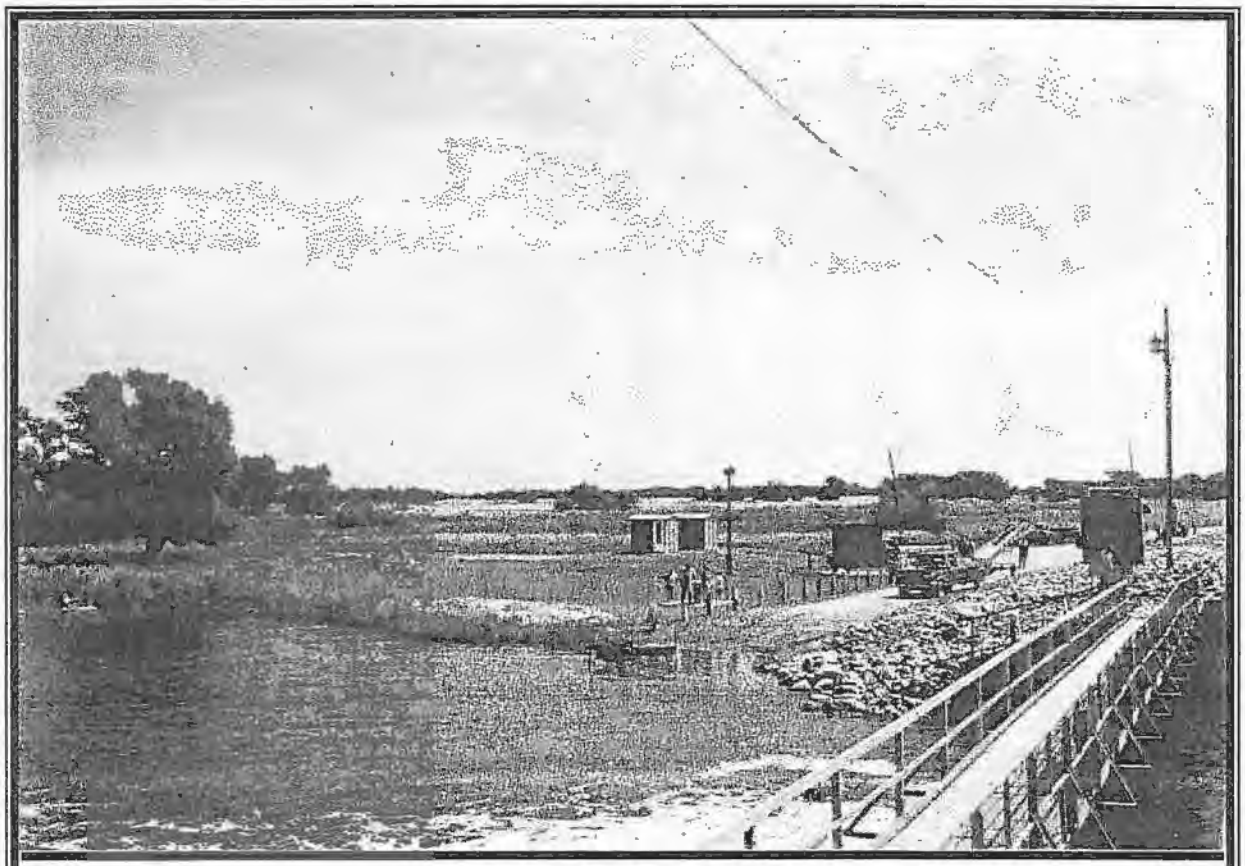


FIGURE D-8 Lake Traverse: Reservation Dam Day Use Area

This site is surrounded by Wildlife Management Areas (Figure D-9). Historically the area had an international reputation as a waterfowl hunting mecca. The site's proximity to the Mustinka River (2 miles east), a shaded, quiet, meandering stream, and White Rock Dam (± 7 miles north), with its miles of cattail marsh, creates great potential for wildlife related recreation opportunities.

Mud Lake and the mouth of the Mustinka River are excellent examples of prairie marsh as it was before the advent of European colonization. Increased opportunities to access this area would enable this site to realize this potential.

This site is small, human scale; a "friendly" oasis in an area of immense open spaces and vast distances.

FIGURE D-9 Lake Traverse: Miles of wetland habitat surround Reservation Day Use Area.

The small scale of the low dam, river, and control structure reinforce this feeling (Figure D-10). The stream and its activity, although not the dominant feature of the site, are the focus of this area and provide welcome contrast to the endless plain.

FIGURE D-10 Lake Traverse: Reservation Dam Control Structure

Table D-2
Unit Name: Reservation Dam Day Use Area **Physiographic Region:** Bed of larger dry lake (L. Agassiz)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Low indistinct bluffs to the east and west. Site is on river bank (wetland). WATER: Dominant feature, small river below low dam, large lake behind.	Medium impact, wetland dominates, very few trees.	Privies dominate site, built on mound.
LINE	River edge is very strong from site. Lake dominates from embankment, somehow it seems a surprise, possibly because of the low dam height.	The few trees on the site have interesting shapes.	Structure is too strong on this site; road, parking, control structure and privies overpower the natural sense of place that this site has.
COLOR	Land colors not evident. Strong water/sky presence.	Wetland vegetation, cattail, dogwood, etc. Seasonal green. Winter is soft, warm browns.	Grays of control structure and rip-rap are very out of place, extremely intrusive.
TEXTURE	Not evident, site and surround is flat.	Wetland plants are fine. The few areas of trees (clumps) are medium to coarse.	Coarse: parking, rip-rap, control structure, privies.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM			1	Extremely flat. Bluffs in distance
VEGETATION			2	Strong wetland presence.
WATER		3		Tailwater is strong presence.
COLOR			2	Sky and green(s)of marsh have powerful influence
INFLUENCE			2	Few resources of this type west of this site.
SCARCITY		3		Wildlife Management Area
MODIFICATION			1	Dam, parking and rip-rap, concentrated at south end.
TOTAL	0	+ 6	+ 8	= 14 **(HIGH > 17 MEDIUM = 12-17 LOW < 12)**

Browns Valley Day Use Area:

This area lies at the southernmost tip of Lake Traverse. Reservation Dam is about 17 miles to the northeast. One interesting natural occurrence at the site is that it sits astride the north/south continental divide. Water to the north of the road in the illustration (Figure D-11) flows to Hudson Bay, water south of the road flows to the Gulf of Mexico.

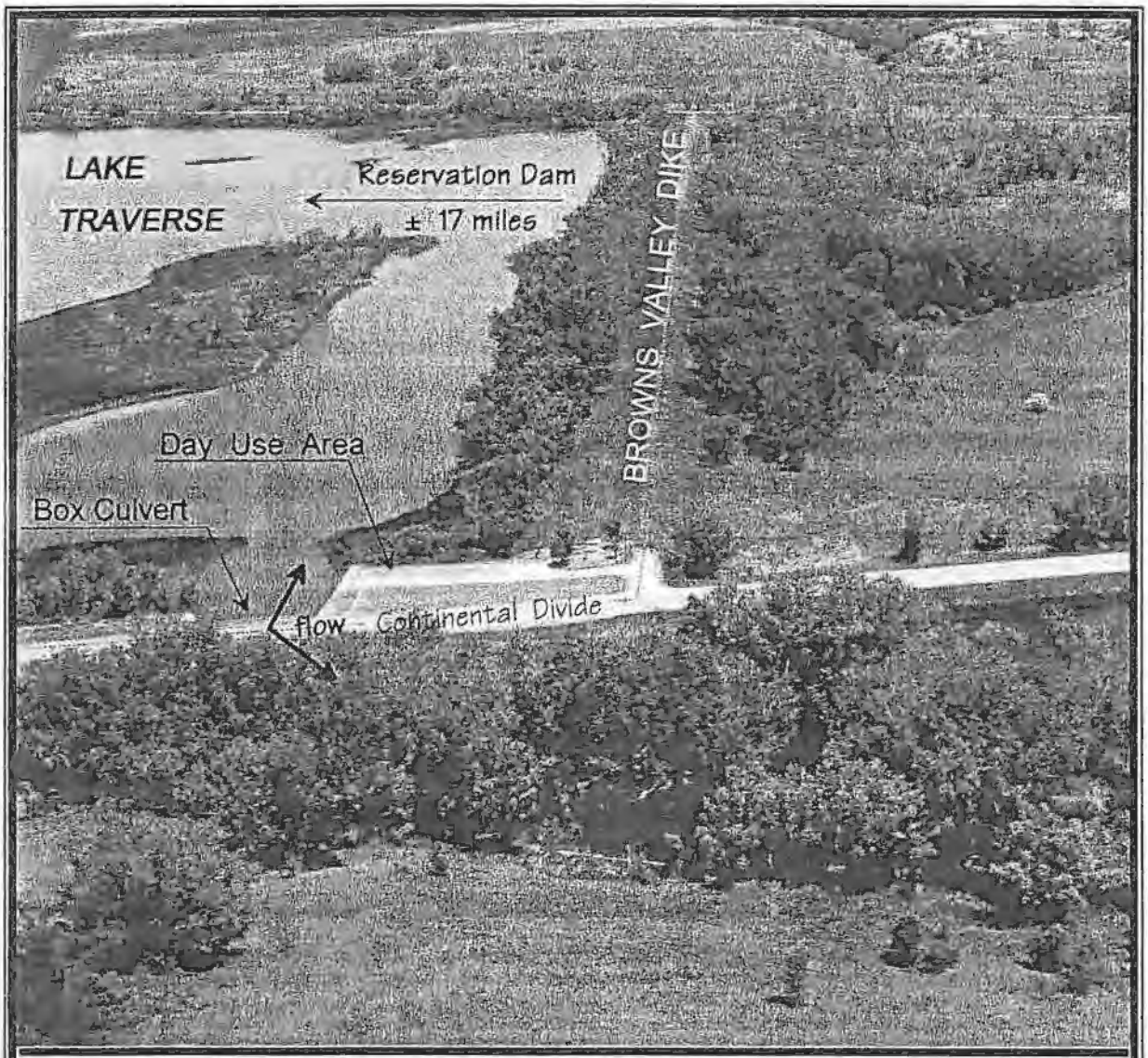


FIGURE D-11 Lake Traverse: Browns Valley Dike and Day Use Area

It is here that Lake Agassiz broke through the Bigstone Moraine, initiating the process (described in Section 1 – Chapter 2) that eventually drained the huge lake. This was the head of the Glacial River Warren which, today is the Minnesota River Valley. The bluff in the accompanying illustration is a portion of the eroded moraine (Figure D-12).

FIGURE D-12 Lake Traverse: Continental Divide at Browns Valley Day Use Area.

Because the enclosing bluffs are less than a mile apart and quite close to the west, and the surrounding area has considerable tree cover, this site does not have the open, exposed feel of the White Rock and Reservation Day Use Areas.

The enclosing bluffs and trees, the lack of water movement, and the calm, quiet waterways winding through the masses of cattails give this site a feeling of serenity and calm; not in keeping with the cataclysmic geological events that have taken place here.

This is the smallest of the Lake Traverse Day Use Areas. It is also the only one with readily expandable areas; i.e., not surrounded by wetlands.

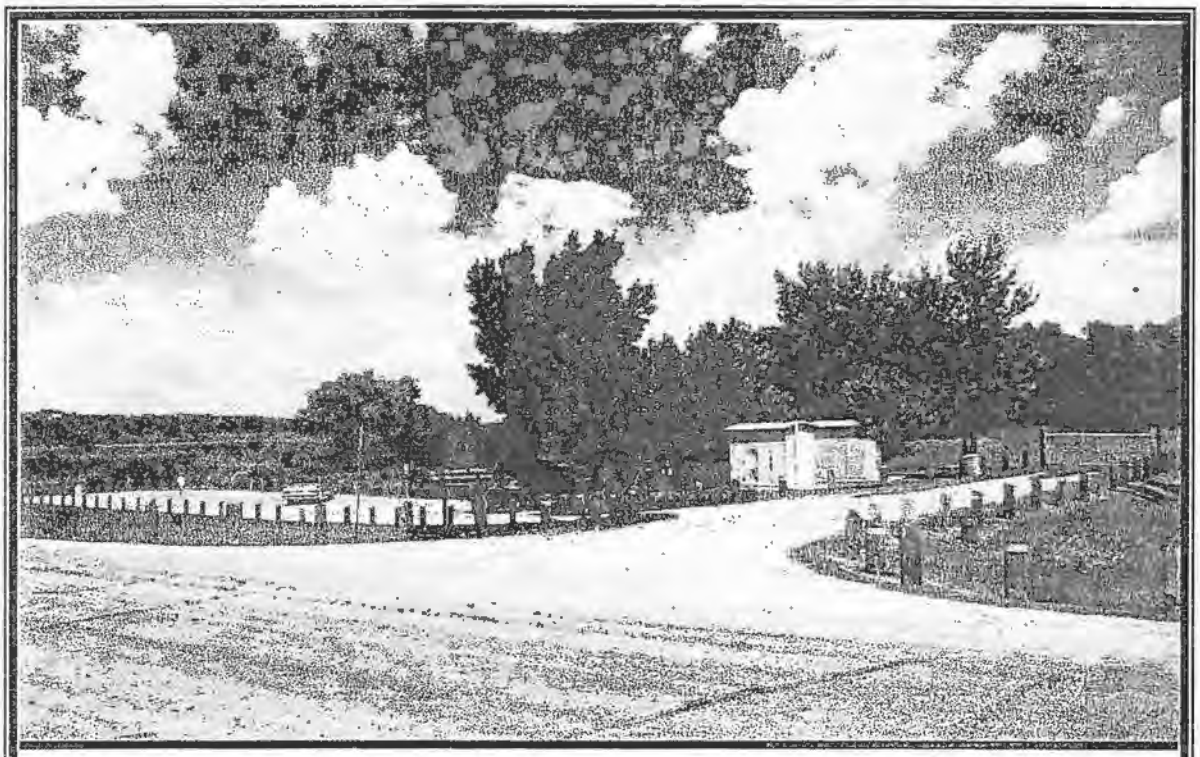


FIGURE D-13 Lake Traverse: Browns Valley Day Use Facility

Although the site has an interesting history and is located close to several historical monuments (an overlook and Indian burial mound on the bluff to the west, and a monument and turn-out to the east), there is little else here to attract potential users (Figure D-13). The site functions well as a wayside rest-stop; an informational kiosk, imparting additional knowledge on the history of the area would add interest and quality to this function.

As the site is very nearly a 1-hour drive from the project offices; efficient and cost effective maintenance and upkeep are a problem for project personnel.

