Attachment 3

US Army Corps of Engineers®
St. Paul District

Main Report

Bass Ponds, Marsh, and Wetland Habitat Rehabilitation and Enhancement Project Feasibility Report and Integrated Environmental Assessment

Upper Mississippi River Restoration Program

Minnesota River: Miles 15-21

St. Paul District

Project Sponsor: U.S. Fish and Wildlife Service

Final Draft, April 2019

This page is intentionally left blank.

EXECUTIVE SUMMARY

This Feasibility Study Report with Integrated Environmental Assessment investigates the feasibility of alternative measures to address problems and opportunities associated with the Bass Ponds, Marsh, and Wetland Habitat Restoration and Enhancement project (Project), which is part of the Upper Mississippi River Restoration (UMRR) Program. The study area includes three lakes and a marsh, situated southwest of St. Paul, MN and adjacent to the Minnesota River.

The project lies within the Minnesota Valley National Wildlife Refuge (Refuge), established by Congress to provide habitat for a large number of migratory waterfowl, waterbirds, fish, and other wildlife species threatened by commercial and industrial development, as well as to provide educational and recreational opportunities to the public.

The hydrology in the study area has changed significantly, and it is likely that this is driven at least in part by changes in land use and climate. Currently the lakes, wetlands, and marshes experience prolonged full pool conditions with depths of 3 to 4 feet throughout the year. The lack of seasonal variability in water levels has resulted in a degraded habitat in the study area by reducing wetland habitat quality, aquatic plant diversity, and the availability of quality habitat for migratory waterbirds and waterfowl.

The objectives of the project are to:

1. Increase the diversity and percent cover of desirable emergent aquatic plant species.
2. Increase the diversity and percent cover of desirable submergent aquatic plant species.
3. Provide quality feeding and resting habitat for a wide variety of waterfowl and waterbirds with particular emphasis on fall migrating waterfowl.

The Project Delivery Team (PDT) identified a variety of measures that could be taken to achieve project objectives, including water level management structures (single and double bay stoplog structures), earthen ditch plugs, access dredging, and rock-lined overflow channels. The measures were combined in various logical combinations to form alternative project plans.

The Recommended Plan, shown in Figure ES-1, would partially restore the lake and marsh habitats by providing water level management capability to improve emergent and submergent aquatic vegetation, and to improve the habitat for waterfowl and waterbirds. The stoplog structures would utilize a 5-feet wide by 6-feet high concrete bay design that would efficiently increase conveyance to allow for periodic drawdowns following periods when floodwaters have receded. The Recommended Plan addresses all project objectives and would be 100% federally funded. The preliminary cost estimate is $5.9 million, with a 255 average annual habitat unit gain, and a cost of $981 per average annual habitat unit.

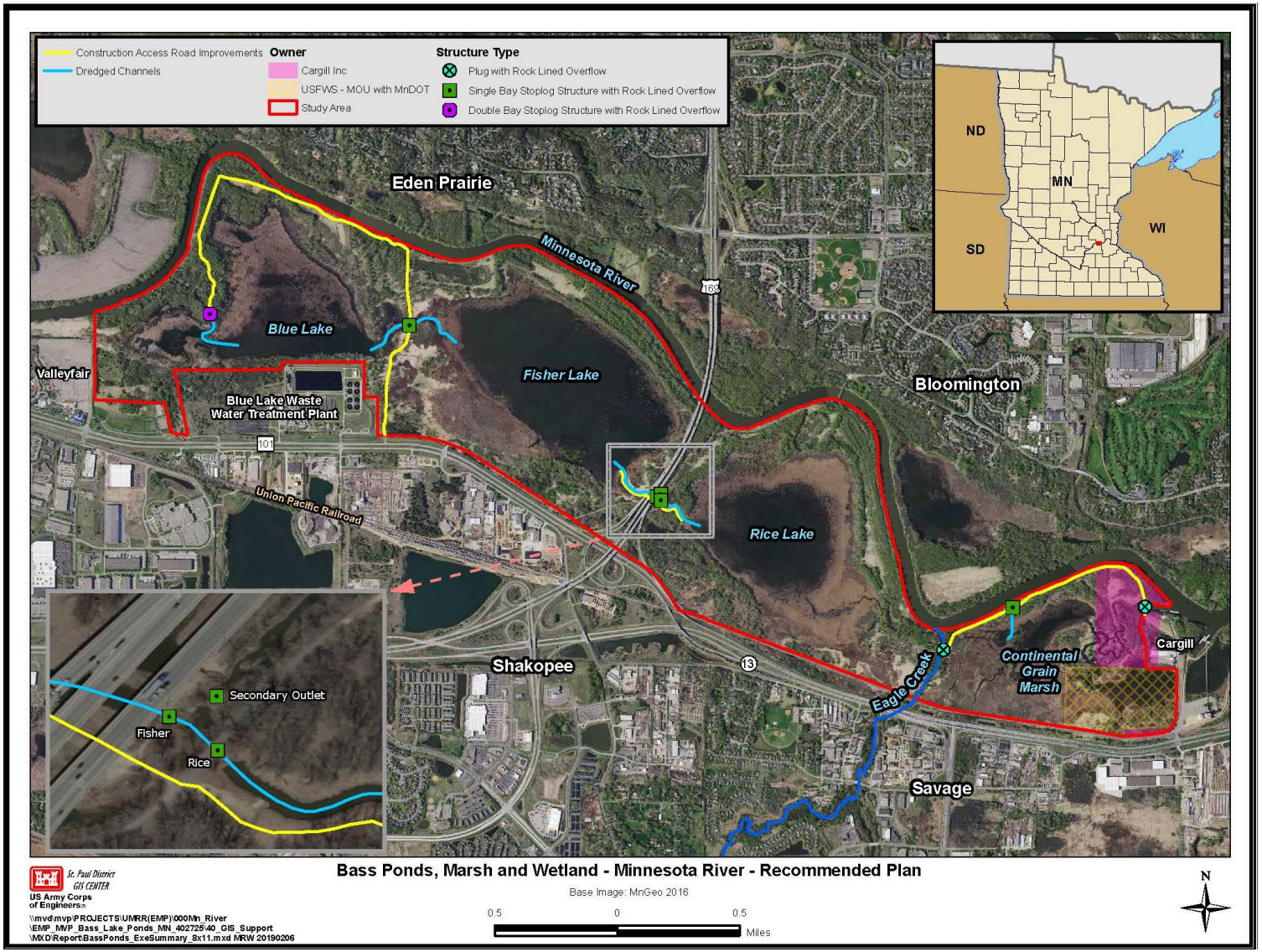


Figure ES-1: Bass Ponds HREP Recommended Plan

FEASIBILITY REPORT AND
INTEGRATED ENVIRONMENTAL ASSESSMENT

BASS PONDS, MARSH, AND WETLAND HABITAT REHABILITATION AND ENHANCEMENT PROJECT
MINNESOTA RIVER
SCOTT COUNTY, MINNESOTA

TABLE OF CONTENTS

List of Figures

List of Tables

Appendices

1 INTRODUCTION

1.1 Study Authority

Congress passed the Upper Mississippi River Management Act in Section 1103 of the 1986 Water Resources Development Act (WRDA) (Public Law 99-662), codified at 33 USC § 652 which authorized the Upper Mississippi River Restoration (UMRR) Program. Over the course of its first 13 years, the UMRR program proved to be one of the Nation's premier ecosystem restoration programs, combining close collaboration between Federal and State partners, an effective planning process, and a built-in monitoring process. This success led Congress to reauthorize the UMRR program in WRDA 1999 (Public Law 106-53). Section 509 of WRDA 1999 adjusted the program and established the following two elements as continuing authorities:

- Planning, construction, and evaluation of fish and wildlife habitat rehabilitation and enhancement projects (also known as Habitat and Restoration and Enhancement Projects, or HREPs).
- Long-term resource monitoring, computerized data inventory and analysis, and applied research (known collectively as Long-Term Resource Monitoring element).

Section 509 of WRDA 1999 provides USACE with the authority to plan, design, and construct HREPs, such as the proposed Project.

1.2 Study Purpose and Scope

The purpose of this Feasibility Report with Integrated Environmental Assessment (EA), including the Finding of No Significant Impact (FONSI), is to evaluate the proposal for the Project within the UMRR program. The Feasibility Report and Integrated EA meets USACE planning guidance and meets National Environmental Protection Act (NEPA) requirements. USACE developed this report with the U.S. Fish and Wildlife Service (USFWS) serving as the Federal project partner. This report provides planning, engineering, and sufficient construction details of the Recommended Plan to allow for final design and construction to proceed subsequent to document approval.

The purpose of the main report is to summarize the multidisciplinary efforts of USACE, USFWS, and the State of Minnesota's Department of Natural Resources (MNDNR) that led to the study recommendation. USACE organized the report to follow a general problem-solving format:

- Review existing conditions and anticipated future conditions;
- Identify project goals and objectives;
- Formulate restoration alternatives to address the goals and objectives;
- Identify costs and benefits of the restoration alternatives;
- Compare the alternatives on the costs and benefits;
- Recommend a single restoration plan for implementation; and
- Present a detailed analysis on the plan.

The detailed analysis includes considerations of design, construction, operations, and maintenance; a detailed cost estimate; a monitoring plan to gage restoration performance; real estate requirements; environmental effects; and a detailed schedule for implementation. Supporting documentation is provided in the appendices of this report.

1.3 Agency Participants and Coordination

Participants in the planning for the Bass Ponds HREP included the USFWS, MNDNR, and USACE. These agencies were involved in project planning because the study area is located within the Refuge and a portion of the Minnesota River in Minnesota. Under Federal regulations governing the implementation of NEPA, USFWS is a cooperating agency.

The following individuals played an active role in the planning of the Bass Ponds project.

U.S. ARMY CORPS OF ENGINEERS		
Tom Novak	Program Manager	Program Manager
Kelli Phillips	Project Manager	Project Manager
Angela Deen	Lead Planner	Study Manager, Plan Formulation
LeeAnn Glomski	Biologist	Environmental/HEP/Adaptive Management
Jon Hendrickson	Hydraulic Engineer	Hydrology/Hydraulics
Kacie Opat	Hydraulic Engineer	Hydrology/Hydraulics
Jeff McGrath	Economist	Economics
Luke Schmidt	Engineer	Geotechnical
Paul Hegre	Engineer	Costs & Specs
Paul Morken	Engineer	Civil/Layout
Brad Perkl	Archaeologist	Cultural Resources
Tony Horacek	Civil Engineer	Construction
Jim Noren	Hydrologist	Water Quality
Steph Dupey	Real Estate	Real Estate
Tony Fares*	Engineer	Structural
Mike Walker	Cartographer	GIS
Eric Hansen	Biologist	Environmental
U.S. FISH AND WILDLIFE SERVICE		
Sharonne Baylor	Environmental Engineer	Upper Mississippi River Nat'l Wildlife and Fish Refuge
Sarena Selbo	Refuge Manager	Minnesota Valley National Wildlife Refuge
Eric Mruz	Deputy Refuge Manager	Minnesota Valley National Wildlife Refuge
Gerry Shimek	Supervisory Wildlife Refuge Specialist	Minnesota Valley National Wildlife Refuge
Vicki Sherry	Wildlife Biologist	Minnesota Valley National Wildlife Refuge
Chris Kane	Wildlife Refuge Specialist	Minnesota Valley National Wildlife Refuge
Chad Lawson	Maintenance	Minnesota Valley National Wildlife Refuge
Sam Finney	Project Leader	La Crosse Fish & Wildlife Conservation Office
James Myster	RHPO/Archaeologist	Regional Office
Nick Utrup	Fish and Wildlife Biologist	MI-WI Ecological Services Field Office
MINNESOTA VALLEY NATIONAL WILDLIFE REFUGE TRUST		
Matt Millet	GIS Specialist	
MINNESOTA DEPARTMENT OF NATURAL RESOURCES		
Jennie Skancke	Habitat Projects Coordinator	

*Technical Lead

1.4 Decisions To Be Made

1.4.1 U.S. Army Corps of Engineers

Because the proposed project is funded by USACE, the St. Paul District Commander will select one of the alternatives for implementation. The District Commander will also determine, based on the facts and recommendations contained herein, whether the EA is adequate to support a FONSI or whether an EIS will be prepared. The Mississippi Valley Division (MVD) Commander has the final approval of the Feasibility Report and the Recommended Plan.

1.4.2 U.S. Fish and Wildlife Service

Because the project would be located on land managed by the Minnesota Valley National Wildlife Refuge, the Regional Director of the USFWS, Region 3, will determine whether the project is compatible with Refuge goals and objectives and the Refuge Comprehensive Conservation Plan. The USFWS Regional Director will also determine if the USFWS approves the selected alternative for potential implementation and if the USFWS will assume operation and maintenance responsibilities. The Regional Director will also determine, based on the facts and recommendations contain herein, whether the final integrated Feasibility Report and EA meets the USFWS's obligation under NEPA, the Fish and Wildlife Coordination Act of 1965, the Endangered Species Act of 1973, the Migratory Bird Treaty Act of 1918, and the Bald Eagle Protection Act of 1940. The USFWS has been a cooperating agency in the preparation of this EA and has been integral in the decision making process for the Feasibility Report.

Before any work is commenced under a construction contract, USACE will obtain a Special Use Permit from the Refuge Manager. This permit will be included in the technical specification package and be part of the contract documents.

1.4.3 State

Decisions to be made by the State of Minnesota include permits for dredging, disposal and structures, state threatened and endangered species review, and archeological review. This project would require endorsement by the River Resources Forum (RRF). The RRF is a state and Federal agency partnership for addressing resource issues concerning the Upper Mississippi River system within the St. Paul District's geographic jurisdiction. The State of Minnesota has been a partnering agency in the decision making process for the Feasibility Report.

1.5 Project Selection Process

1.5.1 Eligibility Criteria

In January 1986, prior to enactment of Section 1103 of WRDA 1986, USACE, North Central Division, completed a "General Plan" for implementation of the UMRR Program. The USFWS, Region 3, and the five affected States (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) participated through the Upper Mississippi River Basin Association (UMRBA). Programmatic updates of the General Plan for budget planning and policy development are accomplished through Annual Addenda.

Coordination with the States and USFWS during the preparation of the General Plan and Annual Addenda led to an examination of the Comprehensive Master Plan for the Management of the Upper Mississippi River System (UMRS). The Master Plan, completed by the Upper Mississippi River Basin Commission in 1981, was the basis for the recommendations enacted into law in Section 1103. The Master Plan and General Plan reports identified examples of

potential habitat rehabilitation and enhancement techniques. Consideration of the Federal interest and Federal policies has resulted in the following conclusions:

a. From the First Annual Addendum:

   The Master Plan report and the authorizing legislation do not pose explicit constraints on the kinds of projects to be implemented under the UMRR-HREP. “For habitat projects, the main eligibility criterion should be that a direct relationship should exist between the project and the central problem as defined by the Master Plan; i.e., the sedimentation of backwaters and side channels of the Upper Mississippi River. Other criteria include geographic proximity to the river (for erosion control), other agency missions, and whether the condition is the result of deferred maintenance…”

b. From the Second Annual Addendum.

   “(1) The types of projects that are definitely within the realm of Corps of Engineers implementation authorities include the following:

   -backwater dredging
   -dike and levee construction
   -island construction
   -bank stabilization
   -side channel openings/closures
   -wing and closing dam modifications
   -aeration and water control systems
   -waterfowl nesting cover (as a complement to one of the other project types)
   -acquisition of wildlife lands”

   “(2) A number of innovative structural and nonstructural solutions, which address human-induced impacts, particularly those related to navigation traffic and operation and maintenance of the navigation system, could result in significant long-term protection of UMRS habitat. Therefore, proposed projects that include such measures will not be categorically excluded from consideration, but the policy and technical feasibility of each of these measures will be investigated on a case-by-case basis and the measures will be recommended only after consideration of system-wide effects.”

1.5.2 Project Selection

Projects are nominated for inclusion in the USACE St. Paul District’s habitat restoration program by a State natural resource agency or the USFWS, based on agency management objectives. To assist the District in the selection process, the States and USFWS have agreed to use the expertise of the Fish and Wildlife Work Group (FWWG) of the River Resources Forum (RRF) to consider critical habitat needs along the Mississippi River and sequence nominated projects on a biological basis.

The FWWG consists of river managers responsible for managing the river for their respective agencies. Meetings are held on a regular basis to evaluate and rank nominated projects according to the biological benefits they could provide in relation to the habitat needs of the river system. The ranking is forwarded to the RRF for consideration of the broader policy perspectives of the agencies involved. The RRF submits the coordinated ranking to the District and each agency officially notifies the District of its views on the ranking. The District then formulates and submits a project that is consistent with the overall program guidance as described in the UMRR General Plan and Annual Addenda and supplemental guidance provided by USACE, MVD.

Personnel familiar with the river have screened potential projects. Resource needs and deficiencies have been considered on a pool-by-pool basis to ensure that regional needs are being met and that the best expertise available is being used to optimize the habitat benefits created at the most suitable locations.

The Bass Ponds HREP was first identified in 2006 by the FWWG for consideration in USACE's St. Paul District habitat projects program. The study was funded and began in December 2017. The USFWS submitted an updated list of habitat project priorities for Bass Ponds and included a description of three areas ranked by priority: 1. Fisher Lake area, 2. Continental Grain Marsh Area, and 3. Bass Ponds area. The Factsheet and updated priority list can be referenced in Appendix A – Correspondence and Coordination.

1.6 Study Area

The study area is located in Scott County, MN, between Minnesota River river miles (RM) 15 and 21, at the convergence of the cities of Eden Prairie, Bloomington, Shakopee, and Savage, MN (Figure 2). The study area is approximately 2,085 acres in size and the project features are located entirely within the Minnesota Valley National Wildlife Refuge, which USFWS manages.

The Minnesota River drains much of west central, southwestern, and south central Minnesota, and flows northeastward into the Twin Cities metropolitan area towards the Minnesota River's confluence with the Mississippi River. Most of the river floodplain is a mosaic of bottomland forest and marsh habitats. In limited areas, portions of the floodplain are farmed. Development in the form of grain terminals, quarries, and landfills are present in the floodplain, and a number of highways and railroads bisect the area. As this reach of the river is within the Twin Cities metropolitan area, much of the upland area bordering the river valley is either already developed or rapidly undergoing development. The 9-foot navigation channel extends to River Mile 14.7, while a federally authorized 4-foot channel extends to RM 25.6 at Shakopee, MN.

1.6.1 Interconnected Lakes and Marsh Complex

The study area includes three interconnected backwater lakes (Blue, Fisher, and Rice Lakes) and Continental Grain Marsh. The waterbodies in the study area are all relatively shallow; the average depth ranges between only 0-2 feet deep, with the deepest area in the southeast corner of Blue Lake at 3-4 feet deep (depths are relative to the average pool elevation under the existing condition, Figure 1). When flows are greater than 26,600 cubic feet per second (cfs) at the Jordan Gage, the Minnesota River berms are overtopped, resulting in complete inundation of the study area, resulting in average depths increasing up to 4 feet deep. During low flows (less than 10,000 cfs), the lakes are largely isolated from river inputs and water recedes by passing through water level management (WLM) structures. Most often, the flow path throughout the system starts with water entering Blue Lake from the river through the Blue Lake structure. The water then can be directed into Fisher Lake through the Interlake structure and finally through the Fisher Lake structure and out to the river through the Secondary structure. Rice Lake is most often separately managed due to the existing conditions of the surrounding structures. The Blue Lake structure operates both as an inlet and outlet depending on the flow conditions and water management goals. Continental Grain Marsh drains into Eagle Creek which flows into the Minnesota River.

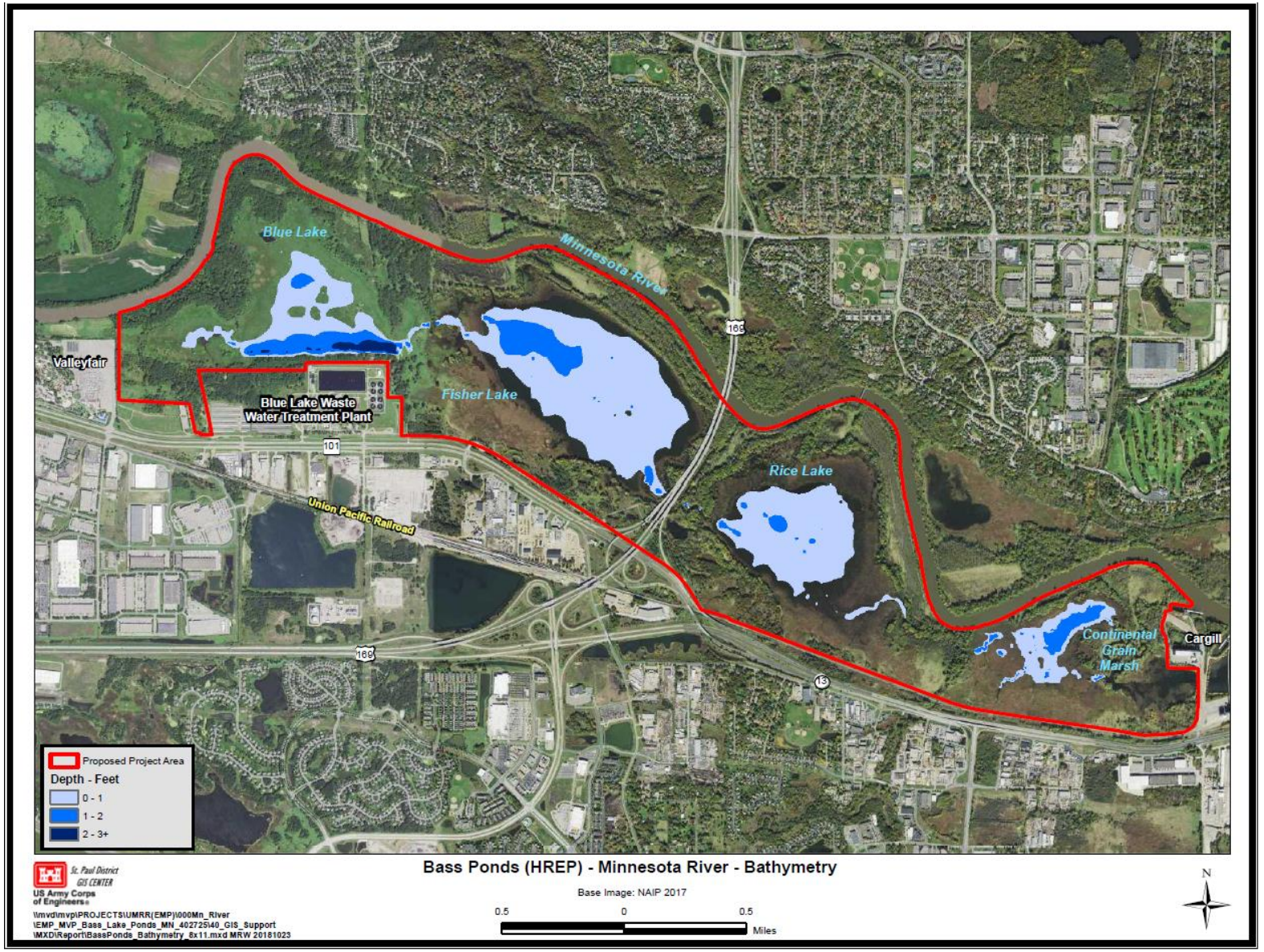


Figure 1: Study Area Bathymetry; Depths Relative to the Average Pool Elevation Under the Existing Condition

1.6.2 Minnesota Valley National Wildlife Refuge

USFWS manages the study area as part of the Refuge. The Refuge as a whole covers over 14,000 acres of the river valley, extending from RM 4 to RM 68 on the Minnesota River. Established in 1976, the Refuge is one of the few national wildlife refuges located within a major metropolitan area. The proposed study area is mostly on Refuge land, with Cargill and Minnesota Department of Transportation (MnDOT) parcels on the east end (Figure 2).

1.6.3 Blue Lake Wastewater Treatment Plant

The Blue Lake Wastewater Treatment Plant (WWTP) is located south of Blue Lake (Figure 2) and is operated by the Metropolitan Council. The WWTP is the fourth largest WWTP in Minnesota (https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/ES_Bluelake2012_combined-pdf.aspx). The Blue Lake WWTP does not discharge its processed wastewater effluent to Blue Lake but instead discharges directly to the Minnesota River upstream of Blue Lake (east of the Valleyfair parking lot).

The only discharge from the plant to Blue Lake is untreated groundwater that the plant pumps as needed to protect underground infrastructure within the facility. The plant added more dewatering capacity in 2008 after record flood events increased groundwater levels higher than targeted. Typical quantities are 1.0 to 1.5 billion gallons per year. This discharge is located in the southeast corner of Blue Lake from a 42-inch storm water outfall.

1.6.4 Cargill West Grain Elevator and CHS Savage Terminal

Cargill is a corporation that trades, purchases, and distributes agricultural commodities among other business endeavors. CHS is a business that performs food processing. Cargill's West Grain Elevator is located on the east side of Continental Grain Marsh (Figure 2). Train and truck traffic enters the Cargill elevator site and the CHS terminal site from the south where the sites meet Minnesota Highway 13.

1.6.5 Flying Cloud Airport

Flying Cloud Airport (FCM) is located less than 1 mile northwest of the project and is one of seven airports owned and operated by the Metropolitan Airports Commission. The airport opened in 1943. FCM is located 14 miles from downtown Minneapolis and is a primary reliever airport for the Minneapolis-St. Paul International Airport.

1.6.6 Neighboring Residential and Industrial Areas

In addition to the noteworthy parts of the project's physical setting, numerous residential and industrial areas neighbor the study area. North of the study area, and on the northern side of the Minnesota River, sits residential housing in Eden Prairie and Bloomington. On the south side runs the Union Pacific railroad as well as OP Rail Systems, which operates a truss swing bridge on the Minnesota River immediately north of the CHS Savage grain elevator.

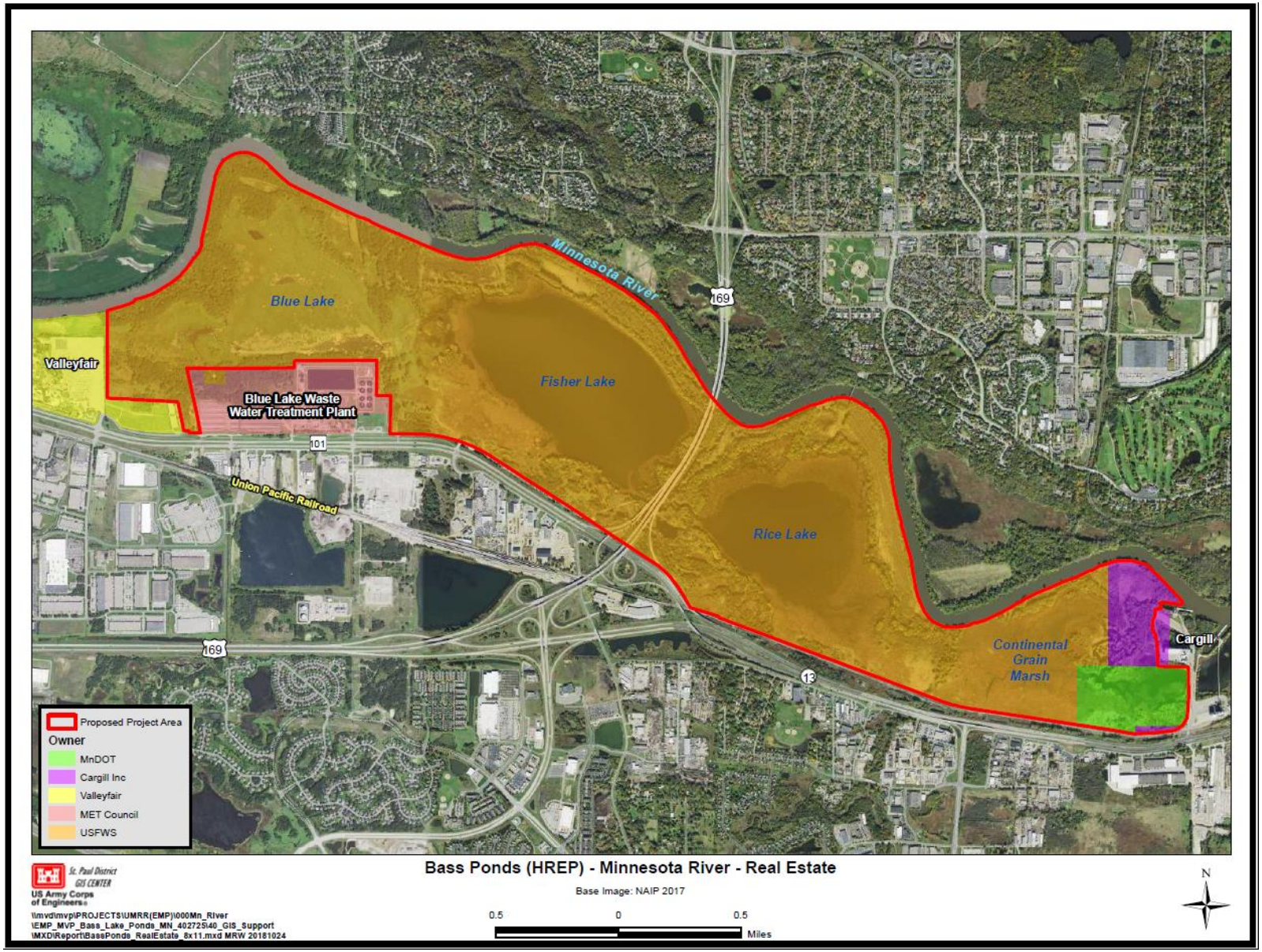


Figure 2: Bass Ponds HREP - Real Estate Map

1.7 Existing and Current Studies, Reports, and Water Resources Projects

1.7.1 Rice Lake HREP

The Rice Lake HREP was constructed in 1998 (USACE 2012a). It consisted of four main strategies: dredging, WLM, bank stabilization, and forest restoration.

The project included an earthen plug in the eastern outlet and a 42-inch culvert and stoplog structure at the western outlet. The purpose of the culvert and stoplog structure was to allow USFWS staff to manage the water levels in Rice Lake and promote optimal growth of aquatic vegetation. The project also included a rock-lined spillway within the Minnesota River berm of Continental Grain Marsh to prevent interior drainage and wetland habitat loss due to riverbank erosion. An additional component was restoration of a 40-acre farm field to bottomland hardwood forest.

The Rice Lake stoplog structure is aging and showing signs of rust damage and deterioration. Section 2.1.4 further discusses the condition of existing infrastructure in the study area.

1.7.2 Long Meadow Lake HREP

The Long Meadow Lake HREP was constructed in 2006 (USACE 2004). Long Meadow Lake is a shallow floodplain lake and marsh located on the left bank of the Minnesota River between RM 5 and RM 10 just downriver of the Bass Ponds HREP study area.

The selected plan for Long Meadow Lake involved the demolition of the existing culvert and concrete attachment, excavation of a channel, installation of a two-bay concrete stoplog control structure, and replacement of the secondary culvert (Figure 3). The two-foot secondary culvert replaced the four-foot culvert that runs under the access road. The replacement culvert includes a slide gate on the upstream end for water level control.

USACE designed the two-bay stoplog control structure to give the USFWS staff the ability to control water levels in Long Meadow Lake when the Minnesota River discharges are below bank full conditions. In addition, the structure decreases inflow frequency to Long Meadow Lake through the channel from the Minnesota River. This structure and proper operation allows USFWS to maintain the lake as a shallow floodplain lake and marsh, providing high quality habitat for migratory birds and aquatic wildlife. Since construction, the USFWS has been successful at achieving drawdowns in this system as designed.

Figure 3: Long Meadow Lake Water Control Structure During Handrail Construction

1.7.3 Minnesota River Basin Interagency Study

The study is in draft form, includes authors and data from numerous Federal, state, and tribal agencies and partners, and has a likely completion date of early 2019. The spatial scope of this study spans 16,770 square miles, roughly 10 million acres, and touches 37 counties. The study examines many different physical and ecological processes using hydrologic and mechanistic modeling tiered to the scale of examination:

- Tier 1 is a basin scale assessment of grassland bird and waterfowl response to alternative landscape scenarios using spatially explicit habitat models.
- Tier 2 is a biological response using Hydrological Simulation Program – FORTRAN output for subbasins to assess fish species richness in response to a tight set of hydrologic metrics.
- Tier 3 is a Gridded Surface Subsurface Hydrologic Analysis limited to flow and sediment with no extension to habitat benefits for the single catchment scale model.

1.7.4 Valleyfair Wetland Mitigation

Valleyfair is an amusement park located to the west of the Bass Ponds HREP project. Recently, the park proposed to expand its facilities, which would result in the loss of 4.52 acres of wetland. To offset wetland impacts associated with its expansion project, Valleyfair has proposed a mitigation plan that includes the creation of 6.38 acres of floodplain forest wetland adjacent to the Minnesota River. An additional 4.64 acres of upland will be preserved and act as buffer to the wetland. The goal of the mitigation plan is to create a backwater wetland system connected to the Minnesota River during flood events that integrates into the Blue, Fisher, and Rice Lake complex.

In order to create the mitigation area, Valleyfair would remove topsoil and subsoil, lowering the ground surface. Following excavation and grading, Valleyfair would place topsoil from adjacent wetlands into the mitigation area and perform seeding using appropriate seed mixes for both floodplain forest and upland buffers. In addition to seeding, Valleyfair would plant trees within the floodplain forest area. Species include silver maple, cottonwood, black willow, green ash, and elms.

The St. Paul District Regulatory office issued a permit and approved the mitigation plan in 2018. Valleyfair will protect the mitigation area by recording a Declaration of Restrictions and Covenants with Scott County. Construction is expected to commence in 2019.

The permit explained that the mitigation site is intended to offset the loss of flood water storage and potential changes in water fluctuations due to the parking lot construction. A short hydraulic discussion between members of the Corps, regulatory and Barr Engineering concluded that a lower bank at the mitigation site is not a concern in regards to frequency of flooding and deposition into Blue Lake because the existing high ground control “saddle” is not breached by the project. Because this high ground will remain intact, the potential for an increase in flood frequency and sediment into Blue Lake is small.

The Valleyfair mitigation plan was not factored into the modelling efforts for this project. However, the hydraulics comments from the issued regulatory permit explained above suggest this should not affect the Bass Ponds HREP features. More information on this topic is included in Section 4.3 of Appendix F, *Hydraulics and Hydrology*.

1.8 Resource Significance

Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (Water Resources Council 1983) (P&G) and USACE

Planning Guidance Notebook Engineering Regulation (ER) 1105-2-100 determine the criteria for the significance of resources (USACE 2000).

Protecting and restoring significant resources are in the national interest because of the scarcity of these resources. For ecosystem restoration projects, monetary and non-monetary values also quantify and qualify the resource significance. The resource's contribution to the Nation's economy determines monetary value (e.g., a lake with waterfowl encourages bird-watching tour businesses) whereas technical, institutional, or public recognition of the ecological, cultural, and aesthetic attributes determines non-monetary value (e.g., a lake serves as a historic site with cultural significance).

ER 1105-2-100 illustrates these three forms of significance determining non-monetary value:

> *"Significance of resources and effects will be derived from institutional, public or technical recognition. Institutional recognition of a resource or effect means its importance is recognized and acknowledged in the laws, plans and policies of government and private groups. Technical recognition of a resource or an effect is based upon scientific or other technical criteria that establishes its significance. Public recognition means some segment of the general public considers the resource or effect to be important. Public recognition may be manifest in controversy, support or opposition expressed in any number of formal or informal ways. The scientific community and natural resources management agencies recognize the technical significance of resources."*

1.8.1 Institutional Recognition

Congress established the Minnesota Valley National Wildlife Refuge in 1976 (PL 94-466) to provide habitat for a large number of migratory waterfowl, waterbirds, fish, and other wildlife species threatened by commercial and industrial development as well as provide educational and recreational opportunities to the public. In addition to Congress, many other governmental entities and agencies as well as non-profit and private organizations have recognized the significance of the Refuge.

Federal, state, and local agencies and institutions have demonstrated tangible support for the restoration of the lake ecosystem. In 1986, Congress designated the Upper Mississippi River System as both a "…nationally significant ecosystem and a nationally significant navigation system…" in Section 1103 of the WRDA 1986. The lower Minnesota River (up to RM 25.4) is included in the Upper Mississippi River System efforts. The National Research Council's Committee on Restoration of Aquatic Ecosystems targeted the Upper Mississippi River for restoration as one of only three large river-floodplain ecosystems so designated. UMRBA is an advocate for restoration on habitat on the Upper Mississippi River. In addition, the Upper Mississippi River Conservation Committee recognized the importance of the floodplain forest to the fish and wildlife of the river.

On September 22, 1992, former Minnesota Governor Arne Carlson said, "Our goal is that within 10 years, our children will be swimming, fishing, picnicking, and recreating in this river." Leading up to this call to action, Minnesota River degradation was well known, and state agencies had collected critical baseline data in an innovative standardized monitoring program to document the river's condition and prioritize critical problems. The Minnesota River Assessment Project assessed water quality, fish, and macro-invertebrates from 1989 to 1994 using a standardized watershed assessment protocol [Minnesota Pollution Control Agency (MPCA) 2011]. The MPCA shared results at public meetings with citizens and interest groups who prioritized issues discovered during the assessment. The state legislature and former Governor Carlson established the county-based Minnesota River Board to coordinate state and Federal activity in the Minnesota River Basin.

Non-profit and private organizations also have recognized the significance of this resource. The Minnesota Valley National Wildlife Refuge Trust, Inc. (MVT) is a 501(c)3 tax-exempt, nonprofit corporation. MVT was created in September 2000 under a settlement agreement with the Metropolitan Airports Commission to mitigate the impact on the Refuge of the new north-south runway at the Minneapolis-St. Paul International Airport. MVT has continued its work in support of the Refuge beyond completion of the Mitigation Plan in 2012. Objectives under the 2019-2023 Strategic Framework including continued strategic land acquisition and habitat restoration, support of special projects and investments to provide a positive, inspiring experience on the Refuge for a diversity of visitors, and investments to connect more people and a diversity of people with the Refuge. MVT is governed by a volunteer board of directors that meets monthly. Nominees from the following partner organizations serve on the MVT board of directors including Audubon Minnesota (state office of the National Audubon Society), Carver County, Friends of the Minnesota Valley, Minnesota Department of Natural Resources, and Minnesota Waterfowl Association. Each of these organizations has recognized the significance of this resource.

1.8.2 Public Recognition

The Refuge also provides environmental education, wildlife recreational opportunities, and interpretive programming for Twin Cities residents and visitors. The public can visit the Refuge at two locations managed by USFWS. The nearest location to the Project is the Bloomington Education and Visitor Center at 3815 American Boulevard East, Bloomington, MN.

Additionally, the Refuge allows the following activities for members of the public:

- Environmental education and interpretation, hiking, cross country skiing, snowshoeing, wildlife observation, and nature photography.
- Biking on designated trails.
- Shore and ice fishing on most Refuge waters according to state and Refuge-specific regulations.
- Hunting in areas designated by Refuge Manager according to state and Refuge-specific regulations.
- Berry, mushroom, and nut picking (not more than one gallon per family, for personal consumption).

Accurate quantification of public activity on the Refuge and, more specifically, at the Project is difficult due to the multiple points of public access and free admission. The public recognizes the Refuge and the Project as a nationally, regionally, and locally significant resource. In general, there is a wide range of uses for the Refuge and the Project, which extends beyond the ecological health of the Minnesota River watershed and the larger UMR watershed and directly impacts public welfare and the long-term ecological health of the region.

1.8.3 Technical Recognition

A great deal of technical and historical information has been published in the literature, as well as webpages (e.g., Lower Minnesota River Watershed District website and Draft Report 2018), documenting the social and economic vulnerabilities and environmental stresses related to the Minnesota River. According to a study conducted by the MPCA, “Overall, the Minnesota River is unhealthy. Sediment clouds the water, phosphorus causes algae, nitrogen poses risks to humans and fish, and bacteria make the water unsafe for swimming. Too much water flowing into the river plays a big part in all these problems. There’s more rain, more artificial drainage, and not enough places to store this water" (https://www.pca.state.mn.us/water/mn-river-study).

2 PROBLEM IDENTIFICATION

2.1 Factors Influencing Habitat Change

Changes in land use and climate are likely the main drivers of habitat change in the study area. Land use changes at the site have resulted from actions relating to flood control, agriculture, industry, and transportation.

2.1.1 Land Use Change

Prior to settlers moving into the Midwest, Native American populations hunted, fished, and lived in the Minnesota River valley, including areas of the Refuge. Substantial land-use change occurred following European settlement, primarily in the form of conversion of native prairie and wetland into agricultural use. Historic maps and aerial imagery of the study area reveal this trend in the landscape.

Late 1800s: The 1896 topographical map portrays conditions prior to agricultural development when the majority of this area was wetland (Figure 4). In 1849, the Bloomington Ferry shuttled people across the Minnesota River. In 1889, the Bloomington Ferry Bridge was built, ending the Bloomington Ferry business. While the shape of the three lakes remains largely unchanged from the 1896 topo, Continental Grain Marsh appears to have drained easterly.

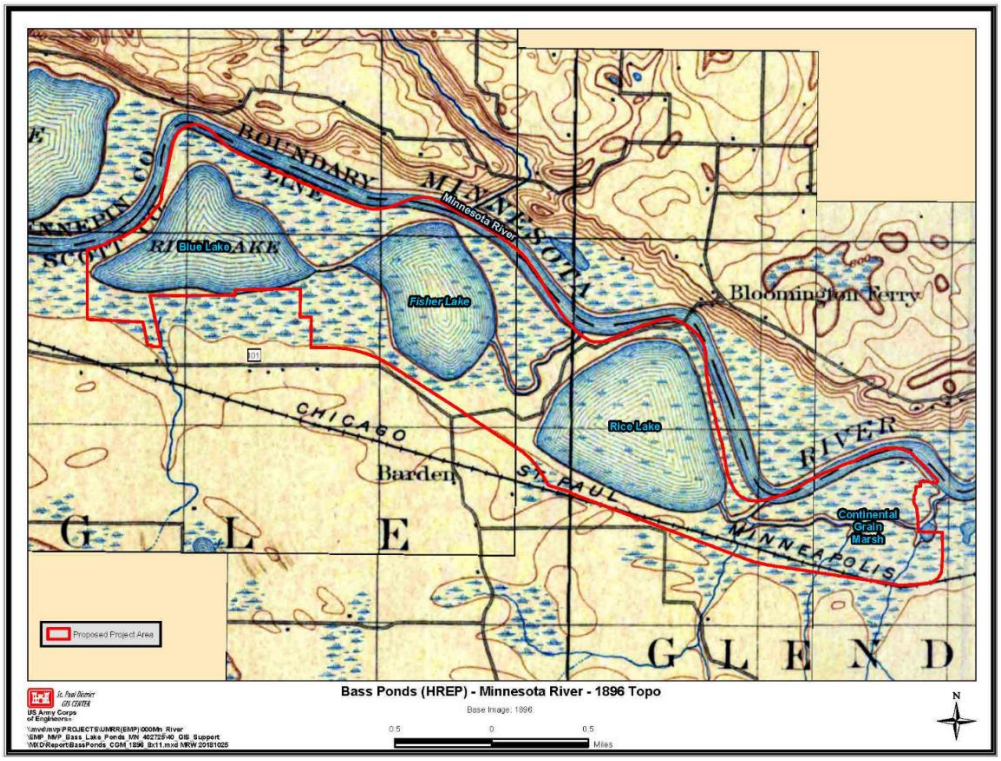


Figure 4: 1896 Topographical Map

Mid-1900s: An image from 1957 illustrates that the wetlands were converted to agricultural fields and grain companies connected by rail lines were constructed across Minnesota and Wisconsin (http://www.soyinfocenter.com/HSS/cargill.php) (Figure 5). With the formation of the Refuge, some of the agricultural fields were acquired and converted back to floodplain forest and wetland habitat. During this period, the hydrology of Continental Grain Marsh was altered to reverse flows westward.

Today: One of the most dramatic changes to the study area in the final aerial image is the new Bloomington Ferry Bridge (Hwy 169), which was completed in 1996 (Figure 5). Hwy 169 is the

main artery connecting Shakopee to Bloomington and runs directly between Fisher Lake and Rice Lake. In the mid-1990s loss of a beaver dam on the west end of Continental Grain Marsh resulted in the formation of a new side-channel. The newly formed channel continues to widen, and has directed flows into Eagle Creek and significantly reduced water levels in the marsh. Since formation of the new side channel, its width has increased significantly due to floodwater events (from less than 5 feet to over 20 feet today).

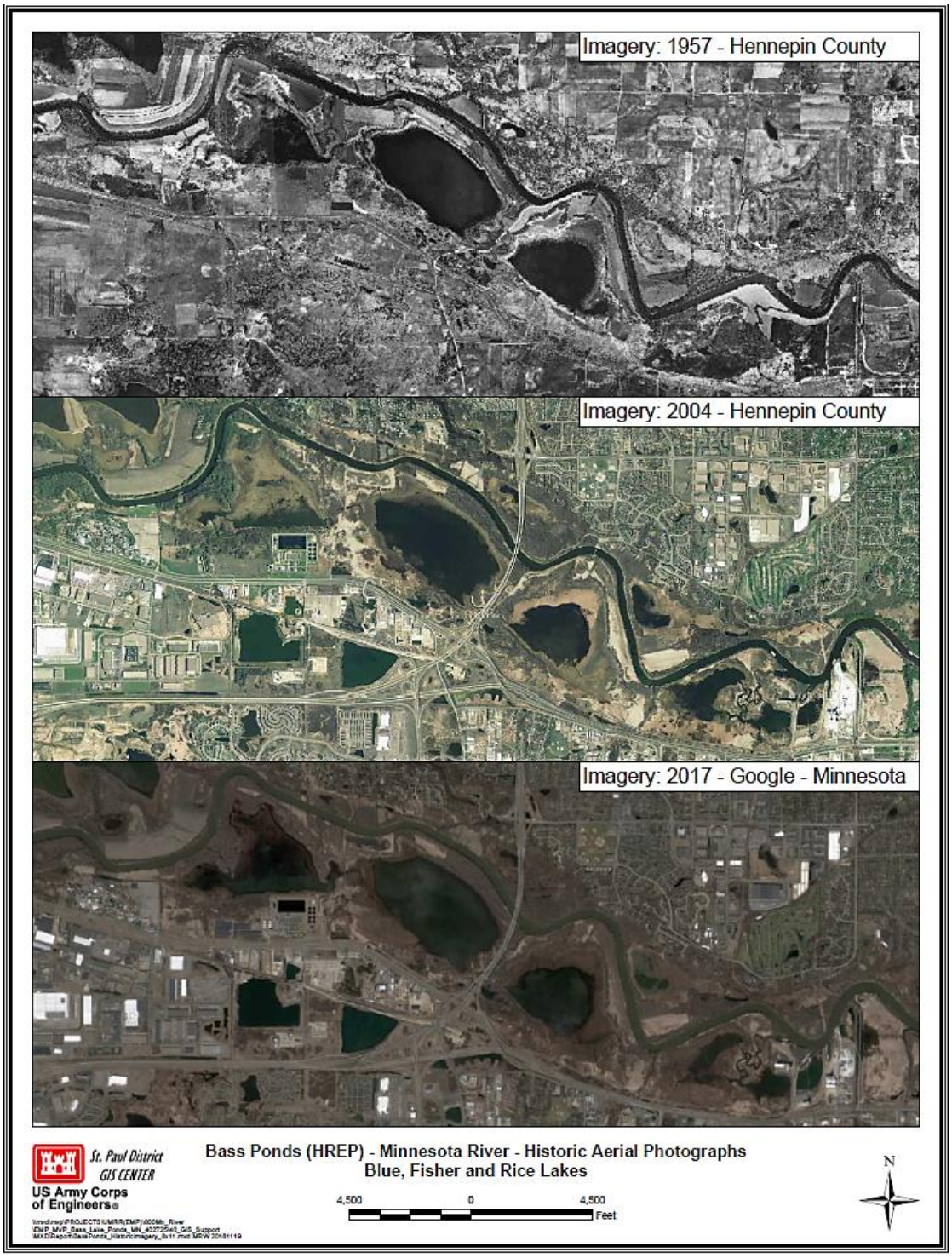


Figure 5: Aerial Photographs of the Study Area: 1957, 2004, 2017

2.1.2 Climate Change

Engineering Construction Bulletin (ECB) No. 2018-14 (USACE 2018) provides guidance for incorporating climate change information in hydrologic analyses in accordance with USACE overarching climate change adaptation policy. It calls for a qualitative analysis and provides links to online tools that can be used in this qualitative analysis. The goal of a qualitative analysis of potential climate threats and impacts to USACE hydrology-related projects and operations is to describe the observed present and possible future climate threats, vulnerabilities, and impacts specific to the study goals or engineering designs. This includes consideration of both past (observed) changes as well as potential future (projected) changes to relevant climatic and hydrologic variables. For additional details on the climate change analysis completed for this study please see Appendix F, *Hydraulics and Hydrology*.

The U.S. Global Research Program completed its Third National Climate Assessment in 2014. It states:

> *"[I]n the Upper Midwest extreme heat, heavy downpours, and flooding will affect infrastructure, health, agriculture, forestry, transportation, air and water quality, and more. Climate change will tend to amplify existing risks climate poses to people, ecosystems, and infrastructure. Direct effects will include increased heat stress, flooding, drought, and late spring freezes. Climate change also alters pests and disease prevalence, competition from non-native or opportunistic native species, ecosystem disturbances, land-use change, landscape fragmentation, atmospheric and watershed pollutants, and economic shocks such as crop failures, reduced yields, or toxic blooms of algae due to extreme weather events. These added stresses, together with the direct effects of climate change, are projected to alter ecosystem and socioeconomic patterns and processes in ways that most people in the region would consider detrimental."*

Specific to the study area, historic discharge data at the USGS Gage at Jordan, MN indicates statistically significant trends of increasing average and peak annual discharge ($p<0.05$) with strong nonstationarities detected in the years 1981 and 1990, respectively. ECB 2018-14 also requires an analysis of other climatic variables. The relevant variables for this study were chosen to be total annual precipitation and average annual air temperature. Historical observed data was compiled from the National Oceanic and Atmospheric Administration's National Climactic Data Center station at the Minneapolis-St. Paul International Airport. The total annual precipitation and average annual air temperature variables also indicate a statistically significant, increasing trend over the period of record and strong evidence of a statistically significant nonstationarity detected in the years 1976 and 1997, respectively. For additional details on the climate change analysis completed for this study please see Appendix F, *Hydraulics and Hydrology*.

Studies on the Minnesota River Basin, as well as analyses on this study area support the U.S. Global Research program's findings of wetter and warmer climate in the future.

2.1.3 Altered Hydrology in Study Area

It is likely that the trends detected within observed streamflows in the Minnesota River Basin are at least in part driven by changes in land use and climate. The Lower Minnesota River Watershed District found that annual runoff, total phosphorus, and total suspended solids have all significantly increased in the last 50-60 years (Draft Report, 2018). Since 1935, the average annual discharge has almost quadrupled from 2,500 cfs to 8,000 cfs (depicted by the trend line in Figure 6).

An analysis conducted by USACE on the period of record in the study area (1935-2018) found a greater number of overbank flood events. The results for the 1935-2018 timeframe indicate that there has been a statistically significant increase in the number of days each year that a bankfull flood event occurs in the study area (flows greater than 26,600 cfs). These events result in the study area lakes filling up with turbid water that reduces the quantity and quality of aquatic vegetation and degrades habitat.

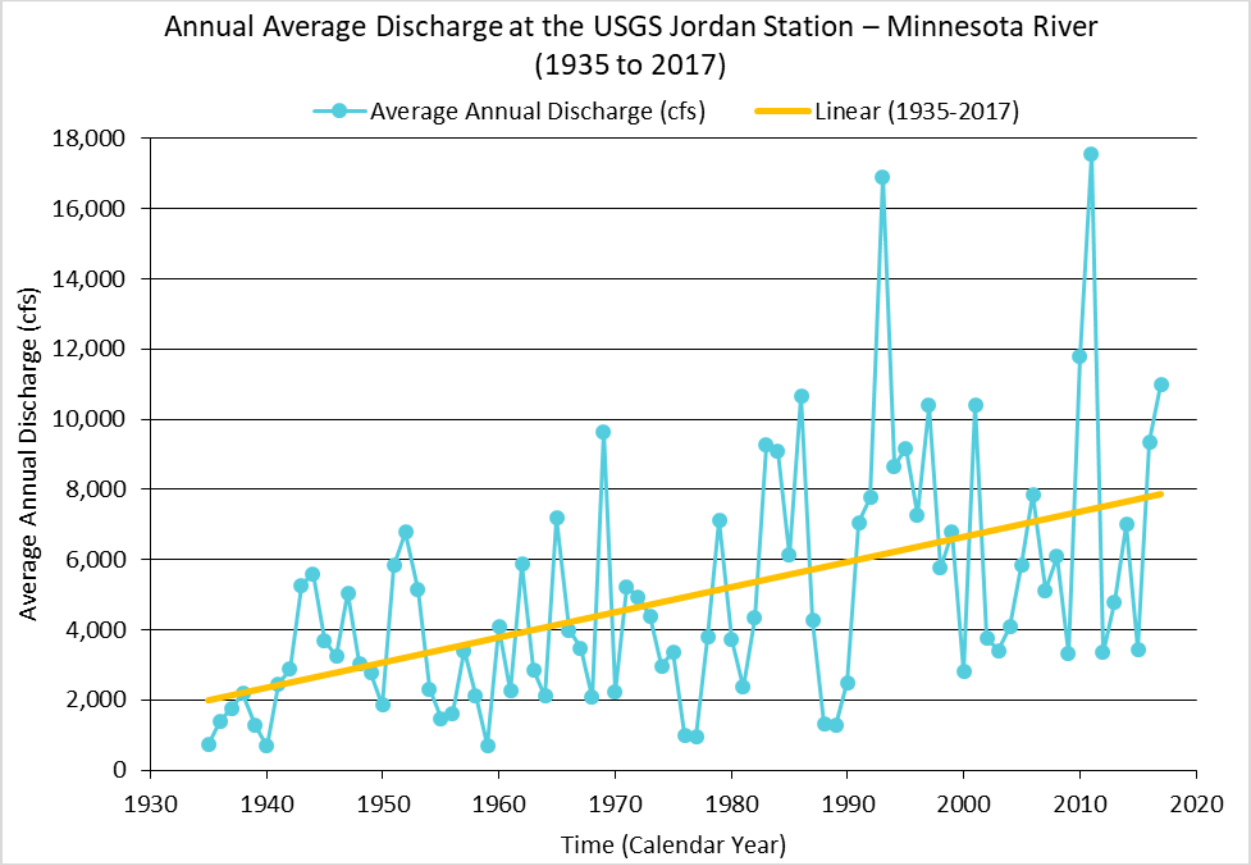


Figure 6: Annual Mean Discharge at the Jordan, MN, Gage (1935-2017)

Furthermore, the 8 years with the greatest number of days of bankfull flood events have all occurred since 1980 (Figure 7 and Appendix F, *Hydraulics & Hydrology*). For example, in 2018 there were 4 major flooding events in the study area, where discharge of 26,600 cfs was met or exceeded 4 different times that year.

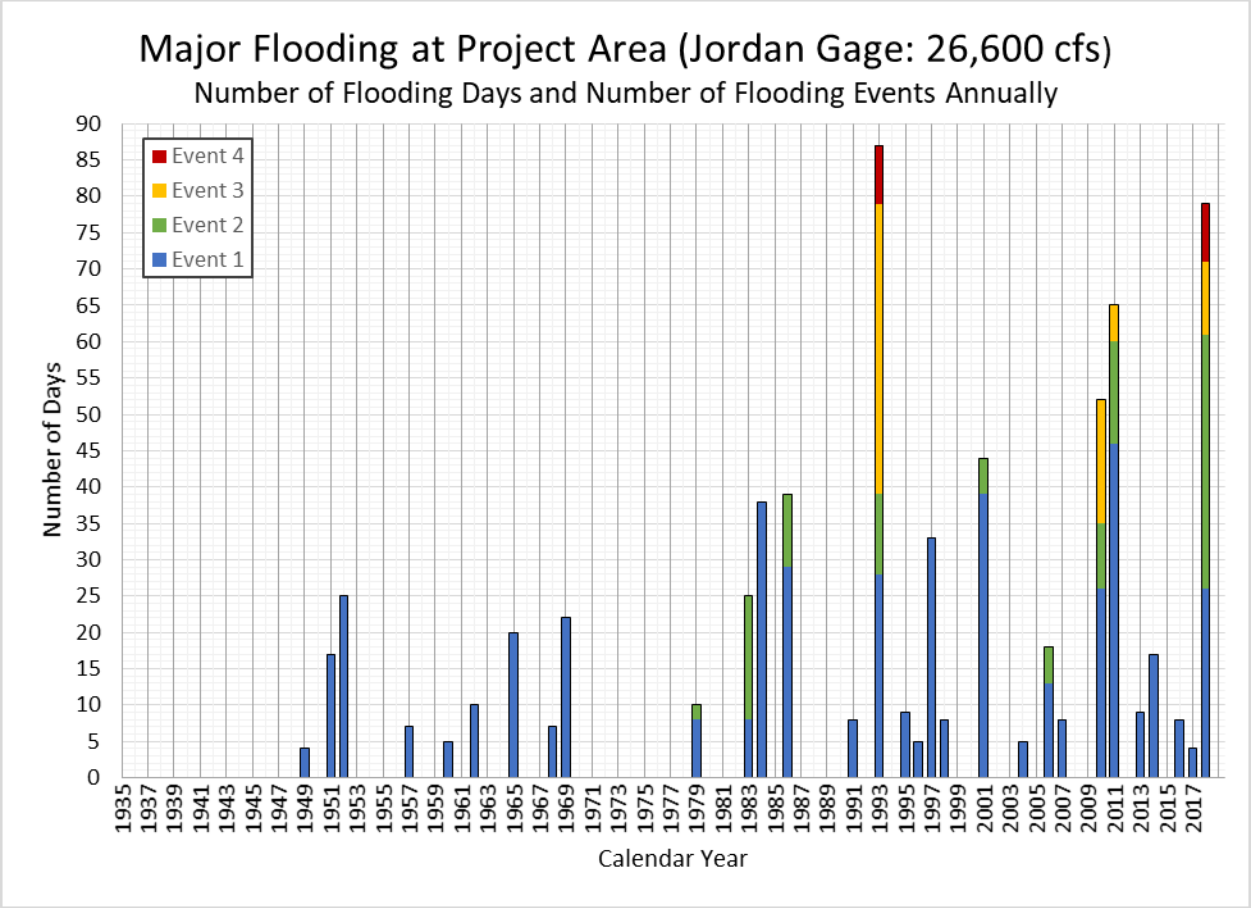


Figure 7: Major Flood Events in the Study Area, Recorded at the Jordan, MN, Gage (1935-2018)

The duration of high or low flows has ecological and engineering significance. Ecologically, the number of days of high flow per year can affect vegetation communities, aquatic organisms, sediment transport, nutrient cycling, and other ecological components and processes. Extended periods of low flows can result in longer residence times in aquatic areas causing increased water temperatures, changes in dissolved oxygen, and higher incidence of algae blooms. From an engineering perspective, longer durations of high flows that overtop ecosystem restoration project features could become detrimental to these structures by causing erosion, increased sediment deposition, and affecting the establishment of riparian vegetative communities. Low flows, if associated with drought conditions, can also affect the establishment of the planted vegetation used to stabilize ecosystem restoration project features.

Many aquatic vegetation and wetland plants life cycles and habitat requirements depend on water level fluctuations. Lower water levels in the summer or fall allow for seed beds to be exposed for germination, consolidate sediments, and oxidize nutrients making them readily available to plants.

Wetland habitat quality has gone down as a result of sustained high water in the three lakes. Sustained high pool has reduced the diversity of aquatic plants within the lakes, and the shorelines are dominated by river bulrush and cattails. Not only does the altered hydrology reduce the quality of wetland habitat and aquatic plant diversity, it also impacts the ability for migrating waterfowl and waterbirds to utilize quality nesting and resting habitat.

2.1.4 Water Management Infrastructure in the Study Area

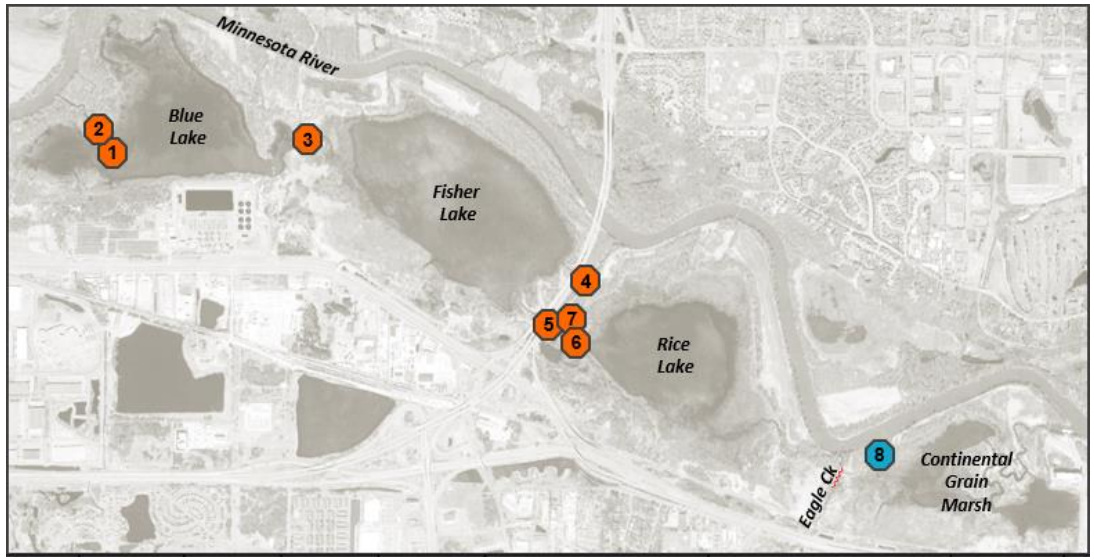
The increasing trend in the number of overbank flood events has negatively impacted the habitat in the study area. Blue, Fisher, and Rice Lakes consistently experience full pool elevations. Compounding the impacts from prolonged high water and peak flow events, is the inability of water in the study area lakes to recede, even after the Minnesota River has gone down.

The primary impedance of flow between these connected systems are the condition of the existing connecting channels and the existing structures located within. There are eight existing structures within the study area, seven of which are not expected to last for the 50-year period of analysis (Figure 8). The existing structures no longer function as intended and/or do not operate holistically for the current desired management of the system for a number of reasons:

- **Deteriorating –** All of the stoplog structures on the Refuge are constructed out of corrugated metal pipe (CMP) and are round culverts. Current structure design approaches are going away from using CMP as this material does not typically last more than 20 years. The CMP stoplog structure at Rice Lake is 20 years old and rusting. Road salt from Hwy 169 may be a contributing factor, as it appears that the structures with the closest proximity to the highway have the most rust damage.

- **No Longer Functional** –The stoplog structure at the Fisher Lake outflow is completely collapsed, preventing drawdowns of Fisher Lake. At Continental Grain Marsh, the failure of a beaver dam has resulted in the formation of a new side channel that has significantly eroded over a short period of time draining the west side of the marsh (See 2017 image, Figure 5). Consequently, the marsh spillway (constructed as a part of the Rice Lake HREP) is no longer functional as the hydrology of the system has further changed and now drains into the adjacent Eagle Creek trout stream.

- **High Operation and Maintenance (O&M)** – Many outlets are too small to allow effective drawdowns and easily become clogged with debris. Existing culverts are 42 inches or less in diameter, and the drawdown rate is twice as long compared to more recently designed structures that can handle the increased flows observed in the more recent hydrologic regime. Debris and sediment has filled in some of the outflowing channels, constricting flows. Beavers have also contributed to the clogging of outlet channels and the existing structures. Currently, the Blue Lake structure requires the most O&M in the study area.



Structure Location		Structure Name	Type	Size	Material	Year Built	Structure Objective	Condition	Currently Meets Objective	Projected To Meet Objective Over 50-year Project Life
1	Blue Lake	Blue Lake	Gated Stoplog	10x8 ft	Metal	1985[1]	Drawdown Blue Lake	High O&M, design difficulties	**Partial**	**No**
2	Blue Lake	Blue Lake	Culvert	84 in	Metal	1985[1]	Road crossing for O&M	Rusting, high debris	**Yes**	**No**
3	Blue Lake-Fisher Lake	Interlake	Stoplog	30 in	Metal	1985[1]	Move water from Blue to Fisher Lake	Unable to fill Fisher or Rice (invert 3ft higher), undersized	**No**	**No**
4	Fisher Lake	North Fisher Lake	Stoplog	36 in	Metal	1985[1]	Move water from Fisher to Minnesota River	Silted in, does not pass flows	**No**	**No**
5	Fisher Lake	South Fisher Lake	Stoplog	36 in	Metal	Unknown	Drawdown Fisher, Fill Rice Lake	Collapsed, undersized	**No**	**No**
6	Rice Lake	Rice Lake	Stoplog	42 in	Metal	1998	Drawdown/Fill Rice Lake	Rusting, undersized	**Yes**	**No**
7	Secondary Pond	Secondary Outlet	Stoplog	48 in	Metal	Unknown	Move water from Fisher to Rice Lake	Rusting, clogged with debris, undersized	**Yes**	**No**
8	Continental Grain Marsh[2]	Con Grain Marsh	Overflow	30x100 ft	Rock	1998	Maximum level of marsh	Silted, does not impact functionality	**Yes**	**Yes**

[1]MNDNR Permit #85-6039; [2]Rice Lake HREP feature

Figure 8: Summary of Existing Water Level Management Structures in the Study Area

2.2 Problem Summary and Interactions

Each of the historic changes and problems identified above has influenced the resulting habitat conditions present today in the study area. The problems were combined and summarized in a conceptual model to show how they may be interacting with one another (Figure 9).

In summary, changes in climate and land-use are likely the main drivers that have altered the hydrology in the study area. As a result, the existing habitat experiences prolonged periods of high water, degrading wetland habitat, reducing aquatic plant diversity, and ultimately reducing the habitat quality for waterbirds and waterfowl (nesting, resting, and food habitat). Several WLM actions have been taken in the past, but are no longer functioning in a way that holistically address the current habitat improvement objectives.

The desired new endpoint is providing WLM capabilities that increase the ability of managers to draw floodwaters off lakes and increase the number of days of low water conditions during the growing season.

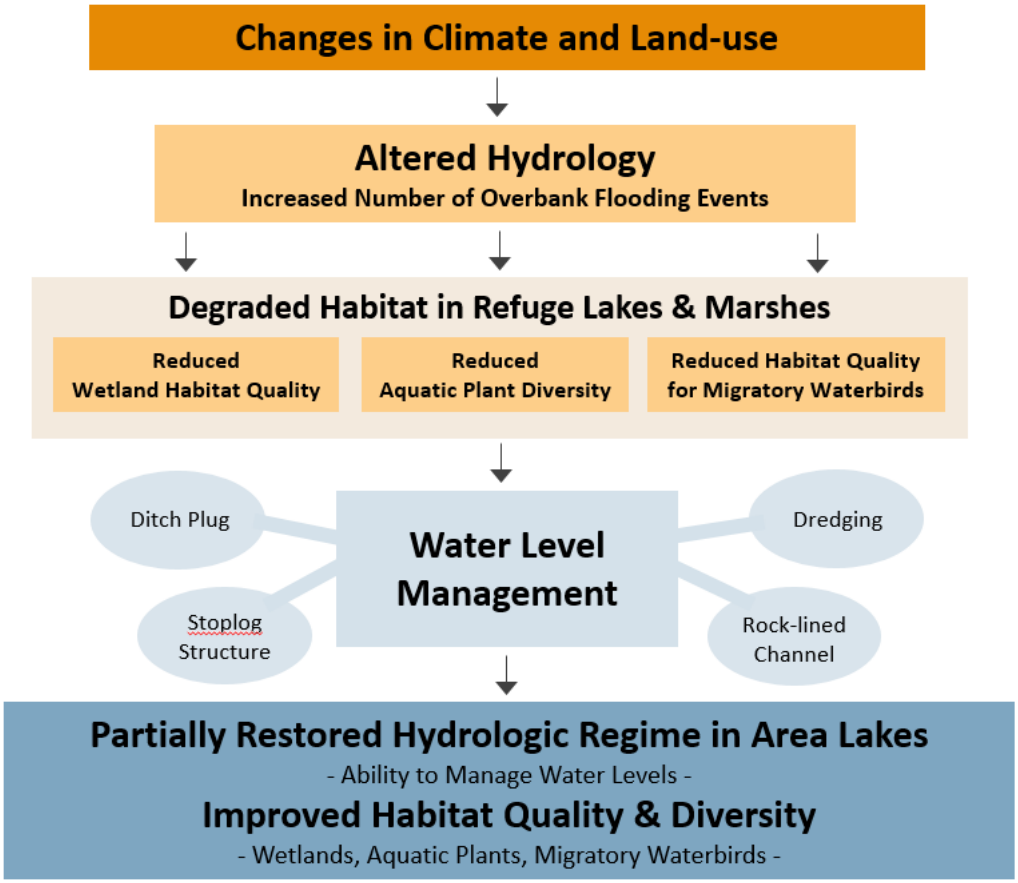


Figure 9: Conceptual Model of the Bass Ponds HREP

2.3 Estimated Future Without-Project Conditions

The Future Without Project condition is the forecasted condition of the study area for the next 50 years assuming that no significant action is taken to address the resource problems identified.

Based on the information discussed above, conditions for a variety of wetland plant species and migratory birds expected to occur in the type of habitat in the study area would generally be

considered marginal in many areas. The lake's overall shallow average depth combined with nearly annual flood events limit the ability of the system to have naturally occurring low-level conditions.

The increased number of flood events combined with the increased duration of full lake levels would likely continue to occur more often based on the trends detected within the Minnesota River Basin. Prolonged periods where lakes are experiencing high water conditions can result in poor emergent and submergent habitat for migratory birds.

Furthermore, if no action is taken, deterioration and failure of existing structures is expected to continue. The existing corrugated metal pipe culverts are expected to continue to rust and eventually collapse within the next 50 years. The Fisher Lake outlet structure is already collapsed which has caused erosion of an adjacent berm and has altered the flow path through the highway holding pond.

3 PLAN FORMULATION

Plan formulation for the Bass Ponds HREP has been conducted in accordance with the six-step planning process described in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (1983) and the *Planning Guidance Notebook* (ER 1105-2-100). The six steps in the iterative plan formulation process are: 1) Specify the water and related land resources problems and opportunities of the study area; 2) Inventory and forecast existing conditions; 3) Formulate alternative plans; 4) Evaluate alternative plans; 5) Compare alternative plans; and 6) Select the recommended plan.

The basis for selection of the Recommended Plan is fully documented below, including the logic used in the plan formulation and selection process.

3.1 Problems and Opportunities

USACE's planning process starts with identifying problems and associated opportunities within the geographic scope of the study area. From the list of problems and opportunities, and in collaboration with agency partners, USACE drafts specific objectives for the project. USACE determines the success of the project planning by the fulfillment of the objectives through identified measures.

Problem Statements

- Reduced wetland habitat quality
- Reduced aquatic plant diversity
- Reduced habitat quality for migratory waterbirds and waterfowl
- Degradation of wetland habitat within Continental Grain Marsh

Opportunities

- Increase bird feeding and nesting habitat
- Increase recreational opportunities where compatible with overall project goals and objectives

3.2 Objectives and Constraints

3.2.1 Project Objectives

Based on the project's problems and opportunities, USACE listed specific objectives below. USACE planning guidance ER 1105-2-100 provides guidance for developing objectives and specifies that objectives must be clearly defined and provide the effect desired, the subject of the objective, the location where the effect will occur and the timing and duration of the effect. For the purpose of this report, the timing or duration of the objectives is assumed to be the 50 year period of analysis. The performance targets to measure the success of each objective are discussed in Appendix K, *Monitoring and Adaptive Management*. The Bass Ponds HREP Objectives are:

1. Increase the diversity and percent cover of desirable emergent aquatic plant species.
2. Increase the diversity and percent cover of desirable submergent aquatic plant species.
3. Provide quality feeding and resting habitat for a wide variety of waterfowl and waterbirds with particular emphasis on fall migrating waterfowl.

3.2.2 USFWS Management Objectives

The project objectives are consistent with the overall objectives of the Refuge, which are to "manage and enhance permanent/semi-permanent wetland systems throughout the Minnesota Valley National Wildlife Refuge to provide habitat for waterfowl, shorebirds and other waterbirds. Provide diverse habitat for other wetland-dependent wildlife while preserving the ecological integrity of the wetland in the Eastern Broadleaf Forest Province" (USFWS 2018a).

In order to successfully achieve the management objectives of the Refuge, the Refuge manager's goals are to be able to adjust water levels throughout the season (full, partial, optimal pool elevations), and when scheduled, to be able to drawdown water quickly (less than 10 days) in order to have the best chance at achieving a beneficial habitat response. Another goal is to manage each lake independently, storing and supplementing water from upstream to downstream sources depending on conditions.

The Refuge's typical WLM plan by season is outlined below in Table 1. Depending on habitat conditions, Refuge managers would target a full drawdown every 5 to 7 years. Desired surface water elevation goals for the Refuge were defined by the total percent of study area with surface water present (see Section 8.2.1 of Appendix F, *Hydraulics and Hydrology*).

A successful full drawdown was defined as achieving a full drawdown (less than 10% inundation) by mid-July for a duration of at least 30 days.

Table 1: Typical Water Level Management Plan within the Refuge

Month	Action
May – Jun	Gradually decrease water levels
Jul – Aug	Maintain water levels
Sept – Nov	Gradually increase water levels
Dec – Apr	Maintain water levels

3.2.3 Constraints

Planning constraints are temporary or permanent limits imposed on the scope of the planning process and the choice of solutions. These limits can be related to the ecological, economic, engineering, legal, and administrative aspects of a project. Some constraints are states of nature, whereas others are based on the design of built structures and other engineering

considerations. Legislation and decision makers can impose other constraints and such human-imposed constraints are possible to change. USACE established the following planning constraints to guide and set boundaries on the formulation and evaluation of alternatives.

- Institutional constraints: Avoid or minimize impacts to flood stages and navigation.
    - Restoration measures should not increase flood heights or adversely affect private property or infrastructure.
- Environmental constraints: Construct measures consistent with Federal, state, and local laws. Compliance and coordination under NEPA emphasizes the importance of environmental impacts to be minimized and avoided, as much as possible. Therefore, the following constraints are considered when analyzing alternatives:
    - Avoid impacts to adjacent trout stream, Eagle Creek.
    - Avoid impacts to threatened and endangered species (the northern long eared bat, and the rusty patch bumblebee, respectively).
    - Minimize waterbird and migratory bird impacts
    - Avoid adverse impacts to cultural resources

3.3 Management Measures and Screening

A management measure is a feature (a structural element that requires construction or assembly on-site) or an activity (a nonstructural action) that can be combined with other management measures to form alternative plans. Management measures were developed to address study area problems, meet study objectives, and to capitalize upon study area opportunities. Management measures were derived from a variety of sources including prior studies, the NEPA public scoping process, and the multidisciplinary, interagency Project Delivery Team (PDT).

Screening of measures is a process whereby various criteria are evaluated to better characterize a specific measure and the likelihood that it can achieve project objectives and cost effective restoration. The evaluation criteria identified in the P&G were used to identify the alternative management measures retained for further consideration. The purpose of this preliminary screening is to narrow down the number of alternatives to be subjected to detailed further analysis; however, it will not preclude resurrecting a measure at a future date if it becomes apparent that a measure was screened out based on incomplete data or an invalid assumption. The measures that are retained for further consideration must derive from the planning objectives for the project, must be feasible within the project constraints, and must be considered to best meet the screening criteria within the range of alternatives considered.

Alternative plans are developed from the measures carried forward; if a measure is not justified and not carried forward, the measure will not be further developed into an alternative plan. Alternative plans are different combinations of various sizes and scales of measures that would contribute to attaining the planning objectives. A measure may stand alone as an alternative plan that can be implemented independently of other measures, resulting in some achievement of the planning objectives. Measures are screened against selected criteria in the first iteration of the planning process and alternative plans are developed and screened against the same criteria in a later iteration of the planning process. Review of the four formulation criteria suggested by the P&G (completeness, effectiveness, efficiency, and acceptability, defined below) and resource significance (institutional, public, and technical, described in the previous section) were used to aide in the selection of the Recommended Plan.

- **Completeness -** Completeness is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planned effects.
- **Effectiveness -** Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified objectives.
- **Efficiency -** Efficiency refers to cost-effectiveness and the most efficient allocation of other resources. Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and achieving the specified objectives.
- **Acceptability -** Acceptability refers to the workability and viability of the alternative with respect to acceptance by state and local entities and the public compatibility with existing laws.

The first step taken in this study was to identify general locations and categories of potential improvements that would satisfy the study objectives. The process began with several discussions concerning the management goals and objectives discussed in the previous section, as well as the USFWS three priority areas: Fisher Lake, Continental Grain Marsh, and Bass Ponds. Based on site visits and interagency discussions, it was agreed to screen out the third priority area (Bass Ponds) from further consideration; It was determined that restoration and enhancement measures to improve this area would jeopardize the adjacent trout stream (Ike's Creek), which the Refuge and the PDT decided was not worth the risk. In addition, early in the planning process it was determined that no action would be taken at Hogback Ridge Dike south of Bass Ponds as clear problems or opportunities for habitat restoration were not identified for that location. Additional discussion and maps of the priority areas can be found in Appendix C, *Plan Formulation*.

An array of general measures was developed for the remaining study area from which alternative plans were developed, and is summarized in Table 2.

- **No Action -** The no action measure is defined as no implementation of a project to modify habitat conditions in the study area. The No Action Alternative is required under NEPA for comparison of proposed actions to a baseline condition.

- **Water Level Management** – Water level management (WLM) of the water elevation within the study area could enhance aquatic habitat. Common designs for WLM include stoplog structures, pump stations, gated structures, rock-lined overflows, and plugging existing undesirable outlets (USACE 2012b). A full or partial drawdown could consolidate sediments and expose the seedbed to stimulate plant germination and growth. A drawdown could be conducted during the growing season (June – August) to best promote aquatic plant growth. In the fall, WLM structures could be used to hold water to optimize seasonal habitat for waterbirds and waterfowl (e.g., feeding, nesting, resting). WLM structures can also be used to drawdown water from one system to fill another; thereby reducing impacts during drought conditions. As an example, the USFWS has found the Long Meadow Lake stoplog structure to be the most reliable, functional, and easily maintainable water control structure on the Refuge. The 5 feet wide by 6 feet high concrete bay design with aluminum stoplogs has resulted in low O&M and the structure has held up well over time. A disadvantage of this measure can be annual O&M, as stoplogs require manual adjustment and monitoring, culverts can clog with debris or by beaver activity, and the size and complexity of some designs can be costly. However, given the numerous advantages of this measure, the PDT retained it for further evaluation.

- **Habitat Dredging -** Habitat dredging is a measure often used to improve overwintering centrarchid habitat. When designed correctly, the increased water depth from habitat dredging creates a larger volume of water with the proper levels of dissolved oxygen and temperature greatly improving winter habitat conditions for centrarchids. Habitat dredging was primarily considered for Blue Lake due to the known shallow water depths in Fisher and Rice Lake. However, after receiving the bathymetry data it was found that Blue Lake was predominantly shallow as well, therefore significant dredging and disposal of material would need to occur in order for this measure to be effective. Additionally, this measure did not meet the project objectives of enhancing habitat for aquatic vegetation and migratory birds and was therefore screened from further consideration.

- **Access Dredging -** Access dredging is accomplished to facilitate access to areas to construct project features or to facilitate flow to WLM structures. While determined not necessary for habitat dredging or access to other features, it was determined that access dredging would need to be evaluated further in combination with WLM in order to allow flow to reach and pass through structures successfully.

- **Floodplain Forest Creation/Enhancement -** Floodplain forest creation or enhancement could serve a variety of habitat purposes in the study area. Floodplain forests increase habitat diversity and provide habitat niches that have been lost in the Minnesota River. In the study area, some agricultural land has already been converted back to floodplain forest. However, within the study area, no opportunities for floodplain forest restoration were identified. The lake, marsh, and wetland environments are the only habitat types considered forward for restoration; this measure was screened from further consideration.

Table 2: Screening of Measures (Shaded Measures Were Screened From Further Analysis)

Measure	Location	Retained	Justification for Elimination or Retention
No Action		Yes	All alternative plans must be compared to No Action Alternative.
Water Level Management *Stoplog Structure* *Rock-lined Channel* *Access Dredging* *Plug* *Pump Station*	 All Sites All Sites All Sites CGM Blue & CGM	Yes	Complete, Effective, Efficient, and Acceptable. Would improve wetland habitat quality and diversity of aquatic vegetation, and habitat for migratory waterbirds and waterfowl.
T-structure *Dikes* *Gated Structure* *CMP Culverts*	Rice-Fisher Bass Ponds Blue Lake All Sites	No	Not Acceptable; Safety concerns No clear problems identified (Hogback Ridge Dike). Does not meet objectives; Not cost-effective. Not Effective or Efficient
Habitat Dredging	Blue Lake	No	Does not meet objectives; Does not meet P&G criteria
Floodplain Forest	All Sites	No	Does not meet objectives; Does not meet P&G criteria

CGM = Continental Grain Marsh

The measures retained for further consideration (no action, stoplog structures, rock-lined channels, access dredging, plugs, and pump stations) were derived from the planning objectives for the project, and are considered to be the most complete, effective, efficient, and acceptable within the range of measures considered. Increments and scales of the retained measures were developed and combinations of the different scales and increments of the measures were used to formulate alternative plans.

3.4 Formulation of Alternatives

Alternatives are combinations of measures that would contribute to attaining the planning objectives. A measure may stand alone as an alternative plan that can be implemented independently of other measures, resulting in some achievement of the planning objectives. Measures that were deemed feasible were carried forward for consideration in the development of alternatives.

Some of the important factors that led to the development of the final array of alternatives for this project are described below. Alternative development is a complex, iterative process with many inputs, and the hydrologic analysis of the study area was the most influential in the development of alternatives leading up to the Recommended Plan.

3.4.1 Drawdown Analysis for Blue-Fisher-Rice System

To evaluate the effectiveness of WLM measures in the Blue-Fisher-Rice Lake system, several iterations of hydraulic modeling and analyses were conducted. A 2D HEC-RAS model was used to analyze and optimize WLM of the interconnected Blue-Fisher-and Rice Lake. The analysis used the existing hydrologic record for the Minnesota River at the nearby Jordan, MN, gage, and incorporated inputs from the Blue Lake WWTP and precipitation. The hydraulic model showed that the existing 42-inch culverts are currently too small to achieve the desired water level conditions throughout the year. To make matters worse, the outlet for Fisher Lake has collapsed and flows are eroding below the highway bridge. Furthermore, the findings of the climate change assessment (Section 2.1.2) and the USFWS management objectives (Section 3.2.2) emphasized the need to design efficient and robust structures that are both tolerant to high flows as well as able to drawdown these systems efficiently. The analysis explored several different scales of culvert sizes and materials to determine efficient drawdown rates (e.g., ability to complete a drawdown in at least 10 days). Initial model runs using standard round culvert sizes of 42 inch, 60 inch, and 72 inch required almost twice as many days to drawdown the system as the newer design of 5 feet wide by 6 feet high rectangular bays (as used in the Long Meadow Lake HREP). Additionally, anecdotal information from the USFWS suggested that the round culverts experienced more debris build-up than the rectangular culverts. The corrugated metal pipe material was also a downside to the existing structures in the study area – as they are susceptible to rusting, and likely need to be replaced within the 50-year period of analysis. More recent WLM projects, like Long Meadow Lake, have moved toward using concrete over CMP for this reason. See Appendix F, *Hydraulics and Hydrology,* for additional details on the drawdown analysis. The results of the preliminary drawdown analysis are summarized below:

Culvert Sizing – 5-feet wide by 6-feet high rectangular concrete box culverts were the best balance between drawdown rates and structure operation and maintenance. The USFWS has experience with a similar size structure at Long Meadow Lake HREP and considers this a desirable size.

Major Flooding – Major flooding at the study area begins at an assumed elevation of 704.5 feet at RM 20 (NAVD 88). At this elevation, the berms between the lakes and marsh as well as the berms between the project and the Minnesota River are beginning to be overtopped. This

overtopping elevation correlates to approximately 26,600 cfs at the USGS Gage at Jordan, MN, which is reflected as a red line in Figure 10. When the historic, observed, mean daily flow at Jordan exceeds the line the study area likely experienced major flooding.

Drawdowns – WLM through replacing the existing structures with new 5-feet wide by 6-feet high bays resulted in the most efficient successful drawdown that could be maintained throughout the growing season. The quickest, most efficient full drawdown can be achieved once the Jordan Gage decreases to a discharge of 10,000 cfs or lower. This discharge value at Jordan correlates to the approximate full drawdown elevation of the lakes (Blue, Fisher, and Rice) and Continental Grain Marsh (see Appendix F for more detailed information). The full drawdown elevation is necessary to provide the variation in pool/water levels necessary to encourage waterfowl and waterbird nesting and the establishment of aquatic plant communities.

A successful drawdown is defined as a full drawdown occurring for a minimum duration of 30 days by mid-July. The time it takes to drawdown the lakes (Blue, Fisher, and Rice) and Continental Grain Marsh when conditions are sufficiently low (<10,000 cfs at Jordan) is listed in Table 3.

Table 3: Minimum Time to Drawdown at Maximum Efficacy
(Minnesota River Receded to 10,000 cfs at Jordan)

Location	Drawdown Time (days)
Blue Lake	0.5
Fisher Lake	3
Rice Lake	4
Continental Grain Marsh	0.2

A period of record analysis from 1935-2018 indicates that if the proposed project structures had been in place, a successful drawdown could have been achieved 86% of the years. The years where a successful drawdown would have been feasible, historically are indicated by the green circles in Figure 10.

Based on the results of the climate assessment presented in Appendix F, there is an abrupt nonstationarity in the mean annual discharge record collected at Jordan, MN, occurring circa 1981. The record collected post-1981 consists of higher flows, relative to the pre-1981 portion of the record. Therefore, the more recent “wetter” period from 1981-2018 was also analyzed, and it was found that a successful drawdown still could be achieved 79% of the years.

Dependencies – WLM structures would be required between Blue, Fisher, and Rice Lakes in order for the interconnected lake system to have successful drawdowns as well as filling capabilities. For example, in order to fill Rice Lake, structures are required between Blue and Fisher (the Interlake structure), as well as between Fisher and Rice (the Secondary Outlet structure) in order to redirect and hold flows in Rice Lake.

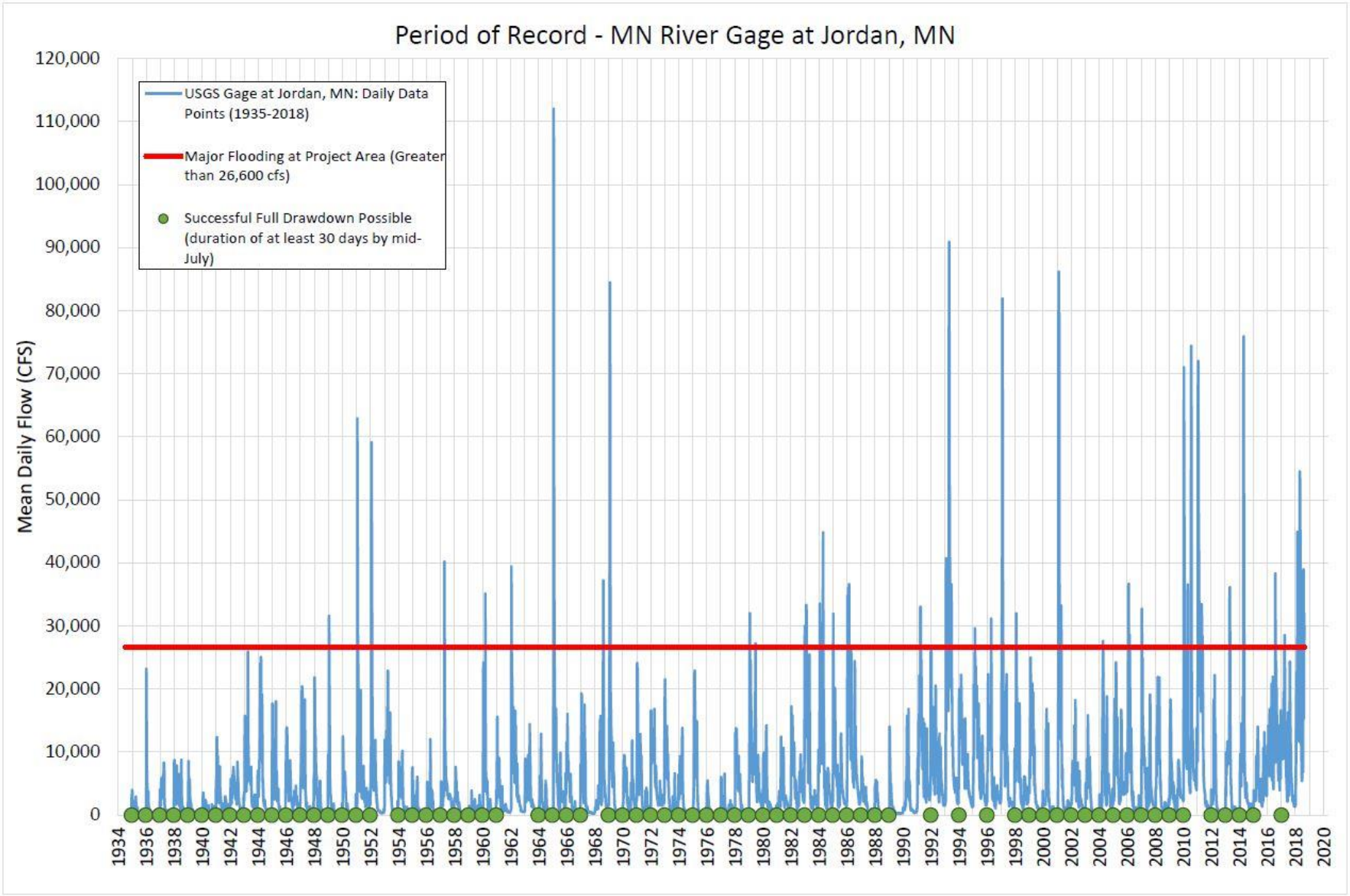


Figure 10: Major Flooding & Successful Drawdown Assessment: Period of Record for the Study Area (1935-2018)

3.4.2 Drainage Analysis of Continental Grain Marsh

A drainage analysis was conducted for Continental Grain Marsh to evaluate the location of low elevation points along the natural levee separating the marsh from the Minnesota River and determine locations where modifications could be made to hold more water within the marsh. Using LIDAR and HEC-RAS modeling, the lowest elevation along the Continental Grain Marsh levee is no longer the Rice Lake HREP rock spillway. The new primary outlet is a channel on the west side of the marsh where a former beaver dam was lost.

3.4.3 Final Array of Alternatives

The drawdown analysis of the Blue-Fisher-Rice Lake system, as well as a drainage analysis of the Continental Grain Marsh site, was conducted during the initial development of alternatives (see Appendix F, *Hydraulics and Hydrology,* and Appendix C, *Plan Formulatio*n, for further details on initial alternatives). The final array of alternatives is summarized in Table 4.

Table 4: Final Array of Alternatives

Site	Feature	Blue-Fisher-Rice Lake System				Con Grain Marsh	
		BFR 1	BFR 4	BFR 5	BFR 6	M1	M2
Blue Lake	Stoplog	4	4	2	1		
Interlake	Stoplog	2	1	1	1		
Fisher Lake	Stoplog	1	1	1	1		
Secondary Outlet	Stoplog	2	1	1	1		
Rice Lake	Stoplog	1	1	1	1		
Con Grain Marsh	Plug					x	x
Con Grain Marsh	Stoplog						1

As a result of the drawdown and drainage analyses of the study area, three standalone alternative groupings were formed, each with different WLM capacities:

- **BFR Alternative** (Blue-Fisher-Rice Alternatives): Consisting of a stoplog structure with a rock-lined overflow at each of the lake sites. Different combinations of this alternative included an analysis of a range of maximum and minimum numbers of stoplog structures at each lake outlet to determine the most effective design to achieve an effective drawdown rate. (BFR1 was the largest with a maximum of four bays at Blue Lake to BFR6 with only one bay at each outlet).

- **M1 Alternative** (Continental Grain Marsh Alternative #1); consisting of an earthen plug at Continental Grain Marsh.

- **M2 Alternative** (Continental Grain Marsh Alternative #2): consisting of an earthen plug and a stoplog structure for WLM at Continental Grain Marsh.

In addition to these standalone alternative groups, a pump station increment was also considered for the BFR Alternatives as well as for the Marsh Alternatives:

- **Cp** (Continental Grain Marsh Pump): an increment that could be added to M1 or M2 that included adding a pump station to Continental Grain Marsh that could fill the marsh during low-water (drought) conditions.

- **Bp** (Blue Lake Pump): an increment that could be added to any BFR alternative that consists of a pump station at Blue Lake to fill the BFR system during low-water (drought) conditions.

The various combinations of these alternatives amounted to 45 different alternatives, including the No Action Alternative (Appendix C, *Plan Formulation*).

3.5 Evaluation and Comparison of Alternatives

This section describes the final array of alternatives that were evaluated. It also documents the process used to determine the potential costs and habitat benefits of each alternative.

3.5.1 Environmental Benefit Analysis

To quantify habitat benefits of the proposed alternatives for the Bass Ponds HREP, the USFWS Habitat Evaluation Procedure (HEP) was used (USFWS 1980). The HEP methodology utilizes Habitat Suitability Index (HSI) models to rate quality of habitat on a scale of 0 to 1 (1 being optimal). The HSI value is multiplied by the number of acres of available habitat to obtain Habitat Units (HUs); the HSIs and acreages are then projected into the future. One HU is equivalent to 1 acre of optimum habitat. HUs are then averaged annually across the project's 50-year period of analysis, referred to as Average Annualized Habitat Units (AAHUs). By comparing the AAHUs of the No-Action Alternative to each of the action alternatives, the benefits can be quantified (net gain in AAHUs).

Based on the management objectives of the resource agencies in this portion of the river, wildlife "bluebook" models were used to quantify habitat benefits and evaluate effectiveness of the proposed measures. To quantify the changes in aquatic habitat, the dabbling duck HSI model (Devendorf 2013) was used. This model has been applied to other HREPs in the UMR and is certified by the USACE Ecosystem Planning Center of Expertise. For a detailed discussion of the HEP conducted for this study, see Appendix D, *Habitat Evaluation Procedure*.

3.5.2 Cost Effectiveness & Incremental Cost Analysis

USACE guidance requires a cost effectiveness analysis and incremental cost analysis (CE/ICA) for determining what project features and design alternatives should be built based on a comparison of quantified habitat benefits (outputs) and estimated costs of alternative designs (ER 1105-2-100, Appendix E, paragraph 36). This process identifies which alternatives or combinations of features fully or partially meet the objectives of the project and are the most cost effective. A cost effective analysis is conducted to ensure that the least cost alternatives have been identified. Subsequent incremental cost analysis is conducted to evaluate changes in cost for increasing levels of environmental output.

CE/ICA is a three-step process: (1) calculate the environmental outputs for each alternative; (2) determine a cost estimate for each alternative; (3) compare and evaluate the alternatives based on habitat benefits and costs.

Costs were annualized (AACost) over a 50-year period of analysis at an interest rate of 2.875% for Fiscal Year 2019. These costs included initial construction with mobilization and demobilization, contingency (32%), planning, engineering, and design (15%), and construction management (8%) above the actual estimated cost for construction. Additionally, operation and maintenance (ranging approximately $2,000 to almost $60,000 per year for 50 years), adaptive management (3%), and interest during construction (2 years of construction was assumed for all alternatives) were included in each alternative.

The incremental analysis for each alternative was accomplished using the USACE Institute for Water Resources Planning Suite II. The results of the CE/ICA analysis is displayed in Figure 11.

The incremental cost per unit of output for Best Buy plans are displayed in Figure 12. Refer to Appendix C, *Plan Formulation*, for the detailed table and results of the analysis.

Of the 45 generated plans, 6 plans were considered Cost Effective, 5 of which were considered Best Buys, including the No-Action Alternative. “Cost Effective” means that for a given level of non-monetary output, no other plan costs less, and no other plans yields more output for less money. From the set of Cost Effective plans, “Best Buy” plans are the most efficient and give the greatest increases in output for the least increase in cost.

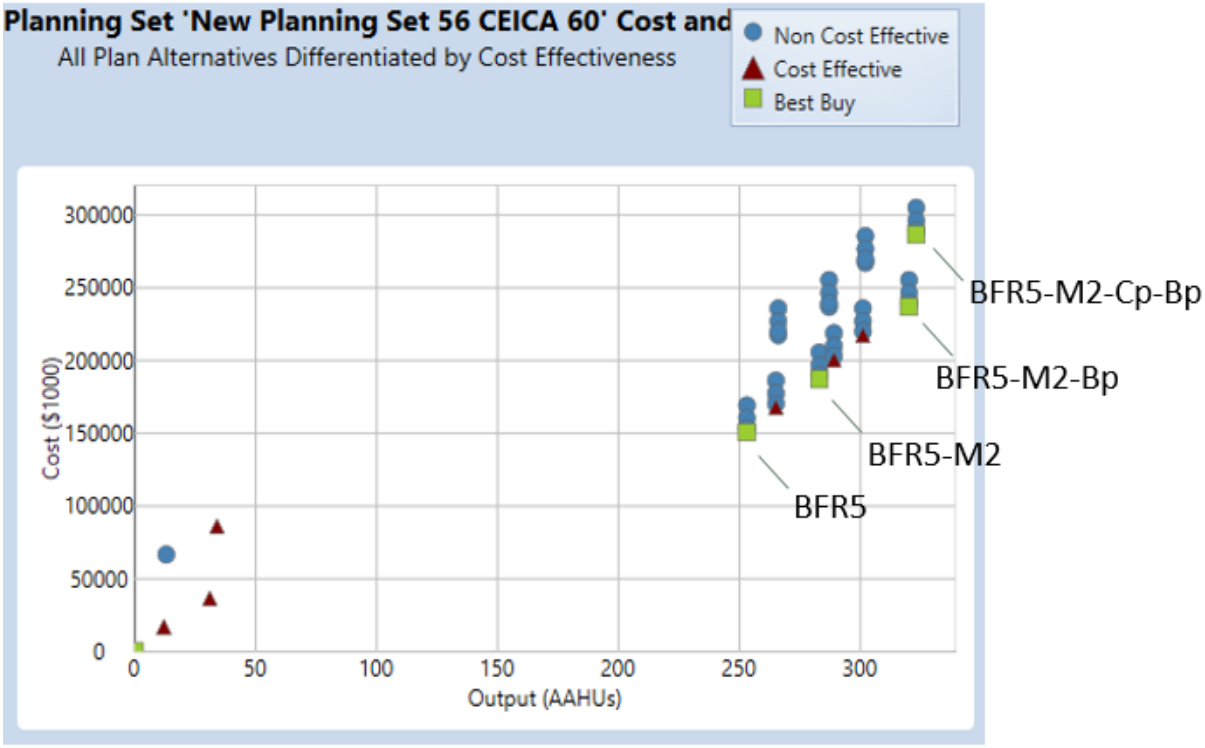


Figure 11: CE/ICA Analysis of All Alternatives

The Best Buy plans presented provide the information necessary to make well-informed decisions regarding desired project scale and features. Progressing through the increasing levels of output for the alternatives helps determine whether the increase in output is worth the additional cost. As long as decision makers consider a level of output to be “worth it”, subsequent levels of output are considered. When a level of output is determined to be “not worth it”, then subsequent levels of output will also likely be “not worth it”, and the final decision regarding desired project scale and features for environmental restoration will be reached.

Typically in the evaluation of Best Buy plans, “break points” are identified in either the second-to-last column in Table 5, or in the stair-step progression from left to right in Figure 12. Break points are defined as significant increases or jumps in incremental cost per output, such that subsequent levels of output may not be considered “worth it”. Identification of such break points can be subjective. For this study, break points were identified between each of the five Best Buy plans (No Action, Alternatives 3, 11, 35, and 43).

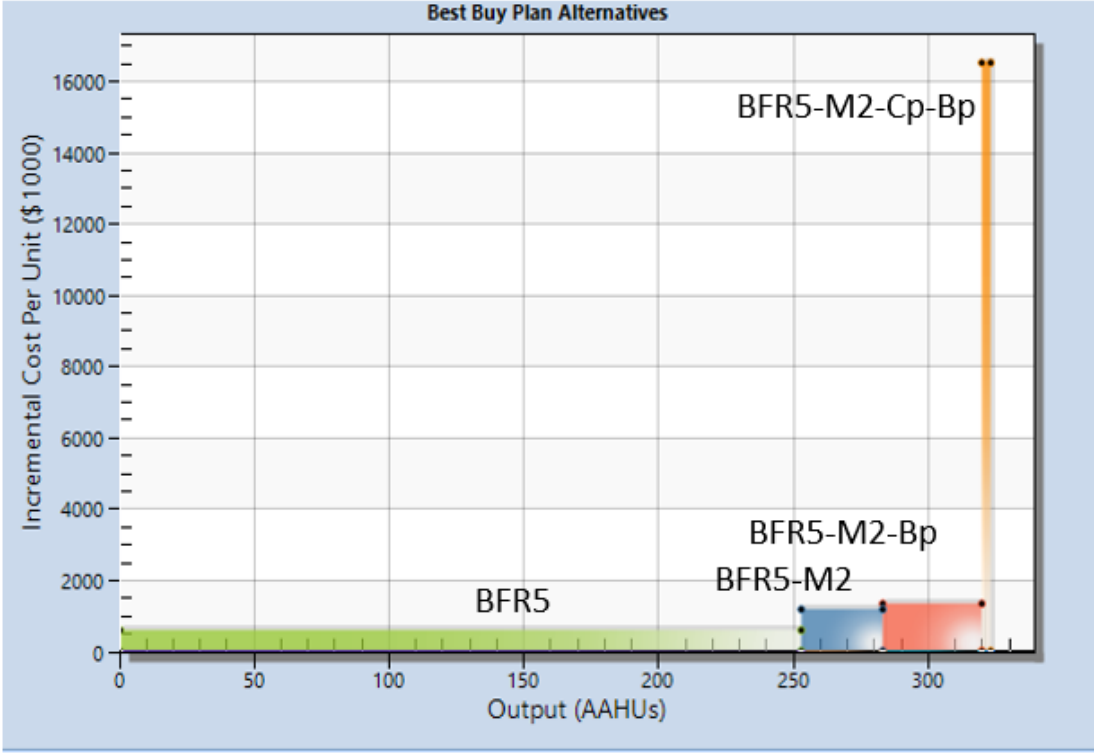


Figure 12: Incremental Cost and Output Results for the Best Buy Plans

Table 5: Results of CE/ICA for Best Buy Plans

Alternative	Feature Groups	Net AAHUs	Total Project Cost	Incremental AACost	AAHU Incremental Output	Incremental AACost/AAHU	$/AAHU
No Action	No Action	0	$0	$0	NA	NA	$0
3	BFR5	225	$3,635,000	$152,700	225	$679	$679
11	BFR5-M2	255	$4,518,000	$36,900	30	$1,230	$774
35	BFR5-M2-Bp	288	$5,388,000	$50,200	33	$1521	$833
43	BFR5-M2-Bp-Cp	291	$6,257,000	$50,100	3	$16,700	$996

3.5.3 Comparison of Best Buy Alternatives

No-Action Alternative – This alternative was not chosen because it does not improve or maintain the ecosystem resources within the study area. This alternative would cost $0. The continued high water events would continue to reduce the habitat value provided in the study area. The existing study area provides 590 HUs, and is assumed to remain at this level over the next 50 years. This alternative does not meet any of the project objectives.

Alternative 3 (BFR5) – This alternative improves the aquatic ecosystem in Blue, Fisher, and Rice Lakes. While this alternative has a low cost per AAHU of $679, it failed to address study objectives in Continental Grain Marsh. Without a plug in the marsh, the system would continue to degrade, and it is likely that the new outlet channel would continue to widen and erode into Eagle Creek. For these reasons, Alternative 3 was deemed as not effective by USACE and the USFWS, and this alternative was eliminated.

Alternative 11 (BFR5-M2) – This alternative meets all of the project objectives and addresses problems in the entire study area, including Continental Grain Marsh. This alternative would cost approximately $4.5 million to construct and would result in a net gain of 255 AAHUs, at an average annual cost per average annual habitat unit of $744/AAHU. The incremental output is 30 habitat units and the incremental average annual cost per average annual habitat unit is $1,230. Alternative 11 was considered worth the investment as it met all project objectives and maximizes habitat benefits at a reasonable cost.

Alternative 35 (BFR5-M2-Bp) – Similar to Alternative 11 with the addition of a pump station at Blue Lake. This alternative meets the project objectives and provides a gain of 33 AAHU above Alternative 11. However, the additional habitat benefits provided by the Blue Lake pump station are minimal compared to the increase in annual O&M costs ($35K/yr) for USFWS. For these reasons, this alternative was eliminated.

Alterative 43 (BFR5-M2-Cp-Bp) – This alternative meets the project objectives and provides similar benefits as Alternative 11 and 35 with the addition of a pump station at Continental Grain Marsh. However, there were several downsides to this alternative. The cost of this alternative was also higher than other alternatives for only minimal benefits achieved; the 3 additional habitat units for this increment cost approximately $16K each. USFWS felt that this large increase O&M costs to maintain and operate two pump stations ($52K/yr) could be better utilized in a different area and therefore was not worth the investment. This small increase in habitat units, at a much larger cost, was deemed not worth it, and this alternative was eliminated.

3.6 Plan Selection

The Bass Ponds, Marsh, and Wetland PDT determined that Alternative 11 (BFR-M2) is the plan that best meets the goals and objectives of the involved agencies and the UMRR program and was chosen as the Recommended Plan. Selecting the National Ecosystem Restoration (NER) plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, completeness, effectiveness, efficiency, and acceptability. The remainder of this section details the considerations made in selection of the Recommended Plan.

3.6.1 National Ecosystem Restoration Plan

The alternative plan that reasonably maximizes the benefits in relation to cost and meets the overall planning objectives is Alternative 11 (BFR5-M2), tentatively selected as the NER plan. The $744 per AAHU created by Alternative 11 is efficient in achieving the ecosystem restoration objectives and has been considered reasonable. For reference, HREPs yielding an average annual cost per AAHU of $2,000-$3,000 have generally been accepted as justified, with over $5,000 per AAHU accepted in some circumstances. These numbers have not been adjusted for inflation since they were developed in the early 1990s. These criteria have been used to justify construction of over $59 million in habitat projects within the St. Paul District since the program began. Alternative 11 is also consistent with regional and State planning for the area.

The Federal objective for water and related land resources planning is to contribute to national economic development consistent with protecting the Nation’s environment, pursuant to national environmental statutes, applicable Executive Orders, and other Federal planning requirements. Achievement of the Federal objective is measured in terms of contribution to Federal accounts intended to track the overall benefits of a given project.

3.6.2 Resource Agency Support

USFWS and the State of Minnesota support Alternative 11 (BFR5-M2) over other alternatives (Appendix A, *Correspondence & Coordinatio*n). The USFWS supports this plan over the other Best Buy plans as it meets all the project objectives, addresses the problems across the entire study area, and this alternative does not include the additional annual O&M costs of pump stations.

3.6.3 Resource Significance

All of the action Best Buy alternatives demonstrate institutional and public significance as they meet goals and objectives of the Minnesota Valley National Wildlife Refuge and the multi-agency coordination effort in maintaining a high quality ecosystem while avoiding adverse impacts.

Review of technical importance for the Best Buy alternatives considered to be worth the investment, supported the selection of Alternative 11. Technical importance can best be described in terms of one of more of the following criteria: scarcity, representativeness, status and trends, connectivity, limiting habitat, and biodiversity. In terms of status and trends, resource agencies have documented an increase in flows in the Minnesota River, especially over the last two decades. Increased major flood events and duration of inundation have resulted in degradation of habitat for aquatic vegetation and migratory waterbirds and waterfowl. Alternative 11 would increase the likelihood of the ability to have a successful drawdown, targeting the recruitment of aquatic plants and habitat conditions for wildlife. In terms of biodiversity, Alternative 11 would likely increase the species richness of aquatic plants and wetland habitat.

The larger alternatives (Alternatives 35 and 43) would not likely result in a distinguishable difference in biodiversity or status and trends. The smaller alternative (Alternative 3) would not include a quarter of the study area by omitting Continental Grain Marsh, and would therefore limit the ability of WLM to address these criteria in the study area.

3.6.4 Risk and Uncertainty

Areas of risk and uncertainty have been analyzed and were defined so that decisions could be made with some knowledge of the degree of reliability of the estimated benefits and costs of alternative plans. Risk depends on the probability or likelihood for an outcome and the consequences of that outcome. Uncertainty refers to a lack of knowledge about critical elements or processes contributing to risk or natural variability in the same elements or processes.

The team worked to manage risk during plan formulation. One way this was done was by using experience from past projects to identify potential risks and reduce uncertainty during the development of potential measures. The team referenced successful similar WLM work in the UMR (especially Long Meadow Lake, MN and Long Lake, WI), the *UMRR Design Handbook* (USACE, 2012), and used best professional judgment. The team also had several meetings to conduct an Abbreviated Risk Analysis during which project risks were factored into project costs (Appendix G, *Cost Engineering*).

The primary risks identified for the Bass Ponds, Wetland, and Marsh study area included constructability risks and risks associated with climate change impacts to flow discharges.

Constructability – During the planning process it was discovered that two utilities (a 12 inch natural gas pipeline and a fiber optic conduit) were a potential risk due to the proximity to proposed structures (see utility map in Appendix H, *Real Estate Plan*). The team revised the dredging plan to avoid the pipeline at the Interlake structure by only dredging on the eastern side and staying outside the 80 ft right of way. To manage risk with the fiber optic cable, the

team had several meetings with USFWS and MnDOT to discuss a path forward. In order to manage construction of the Fisher Lake outlet structure, the team included costs associated with relocating the conduit within the Lands, Easements, Right-of-Way, Relocation, and Disposal (LERRDs) component of the cost estimate.

Flow Risks – Hydraulic and hydrology analyses were done to evaluate the existing flow regime and the probability of drawdown success. Since water levels cannot be managed successfully in the current condition, a with-project 80% chance for a 30-day drawdown is considered a very good outcome by the USFWS.

During the flow analysis, the team identified a WLM structure on the east end of Continental Grain Marsh, located on Cargill property (Figure 13). The Cargill structure was constructed in 1985 by the USFWS, which was before the loss of the beaver dam on the western end of the marsh and throughout the lifespan of the Continental Grain Marsh overflow structure that was installed as a part of the Rice Lake HREP. Throughout this time, this structure did not affect the marsh water levels and has been acting as a plug. Inspection of the structure indicated that it was silted in and functioning as a plug. There was also significant erosion observed around the failed structure. If this structure were to pass flow or fail completely, a new outlet would exist. This new outlet would decrease the effectiveness of the proposed project plug and WLM structure significantly.

The proposed solution for this structure includes the construction of a plug/rock overflow structure at the current location of the Cargill culvert road crossing (Figure 13). The real estate requirements for both the construction access road as well as the plug would total 1.8 acres (see Appendix H, *Real Estate Plan*).

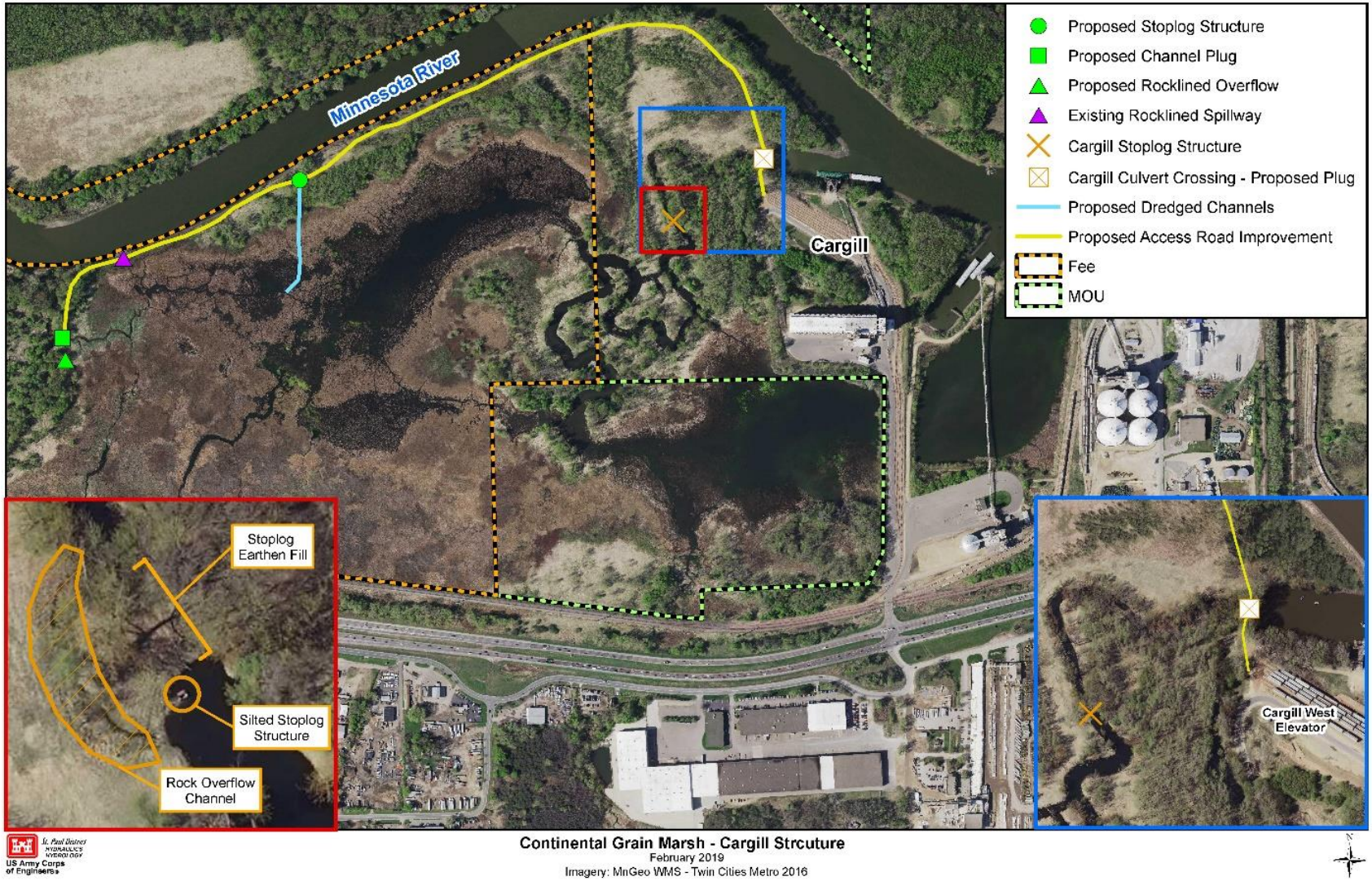


Figure 13: Existing Silted Stoplog Structure and Proposed Plug on Cargill Property

Given that the adjacent Minnesota River is a dynamic system, post-construction monitoring and adaptive management would be used to address any unplanned outcomes of the Recommended Plan. None of the project measures (WLM structures) are believed to be burdened by significant risk or uncertainty regarding the eventual success of the proposed habitat.

3.6.5 Consistency with Corps Campaign Plan

USACE has developed a Campaign Plan with a mission to "provide vital public engineering services in peace and war to strengthen our Nation's security, energize the economy, and reduce risk from disasters." This study is consistent with the Corps Campaign Plan by producing lasting benefits for the Nation, by optimizing agency coordination, and by using innovative solutions in pursuit of a sustainable, environmentally beneficial, and cost-effective ecosystem restoration design.

3.6.6 Consistency with Corps Environmental Operating Principles

USACE has reaffirmed its commitment to the environment by formalizing a set of Environmental Operating Principles (EOP) applicable to all of its decision-making and programs. The formulation of alternatives considered for implementation met all of the EOP principles.

The EOPs are:

- foster sustainability as a way of life throughout the organization;
- proactively consider environmental consequences of all USACE activities and act accordingly;
- create mutually supporting economic and environmentally sustainable solutions;
- continue to meet our corporate responsibility and accountability under the law for activities undertaken by USACE, which may impact human and natural environments;
- consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs;
- leverage scientific, economic and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner; and
- employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

The EOPs were considered during the plan formulation and the Recommended Plan is consistent with the EOPs. The Recommended Plan promotes sustainability and economically sound measures by incorporating the most natural and least cost methods for restoring habitat for aquatic plants and bird species.

4 ASSESSMENT OF EXISTING RESOURCES AND ENVIRONMENTAL CONSEQUENCES OF THE RECOMMENDED PLAN

This chapter identifies the existing conditions of the resources for the Bass Ponds HREP study area and describes the environmental consequences of the alternatives considered compared to the no-action Future Without Project condition. The depth of analysis of the alternatives corresponds to the scope and magnitude of the potential environmental impact. This chapter provides the scientific and analytic basis for the comparison of alternatives and describes the probable consequences (impacts and effects) of each alternative on the selected environmental resources. The purpose of characterizing the environmental consequences is to determine whether the resources, ecosystems, and human communities of concern are approaching

conditions where additional stresses will have an important direct, indirect, or cumulative effect (CEQ 1997).

The Recommended Plan (Alternative 11) and No-Action Alternative are the primary actions evaluated and discussed in this section. The full array of Best Buy alternatives presented in Section 4 (No-Action Alternative and Alternatives 3, 11, 35, and 43) were also considered for environmental consequences. However, these action alternatives involve many of the same restoration measures and the type and degree of the adverse impacts and would not be appreciably different from those associated with the Recommended Plan. Due to the integrated format of this document, the benefits of the alternatives were assessed in the previous section (Section 3) through the development, evaluation, and selection process. Therefore, only the effects of the Recommended Plan and No-Action Alternative are discussed in detail below.

4.1 Water Resources

4.1.1 Water Quality

Water quality in the Lower Minnesota River Watershed has persistent problems with excess phosphorus, sediment, bacteria, and other contaminants, according to a 2017 report by the MPCA (MPCA 2017). The watershed covers 1,835 square miles of south-central Minnesota and includes 87 miles of the Minnesota River, from north of St. Peter, to its confluence with the Mississippi River. The watershed includes the Minnesota Valley National Wildlife Refuge, 133 lakes larger than 10 acres, 2,482 miles of tributaries to the Minnesota River, and the many metropolitan cities including, but not limited to, Bloomington, Prior Lake, Winthrop, Waconia, New Prague, and Le Sueur.

Land use is a major factor affecting water quality. In this watershed, land use ranges from row-crop agriculture in the west to residential suburbs and urban industry in the northeast. More than 90% of the wetlands present prior to European settlement have been drained to accommodate cropland. The lack of wetlands prevents water retention on the landscape and leads to increased storm water runoff and discharges that can destabilize stream banks and increase sediment into the water. Similarly, in urban and suburban environments, impervious surfaces send huge volumes of water into storm drains and nearby bodies of water.

Impacts of the No-Action Alternative – No major changes to water quality would be expected.

Impacts of the Recommended Plan – The Recommended Plan would have temporary, short-term adverse impacts to water quality by increasing turbidity in the immediate study area where construction and excavation occur. There could also be the potential for oil spills from construction equipment; however, Best Management Practices (BMPs) would be used to minimize impacts to water quality during construction. Overall, the Recommended Plan would have a long-term, beneficial effect on water quality by increasing the overall percent coverage of aquatic vegetation. Aquatic vegetation can slow the velocity of flood waters entering the study area, allowing suspended materials to settle to the sediment surface. Excess nutrient or toxic chemicals entering the system, can be taken up by aquatic vegetation, trapped with settled soil particles or converted to less harmful chemical forms by biological processes.

4.2 Geology and Soil Substrate

The region surrounding the Bass Ponds area was glaciated extensively during the Pleistocene Epoch. Advancing and retreating glaciers laid down thick deposits of unsorted till and outwash sand that today form a hummocky, poorly-drained plain dotted with numerous marshes and small lakes. The glacial drift can reach a thickness of between 200 and 250 feet, and it overlies dolomitic limestone and sandstone of the Prairie du Chien and Jordan Formations.

The Glacial River Warren carved the wide valley of the present Minnesota River. Glacial River Warren carried large volumes of water discharging from the now-extinct Glacial Lake Agassiz located in western Minnesota and eastern North Dakota. Glacial River Warren cut deeply into bedrock, scouring and reworking an earlier valley filled with outwash, stratified drift, and till.

Episodic increases in flow caused Glacial River Warren to cut lower into the older valley, leaving remnants of higher channel bottoms as terraces. When Lake Agassiz eventually ceased to drain to the south, local drainage formed the Minnesota River and established its present floodplain in the valley.

Three alluvial and bedrock terraces rise above the Minnesota River floodplain and form regionally prominent benches paralleling the river valley. The lower terrace is 30 to 50 feet above the floodplain, the middle terrace is 75 to 115 feet above the floodplain, and the upper terrace is between 120 and 180 feet above the floodplain. The walls of the river valley form a bluff that grades into a hummocky, poorly drained regional highland.

Impacts of the No-Action Alternative – No major impacts to geology and soils would be expected.

Impacts of the Recommended Plan – Minor impacts to geology and soils would be expected due to construction of project features. Construction of the water control structure and ditch plug at Continental Grain Marsh would replace native soils with impervious materials such as concrete and clay. These features would also impact the existing topography in relatively small areas within the study area. Replacement of existing water control structures at Blue, Fisher and Rice Lakes would have a minor impact on soils as they will mainly be constructed in existing footprints. Dredging channels near control structures will remove accumulated soils but leave the native soils in place. Construction of the access roads would replace native soils with aggregate material.

4.2.1 Hazardous, Toxic, and Radioactive Waste (HTRW)

A Phase I HTRW analysis was conducted in June 2018, in accordance with ER-1165-2-132, Water Resource Policies and Authorities HTRW Guidance for Civil Works Projects (see Appendix L, *Hazardous, Toxic, and Radioactive Waste*, for the full report). Based on the desktop search and on-site inspection, this assessment revealed that there were no recognized environmental conditions. Therefore, USACE does not recommend a Phase II assessment.

There are no known HTRW sites at the study area; therefore, there are no HTRW concerns with either the No-Action Alternative or the Recommended Plan.

4.3 Wetlands

The Palustrine System in the Cowardin Classification Scheme (Cowardin et al. 1979) includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent vegetation and emergent mosses or lichens. The Palustrine System includes vegetated wetlands that are traditionally called marsh, swamp, bog, etc., but can also include water bodies often called ponds and wetlands on river floodplains. Also included in this group are shallow lakes, as defined by the MNDNR (2016), which have permanent or semi-permanent water regimes and are typically dominated by wetland habitat. Shallow lakes are a critical habitat component for Minnesota's wildlife and are characterized by aquatic plants and are generally < 15 feet deep (MNDNR 2016). The habitat type that is dominated by persistent vegetation are permanent/semi- permanent wetlands. The Refuge contains approximately 4,376 acres of permanent/semi-permanent wetlands across all the management units except the Round Lake Unit. The Wilkie Unit, which includes Blue, Fisher and Rice Lakes and Continental Grain Marsh, has approximately 1,832 acres of permanent/semi-permanent wetlands (USFWS 2018).

Per the Habitat Management Plan (HMP) for the Refuge, the goals for permanent/semi-permanent wetlands are to manage and enhance permanent/semi-permanent wetland systems to provide habitat for waterfowl, shorebirds and other waterbirds. And, to provide diverse habitat for other wetland-dependent wildlife while preserving the ecological integrity of the wetlands in the Eastern Broadleaf Forest Province (USFWS 2018).

Project impacts are summarized in Table 6. Fill material would be discharged into 3.43 acres of forested/shrub wetland and 2.15 acres of emergent wetlands. With the exception of the water control structure and western plug at Continental Grain Marsh, all project features are being constructed in previously disturbed areas.

Table 6: Project Features and Impacts

Project Feature	Permanent Impact (Acres)	Temporary Impact (Acres)
1 2-bay water control structure with associated excavator pads	0.07	0.09
5 1-bay water control structures with associated excavator pads	0.30	0.25
2 earthen plugs	0.24	
Access roads	4.67	
Channel dredging	3.55	
Rock-lined overflow channels	0.30	
Coffer dams (if needed)		0.20
Total Fill	**5.58**	**0.54**
Total Dredging	**3.55**	

Impacts of the No-Action Alternative – The aquatic resources in the study area have been adversely affected by the increased frequency and duration of high water events. These conditions have led to reduced aquatic plant diversity and habitat quality for migrating waterbirds and waterfowl. Wetlands in the study area would remain in a degraded state throughout the 50-year planning timeframe under the No-Action Alternative.

Impacts of the Recommended Plan – Short-term negative impacts to aquatic resources, primarily associated with increased water turbidity and sedimentation would occur due to construction activities. BMPs would be used to minimize effects on aquatic resources. Long-term beneficial impacts to aquatic vegetation would occur in the study area. The Recommended Plan would allow the Refuge to quickly remove flood waters from the area each spring and conduct yearly drawdowns to increase the density and distribution of aquatic plant species, ultimately improving habitat for migrating waterbirds and waterfowl.

4.4 Invasive Species

According to the HMP, the primary invasive species within the permanent/semi-permanent wetlands include: purple loosestrife, reed canary grass, non-native cattail and phragmites (USFWS 2018). Vegetation data collected on Blue Lake in 2012 and Fisher Lake in 2011 also indicated the presence of curly-leaf pondweed.

Impacts of the No-Action Alternative – Habitat in the study area will remain in a degraded state due to the frequency and duration of high water events and the failure of existing water control structures. As a result, the diversity of both native emergent and submergent aquatic vegetation will remain degraded or may decline slightly over the 50-year planning timeframe. As native vegetation declines, non-native invasive species may become dominant. High water

events also make the area difficult to access which would hinder any management activities that could take place. Invasive species identified in the Minnesota River include Asian carp and zebra mussels. Due to connectivity to the Minnesota River, Asian carp and zebra mussels could enter the study area.

Impacts of the Recommended Plan – The Recommended Plan would allow the refuge to conduct yearly drawdowns which would increase the density and distribution of native aquatic plant species. With a dense and robust native plant community, invasive species are less likely to establish or spread within the study area. Similar to the No-Action Alternative, Asian carp and zebra mussels, which are present in the Minnesota River, could enter the study area. The Recommended Plan has no measures to prevent these species from entering the study area.

4.5 Fish and Wildlife

The permanent/semi-permanent wetlands on the Refuge are important to spring and fall migratory waterfowl, waterbirds and shorebirds. The Refuge is a part of the Mississippi River Flyway, which is used by millions of birds as a migration corridor. Based on unpublished Refuge data collected annually, approximately 14 species of ducks (including mallard, wood duck, American coot, hooded merganser, ring-necked duck, green-winged teal, northern shoveler, and northern pintail) along with Canada geese and trumpeter swans are observed annually on a consistent basis. White pelicans, great blue herons and great egrets are also seen in large numbers during migration. Between three to eight species of shorebirds, depending on the water conditions (not consistently), are seen each year.

The Refuge is also home to forty-nine species of fish. Species that have been identified within the study area include crappie, bluegill, bowfin, shiners, drum, shad, sunfish, perch and bass and several minnow species. However, many of the lakes adjacent to the Minnesota River, including Blue, Fisher and Rice, have water depths less than 5 feet which limits their fishery potential.

There are seven eagle nests in the study area. Currently two are active: one is located on the southeast portion of Fisher Lake, and the other is located on the southeast corner of Continental Grain Marsh.

According to the HMP, resources of concern utilizing permanent/semi-permanent wetlands on the Refuge include: American white pelican, blue-winged teal, greater and lesser yellowlegs, mallards, pied-billed grebes, ring-necked ducks, short-billed dowitcher, trumpeter swan and Blanding's turtle (USFWS 2018a).

Impacts of the No-Action Alternative – Wetland wildlife would be negatively impacted through the continued degraded state of ecosystem structure and function within the study area. The continued frequency and duration of high water conditions would result in a less diverse aquatic plant community which would result in fewer waterfowl and other wildlife utilizing the area.

Impacts of the Recommended Plan – Fish and wildlife species are likely to avoid areas under construction; however, this effect would be minor and temporary. Following construction, the project will have a positive long-term effect on wildlife such as waterfowl, shorebirds, turtles, beavers, fish, muskrats and other wildlife species that would utilize the study area by improving habitat.

4.5.1 Federally Threatened and Endangered Species

USACE consulted the USFWS Information for Planning and Consultation (IPaC) website on 19 September 2018 to identify the potential presence of federally listed threatened and endangered species within the defined project action area. USFWS listed the northern long-eared bat

(*Myotis septentrionalis*; NLEB) and rusty patched bumblebee (*Bombus affinis*; RPBB) for the action area.

NLEB is a medium-sized bat that hibernates in caves and mines in the winter and in the summer roosts singly or in colonies under the bark or in cracks and crevices of trees. NLEB is relatively widespread, and USFWS lists NLEB as a threatened species because a fungal pathogen causing white-nose syndrome is sharply reducing populations. There are no known NLEB maternity roost trees or hibernacula in the study area (USFWS 2018b).

RPBB inhabit grasslands with flowering plants from April through October and use underground and abandoned rodent cavities or clumps of grasses above ground as nesting sites and undisturbed soil for hibernating queens to overwinter. The study area consists of saturated soils that RPBB would not use for nesting or overwintering. Vegetation in the study area does consist of flowering wetland plants that RPBB could use as a food source; however, the study area is in the "low potential" area for RPBB (USFWS 2018c).

Impacts of the No-Action Alternative – No impacts to NLEB or RPBB would be expected.

Impacts of the Recommended Plan – USACE has initially determined that the proposed project may affect NLEB. Trees will need to be removed to allow construction equipment access to the project features. Anticipated effects to the species from tree removal were consulted with USFWS under Section 7 of the Endangered Species Act,16 U.S.C. §1533(d), through a Section 4(d) Rule Streamlined Consultation Form. Consultation began on January 26, 2018. USFWS did not respond within the 30 days; therefore, no further consultation is required. To reduce potential impacts, no tree clearing will occur between late May and late July.

There will likely be no effect to RPBB. The RPBB likely uses the study area for foraging only and no removal of floral resources is anticipated. Construction will likely occur in the winter when RPBB is hibernating and flowering plants have senesced.

4.5.2 Minnesota State Listed Species

A number of species that are listed by the State of Minnesota as endangered, threatened or special concern have been historically documented in the vicinity of the project area. A review of the MNDNR Natural Heritage Information System Rare Features Database was conducted. Natural Heritage Database information was obtained from the MNDNR Division of Ecological and Water Resources through an inter-agency cooperative licensing agreement and includes the most recent July 14, 2017 update. The search included a one-mile buffer around the project area to ensure that any listed species would be included. There are a total of 36 species listed by the state of Minnesota as endangered, threatened, or of special concern that may occur within or near the project area: 15 freshwater mussels, 1 insect, 1 fish, 4 reptiles and amphibians, 2 rodents, 3 birds and 10 plants.

The project area does not provide suitable habitat for the listed mussel and plant species. Construction will take place during the winter months when any potentially listed species would be dormant. Construction restrictions (Section 6.4.1) have also been applied to the project to avoid any potential impacts.

No major impact to Minnesota state-listed species would be expected for the No-Action alternative or Recommended Plan.

4.6 Air Quality

The U.S. Environmental Protection Agency is required by the Clean Air Act to establish air quality standards that primarily protect human health. These National Ambient Air Quality Standards regulate six major air contaminants across the U.S. When an area meets criteria for

each of the six contaminants, it is called an “attainment area” for the contaminant; those areas that do not meet the criteria are called “nonattainment areas.” Scott County is classified as an attainment area for each of the six contaminants and is therefore not a region of impaired ambient air quality (EPA 2018). This designation means that the study area has relatively few air pollution sources of concern.

Impacts of the No-Action Alternative – The No-Action Alternative would have no impacts to air quality.

Impacts of the Recommended Plan – Minor, temporary increases in airborne particulates are anticipated as a result of mobilization and use of construction equipment. Frequent inspections of construction equipment will be made during construction to ensure they are properly functioning and do not release unnecessary amounts of emissions.

4.7 Noise

The Minnesota Valley National Wildlife Refuge is located in an urban area and existing noise levels are consistent with urban areas. The most significant producers of noise in the area are Highways 101 and 169, Valleyfair and Cargill. Construction would require heavy equipment to operate in the area which would generate noise during construction. This effect would only occur during construction and is anticipated to be temporary and minor. There are no sensitive receptors in the immediate vicinity; therefore, noise is not anticipated to impact quality of life.

Impacts of the No-Action Alternative – No change in noise levels would be expected.

Impacts of the Recommended Plan – The construction of the project would generate a temporary increase in noise levels associated with heavy equipment. This may lead to temporary displacement of some wildlife species and decreased recreational use; however, no long-term impacts would be expected.

4.8 Cultural Resources

The Minnesota River has been a focus of human use and occupation for thousands of years as evidenced by the many archaeological sites associated with the diverse landscape settings of the river valley. Twenty-four historic properties are recorded within 1 mile of the study area, however, no historic properties have been identified within the study area.

USACE conducted preliminary deep soil testing at Continental Grain Marsh (see Appendix M for details). USACE has also sought information from appropriate Native American groups pertaining to any properties of cultural or religious importance that may exist within the area of potential effects for the project (see Appendix A for pertinent correspondence). The preliminary survey as well as the tribes contacted have not identified any historic properties. See Appendix M, *Cultural Resources*, for additional discussion.

Impacts of the No-Action Alternative – No impact to cultural resources would be expected.

Impacts of the Recommended Plan – Preliminary surface reconnaissance and limited deep site testing within the study area indicate that the project would likely have no impacts to historic properties. There would be no permanent indirect effects to proximal recorded historic properties. Additional cultural surveys will be conducted prior to construction to verify the preliminary information. If significant archaeological phenomena are identified, steps would be taken to avoid, minimize, or mitigate adverse effects. Section 106 coordination and cultural resources management plans will be developed in consultation with various partners, such as the Native American Groups, the Minnesota State Historic Preservation Office, the USFWS, and others.

4.9 Socioeconomic Setting

The study area is located within Scott County, MN. As of the 2010 U.S. Census, the population of Scott County was 129,928, and the Census expects the county to have grown to 145,827 by July 2017 (https://www.census.gov/quickfacts/scottcountyminnesota). The largest racial/ethnic groups are White (85.6 percent) followed by Black (4.5 percent) and Native American (1.1 percent). In 2014, the median household income of Scott County residents was $90,198; however, 5.5 percent of Scott County residents live in poverty.

Impacts of the No-Action Alternative – Minor long-term adverse effects to socioeconomic resources would be expected. Human use of the study area would likely continue to decline due to the degraded state of ecosystem resources. Low aquatic plant diversity would affect the number and diversity of waterfowl utilizing the area which would impact the number of hunters using the area.

Impacts of the Recommended Plan – The project would have no measurable impacts on community cohesion, property values, industrial growth, or privately owned farms. The increase in recreational use would likely increase community, regional, and business growth, and tax revenues. In the long-term, habitat improvement would increase wetland wildlife and aquatic plant diversity. This would, in turn, increase outdoor recreational opportunities including bird watching, hunting, and fishing. In the short-term, construction activities would likely disturb recreational activities, but would also create employment opportunities.

4.9.1 Recreation and Aesthetics

The natural character of this area within the Refuge contributes to its recreational and aesthetic desirability. Blue, Fisher and Rice Lakes are located in an area of the Refuge that is open to the public. Recreational activities include wildlife viewing, hiking, biking, cross-country skiing, shore fishing and hunting (waterfowl, deer and other upland game). Continental Grain Marsh is not open to the public.

Impacts of the No-Action Alternative – A long-term decline in recreation and aesthetics may occur due to the continued degraded state of habitat and wildlife populations resulting in minor adverse landscape changes. High water events also make the study area inaccessible which would limit the number of visitors to the study area each year.

Impacts of the Recommended Plan – Short-term impacts to the aesthetic resources would occur with construction equipment and soil disturbance. In the long-term, recreational and aesthetic resources would improve as a result of a more diverse aquatic plant community (emergent and submergent) and increased populations of waterfowl and waterbirds utilizing the area during fall migration.

4.10 Environmental Justice

An evaluation of environmental justice impacts is mandated by Executive Order (E.O.) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994). This E.O. directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of its programs, policies, and activities on minority and low-income populations.

For the Bass Ponds HREP, there are no communities in the study area that would be impacted by the project. Therefore, there are no concerns with environmental justice for either the no-action alternative or the Recommended Plan.

4.11 Greenhouse Gases

Carbon dioxide (CO_2) is the primary greenhouse gas emitted from human activities, chiefly through combustion of fossil fuels (EPA 2015). Greenhouse gases absorb reflected energy from the sun and warm Earth's atmosphere. Increases in greenhouse gases have resulted in measurable warming of the Earth's surfaces and ultimately changes to some ecosystems. Wetlands are able to reduce the amount of CO_2 in the atmosphere by sequestering the gas during photosynthesis and returning oxygen to the atmosphere as a byproduct.

Neither the No-Action Alternative nor the Recommended Plan would impact greenhouse gases.

4.12 Summary of Consequences

The Recommended Plan would result in positive long-term benefits to waterfowl and waterbirds and submergent and emergent aquatic vegetation in and around the Bass Ponds study area. No federally protected species would be negatively affected. Construction of the project would cause short-term adverse effects to water quality, air quality, aesthetics, wildlife habitat, and public use. However, long-term benefits to the study area would far outweigh the short-term impacts. No negative social or economic impacts would result from the project. Environmental consequences of the proposed action are discussed below and summarized in Table 7.

Table 7: Environmental Assessment Matrix for Proposed Project

Alternative	**No Action**							**Recommended Plan (Alt 11)**						
	BENEFICIAL[a]				**ADVERSE[b]**			**BENEFICIAL[a]**				**ADVERSE[b]**		
PARAMETER	+++	++	+	0	-	--	---	+++	++	+	0	-	--	---
A. SOCIAL EFFECTS														
1. Noise Levels				X								ST		
2. Aesthetic Values						X			X			ST		
3. Recreational Opportunities					X				X			ST		
4. Transportation				X							X			
5. Public Health and Safety				X							X			
6. Community Cohesion (Sense of Unity)				X							X			
7. Community Growth & Development				X							X			
8. Business and Home Relocations				X							X			
9. Existing/Potential Land Use				X							X			
10. Controversy				X							X			
B. ECONOMIC EFFECTS														
1. Property Values				X							X			
2. Tax Revenue				X							X			
3. Public Facilities and Services				X							X			
4. Regional Growth				X							X			
5. Employment				X						ST				
6. Business Activity				X							X			
7. Farmland/Food Supply				X							X			
8. Commercial Navigation				X							X			
9. Flooding Effects				X							X			
10. Energy Needs and Resources				X							X			
C. NATURAL RESOURCE EFFECTS														
1. Air Quality				X								ST		
2. Terrestrial Habitat						X					X	ST		
3. Wetlands						X			X			ST		
4. Aquatic Habitat						X			X			ST		
5. Habitat Diversity and Interspersion						X			X			ST		
6. Biological Productivity				X					X			ST		
7. Surface Water Quality				X					X			ST		
8. Water Supply				X							X			
9. Groundwater				X							X			
10. Soils				X								ST		
11. Threatened or Endangered Species				X							X			
D. CULTURAL RESOURCE EFFECTS														
1. Historic Architectural Values				X							TBD			
2. Pre- & Historic Archeological Values				X							TBD			

[a] Beneficial: '+++' = significant; '++' = substantial; '+' = minor. [b] Adverse: '---'= significant; '--' = substantial; '-' = minor. '0' = No effect. X = Long-term effects; ST = Short-term effects, TBD = to be determined.

5 CUMULATIVE EFFECTS

Cumulative effects are changes to the environment that are caused by an action in combination with other past, present, and reasonably foreseeable actions. The actions evaluated for cumulative effects in this section include those associated with the No-Action Alternative and the Recommended Plan. Cumulative effects are studied to enable the public, decision–makers, and project proponents to consider the “big picture” effects of a project on the community and the environment. In a broad sense, all impacts on affected resources are probably cumulative; however, the role of the analyst is to narrow the focus of the cumulative effects analysis to important issues of national, regional, or local significance (CEQ 1997).

The Council on Environmental Quality (CEQ) issued a manual entitled “Considering Cumulative Effects Under the National Environmental Policy Act” (1997) which presents an 11-step process for addressing cumulative impact analysis. The cumulative effects analysis for the Bass Ponds HREP followed these 11 steps (Table 88).

Table 8: CEQ’s Approach for Assessing Cumulative Effects

Component	Steps
Scoping	1. Identify resources
	2. Define the study area for each resource
	3. Define the time frame for analysis
	4. Identify other actions affecting the resource
Describing the Affected Environment	5. Characterize resource in terms of its response to change and capacity to withstand stress
	6. Characterize stresses in relation to thresholds
	7. Define baseline conditions
Determining the Environmental Consequences	8. Identify cause-and-effect relationships
	9. Determine magnitude and significance of cumulative effects
	10. Access the need for mitigation of significant cumulative effects
	11. Monitor and adapt management accordingly

An environmental evaluation in accordance with NEPA (42 U.S.C. §4331) has been conducted for the No-Action Alternative and the Recommended Plan. To maintain brevity, the cumulative effects discussion does not include those parameters where the broad-scale impacts are negligible.

As specified by 33 C.F.R. Part 320.4(a)-(r), the categories of impacts in Table 7 were reviewed and considered in arriving at the final determination. In accordance with USACE regulations (33 C.F.R. §323.4(a)(2)), a Clean Water Act Section 404(b)(1) evaluation has been prepared and is included in Appendix B of this report. A FONSI is attached at the end of the report. If determined appropriate, the FONSI will be signed by the District Commander after the MVD Commander approves the Final Report.

The primary natural resources of the study area and its surroundings are described in Section 4 of this report. Additional descriptions of the ecological effects and benefits associated with the No-Action Alternative and the Recommended Plan can be found in Section 4 and Appendix D, *Habitat Evaluation Procedure*, of this report.

5.1 Programmatic Cumulative Effects

Table 9 shows the only two UMRR HREP projects previously constructed in the Minnesota River.

Table 9: Past, Existing, and Potential Future Ecological Restoration Projects in the Minnesota River

Project	Year Construction Completed/Proposed For Construction	Acres Affected (est)
Long Meadow Lake	2006	2340
Rice Lake	1998	807
Total		**3147**

5.2 Cumulative Effects to Wetlands

The Refuge contains many wetlands which range from wet meadows and calcareous fens to permanently flooded, mixed vegetation marshes. Water control structures have been installed on many of the Refuge's wetlands allowing water levels to be manipulated to improve wetland vegetation and productivity. Previous UMRR projects on the Refuge include Long Meadow Lake and Rice Lake. The Long Meadow Lake HREP included the installation of a water control structure which enhanced vegetation in a 1,500 acre wetland. The project also restored 45 acres of farm field to floodplain forest. The Rice Lake HREP water control structure was installed for the purpose of enhancing 288 acres of wetland. The project also included the restoration of a 40-acre farm field to bottomland hardwood forest. Overall, both previous UMRR projects restored over 1,800 acres of wetland

No-Action Alternative – The cumulative impact to wetlands in the area would be relatively minimal with the no-action alternative. The wetlands would likely remain in a degraded state within this area of the Refuge resulting in fewer waterfowl and waterbirds utilizing the area.

Recommended Plan – The Recommended Plan would enhance approximately 1,000 acres of wetland within the Refuge. By installing water control structures, water levels within the study area will be able to be managed long-term to off-set the negative impacts associated with observed increases in stream flows. Having high quality wetland habitat is beneficial for plant and animal communities, especially in a large, metropolitan area of the state.

6 RECOMMENDED PLAN

The results of the NEPA analysis, incremental cost analysis, P&G criteria evaluation, and habitat evaluation were all considered in the decision-making process along with other factors including physical features on the site, management objectives, critical needs of the region, and ecosystem needs. The Bass Ponds PDT concluded that the alternative plan that best meets the objectives is Alternative 11 (BFR5-M2). This alternative is cost-effective and justified as a "Best Buy" plan.

Alternative 11 was identified by the PDT as the NER Plan and is the Recommended Plan, and is supported by the Project Sponsor, USFWS (Appendix A, *Correspondence & Coordination*). The plan would enhance a complex of three lakes and a marsh through six WLM structures and an earthen plug (Figure 14).

Construction, operation, maintenance, repairs, rehabilitation, and replacement considerations are discussed in this section. The project schedule and initial cost estimates are provided. The project has been developed to a detailed feasibility level of design. Further details will continue to be refined in the Plans & Specifications (P&S) Stage.

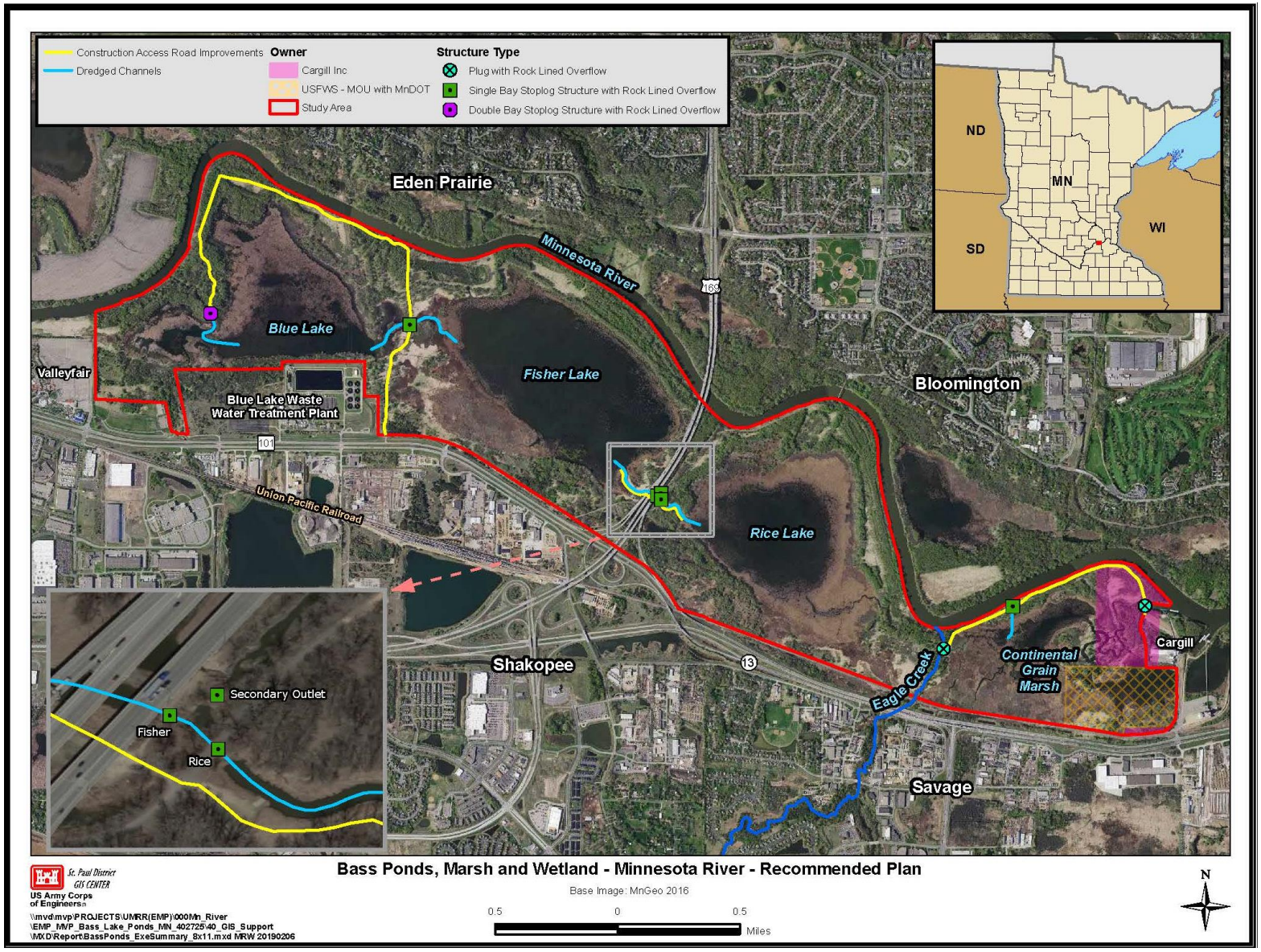


Figure 14: Bass Ponds HREP Recommended Plan

6.1 Plan Features

Each of the proposed project features are related to WLM and contribute to meeting all three of the study objectives (increasing diversity of emergent and submergent aquatic plant species and providing habitat for waterbirds and waterfowl) and are described in Table 1010.

Table 10: Summary of Main Project Features

Features	Description
Stoplog Structures - 1 Double Bay (Blue Lake) - 5 Single Bay (All other sites)	The stoplog structures improve habitat conditions by providing the ability and capacity to drawdown all three lakes and marsh, as well as fill Fisher and Rice Lakes from upstream sources. The structures consist of 5 feet wide by 6 feet high concrete bays with road crossings overtop.
Rock-lined Overflow Structure	The rock-lined overflow feature would be built around the stoplog structures and the western ditch plug. During high-flows, water would pass through the overflow channel first, preventing scour/damage to the structure itself.
Ditch Plug - 2 (Continental Grain Marsh)	Ditch plugs will be constructed of compacted soil and armored by engineered rock at two locations in Continental Grain Marsh: at the eroded channel on the west side, and at the culvert on the east side.
Access Dredging	Access dredging up- and downstream of the stoplog structures would improve hydraulic conveyance to and from the structures to provide control of water elevations between the lakes and marsh. Dredged soil will be hauled to the adjacent landfill.
Construction Access Roads	Construction access roads would provide improved, maintainable access to the stoplog structures and ditch plug. Roads would be excavated and constructed to existing topography.

USACE has constructed many water level improvement structures to improve habitat on the Upper Mississippi over the past few decades. Many of the features and recommendations have been denoted in the *Upper Mississippi River Restoration Program - Environmental Design Handbook, December 2012*. This document was used to ensure structure dimensions and design criteria were in general agreement with currently accepted design characteristics. Figure 15 is an aerial image taken in Pool 7 that shows a stoplog structure with a rock-lined overflow constructed by the USACE as part of a habitat improvement project.

The proposed rock-lined overflows for the Bass Ponds HREP would be similar. See Appendix I, *Civil Drawings,* for details.

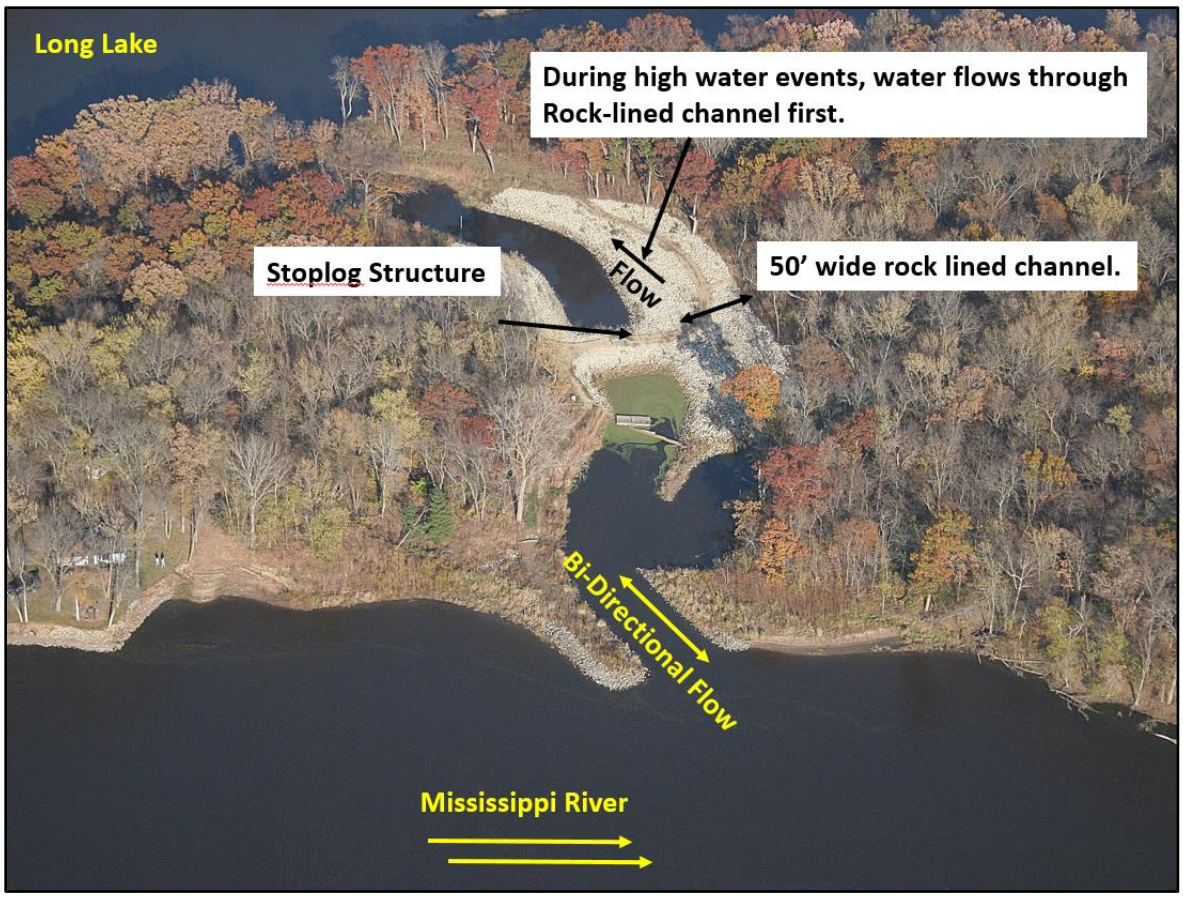


Figure 15: Example of Rock-lined Channel Constructed by USACE for the Long Lake Project

6.2 Design Considerations

The Project has been developed to a feasibility level of design (Table 1111, Table 1312). Design details are included in Appendix I, *Civil Drawings* and Appendix J, *Structural Engineerin*g. As with all feasibility level studies, these details will be refined in the Plans and Specifications (P&S) Stage.

6.2.1 Control Structures

The control structures would improve habitat conditions by providing the ability to raise, lower and/or maintain the Blue, Fisher and Rice Lake water levels. Analysis indicated that it would be more feasible to replace the existing metal structures with rectangular concrete stop log structures. Hydraulic analysis indicated that one rectangular culvert would suffice to meet requirements to allow floodwaters out of the lakes in a timely manner. The structure at Blue Lake was designed as a double-bay largely due to the high O&M at this location. The structures were designed as a 5-foot wide by 6-foot tall concrete box culvert with aluminum stoplogs (Appendix J, *Structural Engineering*). Setting the control structure invert elevation 693.00 feet (NAVD 88) would allow for opportunities to better manage water levels in the three lakes.

The marsh will also have a control structure constructed to provide the ability to raise, lower and/or maintain the Continental Grain Marsh water levels. This control structure will be located at an existing swale/crossing (Figure 14). Hydraulic analysis indicated that one rectangular culvert would suffice to meet requirements to allow floodwaters out of the marsh in a timely

manner. Setting the control structure invert elevation 693.00 feet (NAVD 88) would allow for opportunities to better manage water levels in the marsh (Table 1111).

Table 11: Top and Bottom Elevations (in feet) of Stoplog Structures in the Recommended Plan (NAVD 88)

Structure Location	From	To	Top Elevation	Bottom Elevation	Invert Elevation
Blue Lake	Blue Lake	Minnesota River	700.00	691.75	693.00
Interlake	Blue Lake	Fisher Lake	702.00	691.75	693.00
Fisher lake	Fisher lake	Channel	701.00	691.75	693.00
Rice Lake	Rice Lake	Channel	704.60	691.75	693.00
Secondary Outlet	Channel	Minnesota River	701.00	691.75	693.00
Con Grain Marsh	Con Grain Marsh	Minnesota River	701.50	691.75	693.00

6.2.2 Channel Dredging

To permit the drawdown of the lakes, channel dredging would extend from the control structure to a low point of each lake/marsh. The channel will be dredged on the upstream sides of the structures with the exception of the Interlake structure. The Interlake structure will be dredged on both the upstream and downstream sides. The channel would have a 10-foot bottom width, with 1V:4H side slopes. The channel would be excavated to a depth of 692.5 feet (NAVD 88). The dredge locations and approximate lengths of the dredged channels are listed in Table 1212. No dredging is needed on the downstream sides of the Blue and Secondary structure due to the sufficient existing channel depth of 692.5 feet or lower.

Dredged soil will be hauled to the adjacent Burnsville Landfill which is less than 2 miles east of the study area. Beneficial reuse was not pursued as the material in these channels is very soft and saturated which would not meet the requirements for suitable backfill for the structures. Other measures where this material could have been used (e.g., islands, floodplain forest) were screened out earlier in the formulation process (Section 3.3). Furthermore, due to the urban location, the material may contain contaminates which would limit reuse; soil samples will be tested for contamination to determine placement within the landfill.

Future channel dredging is not anticipated and was not included in project costs (see Section 6.5 OMRR&R for additional discussion).

Table 12: Recommended Plan: Channel Dredging

Location	Dredge Location	Dredged Channel Length (ft.)
Blue	Upstream	662
Interlake	Upstream and Downstream	2240
Fisher	Upstream	1374
Rice	Upstream	1184
Continental Grain	Upstream	717

6.2.3 Ditch Plug

Ditch plugs will be constructed of compacted soil and armored by engineered rock at two locations in Continental Grain Marsh; the eroded channel on the west side and the culvert at the road crossing on the east side. The top of the ditch plug will be set at 700.5 feet which makes the plug flush with the existing adjacent land. The side slopes for the ditch plug are 1V:4H on the upstream and downstream sides, respectively.

6.2.4 Rock-lined Overflow Structures

The rock-lined overflow feature would be built around each stoplog structure and the western ditch plug in Continental Grain Marsh. During high-flows, water would pass through the overflow channel first, minimizing the chance of scour/damage to the structure itself. The overflow channels will be approximately 50 feet wide with 24 inches of R80 riprap. The size and depth of the rock was determined using the potential average velocities over the rock overflow channel.

6.2.5 Construction Access Roads

Construction access roads would provide improved, maintainable access to the WLM structures and ditch plug (Figure 14). Roads would be graded so that drainage occurs with minimal encroachment in the floodway and would be excavated and constructed to existing topography. This would be done by excavating approximately 12 inches of material to be replaced with aggregate. The excavation depth may be reduced after soil borings are completed. The approximate length of construction access road improvements throughout the study area is 18,500 feet.

6.3 Design Quantities

Design quantities are based on topographical and bathymetry surveys performed by USACE in June, 2018. The surveys were performed for the study areas near Blue Lake, Fisher Lake, Rice Lake, and Continental Grain Marsh. Vertical Datum for the surveys is NAVD 88 and Horizontal Datum is NAD 83-MN SPCS-South Zone, U.S. Survey Feet). Estimated quantities for the Recommended Plan are summarized in Table 13.

Table 13: Estimated Quantities (cubic yards) and Footprints (acres) of Material for the Recommended Plan

Feature Type	Location	Feature Name	Fill Quantity (yd^3)	Dredged Quantity (wet) (yd^3)	Top Elevation (msl ft)
Channel Dredging	Blue Lake	BD	N/A	810	N/A
Water Level Control Structure	Blue Lake	WLC-B	N/A	N/A	699.0
Access Road	Blue Lake	AR-B	6,240	N/A	VARIES
Channel Dredging	Fisher Lake	FD	N/A	2,745	N/A
Water Level Control Structure	Fisher Lake	WLC-F	N/A	N/A	699.0
Access Road	Fisher Lake	AR-F	650	N/A	VARIES
Channel Dredging	Rice Lake	RD	N/A	1,545	N/A
Water Level Control Structure	Rice Lake	WLC-R	N/A	N/A	699.0
Access Road	Rice Lake	AR-R	650	N/A	VARIES
Channel Dredging	Interlake	ID	N/A	3,808	N/A
Water Level Control Structure	Interlake	WLC-I	N/A	N/A	699.0
Access Road	Interlake	AR-I	1,560	N/A	VARIES
Channel Dredging	Con Grain Marsh	CD	N/A	1,094	N/A
Water Level Control Structure	Con Grain Marsh	WLC-C	N/A	N/A	699.0
Ditch Plug	Con Grain Marsh	DP-C	937	N/A	700.5
Access Road	Con Grain Marsh	AR-C	3,640	N/A	VARIES
Total			**13,677**	**10,002**	

6.4 Construction Implementation

How structures are constructed is generally left to the discretion of the contractor. The contractor is responsible for providing the finished product (the structures as designed) in a manner best suited to their operation, and without causing environmental damage.

The contractor would be allowed to use available technologies, so long as they are able to meet all the other conditions, including any necessary State permits and/or water quality certifications.

Rock and fill material utilized for the rock-lined overflows can be trucked to the sites.

Generally, a balance must be struck to provide reasonable access for the construction while minimizing the environmental disturbances associated with the dredging and construction. Contractors are allowed to request alternate access routes. These requests would be evaluated on a case-by-case basis for approval and may require additional environmental review.

6.4.1 Construction Restrictions

Construction restrictions could be applied for any number of reasons. Restrictions are generally applied in the construction of habitat projects to minimize the adverse effects of construction and to protect valuable habitats. The following are the basic construction restrictions that would likely be applied in the construction of the project features.

Access Dredging – Preliminary analysis has indicated that access dredging to the Interlake Structure is limited to only the east side due to a 12" natural gas pipeline. Access dredging would be stay outside of the 80 foot right of way to avoid the pipeline.

Bald Eagles – In general, project activities will not be allowed within 660 feet of an active bald eagle nest during the nesting season. If construction activities would involve loud noises, a ½ mile buffer zone would be required during this period.

Fish – No work can be conducted in wetlands where fish may occur between April 1 and June 30.

Non-game wildlife exclusion (reptiles and amphibians, including Blanding's turtle) – If a drawdown is needed for construction, it must be completed prior to October 1.

Northern long-eared bat – No tree clearing can take place between late May and late July.

Drawdowns – At least one lake must contain water as a sanctuary for migratory birds and wildlife during project construction.

6.4.2 Construction Schedule

The length of the schedule was determined to allow the contractor to construct during low water conditions and/or winter construction starting in 2019/2020. The project duration is assumed to be two years to complete the construction.

6.4.3 Environmental Compliance and Permitting

This document will be distributed for public review and comment in compliance with NEPA. Scott County, the Responsible Governmental Unit, will concurrently ensure compliance with the Minnesota Environmental Protection Act. This will be accomplished by distributing the report for review as an EA Worksheet.

- An application for a Public Waters Work Permit from the MNDNR will be submitted. USFWS will issue a Special Use Permit for the construction work.

- The MPCA is the administering agency for Section 401 water quality certification in the State of Minnesota. MPCA issued a Clean Water Act Section 401 water quality certification waiver on March 5, 2019. A copy of the waiver can be found in Appendix B, *Clean Water Act*.

- The St. Paul District has determined that the proposed activity is in compliance with all environmental laws and regulations, including the Endangered Species Act, Clean Water Act, NEPA, and Bald and Golden Eagle Protection Act.

6.5 Operation, Maintenance, Repair, Rehabilitation, and Replacement

The estimated annual maintenance costs are $18,200 annually (see Section 6.6). Repair, rehabilitation, and replacement considerations may extend outside the 50-year period of analysis. The USFWS is expected to operate and maintain the project per the terms outlined in the Memorandum of Agreement (Appendix N).

Upon completion of construction, the USFWS would accept responsibility for the project in accordance with Section 107(b) of the WRDA of 1992, Pub. L. 102-580, 33 U.S.C. §§ 652(e)(7)(A). The operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) responsibilities of the USFWS will be addressed in the proposed Memorandum of Agreement for the project (Appendix N).

The purpose of assigning OMRR&R costs is to ensure commitment and accountability by the project sponsor. The project features require regular attention in order to manage water levels. The present value and estimated average annual OMRR&R costs for USFWS are estimated to be $18,200 annually. USFWS would be responsible for 100 percent of the operation and maintenance of the project features.

Operation and maintenance would be similar to that undertaken by the Refuge for day-to-day management of wildlife areas and other public use areas. The maintenance actions anticipated would be wildlife management activities such as inspections, monitoring water levels, cleaning structures, maintaining riprap, maintaining roads, and management of stoplogs. The Refuge may need to coordinate proposed maintenance activities with nearby stakeholders such as the MnDOT and the Blue Lake WWTP.

Future channel dredging is not anticipated to be necessary. Sediment deposition estimates range from 0.07 - 0.55 inches/year with an average value of 0.33 inches/year. Using the conservative deposition rate of 0.55 inches/year, a 50-year project life results in approximately 28 inches. Dredged channels post-deposition elevations would then increase to 694.8 feet (initially designed at 692.5 feet). This elevation is less than the full drawdown elevations (695-696.2) which do not result in impeding flow through culverts.

6.6 Project Cost Summary

After a Tentatively Selected Plan (TSP) was identified using preliminary costs, a more detailed cost estimate was completed for the final Recommended Plan. The detailed estimate of the project design and construction costs is provided in Appendix G, *Cost Estimat*e; however due to the sensitivity of providing this detailed cost information which could bias construction contract bidding, this material will be omitted in the public document. Quantities and costs may vary during final design.

Table 14 14 shows the estimated cost by account. The costs are expressed as Project First Costs and include construction, contingencies, engineering, planning, design, and construction management. The Project First Costs are the project costs at the effective price level of October 2018.

Table 14: Recommended Plan Project First Cost ($000)

Account	Item	Cost ($)	Contingency (%)	Contingency ($)	Project First Cost ($)
1	LERRDs	$61	25	$15	$76
2	Relocations (Utilities)	$40	25	$10	$50
6	Construction	$3,257	31	$994	$4,251
30	Planning, Engineering, and Design	$695	31	$212	$907
30	Adaptive Mgmt and Monitoring	$98	31	$30	$128
31	Construction Mgmt	$407	31	$124	$531
	Total	**$4,558**	**30**	**$1,385**	**$5,943**

*Numbers have been rounded to nearest thousand; Totals may not add due to rounding.

A cost summary is included in Table 1515. Annual O&M costs are estimated at $18,200 per year. Annual O&M costs for the WLM structures include adjusting stoplogs, debris removal, and maintenance.

A more refined cost estimate will be done on the final Recommended Plan using the Micro-Computer Aided Cost Estimating System), and Total Project Cost System to determine Present Value costs.

Table 15: Cost Summary for Recommended Plan

Item	Cost
Total Project First Cost	$5,943,000
IDC (2 year construction)	$171,500
Total Project Cost	$6,114,000
Average Annual Project Cost	$232,000
Annual O&M	$18,200
Total Average Annual Cost	$250,200
AAHU Gain	255
Total AA Cost / AAHU	$981

6.7 Real Estate Considerations

The land surrounding Blue, Fisher, and Rice Lakes is owned by the sponsor, USFWS (see Figure 2). The east end of Continental Grain Marsh is owned by Cargill. Although all project features will be constructed on Refuge lands owned by USFWS, a perpetual road easement will be required from Cargill in order to access the Continental Grain Marsh for construction and future maintenance (Appendix H, *Real Estate Plan*).

The Recommended Plan also accounts for the potential relocation of a fiber optic cable located at the proposed Fisher Lake outlet structure.

The exact staging area for construction will be determined during development of plans and specifications.

6.8 Project Performance (Monitoring and Adaptive Management)

The project performance assessment will allow measurement of differences from baseline conditions for key biological factors. This should allow a quantitative determination of improvement and assessment of whether features are functioning as intended. Adaptive management allows for the modification of drawdowns regimes, vegetation management features and/or documentation of the lessons learned when the functionality of the project is determined insufficient. Monitoring and adaptive management may extend for up to ten years following project completion and will be 100% federally funded. Monitoring activities to evaluate each of the projects goals and objectives are described in Appendix K, *Monitoring and Adaptive Management*, along with any documentation or adjustments required for underperforming features through adaptive management.

USACE will be responsible for determining ecological success for the ecosystem restoration projects it constructs, and will draft the final performance evaluation report (PER). USACE will also be responsible for vegetation monitoring and data analysis.

USFWS will be responsible for periodically inspecting the project features and documenting the inspection findings. USFWS will be responsible for bird monitoring and data analysis, and will provide USACE with a write-up of the bird monitoring methods and results for incorporation into the PER.

7 PLAN IMPLEMENTATION

The schedule for the feasibility study is documented in Table . After the feasibility report is approved, and an MOA is executed with USFWS, the PDT will initiate Plans & Specifications. The Preconstruction Engineering and Design phase is pending funding and will include refinements to the design of the Recommended Plan. This schedule assumes that funds will be available when needed to prepare plans and specifications and undertake construction.

Project construction would be completed in 2 years and commence in the winter of 2019/2020.

Table 16: Estimated Project Schedule

Requirement	Scheduled Date
Submit draft Feasibility Report and EA to MVD, USACE	January 2019
Submit final Feasibility Report and EA to MVD, USACE	April 2019
Obtain construction approval by MVD, USACE	May 2019
Begin Plans and Specifications	May 2019
Complete Plans and Specifications	August 2019
Advertise for Bids	August 2019
Award Contract (FY19)	September 2019
Begin Construction	December 2019
Complete Construction	Winter 2021
Complete Adaptive Management and Monitoring (10 years)	2031

8 SUMMARY OF ENVIRONMENTAL COMPLIANCE AND PUBLIC INVOLVEMENT

The planning for the Bass Ponds HREP has been an interagency effort involving the St. Paul District, the USFWS, and the MNDNR. Interagency meetings and site visits were held on a periodic basis throughout the study. In addition to the meetings, information and coordination took place on an as-needed basis to address specific problems, issues, and ideas.

The draft Feasibility Report and EA was sent to congressional interests, Federal, state, and local agencies; Native American groups; special interest groups; interested citizens; and others listed in Appendix A, *Correspondence and Coordination*.

8.1 Environmental Laws and Regulations.

This document is an integrated environmental assessment with a Clean Water Act Section 404(b)(1) Evaluation. MPCA issued a Section 401 water quality certification waiver on March 5, 2019. See Appendix B, *Clean Water Act Compliance for additional information*.

A highlight of compliance with the major environmental laws and regulations follows and is summarized in Table 17.

USACE will need to obtain a Special Use Permit for construction activities from the Refuge. Discussions with permitting agencies have not indicated any major obstacles with the issuance of permits that would be critical for construction of the project at this time.

Archaeological and Historic Preservation Act: The St. