WESTERN AREA MASTER PLAN

Minnesota/South Dakota

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US Army Corps of Engineers

St. Paul District

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Executive Summary

The Western Area Project (Master Plan) is a strategic land use document that will serve as a vital tool for the responsible stewardship of resources to benefit present and future generations. This Master Plan has multiple purposes:

- Prescribe an overall land use management plan for all land (fee, easements, or other interests) acquired for the Project.
- Identify resource objectives and associated design and management concepts.
- Provide broad concepts rather than details of design or administration.
- Facilitate appropriate management, use, development, enhancement, protection, and conservation of the natural, cultural, and man-made resources.
- Ensure responsible stewardship of these resources to benefit present and future generations.
- Guide the U.S. Army Corps of Engineers (USACE) pursuant to applicable federal laws, policies, and regulations.

As a dynamic, operational document, this Master Plan is broad and flexible and based upon changing conditions. The Master Plan deals with concepts rather than details of design or administration. Detailed management and administration functions are addressed in the operational management plan, which implements the concepts within this Master Plan into operational actions.

The primary goals of the Master Plan are to prescribe an overall land use management plan and identify resource objectives and associated design and management concepts. An interdisciplinary team developed this Master Plan with input from local, state, and federal agencies, tribal representatives, and the public. The Western Area Master Plan was created in 1997 and updated again in 2020.

By definition, master plans for USACE reservoirs are land and recreational use management plans that do not address the technical aspects of water level management, regional water quality, shoreline management, or operation and maintenance of Project operations facilities. To ensure consideration of natural and cultural resources, USACE also prepared an environmental assessment to identify and evaluate potential impacts of all changes to the Master Plan.

All elevations presented in this plan are relative to the National Geodetic Vertical Datum (NGVD) unless stated otherwise.

PART A
REGIONAL APPLICATIONS

1 REGIONAL INTRODUCTION

1.1 INTRODUCTION*

Master plans are programmatic and designed to be flexible and adaptive to changing management strategies. They are designed to work in conjunction with other plans, regulations, laws, sovereign governments, agencies, and the public. A master plan is used as a vital tool to enable responsible stewardship and sustainable management of resources for the benefit of present and future generations.

This regional master plan proposes a comprehensive strategy for the Lake Traverse, Orwell Lake, Lac qui Parle and Highway 75 Dam projects. This master plan provides overall resource objectives, resource management to achieve the objectives, and management and development concepts for the efficient and cost-effective management, development, and use of project lands for the next twenty-five years.

This regional master plan is administered by the U.S. Army Corps of Engineers, St. Paul District (USACE). USACE is the steward of the lands and waters at USACE water resource projects.

All elevations presented in this plan are relative to the National Geodetic Vertical Datum (NGVD) unless stated otherwise.

1.2 AUTHORIZATION*

Master plans are authorized by Engineer Regulation (ER) 1130-2-550, Recreation, Operations, and Maintenance Guidance and Procedures. Chapter 3, Project Master Plans and Operational Management Plans, 30 January 2013. This ER also provides policy and guidance for the preparation of master plans. It is the policy of USACE that master plans be developed and kept current for all Civil Works projects for which USACE has administrative responsibility. The master plan is the basic document guiding USACE obligations. The current, approved master plan is necessary before any action can be taken which may restrict the range of future operations and will supersede the 1997 master plan. Furthermore, all actions by USACE and out grantees must be consistent with the master plan.

Specific information related to each project can be found in the following sections:

- Lake Traverse – Section 2
- Orwell Lake – Section 5
- Lac qui Parle – Section 8
- Highway 75 Dam – Section 11

1.3 PURPOSE AND SCOPE OF THE MASTER PLAN*

1.3.1 Purpose and Scope

The master plan is a strategic land use management document that guides the comprehensive management and development of all recreational, natural, and cultural resources throughout the life of the projects. The plan guides the efficient and cost-effective development, management, and use of project lands, including real estate actions. The plan guides and articulates the USACE responsibilities pursuant to federal laws to preserve, conserve, restore, maintain, manage, and develop the land. The plan needs to be dynamic and flexible to accommodate changing conditions, focusing on carefully developed goals and objectives.

By definition, this plan doesn't address the technical aspects of the primary project purposes of the project, including flood risk management, water control, but instead seeks to provide a management framework that balances the stewardship of natural resources and provision of high-quality recreation opportunities with the primary project purposes. The master plan doesn't

address specifics of water quality, shoreline management, or water level management. The technical aspects of operation and maintenance of primary project operations facilities, including but not limited to the dams, spillways, and gate-controlled outlets is not included in this plan.

This master plan updates the existing and outdated plan. This master plan will lead to updated Operational Management Plans (OMPs) for each project. An OMP is the document which implements the strategic resource objectives and development needs identified in this master plan.

The scope of this master plan covers the present and future use of all land within the project boundaries of the Lake Traverse, Orwell Lake, Lac qui Parle and Highway 75 Dam projects. This master plan is a strategic land use document with multiple purposes:

- prescribe an overall land-use management plan for all land (fee, easements, or other interests) acquired for the projects;
- identify resource objectives and associated design and management concepts;
- provide broad concepts rather than details of design or administration;
- facilitate appropriate management, use, development, enhancement, protection, and conservation of the natural, cultural, and man-made resources;
- ensure responsible stewardship of these resources to benefit present and future generations; and
- guide USACE pursuant to applicable federal laws, policies, and regulations.

This revision of the Lake Traverse, Orwell Lake, Lac qui Parle and Highway 75 Dam Master Plan is intended to bring the master plan up to date to reflect current ecological, socio-demographic, and outdoor recreation trends that are affecting the lakes, as well as those anticipated to occur within the planning period of 2021 to 2046 (i.e. 25 years).

As a dynamic, operational document, this master plan is broad and flexible based upon changing conditions. All USACE actions and individuals who are granted leases to USACE's lands must be consistent with the master plan. Therefore, the master plan must be updated regularly to provide effective guidance to the USACE's decision-making.

The master plan is based on regional and local needs, resource capabilities, and expressed public interests that are consistent with authorized project purposes. It provides a district-level policy consistent with national objectives as well as state and regional goals and programs.

To ensure consideration of natural and cultural resources, the USACE also prepared an environmental assessment to identify and evaluate potential impacts. The environmental assessment can be found in Appendix C – Environmental Assessment.

This master plan presents a concept of best use practices and development. Implementation of the objectives established by this document is beyond the scope of the plan; this is a conceptual document. The OMP describes in detail how the concepts and objectives prescribed in the master plan will be implemented and achieved. Operation and maintenance of the project is also outside the scope of this master plan. The operations manuals for the dams and related structures present the project operational requirements in detail.

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 USACE 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 would supply much of the needed information. Resource Use Objectives were established from these documents.

1.3.2 Format

This master plan consists of six parts under one cover.

Part A – Regional Introduction

Part B – Lake Traverse Project

Part C – Orwell Lake Project

Part D – Lac qui Parle Project

Part E – Big Stone Lake – Whetstone River (Highway 75 Dam)

Part F – Regional Summary

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

1.4 REGIONAL DESCRIPTION

1.4.1 Location and Watershed*

The Western Area Projects are located in western Minnesota and eastern South Dakota (Figure 1). The Orwell Lake and Lake Traverse Projects lie within the Upper Red River watershed and the Highway 75 and Lac qui Parle Projects lie within the Minnesota River watershed (Figure 1).

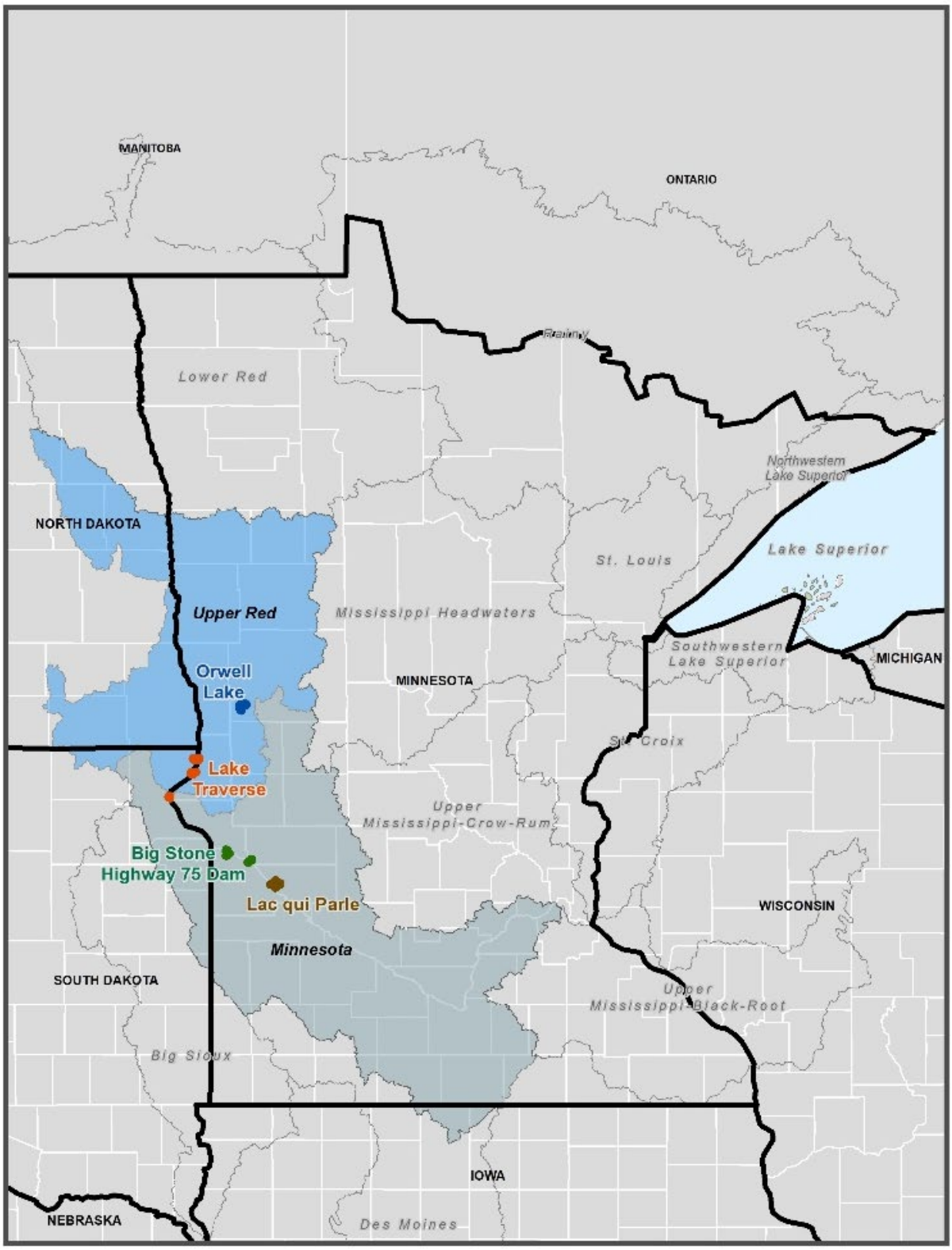


Figure 1. Location of each project within watersheds.

1.4.2 Chronology of the Region

The project area is roughly 160 by 288 kilometers (km) somewhat centered on the corners of North Dakota, South Dakota, and Minnesota, with its long axis aligned along the Minnesota border. Historically, this was the northeastern edge of the great plains of North America—a seemingly endless expanse of rolling, grass covered hills inhabited by seminomadic Native American tribes. Today the region is part of the Midwestern farm belt, the so-called "Breadbasket of America." It is a sparsely populated rural landscape that stretches across the center of the continent for hundreds of miles. The northern part of the project area (Orwell Lake) is in the Central Lakes Deciduous West of western Minnesota, 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 that do not all share common watersheds. The unusual topography 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 Wisconsinan glaciation occurring from about 75,000 to 11,000 years ago. The project area lies predominantly within the till of the Big Stone Moraine, a barrier that forms the continental divide that separates watersheds and contributes to the development of different subsistence regimes by its human occupants.

Vast sheets of ice formed as the climate of the earth cooled, contributing to changing weather patterns. Winters became longer and precipitation in the form of snow and ice accumulated in the northern areas of the continent creating glaciers thousands of feet high. Geological evidence indicates that the weight of the ice was sufficient that the crust of the earth was bent under its pressure and this tremendous weight pushed the edges of glaciers southward, away from the center.

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 bedrock of the region. This abrasive action created 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. The moraine that delineates the outer edges of the ice sheet within the project area covers 12,103 square miles, is 750 to 1,300 feet in elevation and is over 30 miles wide.

A glacier's size fluctuates according to 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 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 modern watersheds.

Over many years, the climate cycle warmed, and the ice sheets began a slow retreat northward. As the glaciers melted, 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, its meltwater was contained by the remaining ice of the retreating glacier to the north and by Big Stone Moraine to the south. This constrained body of water was Glacial Lake Agassiz.

Glacial Lake Agassiz occupied most of northwestern Minnesota, and a portion of eastern North Dakota extending northward into Manitoba, Saskatchewan, and Ontario. Eventually, the lake covered an area of about 200,000 square miles (322,000 square km) with a maximum depth of about 400 feet (122 m), in comparison with Lake Superior, the largest freshwater lake on earth, which is roughly 51,200 square km.

Fed by the waters of the melting glacier, the lake level rose, eventually overtopping and breaching the moraine, and Glacial 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, currently a ridge extending from South Dakota in a southeasterly direction across Minnesota and into Iowa. The crest of this ridge is nearly 1,729 feet (527 meters) above sea level. As the outflow from Lake Agassiz increased, so did the erosion into the drift. The modern testimony to these natural forces is now known as the Minnesota River Valley.

The prehistoric river that created the Minnesota River Valley was named 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 in 1866-67. Over its length of 330 miles (531 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 (1.6-4.8 km) and in depth to 200 feet (61 meters). During periods of lake stability, its estimated outflow averaged over 130,000 ft^3/sec with peak flows estimated at over 3.2 million ft^3/sec. From the lower end of the lake outlet at Browns Valley, Minnesota, to the vicinity of Lac qui Parle, the erosion eventually carved down to Precambrian bedrock.

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

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 linesat 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 Glacial River Warren and it ceased to function as a drainage channel for Glacial Lake Agassiz.

After drainage was blocked, siltation of the main channel of the river began. Tributary streams created alluvial fans where they entered the main stem, and the fans formed the series of river lakes know as Big Stone Lake, Marsh Lake, and Lac qui Parle. Erosion of these tributary river valleys did not reach the Archean rock bed as it did in the main channel. Erosion stopped at depths of 40 to 50 feet (12.2 to 15.2 m) below the present drift on a moraine of an earlier ice age that is composed of granite, syenite, and gneiss.

The huge lake continued draining to the north after breaking through an ice dam, 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 its margins.

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 Valley (of the North) which lies on the Minnesota-North Dakota border. The highly modified landscape of glacial drift (ground moraines, beach ridges, and terminal moraines), the ancient lakebed, 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 project area.

The alluvial fan of the Little Minnesota River, within the course of Glacial River Warren, forms a part of the Laurentian 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 Glacial 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 rivers and lakes of the glaciated prairie states, these waters are hidden in the landscape. Lying deep in the abandoned river channel, these waters cannot be seen as one crosses the rolling plain. They are not visible until the bluffs of the valley are attained.

Environmental Setting

Climate changes also account for the establishment of tundra vegetation in ice margin locales. By 12,000 years ago, boreal (spruce) forest colonized the project area. As the climate continued its warming trend, the boreal vegetation was replaced, first with mixed deciduous forest then, about 9,000 years ago, with prairie vegetation. Despite continued climate fluctuations, tall and mixed prairie grasses remained the principal biome until the onset of modern farming practices after the 1860s.

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 stream banks and in the gullies. As the prairies were periodically swept by fires, the only woody plants in the area were those that survived. As a consequence, stands of native trees and brush were few and widely dispersed, found only on the stream banks or in naturally protected areas.

The project 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 numerous herds of bison, elk and deer, and the predators and scavengers that depended on them. Native Americans lived in this area for thousands of years, and many small archaeological sites are scattered along the banks of the streams and lakes of the region. Contemporary processes of erosion, caused by wave action, expose these sites regularly.

European settlers began to colonize this area in the middle to late 1800s, where they found fertile soils with rich habitat and diverse animal and plant populations. Settlers transformed the landscape to farmland and suppressed the native, prairie dwelling

human and animal populations. Diverse foreign species of plants and animals were introduced, some of which have been harmful to the ecology of the area.

1.4.3 Cultural Chronology: Prehistoric and Historic Periods

A cultural chronology is primarily a description of subsistence, technology, and settlement pattern. The material remains called artifacts were lost, discarded, or deliberately buried by people in the past. The names associated with cultural complexes and traditions used here and elsewhere in archaeological writing are labels based most often on individual locations or "type" sites. The academic investment expended on sorting stylistic types and establishing relative and absolute dates for objects, and then extrapolating that data to settlements has been enormous, and the literature is vast.

Early Prehistory

Paleoindians entered the study region as early as 9,000 years ago. Archaeological evidence points to the area around Lake Traverse and Browns Valley, where excavated materials consist of a partial human skeleton in association with distinctive stone knives and projectile points. The burial fragments, subsequently called Browns Valley Man, were originally discovered in a gravel pit in 1933 and is the only burial of this early period in Minnesota. At the time these people arrived in the study region the climate had improved sufficiently to support habitats that would sustain them, and they took advantage of a variety of resources available in and along the margins of the river valley.

Artifacts associated with the Paleoindian tradition include fluted and unfluted lanceolate projectile points. The diagnostic Clovis point is the earliest cultural complex found broadly across the New World, where it appears to have been utilized for 500 years with only minor variations. These spear points, which have been located in direct contact with mammoth remains, are the hallmark of the cultural tradition and promote a generally accepted view that these people were hunting megafauna. Over 10,000 Clovis points have been recovered from about 1,500 locations, primarily across North America. The Folsom points that came into use after Clovis are associated with the skeletal remains of Bison, the descendants of megafauna that survived the end of the Ice Age.

The study region supports a series of overlapping stone tool types, all based on projectile point characteristics, for the Paleoindian period near Glacial Lake Agassiz. These types include Clovis, Folsom, Hell Gap, Agate Basin, Browns Valley, Cody, and Parallel-Oblique Flaked. Taken together, the plains lanceolate tradition is also referred to as the Plano Complex. Over 300 Late Paleoindian examples of points have been found in Minnesota including 12 Browns Valley type points. By the end of the Plano period—circa 8,000 years ago—bison dominated the plains political economy, and was used for meat, hides, and tools, all of which contributed to trade networks that radiated out from the region. Campsites that were occupied for both long and short durations for bison butchering and processing are tentatively dated by lost and discarded, or fragmented, projectile points. The highest probability locations for campsites for the period are on beach ridges of Glacial Lake Agassiz, and along the terraces of meltwater channels including tributaries to Glacial River Warren.

The mid-Holocene climatic transition to warmer and considerably dryer conditions was well established by 8,000 years ago, transforming landscapes around the globe. River valleys and floodplains stabilized allowing for settlement closer to many waterways, grasslands flourished, and a variety of deciduous trees advanced north into areas that had been dominated by coniferous forest. Following this change to a warmer and dryer climate, a number of new food resources became available to prehistoric populations. Communities appear to have become less nomadic, and subsistence patterns were based on exploiting a broader range of locally available foods. Bison were still present, but on-site remains of smaller animals and alterations

in tool technologies show how people adjusted to a shifting environment that favored grasslands, small mammals and fowl. The archaeological record indicates greater cultural diversity, possibly resulting in part from adaptation to different local environments. These adaptations to locally available resources are considered part of a widespread cultural pattern known as the Archaic Tradition.

The Archaic Tradition covers a period from 8,000-2,500 years ago and appears to have developed out of Late Paleoindian complexes. Many styles of smaller projectiles or dart points were developed and were often stemmed or side-notched, indicating different hafting methods, and ground stone plant-processing tools made their first appearance. It is at this time that the use of copper for fashioning weapons, tools, and body adornments 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 Lake Agassiz. It is likely that similar Archaic sites exist in the project area.

River terraces provide locations most often associated with sites from the Archaic period. So long as the climate was favorable, access to water, food and fuel along with the advantage of elevation for protection from flooding and the ability to observe the surrounding landscape made low, and medium terraces ideal. Archaeological recovery for many of these locations is complicated by erosion and flooding. In the former case, remains of sites have been scoured off the landform and, in the latter, sites have been deeply buried under many feet of flood sediments.

The onset of the Middle Archaic (4,500 years ago) is correlated to the Subboreal climatic period, when temperatures and wet/dry cycles became only slightly warmer than at present, and the Late Archaic (3,500-2,500 years ago) was even cooler and more humid. Human populations during these periods prove increasingly difficult to “type” or characterize based solely on their material debris. There is evidence for a great deal of movement of peoples with the return of a temperate climate and the plants and animals that came with it. There is also evidence for the adoption and adaptation of innovative technologies, including pottery making in the Late Archaic. Taken together, this material evidence indicates an increase in group mobility and group interaction. Stylistic variations demonstrate both individual responses to local conditions, and a shared group identity.

The Woodland tradition began around 3,000 years ago—overlapping with the preceding Late Archaic—and continued until around 500 years ago. The majority of sites in the region date to the Woodland period. While Woodland cultural markers are varied and the period is divided into Early, Middle, and Late, the common denominator is a major shift in subsistence regimes. Cultivation of a limited number of native seed plants and increasing reliance on ceramics and stone tools used for grinding and processing plants, are hallmarks of Woodland culture. The variability in sites from this time shows that while some groups didn’t embrace opportunities to diversify, others went so far as to specialize, using seasonal availability as a driver for movement and the choice of settlement locales. Consistent with earlier periods, Woodland period habitation sites and campsites continued to be located on riverine terraced landforms, such as along the Minnesota River. Burial mounds, a mortuary treatment new to the Woodland period, were situated on the uplands overlooking the river valleys, and on glacial beach ridges. Both provided views of the surrounding areas. 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 from A.D. 500 to A.D. 900.

Late Prehistory

At the start of the Late Prehistoric Period, circa 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. Both of these cultigens transformed nomadic and semi-nomadic populations into sedentary village agriculturalists in areas where farming was practiced. Within the project area, climatic conditions favored the adoption of corn, squash, including pumpkins, and potatoes. These cultigens were traded into the project area just as horses were. Surplus maize and wild rice were traded for exotic materials including Knife River flint and other superior stone from distant sources. Horses didn't come into common use by native people in the region until nearly A.D. 1750, when they were introduced by native traders.

Subsistence regimes during pre-contact and post-contact periods primarily follow one of two dominant strategies, hunting and gathering, or horticulture/agriculture supplemented by hunting and fishing. Within the project area these two subsistence strategies were applied to different but complementary environments. Groups who followed a predominantly nomadic regime, located on the prairie north of the continental divide, had opportunities to interact and trade with horticulturalists and agriculturalists in the Minnesota River Valley to the south. Prior to the introduction of the horse these nomadic hunters and their dogs packed their equipment, including dwellings, and followed the bison herds in seasonal rounds across the Plains. Horses became the new and improved technology, embraced for their mobility and the advantages they gave a hunting population. With horses, habitation sites could be shifted to uplands, as line of sight is desirable, and it isn't particularly onerous to move from an elevated landform downslope to a food resource when one is on horseback. Equestrian period tepee rings indicate temporary camps frequently located along permanent river courses and situated up where only the burial mounds of earlier cultures had been.

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 Nation (Dakota) 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.

Contact and Post-Contact History

To understand the relationship between native groups and geography, archaeologists rely primarily on available historic information. Early histories of people encountered by Europeans frequently combined and conflated tribal peoples' names, interchanging terms that others used for a group of people with those used by individuals to refer to themselves. Further, many names used for groups describe their spoken language. Dakota (Eastern, represented by Santee and Sisseton, and Western by Yankton and Yanktonai) and Lakota (the Teton) comprise closely related language groups associated with prairie Sioux bands. In 1660 and 1679 when the earliest European travelers chronicled their experiences, the Dakota mostly occupied the study region. These groups had all resided in what is now Minnesota until the early 1600s. Cheyenne bands who also were located in Minnesota migrated west into North Dakota in the

early 1700s. Following their push west, the Cheyenne and the Dakota occupied the region west of the Red River until the Ojibwe speaking Chippewa moved from Canada into Minnesota and North Dakota allying themselves with the Cree and Assiniboine in the mid-1700s.

The influence of Europeans on native people was not immediately felt across the study region. For a century between about 1750 and 1850 life went on more or less as it had, though with the addition of the horse and the availability of European trade goods, including firearms, introduced through trading posts. French traders established the first forts and fur trading posts, including several in and around the Red River Valley, beginning in the late 1730s. While the trading posts provided a source for European goods, they also offered divergent opportunities for indigenous groups wanting to participate in the fur trade. There were active fur trading operations in the Lake Traverse area beginning in the late 1790s. The first 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 located near the southeast shore of Lake Traverse about 6 miles from Browns Valley maintained 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, and in 1844, they installed another post on Big Stone Lake. Until 1849, when the Red River area was incorporated into the Minnesota Territory the region was populated by indigenous people and isolated small clusters of largely mixed households made up of French descended trappers with native wives and their children.

Competition among traders was intense, as over-trapping forced them to continually expand their territories. Exclusive trading rights agreements were given to the North West Fur Company, the Michilimackinac Company, and The American Columbia Fur Company (ACF) for control of specific regions between 1805 and the late 1820s. By the 1830s and 1840s troops from Ft. Snelling were used to deter non-ACF traders from infringing on designated ACF areas. Agricultural settlement followed closely on the intensifying fur trade in 1811 when the Scottish Earl of Selkirk, who had a controlling interest in the Hudson's Bay Company secured a grant of millions of acres of land in Manitoba, Minnesota, and North Dakota for the settlement of immigrant farmers. The establishment of the colony at the confluence of the Red and Assiniboine Rivers, incensed the North West Fur Company. Immediate and sanctioned harassment of the settlers by the Metis began, and the Europeans were forced to relocate several times until an uneasy peace was accorded in 1818.

Ultimately, involvement with Europeans came at a price for native people, who were increasingly drawn into political relationships with them. Europeans also meddled in tribal affairs. Trading posts and forts stimulated the entrepreneurial desires of a growing merchant class. St. Paul merchants found themselves in competition with those from as far south as St. Louis in their efforts to both supply and benefit from settlements along the Minnesota and Red Rivers. The Ox Cart Trails, which passed through the project area, followed by Red River steamboats and stagecoach lines attempted to provide a never-ending supply of European goods to settlers.

Coinciding with these events was the dramatic displacement of communities, and the diseases, poverty, and inter-tribal warfare that accompanied the migration of native groups from the eastern Great Lakes. The tipping point occurred when lands that had been considered unproductive to most Europeans became attractive for resources, which included gold in 1849. Native groups living near trails that led from the east to Oregon and California were particularly vulnerable to contagion carried by white travelers. The intervention of U.S. armed forces followed on a number of treaty agreements (1852) that

served to remove native populations from their homelands, and armed conflicts ensued. Native populations in the Dakota and Minnesota Territories rebelled, and settlers fled the post at Georgetown following the massacre of over 300 persons across the territory in 1862. 1863 and 1864 saw the response by troops led by Generals Sully and Sibley as they pushed native groups west of the study region across the Missouri River. The outcome of the Dakota conflict was the eviction of the Dakota from Minnesota, the westward displacement of the Yanktonai, the establishment of the first reservations in Dakota Territory, and the construction of military forts.

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.

Initially, wheat farming was the primary agrarian focus of settlers in the region, and various communities were established in the area by the late 1800s, including the towns of Diamond and Travare, South Dakots, and Dakomin and Maudada, Minnesota. Between 1900 and 1920, tow and tugboats as well as 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 different 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.

1.4.4 Chronology of Project Development

1.4.4.1 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.

1.4.4.2 Orwell Lake

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.

1.4.4.3 Lac qui Parle

Before damming, Lac qui Parle and Marsh Lake were wider sections along 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 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. Water conservation was not featured in these early plans. On March 1, 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 had constructed a low-head dam about 1.3 miles above the present dam, and 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 June 22, 1936. The USACE constructed its portion of the project, including Marsh Lake Dam, between 1941 and 1951. On September 7, 1950, operation of the project was transferred from the State of Minnesota to USACE. The USACE completed land acquisition during March 1961. The Lac qui Parle Flood Control Project was a complex project that had diverted two rivers, created two reservoirs, constructed four dams, multiple weirs, two railroads, and retrofitted three state highways, in addition to the development of 570 acres of parkland.

1.4.4.4 Big Stone Lake – Whetstone River (Highway 75 Dam)

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.

1.5 TRIBAL TRUST

Under the federal trust responsibility—also referred to as the trust doctrine—USACE recognizes the relationship between sovereign Native American Tribes and the federal government and is obligated to uphold rights reserved by or granted to Indian individuals by treaties, federal statues, and executive orders. Sovereignty is the foundation of tribal governments and their sovereign status affords them special recognition and treatment under federal law. All federally recognized Tribes are responsible for their own governance and management.

Lakes and streams, as well as the plants and animals associated with them, can hold spiritual, economic, and subsistence value for Tribes. Natural resources are fundamentally significant to Indian cultural identity. Under the trust doctrine, the USACE owes a fiduciary duty to Tribes. The

nature of that duty depends on the underlying substantive laws (e.g. treaties, statutes, agreements) upholding the duty. Where USACE actions may affect Tribal lands or off-reservation treaty rights, the trust duty includes a substantive obligation to protect these lands and treaty rights "to the fullest extent possible."

1.6 Key Factors and Resources of the Region

1.6.1 Climate & Climate Change

Annual precipitation within the project area ranges from approximately 24 to 27 inches, with the majority of precipitation occurring in the spring, summer, and fall. Temperatures during the summer are generally comfortable, with average highs near 80°F and average lows in the high 50's (°F). Winters are typically cold and dry, with average high temperatures in the low 20's (°F) and average low temperatures near 5°F (MNDNR, 2020). Due to the lack of tree cover across the landscape, wind is relatively constant, with annual average wind speeds ranging from 10 to 12 mph across the project area (Klink, 2002). Flooding is primarily caused by snowmelt runoff in early spring or heavy precipitation during the summer months. The largest flood events in the region have historically been caused by a combination of snowmelt runoff and intense, spring rainfall.

Per USACE Engineering and Construction Bulletin 2018-14 (U.S. Army Corps of Engineers, 2018), current USACE policy is to perform a qualitative assessment of climate change for all detailed hydrologic studies of inland watersheds. Since the primary goal of this master plan is to prescribe an overall land use management plan and not address technical aspects of the Western Area Projects, a full, qualitative climate change assessment is not required. Instead, information from readily available climate change assessments for projects in the basin can be used to inform the management plan for this effort.

Two qualitative climate change assessments have recently been conducted by USACE in the Red River of the North and Minnesota River basins. The qualitative climate assessment for the Red River of the North Long-Term Flood Solutions and Flood Risk Reduction Study (U.S. Army Corps of Engineers, 2019) concluded there is evidence of climate change occurring in the basin. There is also evidence that the watershed naturally transitions between multi-decadal wet and dry cycles. Since 1970, annual snowfall, precipitation, and peak streamflow have all increased throughout the watershed, resulting in increased flood risk. The number of historically significant flood events that have occurred since 2000 suggests large-scale flooding is occurring more frequently. A shift in seasonality has also been observed, with more flooding occurring during the summer and fall months in recent years. In the future, temperature is expected to increase, leading to an increase in precipitation in the form of more frequent, intense rainfall events.

The qualitative climate assessment for the Minnesota River Integrated Watershed Study (U.S. Army Corps of Engineers, 2017) concluded climate change is a factor in the basin and is likely to persist in the future. However, there is a great deal of uncertainty surrounding the magnitude to which climate change is likely to impact streamflow. Precipitation and peak streamflow have both increased over the period of record, and an extensive literature review suggested precipitation is likely to continue to increase in the future. Increased precipitation could result in more runoff from the watershed. However, temperature is also expected to increase, which would increase evapotranspiration rates and reduce soil moisture. This reduction in soil moisture could potentially offset increases in runoff from future, heavy precipitation by allowing for more infiltration.

Both qualitative climate change assessments indicate climate change is occurring throughout the project area. Increasing trends in precipitation and temperature are likely to continue in the future. This increase in temperature will likely lead to a shift in seasonality, with longer summers

and shorter winters, and more frequent, intense rainfall events. The magnitude to which these changes will impact streamflow is unclear, although the frequency of large flood events will likely increase. It is recommended planners and engineers account for uncertainty in a changing climate by incorporating resilience into the design of new projects or the maintenance of existing infrastructure. Some examples of incorporating resilience include selecting more flood-tolerant plant species when establishing floodplain forest habitat and budgeting for increased maintenance costs associated with erosion from intense, summer rainstorms.

1.6.2 Invasive Species*

Exotic and invasive plant species are a part of the existing ecosystem at the Western Area Reservoirs. Invasive species can rapidly disrupt land and water resources if not aggressively managed. Over time, native species can be replaced, and the ecology altered. Additionally, the interdependence and connectivity between the flora and fauna will be out of balance, and the fauna may relocate to find habitat required for preferred food, shelter, or habitat structure. In addition to their negative effects on native ecosystems, invasive species also cost natural resource managers' time and money as they work to control the spread of these species. A list of invasive species present in the region can be found in Table 1. Diligent monitoring and swift reaction are key to successful invasive species management.

Table 1. Invasive Species

Common Name	Scientific Name
Bird's-foot trefoil	*Lotus corniculatus*
Purple loosestrife	*Lythrum salicaria*
Reed canarygrass	*Phalaris arundinacea*
Common reed	*Phragmites spp.*
Common buckthorn	*Rhamnus cathartica*
Crownvetch	*Securigera varia*
Johnson grass	*Sorghum halepense*
Common tansy	*Tanacetum vulgare*
Poison ivy	*Toxicodendron radicans*
Common vetch	*Vicia sativa*
Giant cutgrass	*Zizaniopsis miliacea*
Garlic mustard	*Alliaria petiolata*
Smooth bromegrass	*Bromus inermis*
Musk thistle	*Carduus nutans*
Canada thistle	*Cirsium arvense*
Dogwood	*Cornus spp.*
Zebra mussel	*Dreissena polymorpha*
Leafy spurge	*Euphorbia esula*
Tall fescue	*Festuca arundinacea*

USACE has an Invasive Species Leadership Team, which will provide oversight of the USACE invasive species program established by policy in June of 2009 (USACE 2009). This USACE Policy supports the National Invasive Species Management Plan. The USACE goals mirror and add to the strategic goals found in the NISMP, they are: 1) Leadership and Coordination; 2) Prevention; 3) Early Detection and Rapid Response; 4) Control and Management; 5) Restoration; 6) Research; 7) Information Management; and 8) Education and Public Awareness. Creation and implementation of these goals would not only help prevent the introduction of invasive species, but also control and monitor invasive species already present at Ashtabula and Homme. Executive Order (EO) 13112 provides direction and asks Federal agencies to

identify and reduce actions that introduce or spread invasive species. All Federal land and water management agencies within the Department of Interior, NOAA, and Defense have authority to control and manage invasive species as well as restore affected areas on their lands and waters. This authority arises from the various agency regulations and other statutes that govern management, uses, and planning on the lands and waters under their jurisdiction. The level of effort and budgetary resources for management, control, and restoration vary with each Department. None of them has the resources to control every invasive species present on Federal lands and waters. Departments and their agencies also work in partnership with States and private landowners to control invasive species on public lands.

1.6.3 Recreation Trends

The Minnesota and South Dakota Statewide Comprehensive Outdoor Recreation Plans (SCORP) serve as a management tool to help decision-makers, provide better understanding, and prioritize the use of recreational resources statewide. SCORPs are used by USACE to better understand and adapt to the current and future recreation trends and needs specific to Minnesota and South Dakota.

The Minnesota SCORP identified the most pressing current and future trends and issues that impact outdoor recreation (MNDNR, 2019). These trends include recognition of 1) the public health benefits of outdoor recreation; 2) the need to serve all Minnesotan's equitably in outdoor recreation spaces; 3) Minnesota's changing population demographics; 4) climate change impacts on the natural world and recreational facilities; and 5) continued accessibility challenges at outdoor recreation facilities.

During development of the SCORP, feedback was given by outdoor recreation providers and the public. Major priorities of interests identified include:

- Acquiring land for parks, trails and conservation
- Maintaining and improving parks natural resources
- Maintaining parks and trails
- Providing more programming and events
- Providing more and improved features (e.g., equipment and accessible infrastructure)
- Creating greater awareness and marketing of parks, trails and programming

The South Dakota SCORP identified many challenges to improving outdoor recreation opportunities in the state (South Dakota Department of Game, 2018). Some of these challenges include: an aging population, movement of people from rural areas to cities, low incomes, high obesity and inactivity rates, time, universal accessibility, winter and funding. The strategies listed below were established to address these challenges:

- Provide and promote year-round, diverse outdoor recreation opportunities for South Dakotans of all ages, interests, economic status and ability.
- Maintain and improve existing park and recreation areas, open spaces and facilities for outdoor recreation opportunities.
- Acquire and protect South Dakota's open space and natural resources for future outdoor recreation opportunities.
- Protect and improve the state's fish and wildlife habitat for outdoor recreation opportunities.
- Educate, promote and improve communications related to outdoor recreation opportunities.
- Be a compelling voice for action when it comes to making outdoor recreation a priority in people's choices to improve their health and lifestyle.

1.6.4 Economics

Communities across South Dakota and Minnesota recognize that outdoor recreation support and contributes to a high quality of life. Investing in outdoor infrastructure attracts employers and active workforces, ensuring those communities thrive economically and socially (Outdoor Industry Association, 2018).

Outdoor Industry found that Minnesota residents are more likely to participate in cruising/sightseeing by boat and fishing than the average American whereas, South Dakota residents are more likely to participate in hunting and fishing. Figure 2 shows consumer spending on outdoor recreation in Minnesota and South Dakota.

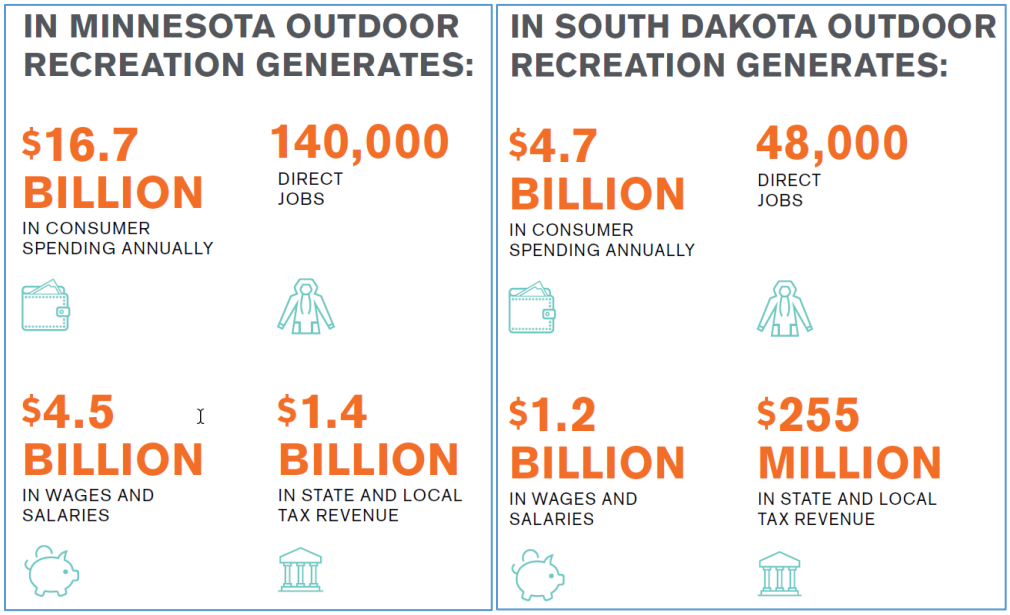


Figure 2. Consumer spending on outdoor recreation in Minnesota and South Dakota (Source: Outdoor Industry)

1.6.5 Demographics

The 2010 census counted a total population of 5,303,925 in Minnesota and 814,180 in South Dakota. Population trends for the counties surrounding the Western Area sites is shown in Table 2.

Table 2. Population Trends

State	County	2010 Census	2019 Estimate	Percent Change
Minnesota	Big Stone	5,016	4,991	-5.3
	Chippewa	12,010	11,800	-5.2
	Lac qui Parle	7,259	6,623	-8.7
	Otter Tail	57,992	58,746	2.5
	Swift	9,411	9,266	-5.3
	Traverse	5,269	3,259	-8.4
South Dakota	Roberts	10,149	10,394	2.4

Although the area surrounding the Western Area sites in Minnesota has seen an overall decline in population, the State of Minnesota saw a 6.3 percent increase between 2010 and 2019. The State of South Dakota saw an 8.7 percent increase in population over the same timeframe.

1.6.6 Education

University, college, and vocational training is available throughout the region. A comparison of the level of education for the residents of Lac qui Parle, Big Stone, Traverse, Chippewa, Swift and Otter Tail Counties in Minnesota shows that most persons 25 years or older have a high school diploma. The percentage of persons with a high school diploma and a bachelor's degree is greater in Otter Tail County. According to the 2010 Census of Roberts County, South Dakota, 88% of the population 25 years and older graduated high school and 31.5% have earned a bachelor's degree.

1.7 Pertinent Public Laws*

The following presents a brief description of many of the key Public Laws that provide guidance for resource use, development, and management of USACE Civil Works Projects.

Public Law 59-209, June 1906 – The Antiquities Act of 1906 (34 Stat. 225), 8 June 1906, provides for the privation and protection of antiquities on public lands. This includes archeological remains and historic sites.

Public Law 74-738 Flood Control Act of 1936 authorized the USACE to construct dams, levees, and dikes on inland rivers to control flooding.

Public Law 89-72 Federal Water Project Recreation Act required the USACE to consider fish and wildlife as well as recreation in all water resource projects.

Public Law 75-624 Fish and Wildlife Coordination Act of 1958 requires the USACE to coordinate with USFWS and affords equal consideration of wildlife conservation at water resource projects.

Public Law 92-500 Federal Water Pollution Control Act requires states and federal agencies to address pollution of waters. Its objective is to restore and maintain the integrity of the nation's waters.

Public Law 78-534 Flood Control Act of 1944 authorized the USACE to construct dams and other water resource projects for the purpose of navigation on inland rivers.

Public Law 93-205 Conservation, Protection and Propagation of Endangered Species Law of 1973 provided for the conservation of ecosystems on which threatened and endangered species depend. Authorized the USFWS to list species as threatened or endangered and prohibited the taking of endangered species.

Public Law 99-662 Water Resources Development Act of 1986 established cost sharing formulas with non-federal sponsors for the construction of water resource development projects. Authorized numerous water resource studies and projects.

Public Law 91-190 National Environmental Policy Act of 1969 authorizes and requires the USACE to collect environmental data and to prepare impact assessments of projects.

1.8 Management Goals

The USACE goal as the steward of the lands and waters at Western Area projects is to manage and conserve those natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations.

1.8.1 Western Area Management Goals

This vision for the Western Area Projects is supported by the following broad management goals:

- In all aspects of natural and cultural resources management, the USACE promotes awareness of environmental values and adheres to sound environmental stewardship, protection, compliance, and restoration practices.
- The USACE manages for long-term public access to, and use of, the natural resources in cooperation with other Federal, State, and local agencies as well as the private sector.
- The USACE integrates the management of diverse natural resource components such as fish, wildlife, forests, wetlands, grasslands, soil, air, and water with the provision of public recreation opportunities. The USACE conserves natural resources and provides public recreation opportunities which contribute to the quality of American life.

1.9 RESOURCE OBJECTIVES*

The following resource objectives set forth specific objectives for recreation, environmental stewardship, and general resources. The resource objectives are intended to guide the future management of the Western Area Projects.

Implementation of these objectives depends upon time, manpower, and budget. The objectives provided below are established to provide high levels of stewardship to lands and resources managed by the USACE while still providing a high level of public service. These objectives will be pursued using a variety of mechanisms, including assistance from volunteer efforts, partnership agreements, hired labor, contract labor, permit conditions, remediation, and special lease conditions. In all management actions, USACE will strive for a reasonable and pragmatic approach to the management of resources.

ER 1130-2-550 establishes the policy for the administration and management of USACE recreation programs and facilities. ER 1130-2-540 establishes the policy for the administration and management of natural resource activities. The rules and regulations governing public use of USACE water resources development projects are published as Title 36 of the Code of Federal Regulations, Chapter III, Section 327.0-327.30 and are enforced by USACE personnel with Title 36 citation authority.

The following documents the Environmental Stewardship, Recreation, and General Resource Objectives for Western Area Projects.

1.9.1 Environmental Stewardship Resource Objectives

- Proactively manage lands designated for wildlife to provide habitats for a variety of species with a focus on providing habitats that support the goals of the North American Waterfowl Management Plan where possible.
- Monitor lands and waters for invasive and exotic species and take action to prevent and/or reduce their spread.
- Identify, protect and/or restore important native vegetation ecosystems where they occur, or historically occurred, on Project lands.
- Inventory, protect, and interpret cultural resources.
- Carefully evaluate land use requests such as road and utility easements to avoid unnecessary resource damage or negative effects on public use. Ensure that all alternatives are considered.

1.9.2 Recreation Resource Objectives

- Provide safe public access for low to moderate levels of river-based recreation use, including fishing, picnicking, and wildlife viewing.
- Improve, modernize, and maintain day use areas through additional amenities, including, but not limited to road improvements, picnic sites,

pavilions, restrooms, trails, interpretive signage, playgrounds, fishing piers and boat launching facilities.
- Continue to provide and enhance existing opportunities for hiking, birding, and nature study by maintaining high quality trails and wildlife viewing stations.
- Continue to provide access for public hunting activities and work with the Minnesota Department of Natural Resources to ensure public safety and resource protection.
- Work toward universal accessibility in all aspects of the recreation mission. Provide access opportunities that contribute to the quality of life for all ages, ethnic backgrounds and for those with physical limitations.
- Evaluate and maintain high quality public water access points.
- Evaluate recreational experiences using comment cards and other methods.
- Evaluate current land use and ensure proper balance between impacts of visitors and the resources.
- Maintain, design, and construct sustainable and resilient infrastructure. Use energy-efficient, easy-to-maintain and recycled/recyclable materials. Conserve the use of water at the facilities and reuse when possible.
- Improve and expand public outreach and education about the history of the area, Project resources, and the USACE role in developing and managing these resources to foster a sense of ownership and responsibility.

1.9.3 General Resource Objectives

- Comply with all applicable laws, regulations, and policies.
- Foster public and employee safety through education, training, research, and proactive visitor assistance activities, such as personal visitor contact, water safety patrols, and timely maintenance of signs and public use facilities.
- Establish carrying capacities for all activities through a process of public involvement and scientific analysis as needed.
- Maintain regular contact with community members and agency stakeholders and partners. Host and attend periodic information exchange meetings and public workshops to ensure open communication on all activities.
- Eliminate encroachments and trespassing by maintaining an easily recognized Federal property boundary line and performing periodic inspections of the boundary. Maintain contact with adjoining landowners, real estate agents and developers to ensure that USACE policy and regulation is understood. Take prompt action to resolve encroachments and trespass.

1.10 Land Allocation and Land Classification*

The master plan is essentially a land-use plan, meaning specific parcels of land are classified into land-use categories based on resource capability. This plan provides a conceptual guide for use, management, and development of all USACE lands, which are divided into management areas. The boundaries of the management areas are based on physical, administrative, and operational characteristics.

The represented mapped acreages on figures and plates are calculated from Geographic Information System (GIS) polygon data and are approximate values. GIS acres are not the deeded legal acreage. Fee and easement acreages for each project are included in the appropriate parts of this document. All figures in the report will show the GIS acres for each project.

The following describes the types of land classification in general terms. Specific land classifications for each project are documented in the appropriate parts of this document.

1.10.1 Land Allocation

In accordance with ER 1130-2-550, all lands will be allocated in accordance with the authorized purposes for which they were acquired. Acquired lands will be allocated into one of the following categories: Operations, Recreation, Fish and Wildlife, and Mitigation. All project lands at the Western Area Projects were acquired for project operations and are allocated to the Operations category.

1.10.2 Land Classification

In accordance with ER 1130-2-550, land classification corresponds to the primary use for which Project lands are managed. Classifying lands further provides for development and resource management consistent with authorized purposes and other federal laws. Project lands are zoned for development and resource management consistent with authorized project purposes and the provisions of the National Environmental Policy Act and other Federal laws.

1.10.2.1 Project Operation

This classification includes lands required to construct, operate and maintain the Western Area Project features (dam, stilling basin, emergency spillway, administrative offices, maintenance facilities, and other areas that are used to operate and maintain the Projects). When compatible with operational requirements, Project operations lands may be used for wildlife habitat management or recreational use. Licenses, permits, easements, or other outgrants are issued only for uses that do not conflict with operational requirements. Public access to these areas may be restricted in some locations.

1.10.2.2 High Density Recreation

These lands are designated for intensive levels of recreational use to accommodate and support the recreational needs and desires of visitors. They include lands on which existing major recreational facilities are located and allow for developed public recreation facilities, commercial concession development, quasi-public development, and high-density or high-impact recreational use. In general, any uses of these lands that interfere with public enjoyment of recreation opportunities are prohibited. Low-density recreation and wildlife management activities compatible with intensive recreation use are acceptable. No agricultural uses are permitted on those lands except on an interim basis for maintenance of scenic or open space values. Permits, licenses, and easements are not issued for non-compatible manmade intrusions, such as pipelines, overhead transmission lines, and non-Project roads, except where warranted by the public interest and where no viable alternative area or route is available.

1.10.2.3 Mitigation

This classification is for lands that were acquired specifically for the congressionally authorized purpose of offsetting losses associated with development of the project. There are no mitigation lands within the Western Area project.

1.10.2.4 Environmentally Sensitive Areas

This classification describes areas where scientific, ecological, cultural, or aesthetic features have been identified. These areas must be considered by management to ensure they are not adversely impacted. Typically, there is limited or no public use development on lands within this classification to ensure these sensitive areas are not adversely impacted. Agricultural or grazing uses are not permitted on lands with this classification. These areas are typically distinct parcels located within another land classification area which is sometimes larger than the environmentally sensitive area.

1.10.2.5 Multiple Resource Management Lands

This classification allows for the designation of a predominate use as described below, with the understanding that other compatible uses described below may also occur on these lands.

- **Wildlife Management:** These lands are designated for stewardship of fish and wildlife resources. They contain valuable wildlife habitat components that are maintained to yield habitat suitable for a designated wildlife species or group of species. Private use of wildlife lands is prohibited except for agricultural activities undertaken to improve wildlife habitat. Licenses, permits, and easements are not allowed for manmade intrusions, e.g., pumping plants, pipelines, cables, transmission lines, or non-Project roads. Exceptions to this policy are allowable where necessary for the public interest and where no viable alternative location or route exists. Wildlife lands are available for sightseeing, wildlife viewing, nature study, and hiking. Consumptive uses of wildlife, including hunting, fishing, and trapping, are allowed when compatible with the wildlife objectives for the area and with both Federal and state fish and wildlife management regulations.

- **Vegetation Management:** Management activities in these areas focus on the protection and development of forest resources and native vegetative cover.

- **Future or Inactive Recreation Areas:** This sub-classification consists of lands on which recreation areas are planned or lands that contain existing recreation areas that have been temporarily closed.

- **Low Density Recreation:** These lands are designated for dispersed and/or low-impact recreation use. Development of facilities on these lands is limited. This classification can be included in multiple resource wildlife management areas. Emphasis is on providing passive recreational opportunities such as walking, fishing, hunting, or nature study. Site-specific, low-impact activities like primitive camping and picnicking are allowed. Facilities may include boat ramps, boat docks, trails, parking areas and vehicle controls, vault toilets, picnic tables, and fire rings. Manmade intrusions, including power lines, non-project roads, and water and sewer pipelines, may be permitted under conditions that minimize adverse effects on the natural environment. Vegetation management, including agricultural activities that do not greatly alter the natural character of the environment, are permitted for a variety of purposes, including erosion control, retention and improvement of scenic qualities, and wildlife management. Hunting and fishing are allowed in some locations pursuant to tribal or state fish and wildlife management regulations where these activities are not in conflict with the safety of visitors and project personnel.

1.10.2.6 Water Surface

There are four sub-classifications for water surface.

- **Restricted:** Water areas restricted for Project operations, safety, and security purposes.

- **Designated No-Wake:** To protect environmentally sensitive shoreline areas, recreational water access areas from disturbance, public safety, or some combination.

- **Fish and Wildlife Sanctuary:** Annual or seasonal restrictions on areas to protect fish and wildlife species during periods of migration, resting, feeding, nesting, spawning, or some combination.

- **Open Recreation:** Those waters available for year-round or seasonal water-based recreational use.

PART B
Lake Traverse Project

2 LAKE TRAVERSE PROJECT DESCRIPTION*

2.1 PROJECT AUTHORIZATION*

Authorization for Federal participation in the Lake Traverse-Bois de Sioux River Flood Control Project was provided by Public Law 74-738, the Flood Control and Water Conservation Act of 22 June 1936, and by the formation of the Tri-State Waters Commission, which provided for local cooperation by Minnesota, North Dakota, and South Dakota. In the 1970s, the three states repealed their statutes that created the Tri-State Waters Commission, effectively abolishing it. The Federal Water Project Recreation Act of 1965 required consideration of both recreation and fish and wildlife habitat enhancement in planning water resource projects and establishing cost-sharing principles for development of recreational facilities.

2.2 PROJECT PURPOSE*

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 Bois de Sioux River channel was widened and straightened for about 24 miles downstream to provide adequate capacity when lowering the reservoir to project conservation levels.

2.3 BRIEF PROJECT DESCRIPTION*

The Lake Traverse Flood Control Project lies west-northwest of St. Paul, Minnesota, on the boundaries of Minnesota and North and South Dakota (Figure 3). The project consists of two reservoirs: Lake Traverse, a modified natural lake, and Mud Lake (Figure 4).

Figure 3. Locator Map – Lake Traverse

Figure 4. Lake Traverse Reservoirs

Project structures and features include:

- 3,700 feet of dike and three culverts at Browns Valley, Minnesota. This is the southernmost structure in the 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 Otter Tail 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 and 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.

The watershed of this project is roughly circular and constitutes the southern limit of the Red River of the North drainage basin (Figure 1). 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.

2.4 Listing of Prior Design Memorandums*

- Diversion of Floodwaters of Little Minnesota River into Lake Traverse, September 1945.
- Reservoir Regulation Manual, Flood Control and Water Conservation, Red River of the North Watershed, Lake Traverse Reservoir and Bois de Sioux River – Channel Improvement, June 1963.
- Master Plan for Public Use Development and Management Lake Traverse Minnesota – South Dakota, January 1979.
- Problem Appraisal Report, Operation Plan Evaluation, January 1987.
- Emergency Plan, White Rock Dam and Lake Traverse, October 1989.
- Operational Management Plan, Lake Traverse Project, September 1993.
- Operation Plan Evaluation and Environmental Assessment, Lake Traverse, Bois de Sioux River and Orwell Reservoir, April 1994.
- Water Control Manual, Lake Traverse Project, December 1994.
- Western District Flood Control Projects Master Plan, June 1997.

2.5 Listing of Pertinent Project Information*

Basic project information is summarized in Appendix A.

2.5.1 Reservation Highway Dam and Control Structure

The Reservation Dam is coincident with the State Highway 117, crossing the narrows between Lake Traverse proper and that portion of the project known as Mud Lake (Figure 5). The dam/highway embankment is rolled earth fill, the highway surface is bituminous concrete, and the embankment side slopes are riprapped. Highway 117 crosses the South Dakota/Minnesota state boundary.

The embankment on the Minnesota side is about 9,100 feet long and has a top elevation of 981.0 feet (± 0.5 foot) thereby providing additional spillway capacity during floods when the reservoir elevation exceeds approximately 980.5 feet. The embankment on the South Dakota side is about 1,100 feet long and has a top elevation of 983.0 feet which is 1 foot above the maximum flood of record. Additional information is listed in Appendix A.

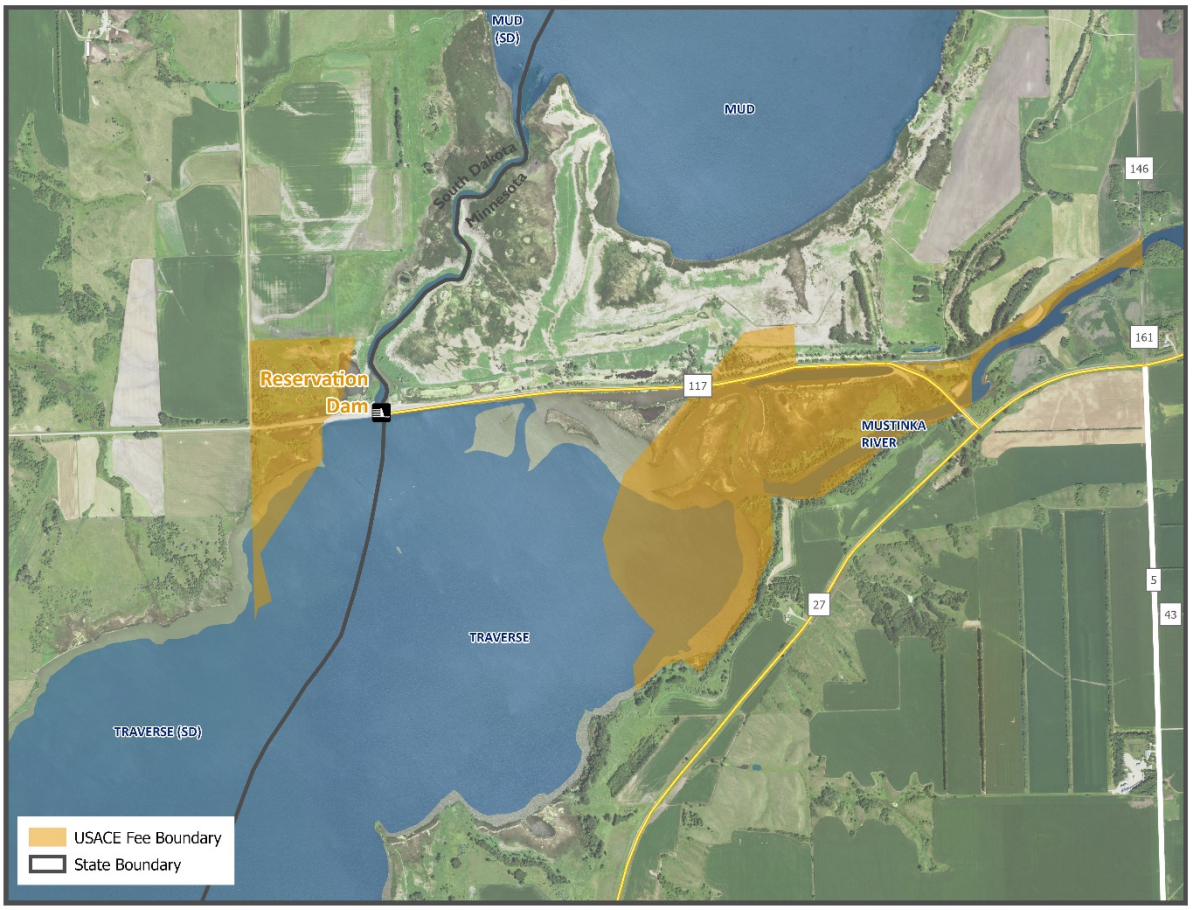


Figure 5. Aerial view of Reservation Dam.

2.5.2 White Rock Dam and Control Structure

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 (Figure 6). It carries a roadway connecting Traverse County Road 10 to South Dakota Highway 127. 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 in Appendix A.

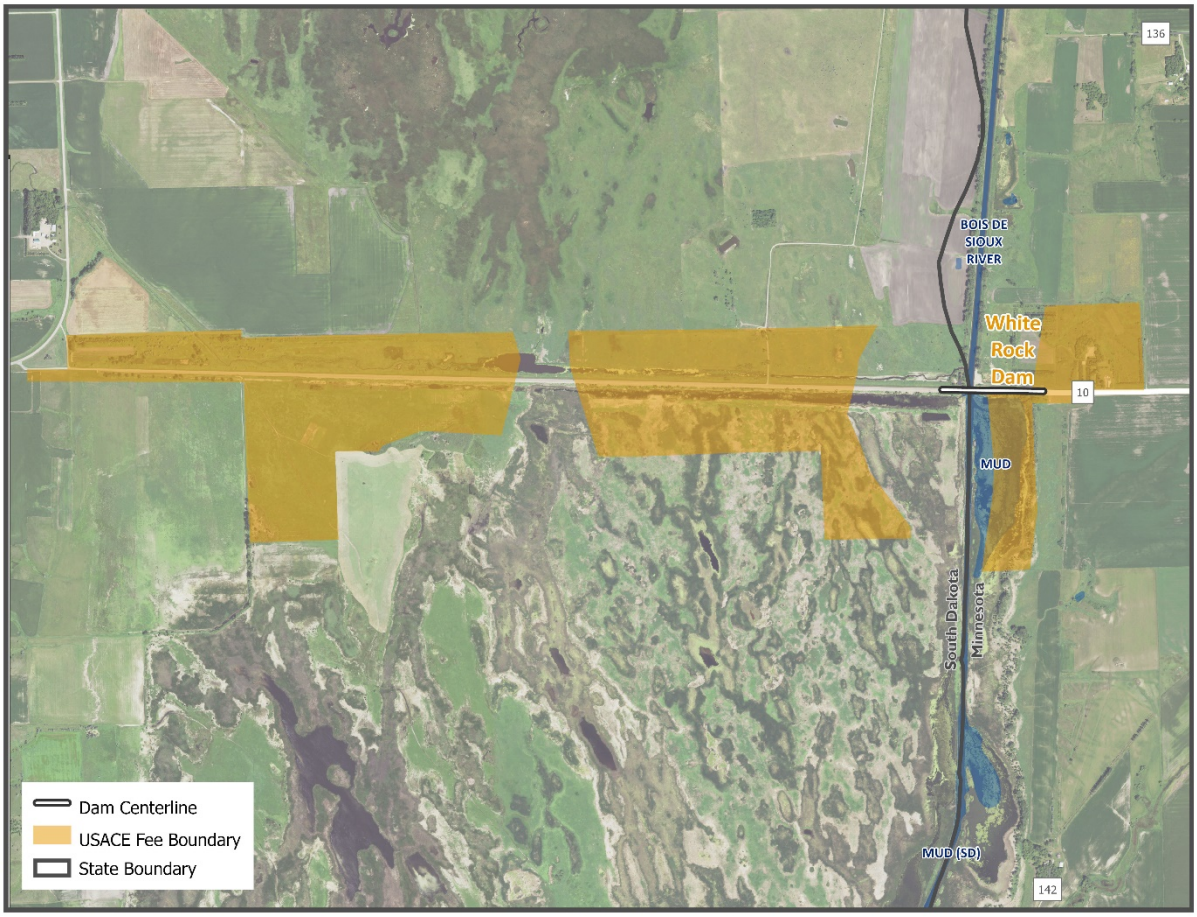


Figure 6. Aerial view of White Rock Dam.

2.5.3 Browns Valley Dike and Control Structure

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. 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. 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 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.

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 on the river end.

2.5.4 Lake Traverse Recreation Facilities

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

There are no USACE administered public boat launching facilities at the Lake Traverse project; however, all three recreation areas are close to at least one of eight boat ramps provided by other entities.

2.5.4.1 Reservation Highway Recreation Area

1. **Unit Description**
   a. **Size:** This site is 2 acres in size.
   b. **Location and Access:** The site 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.
   c. **Existing Site Use:** Recreational uses vary with the seasons. Picnicking, sightseeing, wildlife observation, hunting access, and bank fishing are popular warm weather uses. 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.
   d. **Public use facilities include:**

      - 3 Picnic sites
      - 2 Vault toilets
      - 16 Parking spaces
      - 1 Playground
      - 1 Picnic shelter

   e. **Adjacent Land Use:** Land surrounding this site is managed for wildlife.
   f. **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.
   g. **Vegetation:** There are a few scrub trees and a small area of mown grass on the site. The surrounding vegetation is marsh.
   h. **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.
   i. **Cultural Resources:** The Traverse Lake facilities and other project related features 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.
   j. **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.

2. **Land Use Classification**: This site is classified as Recreation in accordance with ER 1130-2-550.
3. **Visitation**: Site visitation in 2018 was 3,184 visits.
4. **Summation**: This site 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.

2.5.4.2 White Rock Dam Recreation Area

1. **Unit Description**
   a. **Size:** This recreation area covers 3 acres.
   b. **Location and Access:** This area is located directly north of the dam and sits astride the Bois de Sioux River and the state boundaries.
   c. **Existing site use:** The east (Minnesota) side is used for shoreline fishing, hunting access and wildlife observation. The west (South Dakota) side is used for picnicking, bank fishing, sightseeing, hunting access and wildlife observation. 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.

   d. Public use facilities include:

   - 1 Picnic shelter
   - 4 Picnic sites
   - 1 Playground
   - 3 Vault toilets
   - 35 Parking spaces on the east side
   - 20 Parking spaces on the west side
   - 1 Fish cleaning station

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

   f. Soils and Topography: This area is on a built-up area that extends into low-lying wetlands. There are low bluffs directly to the east; this is the only topography of substance within sight. This region in general is an ancient lakebed and is extremely flat. Soils in the area are Arvilla-Hubbard-Dorset series. They are formed mainly in outwash sediments and can be in glacial drift overlying outwash sediments.

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

   h. 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.

   i. Cultural Resources: The White Rock Dam and other project related features 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.

   j. Limitations and Hazards: Development of this site is limited by the available land area. 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.

2. Land Use Classification: This unit is classified as Recreation in accordance with ER 1130-2-550.

3. Visitation: In 2018, the east side had 3,186 visits and the west had 2,940.

4. Summation: 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.

2.5.4.3 Browns Valley Dike Recreation Area

1. Unit Description

a. Size: This site covers 1 acre.

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: This site is used for picnicking, bank fishing, sightseeing, wildlife observation and hunting access.

d. Public use facilities include:

- 1 Picnic site
- 2 Vault toilets
- 15 Parking spaces

e. Adjacent Land Use: Land adjacent to the site is used for agriculture.

f. 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.

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

h. 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.

i. Cultural Resources: The Browns Valley Dike and other project related features 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.

j. Limitations and Hazards: This area is very small which will limit improvements to the area.

2. Land Use Classification: This are1976a is classified as recreation in accordance with ER 1130-2-550.

3. Visitation: There were 3,284 visits in 2018.

4. Summation: The Browns Valley Dike Day Use Area is currently managed as a high-density recreation area. 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.

2.6 PROJECT ACCESS

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 1-29 South Dakota, exit 232- east on State Highway 10 for 11 miles.

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. When on the water, seaplanes are subject to marine "rules of the road" as established by the Minnesota Department of Transportation and South Dakota Department of Game, Fish and Parks. Seaplanes may only be operated on lakes between sunrise and sunset unless adequate lighting and supervision are available. Additional guidelines for seaplane use of project waters can be found at 36 CRF § 328.5.

3 Lake Traverse Project Setting and Factors Influencing Management and Development*

3.1 Description of the Reservoir*

3.1.1 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. Additional reservoir information is listed in Appendix A. It is a highly productive lake and popular recreational destination in the Bois de Sioux River watershed, well known for its high-quality walleye fishery.

3.1.2 White Rock Pool (Mud Lake)

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 in Appendix A. Mud Lake is not highly used by anglers due to the difficulty in accessing and navigating the lake.

3.2 Water Resources

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. Lake Traverse above White Rock Dam has a drainage area of 1,160 square miles.

3.3 Hydrology*

Lake Traverse reservoir stores flood runoff during and after the spring breakup which usually occurs during March and April. After 1 May, or when downstream conditions permit, flood waters are released from White Rock Dam and the reservoir is drawn down to conservation levels.

3.4 Sedimentation and Shoreline Erosion

The Mustinka River and shoreline erosion are the primary sources of sediment into the reservoir. Secondary sources include the small streams and drainage ditches that enter the reservoir directly. Runoff from agricultural fields and stream bank erosion provide a majority of the sediment load.

3.5 Water Quality

Water quality of Lake Traverse and Mud Lake is poor. The eutrophication in Lake Traverse and Mud Lake has advanced to the point where both lakes have hypereutrophic characteristics, and algae blooms regularly occur in summer and early fall. Causative factors of eutrophication identified in a 2020 Minnesota Pollution Control Agency - Bois de Sioux River Watershed Restoration and Protection Strategy Report (WRAPS), include overland runoff, failing septic

systems and high internal loading as contributing nonpoint pollutant sources along with the effects of altered hydrology (MPCA, 2013, 2020).

The WRAPS report addresses waters of the State of Minnesota for the protection or restoration of aquatic life and of aquatic recreation. Lakes are assessed for aquatic recreation uses based on ecoregion-specific water quality standards for total phosphorus (TP), chlorophyll-a (chl-a) and secchi transparency depth. To be listed as impaired, a lake must not meet water quality standards for TP and either chl-a or secchi depth. Data used for Lake Traverse and Mud Lake for the 2013 Watershed Monitoring and Assessment Report are shown in Table 3. While the data collected for the two lakes show very high phosphorus levels compared to the Northern Glaciated Planes (NGP) ecoregion and Mud Lake had a poor secchi depth, the MPCA determined there were not enough recent data to perform a total maximum daily load (TMDL) study for Mud Lake or a support of an aquatic recreation determination for Lake Traverse.

Because they are shallow, the two lakes also suffer from high turbidities generated by wind, wave action and carp induced re-suspension. And in winter, both lakes experience decreased dissolved oxygen (D.O.) concentrations when there is restricted inflows combined with decomposition of accumulated organic matter and limited photosynthesis due to ice cover with snow. Winter D.O. levels is one of the critical limiting factors on Lake Traverse fishery. The winter D.O. problem is of particular concern when considering alternative lower fall pool drawdown targets to increase flood control storage for the following spring.

Traverse Lake is also listed as impaired waters because of mercury in fish tissue. Multiple species in Traverse Lake have be recorded with high levels of mercury, including Walleye and Northern Pike.

Table 3. Lake Traverse and Mud Lake Water Quality and Lake Characteristics

MPCA Lake ID	Lake Name	Lake Area (ha)	Max depth (m)	Mean Depth (m)	Observed TP (µg/L) < 90 *	Observed Chl-a (µg/L) < 30 *	Observed Secchi (m) > 0.7 *	Residence Time (yrs)
178-0024-00	Mud	664	2.6	1	442	28.9	0.3	16 days
78-0025-00	Traverse	2339	3.7	2.3	211	19.6	1.0	0.4

*Aquatic Rec. Use (Class 2B) Shallow lakes for Northern Glaciated Plains (NGP) Ecoregion

3.6 TOPOGRAPHY, GEOLOGY, AND SOILS*

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. 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 river. The area is designated a Registered National Landmark.

3.6.1 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 northern, 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. 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.

3.6.2 Geology*

The area surrounding the Lake Traverse project is covered by a mantle of glacial drift 100 to 300 feet deep. The drift is till or boulder-clay, imperfectly stratified within the area that was once the bed of the ancient glacial Lake Agassiz. The natural descent of the land is to the north.

3.6.3 Soils*

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 draughty 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. See Appendix E2 the SSURGO Soils plates.

3.7 RESOURCE ANALYSIS*

3.7.1 Fish and Wildlife Resources*

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.

3.7.1.1 Mammals

The white-tailed deer (*Odocoileus virginianus*) is the primary big game species in the project area. Other mammals found in the Lake Traverse project area range from the tiny shrew to the coyote (*Canis latrans*). The area's grassland and riparian habitats support a large variety of the smaller mammals.

Moose (*Alces alces*), mule deer (*O. hemionus*) and pronghorn antelope (*Antelocarpa americana*) are casual visitors to the project area. Cottontail rabbit (*Sylvilagus sp.*), jackrabbit (*Lepus californicus*), red squirrel (*Tamiasciurus hudsonicus*), fox squirrel (*Sciurus niger*), raccoon (*Procyon lotor*), and white-tailed deer are hunted with firearms during Minnesota DNR authorized seasons. Beaver (*Castor sp.*), muskrat (*Ondatra zibethicus*), mink (*Neovison vison*), and raccoon are trapped for fur. Coyote, red and gray fox (*Vulpes vulpes* and *Urocyon cinereoargenteus*), badgers (*Meles meles*), weasels (*Mustela sp.*), and skunks (*Mephitis mephitis*) are also hunted and/or trapped during the late fall and winter.

3.7.1.2 Upland Birds

The ring-necked pheasant (*Phasianus colchicus*) 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 (May and June). 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 (*Perdix perdix*) 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.

3.7.1.3 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 (*Anas platyrhynchos*), pintail (*A. acuta*), blue-winged teal (*A. discors*), gadwall (*Mareca strepera*), lesser scaup (*Aythya affinis*), northern shoveler (*Spatula clypeata*), redhead (*A. americana*), ruddy duck (*Oxyura jamaicensis*), and common coots (*Fulica atra*) are known to nest in the project area.

Canada geese (*Branta canadensis*) 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.

3.7.1.4 Non-game Birds

Two-hundred twelve species of birds have been found or observed in the Lake Traverse project area. The most visible non-game bird in the area is the white pelican (*Pelecanus erythrorhynchos*), which uses the lakes as a feeding and loafing area but is not known to nest in the project area. The double-crested cormorant (*Phalacrocorax auritus*) 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 (*Hirundinidae sp.*) are also very abundant and can be seen flying along the shoreline and open areas of the lake.

3.7.1.5 Reptiles and Amphibians

There are 16 known species of herpetofauna in the project area of which frogs, toads, turtles, and garter snakes (*Thamnophis sirtalis*) are the most common. Salamanders are common to wetlands. The western hognose snake (*Heterodon nasicus*), bull snake (*Pituophis catenifer sayi*), and Great Plains toad (*Anaxyrus cognatus*) are typical prairie species. A seldom seen species is the western spiny soft-shell turtle (*Apalone spinifera*).

3.7.1.6 Fish

Lake Traverse supports a productive and popular sport fishery that is economically important to the area. Fish habitat in Lake Traverse is limited by water quality, spawning habitat, and the presence of high populations of rough fish. Dense blue-green algae blooms in the summer detract from the aesthetic appeal of the lake and impose additional stress on fish. Mud Lake does not support a consistent fishery because it is shallow and prone to winterkill.

3.7.2 Vegetative Resources*

Lake Traverse is 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. 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 and prairie type habitats available for wildlife resources and degraded the quality of those areas that remain.

Lake Traverse vegetation resources were evaluated by reviewing 2020 imagery and verifying or updating data from a 2012 level 1 vegetation inventory. Vegetation types were mapped to the lowest hierarchical level of the National Vegetation Classification Standard (NVCS). The Subclass level defines general dominant and diagnostic growth forms driven by factors such as substrate or aquatic conditions. This level is divided into the 11 categories listed below in Table 4. See Appendix I for vegetation plates.

Table 4. Lake Traverse Vegetation

Vegetation Subclass	Acreage	Percentage
Annual Graminoid or Forb Vegetation	6.89	0.30%
Boulder Gravel Cobble or Talus Sparse Vegetation	0.00	0.00%
Deciduous Forest	95.44	7.93%
Deciduous Shrubland	19.47	3.73%
Developed	31.50	0.80%
Evergreen Forest	0.00	0.00%

Hydromorphic Rooted Vegetation	209.49	0.74%
Mixed Evergreen - Deciduous Forest	4.84	7.41%
Open Water	362.06	0.00%
Perennial Graminoid Vegetation	338.84	39.21%
Unconsolidated Material Sparse Vegetation	92.07	39.88%

3.7.3 Threatened and Endangered Species*

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) website was consulted on July 2, 2021 to identify potential presence of federally listed threatened and endangered species within the project area. Five species were listed as threatened or endangered by USFWS may be found in the Lake Traverse project area (Table 5). The northern long-eared bat utilizes tree cavities and crevices as roosts in the summer, making forested areas within the project potential habitat for the species. Red knot is a shorebird that inhabits mudflats and sandy beaches. The Dakota skipper and Poweshiek skipperling are butterfly species that occupy native prairies. The western prairie fringed orchid occurs in moist tallgrass prairies and sedge meadows. The USFWS also lists eight bird species as migratory or Birds of Conservation Concern (Table 6). The state of South Dakota lists six species as endangered or threatened within Roberts County (Table 7). The State of Minnesota lists five species as threatened, endangered or of special concern for the remainder of the project area (Table 8).

Table 5. Federally listed species

Common Name	Scientific Name	Minnesota	South Dakota
Northern long-eared bat	*Myotis septentrionalis*	X	X
Red knot	*Calidris canutus rufa*		X
Dakota skipper	*Hesperia dacotae*		X
Poweshiek skipperling	*Oarisma poweshiek*		X
Western prairie fringed orchid	*Platanthera praeclara*		X

Table 6. Birds of Conservation Concern (BCC) and Migratory bird species

Common Name	Scientific Name
Bald Eagle	*Haliaeetus leucocephalus*
Black Tern*	*Chlidonias niger*
Bobolink*	*Dolichonyx oryzivorus*
Dunlin*	*Calidris alpine arcticola*
Franklin's Gull*	*Leucophaeus pipixcan*
Lesser Yellowlegs*	*Tringa flavipes*
Ruddy Turnstone*	*Arenaria interpres morinella*
Semipalmated Sandpiper*	*Calidris pusilla*
Smith's Longspur*	*Calcarius pictus*

*Denotes BCC status

Table 7. South Dakota State-listed species.

Common Name	Scientific Name
Dakota skipper	*Hesperia dacotae*
Poweshiek skipperling	*Oarisma poweshiek*
Blacknose shiner	*Notropis heterolepis*
Osprey	*Pandion haliaetus*
Whooping crane	*Grus americana*
Northern river otter	*Lontra canadensis*

Table 8. Minnesota State-listed Species

Common Name	Scientific Name
Cutleaf Ironplant	*Xanthisma spinulosum var. spinulosum*
Forster's Tern	*Sterna forsteri*
Franklin's Gull	*Leucophaeus pipixcan*
Great Plains Toad	*Anaxyrus cognatus*
Piping Plover	*Charadrius melodus*

3.7.4 Wetlands*

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 (MNDNR), and cooperating private organizations, have begun to reverse the changes in habitat.

The preservation of existing habitat and the creation of potholes in Mud Lake marsh areas have improved habitat conditions. Channelization of Mud Lake was completed to provide additional control over the conditions favorable to desired habitat.

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 which destroyed the existing marsh and riparian habitat.

According to the USFWS Classification of Wetlands and Deepwater Habitats of the US, Lake Traverse supports 14,345 acres of emergent wetland and 1,185 acres of forested/scrub shrub wetland. See Appendix F2 for Wetland Inventory plates.

3.8 Utilities and Borrow Areas

MDU Resources Group Inc. and Otter Tail Power Company have electrical transmission lines that cross the Lake Traverse project area.

3.9 Cultural Resources*

Fee title lands were inventoried for cultural resources beginning 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. At present, there are 11 known sites or site leads to sites for easement lands, including three former townsites, a grain elevator, three prehistoric villages, a prehistoric earthwork, and three prehistoric cultural material scatters. Except for 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 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.

3.10 Economics

Agriculture is the major industry surrounding the Lake Traverse project. Land use within the surrounding area is also dominated by agriculture.

The natural and recreational resources at USACE lakes provide social, economic, and environmental benefits for all Americans. The following information is related to the Lake Traverse Project for Fiscal Year 2019 (U.S. Army Corps of Engineers, 2019). Visitation resulted in:

- $988,202 in visitor spending within 30 miles of the Lake Traverse project
- $488,077 in sales within 30 miles of the Lake Traverse project
- 9 jobs within 30 miles of the Lake Traverse project
- $169,169 in labor income within 30 miles of the Lake Traverse project
- $241,074 in value added within 30 miles of the Lake Traverse project
- $247,951 in National Economic Development Benefits

With multiplier effects, visitor trip spending resulted in:

- $645,623 in total sales
- 10 jobs
- $211,688 in labor income
- $319,218 in value added (wages & salaries, payroll benefits, profits, rents, and indirect business taxes)

3.11 Recreation Facilities, Activities, and Needs*

3.11.1 Recreation Facilities

See section 2.5.4 for a description of all recreation facilities at Lake Traverse.

3.11.2 Zones of Influence & Visitation Profile*

While visitors come to Lake Traverse for many different reasons, the reservoir remains the most significant draw. The table below documents visitation numbers for recreation areas at the Lake Traverse Project (Table 9). Visitation numbers are recorded from USACE VERS (Visitation Estimation Reporting System) and based on traffic counter readings.

Table 9. Visitation numbers for Lake Traverse Project

Visitation Numbers[1]							
Fiscal Year[1]	**Browns Valley**	**Mustinka Boat Access**	**Mustinka Park North[2]**	**Mustinka Park South[2]**	**Reservation Dam**	**White Rock Dam East**	**White Rock Dam West**
2015	3,719	3,130	2,461	3,311	3,040	2,554	--
2016	4,253	1,961	2,697	3,302	3,373	1,984	2,690
2017	3,880	2,817	3,049	2,928	3,930	2,519	3,037
2018	3,284	2,311	2,637	1,681	3,184	3,186	2,940
2020	3,787	3,260	NA[3]	2,761	5,037	5,317	3,080

[1]In 2019 the area was heavily flooded.
[2]Leased to Traverse County.
[3]Traffic counter loop broken.

3.11.3 Recreation Analysis*

USACE customer satisfaction comment cards have not been collected for the Lake Traverse Project.

3.11.4 Recreation Trends

See Section 1.6.3 for a discussion on the Minnesota and South Dakota SCORPs.

3.11.5 Recreational Carrying Capacity*

In recreation management, carrying capacity refers to the level of use that a recreation area can receive without suffering negative impacts to its environmental resources or the visitor experience. Overcrowding and overuse of lakes are also a concern for the water-based recreation opportunities. At this time, a carrying capacity is not known for the Lake Traverse Project and should be evaluated in the future as funding allows.

3.12 Real Estate and Acquisition Policy*

Table 10 documents the real estate interest for the Lake Traverse Project. Appendix G2 documents USACE real property for the Lake Traverse Project.

Table 10. Deeded Acres for Lake Traverse Project.

	Fee Acres	Easement Acres
Deeded	1,137.43	5,969.24

3.12.1 Acquisition Policy*

Acquired lands will be allocated into one of the following categories: Operations, Recreation, Mitigation, and Fish and Wildlife. All project lands at the Lake Traverse Project were acquired for project operations. Maps delineating project lands is available in Appendix G1.

Acquisition of any additional real estate interests deemed necessary for the Lake Traverse Project operation or maintenance purposes will be completed pursuant to Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition of 1970, as amended.

3.12.2 Fee Acquired Lands

Fee lands for the Lake Traverse project total 68 tracts.

3.12.3 Flowage Easement

Easements were acquired in those areas where only periodic or sporadic inundation occurs. USACE has acquired flowage easements on 510 tracts. The only interest or privilege the USACE has in these lands is the right to periodically inundate them during flood events and to restrict the building of permanent structures on them.

3.12.4 Outgrants

The purpose of an outgrant is to allow other agencies or individuals use of Project lands. These outgrants are issued by easement, license, or lease. They are issued if the land is available, and if the proposed use is consistent with operational needs and resource management objectives. Other outgrants may be issued and existing one terminated or amended, as circumstances warrant. There are currently 14 outgrants on Lake Traverse Project lands. There are also pre-existing less-than-fee interests that the USACE must recognize, referenced as "reservations". These are typically not included in Real Estate databases as they were not granted by the USACE. The Real Estate Division of the St. Paul District maintains all current information on outgrants and reservations. Copies of the real estate agreements with Traverse County and MNDNR can be found in Appendix J.

3.13 Management Plans*

There are several Management Plans which implement the Natural Resource Management objects put forth in this Master Plan for Lake Traverse.

Operational Management Plan (OMP): The OMP contains detailed management actions for each recreation area and wildlife management area for Lake Traverse. These management actions are the steps USACE is taking to meet the resource objectives outlined in the Master Plan. Management actions are outlined in a five-year plan for each recreation and wildlife management unit.

Water Management Plan: The water management plan covers the operation of the Reservation Dam and Lake Traverse as well as White Rock Dam and Mud Lake for their primary mission of flood risk management.

4 LAKE TRAVERSE RESOURCE PLAN

4.1 MANAGEMENT BY CLASSIFICATION

The management plan is based on resources available and public needs and will provide for full utilization while protecting Project resources. This plan provides guidance on what types of development and activities are permitted.

4.1.1 Classification and Justification*

The Lake Traverse Project land classifications are the following:

- Project Operations
- High Density Recreation
- Multiple Resource Managed Lands

The management plans identified are presented in broad terms. A more descriptive plan for managing these lands can be found in the Lake Traverse Project Operational Management Plan (OMP). Management tasks described in the OMP must support the Resource Objectives, Land Classifications, and Resource Plan set forth in this master plan.

Land classifications in the Western Area Master Plan of 1991 may have been misclassified. The 2021 Master Plan documents how the lands are currently managed and how USACE intends to manage the lands into the future. Change in land classification acreage can be attributed to improvements in mapping technologies, increased aerial imagery resolution aiding in visual classification, and enhanced geospatial data delineating USACE fee land. The 2021 Master Plan documents classifies all land within USACE fee boundaries, while the 1991 plan classified only areas that fell into the land classification categories defined at that time. The calculated acreages for land classifications are based on geographic information (GIS) polygon data, which is not a legal survey. Though GIS technology has improved, errors are inherent in the calculations.

See Appendix D2 for the Lake Traverse Land Classification.

Project Operations (576.1 acres)

This category includes those lands required for the dam, stilling basin, emergency spillway, office, maintenance facilities, and other areas that are used solely for the operations of the Project. The management plan reinforces that physical security is necessary to continue operations of the dam and related facilities. Examples of management activities for these lands include renovating and updating facilities and aging infrastructure with modern, energy efficient technology.

Management for wildlife, natural resources, and recreational use will remain a priority in these lands as long as there is no conflict with operational requirements. Examples of wildlife, natural resources, and recreational use management include modernizing interpretive building, trails, or interpretive information and protecting culturally sensitive areas.

This land classification increased from 506.9 acres to 576.1 acres.

High Density Recreation (12.4 acres)

Lands developed for intensive recreational activities for the public include day use areas and campgrounds. The facilities in these areas will accommodate the recreation needs of visitors in concentrated numbers while also offering open space lands to provide more complete and attractive recreation areas.

This land classification increased from 11.4 acres to 12.4 acres.

Multiple Resource Management Lands

These lands are classified by their predominate use; however, these lands can also have other compatible, simultaneous uses that do not impact the predominate use. These lands can be divided into four sub-categories:

- Wildlife Management
- Low Density Recreation
- Vegetative Management
- Future/Inactive Recreation Areas
- Water Surface

The following is a description of the resource objectives, acreage, and description of use pertaining to each sub-category.

Wildlife Management (653.8 acres)

These lands are designated for stewardship of fish and wildlife resources. However, areas of low-density recreation, environmentally sensitive areas, and vegetative management all support wildlife. Management efforts focus on producing native wildlife food and habitat. Non-game wildlife is also managed by the USACE.

This land classification decreased from 747.7 acres to 653.8 acres.

Low Density Recreation (0 acres)

There are currently no lands classified as low-density recreation and there are no proposed changes to this land classification.

Vegetative Management (0 acres)

There are currently no lands classified as low-density recreation and there are no proposed changes to this land classification.

Future/Inactive Recreation areas (0 acres)

There are currently no lands classified as future/inaction recreation areas and there are no proposed changes to this land classification.

Water Surface (11,039.6 acres)

The two sub-classification identified at Lake Traverse are: Open Recreation (11,022.9 acres) and Restricted (16.7 acres).

This land classification increased from 0 to 11,039.6 acres.

4.1.2 Recreation Area Maps

Maps of all recreation areas for the Lake Traverse Project can be found in Appendix H2.

PART C
Orwell Lake Project

5 ORWELL LAKE PROJECT DESCRIPTION*

5.1 PROJECT AUTHORIZATION*

The Orwell Dam is part of a comprehensive flood control plan for the Red River of the North drainage basin authorized by Public Law 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 Public Law 78-634. No local cooperation is required for this project.

5.2 PROJECT PURPOSE*

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.

5.3 BRIEF PROJECT DESCRIPTION*

Orwell Dam is on the Otter Tail River, approximately 6 miles southwest of Fergus Falls, Minnesota, 190 miles northwest of St. Paul in west-central Minnesota (Figure 7 and Figure 8). 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; the lowland to the west is the abandoned bed of the huge lake.

The source of the Otter Tail River is north of Fergus Falls, Minnesota. The river winds in a southerly direction through a series of lakes until it reaches Otter Tail Lake. From there it flows to the southwest to Orwell Lake. 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 Otter Tail 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.

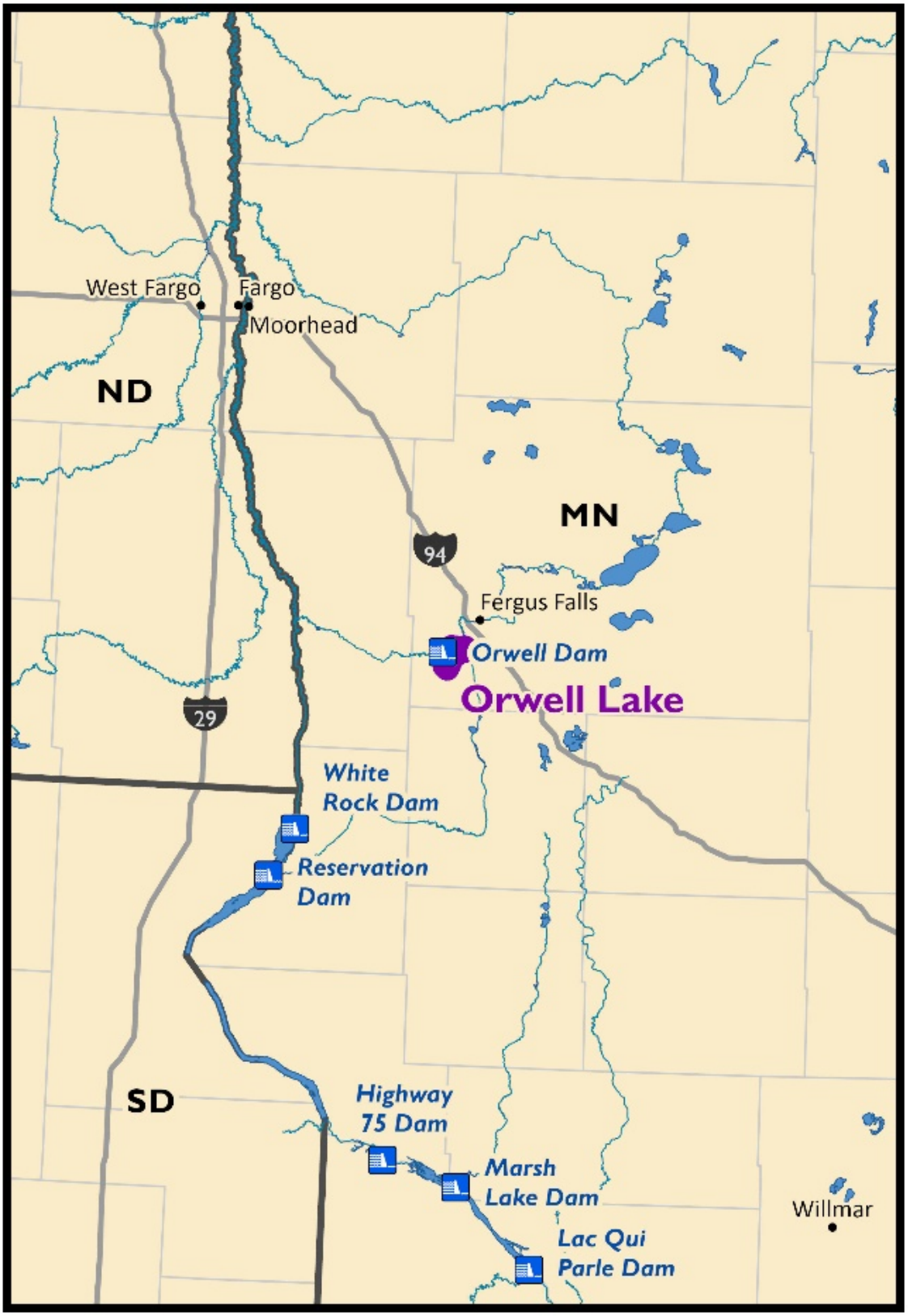


Figure 7. Locator Map – Orwell Lake

5.4 LISTING OF PRIOR DESIGN MEMORANDUMS*

- Flood Control Definite Project Report on Orwell Reservoir, Otter Tail River, Minnesota, February 1949 (revised August 1950)
- Flood Control and Water Conservation, Otter Tail River, Minnesota Red River of the North Watershed, Orwell Dam and Reservoir, Reservoir Regulation Manual, April 1954 (Revised August 1963)
- Flood Control Project, Orwell Dam & Reservoir Emergency Plan, April 1990
- Orwell Lake Dam and Reservoir, Operational Management Plan, June 1993
- Western District Flood Control Projects Master Plan, June 1997
- Water Control Manual, Orwell Lake Project, August 2001

5.5 LISTING OF PERTINENT PROJECT INFORMATION*

Appendix A documents pertinent information related to the Orwell Lake Project.

5.5.1 Orwell Dam, Control Structure and Dikes

5.5.1.1 Orwell Dam

The embankment 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 under seepage. 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.

5.5.1.2 Orwell Control Structure

The reinforced concrete spillway 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 weep holes. Drainage for the wall section is provided by pervious backfill with filter gravel surrounding a perforated 8-inch PVC drain system that discharges through the chute and stilling basin walls.

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.

5.5.1.3 Tailwater Control Structure

To meet dam safety requirements for the Probable Maximum Flood (PMF), construction of a tailwater structure began in 1998 and was completed in 1999. The purpose of the structure is to provide the required tailwater to contain the hydraulic jump within the existing stilling basin for extreme events. The structure is located approximately 1,000 feet downstream of Orwell Dam. It consists of a 765-foot-long earthen embankment with five concrete box culvert openings designed to ensure adequate tailwater elevations for all discharges passing over the spillway of Orwell Dam. The earthen embankment has a maximum height of 20 feet with 1V:3H side slopes and a crest width of 15 feet at elevation 1052.5 feet. The crest and downstream slope of the embankment is protected from erosion during overtopping by an articulated concrete mattress system. The approach channel is protected by an 18-inch layer of inch riprap and the outlet channel is protected by a 63-inch layer of 42-inch riprap. The five box culverts are 15.5 feet by 15.5 feet and about 40 feet in length. The culverts have an invert elevation of 1032.5 feet. The structure is designed to be overtopped with an effective overflow length of 564 feet.

5.5.1.4 Perimeter Dikes

Two small perimeter dikes consisting of compacted earth fill are located on the southwest perimeter of the reservoir. Their function is to prevent overflow during high reservoir stages. One dike is located 500 feet southeast of the dam, has a length of about 720 feet, and a maximum height of 8 feet. The other dike is located about a mile south of the dam, has an approximate length of 420 feet, and a maximum height of 10 feet. Both dikes have a crest elevation of 1080.0 feet, a top width of 10 feet, and side slopes of 1V:3H on the landward side and 1V:2H on the reservoir side. Erosion protection for the side slopes consists of vegetation on the landward side and 12 inches of riprap on the reservoir side.

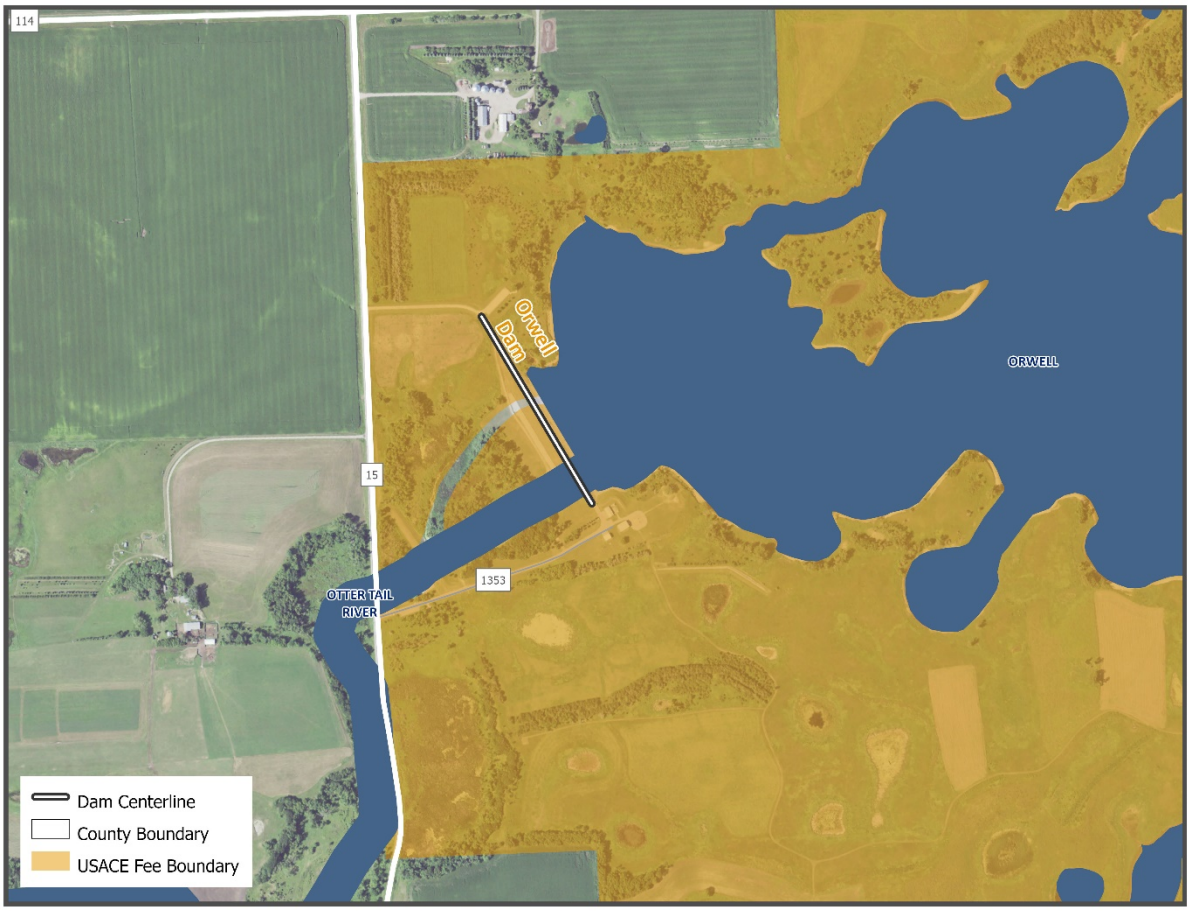


Figure 8. Aerial view of Orwell Dam.

5.5.2 Orwell Lake Recreation Facilities

USACE managed public day use facilities at the Orwell Lake Flood Control Project are limited to two areas: Orwell Lake overlook north of the river, and a picnic area and tailwater facility, located on the entrance road south of the river. There are no USACE administered public boat launch facilities at this project. The MNDNR manages the Federal lands surrounding Orwell Lake and operates a graveled boat ramp on the lake, located east of the dam. The MNDNR has established specific areas where hunting, fishing, and trapping are restricted; approximately half of the lake is designated as sanctuary where no trespassing is allowed any time during the year. Public use of Orwell Lake and all surrounding areas shall be pursuant to all applicable local, State, and Federal regulations.

5.5.2.1 Otter Tail River Day Use Area

1. Unit Description

- **a. Size:** This recreation area is approximately 6 acres.
- **b. Location and Access:** This Day Use Area is adjacent to the main entrance road south of the river, lying between the main entrance road and the Otter Tail River.
- **c. Existing site use:** This site is used for picnicking, sightseeing, wildlife observation, and hunting access. This area also provides access to the tailwater of the dam, and bank fishing is a popular pastime.

d. Public use facilities include:

a. 1 Picnic shelter
b. 2 Vault toilet
c. 14 Parking spaces
d. 1 Playground

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

f. 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.

g. 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.

h. Habitat Availability: The lands adjacent to this area are wildlife management areas with a wide variety of wildlife and habitats.

i. Cultural Resources: The Orwell Dam project recreational facilities are not eligible for listing on the National Register of Historic Places.

j. 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.

2. Land Use Classification: This area is classified as Recreation.

3. Visitation: Total visitation for this area in fiscal year 2019 was 15,621.

4. Summation: The Otter Tail 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.

5.5.2.2 Dam Overlook

1. Unit Description

a. Size: This area is approximately 2 acres.

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. Public use facilities include:

- 1 Picnic shelter
- 1 Vault toilet
- 30 Parking spaces

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

f. 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.

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

h. Habitat Availability: The lands adjacent to this area are wildlife management areas with a wide variety of wildlife and habitats.

i. **Cultural Resources:** The Orwell Dam and several other project related features are potentially eligible to the National Register of Historic Places due to the project's association with the Flood Control Acts of 1948 and1950 for the improvement of rivers, harbors, flood control, and other waterways of navigation. Construction of Orwell Dam was authorized under these acts.

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

2. Land Use Classification: This unit is classified as Recreation.

3. Visitation: Total visitation for this area for fiscal year 2018 was 10,562. Issues with meter readers in fiscal year 2019 resulted in inaccurate numbers.

4. Summation: 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.

5.6 PROJECT ACCESS

Orwell Lake 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.

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

Project Roads: Other than the two entrance roads, project roads are for access to the wildlife management areas and are maintained by the MNDNR.

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 MNDNR. Seaplanes may only be operated on lakes between sunrise and sunset unless adequate lighting and supervision are available. Additional guidelines for seaplane use of project waters can be found at 36 CRF § 328.5.

6 Orwell Lake Project Setting and Factors Influencing Management and Development*

6.1 Description of the Reservoir*

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.

6.2 Water Resources

The watershed of the Otter Tail 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.

6.3 Hydrology*

Orwell reservoir is regulated between a minimum elevation of 1050.0 feet (maximum drawdown) and 1073.0 feet (top of surcharge pool). The top of flood control pool is elevation 1070.0 feet. At this elevation, the reservoir has a length of 4.0 miles and a maximum width of 1.0 mile. Conservation pool is 1064.0 feet ± 0.5 feet. When snow surveys reveal a high potential for flooding in the basin, a winter drawdown of the reservoir is performed. The draw down elevation varies between 1060.0 and 1050.0 feet, depending on hydrologic conditions.

6.4 Sedimentation and Shoreline Erosion

Repeat soundings were taken in January 1964 and January 1985. Inflow of sediment from upstream is restricted by the presence of the Dayton Hollow Dam and the numerous lakes in the upper portions of the basin; however, the sedimentation surveys indicate there is continuing shoreline erosion. While bank erosion has caused aggradation of the deeper areas of the reservoir, sedimentation is occurring at a slow rate. The establishment of the lower, more stable conservation pool in 1986 and the resulting vegetation near the shore, has reduced shoreline erosion and thereby the sedimentation rate.

6.5 Water Quality

The largest impoundment on the Otter Tail River, Orwell Lake was created for flood control and pollution abatement during low-flow periods. The MPCA sampled Orwell Lake between 2016 and 2017 for the assessment of aquatic recreation. The lake recreation use assessment requires eight observations/samples within a 10-year period (June to September) for phosphorus, chlorophyll-a and Secchi depth. Sulfate was also sampled at Orwell Lake because it is designated wild rice waters. Table 11 shows that the Orwell Lake fully supports Aquatic Recreation. However, Orwell Lake is impaired for mercury in fish tissue as of the 2018 Impaired Waters Inventory; categorized as EPA Category 4a for waters covered by the Statewide Mercury TMDL.

Table 11. Orwell Lake characteristics and MPCA aquatic life and recreation assessments

Lake Name	DNR ID	Area (acres)	Max Depth (ft)	Assessment Method	Ecoregion	Secchi Trend
Orwell	56-0945-00	590	25	Shallow Water	NCHF	--

Aquatic Life Indicators:			Aquatic Recreation Indicators:			Aquatic Recreation Use
Fish IBI	Chloride	Pesticides ***	Total phosphorus	Chlorophyll-a	Secchi	
--	MTS	--	MTS	MTS	MTS	SUP

Abbreviations for Ecoregion: NCHF = North Central Hardwood Forest

Abbreviations for Secchi Trend: -- = not enough data

Abbreviations for Indicator Evaluations: -- = No Data, MTS = Meets Standard

Abbreviations for Use Support Determinations: SUP = Full Support (Meets Criteria)

6.6 TOPOGRAPHY, GEOLOGY, AND SOILS*

6.6.1 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.

6.6.2 Geology*

The Otter Tail 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 mean sea level (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.

6.6.3 Soils*

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. See Appendix E1 for the SSURGO Soils plate at Orwell Lake.

6.7 RESOURCE ANALYSIS

6.7.1 Fish and Wildlife Resources*

The general area in and around Orwell Lake is well known as an excellent wildlife area. The lake receives heavy use from migrating waterfowl and provides excellent hunting opportunities for both ducks and geese. The wetlands throughout the Orwell Wildlife Management Area (WMA) provide critical habitat for breeding waterfowl. The Orwell WMA is also the center of a wintering area for white-tailed deer, as well as other resident wildlife species typical to the area.

6.7.1.1 Mammals

Of the 58 species of mammals likely to occur within the project area, the white-tailed deer is the only big game species in the project area. The number of antlerless deer hunting permits issued within the area serves to control the size of the deer herd. The Orwell WMA is known throughout the area for the wintering deer. Food plots are left on the WMA to support the deer herd, and to reduce depredation.

6.7.1.2 Upland Birds

Avian upland game species in the Orwell Lake project area include ring-necked pheasant and gray (Hungarian) partridge.

6.7.1.3 Waterfowl

The Orwell WMA serves as an important resting area for migratory waterfowl, principally mallards and Canada geese. Approximately half of the lake is designated as sanctuary where no trespassing is allowed any time during the year. Mallard numbers may climb to 8,000-10,000 birds late in the fall while Canada geese numbers may peak at 5,000-6,000. Smaller numbers of other ducks also utilize this area during migration on all the wetlands in the WMA. The 360 acres of emergent wetlands on the Orwell WMA, along with 630 acres of open water and the available upland nesting cover also attract breeding waterfowl. Principal species include mallards, blue-wing teal, redheads, ruddy ducks, northern shovelers, coots, gadwalls, and Canada geese. Other water birds include western grebes (*Aechmophorus occidentalis*) and pied-billed grebes (*Podilymbus podiceps*).

6.7.1.4 Non-game Bird Species

Currently, no list of birds within the Orwell Lake project area has been prepared; however, 249 species of birds are likely to occur within the area.

6.7.1.5 Fish

The existing fishery in Orwell Lake consists primarily of rough fish such as carp (*Cyprinus carpio*) and bullheads (*Ameiurus nebulosus*). Some game and panfish species, such as walleye (*Sander vitreus*), northern pike (*Esox luscius*), and crappie (*Pomoxiis sp.*), are present in low numbers.

The Otter Tail River upstream of Orwell Dam is free flowing for less than a mile to the Dayton Hollow Dam. This reach of the river is shallow with an extensive riffle area. Downstream of

Orwell Dam, the Otter Tail River has successive riffles and pools, with rocks and woody debris for cover. This reach of the river supports walleyes, carp, redhorse (*Moxostoma sp.*), and sucker species. A popular sport fishery for walleyes exists in the tailwaters below Orwell dam. Lake sturgeon have been stocked below Orwell Dam; however, there is no record of any being sampled or caught in Orwell Reservoir.

6.7.1.6 Reptiles and Amphibians

Although there is no species list for the Orwell Lake project, it is estimated that 20 species of reptiles and amphibians that are likely to occur within the area.

6.7.2 Vegetative Resources*

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. 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 forest and prairie type habitats available for wildlife resources and degraded the quality of those areas that remain.

Orwell Lake vegetation resources were evaluated by reviewing 2020 imagery followed by field verification in August 2021. Vegetation types were mapped to the lowest hierarchical level of the NVCS. The Subclass level defines general dominant and diagnostic growth forms driven by factors such as substrate or aquatic conditions. This level is divided into the 11 categories listed below in Table 12. See Appendix I for vegetation plates.

Table 12. Orwell Lake Vegetation

Vegetation Subclass	Acreage	Percentage
Annual Graminoid or Forb Vegetation	6.342037	0.003%
Boulder Gravel Cobble or Talus Sparse Vegetation	0.00	0.00%
Deciduous Forest	168.361091	0.08%
Deciduous Shrubland	79.186404	0.04%
Developed	16.901067	0.01%
Evergreen Forest	15.77922	0.01%
Hydromorphic Rooted Vegetation	157.400341	0.07%
Mixed Evergreen - Deciduous Forest	0.00	0.00%
Open Water	832.422706	0.39%
Perennial Graminoid Vegetation	846.6433	0.40%
Unconsolidated Material Sparse Vegetation	0.00	0.00%

6.7.2.1 Disturbed Areas

In 1954 and in 1955, the Otter Tail River channel was cleaned, enlarged, and straightened by USACE 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.

6.7.3 Threatened and Endangered Species*

The USFWS IPaC website was consulted on July 2, 2021 to identify potential presence of federally listed threatened and endangered species within the project area. The northern long-eared bat is listed as threatened by the US Fish and Wildlife Service (USFWS) and may be

found in the Orwell Lake project area. The northern long-eared bat utilizes tree cavities and crevices as roosts in the summer, making hardwood forests within the project potential habitat for this species. However, northern long-eared bats have never been documented on project lands. The USFWS also lists ten protected bird species in the area surrounding Orwell Lake (Table 13). Nine of these species are considered Birds of Conservation Concern (BCC) by USFWS. In addition, the Bald Eagle is protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668(a); 50 CFR 22).

The state of Minnesota lists five species as endangered, threatened species or species of concern (Table 14).

Table 13. Migratory Bird Species and Birds of Conservation Concern (BCC)

Common Name	Scientific Name
American Bittern*	*Botarus lentiginosus*
Bald Eagle	*Haliaeetus leucocephalus*
Black Tern*	*Chlidonias niger*
Bobolink*	*Dolichonyx oryzivorus*
Dunlin*	*Calidris alpine arcticola*
Franklin's Gull*	*Coturnicops noveboracensis*
Hudsonian Godwit*	*Limosa haemastica*
Lesser Yellowlegs*	*Tringa flavipes*
Marbled Godwit*	*Limosa fedoa*
Semipalmated Sandpiper*	*Calidris pusilla*

*Denotes BCC status

Table 14. Minnesota State-listed Species

Common Name	Scientific Name
Bald Eagle	*Haliaeetus leucocephalus*
Black Sandshell	*Ligumia recta*
Creek Heelsplitter	*Lasmigona compressa*
Fluted-shell	*Lasmigona costata*
Greater Praire-chicken	*Tympanuchus cupido*

6.7.4 Wetlands*

Prior to project construction, the Otter Tail 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 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 MNDNR as a Wildlife Management Area.

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation adapted to life in saturated soil conditions. Wetlands are distinguished not only from uplands, which do not hold sufficient water to support wetland functions, but also deep-water habitats, with water depths greater than 2 meters (6.6 feet) deep. The Orwell Lake project has 169 acres of emergent wetland and 22 acres of forested/shrub wetland. See Appendix F1 for the National Wetlands Inventory plate at Orwell Lake.

6.8 Borrow Areas and Utilities

Otter Tail Power Company has three power lines that cross the Orwell Lake project area.

6.9 Cultural Resources*

A literature search and records review of the 19 sections in Otter Tail County containing Orwell Lake 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. The mound complex, site 21OT89, is typically inundated. In addition, testing was conducted where bison bones were eroding out of the spillway bank below the dam. No cultural materials were found, and the bones appeared to have been naturally deposited. The Dam, generator building and a storage building, all associated with the Orwell Project are potentially eligible for listing on the National Register of Historic Places. A 2019 synthesis of previous surveys recommends focusing on at-risk areas where erosion endangers prehistoric archaeological sites whose eligibility has not been determined.

6.10 Economics

Agriculture is the major industry surrounding the Orwell Lake project. Land use within the surrounding area is also dominated by agriculture.

The natural and recreational resources at the USACE lakes provide social, economic, and environmental benefits for all Americans. The following information is related to the Orwell Lake Project for Fiscal Year 2019 (U.S. Army Corps of Engineers, 2019). Visitation resulted in:

- $834,300 in visitor spending within 30 miles of the project
- $392,589 in sales within 30 miles of the project
- 7 jobs within 30 miles of the project
- $144,005 in labor income within 30 miles of the project
- $205,137 in value added within 30 miles of the project
- $217,611 in National Economic Development Benefits

With multiplier effects, visitor trip spending resulted in:

- $558,343 in total sales
- 8 jobs
- $191,011 in labor income
- $286,155 in value added (wages & salaries, payroll benefits, profits, rents, and indirect business taxes)

6.11 Recreation Facilities, Activities, and Needs

6.11.1 Zones of Influence & Visitation Profile*

While visitors come to Orwell Lake for many different reasons, the reservoir remains the most significant draw. The most popular activities include boating and fishing.

The table below documents the visitation numbers for recreation areas at the Orwell Lake project (Table 15).

Table 15. Orwell Lake Project Visitation Numbers for Fiscal Years 2015-2019

Visitation Numbers		
Fiscal Year	**Otter Tail River Day Use**	**Dam Overlook**
2015	14,654	4,859*
2016	14,649	8,604
2017	16,733	16,809
2018	15,648	10,562
2019	15,621	4,515*
2020	2,424[1]	3,772*

*Low numbers are a result of meter reading issues.

[1]Area was closed for 5 months for construction of new bridge

6.11.2 Recreation Analysis*

USACE customer satisfaction comment cards have not been completed for the Orwell Lake Project.

6.11.3 Recreation Trends

See 1.6.3 for a discussion on the Minnesota SCORP.

6.11.4 Recreational Carrying Capacity*

In recreation management, carrying capacity refers to the level of use that a recreation area can receive without suffering negative impacts to its environmental resources or the visitor experience. Overcrowding and overuse of lakes are also a concern for water-based recreation opportunities. At this time, the carrying capacity is unknown for the recreation facilities at the Orwell Lake Project. In the future, carrying capacity may be considered as part of determining how to manage natural resources on USACE owned land.

6.12 Real Estate and Acquisition Policy*

Table 16 documents the real estate interest for the Orwell Lake Project.

Table 16. Deeded Acres for Orwell Lake Project.

	Fee Acres	**Easement Acres**
Deeded	2,019.46	10.25

6.12.1 Acquisition Policy*

Acquired lands will be allocated into one of the following categories: Operations, Recreation, Mitigation, and Fish and Wildlife. All project lands at the Orwell Lake Project were acquired for project operations. Maps delineating project lands are available in Appendix G1.

Acquisition of any additional real estate interests deemed necessary for the Orwell Lake Project operation or maintenance purposes will be completed pursuant to Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition of 1970, as amended.

6.12.2 Fee Acquired Lands

Fee lands for the Orwell Lake project total 38 tracts.

6.12.3 Flowage Easement

Easements were acquired in those areas where only periodic or sporadic inundation occurs. USACE has acquired flowage easements on 6 tracts. The only interest or privilege the USACE has in these lands is the right to periodically inundate them during flood events and to restrict the building of permanent structures on them.

6.12.4 Outgrants

The purpose of an outgrant is to allow other agencies or individuals use of Project lands. These outgrants are issued by easement, license, or lease. They are issued if the land is available, and if the proposed use is consistent with operational needs and resource management objectives. Other outgrants may be issued and existing one terminated or amended, as circumstances warrant. There are currently 4 outgrants on Orwell Lake Project lands. There are also pre-existing less-than-fee interests that the USACE must recognize, referenced as "reservations". These are typically not included in Real Estate databases as they were not granted by the USACE. The Real Estate Division of the St. Paul District maintains all current information on outgrants and reservations. A copy of the agreement with MnDNR can be found in Appendix J.

6.12.5 Shoreline Management

Orwell Lake does not have a Shoreline Management Plan. There are no shoreline permits on this reservoir. Boundary management is covered in the Operational Management Plan.

6.13 Management Plans*

There are several Management Plans for Orwell Lake.

Operational Management Plan:

The OMP contains detailed management actions for each recreation area and wildlife management area for Orwell Lake. These management actions are the steps USACE is taking to meet the resource objectives outlined in the Master Plan. Management actions are outlined in a five-year plan for each recreation and wildlife management unit.

Water Management Plan:

The water management plan covers the operation of the dam and reservoir for its primary mission of flood control and secondarily for water supply and pollution abatement during low flow periods.

7 ORWELL LAKE RESOURCE PLAN

7.1 MANAGEMENT BY CLASSIFICATION

The management plan is based on resources available and public needs and will provide for full utilization while protecting Project resources. This plan provides guidance on what types of development and activities are permitted.

7.1.1 Classification and Justification*

The Orwell Lake Project land classifications are the following:

- Project Operations
- High Density Recreation
- Multiple Resource Managed Lands

The management plans identified are presented in broad terms. A more descriptive plan for managing these lands can be found in the Orwell Lake Project Operational Management Plan (OMP). Management tasks described in the OMP must support the Resource Objectives, Land Classifications, and Resource Plan set forth in this master plan.

Land classifications in the Western Area Master Plan of 1991 may have been misclassified. The 2021 Master Plan documents how the lands are currently managed and how USACE intends to manage the lands into the future. Change in land classification acreage can be attributed to improvements in mapping technologies, increased aerial imagery resolution aiding in visual classification, and enhanced geospatial data delineating USACE fee land. The 2021 Master Plan documents classifies all land within USACE fee boundaries, while the 1991 plan classified only areas that fell into the land classification categories defined at that time. The calculated acreages for land classifications are based on geographic information (GIS) polygon data, which is not a legal survey. Though GIS technology has improved, errors are inherent in the calculations.

See Appendix D2 for the Orwell Lake Land Classification.

Project Operations (495.2 acres)

This category includes those lands required for the dam, stilling basin, office, maintenance facilities, and other areas that are used solely for the operations of the Project. The management plan reinforces that physical security is necessary to continue operations of the dam and related facilities.

This land classification increased from 19.7 acres to 495.2 acres.

High Density Recreation (13.2 acres)

These are lands developed for intensive recreational activities for the public include day use areas. The facilities in these areas will accommodate the recreation needs of visitors in concentrated numbers while also offering open space lands to provide more complete and attractive recreation areas.

This land classification increased from 11.1 acre to 13.2 acres.

Multiple Resource Management Lands

These lands are classified by their predominate use; however, these lands can also have other compatible, simultaneous uses that do not impact the predominate use. These lands can be divided into five sub-categories:

- Wildlife Management
- Low Density Recreation
- Vegetative Management

- Future/Inactive Recreation Areas
- Water Surface Zoning

The following is a description of the resource objectives, acreage, and description of use pertaining to each sub-category.

Wildlife Management (726.8 acres)

These lands are designated for stewardship of fish and wildlife resources. However, areas of low-density recreation, environmentally sensitive areas, and vegetative management all support wildlife. Management efforts focus on producing native wildlife food and habitat. Non-game wildlife is also managed by the USACE.

This land classification increased from 0 acres to 726.8 acres.

Low Density Recreation (0 acres)

There are no lands classified as low-density recreation. There are no proposed changes to this land classification.

Vegetative Management (0 acres)

There are no lands classified as low-density recreation. There are no proposed changes to this land classification.

Future/Inactive Recreation Areas (0 acres)

There are no lands classified as future/inactive recreation areas. There are no proposed changes to this land classification.

Water Surface Zoning (887.9 Acres)

The two sub-classification identified at Orwell Lake are: Designated No-Wake (517.3 acres) and Restricted (370.6 acres).

This land classification increased from 0 to 887.9 acres.

7.1.2 Recreation Area Map

Maps of all recreation areas for the Orwell Lake Project can be found in Appendix H1.

PART D
Lac qui Parle Project

8 LAC QUI PARLE PROJECT DESCRIPTION

8.1 PROJECT AUTHORIZATION*

The Lac qui Parle Flood Control Project was authorized as a Federal project by the Flood Control Act of 1936, Public Law 74-738. Section 4 of the Flood Control Act of 1944, as amended, provided USACE 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 USACE 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.

The project includes the Lac qui Parle Dam, the Marsh Lake Dam, and the Chippewa River Diversion including the Watson Sag weir and levee. The project was partially constructed under the Works Progress Administration starting in 1934 by the State of Minnesota. USACE completed construction between 1941 and 1951. Operation of the project was transferred from the State of Minnesota to USACE in 1950.

8.2 PROJECT PURPOSE*

The 1936 Act authorized flood control as a federal project purpose. The project was constructed as a joint state and federal project. It is now a federal project.

The Lac qui Parle Dam creates the Lac qui Parle flood control reservoir. The Chippewa Diversion reduces downstream flows at Montevideo, Minnesota, by diverting a portion of the Chippewa River floodwaters into the Lac qui Parle reservoir through the Watson Sag. Marsh Lake Dam was constructed to hold a conservation pool in the upper portion of the Lac qui Parle reservoir. The MNDNR's Lac qui Parle Wildlife Management Area surrounds Lac qui Parle Lake and Marsh Lake.

Marsh Lake Ecosystem Project

A feasibility report was published in November of 2011 regarding a Marsh Lake Ecosystem Restoration Project. The purpose of the Marsh Lake Ecosystem Restoration Project is to restore the aquatic and riparian ecosystems within the Marsh Lake project area. Impoundment of Lac qui Parle and Marsh Lake, along with diversion of the Pomme de Terre River into Lac qui Parle, and other river regulation activities have significantly altered the ecosystem state.

In some circumstances, as at Marsh Lake, a return to pre-disturbance conditions may not be feasible. In those instances, "the goal is to partially or fully reestablish the attributes of a naturally functioning and self-regulating system." The goal of this project is to return the Marsh Lake area ecosystem to a less degraded, more natural condition by restoring natural functions and processes. The original construction of the Marsh Lake Dam was intended to serve as a flood damage reduction measure as well as a recreational feature to the region, primarily through the creation of a static pool on the river. The intended flood damage reduction benefits provided by the Marsh Lake Dam are minor due to effectiveness of the Lac qui Parle Dam immediately downstream. Marsh Lake is a popular recreation destination in the region. As with many projects constructed at the time, a full understanding of the ecology of the system was not of primary concern.

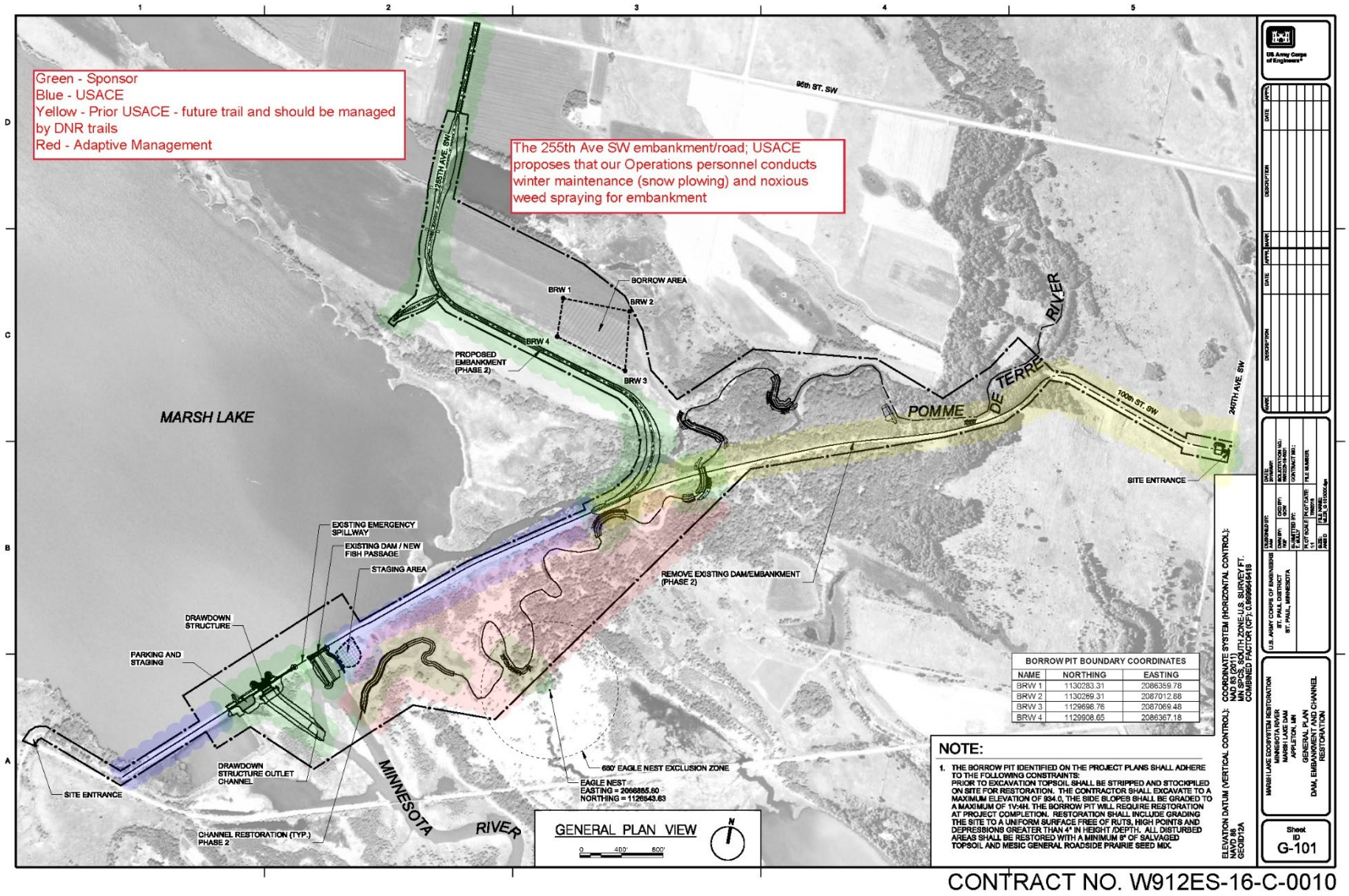
Since impoundment, Marsh Lake has undergone significant degradation of aquatic habitat due to a number of stressors including high sediment and nutrient loading, a fixed crest dam that prevents low seasonal water levels, high turbidity from wind-driven sediment resuspension, and abundant common carp that increase turbidity and graze off submersed aquatic vegetation and

macroinvertebrates. Although Marsh Lake provides an open water area for migratory waterfowl to rest and islands for nesting colonial waterbirds, degradation of the aquatic ecosystem limits habitat suitability for many species of fish and wildlife.

The underlying purpose and need for this project is to restore the degraded Marsh Lake ecosystem. The stated goal of the Marsh Lake Ecosystem Restoration Project is to "return the Marsh Lake area ecosystem to a less degraded and more natural condition by restoring ecosystem structure and functions." The intent of the Marsh Lake ecosystem restoration project is to increase variability in ecosystem processes, restore a more natural water level regime, aquatic habitat connectivity, and a vegetated lake ecosystem state.

The objectives of the project are: 1) reduce sediment loading to Marsh Lake, 2) restore natural hydrologic fluctuations to Marsh Lake, 3) restore geomorphic and floodplain processes to the Pomme de Terre River, 4) reduce sediment resuspension in Marsh Lake, 5) increase emergent and submergent aquatic plants in Marsh Lake, 6) increase waterfowl and native fish habitat, 7) restore aquatic habitat connectivity between Marsh Lake, the Pomme de Terre River, and Lac Qui Parle, and 8) reduce aquatic invasive fish in Marsh Lake.

Construction has been completed and as of May 2021, the USACE is working with MNDNR on land ownership and responsibilities. A land swap is being proposed as shown in Figure 9. The USACE would be responsible for functions related to flooding. MNDNR would be responsible for habitat functions and would be responsible for fish passage and operation of the control structure gates.



CONTRACT NO. W912ES-16-C-0010

Figure 9. Marsh Lake responsibilities.

8.3 BRIEF PROJECT DESCRIPTION*

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 10. Locator map – Lac Qui Parle). The project forms the northeastern boundary of Lac qui Parle County and the southwesterly boundaries of Chippewa, Swift, and Big Stone Counties. 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 Park borders Lac qui Parle (lake). Both of these facilities are administered by the MNDNR. 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.

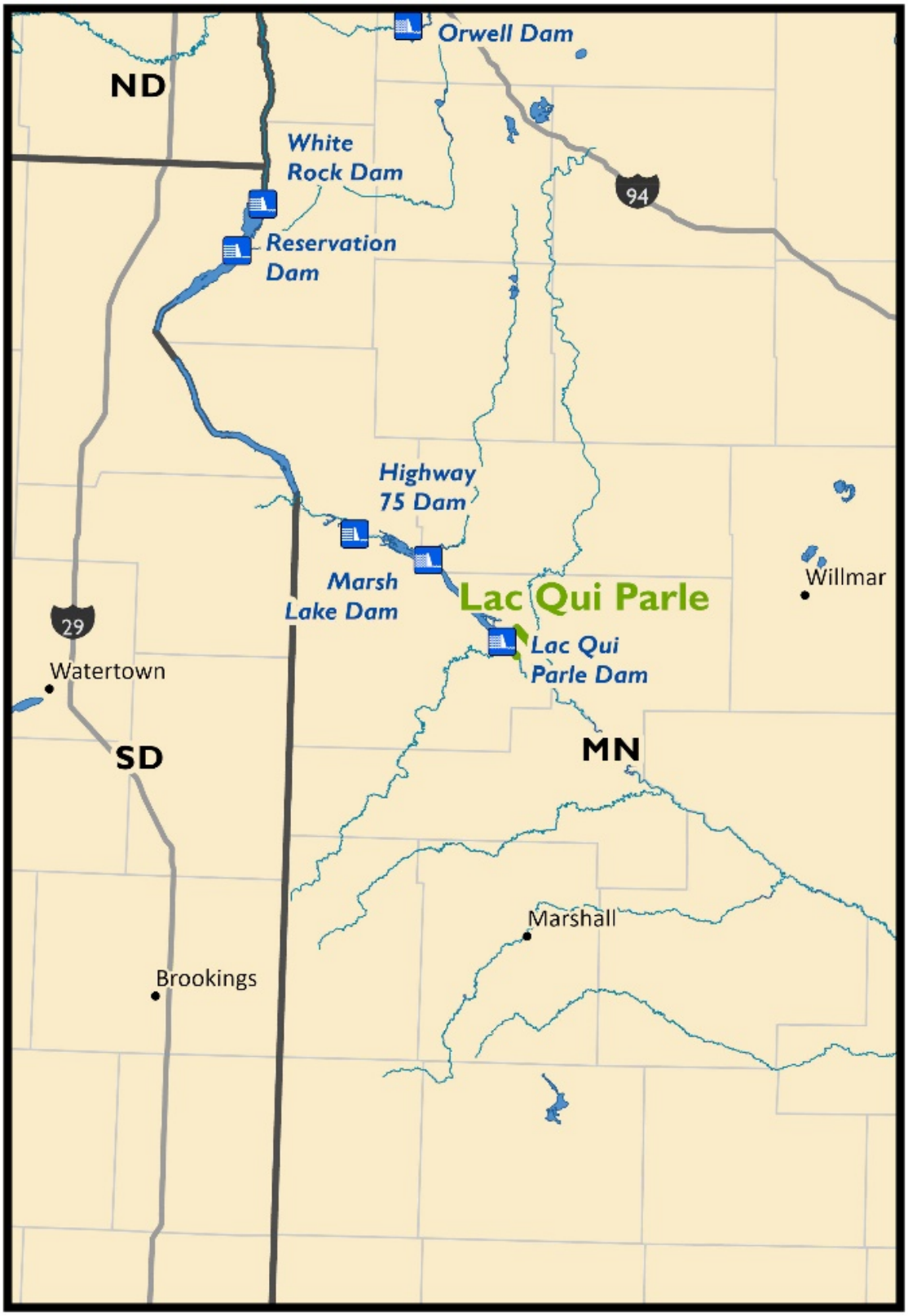


Figure 10. Locator map – Lac Qui Parle

8.4 LISTING OF PRIOR DESIGN MEMORANDUMS*

- Lac qui Parle Reservoir and Minnesota River, Channel Improvement, Reservoir Regulation Manual, July 1966.
- Lac qui Parle Flood Control Project Master Plan for Resource Use Development and Resource Management, August 1980.
- Lac qui Parle Master Plan, Public Use Development and Resource Management, July 1981.
- Dam Failure Planning Report, Marsh Lake Dam, Minnesota River, Minnesota, August 1987.
- Operation Plan Evaluation, Highway 75 – Lac qui Parle Reservoir, September 1987.
- Emergency Action Plan, Lac qui Parle Flood Control Project, October 1988.
- Environmental Assessment, Modification to Lac qui Parle Reservoir Regulation Plan, Minnesota River, December 1994.
- Water Control Manual, Flood Control, Minnesota River, Lac Qui Parle Reservoir, Lac qui Parle Reservoir and Marsh Lake Reservoir Including Marsh Lake Dam, Lac qui Parle Dam, Chippewa River Diversion Dam and Watson Sag Weir, August 1995.
- Western District Flood Control Projects Master Plan, June 1997.
- Lac qui Parle Operational Management Plan, February 1999.
- Feasibility Report and Environmental Assessment, Marsh Lake Ecosystem Restoration Project, Minnesota River, Big Stone, Lac qui Parle, and Swift Counties, Minnesota, November 2011.
- Water Control Manual, Flood Control, Minnesota River, Lac Qui Parle Reservoir, Lac qui Parle Reservoir and Marsh Lake Reservoir Including Marsh Lake Dam, Lac qui Parle Dam, Chippewa River Diversion Dam and Watson Sag Weir, November 2014.
- Interim Water Control Manual, Lac qui Parle Project, January 2017.

8.5 LISTING OF PERTINENT PROJECT INFORMATION*

Appendix A documents pertinent information related to the Lac qui Parle Project.

8.5.1 Lac qui Parle Dam and Control Structure

Lac qui Parle Dam is the main dam in the project; it supports a county road (Figure 11.). 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. Additional information is listed in Appendix A.

Figure 11. Lac Qui Parle Dam and Control Structure locator map

8.5.2 Marsh Lake Dam and Control Structure

The Marsh Lake Dam is comprised of dredged earth fill totaling approximately 12,500 feet in length (Figure 12). The original earth fill portion has a top width of 10 feet with a 1 on 3 side slope on the upstream and downstream sides. On the downstream side, the 1 on 3 side slope extends only to an elevation 5 feet below the top of the dam. Below this elevation, the slope changes to a 1 on 4 grade. The elevation of the top of the embankment ranges between elevation 948.6 feet and 952.6 feet. The maximum height of the dam is about 19.5 feet with an average top elevation of approximately 950.0 feet.

As part of the Marsh Lake Ecosystem Project, a new embankment to the east was created to allow the Pomme de Terre to return back to its historic channel. The elevation of the new embankment is 952.1 feet. Dam height varies from 2 feet to 10 feet. The top width is 26 feet which allows for an access road. The design grade for the new embankment has 5-foot freeboard for a Spillway Design Flood (SDF) event. Rock riprap was installed on the lake side to elevation 942 feet.

The Marsh Lake Dam service spillway was also modified to a fishway rock ramp. The concrete fixed crest spillway section (112 feet in width with a crest elevation of 937.6 feet) remains but a notch was cut into the middle of it (elevation 935.5 feet, width 30 feet). The fishway starts at the location of the fixed crest spillway and extends about 300 feet downstream at a 3% slope. Boulder weirs are spaced 20 feet apart with each achieving individual 10-inch drops. The ramp ranges in width from 150 feet at the dam, to 200 feet wide at the downstream edge and is approximately 300 feet long. The downstream invert ties into the riverbed at elevation 925.5 feet. The ramp ties into the existing bank on the east side. On the west side, the ramp ties into a

partially rip-rapped earthen (containment) embankment, 20 feet wide and with 1H:4V side slopes. 1,579 cubic yards of large (1.6-foot diameter and larger boulders for weirs) rock was used in the fishway channel. Riprap and gravel bedding were used to armor the fishway channel. Impervious fill was used as bedding and fill material.

The Marsh Lake Dam auxiliary spillway (sometimes referred to as the emergency spillway) has a crest elevation of 940.0 feet. Both the upstream and downstream slopes are paved with 12 inches of grouted riprap. The spillway is 90 feet wide.

The Marsh Lake Dam low flow gate has a sill elevation of 932.6 feet and discharges through a 2-foot square conduit into the stilling basin. The discharge is regulated by a 2-foot square sluice gate in the main spillway. The low-flow outlet was filled as part of the Ecosystem Project.

The Marsh Lake Ecosystem Project also included the addition of a drawdown structure. The drawdown structure has six bays, each containing two sluice gates. Each sluice gate is 5 feet wide by 6 feet tall. The approach channel leads to a flat crest slab at elevation 934.0 feet (sill of sluice gates). The top elevation of the sluice gates is 940.0 feet. Downstream of the sluice gates, the flow passes over a sloping (1H:4V) slab down to elevation 927.0 where it enters the 30-foot-long energy dissipation slab set at a flat elevation of 927.0. The approach channel wing walls include a 1:3 flare, while the outlet channel flares at 1:5.

The Marsh Lake Dam outflow channel extends for about 1,500 feet downstream from the spillways. The channel has a bottom width of 25 feet and 1 on 2 side slopes, bounded on both sides by dikes having a top elevation of 938.0 feet.

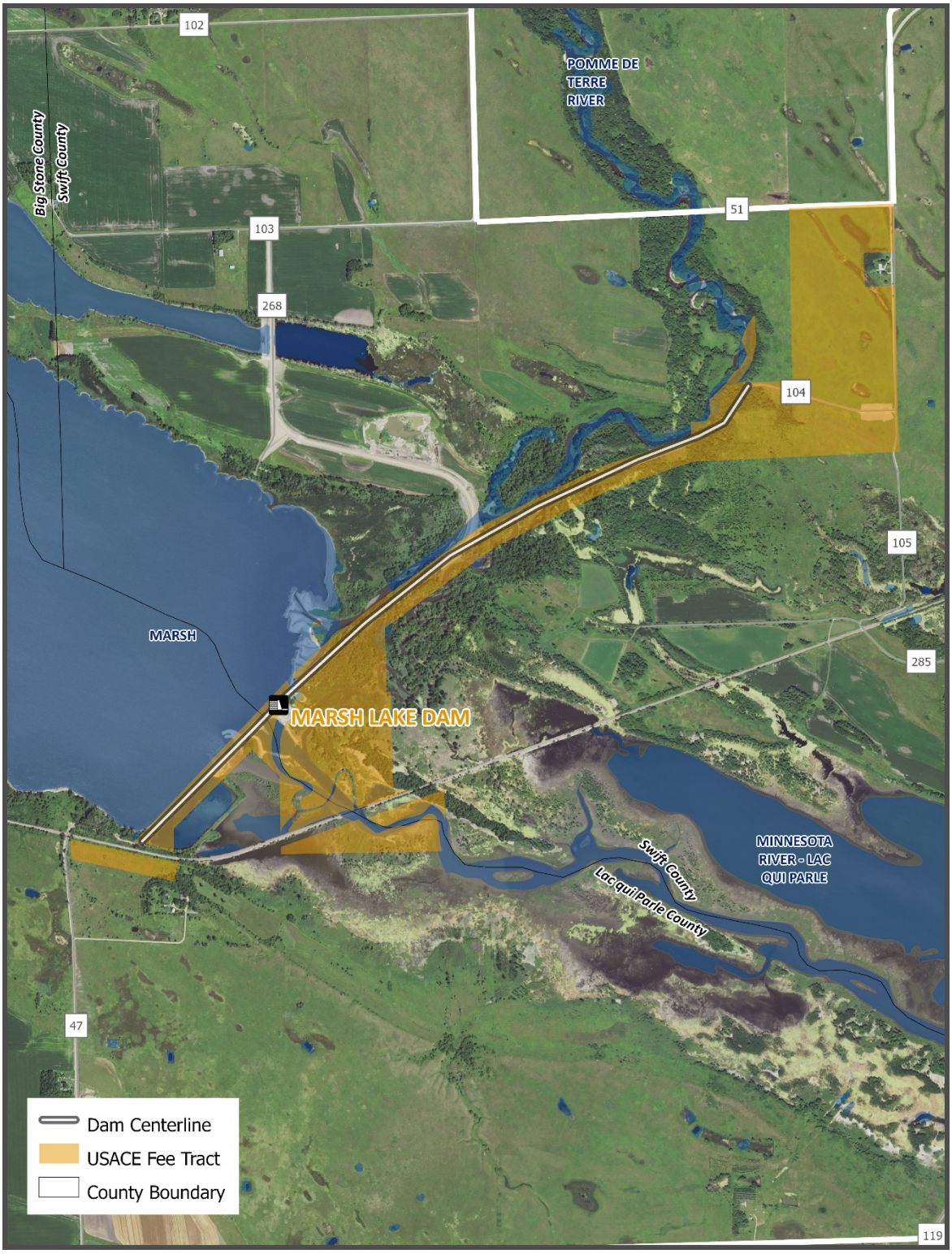


Figure 12. Aerial view of Marsh Lake Dam.

8.5.3 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 (Figure 13). 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. The 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. Additional information is listed in Appendix A.

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 (Figure 14). A six-span combination highway bridge and spillway near the point of diversion controls the flood flows of the Chippewa River into the channel. 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.

Figure 13. Chippewa Diversion Dam

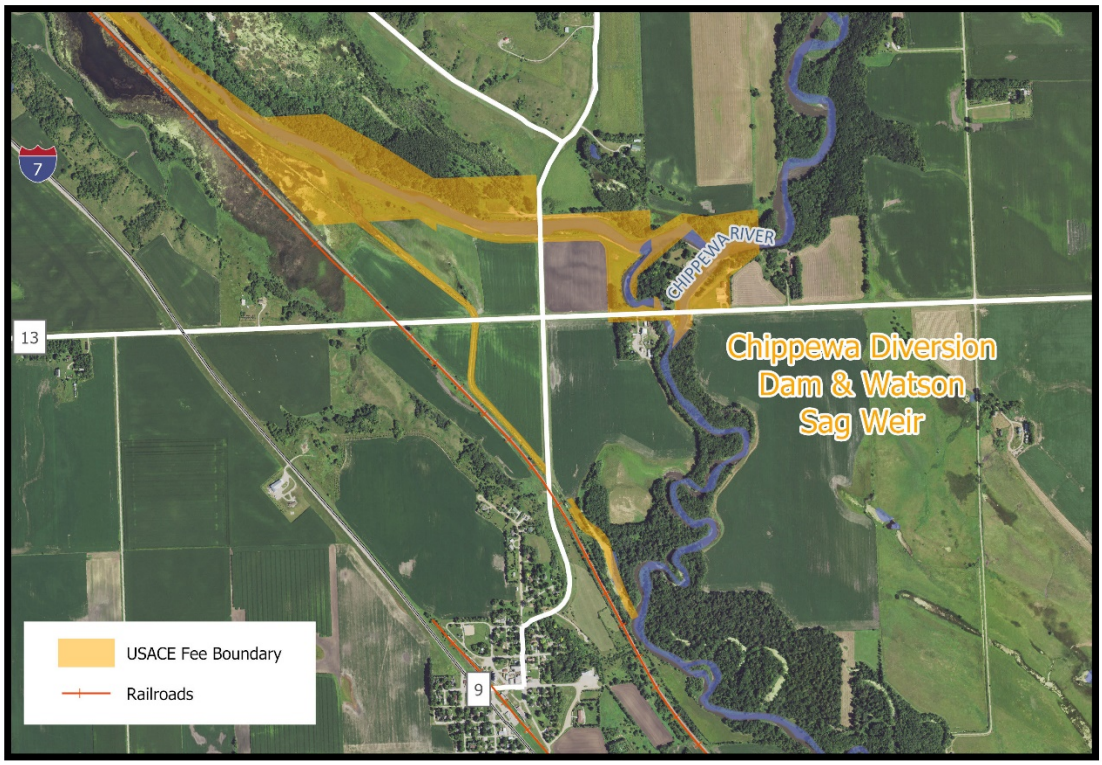


Figure 14. Chippewa Diversion Dam & Watson Sag Weir locator map.

8.5.4 Lac qui Parle Recreation Facilities

8.5.4.1 Lac qui Parle East Bank Day Use Area

1. Unit Description

a. Size: This recreation area is approximately 2 acres.

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 15) crosses the river on the dam. The entrance drive to the site is adjacent to the dam, on the east side.

c. Public use facilities include:

a. 1 Picnic shelter
b. 1 Unsheltered picnic area
c. 1 Unisex Restroom
d. 1 Parking area
e. 1 Fish Cleaning Station

d. Existing Site Use: 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.

e. 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; to the west are wildlife management lands.

f. **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.
g. **Vegetation:** The site has a few mature trees and mown turf grasses.
h. **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.
i. **Cultural Resources:** The Lac qui Parle Dam and any associated project features are eligible for National Register of Historic Places listing based on the project's association with the Federal Relief Construction during the period from 1933 to 1941.
j. **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.

2. **Land Use Classification:** This unit is classified as Recreation (High Density).
3. **Visitation:** The total visitation for fiscal year 2019 was 3,001.
4. **Summation:** 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.

8.5.4.2 Lac qui Parle West Bank Day Use Area

1. Unit Description

a. **Size:** This recreation area is approximately 3 – 4 acres.
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 14) crosses the river on the dam. The entrance drive to the site is adjacent to the dam, on the west.
c. **Existing Site Use:** 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. **Public use facilities include:**

   a. 2 Picnic shelters
   b. 5 Unsheltered picnic areas
   c. 1 Unisex Restroom-Privy
   d. 1 Parking area

e. **Adjacent Land Use:** The area adjacent to this site is managed for wildlife by the MNDNR.
f. **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.

g. **Vegetation:** This site has good tree cover (± 60% ash and boxelder) with mown turf grasses.
h. **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.
i. **Cultural Resources:** The Lac qui Parle Dam and any associated project features are eligible for National Register of Historic Places listing based on the project's association with the Federal Relief Construction during the period from 1933 to 1941.
j. **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.

2. **Land Use Classification:** This unit is classified as Recreation (High Density) and Project Operations.
3. **Visitation:** The total visitation for fiscal year 2019 was 12,082.
4. **Summation:** 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.

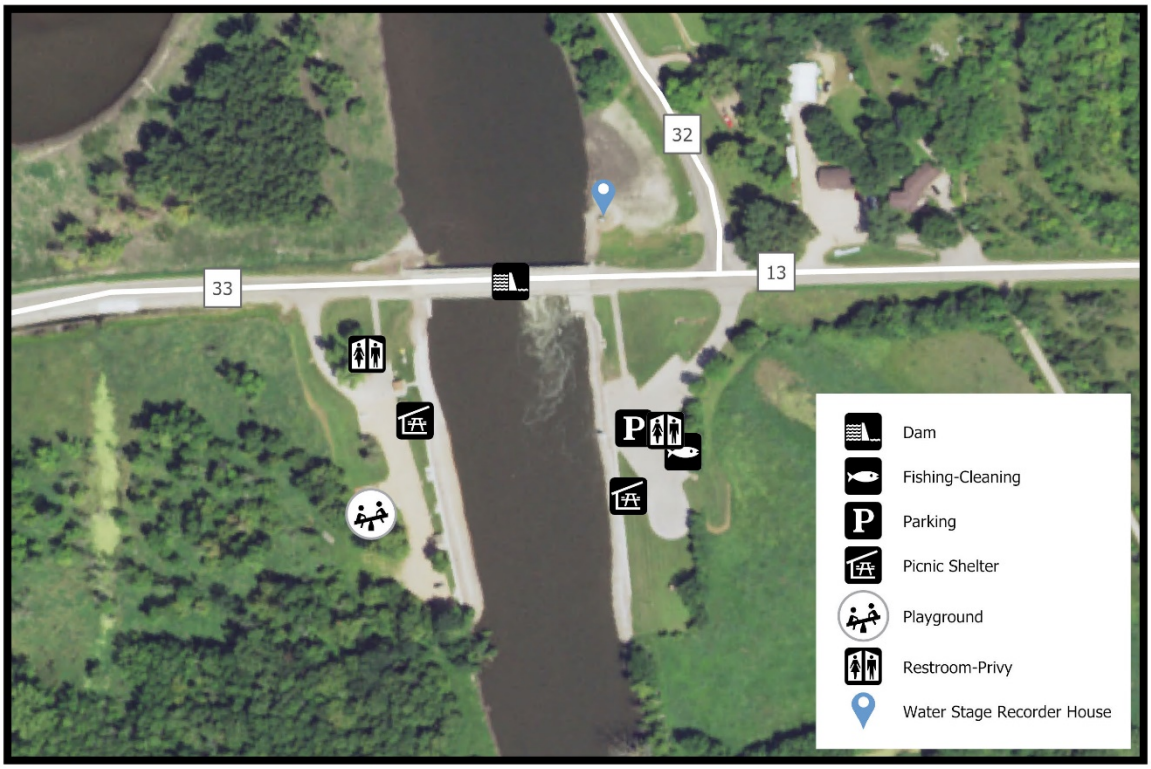


Figure 15. Lac Qui Parle Recreation Features (East and West Bank)

8.5.4.3 Marsh Lake Day Use Area

1. Unit Description

a. Size: This recreation area is approximately 3 acres.

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, Minnesota and can be accessed from State Highway 119 to the gravel access road, then about 3 miles following this road.

c. Existing Site Use: 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. Public use facilities include:

- 2 Restroom-Privy
- 1 Gravel parking lot

e. Adjacent Land Use: The site is surrounded by the Lac qui Parle Wildlife Management Area.

f. 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.

g. Vegetation: This unit is almost exclusively short varieties of native grasses. Directly offsite, wetland vegetation communities dominate.

h. **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.
i. **Cultural Resources:** The Lac qui Parle Dam and any associated project features are eligible for National Register of Historic Places listing based on the project's association with the Federal Relief Construction during the period from 1933 to 1941.
j. **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.

2. **Land Use Classification:** This unit is classified as Recreation (High Density) and Project Operations.
3. **Visitation:** The total visitation for fiscal year 2018 was 14,391. The area was closed for construction during fiscal year 2019.

4. Summation: 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.

8.5.4.4 Boat Launches

There are no boat launches managed by the USACE.

1. **Lac qui Parle:** The MNDNR 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.
2. **Marsh Lake:** The MNDNR provides two boat ramps on each side of Marsh Lake and two canoe accesses on the east side of the lake.
3. **Minnesota River:** Because this part of the river is designated a "Scenic River," the MNDNR maintains canoe launch facilities along the reaches so designated.

8.5.4.5 Other Public Use Facilities

The following public use facilities are located on or near the Lac qui Parle project:

1. **Lac qui Parle State Park:** The MNDNR manages the state park which is used for camping, fishing, bird watching and winter eagle sightings, hunting, canoeing and cross-country skiing.
2. **Big Stone National Wildlife Refuge:** The U.S. Fish and Wildlife Service (USFWS) manages the refuge. Popular activities include hunting, fishing, hiking, and viewing wildlife.

8.6 PROJECT ACCESS

The project is located about 140 miles west of St. Paul, Minnesota, and about 120 miles north of Sioux Falls, South Dakota, and the same distance south from Fargo, North Dakota and Moorhead, Minnesota. Access to the project from these metropolitan areas is good via the Federal and State highway systems.

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.

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 and passes through Montevideo, Watson, and Appleton, Minnesota.

- Lac qui Parle: Lac qui Parle Dam is located on Lac qui Parle County Road 33/Chippewa County Road 13 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, Minnesota, 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 MNDNR.

9 LAC QUI PARLE PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

9.1 DESCRIPTION OF THE RESERVOIRS, RIVERS AND DIVERSIONS*

9.1.1 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.

9.1.2 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 (USACE 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.

9.1.3 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.

9.1.4 Minnesota River

There are easements for clearing and snagging operations and other channel improvements for 30 miles downstream from the Lac qui Parle Dam.

9.2 HYDROLOGY*

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. 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.

9.3 Sedimentation and Shoreline Erosion

There has been a large amount of sediment deposition in Marsh Lake reservoir since Marsh Lake Dam was completed. A study published by the University of Minnesota in 1987 (Van Alstine, 1987) indicated that approximately 105 centimeters of silt has been deposited at the mouth of the Pomme de Terre River (near the dam). Only one core sample was taken for the University study. One of the goals of the rerouting of the Pomme Terre River is to help reduce sediment and nutrient transport and resuspension by trapping sediments and nutrients in the natural floodplain.

There is a relatively narrow stretch of water upstream of Lac qui Parle Dam that extends upstream to where the valley channel widens (i.e. a neck) into the larger reservoir. Sediment settles in this neck area. The sill of the LQP Dam low-flow gate is at elevation 915.2 feet; however, the inlet grate has a sill elevation at 919.2 feet which limits low-flow control to this elevation. During the winter of 1976-77 the pool elevation ranged from 927.1 to 930 feet. During that period outflows at the dam were nearly zero. In 1995 the elevation of the sandbar was estimated to be at elevation 928 feet thereby limiting drawdown at the dam and the ability to pass low flow, to this elevation. As a result, sediment ranges and soundings were collected upstream of Lac qui Parle Dam during August 5-7 1997 (Table 17). An estimate of the amount of storage volume lost to sedimentation is shown in Table 17.

Table 17. Sediment Deposition

Sediment Deposition				
Reservoir	**Sediment Load Ac-Ft/Year[1]**	**Number Of Years[2]**	**Estimated Deposition Ac-Ft**	**Percent of Conservation Storage Lost[3]**
Marsh Lake	60.5	56	3,388	28
Lac qui Parle[4,5]	69.0	56	3,864	9

[1] U.S. Army Corps of Engineers, General Design Memorandum No. 1, Supplement No. 2, Flood Control, Big Stone-Whetstone River, Page 3, 30 November 1979. Based on an observed Sediment rate of 0.05 ac-ft/sq. mi. for the Big Stone River. Also see the Reservoir Operation Plan Evaluation dated September 1989, Pages 75 and 103.
[2] 1939 through 1994.
[3] Marsh Lake Conservation Storage = 12,050 ac-ft = Storage Below Elevation 937.6 feet.
Lac qui Parle Conservation Storage = 41,000 ac-ft = Storage Below Elevation 933.0 feet.
[4] Sediment ranges and soundings were collected upstream of Lac qui Parle Dam during 05 to 07 August 1997. See St. Paul District Drawing Nos. M34-S-LQP-13/40 thru M34-S-LQP-13/51.
[5] Other: Sediment surveys tied to range lines from Lac qui Parle Dam to Minnesota Falls were done in 1939. The maps are filed in the Corps Real Estate files.

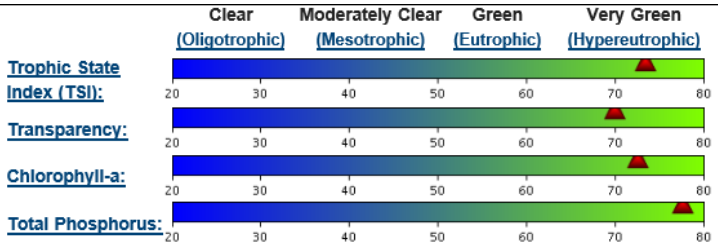
9.4 Water Quality

Located in the headwaters of the Minnesota River, Lac Qui Parle Lake is a long, run of the river reservoir whereas Marsh Lake is a small, shallow basin. At normal pool Lac Qui Parle and Marsh Lake reservoirs have a length of approximately 27 miles. The reservoirs are shallow, and wind swept with relatively poor water quality. The water quality is characterized by hard, nutrient rich water and frequently suspended sediment. Lac Qui Parle and Marsh Lakes are classified as

hypereutrophic lakes. The trophic classification is based on measures of water transparency (secchi disk), total phosphorus, and chlorophyll a (a measure of algae abundance). Specific issues and concerns for Lac Qui Parle and Marsh Lakes include:

- Nuisance blue-green algae
- Low dissolved oxygen
- High turbidity
- Few submersed aquatic plants
- Limited macroinvertebrate fauna
- Limited zooplankton fauna
- Poor game fish reproduction
- Toxic methyl-mercury in fish
- Pathogenic bacteria

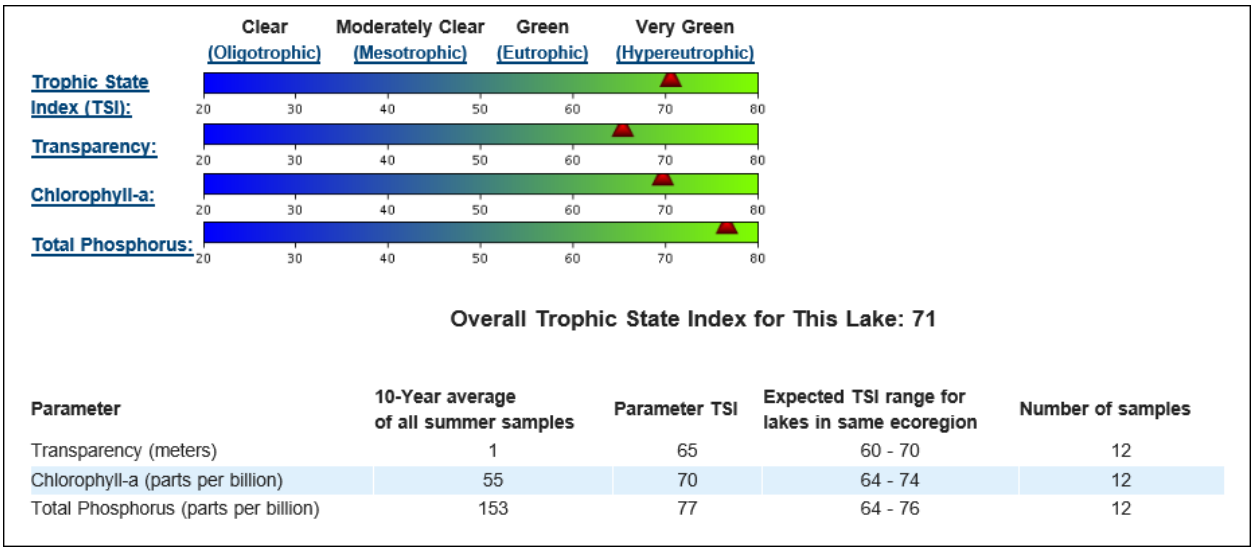
USACE collected water samples from Lac Qui Parle and Marsh Lakes bi-weekly during the summer months at the four locations between 1990-2005. The water was tested for nutrient forms of phosphorus and nitrogen, chlorophyll a, ammonia, total organic carbon, sulfate, and total suspended solids. More recently, the Minnesota Pollution Control Agency (MPCA) sampled Lac qui Parle and Marsh lakes (1988 through 2019). Using data from 2008-2017, the MPCA calculated the Trophic State Index (TSI) to summarize the lakes' overall nutrient richness. Figure 16, Figure 17 and Figure 18 display the hypereutrophic nature of Lac Qui Parle NW Basin, SE Basin and Marsh Lake, respectively.



Overall Trophic State Index for This Lake: 73

Parameter	10-Year average of all summer samples	Parameter TSI	Expected TSI range for lakes in same ecoregion	Number of samples
Transparency (meters)	1	70	60 - 70	12
Chlorophyll-a (parts per billion)	73	73	64 - 74	12
Total Phosphorus (parts per billion)	164	78	64 - 76	12

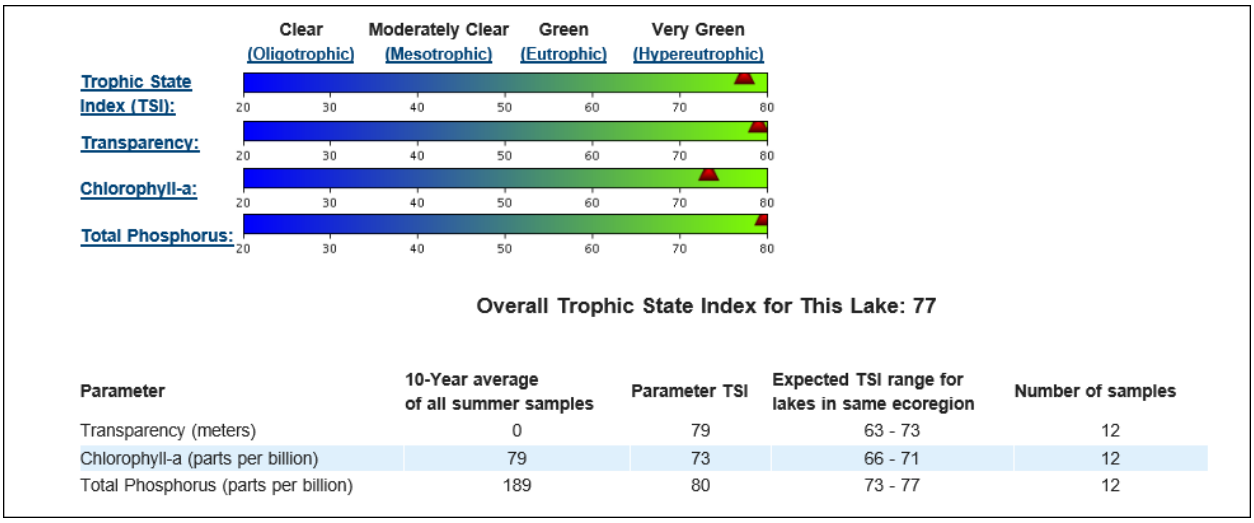
Figure 16. Trophic State Index for Lac Qui Parle (NW Basin)



Overall Trophic State Index for This Lake: 71

Parameter	10-Year average of all summer samples	Parameter TSI	Expected TSI range for lakes in same ecoregion	Number of samples
Transparency (meters)	1	65	60 - 70	12
Chlorophyll-a (parts per billion)	55	70	64 - 74	12
Total Phosphorus (parts per billion)	153	77	64 - 76	12

Figure 17. Trophic State Index for Lac Qui Parle (SE Basin)



Overall Trophic State Index for This Lake: 77

Parameter	10-Year average of all summer samples	Parameter TSI	Expected TSI range for lakes in same ecoregion	Number of samples
Transparency (meters)	0	79	63 - 73	12
Chlorophyll-a (parts per billion)	79	73	66 - 71	12
Total Phosphorus (parts per billion)	189	80	73 - 77	12

Figure 18. Trophic State Index for Marsh Lake

Factors Affecting Water Quality

- Large watershed, which is mostly cultivated has increased capacity to load nutrients and fine sediment into the lakes. Land use within the Lac qui Parle Reservoir-Minnesota River Aggregated 12-HUC subwatershed includes: 52.5% cropland, 20.4% wetland, 12.0% rangeland, 9.5% open water, 4.6% development, 0.8% forest, and 0.2% barren. Large nutrient and sediment loads promote nuisance phytoplankton (algae) growth and inhibits littoral vegetation needed to support diverse aquatic communities including game fish.
- Decaying organic matter from planktonic algae creates stressful conditions for fish by consuming too much dissolved oxygen and producing excessive ammonia. Fish kills have been associated with depleted dissolved oxygen conditions.
- The relatively large watershed determines a relatively high-water flow-through rate which means that in-lake conditions are highly influenced by conditions arising in

upstream impoundments, especially Marsh Lake. It is likely that much of the phytoplankton in Lac Qui Parle begins its life cycle in Marsh Lake. Also, episodes of high sediment and phosphorus loading may be caused by windy conditions on shallow Marsh Lake.

- Wind-induced mixing frequently re-suspends bottom sediment in shallow areas, reducing transparency and maintaining high nutrient levels in the water column.
- Reservoir operations for flood control can cause low dissolved oxygen conditions in late winter.

Impaired Uses

Every two years, MPCA creates a list (303(d)) of impaired waters that do not meet water quality standards. Lake Qui Parle Reservoir is currently listed as impaired for Aquatic Recreation and Aquatic Life (Table 18). Marsh Lake is currently listed as having insufficient data available for aquatic life or aquatic recreation use assessments.

Table 18. Lac Qui Parle Listed (303(d)) impairments

Water body name	Year added to List	Basin	AUID	County	HUC 8	Affected designated use	Pollutant or stressor	TMDL target completion year
Lac Qui Parle (NW Bay)	2018	Minnesota River	37-0046-02	Chippewa	07020001	Aquatic Recreation	Nutrients	2029
Lac Qui Parle (SE Bay)	1992	Minnesota River	37-0046-01	Chippewa	07020001	Aquatic Life	Ammonia, un-ionized	2029
Lac Qui Parle (SE Bay)	2018	Minnesota River	37-0046-01	Chippewa	07020001	Aquatic Recreation	Nutrients	2029

In 1998, Lac Qui Parle and Marsh Lakes were both added to the aquatic consumption impaired list due to mercury in fish tissues.

9.5 Topography, Geology, and Soils*

9.5.1 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.

9.5.2 Geology*

The Lac qui Parle project lies in the Minnesota River Valley which is the abandoned channel of the Ancient River Warren. 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.

9.5.3 Soils*

NRCS 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 draughty 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. See Appendix E3 for the SSURGO Soils plate for Lac qui Parle.

9.6 RESOURCE ANALYSIS*

9.6.1 Fish and Wildlife Resources*

Most of Lac qui Parle and Marsh Lake lie within the Lac qui Parle Wildlife Management Area administered by the MNDNR. The unit is about 25 miles long, 1 to 3 miles wide, and includes 32,000 acres under State administration. Marsh, forest, brush lands and uplands with grassland and cropland characterize the area. Immediately upstream, the Big Stone National Wildlife Refuge is administered by the USFWS. 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.

9.6.1.1 Mammals

Since settlement, the number of species of mammals found in the vicinity has changed. Bison, pronghorn antelope, elk, mule deer, and eastern timber wolves were a part of presettlement prairie fauna. An occasional grizzly bear also occurred. Cultivation, fencing, and uncontrolled hunting were responsible for the reduction in number and elimination of some mammals from the Lac qui Parle vicinity.

Fifty-two mammal species are known to or probably occur in the area. 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 MNDNR authorized 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.

9.6.1.2 Non-game Bird Species

A total of 253 species are likely to occur in the vicinity. Migrants and winter visitors account for 148 species, and six species have been observed only casually. Of 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. Of 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.

9.6.1.3 Waterfowl

Waterfowl are probably 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. Waterfowl hunting also has a positive economic impact within the area. The Lac qui Parle Wildlife Management Area (WMA) has significant waterfowl concentrations during migration periods, in addition to resident population of Canada geese. Lac qui Parle 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 WMA offers excellent opportunities for observation and photography.

9.6.1.4 Fish

Lac qui Parle Lake is considered a "warm-water game fish lake" and has maximum and median depths of about 14 to 8 feet. Marsh Lake is classified as a "warm-water fish and waterfowl/aquatic fur-bearer lake" with maximum and median depths of about 4.3 and 2.5 feet. Sixty-four species of fish are known to occur within the project area, including 13 game fish and six commercially-harvested (for management purposes) rough fish. Anglers commonly catch bluegill, lake sturgeon, northern pike and walleye.

9.6.1.5 Reptiles and Amphibians

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

9.6.2 Vegetative Resources*

When European explorers came to the Lac qui Parle area, the predominant vegetation type was prairie. Bottomland hardwood forests occupied narrow strips along the various rivers, and numerous wetlands dotted the landscape. With settlement and expanding agriculture, the prairie was converted to croplands. Most of the wetlands in the region have disappeared either by natural processes or artificial drainage to create "productive" farmlands. Today the predominant vegetation is crops, such as corn and soybeans. Forest remnants can be found along the rivers. Remaining wetlands are either in public ownership and held for wildlife purposes or in areas with severe agricultural limitations.

Lac qui Parle vegetation resources were evaluated by reviewing 2020 imagery and verifying or updating data from a 2012 level 1 vegetation inventory. Vegetation types were mapped to the lowest hierarchical level of the NVCS. The Subclass level defines general dominant and diagnostic growth forms driven by factors such as substrate or aquatic conditions. This level is divided into the 11 categories listed below in Table 19. See Appendix I for vegetation plates.

Table 19. Lac qui Parle Vegetation

Vegetation Subclass	Acreage	Percentage
Annual Graminoid or Forb Vegetation	1.49	0.28%
Boulder Gravel Cobble or Talus Sparse Vegetation	2.19	0.41%
Deciduous Forest	121.98	23.09%
Deciduous Shrubland	55.09	10.43%
Developed	38.41	7.27%
Evergreen Forest	0.00	0.00%
Hydromorphic Rooted Vegetation	0.00	0.00%
Mixed Evergreen - Deciduous Forest	0.00	0.00%
Open Water	77.35	14.64%
Perennial Graminoid Vegetation	231.43	43.82%
Unconsolidated Material Sparse Vegetation	0.25	0.05%

9.6.3 Threatened and Endangered Species*

The USFWS IPaC website was consulted on July 2, 2021 to identify potential presence of federally listed threatened and endangered species within the project area. The northern long-eared bat and Dakota skipper are listed as threatened by the USFWS within the Lac qui Parle project area. The NLEB utilizes tree cavities and crevices as roosts in the summer, making hardwood forests within the Lac qui Parle project potential habitat for this species. However, northern long-eared bats have never been documented on project lands. The Dakota skipper is a butterfly species that occupies native prairies. The USFWS also lists three Birds of Conservation Concern (BCC). In addition, the Bald Eagle is protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668(a); 50 CFR 22) (Table 20).

Table 20. Migratory Bird Species and Birds of Conservation Concern (BCC)

Common Name	Scientific Name
Bald Eagle	*Haliaeetus leucocephalus*
Dunlin*	*Calidris apina arcticola*
Lesser Yellowlegs*	*Tringa flavipes*
Semipalmated Sandpiper*	*Calidris pusilla*

*Denotes BCC status

The state of Minnesota lists four species as either endangered, threatened species or species of concern (Table 21).

Table 21. Minnesota state-listed species

Common Name	Scientific Name	Status
Mucket	*Actinonaias ligamentina*	Threatened
Black sandshell	*Ligumia recta*	Species of concern
Elktoe	*Alasmidonta marginata*	Threatened
Mudpuppy	*Necturus maculosus*	Species of concern

9.6.4 Wetlands*

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation adapted to life in saturated soil conditions. Wetlands are distinguished not only from uplands, which do not hold sufficient water to support wetland functions, but also deep-water habitats, with water depths greater than 2 meters (6.6 feet) deep. The Lac qui Parle project has 188 acres of emergent wetland and 263 acres of forested/shrub wetlands. See Appendix F3 for the National Wetlands Inventory plate at Lac qui Parle.

9.7 Borrow Areas and Utilities

An active natural gas transmission line operated by Northern Natural Gas Company runs through Lac Qui Parle easement parcels adjacent to Minnesota Highway 119. A Minnesota Valley Coop Light & Power Association electrical transmission line also crosses through the Lac qui Parle project area.

9.8 Cultural Resources*

In addition to being an area of high potential for the presence of archaeological and historic sites, the location 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 accessed by various human groups for about 10,000 years; first by nomadic hunters and later by the Dakota Indians living a semi-nomadic hunting and gathering life in the vicinity of Lac qui Parle, and finally by European settlers. 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, and 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 straightforward water travel.

White settlement expanded rapidly after the Dakota were confined to reservations following the Great Sioux Uprising of 1862. Immigrants of European heritage first settled near the rivers and overland transportation routes. The timber of the floodplain forests and the availability of relatively easy waterborne transportation still 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 1870s, 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 region meant that those areas that were unsuitable for cropping could be used for grazing.

On the basis of currently available information regarding cultural resources, a wide variety of significant prehistoric, historic and geologic features 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 bluffs overlooking the river. The Lac qui Parle State Park has two identified burial mound sites and several prehistoric village and habitation sites. A number of significant historic sites are located at and near the project, including Lac qui Parle Dam, Marsh Lake Dam, Chippewa Diversion Works, and Watson Sag Dike. All are considered eligible to the National Register of Historic Places. Other National Register listed 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 (Dakota) Mission, established in 1835 at the request of fur trader Joseph Renville, 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 for National Register of Historic Places listing. The Lac qui Parle Mission was a Protestant mission that 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 used it to prepare a translation of the Bible.

Fee title property of the project have been surveyed for cultural resources and are reported in 1977, 1980, 1994, 2014, and 2015. An isolated chipped stone flake and an isolated mammal bone fragment found near the Lac qui Parle Dam, and a surface scatter of historic bottles and fragments found at Watson Sag Dike constitute the only known prehistoric or historic archaeological sites on fee title lands. Neither site is recommended eligible for listing on the National Register of Historic Places. The Lac qui Parle Dam and any associated project features are eligible for National Register of Historic Places listing based on the project's association with the Federal Relief Construction during the period from 1933 to 1941.

9.9 Interpretation / Visual Qualities

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. There are no USACE 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.

9.10 Economics

Agriculture is the major industry surrounding the Lac qui Parle project. Land use within the surrounding area is also dominated by agriculture.

The natural and recreational resources at the USACE lakes provide social, economic, and environmental benefits for all Americans. The following information is related to the Lac qui Parle Project for Fiscal Year 2019 (U.S. Army Corps of Engineers, 2019). Visitation resulted in:

- $561,318 in visitor spending within 30 miles of the project
- $279,898 in sales within 30 miles of the project
- 5 jobs within 30 miles of the project
- $98,078 in labor income within 30 miles of the project
- $144,847 in value added within 30 miles of the project
- $151,866 in National Economic Development Benefits

With multiplier effects, visitor trip spending resulted in:

- $380,390 in total sales
- 6 jobs
- $125,633 in labor income

- $194,385 in value added (wages & salaries, payroll benefits, profits, rents, and indirect business taxes)

9.11 Recreation Facilities, Activities, and Needs

9.11.1 Zones of Influence & Visitation Profile*

While visitors come to Lac qui Parle for many different reasons, the reservoir remains the most significant draw. The most popular activities include boating and fishing.

The table below documents the visitation numbers for recreation areas at the Lac qui Parle Project (Table 22).

Table 22. Lac qui Parle Project Visitation Numbers for Fiscal Years 2015-2019

Fiscal Year	Day Use Visitation Numbers		
	East Bank Day Use	West Bank Day Use	Marsh Lake Day Use
2015	15,875	16,227	17,963
2016	15,527	18,078	26,665
2017	15,764	12,970	17,048
2018	11,490	11,257	14,391
2019	13,001	12,082	0*
2020	13,655	16,682	938*

*Closed for construction

9.11.2 Recreation Analysis*

USACE customer satisfaction comment cards have not been completed for the Lac qui Parle Project.

9.11.3 Recreation Trends

See Section 1.6.3 for a discussion on the Minnesota SCORP.

9.11.4 Recreational Carrying Capacity*

In recreation management, carrying capacity refers to the level of use that a recreation area can receive without suffering negative impacts to its environmental resources or the visitor experience. Overcrowding and overuse of lakes are also a concern for water-based recreation opportunities. At this time, the carrying capacity in unknown for the recreation facilities at the Lac qui Parle Project. In the future, carrying capacity may be considered as part of determining how to manage natural resources on USACE owned land.

9.12 Real Estate and Acquisition Policy*

Table 23 documents the real estate interests for the Lac Qui Parle Flood Control Project. See Appendix G3 for plate showing USACE real property.

Table 23. Deeded Acres for Lac Qui Parle Flood Control Project

	Fee Acres	Easement Acres
Deeded	519.928	**19,373.22**

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 USACE 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 USACE 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.

9.12.1 Deeded Fee Title

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 519.928 acres. USACE 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.

The represented mapped acreages on figures and plates are calculated from GIS polygon data. GIS acres are not the deeded legal acreage. All figures in the report referencing Lac Qui Parle Flood Control Project show fee title as 570.03 acres.

9.12.2 Flowage Easements

USACE has acquired flowage easement rights on 19,373.22 acres. Within the project area, the only interest or privilege USACE 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.

The represented mapped acreages on figures and plates are calculated from GIS polygon data. GIS acres are not the deeded legal acreage. All figures in the report referencing Lac Qui Parle Flood Control Project show easements as 19,343.05 acres.

9.12.3 Outgrants

The purpose of an outgrant is to allow other agencies or individuals use of Project lands. These outgrants are issued by easement, license, or lease. They are issued if the land is available, and if the proposed use is consistent with operational needs and resource management objectives. Other outgrants may be issued and existing ones terminated or amended, as circumstances warrant. There are currently 5 outgrants on Lac Qui Parle Flood Control Project lands: County of Chippewa (easement), Federated Telephone Cooperative (powerline easement), Upper Minnesota River Watershed District (easement), MN Valley CO-OP L & P Association (easement), and State of MN (DNR Fish and Wildlife license). The Real Estate Division of the St. Paul District maintains all current information on outgrants. Copies of the real estate agreements with MnDNR can be found in Appendix J.

9.12.4 Shoreline Management

Lac qui Parle does not have a Shoreline Management Plan. There are no shoreline permits on this reservoir. Boundary management is covered in the Operational Management Plan.

9.13 MANAGEMENT PLANS*

There are several Management Plans for the Lac qui Parle project.

Operational Management Plan:

The OMP contains detailed management actions for each recreation area and wildlife management area for the Lac qui Parle project. These management actions are the steps USACE is taking to meet the resource objectives outlined in the master plan. Management actions are outlined in a five-year plan for each recreation and wildlife management unit.

Water Management Plan:

The water management plan covers the operation of the dam and reservoir for its primary missions of primarily for water supply and pollution abatement during low flow periods and secondarily for flood control.

10 LAC QUI PARLE RESOURCE PLAN

10.1 MANAGEMENT BY CLASSIFICATION

The management plan is based on resources available and public needs and will provide for full utilization while protecting Project resources. This plan provides guidance on what types of development and activities are permitted.

10.1.1 Classification and Justification*

The Lac qui Parle Project land classifications are the following:

- Project Operations
- High Density Recreation
- Environmentally Sensitive Areas
- Multiple Resource Managed Lands

The management plans identified are presented in broad terms. A more descriptive plan for managing these lands can be found in the Lac qui Parle Project Operational Management Plan (OMP). Management tasks described in the OMP must support the Resource Objectives, Land Classifications, and Resource Plan set forth in this master plan.

Land classifications in the Western Area Master Plan of 1991 may have been misclassified. The 2021 Master Plan documents how the lands are currently managed and how USACE intends to manage the lands into the future. Change in land classification acreage can be attributed to improvements in mapping technologies, increased aerial imagery resolution aiding in visual classification, and enhanced geospatial data delineating USACE fee land. The 2021 Master Plan documents classifies all land within USACE fee boundaries, while the 1991 plan classified only areas that fell into the land classification categories defined at that time. The calculated acreages for land classifications are based on geographic information (GIS) polygon data, which is not a legal survey. Though GIS technology has improved, errors are inherent in the calculations.

See Appendix D3 for the Lac qui Parle project Land Classification.

Project Operations (350.9 acres)

This category includes those lands required for the dam, stilling basin, emergency spillway, office, maintenance facilities, and other areas that are used solely for the operations of the Project. The management plan reinforces that physical security is necessary to continue operations of the dam and related facilities. Examples of management activities for these lands include renovating and updating facilities and aging infrastructure with modern, energy efficient technology.

Management for wildlife, natural resources, and recreational use will remain a priority in these lands as long as there is no conflict with operational requirements. Examples of wildlife, natural resources, and recreational use management include modernizing interpretive building, trails, or interpretive information and protecting culturally sensitive areas.

Proposed change to this classification would increase acreage from 167.1 acres to 350.9.

High Density Recreation (12.9 acres)

These are lands developed for intensive recreational activities for the public include day use areas and campgrounds. The facilities in these areas will accommodate the recreation needs of visitors in concentrated numbers while also offering open space lands to provide more complete and attractive recreation areas.

Proposed change to this classification would increase acreage from 11.4 to 12.9.

Environmentally Sensitive Areas (18.7 acres)

The goal of environmentally sensitive area management is to protect and preserve known areas that contribute to the diversity and health of the Lac qui Parle Project. Areas designated as ESAs within the Lac qui Parle project area include known mussel beds, a mussel relocation area, and areas with mussels listed as state species of concern.

Proposed change to this classification would increase acreage from 0 to 18.7.

Multiple Resource Management Lands

These lands are classified by their predominate use; however, these lands can also have other compatible, simultaneous uses that do not impact the predominate use. These lands can be divided into four sub-categories:

- Wildlife Management
- Low Density Recreation
- Vegetative Management
- Future/Inactive Recreation Areas
- Water Surface

The following is a description of the resource objectives, acreage, and description of use pertaining to each sub-category.

Wildlife Management (122.0 acres)

These lands are designated for stewardship of fish and wildlife resources. However, areas of low-density recreation, environmentally sensitive areas, and vegetative management all support wildlife. Management efforts focus on producing native wildlife food and habitat. Non-game wildlife is also managed by the USACE.

Proposed change to this classification would increase acreage from 121.3 to 122.0.

Low Density Recreation (0 acres)

There are no proposed changes to this classification.

Vegetative Management (51.8 acres)

These lands are designated for stewardship of forest, prairie, and other native vegetative cover. Management activities in these areas focus on the protection and development of vegetative wildlife resources. With proper management, these areas also provide valuable habitat for a wide range of species. These lands are available for sightseeing, wildlife viewing, nature study, hiking, and horseback riding. Consumptive uses of wildlife, including hunting, fishing, and trapping, are allowed when compatible with the objectives for a given area and with both federal and state fish and wildlife management regulations. Examples of management activities compatible with both vegetative development and low-density recreation may include developing self-guided interpretive trails, creating wildlife viewing stations, updating scenic viewing areas, planting trees and native vegetation, and livestock grazing.

Proposed change to this classification would increase acreage from 0 to 51.8.

Future/Inactive Recreation Areas (0 acres)

There are no lands classified as future/inactive recreation areas. There are no proposed changes to this land classification.

Water Surface (4,461.7 acres)

The two sub-classification identified at Lac qui Parle are: Open Recreation (4451.7 acres) and Restricted (15.0 acres).

This land classification increased from 0 to 4,461.7 acres.

10.1.2 Recreation Area Map

Appendix H3 provides detailed maps of the Lac qui Parle project recreational areas.

PART E
Highway 75 Dam Project

11 HIGHWAY 75 DAM PROJECT DESCRIPTION

11.1 PROJECT AUTHORIZATION*

The project 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 related to land acquisition for the National Wildlife Refuge System. Public Law 89-72 (1965) added recreation as a specific purpose to be considered at all Federal reservoir projects.

USACE operates and maintains the Highway 75 Dam near Odessa, Minnesota, for the U.S. Fish and Wildlife Service in accordance with a 1975 cooperative agreement between the two agencies. The dam is integral to the Big Stone National Wildlife Refuge and was completed in 1971. Improvements to the upstream Minnesota River channel and modification to the existing Big Stone Lake outlet control structure was completed in 1987.

The original Big Stone Lake project at the outlet of Big Stone Lake (about 8 miles upstream) 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.

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.

11.2 PROJECT PURPOSE*

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.

11.3 BRIEF PROJECT DESCRIPTION*

The Big Stone Lake-Whetstone River project is upstream of the Lac qui Parle project and downstream of Big Stone Lake (Figure 18). 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 USFWS as the Big Stone National Wildlife Refuge under a cooperative agreement with USACE.

11.4 Listing of Prior Design Memorandums*

- Flood Control, Big Stone Lake – Whetstone River, Minnesota and South Dakota, Design Memorandum No. 1, General, August 1969.
- Final Environmental Impact Statement, Big Stone Lake – Whetstone River, Big Stone and Lac qui Parle Counties, Minnesota and Grant County, South Dakota, December 1971.
- Master Plan for Resource Management, Big Stone Lake – Whetstone River, Minnesota and South Dakota, June 1973.
- Flood Control, Big Stone Lake-Whetstone River, Minnesota-South Dakota, Design Memorandum No. 3, Upstream Works on the Minnesota River, Department of the Army, St. Paul District, Corps of Engineers, St. Paul, Minnesota, June 1973.
- Flood Control, Big Stone Lake-Whetstone River, Minnesota-South Dakota, Design Memorandum No. 4, Master Plan for Resource Management, June 1973.
- Flood Control, Big Stone Lake-Whetstone River, Minnesota-South Dakota, Design Memorandum No. 5, Upstream Works on the Minnesota River, December 1973.
- Flood Control, Big Stone Lake-Whetstone River, Minnesota-South Dakota, Design Memorandum No. 5, Upstream Works on the Minnesota River, December 1973.
- Natural Resources Study to Determine Causes and Alternative Solutions to the Siltation and Pollution Problems of Big Stone Lake, December 1974.
- Feasibility Report, Silt Reduction-Pollution Control, Big Stone Lake, Minnesota and South Dakota, June 1975.
- Flood Control, Minnesota River, Minnesota and South Dakota, Big Stone Lake – Whetstone River, Appendix B, Reservoir Regulation Manual, Highway 75 Dam and Reservoir, October 1979.
- Flood Control, Big Stone Lake – Whetstone River, Minnesota and South Dakota, DM No. 1, General, Supplement No. 2, November 1979.
- Final Supplement, Environmental Impact Statement, Modification Project, Big Stone Lake – Whetstone River, July 1980.
- Flood Control, Big Stone Lake – Whetstone River, Supplement to Master Plan for Resource Management, January 1982.
- Operation Plan Evaluation, Highway 75 – Lac qui Parle Reservoir, September 1987.
- Western District Flood Control Projects Master Plan, June 1997.
- Water Control Manual, Highway 75 Dam and Reservoir, Big Stone Lake – Whetstone River Project, March 2005.

11.5 Listing of Pertinent Project Information*

Appendix A documents pertinent information related to the Highway 75 Project.

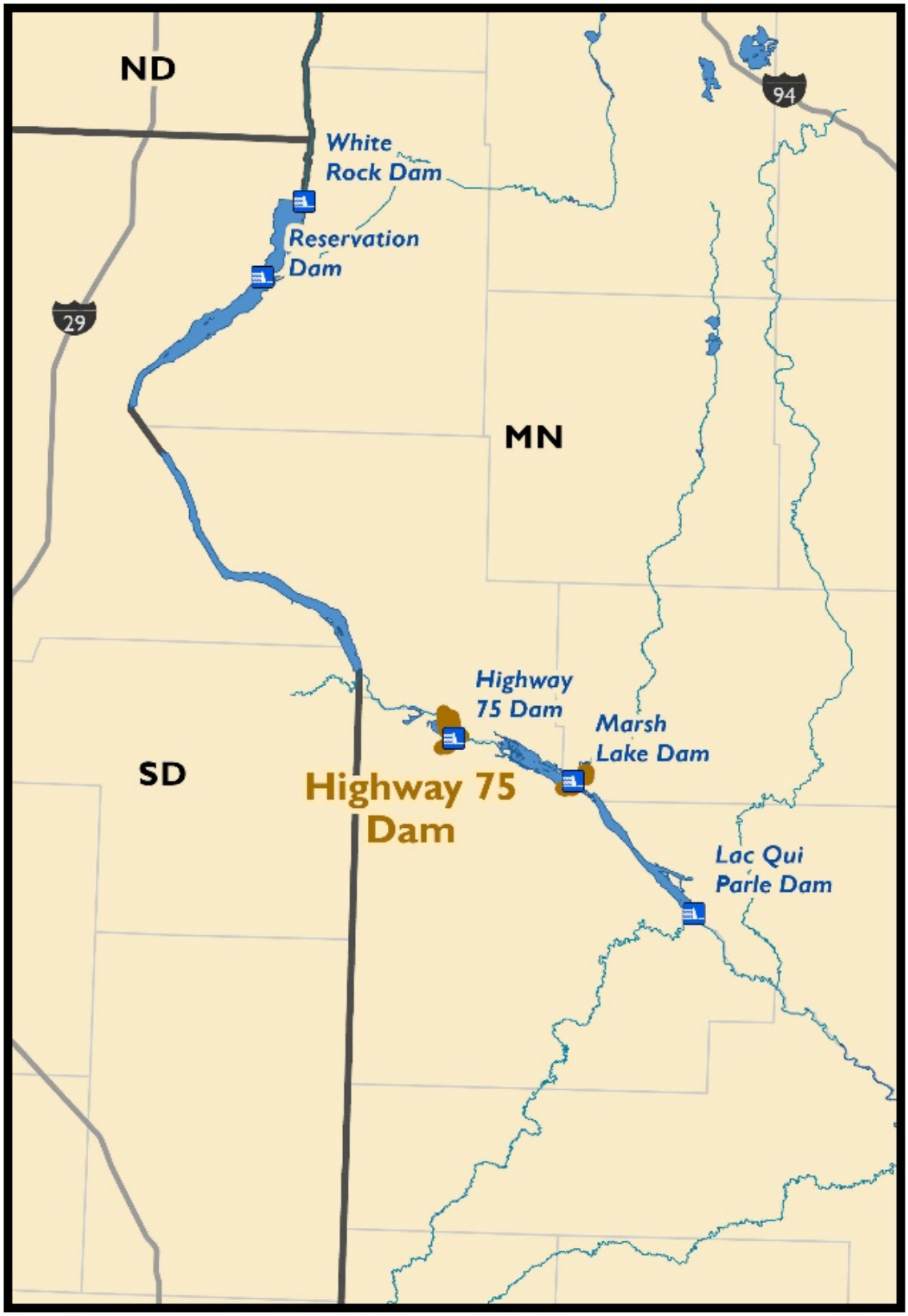


Figure 19. Locator map – Highway 75 Dam

11.6 HIGHWAY 75 DAM AND CONTROL STRUCTURE

The dam is two sections of compacted impervious earthen fill, separated by about 2,000 feet of high ground (Figure 19 and Figure 20). 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 crest is 12.2 feet above the conservation pool (elevation 952.3), 6.0 feet above the emergency spillway design flood (elevation 958.5), and 3.1 feet above the standard project flood (elevation 961.4).

Figure 20. Aerial view of Highway 75 Dam.

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 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.

A 715-foot-long emergency spillway, located between the service spillway and the low flow outlet, was excavated through 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.

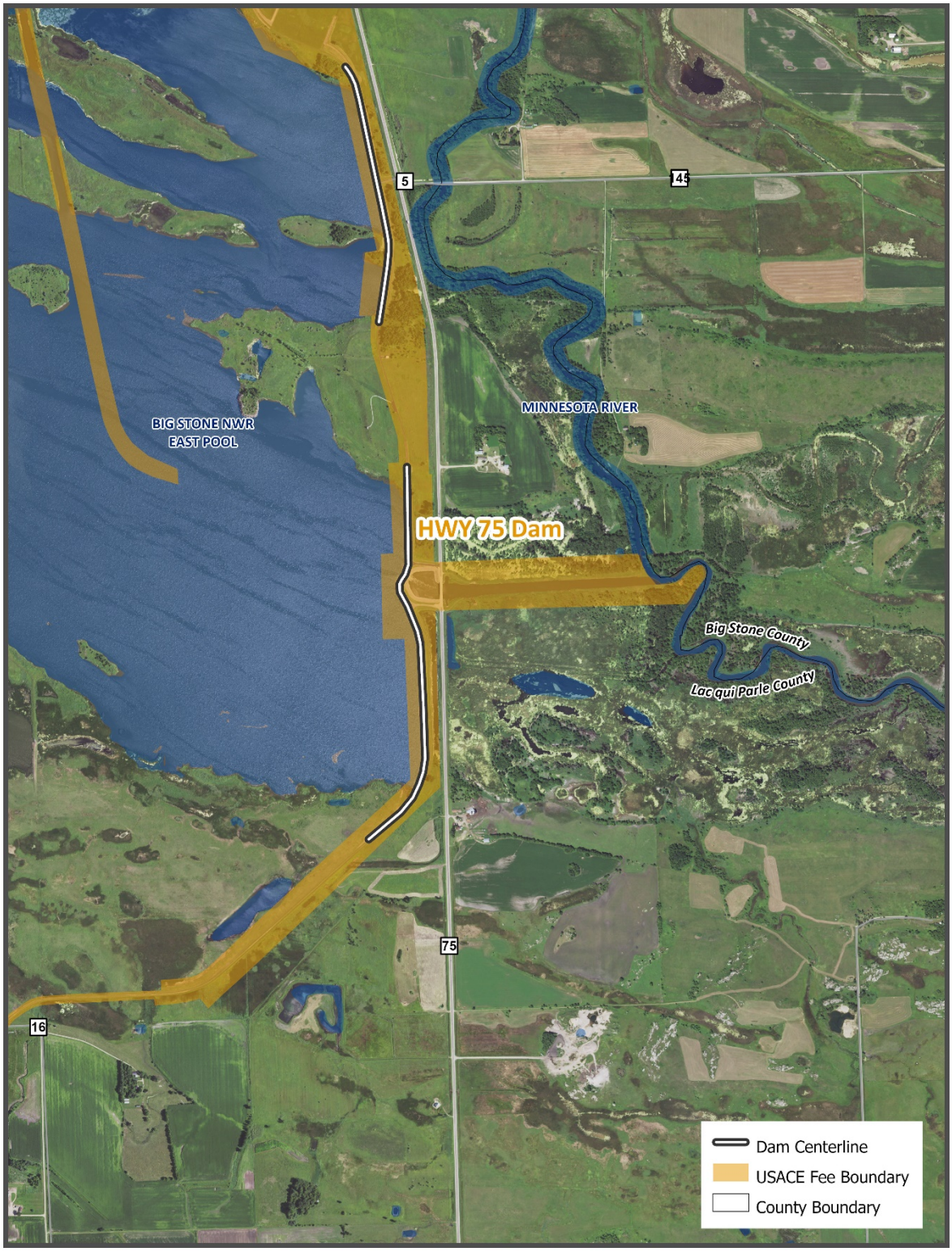


Figure 21. Aerial map of Highway 75 Dam.

11.6.1 Highway 75 Dam Recreation Facilities

11.6.1.1 Highway 75 Impoundment scenic overlook

A parking lot for fishing and hunting access and a scenic overlook to view the impoundment are the only public facilities provided.

11.6.1.2 Other Public Use Facilities

The Big Stone National Wildlife Refuge surrounds the Highway 75 Dam project. The refuge is managed by the USFWS. Popular activities include hunting, fishing, hiking, and viewing wildlife.

11.7 PROJECT ACCESS

The project is accessed from Highway 75, west of Odessa, Minnesota.

12 HIGHWAY 75 DAM PROJECT SETTING AND FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

12.1 DESCRIPTION OF THE RESERVOIR*

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 of 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.

12.2 WATER RESOURCES

The total contributing drainage area of the Minnesota River at the Highway 75 Dam includes the Whetstone River and Yellow Bank River sub basins. 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.

12.3 HYDROLOGY*

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 Water Control Manual, Highway 75 Dam and Reservoir, Appendix C. The Highway 75 Reservoir and surrounding lands are part of the Big Stone 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.

Water Storage Strategy: 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. If 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.

12.4 SEDIMENTATION AND SHORELINE EROSION

Silt deposition in the lower reach of Big Stone Lake started to become a problem of appreciable magnitude shortly after construction of the Whetstone River Diversion Project. While a silt barrier was part of the original construction, sediment from the Whetstone River still collected at the Big Stone Lake outlet. In 1986 the silt barrier was raised one foot in an effort to reduce silt deposition in Big Stone Lake; however, no measurements of actual sediment entering the lake

have been made. From information provided by the US Soil Conservation Service (now Natural Resource Conservation Service (NRCS)) and soundings of lower Big Stone Lake obtained in 1956 and 1967, it was estimated that approximately 280 acre-feet of sediment per year would enter the project area from the Whetstone River and Yellow Bank River. This represented about 0.35 acre-feet of sediment per square mile of effective contributing drainage area. Of this amount it was estimated that about 14 acre-feet would move into Big Stone Lake and the remainder, or 266 acre-feet, would enter the Highway 75 project reservoir area. NRCS expected land treatment measures for the Whetstone River and Yellow Bank River watersheds to reduce the average annual sediment yield to an estimated 187 acre-feet by the year 1980 and to 173 acre-feet by the year 2000. The average annual silt deposition was expected to be 157 acre-feet at the year 1980 based on a trap efficiency of 84 percent and 137 acre-feet at the year 2000 based on a trap efficiency of 79 percent. Using this average annual rate of sedimentation and variable trap efficiency the silt deposition in the Highway 75 Reservoir would be 2,700 acre-feet after 15 years, 7,300 acre-feet after 50 years and about 12,000 acre-feet after 100 years. The high pool elevation of 952.3 feet has a storage capacity of 11,700 acre-feet. However, because of the nature of the terrain and the shape of the pool, sediment would not be deposited uniformly in the pool. The sediment transported by the Whetstone River to the Minnesota River would form a delta in the upper end of the reservoir while the sediment carried by the Yellow Bank River would be deposited in a delta at the mouth of the Yellow Bank River in the lower reaches of the reservoir.

Sediment ranges were established in the Highway 75 Reservoir in June 1975 for purposes of periodic sediment surveys. No sediment surveys have been completed since the construction of Highway 75 Dam.

12.5 Water Quality

Highway 75 project reservoir, also known as East Pool Impoundment, is the furthest downstream pool in the Big Stone National Wildlife Refuge. The Refuge is located roughly 2 miles downstream of Big Stone Lake and is an 18 square mile complex of wetlands and several pools. The West and East pools are the primary impoundments and are separated by a dike and water control structure that allows them to be managed independently. The East pool elevation is controlled by the Highway 75 Dam gates which are operated to maintain the reservoir pool at the conservation pool elevation of 952.3. During drawdowns, the low-flow outlet can drop the pool elevation as much as five feet to 947.3.

The amount of water quality data collected from the East Pool Impoundment is quite limited, but like the downstream reservoirs (Lac Qui Parle and Marsh Lake) the impoundment is characterized by hard, nutrient rich water and frequently suspended sediment. Currently, the Minnesota River delivers water and transports sediments that have the potential to carry contaminants into the Refuge (Tangen et al 2019). In addition to this sediment loading, nutrients and heavy metals are suspected of affecting one or more pools on the Refuge and the U.S. Environmental Protection Agency and Minnesota Pollution Control Agency has listed the Minnesota River reach between Big Stone Lake and Marsh Lake Dam as impaired due to levels of mercury, bacteria, dissolved oxygen, and turbidity (MPCA 2020; USEPA 2015; USFWS 2012).

One recent fish study used for the Impaired Waters Inventory (IWI) sampled the Big Stone National Wildlife Refuge East and West Pools in 2013 and 2011, respectively, and mercury concentrations were below the threshold for impairment (0.2 mg/kg; Table 24).

Table 24. Fish contaminants: summary of fish length, mercury.

							Length (in)			Mercury (mg/kg)		
DOWID	Waterway	Species	Year	Anatomy1	Total Fish	Number Samples	Mean	Min	Max	Mean	Min	Max
37035100	BIG STONE NWR EAST POOL	Common Carp	2013	FILSK	2	1	27.8	27.8	27.8	0.11	0.11	0.11
		Walleye	2013	FILSK	5	5	15.4	13.4	17.8	0.116	0.092	0.144
		Yellow perch	2013	FILSK	5	1	9.3	9.3	9.3	0.088	0.088	0.088
37035600	BIG STONE NWR WEST POOL	Bluegill sunfish	2011	FILSK	8	2	8.4	8	8.7	0.134	0.129	0.139
		Black crappie	2011	FILSK	4	1	8.4	8.4	8.4	0.22	0.22	0.22
		Common Carp	2011	FILSK	3	1	27.3	27.3	27.3	0.152	0.152	0.152
		Northern pike	2011	FILSK	10	10	16.3	14.4	19.7	0.158	0.115	0.199

[1]Anatomy codes: FILSK – edible fillet, skin-on; FILET—edible fillet, skin-off; WHORG—whole organism.

Anecdotally, USFWS staff have observed that the "Yellow Bank River delivers a large amount of sediment into East Pool. Based on aerial imagery, it appears sediment deltas are forming in several areas of the pool. Sedimentation does not pose any immediate threat but is something that should be tracked over time."

12.6 Topography, Geology, and Soils*

12.6.1 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.

12.6.2 Geology*

The project lies in the Minnesota River Valley which is the abandoned channel of the Ancient River Warren. 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.

12.6.3 Soils*

NRCS 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. See Appendix E4 for the SSURGO Soils plate at Highway 75 Dam.

12.7 Resource Analysis*

12.7.1 Fish and Wildlife Resources*

Due to the proximity of the Highway 75 Dam project to the Lac qui Parle Project, similar fish and wildlife resources can be found at each site. Refer to Section 9.7.1 for a description of fish and wildlife resources.

12.7.2 Vegetative Resources*

Highway 75 vegetation resources were evaluated by reviewing 2020 imagery and verifying or updating data from a 2012 level 1 vegetation inventory. Vegetation types were mapped to the lowest hierarchical level of the NVCS. The Subclass level defines general dominant and diagnostic growth forms driven by factors such as substrate or aquatic conditions. This level is divided into the 11 categories listed below in Table 25. See Appendix I for vegetation plates.

Table 25. Highway 75 Vegetation

Vegetation Subclass	Acreage	Percentage
Annual Graminoid or Forb Vegetation	0.00	0.00%
Boulder Gravel Cobble or Talus Sparse Vegetation	3.09	1.09%
Deciduous Forest	43.61	15.40%
Deciduous Shrubland	7.01	2.47%
Developed	22.14	7.82%
Evergreen Forest	0.00	0.00%
Hydromorphic Rooted Vegetation	4.63	1.64%
Mixed Evergreen - Deciduous Forest	0.00	0.00%
Open Water	69.58	24.57%
Perennial Graminoid Vegetation	128.61	45.41%
Unconsolidated Material Sparse Vegetation	4.53	1.60%

12.7.3 Threatened and Endangered Species*

The USFWS IPaC website was consulted on July 2, 2021 to identify potential presence of federally listed threatened and endangered species within the project area. Only two species listed as threatened or endangered by USFWS may be found in the Highway 75 project area. The northern long-eared bat utilizes tree cavities and crevices as roosts in the summer, making hardwood forests within the Highway 75 Dam project potential habitat for this species. However, northern long-eared bats have never been documented on project lands. The Dakota skipper is a butterfly species that occupies native prairies. The USFWS also lists 12 protected bird species in the area surrounding the Highway 75 Dam (Table 26). Eleven of these species are considered Birds of Conservation Concern (BCC) by USFWS. In addition, the Bald Eagle is protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668(a); 50 CFR 22).

Table 26. Migratory Bird Species and Birds of Conservation Concern (BCC)

Common Name	Scientific Name
Bald Eagle	*Haliaeetus leucocephalus*
Black Tern*	*Chlidonias niger*
Black-billed Cuckoo*	*Coccyzus erythropthalmus*
Bobolink*	*Dolichonyx oryzivorus*
Buff-breasted Sandpiper*	*Calidris subruficollis*
Dunlin*	*Calidris alpine arcticola*
Franklin's Gull*	*Leucophaeus pipixcan*
Hudsonian Godwit*	*Limosa haemastica*
Lesser Yellowlegs*	*Tringa flavipes*
Marbled Godwit*	*Limosa fedoa*
Semipalmated Sandpiper*	*Calidris pusilla*
Short-billed Dowitcher*	*Limnodromus griseus*

*Denotes BCC status

The state of Minnesota lists three species as either endangered, threatened species or species of concern (Table 27).

Table 27. Minnesota state-listed species

Common Name	Scientific Name
Black Sandshell	*Ligumia recta*
Forster's Tern	*Sterna forsteri*
Mucket	*Actinonaias ligamentina*

12.7.4 Wetlands*

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation adapted to life in saturated soil conditions. Wetlands are distinguished not only from uplands, which do not hold sufficient water to support wetland functions, but also deep-water habitats, with water depths greater than 2 meters (6.6 feet) deep. The Highway 75 Dam project has approximately 12 acres of emergent wetland and 3 acres of forested/shrub wetland. See Appendix F4 for the National Wetlands Inventory plate at Highway 75 Dam.

12.8 Borrow Areas and Utilities

There are no borrow areas or utility easements at the Highway 75 Dam project.

12.9 CULTURAL RESOURCES*

Cultural resources in the area that includes the Highway 75 Dam project indicate continual human habitation beginning around 10,000 years ago. Glacial Lake Agassiz formed in southeastern North Dakota approximately 12,500 years ago and expanded northwards following receding glacial ice lobes. Lake Agassiz's shoreline changed frequently depending on ice advances and recessions until it began to drain for the final time out of North Dakota around 9,000 years ago and no longer existed by about 7,500 years ago. The Big Stone Moraine formed at the lake margin defines the landscape, supporting dependable supplies of food and water. It is likely that the area was utilized by people beginning around 10,000 years ago as major climatic and environmental changes took place. Known cultural resources in and around Highway 75 Dam include Precontact and Euro-American archaeological sites and historic standing structures.

Cultural resources investigations in the vicinity of the dam were undertaking in 1993 and 2015 during which a total of three sites were recorded on fee-title lands associated with the project. The remains of a single farmstead identified during the 1993 survey was subsequently evaluated as being not eligible to the National Register of Historic Places. As part of later surveys, including those associated with proposed borrow areas undertaken in 2015, additional sites—all surface debris scatters—were identified. All three of these ephemeral sites contained archaeological materials of Precontact origin, and all of the sites were found on terrace landforms. Two lithic debris scatters and a third location with artifacts dating to both Precontact and historic time periods. All sites were recommended not eligible for listing on the National Register of Historic Places.

12.10 ECONOMICS

This site is part of the Big Stone Wildlife Management Area. Other area land use is almost exclusively agricultural.

See Section 9.12 for a discussion on economics in the area.

12.11 RECREATION FACILITIES, ACTIVITIES, AND NEEDS

12.11.1 Zones of Influence & Visitation Profile*

There are no visitation numbers for the Highway Dam 75 project.

12.11.2 Recreation Analysis*

USACE customer satisfaction comment cards have not been completed for the Highway 75 Project.

12.11.3 Recreation Trends

See Section 1.6.3 for a discussion on the Minnesota SCORP.

12.11.4 Recreational Carrying Capacity*

In recreation management, carrying capacity refers to the level of use that a recreation area can receive without suffering negative impacts to its environmental resources or the visitor experience. Overcrowding and overuse of lakes are also a concern for water-based recreation opportunities. Currently, the carrying capacity in unknown for the recreation facilities at the Highway 75 Dam Project. In the future, carrying capacity may be considered as part of determining how to manage natural resources on USACE owned land.

12.12 Real Estate and Acquisition Policy*

Table 28 documents the real estate interests for the Big Stone/Highway 75 Dam Project. See Appendix G4 for plate showing USACE real property.

Table 28. Deeded Acres for Big Stone/Highway 75 Dam Project

	Fee Acres	Easement Acres
Deeded	231.7	10,671.17

The project 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 related to land acquisition for the National Wildlife Refuge System.

Public Law 89-72 (1965) added recreation as a specific purpose to be considered at all Federal reservoir projects.

12.12.1 Deeded Fee Title

The U.S. Government currently owns 231.7 fee acres within the Project boundary. The USACE has management rights and responsibilities on these U.S. Government owned lands and interests.

The represented mapped acreages on figures and plates are calculated from GIS polygon data. GIS acres are not the deeded legal acreage. All figures in the report referencing Big Stone/Highway 75 Dam Project show fee title as 231.7 acres.

12.12.2 USACE-Held Easements

USACE-held easements are lands for which the USACE holds an easement interest, but not the fee title. The USACE has the right to enter the property in connection with the operations of the Project. Planned use and management is in strict accordance with the terms and conditions of the easement estate acquired for the Project. The USACE holds deeded easements on 10, 671.17 acres of land throughout the Big Stone/Highway 75 Dam Project area.

The represented mapped acreages on figures and plates are calculated from GIS polygon data. GIS acres are not the deeded legal acreage. All figures in the report referencing Big Stone/Highway 75 Dam Project show easements as 11,247.84 acres.

12.12.3 Outgrants

The purpose of an outgrant is to allow other agencies or individuals use of Project lands. These outgrants are issued by easement, license, or lease. They are issued if the land is available, and if the proposed use is consistent with operational needs and resource management objectives. Other outgrants may be issued and existing ones terminated or amended, as circumstances warrant.

There are currently no outgrants on Big Stone/Highway 75 Dam Project lands. The Real Estate Division of the St. Paul District maintains all current information on outgrants.

12.12.4 Shoreline Management

The Highway 75 Dam project does not have a Shoreline Management Plan. There are no shoreline permits on this reservoir. Boundary management is covered in the Operational Management Plan.

12.13 MANAGEMENT PLANS*

There are several Management Plans for the Highway 75 Dam.

Operational Management Plan:

The OMP contains detailed management actions for each recreation area and wildlife management area for Highway 75 Dam. These management actions are the steps USACE is taking to meet the resource objectives outlined in the Master Plan. Management actions are outlined in a five-year plan for each recreation and wildlife management unit.

Water Management Plan:

The water management plan covers the operation of the dam and reservoir for its primary missions of primarily for water supply and pollution abatement during low flow periods and secondarily for flood control.

13 HIGHWAY 75 DAM RESOURCE PLAN

13.1 MANAGEMENT BY CLASSIFICATION

The management plan is based on resources available and public needs and will provide for full utilization while protecting Project resources. This plan provides guidance on what types of development and activities are permitted.

13.1.1 Classification and Justification*

The Highway 75 Dam Project land classifications are the following:

- Project Operations
- High Density Recreation
- Multiple Resource Managed Lands

The management plans identified are presented in broad terms. A more descriptive plan for managing these lands can be found in the Highway 75 Dam Project Operational Management Plan (OMP). Management tasks described in the OMP must support the Resource Objectives, Land Classifications, and Resource Plan set forth in this master plan.

Land classifications in the Western Area Master Plan of 1991 may have been misclassified. The 2021 Master Plan documents how the lands are currently managed and how USACE intends to manage the lands into the future. Change in land classification acreage can be attributed to improvements in mapping technologies, increased aerial imagery resolution aiding in visual classification, and enhanced geospatial data delineating USACE fee land. The 2021 Master Plan documents classifies all land within USACE fee boundaries, while the 1991 plan classified only areas that fell into the land classification categories defined at that time. The calculated acreages for land classifications are based on geographic information (GIS) polygon data, which is not a legal survey. Though GIS technology has improved, errors are inherent in the calculations.

See Appendix D4 for the Highway 75 Dam Land Classification plates.

Project Operations (231.2 acres)

This category includes those lands required for the dam, stilling basin, emergency spillway and other areas that are used solely for the operations of the Project. The management plan reinforces that physical security is necessary to continue operations of the dam and related facilities. Examples of management activities for these lands include renovating and updating facilities and aging infrastructure with modern, energy efficient technology.

Management for wildlife, natural resources, and recreational use will remain a priority in these lands as long as there is no conflict with operational requirements. Examples of wildlife, natural resources, and recreational use management include modernizing interpretive building, trails, or interpretive information and protecting culturally sensitive areas.

Proposed change to this classification would increase acreage from 0 to 231.2.

High Density Recreation (7.9 acres)

These are lands developed for intensive recreational activities for the public include day use areas and campgrounds. The facilities in these areas will accommodate the recreation needs of visitors in concentrated numbers while also offering open space lands to provide more complete and attractive recreation areas.

Proposed change to this classification would decrease acreage from 101.1 to 7.9.

Multiple Resource Management Lands

These lands are classified by their predominate use; however, these lands can also have other compatible, simultaneous uses that do not impact the predominate use. These lands can be divided into four sub-categories:

- Wildlife Management
- Low Density Recreation
- Vegetative Management
- Future/Inactive Recreation Areas
- Water Surface

The following is a description of the resource objectives, acreage, and description of use pertaining to each sub-category.

Wildlife Management (0 acres)

There are no lands classified as wildlife management. There are no proposed changes to this land classification.

Low Density Recreation (0 acres)

There are no lands classified as low-density recreation. There are no proposed changes to this land classification.

Vegetative Management (44.6 acres)

These lands are designated for stewardship of forest, prairie, and other native vegetative cover. Management activities in these areas focus on the protection and development of vegetative wildlife resources. With proper management, these areas also provide valuable habitat for a wide range of species. These lands are available for sightseeing, wildlife viewing, nature study, hiking, and horseback riding. Consumptive uses of wildlife, including hunting, fishing, and trapping, are allowed when compatible with the objectives for a given area and with both federal and state fish and wildlife management regulations. Examples of management activities compatible with both vegetative development and low-density recreation may include developing self-guided interpretive trails, creating wildlife viewing stations, updating scenic viewing areas, planting trees and native vegetation, and livestock grazing.

Proposed change to this classification would be to increase acreage from 0 to 44.6.

Future/Inactive Recreation Areas (0 acres)

There are no lands classified as future/inactive recreation areas. There are no proposed changes to this land classification.

Water Surface (1,237 acres)

The two sub-classification identified at Lake Highway 75 are: Open Recreation (1232.6 acres) and Restricted (4.4 acres).

This land classification increased from 0 to 1,237 acres.

13.1.2 Recreation Area Map

Appendix H4 provides detailed maps of the Highway 75 Dam project recreational areas.

PART F
REGIONAL SUMMARY

14 SPECIAL TOPICS*

14.1 PARTNERSHIPS AND VOLUNTEERS

There are no volunteers at any of the Western Area project sites. Orwell recreation staff do work with Midwest Outdoors Unlimited to put on special deer hunts for disabled and near to death individuals. Orwell staff also work with the local Veteran Affairs home to get Veterans out to the site for fishing.

USACE plans to continue to work with partners and the public (agencies) to manage resources, provide high quality recreational opportunities, and reach desired management goals.

14.2 ENCROACHMENTS AND BOUNDARY MANAGEMENT

USACE Natural Resources Management Mission is to manage and conserve natural resources consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations. Encroachments on USACE managed lands directly conflict with that mission. The USACE, therefore, committed to resolving encroachments by the most expedient and effective means available. To meet this commitment the USACE intends to:

- Conduct boundary surveys and add monuments where needed to prevent and readily identify possible encroachments.
- Partner with all adjacent land-owning stakeholders to ensure USACE and public interest are protected.

14.3 RECREATION RECOMMENDATIONS

The following recreation recommendations were identified for the Western Area projects based on (input during scoping, agency recommendations, trends identified in the SCORP, others). Any potential improvements are dependent upon future funding sources.

- Provide safe universal public access for low to moderate levels of river-based recreation use, including fishing, picnicking, and wildlife viewing.
- Create more opportunities for hiking, birding, and nature study by providing and maintaining high quality trails and wildlife viewing stations.
- Improve, modernize, and maintain day use areas through additional amenities, including, but not limited to road improvements, picnic sites, pavilions, restrooms, trails, interpretive signage, playgrounds, fishing piers and boat launching facilities.

15 PUBLIC AND AGENCY COORDINATION*

USACE has involved the public and coordinated with Tribes, Federal, state, and local agencies, and communities throughout the planning process. The following documents the coordination which occurred as part of this master planning process. Additional information can be found in Appendix B – Coordination and Public Involvement.

15.1 CONGRESSIONAL NOTIFICATION

Congressional representatives from the area were notified of the updates of the master plan in November 2019. A copy of the letters can be found in Appendix B – Coordination.

15.2 PUBLIC INVOLVEMENT

15.2.1 Scoping Process

In December 2019, USACE announced its decision to revise the Western Area Projects master plan, which was last revised in 1997.

Three public scoping meetings were held to brief the public on the master planning process and gather input for this master plan. A meeting focusing on Lac qui Parle and Highway 75 was held on December 9, 2019 at the USACE Lac qui Parle project office, Watson, Minnesota. A second meeting focusing on Lake Traverse was held on December 10, 2019 at the USACE Lake Traverse project office, Wheaton, Minnesota. The third meeting was held on December 11, 2019 focusing on Orwell Lake at the USACE Orwell Lake project office, Fergus Falls, Minnesota. The meetings were advertised via the St. Paul District public website and a news release.

Information received during the scoping process can be found in Appendix B – Coordination.

15.2.2 Needs Identified from User Comments & USACE Staff Observations

Needs identified by the public and state agencies during the scoping process are listed below.

<u>Lac qui Parle</u>

- Have the parking area on the west end of the Marsh Lake Dam open to the public as much as possible for fishing access. Include toilets and an Americans with Disabilities Act (ADA)-compliant fishing platform at this location.
- Provide canoe access to the Pomme de Terre river.
- MN DNR would like to add the Louisberg Grade Road culverts that were in the authorized plan for Marsh Lake improvements.
- Improve wayfinding (i.e., signage) that is inclusive of non-English-speaking people who live in the Montevideo area and use USACE and MNDNR recreation areas.
- Provide a new day-use area that would be less prone to flooding and accommodate groups as large as 50 people.

<u>Highway 75</u>

- Add chinking stone to the class IV riprap in the vicinity of the structure to allow anglers easier access to the shoreline for fishing. It would also be beneficial to add an ADA shore fishing platform.

<u>Lake Traverse</u>

- Mark the Minnesota State line in the pool (primarily on Mud Lake, where DNR has restrictions on surface water use).
- Add markers in Lake Traverse where there are dangerous rocks (near certain islands).
- Add more fishing platforms on the South Dakota side of the USACE day-use areas.
- Keep federal land open for public use.
- Provide facilities that comply with the ADA.

Orwell Lake

- Provide more day use facilities at the boat ramp and dock provided by DNR, i.e., toilets, trash, signage, etc.
- Conduct boundary surveys and add monumentation of the federal property.

USACE staff have identified a fishing pier to be placed in the recreation area below Orwell Lake Dam on the Otter Tail River and playground equipment in the recreation area below Reservation Highway Dam.

15.2.3 Release of Draft Master Plan

This draft EA is being made available for a 30-day public review and comment period. The document can be viewed at: https://www.mvp.usace.army.mil/Home/Public-Notices/. Questions on the project or comments on the Environmental Assessment can be directed to LeeAnn Glomski at (651) 290-5595 or at LeeAnn.M.Glomski@usace.army.mil. Written comments can be addressed to District Engineer, St. Paul District, Corps of Engineers, ATTN: Regional Planning and Environment Division North, 180 Fifth Street East, St. Paul, Minnesota 55101-1638.

15.3 Agency Coordination

An agency meeting focusing on Lac qui Parle and Highway 75 was held on December 9, 2019. MnDNR and US Fish and Wildlife Service (USFWS) attended the meeting. An agency meeting focusing on Lake Traverse was held on December 10, 2019 and was attended by MnDNR. An agency meeting focusing on Orwell Lake was held on December 11, 2019 and was attended by MnDNR. Comments received during the scoping process are summarized in Section 15.2.2. and presented in Appendix B, Coordination.

15.4 Tribal Coordination

The Tribal Historic Preservation Officer (THPO) for the following tribes, along with the Review and Compliance Coordinators at the State Historic Preservation Offices of Minnesota and of South Dakota (SHPO), were notified by correspondence on November 22, 2019, that both public and agency/stakeholder meetings would be held to answer questions and seek input to the master planning process. THPOs for the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Bois Forte Band of Chippewa Indians, Cheyenne River Sioux Tribe, South Dakota, Crow Creek Sioux Tribe, Flandreau Santee Sioux Tribe, Leech Lake Band of Ojibwe, Lower Sioux Indian Community, Northern Cheyenne Tribe, Oglala Sioux Tribe of the Pine Ridge, Red Lake Band of Chippewa Indians, Rosebud Sioux Tribe, Sisseton-Wahpeton Oyate of Lake Traverse, Spirit Lake Tribe of Fort Totten, Standing Rock Sioux Tribe, Three Affiliated Tribes (Mandan, Hidatsa and Arikara Nation), Turtle Mountain Band of Chippewa Indians, Upper Sioux Community of Minnesota, White Earth Nation of Minnesota Chippewa, and Yankton Sioux Tribe were contacted. Each THPO and SHPO were contacted to bring their attention to the document during the public comment period. Formal consultation under Section 106 or Section 110 of the National Historic Preservation Act is not a requirement for preparation of a document such as a Master Plan, as there is no undertaking associated with the develop of such a document. Any subsequent action or alteration to fee-title lands that may be developed based upon the Master Plan will require consultation in compliance with the Section 106 process of the National Historic Preservation Act, and 36 CFR Part 800, its implementing regulation.

16 SUMMARY OF RECOMMENDATIONS*

The Western Area Master Plan conceptually establishes and guides the orderly administration, maintenance, preservation, enhancement, and management of all natural, cultural, and recreational resources at the Lake Traverse, Orwell Lake, Lac qui Parle and Highway 75 Projects. This plan is stewardship-driven, seeking to balance recreational development and use with protection and conservation of natural and cultural resources. Changes in population, demographics, recreation, climate, flora, and fauna are some of the influences affecting the resources, management decisions, and land use around the Western Area projects.

The following subsections describe focal points to assist USACE when facing future challenges. The goals outlined in section 1.8 define how USACE plans to manage its lands and resources. These goals are conceptual, whereas implementation details will be provided in the Lake Traverse, Orwell Lake, Lac qui Parle and Highway 75 Operation Management Plans. Implementation of these recommendations requires time, manpower, and budget.

16.1 MONITOR CHANGED LAND CLASSIFICATIONS

This master plan includes changes to land classifications. The majority of the acreage changes occurred due to changes in classification categories required by current USACE regulations. Through updated mapping technology, USACE was able to re-evaluate managed lands to determine the proper land classifications.

16.2 BUILD PARTNERSHIPS AND RECRUIT VOLUNTEERS

USACE must continue to build partnerships and develop opportunities for volunteers to sustain a high standard of service and expand programs within its authorized missions. USACE must work with local, state, and other federal agencies, special interest groups, and individuals towards common goals. These goals can involve growing community events, expanding recreation opportunities, combating invasive species, and planning watershed-based efforts to improve water quality. Partnerships and volunteering efforts provide benefits to all parties involved and, by collectively sharing knowledge and resources, all parties involved can do more with less.

16.3 FURTHER MANAGEMENT STUDIES

Further studies should focus on management of the Western Area Projects and be conducted by staff. USACE would need to work closely with its partners to determine a more in-depth natural resource inventory on Project lands, (e.g., vegetation and timber stand inventories). Once inventories are established, USACE can develop plans to better manage lands for wildlife. A recreational carrying capacity study would help determine if existing visitation rates create an appropriate balance between recreation and environmental stewardship and identify what effects additional visitation may have on wildlife.

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18 AUTHORSHIP

An interdisciplinary team of USACE professionals developed this Master Plan with input from local, state, and federal agencies; tribal representatives; and the public. The team consisted of the following personnel:

District Personnel	Area of Expertise
Jason Mothershed	Natural Resource Specialist
Tom Mattis	Natural Resource Specialist
Craig Evans	Planner
LeeAnn Glomski	Biologist, NEPA
Jacquie Kovarik	GIS
Susan Malin-Boyce	Archaeologist and Tribal Liaison
Ken Peterson	Real Estate
Jim Noran	Water Quality
Brett Hultgren	Climate Change/Hydrology

Input from outside USACE helped identify significant resources, problems and opportunities, and resource objectives. The authors of this document are grateful for the participation of all parties in the document development process.