Table D-3
Unit Name: Browns Valley Day Use Area **Physiographic Region:** River Valley (Minnesota)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Steep bluff immediately to west and about 1 mile to the east. WATER: Site is at south end of L. Traverse. Water is the dominant natural feature of this site; protected and calm.	Few trees. Wetland plants, mostly cattails create water corridors. Hardwood floodplain forest south of site (across and below level of adjacent road) does not contribute.	Parking lot dominates this site, it occupies most of the space. Privies are bold against natural setting.
LINE	Water edge is very strong. Bluff is close enough to give spatial definition to the site. It also foreshortens the horizon, especially to the west.	Interest is created by cattail, water edge. Trees not much of an influence.	Roadway on embankment creates strong horizontal element. Bollards strengthen parking lot edge, contribute to dominant form. Geometric form of privies is intrusive.
COLOR	Land colors not evident. Strong water/sky contribution	Brilliant greens of summer, and muted browns of winter react well with calm water presence.	Pale green privies - intrusive.
TEXTURE	Not evident, heavily vegetated.	Bluffs and riparian edge are coarse, wetlands are fine.	Gravel parking lot, bollards and privies are coarse. Levee is fine.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM			2	Bluff contributes, close enough to have impact.
VEGETATION		3		Wetlands have interesting form.
WATER		3		Calm water contributes heavily to the sense of place.
COLOR		2		Sky and green(s) of marsh are very strong.
INFLUENCE			0	Very small facility, limited resources.
SCARCITY			2	Limited water resources to the west. W.M.A.
MODIFICATIONN			1	Parking lot, concrete structures.
TOTAL	0	+ 8	+ 5	= 13 **(HIGH > 17 MEDIUM = 12-17 LOW < 12)**

VISUAL QUALITY EVALUATION – LAKE ORWELL:

Ottertail River Day Use Area:

The Lake Orwell Project lies within a series of ancient beach ridges deposited by Lake Agassiz as it retreated from these upland areas. The areas adjacent to the lake are reserved for wildlife management and associated activities. Further from the lake, agricultural lands dominate the landscape. There are two day use areas on the project: one provides access to the tailwater and to the Ottertail River, the other is a scenic overlook to the lake (see Figure D-14). The visual

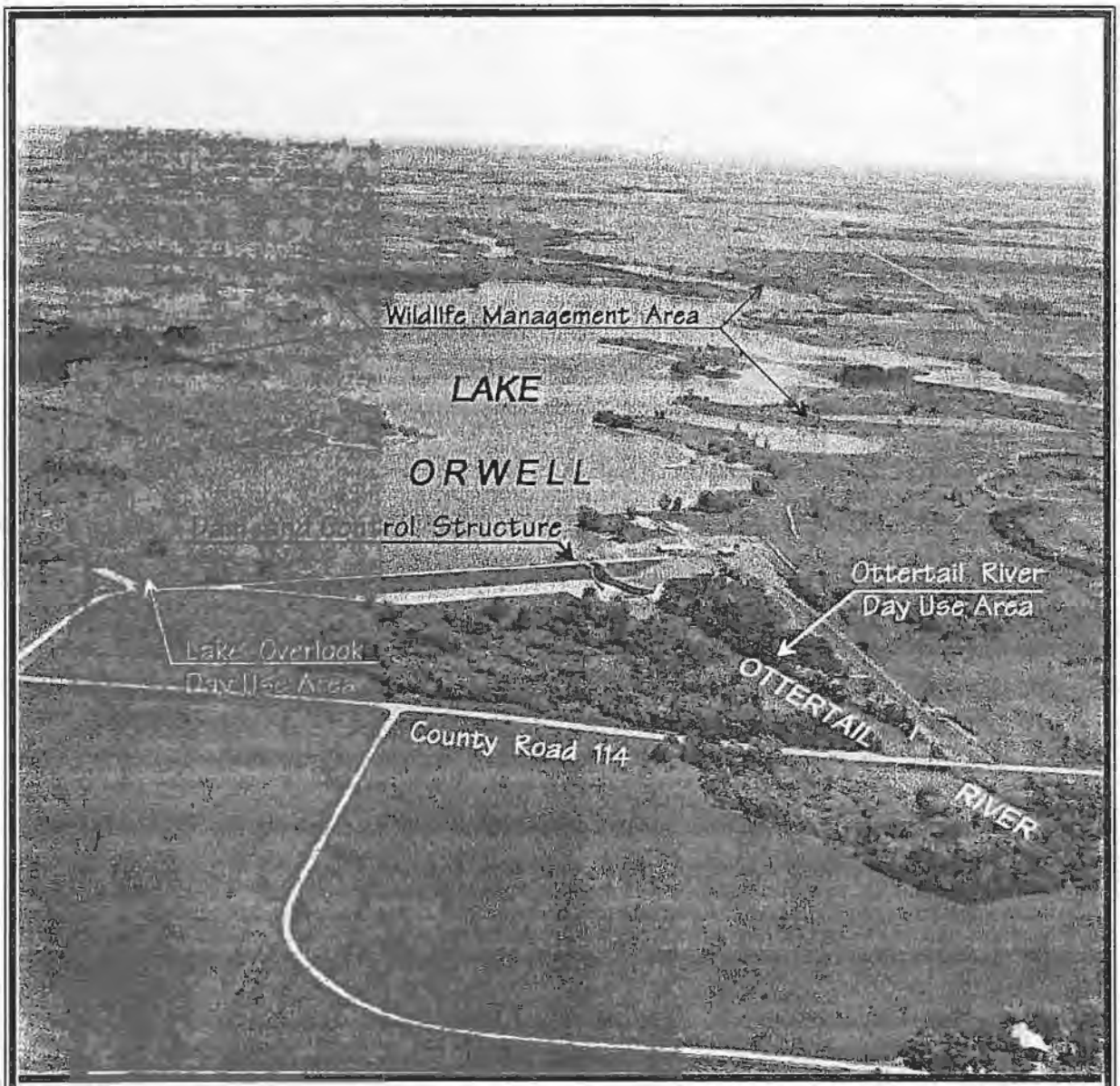


FIGURE D - 14 Lake Orwell, Dam and Reservoir

quality of most of the project is limited because of the lack of significant vegetation. The lake is small (± 1 x 4 miles) and the eye is able to grasp the entire panorama at a single glance.

The downstream end of this site is open and visibility is good. Sited parallel to the river in the small valley, it is isolated and quiet. With the river adjacent to the east, and the meadows of the wildlife management area directly to the west, views are varied and interesting. Visual interest at this site is high.

FIGURE D - 15 Lake Orwell: Main Entrance and Parking for the Ottertail River Day Use Area

The closest parking turn-out in the accompanying illustration is reserved for hunters using the hunting pits, located across the river in another portion of the wildlife management area. The distant parking is for the recreation area. Note that the parking and the privies are accessed from the playground only by crossing the main entrance road (see Figure D-15).

This site has good tree cover and, set amidst the rolling hills, has a comfortable feel. Although still on the Great Plains, this variance in the topography reduces the impact of the sky and, unlike the Lake Traverse sites which feel very exposed, this site feels more enclosed and thus, more comfortable to the casual onlooker.

The downstream end of this site has a playground and a picnic shelter (see Figure D-16). It also provides access to the adjacent wildlife management area. A tree planting program has seen the establishment of additional shade trees on the site with enough open spaces left unplanted for a good mix of sun/shade areas. The visual quality and physical comfort of this area will improve dramatically as the trees mature. The river, shallow, quiet, and clear provides a strong focal point.

FIGURE D - 16 Lake Orwell: Ottertail River Day Use Area Playground

The wildlife management areas to the east (across the road), and to the west (across the river) contribute to the good visual qualities of the site and, with the river close alongside, it has excellent visual variety.

The style of the picnic shelter does not sit well on this site. This is an isolated area, rustic and undeveloped and the modern architectural styling of the shelter seems to be out of place with this setting.

The upstream end of the site serves as access to the tailwater (see Figure D-17). The low bluff supporting the entrance road is directly to the east, an enclosing element for this area. There is good established tree cover here and, with the contribution of the bluff, this part of the site is sheltered and private (see Figure D-18)

FIGURE D - 17 Lake Orwell: Ottertail River Day Use Area, Upstream End

.This end of the site is narrower, lying below the surrounding land on the banks of the river. The vegetation and landform combine to give this area a strong feeling of enclosure – a sense of place.

IGURE D - 18 Lake Orwell: Ottertail River, from Control Structure

Table D-4
Unit Name: Orwell Dam Day Use Area **Physiographic Region:** Small river valley (Ottertail)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: small river valley surrounded by rolling hills = ancient beaches of L. Agassiz. WATER: Roiling tailwaters turn into "friendly" clear, shallow stream; dominates linear site.	Riparian zone dominant throughout. Wetland plants evident on lower portion of site. The upper portion is steeper, with hillside (drier) forms of trees and other woody plants.	Picnic shelter and privies do not contribute to "peaceful" sense of place. Dam, control structure, and rip-rap dominate the upstream end of the site.
LINE	Dominated by texture. Land/water contributes strong edge. Strong, close horizon.	Wetland plants in lower area have solid winter interest. Trees in upper area generate bold vertical line and contribute to sense of enclosure.	Strong lines associated with road and parking lots. Dam, control structure and rip-rap generate very bold geometric line, very strong dominance, very intrusive.
COLOR	Soft, muted earth tones. Clear, quiet stream.	Strongly influenced by season. Spring/summer interest would be high. Winter color is soft earth tones; warm browns, cold grays.	Privies are very intrusive, not a favorable experience (pale green, or aqua). Concrete very cold in winter viewshed, intrusive.
TEXTURE	Not evident. Concealed by vegetation. Tailwater is medium. Strong water influence on whole site.	Dominant factor at the downstream end. Winter vegetation is coarse to medium.	Upstream end: smooth expanses of concrete are fine. Rip-rap and other structures are coarse. Downstream end: Asphalt surfaces are fine. All other structures are coarse.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM		4		Encloses, strongest element.
VEGETATION		3		This could be improved with management.
WATER		3		Tailwater and river dominant contributors.
COLOR			2	Some fall color, good seasonal variations.
INFLUENCE			2	Very small project with small impact.
SCARCITY		3		WMA, diminished water resources to the west of project
MODIFICATION			1	Dam, road, parking lots, rip-rap.
TOTALS	0	+ 13	+ 5	=18 **(HIGH > 17 MEDIUM = 12-17 LOW < 12)**

Overlook Day Use Area:

This day use area is designed as an overlook for the lake. It provides parking and picnic facilities with a picnic shelter.

This is an upland site, located on high ground, directly north of the dam. It offers little other than the picnicking facility. There is no shade except that provided by the shelter and there are no restrooms; as a result, sightseeing is the most popular recreation pastime at this site. The erosion of the shoreline has resulted in steep gravel banks; it is difficult to access the lake because of this. The lake is small and offers little visual variety and the eroded banks are unsightly. The land to the north of this site is cropland; the perimeter of the lake is managed for wildlife. Sightings of deer and large flocks of waterfowl are very common here.

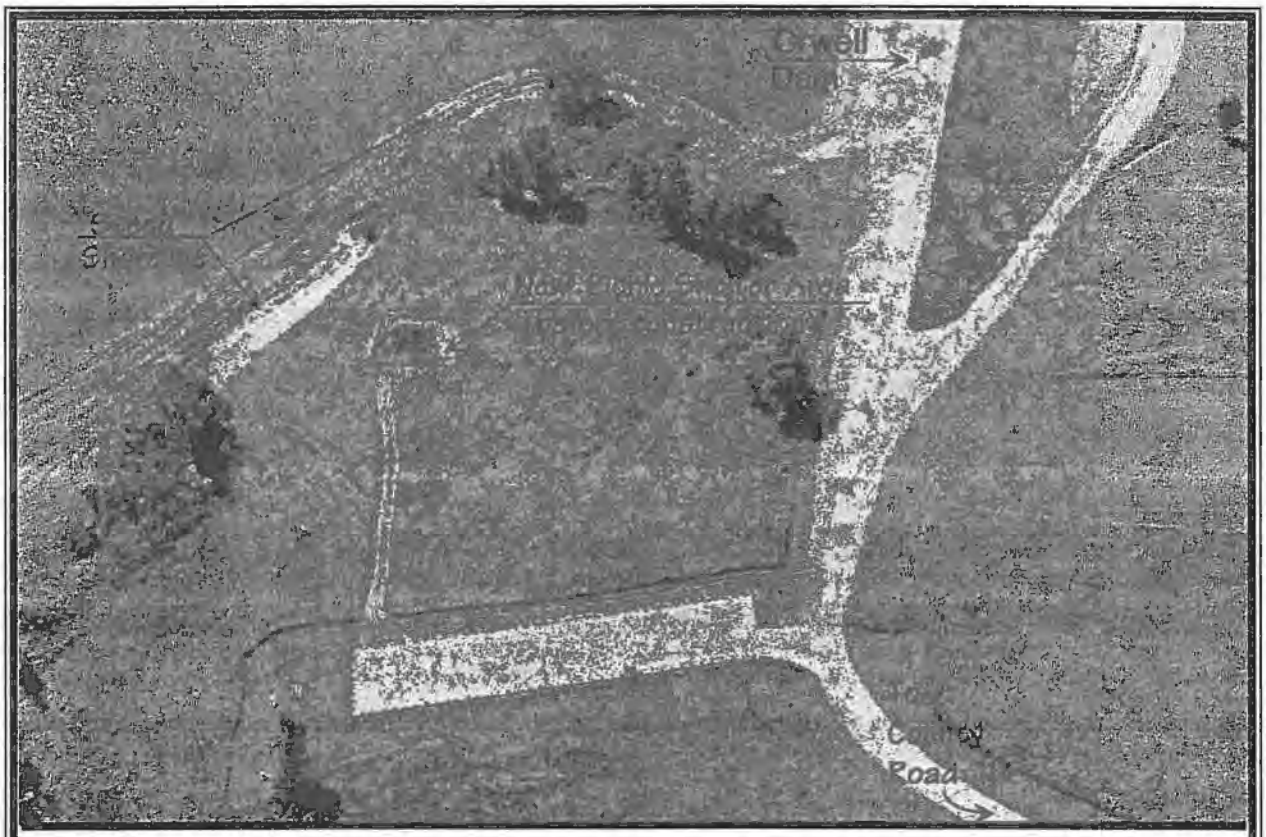


FIGURE D-19 Lake Orwell: Lake Overlook Day Use Area.

A few trees would benefit this site a great deal, as would the addition of some sanitary facilities. Although there is not much that can be done with the viewshed, raising the comfort level of the site will make it much more useable.

Table D-5
Unit Name: Orwell Lake Overlook **Physiographic Region:** Rolling upland (farmland)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Gently rolling hills, Former beaches of L. Agassiz. Site = hilltop. Obvious erosion from drawdowns around lake edge. WATER: Can view entire (small) reservoir from this site.	This site is turf, with no other vegetation. Views are of a typical reservoir edge. Farmland immediately to the north.	Picnic shelter does not fit in rural setting.
LINE	Extremely open character of site makes line (edge) dominant. Strong skyline, shore line and curve of landform all contribute.	The site is turf. Trees and low vegetation are too distant and/or sparse to contribute.	Picnic shelter is very strong, there is nothing to soften its impact. Distant tree clump obscures dam and part of control structure.
COLOR	Weak, due to blandness of viewshed. Muted earth tones, strong water/sky presence.	Weak, again, due to the lack of variety in the immediate area.	Does not fit into rural nature of this site.
TEXTURE	Blocks of texture - rounded hillsides, large water surface, are fine. Eroded areas in drawdown zone are coarse.	Fine - turf grasses, crops and distant trees and groundcovers. Areas of eroded zones with emergent vegetation are coarse.	Coarse - parking lot with many bollards, simple picnic shelter, partially visible control structure.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM			1	Rolling farmland.
VEGETATION			1	Crops dominate, W.M.A. has little impact.
WATER			2	Lake view is nice but uninspiring.
COLOR			1	Not much interest, water dominates, bland viewshed.
INFLUENCE			0	Close to major Rec. areas, few facilities here.
SCARCITY		3		Wildlife Management Area.
MODIFICATION			0	Dam, control structure, parking area, eroded zones.
TOTALS	0	+ 3	+ 5	= 8 **(HIGH > 17 MEDIUM = 12-17 LOW < 12)**

VISUAL QUALITY EVALUATION, BIG STONE LAKE - WHETSTONE RIVER PROJECT

The Big Stone Lake - Whetstone River Project is upstream of Marsh Lake (the Lac qui Parle project), and downstream of Big Stone Lake. The project includes the dam and reservoir on the

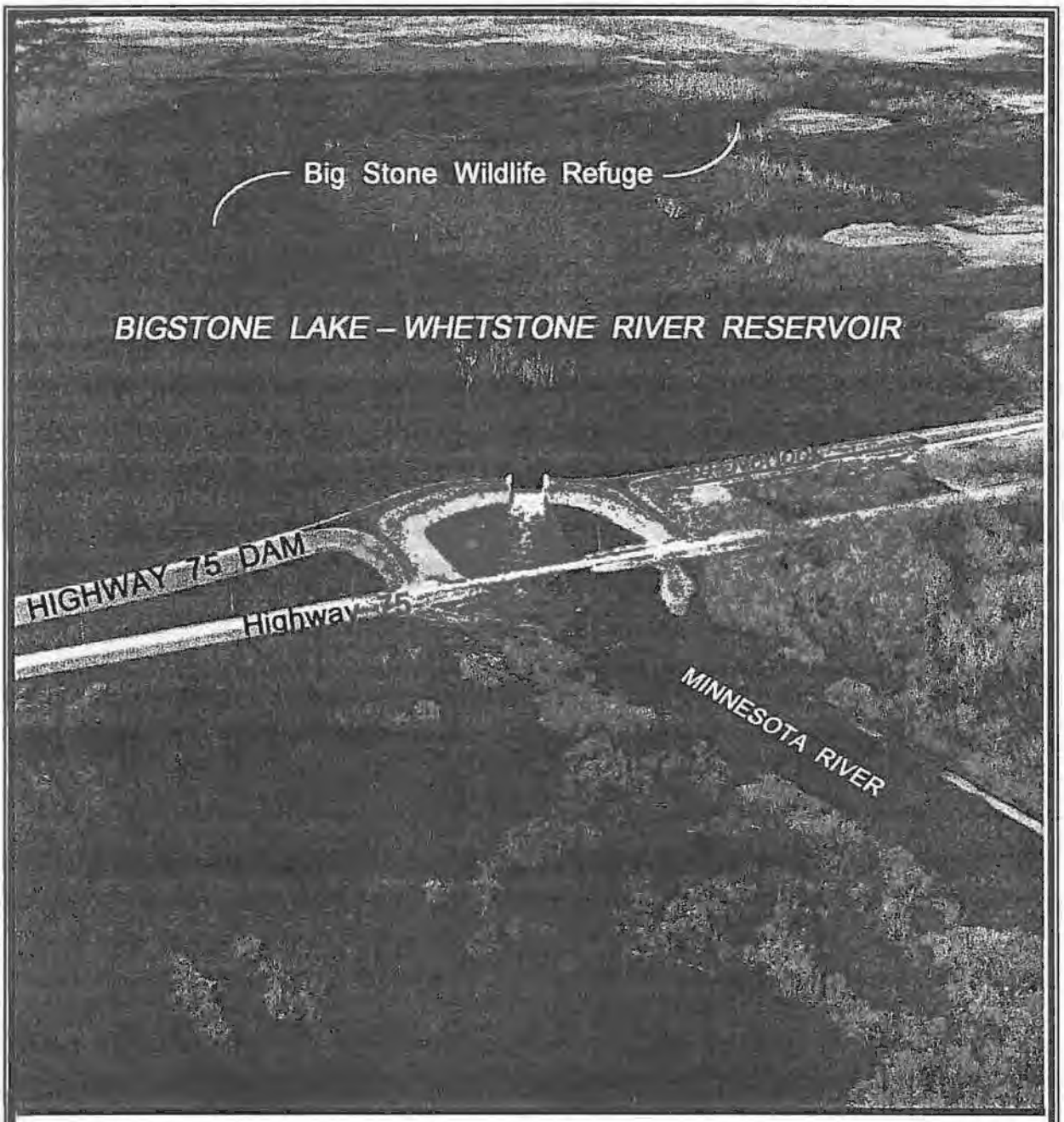


FIGURE D-20 Big Stone Lake - Whetstone River: View of Highway 75 Dam

Minnesota River upstream of U.S. Highway 75 (see Figure D-19), and about 1,600 acres bordering the reservoir for wildlife conservation and development. Approximately 10,800 acres of project land and water are managed by the U.S. Fish and Wildlife Service as the Big Stone National Wildlife Refuge, under cooperative agreement with the Corps of Engineers.

The river valley at the Highway 75 Dam is very wide, so wide that the valley terraces are perceived as low hills in the distance rather than an enclosing element. The focus of the area is the control structure (see Figure D-20). There are no trees or other vertical elements to add variety to the landscape.

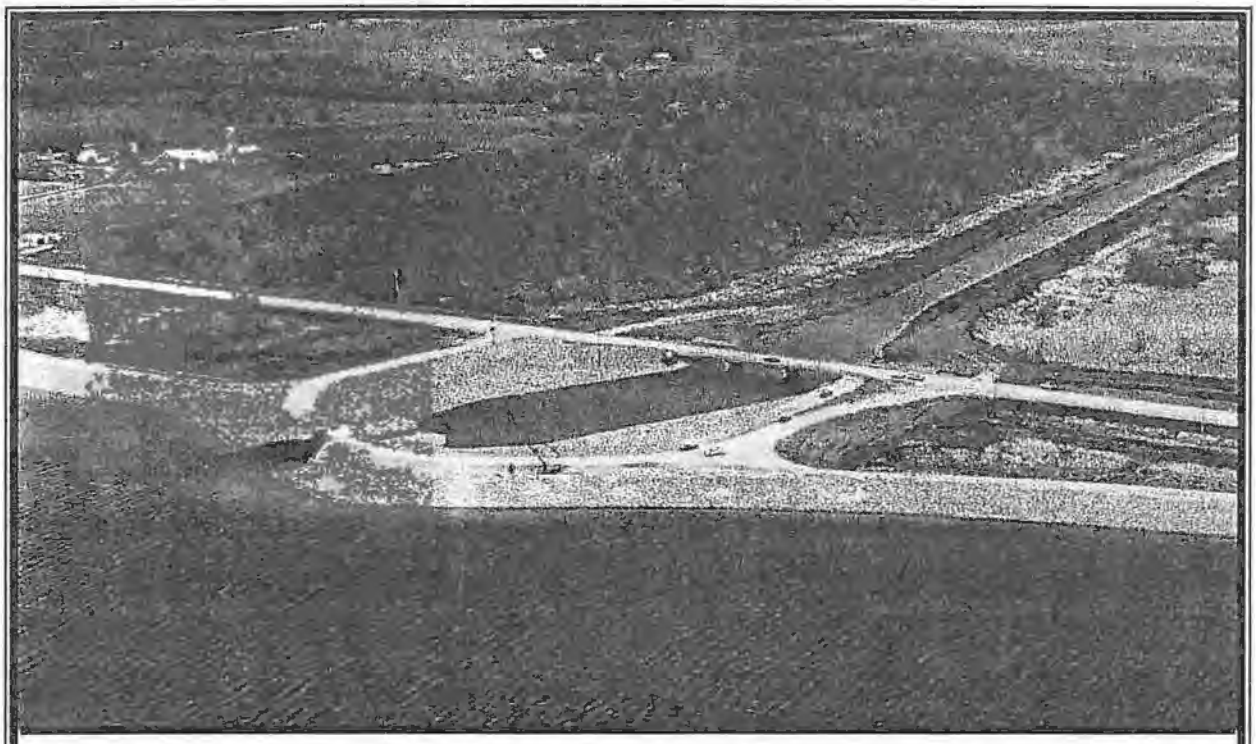


FIGURE D-21 Big Stone Lake-Whetstone River: Control Structure and Tailwater Area

This recreation area is located at the control structure. It is considered fully developed. The primary use of this area is bank fishing; public use facilities are limited to providing fishing access to both sides of the dam. Wildlife observation and sightseeing is also an important activity.

The impoundment created by the dam at Highway 75 is located on the Minnesota River below Ortonville, Minnesota, in Big Stone and Lac qui Parle Counties. The dam site is about 9 miles downstream from Big Stone Lake, the headwaters of the river.

There is a designated canoe trail through the refuge and there are canoe portages at Lac qui Parle Dam and at the low flow structure at Highway 75 Dam. The Minnesota River from the Lac qui Parle Dam east (downstream) to Franklin, Minnesota, is part of the Minnesota Wild and Scenic Rivers System. This 95.5-mile stretch of the river has been designated as Scenic and Recreational under provisions of the Minnesota Wild and Scenic Rivers Act.

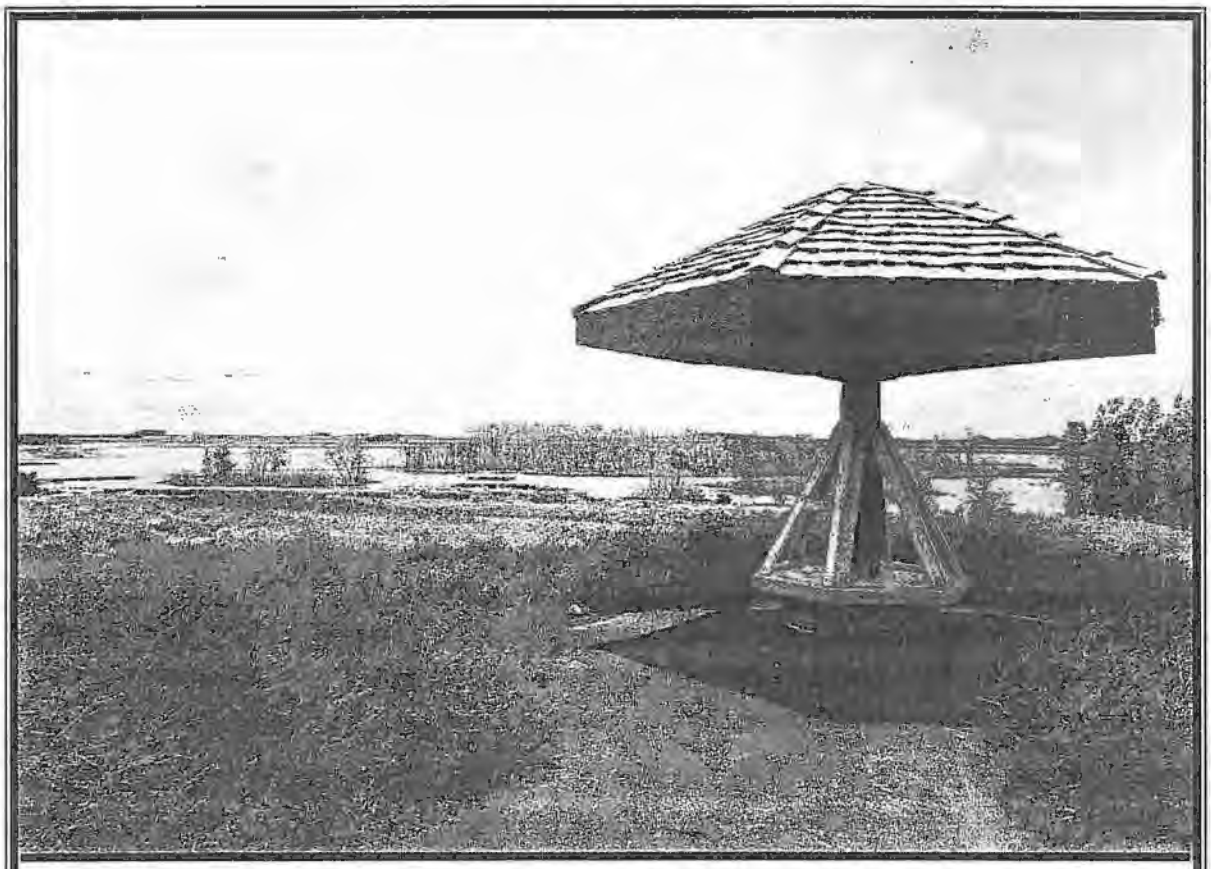


FIGURE D-22 Big Stone Lake - Whetstone River: Scenic Overlook

Table D-6
Unit Name: Highway 75 Day Use Area **Physiographic Region:** Large River Valley (Minnesota)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Valley bluffs too distant to affect. Site is surrounded by marsh and lake. This makes embankment very strong. WATER: Very much dominant. Shallow lake behind embankment, small river and tailwater, all are very strong features.	No trees on the site, grasses are the only vegetation. Marsh vegetation off-site (dead and live trees, grasses and brush). This is a remote site.	Dam embankment provides very strong horizontal element.
LINE	The line of the horizon is very strong. The land/water edge is dominant.	Verticality of trees (off-site) is very bold against barren site and distant horizon.	Impact of structure here is emphasized by flat site.
COLOR	LAND: Not a factor. Water/sky is the dominating feature here.	Major vegetation is too far away to have much effect on this site. Soft browns of winter grasses sit well on site.	Not a factor
TEXTURE	Not a factor. Below the level of the dike only the tailwater is visible. it is smooth like glass most of the year	On site, grasses are fine.	All structures are coarse.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM			1	Setting is non-descript, provide little variation.
VEGETATION			0	Lack of significant vegetation detracts.
WATER		3		Very strong presence.
COLOR			1	Little variation
INFLUENCE			0	Remote site with few facilities
SCARCITY		3		Wildlife Management Area
MODIFICATION			0	Site is highly modified.
TOTALS	0	+ 6	+ 2	= 8 **(HIGH>17 MEDIUM = 12-17 LOW<12)**

VISUAL QUALITY EVALUATION – LAC QUI PARLE PROJECT:

Lac qui Parle:

The entire project lies in the Minnesota River Valley, most of it surrounded by the Lac qui Parle Wildlife Management area. Like Traverse, the project is long and narrow, with little variance, visually. The project has two pools, and three control structures: Lac qui Parle, Marsh Lake (with day use areas at the dams), and the Chippewa River Diversion Dam and levee . The Chippewa Diversion Structure does not have a dedicated day use area, although the levee has good potential for wildlife viewing and walking/biking. Views within the project are limited; project lands are floodplain, very near conservation water levels.

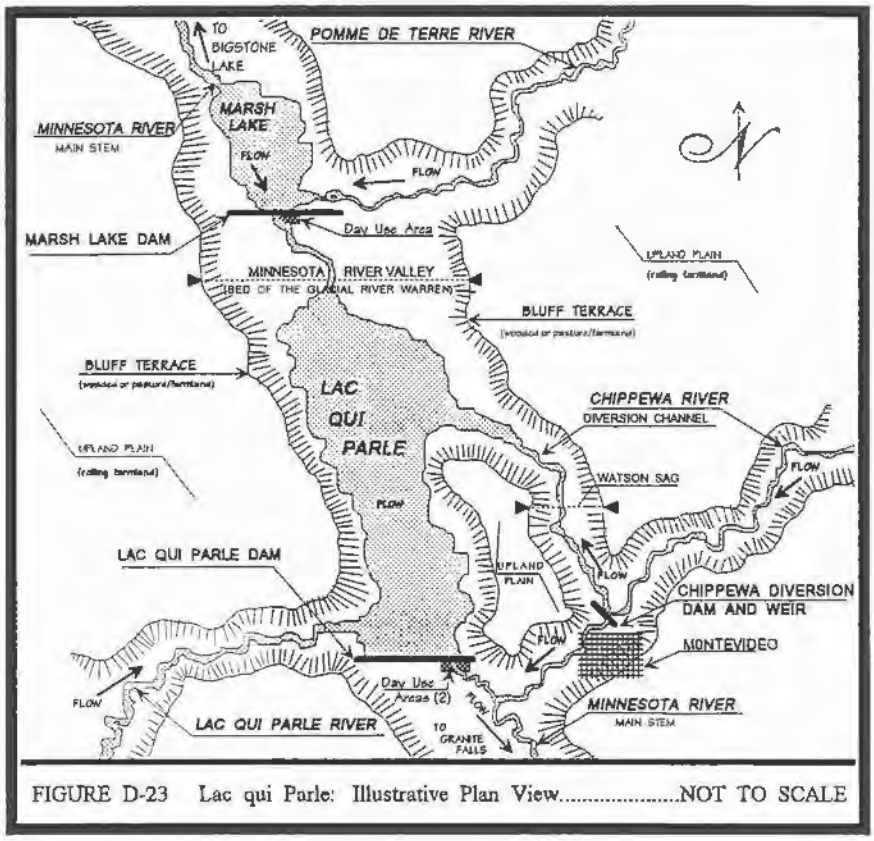


FIGURE D-23 Lac qui Parle: Illustrative Plan View.....NOT TO SCALE

There are no Corps sites that provide elevated vantage points from which to view the lake; As a result, from project lands, the visual character of Lac qui Parle is limited. The day use areas are very small and have an strong industrial look and feel about them. Lakeside vegetation is riparian in nature, floodplain forest or wetland with little visual appeal to the casual observer. Taken as a whole, the lake offers few of the visual amenities that are usually associated with scenic value.

There are two small day use areas at the Lac qui Dam. Both offer limited access to the tailwater. The East Bank Day Use Area is adjacent to actively worked farmland. The West Bank Day Use Area is surrounded on three sides by a wildlife management area.

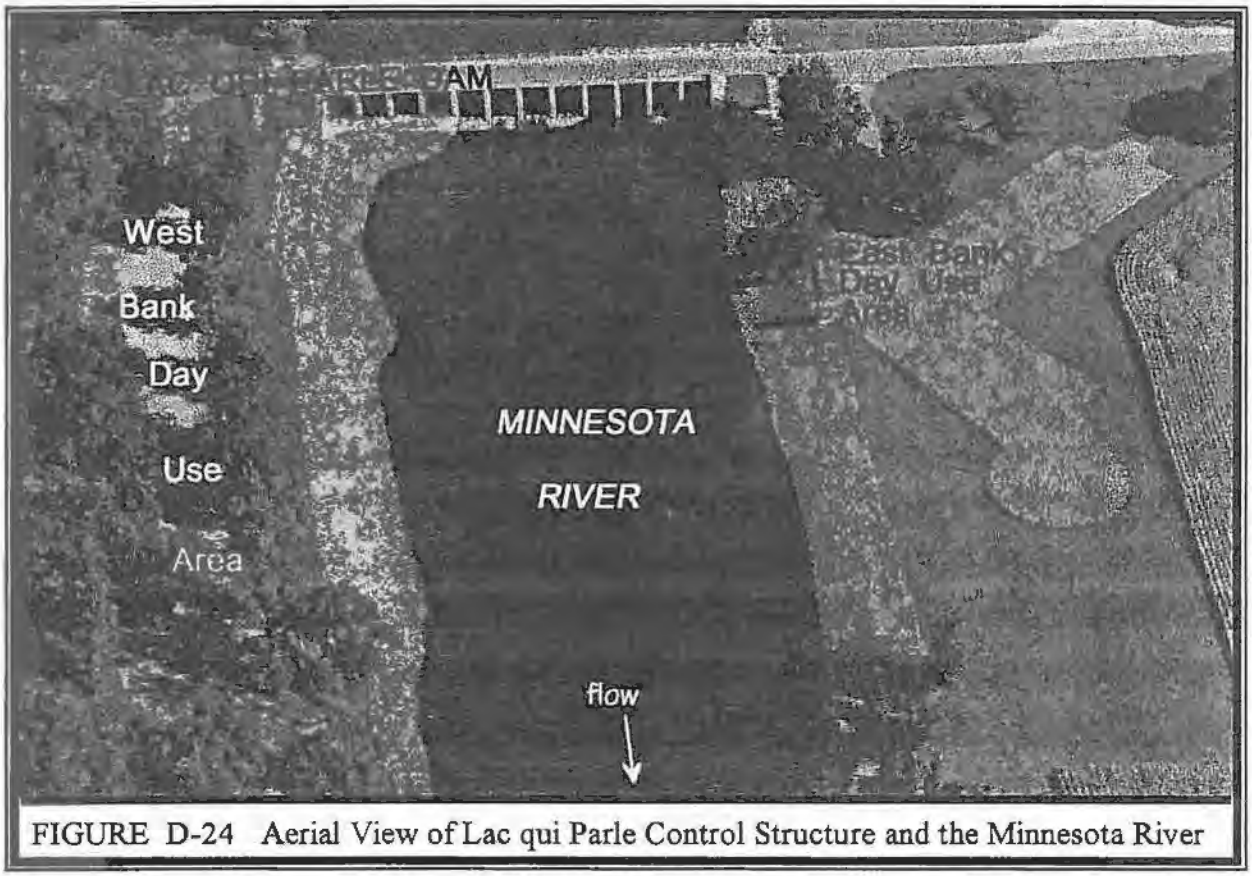


FIGURE D-24 Aerial View of Lac qui Parle Control Structure and the Minnesota River

The large areas of rip-rap, the strong presence of the concrete control structure, and the very poor water quality of the river combine to give both of these areas an industrial look and feel. The roadway over the control structure is badly deteriorated and contributes to this. This ambiance (or lack thereof) is not in keeping with the isolated, rural nature of the landscape in general, or the adjacent, very large, wildlife management area in particular.

The valley bluff is close to the east and this landform with its shroud of hardwoods acts as an enclosing element. Dead trees in the marsh directly north of the dam (in the WMA) are also significant contributors to the visual variety of this area. In general, this area has moderate to low visual quality.

East Bank Day Use Area:

This site is open, with large parking lots and very few trees or other types of vegetation. While the control structure has a very strong presence, the river is the strongest visual element. There is actively worked farmland directly to the east.

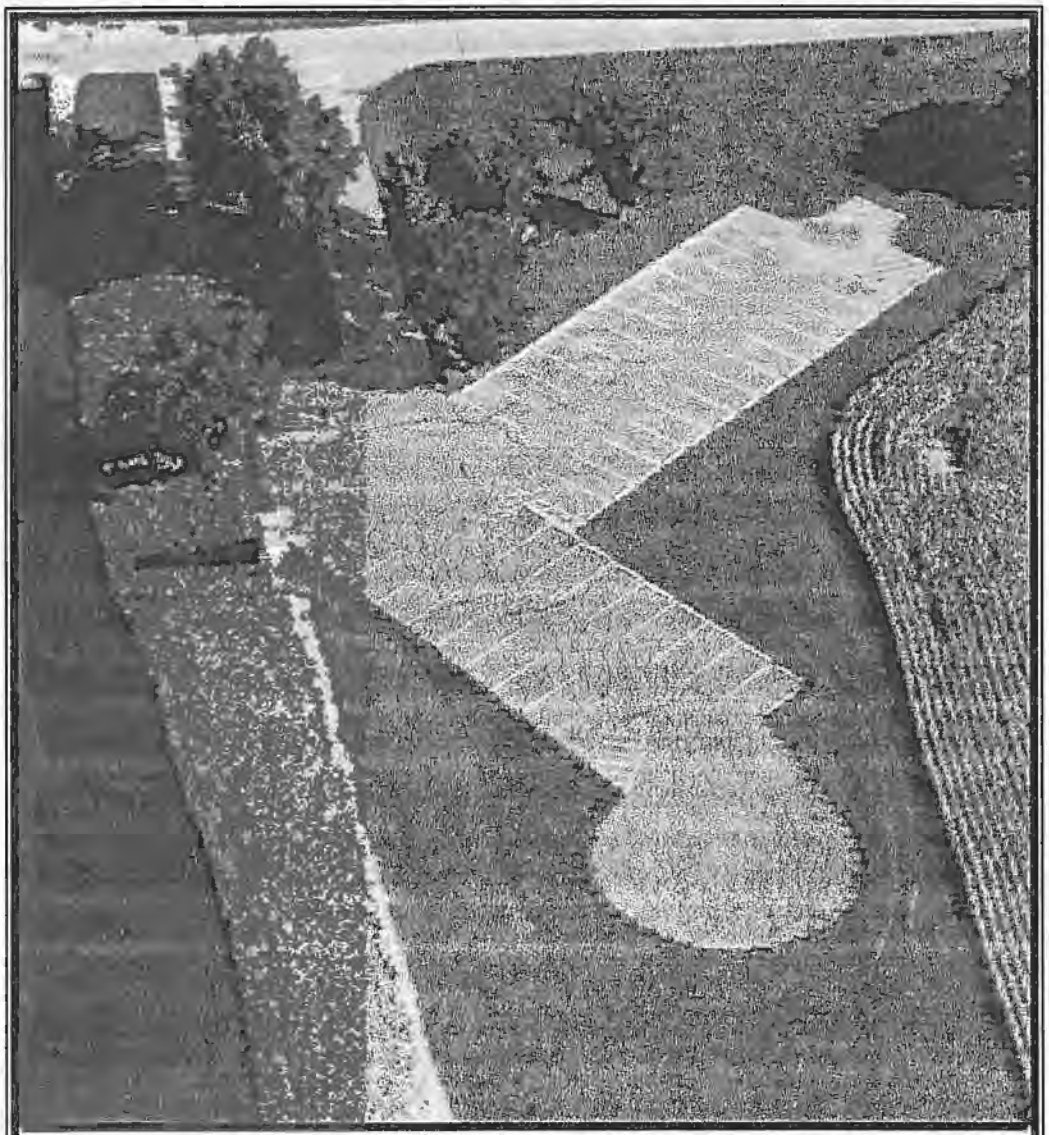


FIGURE D-25 Lac qui Parle: East Bank Day Use Area

This site provides access to the trails along the east bank of the Minnesota River, a popular area for bank fishing. Unlike the west bank, the parking lot is paved and well organized, but is lacking in amenities. There are no sanitary facilities on this bank. Access to the west bank privies entails crossing the control structure on the roadway, there is no pedestrian walkway on the dam.

There is no transition from the recreation area to the farm fields, simply the edge of the row crops. The large, exposed paved areas of the parking lots also detract from the visual qualities of the site. Visual screening, buffering planting zones, and more trees would improve visual quality, realignment of the parking lot would improve safety.

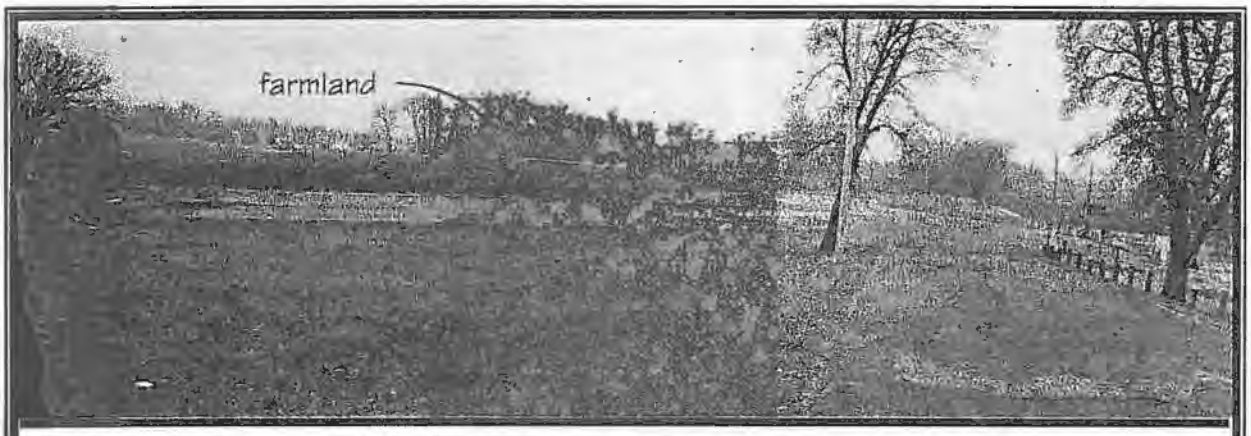


FIGURE D-26. Lac qui Parle: East Day Use Area Viewed From Entrance Road.

Large areas of rip-rap limit access to the tailwater and detract from the visual qualities of the river. Downstream from Federal property, the unprotected west bank is badly eroded; this is visible from the east bank, impacting the visual qualities of the site.

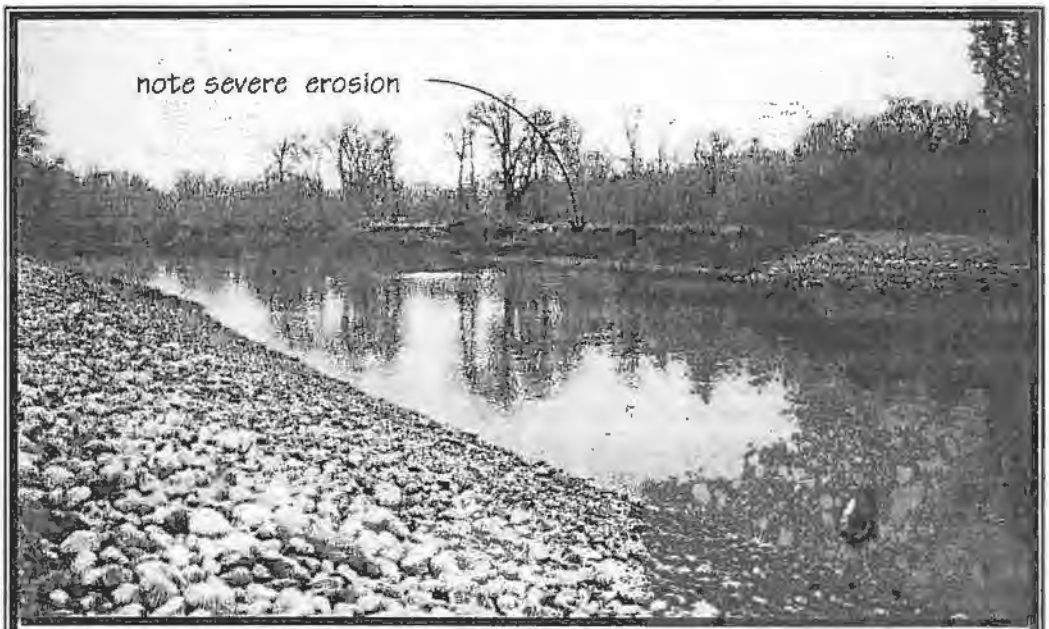


FIGURE D-27 Lac qui Parle: The Banks of the Minnesota River

Table D-7
Unit Name: Lac qui Parle East Bank Day Use Area **Physiographic Region:** Wide River Valley (Minnesota)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Bluffs to the east and about 1 mile to the west. Site is riverbank. WATER: Medium river adjacent (west) with tailwater.	Site is riverbank (rip-rap) and turf with farmland adjacent (east), very few trees.	Paved parking lots, bollards, rip-rap and gauge station. Dam with road and associated control structures.
LINE	Land/water edge is very strong, dominant line. Bluff to north and east creates close horizon.	Trees to south and across river create close horizon (esp. when considering the other sites in this M.P.), they add some bold vertical elements but are not on the site. Trees on the site are too few to impact. This site, in essence, is a parking lot.	Strong "industrial strength" line from road, dam and control structures; impacts northern viewshed, extremely intrusive. Parking lots with bollards dominate site, detract.
COLOR	Winter farmland (plowed) is strong intrusion. Eroded riverbank (opposite) is an ugly scar. Otherwise typical landscape colors, muted earth tones. Water is strong presence.	Site: Turf grass and a few trees; color not much of a factor. Oak bluffs to N/W and trees off-site contribute. Dead trees in swampy W.M.A. are very strong, bold, white, vertical strokes in the landscape.	Concrete of dam structure and asphalt roadway do not fit in this landscape. Light green gage station contributes to this.
TEXTURE	Eroded bank and plowed fields are coarse. Roiling tailwater is medium.	Turf if fine, all other is coarse	Paved parking areas are fine. Bollards and other structures are coarse.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM			2	Bluff is strong contributor.
VEGETATION			1	Mostly turf grass
WATER			2	River is strong presence.
COLOR			1	Very little variation.
INFLUENCE			1	This is a tailwater access
SCARCITY		3		Wildlife Management Area
MODIFICATION			-2	Most of this site is parking lot with bollards.
TOTALS	0	+ 3	+ 5	= 8 **(HIGH >17 MEDIUM = 12-17 LOW<12)**

West Bank Day Use Area:

This site is long and narrow, with good tree cover and areas of sturdy and well established undergrowth. The site also suffers from the negative visual factors that beset the east bank; i.e., rip-rap, strong concrete presence, and poor water quality. Here the trees and additional

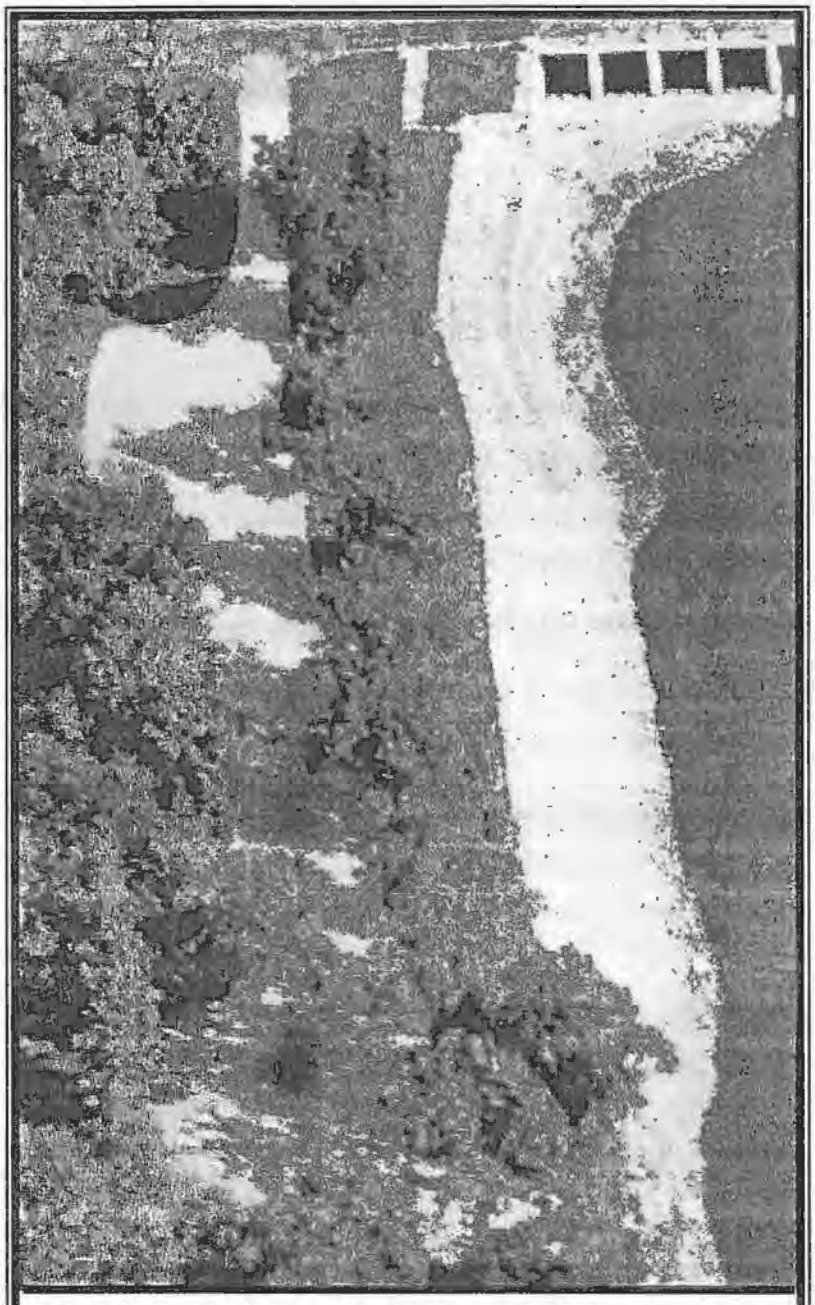


FIGURE D-28 Lac qui Parle: West Bank Day Use Area

vegetation tend to soften the effects of those factors; they give this site a definite park-like feel. The east bank would share this ambiance if even a simple planting plan were instituted.

The driveway and parking split the site, with restrooms and playground on one side, and the river on the other. The parking lot is long and narrow and is not paved. The small space that is available is not used efficiently due to the lack of parking controls. The alignment of the lot contributes to auto/pedestrian conflicts.

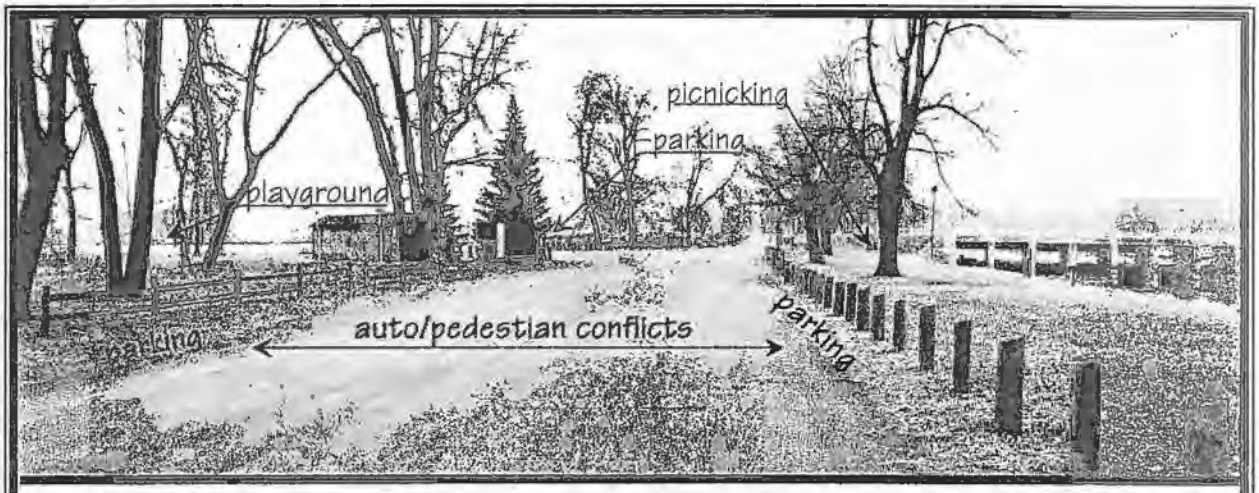


FIGURE D-29 Lac qui Parle: West Bank Day Use Area, Parking and Entrance

Unlike the east day use area, here the dam tends to be the strongest visual element, although the river is also very apparent. From the east bank, the view of the river is strengthened and framed

FIGURE D-30 Lac qui Parle: Main Control Structure

by the "forest" of the west bank. From the forested west bank, the viewing angle is slightly better, in addition, the treeless eastern shore does not attract the eye.

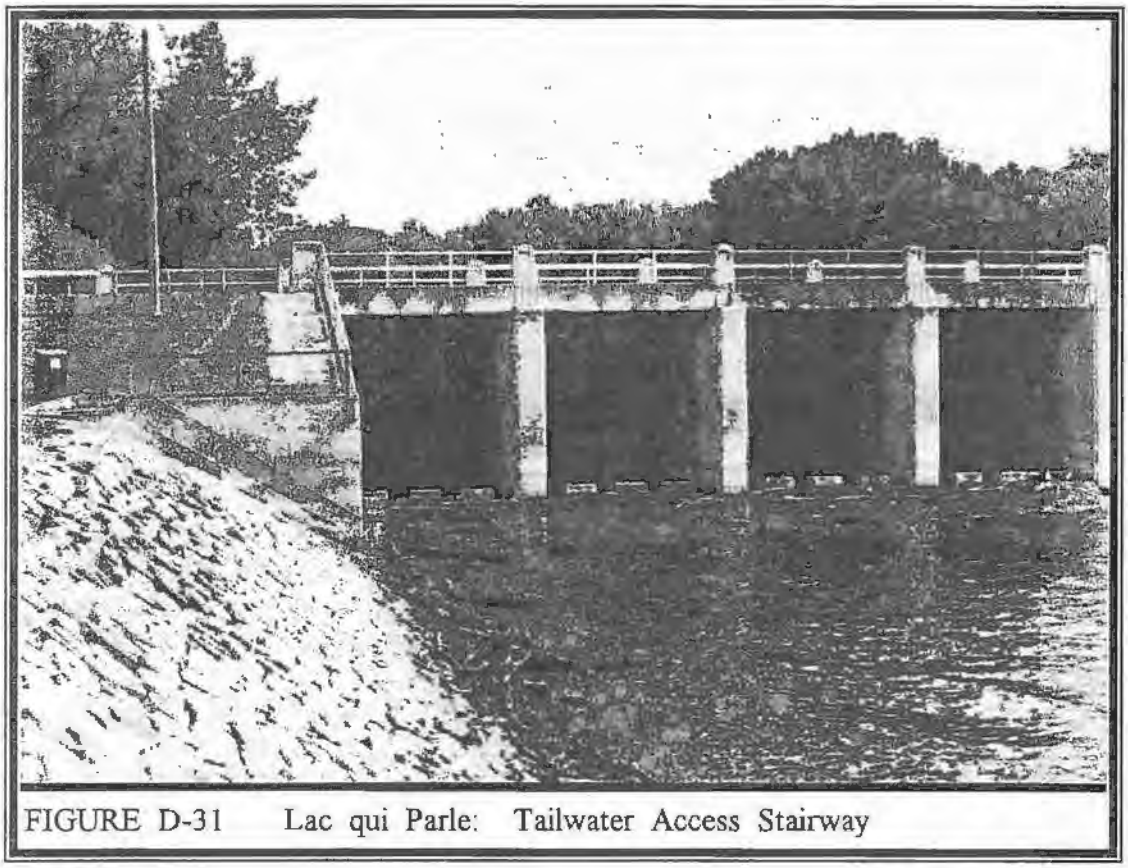


FIGURE D-31 Lac qui Parle: Tailwater Access Stairway

The roadway on the dam serves as the pedestrian connection for the two day use areas. The road surface is in a poor state of repair, difficult, and dangerous, to walk on. There is limited access to the tailwater on both sides of the river; the stairs and steep areas of rip-rap are not accessible to persons of limited personal mobility.

While both the east and west day use areas are contiguous, only separated by the river, there is a distinct lack of accessibility that separates them. These two areas could be considered as one day use area if a strong pedestrian connection were made over the dam.

Table D-8
Unit Name: Lac qui Parle West Bank Day Use Area **Physiographic Region:** Wide river valley (Minnesota)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Bluffs to east and about 1 mile to the west. Site is riverbank. Spoil piles are a very strong intrusion. WATER: medium river adjacent (east), tailwater.	Site is riverbank (rip-rap) and turf with farmland across river (east). This site has over 60% tree cover. They provide strong enclosure. W.M.A. to the west and south.	Graveled parking lots, bollards, rip-rap. Dam with paved road and associated control structures. Privy fits well on site (wooden construction, screening)
LINE	Land/water edge is strong, dominant line.	Trees on this site are very bold vertical elements and add to interest. Dead trees in W.M.A. are strong element silhouetted against lake sky.	Strong "industrial strength" line from road, dam and control structures. Very intrusive. Parking lot with bollards detract.
COLOR	Winter farmland (plowed) is distant intrusion. Eroded river bank is an ugly scar (off-site). Otherwise typical landscape colors, soft, muted earth tones. Water is strong presence.	Site: Turf grass and trees; good seasonal color. Dead trees in W.M.A. (across road) are bold, white vertical strokes across the northern viewshed.	Concrete of dam structure and asphalt roadway are strong intrusion, so is light green water gauge station across the river.
TEXTURE	Eroded bank and plowed fields are coarse. Tailwater is medium.	Turf is fine, all other is coarse.	All structure is coarse.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM			1	Bluff close to the east, steep river banks on site.
VEGETATION		3		Trees provide strong relief in prairie/farm environs.
WATER			2	River has powerful presence.
COLOR			1	Good color variations
INFLUENCE			2	Water is a scarce resource to the west of the project.
SCARCITY		3		Wildlife Management Area
MODIFICATION			0	Control structure, road (breaking up), spoil piles.
TOTALS	0	+ 6	+ 6	= 12 **(HIGH >17 MEDIUM = 12-17 LOW <12)**

Marsh Lake Day Use Area:

Marsh Lake recreation area is set, as the name implies, in the midst of a large marsh. The day use area is contained by the dam on the upstream end, and floodplain forest downstream. The site is very remote, accessed over several miles of dirt roads, and is used by local residents. The main attraction of this recreation area is fishing. There are wildlife management areas adjacent to the site; many related recreation activities are possible.

The site sits low in the landscape, and this tends to limit views. The area's visual appeal is low because of the limited visual variety in the area, although the tremendous seclusion of the site is attractive to its users and is a strong contributor to its "sense of place".

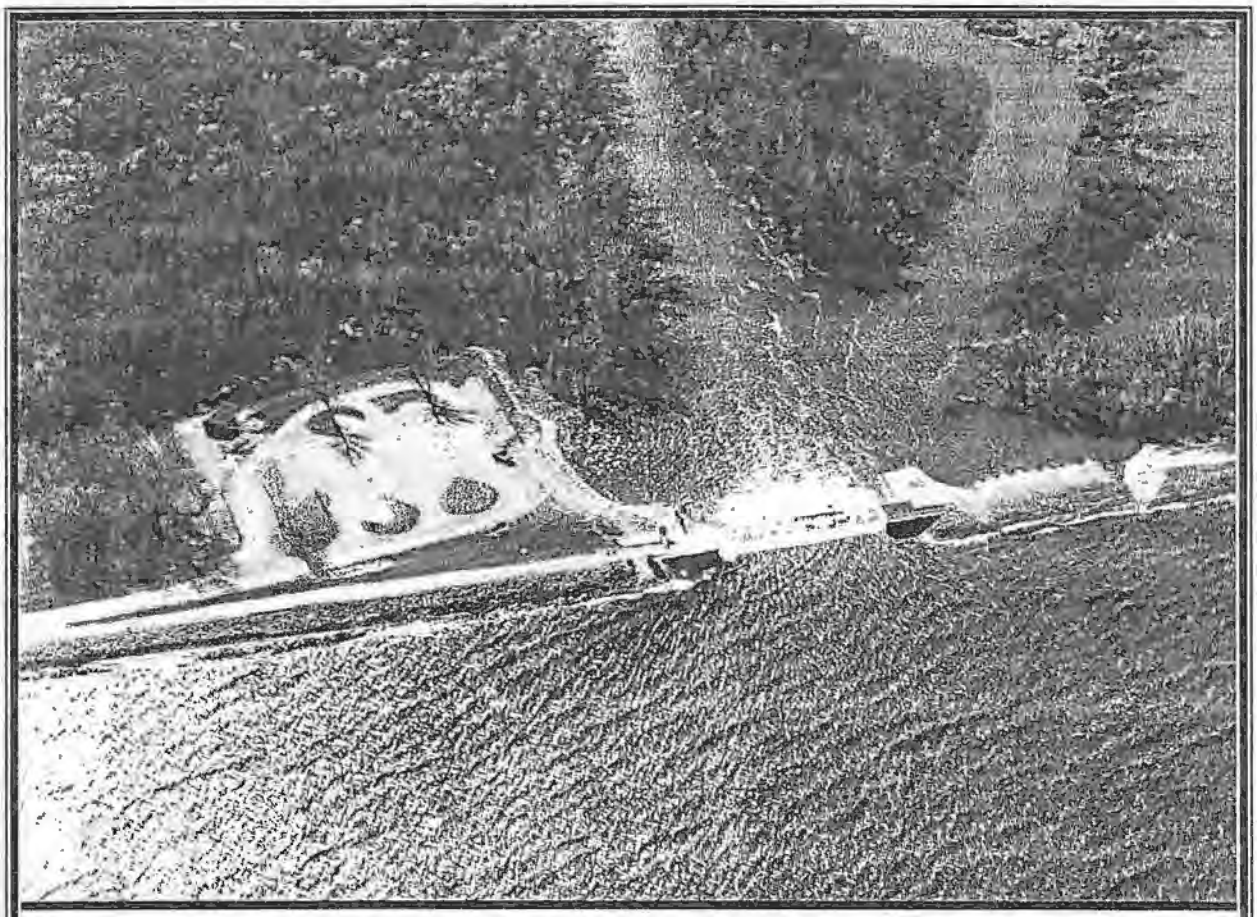


FIGURE D-32 Lac qui Parle: Aerial View, Marsh Lake Day Use Area

FIGURE D-33 Lac qui Parle: Marsh Lake Day Use Area

The lack of trees makes the site very open and exposed. Although trees surround much of the area, they are too far away to affect the visual quality on the site. The site is very near the level of the tailwater, the dominant visual factor.

The embankment and control structure present a very strong horizontal element. Although the recreation facilities are limited here, the remote location of the site is a desirable element for many of its users; this same feature makes this area difficult to patrol and maintain.

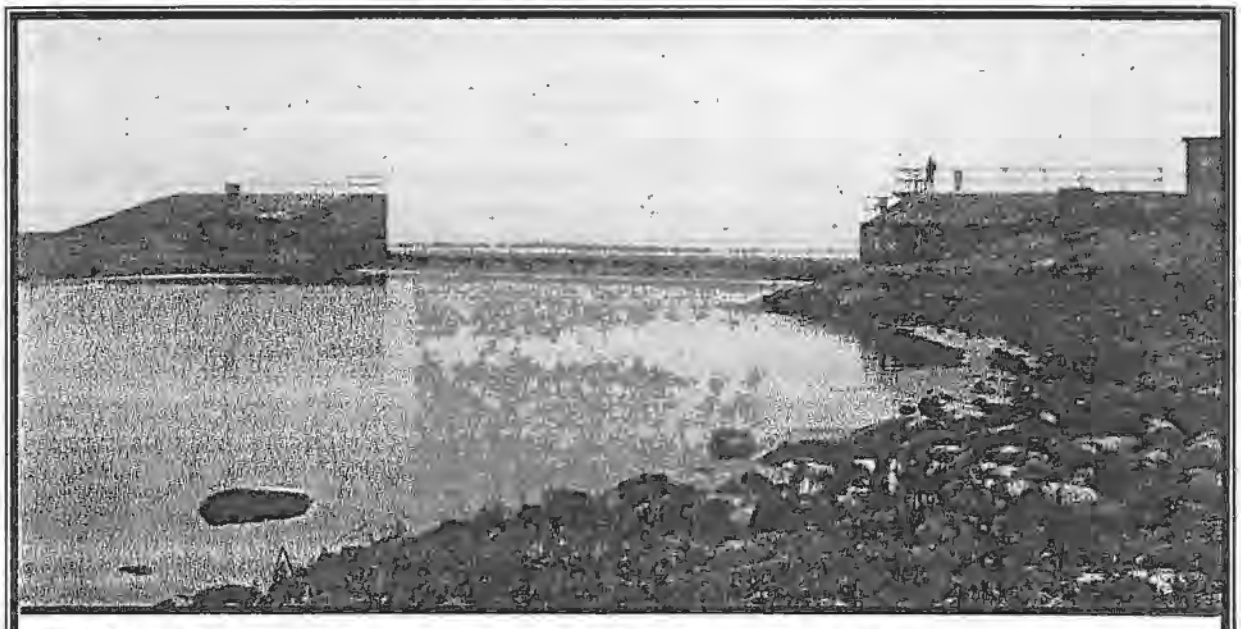


FIGURE D-34 Lac qui Parle: Marsh Lake Control Structure

Table D-9
Unit Name: Marsh Lake Day Use Area **Physiographic Region:** Wide river valley (Minnesota)

	LAND OR WATER	VEGETATION	STRUCTURES
FORM	LAND: Valley bluffs too distant to affect. Site is very low, surrounded by marsh and lake. This makes embankment very strong. WATER: Very much dominant. Shallow lake behind embankment, small river and tailwater, all are very strong features.	No trees on the site, grasses are the only vegetation. Marsh vegetation off-site (dead and live trees, grasses and brush). This is a remote site.	Verticality of trees (off-site) is very bold against barren site and distant horizon.
LINE	The line of the horizon is very strong. The land/water edge is dominant.	Verticality of trees (off-site) is very bold against barren site and distant horizon.	Impact of structure here is emphasized by flat site.
COLOR	LAND: Not a factor. Water/sky is the dominating feature here.	Major vegetation is too far away to have much effect on this site. Soft browns of winter grasses sit well on site.	Brown privy, fits on site. Pale green gage station is intrusive.
TEXTURE	Not a factor. Below the level of the dike only the tailwater is visible. it is smooth like glass most of the year	On site, grasses are fine. Trees and other woody plants (off-site) are coarse.	All structures are coarse.

	HIGH	MODERATE	LOW	REMARKS
LANDFORM		3		Remote marsh setting is very strong.
VEGETATION			0	Lack of significant vegetation detracts.
WATER		3		Very strong presence.
COLOR			1	Little variation
INFLUENCE			0	Remote site with few facilities
SCARCITY		3		Wildlife Management Area
MODIFICATION			0	Site is highly modified.
TOTALS	0 +	9 +	1	= 10 **(HIGH>17 MEDIUM = 12-17 LOW<12)**

APPENDIX E – LAND USE ALLOCATION

PROJECT LAND ALLOCATION:

In accordance with ER 1130-2-435, Project Operation Preparation of Master Plans, all lands will be allocated in accordance with the authorized purposes for which they were or are to be acquired. Land will be allocated into one of the following categories:

1. Operations:

Lands acquired in accordance with authorizing documents for operation of the project. These operations include: flood control, water supply and navigation.

2. Recreation:

Separable lands acquired in accordance with authorizing documents for Public recreation.

3. Fish and Wildlife:

Land acquired in accordance with authorizing documents, specifically for wildlife management.

4. Mitigation:

Land acquired or designated in accordance with authorizing documents to offset losses associated with project development to those lands classified as protected.

TABLE E-1: LAND ALLOCATION

Project	**Allocated Land, in Acres**			
	Operations	Recreation	Fish and Wildlife	Mitigation
Lake Traverse	1144.13*			
Lake Orwell	2019.83*			
Big Stone Lake - Whetstone River	254.2*			
Lac qui Parle	517.62*			

* all project land

PROJECT LAND CLASSIFICATION:

Project Operation Preparation of Master Plans, ER 1130-2-435, states that allocated project lands will be further classified to provide for development and resource management consistent with authorized project purposes and the provisions of the National Environmental Policy Act (NEPA)

and other Federal laws. The classification process further refines land allocations to maximize utilization of project lands. It must consider public desires, legislative authority, regional and project specific resource requirements and suitability. Allocated uses take precedent over any of the following classification categories:

1. Project Operations:

These lands are defined as those lands acquired and allocated to provide for safe, efficient operation of the project.

2. Recreation, Intensive Use:

These lands are defined as lands acquired for project operations and classified for development as public use areas for intensive recreational activities. Such areas include land developed for the visiting public such as concession, resort, and quasi-public development and picnic areas and bulletin boards. Recreation lands are used to promote the health, safety, and welfare of the region's population in accordance with expressed needs and desires. Recreation lands may be administered by the Corps or by other public or private agencies under lease agreement to the Corps.

In general, any use or development of these lands which would interfere with or otherwise negatively affect public recreational opportunities is not allowed. Private, exclusive use of public recreation lands is not permitted. Agricultural use of these lands, except on an interim basis or for maintenance purposes, is not permitted. Permits, licenses, or easements are not issued for non-compatible uses such as pipelines, transmission lines or roads except those warranted to be in the best interests of the public.

3. Mitigation:

Land acquired or designated in accordance with authorizing documents to offset losses associated with project development to those lands classified as protected.

4. Environmentally Sensitive Areas:

Lands designated in accordance with State and Federal law for protection or preservation of: rare, threatened, or endangered species and/or habitat; historical or archeological resources; ecological resources; scientific features; aesthetic qualities. Normally limited, or no, public use of the land is contemplated; no agricultural or grazing uses are permitted.

5. Multiple Resource Management

Multiple Resource Management lands are those lands that are managed for a variety of compatible uses. Their use should not be limited to a single category if there are other needed or desired uses that are compatible with the primary land use allocation.

Classification of these lands into a sub-category is based on the primary Resource Objective that has been established for a given management unit or specified portion thereof.

(a) Recreation Low Density:

These lands are those project operation lands allocated for low impact recreational uses that require a minimum of development. These types of activities generally require large land or water areas and a wide dispersal of the users. Emphasis is placed on non-motorized recreation activities such as walking, hiking, nature study, biking, canoeing, and picnicking. Primitive camping may be allowed in designated areas. Hunting, fishing, and trapping may be allowed where these activities will not be in conflict with other users.

(b) Wildlife Management:

These lands were acquired for project operations and allocated as habitat for, or propagation of, fish and wildlife species. These lands are generally available for low intensity recreational pursuits such as nature study, hiking, sightseeing and other low impact activities. Consumptive uses of wildlife areas such as hunting, fishing, and trapping may be permitted when these uses are compatible with the Resource Objectives of a given unit.

(c) Vegetative Management:

Lands where special management activities have been implemented for the protection and development of specific vegetation types.

(d) Inactive:

Lands that are reserved for future development, and recreation areas that have been temporarily closed. This is an interim classification.

TABLE E-2: LAND CLASSIFICATION

Project	**Acres of Land Classified As:**				
	Project Operations	Recreation, Intensive Use	Mitigation Lands	Environmentally Sensitive Areas	Multiple Resource Management *
Lake Traverse**	81.0	15	0	0	288(R), 1626 (W)
Lake Orwell	20.2	7	0	0	1992.6(W)
Big Stone Lake - Whetstone River	254.2	0	0	0	0
Lac qui Parle	169.6	2.2	0	0	345.8(W)

*Multiple Resource Management categories: R = Recreation, Low Density
W = Wildlife Management
V = Vegetation Management
I = Inactive

** Includes lands formed by reliction

For additional information on Land Use Classification see Plates 21 - 27

FEE ACQUIRED LANDS:

Lake Traverse:

There are 2010.0 acres under fee title at the project; this includes additional lands formed by reliction.

Lake Orwell:

Project lands owned in fee by the Federal Government at Lake Orwell total 2,019.83 acres.

Lac qui Parle:

The project has 517.62 acres under fee title.

Big Stone Lake - Whetstone River:

The Corps of Engineers retained 254.20 acres of fee title land for this project; the 60.10 acres of public domain land is within the lake flowage area.

EASEMENT LANDS:

Easement lands include all lands for which the Corps holds an easement interest but not fee title. Management and use of easement lands will be in accordance with the terms and conditions of the easement estate acquired for the project.

Lake Traverse:

Real estate interests include 6,172.25 acres in flowage easements. Real estate interests at the project are required for impoundment of water above the dams, the dam structures, and the associated maintenance facilities. In general, fee title was acquired for the dam structures and maintenance facilities. Flowage easements, intermingled with fee acres, were acquired along the main channel of the river for the entire length of the pool. Federal flowage rights are to elevation 983.0 feet.

Lake Orwell:

There are no easements for the project

Lac qui Parle:

The reservoir is covered by flowage easements over State lands managed as a wildlife conservation area. Flowage and channel improvement easements total 19,859.47 acres. Flowage easements are to elevation 945.0 feet msl. There are easements for channel improvements for 30 miles downstream from Lac qui Parle Dam.

Big Stone Lake - Whetstone River:

Flowage easements of 104.84 acres are required for flowage in the reservoir during flood stage. The acquisitions guide taking line contour elevation was 959.5. Parcels are scattered around the lake in the lower elevations.

OUTGRANTS AND PERMITS:

Lake Traverse:

There are currently 3 active outgrants of project lands to other agencies, entities or individuals, to be managed for uses that are consistent and compatible with authorized project purposes. These outgrants convey varying rights and responsibilities for management of project resources to the outgrantees. One lease is for wildlife management purposes, and two leases are for recreation. There are also easement for roads and utility rights-of-way. They generally allow the outgrantee the right to construct, use operate and maintain roadways and utilities crossing project lands.

Lake Orwell:

The State of Minnesota has an outgrant permit for 1,992.6 acres for wildlife management purposes. There is a management plan on file (March 11, 1991), and this license expires on December 31, 2004. There are outgrants to Otter Tail County for rights-of-way for two roads, totaling 11.27 acres.

There are currently 4 active outgrants of project lands to other agencies, entities or individuals, to be managed for uses that are consistent and compatible with authorized project purposes. These outgrants convey varying rights and responsibilities for management of project resources to the outgrantees. They generally allow the outgrantee the right to construct, use, operate and maintain roadways and utilities crossing project lands. In addition, there is an outgrant to another agency for wildlife management purposes.

There are two perpetual outgrants to Otter Tail County for roads on, or through, the Orwell Lake project.

Lac qui Parle:

There are currently eight active outgrants of project lands to other agencies, entities or individuals, to be managed for uses that are consistent and compatible with authorized project purposes. These outgrants convey varying rights and responsibilities for management of project resources to the outgrantees. The greatest number of outgrants are for roads and utility rights-of-way. They generally allow the outgrantee the right to construct, use, operate and maintain roadways and utilities crossing project lands. In addition, there a number of outgrants to other agencies for wildlife management purposes, and one license for recreation purposes.

Big Stone Lake - Whetstone River:

There are no outgrants at this project.

CHANGES TO ORIGINAL PROJECT LANDS:

Lake Traverse:

Originally, 1,348.13 acres were acquired for operations; 204 acres have been disposed of.

Lake Orwell:

The original land acquisition was for 1,984 acres. Thirty-five acres were acquired by warranty deed in August 1988 to remedy a Government encroachment on private land.

Lac qui Parle:

There have been no changes to original lands.

Big Stone Lake - Whetstone River:

The original land acquisition for the project was 10,794.63 acres. On March, 31, 1975 the Corps of Engineers transferred 10,540.43 acres to the Department of the Interior. This land is managed by the U.S. Fish and Wildlife Service as the Big Stone Wildlife Refuge.

APPENDIX F – PUBLIC LAWS, EXECUTIVE ORDERS, AND REGULATIONS PERTINENT TO RESOURCE MANAGEMENT

APPLICATION:

The following paragraphs list the applicable Public Laws (PL), Executive Orders (EO), Corps of Engineers' Engineer Manuals (EM), Engineer Pamphlets (EP), and Engineer Regulations (ER) for planning, development, and management of natural and cultural resources at Corps of Engineers Civil Works Projects. Part 2 provides a more detailed annotation of these PL's, EO', EM's, EP's, and ER's; FR denotes an entry to the Federal Register.

Specific Project Authority:

Lake Orwell:	PL 81-516, Flood Control Act of 30 June 1948; Supplemented May 17, 1950
Lake Traverse:	PL 74-738, Flood Control Act of 22 June 1936.
Lac qui Parle:	PL 74-738, Flood Control Act of 1936.
Big Stone Lake - Whetstone River	PL 89-298, Flood Control Act of 1965.

Planning:

PL 79-14	River and Harbor Act of 1945.
PL 79-526	The Flood Control Act of 1946.
PL 89-80	Water Resources Planning Act of 1965, 22 July 1965.
PL 91-190	National Environmental Policy Act of 1969, 1 January 1970.

EO 11514	Protection and Enhancement of Environmental Quality, 5 March 1970 (Amended by EO 11991).
EO 11990	Protection of Wetlands, 24 May 1977.
EO 11991	Relating to Protection and Enbancement of Environmental Quality, 24 May 1977 (Amended EO 11514).
EP 1105-2-35	Public Involvement and Coordination, 5 February 1982 (Change 1).
EP 1165-2-1	Digest of Water Resource Policies and Authorities.
EP 1165-2-501	Environmental Policies, Objectives, and Guidelines for the Civil Works Program of the Corps of Engineers, 18 December 1988.
ER 202-2-2	Policy and Procedures for Implementing NEPA, 1 November, 1971 (Change 3).
ER 1105-2-20	Project Purposes Planning Guidance, 29 January 1982 (Change 3).
ER 1130-2-435	Project Operation Preparation of Master Plans, 30 December 1987.
ER 1165-2-400	Water Resource Policies and Authorities: Recreation Planning, Development, and Management Policies, 9 August 1985.

Resource Management, General:

PL 86-717	Forestry Management Practices at Corps Reservoirs.
PL 96-366	Fisb and Wildlife Conservation Act of 1980, 29 Sept 1980.
ER 190-1-50	Law Enforcement Policy, U.S. Army Corps of Engineers.
ER 1130-2-401	Visitor Center Program.

ER 1130-2-404 Recreation Use Fees, 2 July 1985.

ER 1130-2-405 Use of Off Road Vehicles on Civil Works Projects.

ER 1130-2-406 Lakeshore Management of Civil Works Projects.

ER 1130-2-407 Operating and Testing Potable Water Systems.

ER 1130-2-411 Regulation of Seaplane Operations.

ER 1130-2-412 Aquatic Plant Control Program.

ER 1130-2-413 Pest Control Program for Civil Works Projects.

ER 1130-2-414 Recreation-Resource Management System (RRMS).

ER 1130-2-418 Law Enforcement Service Contracts.

ER 1130-2-420 Visitor Assistance Program.

ER 1130-2-428 Interpretive Services.

ER 1130-2-432 Corps of Engineers Resources Volunteer Program (CERV).

Aesthetic Resources:

PL 91-190 National Environmental Policy Act of 1969, 1 January 1970.

ER 1105-2-50 Environmental Resources: Aesthetic Resource Considerations, Chapter 5 (Draft 1984).

EP 1165-2-501 Environmental Policies, Objectives, and Guidelines for the Civil Works Program of the Corps of Engineers, 18 December 1988.

Cultural and Historical Resources:

PL 59-209 Antiquities Act of 1906, 8 June 1906.

PL 74-292 Historic Sites, Buildings and Antiquities Act of 1935, 21 August 1935.

PL 86-523 Reservoir Salvage Act of 1960, 27 June 1960.

PL 89-665 National Historic Preservation Act of 1966, 15 October 1966.

PL 91-190 National Environmental Policy Act of 1969, 1 January 1970.

PL 93-291 Archeological and Historic Preservation Act of 1974, 24 May 1974.

PL 95-341 American Indian Religious Freedom Act of 1978.

PL 96-95 Archaeological Resources Protection Act of 1979, 31 October 1979.

PL 96-515 National Historic Preservation Act, Amendments of 1980, 12 December 1980.

PL 99-662 Water Resources Development Act of 1986

PL 100-555 Archeological Resources Protection Act, Amendment of 1988, 28 October 1988

PL 101-601 Native American Graves Protection and Repatriation Act, 16 November 1990

PL 102-575 National Historic Preservation Act, Amendments of 1992

EO 11593	Protection and Enhancement of Cultural Resources, 13 May 1971.
ER 1105-2-50	Environmental Resources, 29 January 1982 (Change 2).
ER 1105-2-100	Planning Guidance – Historic Preservation, 28 December 1990
ER 1130-2-438	Project Construction and Operation – Historic Preservation Program, 25 October 1987.
ER 1130-2-433	Collections Management and Curation of Archeological and Historic Data.
53 FR 4727-46	Guidelines for Federal Agency Responsibilities Under Section 110 of the National Historic Preservation Act
32 CFR Part 229	Uniform Regulations for ARPA
36 CFR Part 60	National Register of Historic Places.
36 CFR Part 78	Waiver of Federal Agency Responsibilities Under Section 110 of the National Historic Preservation Act
36 CFR Part 800	Advisory Council on Historic Preservation's Regulations for the Protection of Historic Properties

Endangered Species:

PL 93-205	Conservation, Protection, and Propagation of Endangered Species, 28 December 1973.
PL 95-632	Endangered Species Act Amendments of 1978, 10 November 1978.
PL 96-159	Endangered Species Act of 1973, 28 December 1979.

Fish and Wildlife:

PL 78-534	Flood Control Act of 1944.
PL 85-624	Fish and Wildlife Coordination Act of 1958, 12 August 1958.
PL 89-72	Federal Water Project Recreation Act (also see public laws under Endangered Species).
PL 96-366	Fish and Wildlife Conservation Act of 1980, 29 September 1980.
EL 86-25	Technical Report: U.S. Army Corps of Engineers Wildlife Resources Management Manual.
EO 11990	Protection of Wetlands, 24 May 1977.
ER 1105-2-50	Environmental Resources, 29 January 1982 (Changes 1-2).
ER 1130-2-400	Management of Natural Resources and Outdoor Recreation at Civil Works Water Resource Projects, 1 June 1986.

Pest Control:

PL 92-516	Federal Insecticide, Fungicide, and Rodenticide Act.
ER 1130-2-413	Pest Control Program for Civil Works Projects, 1 February 1982.

Recreation (also see Resource Management, General):

PL 78-534	Flood Control Act of 1944, 22 December 1944.
PL 79-526	Flood Control Act of 1946, 24 July 1946.

PL 88-578	Land and Water Conservation Fund Act of 1965, 9 July 1965.
PL 89-72	Federal Water Project Recreation Act of 1965, 9 July 1965.
EO 11644	Use of Off-Road Vehicles on Public Lands, 8 February 1972 (Amended by EO 11989).
EO 11989	Off-Road Vehicles in Public Lands, 24 May 1977 (AmendsEO 11644).
EM 1110-1-103	Design for the Physically Handicapped, 15 October 1976.
EM 1110-2-400	Design of Recreation Sites, Areas, and Management Policies, 31 May 1988.
EM 1110-2-410	Design of Recreation Areas and Facilities – Access and Circulation, 31 December 1982.
EP 310-1-6	Graphic Standards Manual, December 1980, (Change 1).
ER 70-2-7	Recreation Research and Demonstration System.
ER 1105-2-20	Project Purposes Planning Guidance, 29 January 1982 (Change 3).
ER 11101-102	Design for the Physically Handicapped, 15 October 1976.
ER 1120-2-400	Recreation Resources Planning, 1 November 1971 (Change 3).
ER 1130-2-400	Management of Natural Resources and Outdoor Recreation at Civil Works Water Resource Projects, 1 June 1986.
ER 1130-2-405	Use of Off-Road Vehicles on Civil Works Projects, 17 January 1974.
ER 1130-2-411	Regulation of Seaplane Operations at Civil Works Water Resource Development Projects, 15 November 1977.

ER 1130-2-413 Pest Control Program on Civil Works Projects.

ER 1165-2-400 Recreation Planning, Development, and Management Policies, 9 August 1985.

Water Supply and Quality:

PL 87-88 Federal Water Pollution Control Act Amendments of 1961, 20 July 1961.

PL 95-217 Clean Water Act of 1977, 15 December 1977.

EO 11990 Protection of Wetlands, 24 May 1977.

Real Estate:

EO 12512 Federal Real Property Management.

ER 405-1-12 Real Estate Handbook, 20 November 1985 (Change 23).

ANNOTATION:

The following paragraphs present a brief description of many of the key Public Laws, Executive Orders, Engineers Manuals, Engineer Regulations, and Engineer Pamphlets that provide guidance for resource use, development, and management of Corps of Engineers Civil Works Project. The annotated descriptions are not inclusive of all of the items listed in Part 1.

Public Laws:

1. PL 59-209, Antiquities Act of 1906 (8 June 1906): This Congressional Act placed primary responsibility for archaeological investigation on professionals while cooperating with the Smithsonian Institution and the National Park Service. It applies specifically to the appropriation or destruction of antiquities on Federally owned or controlled lands and has served as precedent for subsequent legislation (34 Stat. 225).

2. PL 74-292, Historic Sites Act of 1935 (21 August 1935): This act placed the responsibility for the administration and operation of historic and prehistoric preservation activities under the Secretary of the Interior and the National Park Service (49 Stat. 666, 16 U.S. C. 461-467).

3. PL 78-534, Flood Control Act of 1944 (22 December 1944):

- Recreation. Section 4 authorized providing facilities in reservoir areas for public use, including recreation and conservation of fish and wildlife (58 Stat. 889, 16 U.S. C. 460d).

- Water Supply. Section 6 authorized disposal by the Secretary of the Army, for domestic and industrial uses, of surplus water available at reservoirs (33 U.S.C. 708).

4. PL 79-526, Flood Control Act of 1946 (24 July 1946):

- Leases. Section 4 Amended Public Law 534, 78th Congress, to include authority to grant leases to nonprofit organizations at recreation facilities in reservoir areas at reduced or nominal charges (60 Stat. 642, 16 U.S.C. 460d).

5. PL 85-624, Fish and Wildlife Coordination Act (12 August 1958) : Provided that fish and wildlife conservation receive equal consideration and coordination with other project purposes. Proposals for work affecting any body of water by coordinated with the Fish and Wildlife Service (FWS) and the State wildlife agency. The recommendations of the FWS and the State agency are to be given full consideration and that justifiable means and measures for wildlife purposes, including mitigation measures, be adopted. Adequate provisions are to be given to use of project lands for the conservation, maintenance, and management of wildlife resources, including their improvement and development. The use of project lands for wildlife management

will be in accordance with general plans approved jointly by Army, Interior, and the State wildlife agency (72 Stat. 563.16 U.S.C. 661).

6. PL 86-523, Reservoir Salvage Act of 1960 (27 June 1960): Provides for the preservation of historical and archaeological data, by the Secretary of the Interior, which might otherwise be lost as the result of the construction of a dam and attendant facilities and activities (74 Stat. 220). Act further amended by PL 93-291.

7. PL 87-88, Federal Water Pollution Control Act Amendments of 1961 (20 July 1961) : Amended the Federal Water Control Act (70 Stat. 498) to provide for a more effective program of water pollution control, and for other purposes (75 Stat. 204, 33 U.S.C. 1151).

8. PL 88-578, Land and Water Conservation Fund Act of 1965 (3 September 1964) : Established a fund from which Congress can make appropriations for outdoor recreation. The fund derives revenue from entrance and user fees, sale of surplus Federal property, and the Federal motorboat fuel tax. Entrance and user fees at reservoirs were made possible by Section 2(a) which deleted the words "without charge" from Section 4 of the 1944 Flood Control Act as amended (78 Stat. 897, 16 U.S.C. 4601-4). Flood Control Act as amended (78 Stat. 897, 16 U.S.C. 4601-4). NOTE: Section amended and restated by Section 101(1), PL 94-422.

9. PL 89-72, Federal Water Project Recreation Act (9 July 1965): Requires that full consideration be given to opportunities for recreation and fish and wildlife enhancement. Recreation planning is to be based on coordination of use with existing and planned Federal, State and local recreation, and non-Federal administration of recreation and enhancement areas will be encouraged. The law requires that, without cost sharing by a local sponsoring entity, no facilities for recreation and fish and wildlife enhancement can be provided except those justified to serve other project purposes or needed for public health and safety. If, in the absence of a local sponsor, lands are acquired to preserve the recreation and fish and wildlife potential of the project, and if 10 years after the lands may be sold or used for other project purposes. The views of the Secretary of the Interior on the extent to which the proposed recreation and fish and wildlife development conforms to included in any project report.

10. PL 89-80, Water Resources Planning Act of 1965, 22 July 1965: Declares a policy of encouraging the conservation, development, and utilization of water and related land resources. The Act established the Water Resources Council and river Basins Commissions, and provides for financial assistance to States.

11. PL 89-665, National Historic Preservation Act of 1966 (15 October 1966) Amended PL 74-292: Declared a national policy of historic preservation, including the encouragement of preservation on the State and private levels; provided authority for the expansion of the National Register of Historic Places to include cultural resources of State and local as well as national significance; authorized matching Federal grants to the States and the National Trust for Historic

Preservation for the established the Advisory Council on Historic Preservation (one of which is the Secretary of Defense); provided certain procedures to be followed by Federal agencies in the event of a proposal that might have an effect on National Register properties; and defined the term "historic preservation' as the protection, rehabilitation, restoration, and reconstruction of Districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, or culture.

12. PL 91-190, National Environmental Policy Act (1 January 1970): Section 101 established a broad Federal policy on environmental quality (83 Stat. 852, 42 U.S.C. 4331). The Federal Governmental quality (83 Stat. 852, 42 U.S.C. 4331). The Federal Government shall ". . . assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings . . . preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice." (83 Stat. 852, 42 U.S.C. 4331). Section 102 requires an Environmental Impact Statement (EIS) on proposed Federal actions. "All agencies of the Federal Government shall . . . identify and develop methods and procedures . . . which will insure that presently unquantified environment consideration in decision making along with economic and technical considerations . . . ." (83 Stat. 853, 42 U.S.C. 4332).

13. PL 91-243, 9 May 1970: This legislation amended the National Historic Preservation Act of 1966 by extending the funding for the program through 1973, increasing the membership of the Advisory Council on Historic Preservation, and authorizing the participation of the United States as a member in the International Centre for the Study of Preservation and Restoration of Cultural Property, and authorized funds for that purpose.

14. PL 93-205, Conservation, Protection, and Propagation of Endangered Species (28 December 1973): Repeals the Endangered Species Conservation Act of 1969. Directs all Federal departments/agencies to carry out programs to conserve endangered and threatened species, in consultation with the Secretary of the Interior (or commerce in appropriate situations), and to preserve the habitat of such species (87 Stat. 884). NOTE: Section 7 of the Endangered Species Act Amendments of 1978 (PL 95-632) authorizes procedures hy which a Federal agency, State governor, or license applicant may apply for an exemption to the Act.

15. PL 93-291, The Archaeological and Historic Preservation Act of 1974 (24 May 1974): This Act amended the 1960 Salvage Act, provided for the preservation of significant scientific, prehistoric, historic, or archaeological data, including relics and specimens, that might be lost or destroyed as a result of the construction of dams, reservoirs, and attendant facilities and activities, or any alteration of the terrain caused as a result of any Federal construction project of Federally licensed project, activity, or program. It provided that the Secretary of the Interior be notified of impending loss of such resources, and that the agency or the Secretary may survey and recover the data and publish the results. It provided for agreement on time limits for initiation and completion of survey and recovery efforts. It requires the Secretary to coordinate, report on,

consult with appropriate experts, and distribute funds appropriated for those survey and recovery efforts. It provides that up to 1 percent of the total amount authorized to be appropriated for the Federal activities may be transferred to the Secretary for implementation of the Act, and provides funds for certain other costs. Compliance with this Act presumes prior compliance with Section 106 of the National Historic Preservation Act of 1966 with regard to properties listed in or eligible for listing in the National Register of Historic Places (88 Stat. 174).

16. PL 94-422 (28 September 1976): Amended Section 106 of the National Historic Preservation Act to apply to properties eligible for inclusion in the National Register. Additional funding was appropriated to carry out the provisions of the Act, the organization of the Advisory Council was clarified, and the membership was expanded to 29 members. The Council was established as a fully independent agency within the Executive Branch and authorized to promulgate such rules and regulations it deemed necessary to implement Section 106 of the Act.

17. PL 95-341, American Indian Religious Freedom Act of 1978: This act insures the " . . . inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians including but not limited to access to sites, use, and possession of sacred objects and the freedom to worship through ceremonials and traditional rites." The Act requires consultation with Indian leaders (92 Stat. 469, 42 U.S.C. 1996).

18. PL 95-217, Clean Water Act of 1977 (15 December 1977): Amends Federal Water Pollution Control Act and extends the appropriations authorization.

- Section 51: Requires the Environmental Protection Agency to enter into written agreements with Secretaries of Agriculture, Army, and Interior to provide maximum utilization of the laws and programs to maintain water quality.

- Section 60: Provides for Federal compliance with all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions in the same manner and extent as other entities.

- Section 67: Provides for the processing of permits for dredged or fill material through the Secretary of the Army acting through the Chief of Engineers and defines requirements to meet in the construction of Federal projects (91 Stat. 1566).

19. PL 95-632, Endangered Species Act Amendment of 1978 (10 November 1978): Amends the 1973 Act (PL 93-205) to establish an Endangered Species Interagency Committee to review proposed actions to determine whether exemptions from certain requirements of the Act should be granted. Prescribes a consultation process between Federal agencies and the Secretary of the Interior, Secretary of Commerce, or Secretary of Agriculture, as appropriate, for carrying out programs for the conservation of endangered and threatened species. Directs agencies to

conduct a biological assessment to identify endangered or threatened species which may be present (92 Stat. 3752).

20. PL 96-95, Archaeological Resources Protection Act of 1979 (31 October 1979): Protects archaeological resources and sites which are on public lands and Indian lands and fosters increased cooperation and exchange of information between Governmental authorities, the professional archaeological community, and private individuals; defined archaeological resources to be any material remains of past human life or activities which are of archaeological interest and are at least 100 years old; established permit requirements for the excavation or removal of archaeological resources from public or Indian lands, with special permit and disposition rules for the protection of archaeological resources on Indian lands in light of the American Indian Religious Freed Act; provided that information regarding the nature and location of archaeological resources may remain confidential; establisbed civil and criminal penalties, including forfeiture of vehicles and equipment used, fines of up to $100,000 and imprisonment of up to 5 years for second violations for the unauthorized appropriation, alteration, exchange, or other handling of archaeological resources; and provided for rewards for furnishing information about such unauthorized acts. Archaeological resources covered by the Antiquities Act of 1906 are now covered by this Act.

21. PL 96-159, Endangered Species Act of 1973 (28 December 1979): Expanded the Act to protect endangered plants; require the Secretary of Interior, when proposing land as critical habitat, to publish a summary of the proposal and a map in the local newspapers; and to require Federal agencies to insure their projects "are not likely" to jeopardize an endangered species. It also authorized all those seeking exemptions from the Act to get permanent exemptions for a project unless a biological study indicates the project would result in the extinction of a species (93 Stat. 1225).

22. PL 96-366, Fish and Wildlife Conservation Act of 1980 (29 September 1980): Provides funds to States to conduct inventories and conservation plans for conservation of nongame wildlife. Also encourages Federal departments and agencies to use their statutory and administrative authority to conserve and promote conservation in accordance with this Act (94 Stat. 1322).

23. PL 96-515, National Historic Preservation Act Amendments of 1980 (12 December 1980): Amends the National Historic Preservation Act of 1966 and authorizes the Secretary of Interior to expand and maintain a national register of Historic Places. Within 1 year after the date of enactment, the Secretary shall establish, in consultation with the Secretary of Defense and other agencies, standards for the preservation of historic properties in Federal ownership or control (94 Stat. j2987).

Executive Orders Pertinent to the Water Resources:

1. EO 11514, Protection and Enhancement of Environmental Quality (5 March 1970): Section 2 of the Order outlines the responsibilities of Federal agencies in consonance with Title I of the National Environmental Policy Act (NEPA) of 1969 (amended by EO 11991, 24 May 1977).

2. EO 11593, Protection and Enhancement of Cultural Environment (13 May 1971): Section 2 of the Order outlines the responsibilities of Federal agencies in consonance with the NEPA (1969), the National Historic Preservation Act of 1966, the Historic Sites Act of 1935, and the Antiquities Act of 1906. Instructed all Federal agencies to provide national leadership in historic preservation, to assure the preservation of cultural properties in Federal ownership, and to "institute procedures to assure that Federal plans and programs contribute to the preservation and enhancement of non-Federally owned sites, structures, and objects of historical, architectural, or archaeological significance." Directed all Federal agencies to "locate, inventory, and nominate to the Secretary of the Interior jurisdiction or control that appear to qualify for listing in the National Register of Historic Places." The order further established procedures to be followed by all Federal agencies pending completion of the cultural resources inventories.

3. EO 11644, Use of Off-Road Vehicles on Public Lands (8 February 1972): This Order establishes a uniform Federal policy regarding the use of vehicles such as trail bikes, snowmobiles, dune buggies, and others on public lands. Section 3 provides guidance for establishing zones of use for sucb vehicles (amended by EO 11989, 24 May 1977).

4. EO 11989, Off-Road Vehicles on Public Lands (24 May 1977): Agency heads are authorized to close areas or trails, within their jurisdiction, to off-road vehicles which cause adverse effects to soil, vegetation, wildlife, wildlife habitat, and cultural or historical resources. Fire, military, emergency and law enforcement vehicles are excluded when used for emergency purposes. This Order amends EO 11644, 8 February 1972.

5. EO 11991, Relating to Protection and Enhancement of Environmental Quality (24 May 1977): Section 1 of this Order amends Section 3(h) of EO 11514 by directing the Council of Environmental Quality to issue guidelines to Federal agencies for implementing procedural provisions of NEPA (1969). These regulations will include procedures for early EIS preparation and require impact statements to be concise, clear, and supported by evidence that agencies have made the necessary analyses. The Council will resolve conflicts between agencies concerning the implementation of NEPA and Section 309 of the Clean Air Act, as amended.

6. EO 11990, Protection of Wetlands (24 May 1977): Restricts Federal agencies from taking action which would destroy or modify wetlands when there is a practical alternative.

7. EO 12512, Federal Real Property Management (29 April 1985): Requires all executive departments to set annual real property management goals and designated OMB as the agency to review progress toward those goals. Under the provision of this EO, project lands are surveyed to identify those areas of real property which are not being utilized, are underutilized, or are not being put to optimum use. Project real property identified as excess to project needs is reported to the General Services Administration for disposal. Revoked EO 12348 of 25 February 1982.

Engineer Manuals:

1. EM 1110-1-103, Design for the Physically Handicapped (15 October 1976): This manual sets forth criteria for the provision and design of features to make facilities designed by the Corps of Engineers accessible to, and usable by, physically handicapped persons.

2. EM 1110-2-400, Design of Recreation Site, Area and Facilities (7 July 1972) Change 1, 13 September 1974:

3. EM 1110-2-410, Design of Recreation Areas and Facilities - Access and Circulation (31 December 1982): This manual presents data compiled from experience and research that should be useful in the design of access and circulation to recreation sites, areas, and facilities.

Engineer Pamphlets:

1. EP 310-1-6, Graphic Standards Manual (December 1980), Change 1: This manual is a reference book for use by all Corps activities. It establishes a unified approach regarding the use of Corps logotype and preparation of visual communications. The manual covers use of the logo in business cards, signs, publications, forms, vehicles, and miscellaneous items.

2. EP 1105-2-35, Public Involvement and Coordination (5 February 1982), Change 1: This regulation provides guidance for public involvement and coordination in the Corps planning process.

3. EP 1165-2-501, Environmental Policies, Objectives, and Guidelines for the Civil Works Program of the Corps of Engineers (18 December 1988): Provides a summary of the environmental policies, objectives, and guidelines for the Civil Works Program.

Engineer Regulations:

1. ER 202-2-2, Policy and Procedures for Implementing NEPA (1 November 1971), Change 3: Provides policy and procedural guidance to supplement Council of Environmental Quality regulation and requirements and consideration related to NEPA.

2. ER 405-1-12, Real Estate Handbook (20 November 1985), Change 25: Provides guidance for real estate activity on Corps of Engineers projects.

3. ER 1105 2-20, Project Purposes Planning Guidance (29 January 1982), Change 3: Provides policy guidance to project purposes of navigation, flood damage reduction, shore protection, hydroelectric power, recreation, and water supply. The guidance covers the subject of Federal interest, types of projects and facilities provided, and Federal and non-Federal participation. Guidance for the project purposes of fish and wildlife enhancement and water quality is contained in ER 1105-2-50.

4. ER 1105-2-50, Environmental Resources (29 January 1982), change 2: This regulation is consistent with national policies to both create and maintain conditions under which human and natural environments can exist in productive harmony and to preserve important aesthetic, historical, and archaeological resources. This regulation provides requirement for environmental resource planning. Chapter 2 – provides guidance for consideration of fish and wildlife resources in Civil Works planning studies, Chapter 3 – Historic Preservation, Chapter 4 – Water Quality, and Chapter 5 – Aesthetic Resources (draft).

5. ER 1110-1-102, Design for the Physically Handicapped (15 October 1976): Stipulates procedures and responsibilities to assure compliance with criteria herein.

6. ER 1110-2-400, Design of Recreation Sites, Areas, and Facilities (31 May 1988), change 1: Provides information and criteria related to planning and design of recreation facilities at water resource projects.

7. ER 1130-2-400, Management of Natural Resources and Outdoor Recreation at Civil Works Water Resource Projects (1 June 1986), Changes 1-2: This regulation provides policy and procedural guidance for the administration and management of Civil Works water resource projects. The objectives are to manage natural resources on Corps lands to insure their continued availability, to provide outdoor recreation opportunities, and to provide a safe and healthful environment for project visitors. This regulation also requires and gives guidance for operational management plans.

8. ER 1130-2-405, Use of Off-Road Vehicles on Civil Works Projects (17 January 1974): Provides uniform policies, procedures, and criteria for designations of project lands where use of off-road vehicles will and will not be permitted.

9. ER 1130-2-411, Regulation of Seaplane Operations at Civil Works Water Resource Development Projects (15 November 1977): This regulation is designed to provide uniform policies and criteria for designating Corps projects, or portions thereof, at which seaplane operations are prohibited, restricted, or allowed.

10. ER 1130-2-413, Pest Control Program for Civil Works Projects (1 February 1982): This regulation is to assign responsibilities and prescribe procedures concerning the use of chemicals in the Corps pest control program at all civil works projects.

11. ER 1130-2-435, Project Operations Preparation of Master Plans (30 December 1987): Provides policy and procedure for the conduct of USACE Civil Works Master Planning Program and guidance for the preparation of master plans.

12. ER 1165-2-400, Recreation, Planning, Development, and Management Policies (9 August 1985): Defines the objectives and basic policies governing planning, development, and management of outdoor recreation resources and enhancement of fish and wildlife at Corps of Engineers water resource projects.

APPENDIX G – LITERATURE CITED

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United States Department of the Interior, Soil Conservation Service (USDA SCS) Soil Associations of Minnesota, October 1982.

APPENDIX H – PUBLIC REVIEW AND COMMENT

PUBLIC INVOLVEMENT STRATEGY:

Public involvement is required by law and is an essential part of understanding, and fulfilling, the needs of the region. The strategy for public involvement was formulated under three considerations:

- **1).** Regulations (ER 1130-2-435) require that every effort be made to insure that this study be as cost effective as possible.
- **2).** All of the projects in the study are existing and well documented. Many other studies (Reservoir Operation Plan Evaluations, prior Master Plans, etc.) have been prepared previous to this. As a result, the concerned public of the region is already familiar with the projects.
- **3).** This study is only recommending changes that will increase project accessibility – as per the requirements of the Rehabilitation Act of 1973 (amended 1975) Title V, Section 504 – and safety; this study is not recommending any major changes. Considering these three factors, the Public Involvement Strategy for this study is not as involved as it would be for a new project, or for a study that was recommending major changes.

Public involvement for this Master Plan for Resource Use will be a two-step process: 1). All existing documentation will be garnered for information that is pertinent to the study and incorporated into the plan; a technical review by the Corps will provide revisions to the plan; draft copies of the plan will be sent to local libraries and Corps field offices; notices will be posted in local newspapers. 2). Public comments will be addressed and reviewed for possible incorporation into the final plan. All correspondence received by the Corps concerning this Master Plan for Resource Use will be answered by the study manager or another qualified source.

Phase 1 of the master plan study is the gathering and analyzing of data from the entire study area. The study team accomplished this by first reviewing existing documentation and inventorying resource capabilities. Next, key factors which might condition or limit resource use at the project lakes were identified. These include: agency guidelines, Federal and State regulations, funding limitations, and social circumstances. To gather public views on present and future use and management of area resources, copies of the draft Master Plan for Resource Use were placed in area libraries and at Corps field offices. This was for the purpose of eliciting comments that would establish the needs and desires of the area users of the project facilities. The study team analyzed this information to determine preliminary project development and resource management actions. Synthesis of the information and conclusions from the previous steps produced the final regional objectives, identifying the lake(s) which could most suitably meet the

needs expressed by the public. Phase 2 of the study is the incorporation of the review comments that are received into the final draft of the plan.

AGENCY COORDINATION:

Early in the study process, other agencies involved with the projects were informed of the study. Notification was mailed to the U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, North Dakota Parks and Recreation, North Dakota Game and Fish Department, and South Dakota Department of Game, Fish, and Parks. Agencies that responded to this notification will be mailed a copy of the draft plan for review and comments. The study manager or another qualified source will review and respond to any comments received.

PUBLIC COMMENT:

Comments on the Master Plan by the public are included in the following pages. They were received by the study team during the review period. All comments will be reviewed and responded to by the study team.

February 10, 1997

District Engineer
St. Paul Dist.
Corps of Engineers
ATTENTION: Tom Novak
Cencs-Pe-M
190 5th Street East
St. Paul, MN 55101-1638

RE: Master Plan for Western District Flood Control Projects

Dear Mr. Novak:

This letter is our written response to the Master Plan, western district, primarily with regard to Lake Traverse. We have some comments in Section 2-2, Page 76 under the paragraph titled, "Resource Management Responsibility". About half way through that paragraph it states, "Regulations (ER 130-2-400), direct that, whenever the opportunity exists, management techniques to improve vegetative conditions for wildlife, recreation, scenic value, cultural resources, fire prevention, pest control, and watershed protection be properly implemented", and furthermore on Page 77, top paragraph, "The lake resource manager is responsible for all aspects of management administration, with regard to the project. These responsibilities include range management, fish and wildlife management, SOIL EROSION CONTROL... employee safety program.

To our knowledge, there have been little if any management techniques implemented to improve vegetative conditions for watershed protection primarily on lakeshore. When you refer to soil erosion control, as responsibility of the Lake Traverse Resource Manager again, there has been no efforts made that we know of to control the erosion of the lakeshore around the reservoir known as Lake Traverse. Seeing this is in your plan, we wish to point out the fact that we do have a severe erosion problem along shoreland which takes place primarily when pool elevations are high. We sincerely hope that the recipients of our comments will take this information seriously and begin to work towards repairing those high erosion areas.

Page 2
February 10, 1997

We wish to point out also that on Page 47, Section 2-1, Lake Traverse as a Bois de Sioux River project is identified as a multiple purpose project designed primarily for the control of floods on reaches of the Bois de Sioux River in the lower Red River Valley. It is a multiple purpose project which is kind of a loose term. If possible, we would like some definition of that.

Kindly consider these comments and respond as soon as possible.

Thank you.

Sincerely,

John Conroy
LTAC President

JC:mw

March 14, 1997

U. S. Army Corps of Engineers
Western Flood Control Project Office
Suite 102, Feder Building
15 South 21st Street
Fargo, ND 58103

Mr. John Conroy, President
Lake Traverse Association Corporation
1002 Broadway
Wheaton, MN 56296-1304

Dear Mr. Conroy:

Thank you for your February 10, 1997 letter to Mr. Tom Novak of our St. Paul office with comments on the final draft of the Master Plan for the Western District sites.

In response to the issue raised in the first two paragraphs of your letter, I offer the following information which I hope will clarify the intent of the language in the Master Plan.

Guidance for management of all Corps owned and operated natural resources is provided in the ER (Engineer Regulation) reference in your letter. Therefore, if sufficient resources are available, the Resource Manager through proper channels is authorized and has responsibility for the list of programs stated in the Master Plan on lands held in fee title by the Corps of Engineers.

Unfortunately, at the request of the local governmental entities at the time the Lake Traverse Project was authorized and constructed, very little land was acquired by the federal government in fee. The lands held in fee by the Corps at Lake Traverse are either managed by the Corps for wildlife habitat maintenance, leased to the MN DNR, or used for lands and structures adjacent to the dams. The lakeshore on virtually all of Lake Traverse is held in fee by private individuals with the federal government holding easement interests allowing permanent or intermittent flooding of that land. The Corps of Engineers has no authority to perform soil erosion control measures on private lands held around the reservoir.

In the last year the Corps has taken aerial photographs of Lake Traverse and had those photos interpreted to attempt to determine if erosion has exceeded the easement interests held at Lake Traverse. A few areas where positive determination cannot be made from photo interpretation will be ground surveyed this summer; and if it is found Lake Traverse reservoir operations

have caused erosion exceeded the Corps easements, measures will be initiated to rectify those situations.

There is a program which the Corps can use to perform natural resource management activities on private land if those measures would serve to better such parameters as water quality and fish and wildlife habitat. This program was written into law in Section 1135 of the 1986 Water Resource Development Act (WRDA). The program requires a local government sponsor who is required to fund 25% of the total cost of the any measures taken. Additionally, this program is subject to approval of funding at the Washington level and recent emphasis on reduction of the federal budget has resulted in few approved projects nationwide the last couple fiscal years.

When identifying Corps water resource projects as "multi-purpose"; it means that the Congressionally authorized purposes for the existence and management of the project are multiple. In the case of Lake Traverse, the authorized purposes are flood control, recreation, management of fish and wildlife resources.

If you have any questions or require any further clarification on any issues at Lake Traverse, I would gladly meet with you or your group in person to discuss them. Again, I thank you for your interest in management activities at Lake Traverse and comments on the proposed Master Plan.

Sincerely yours,

Tim Bertschi

Tim Bertschi
Operations Project Manager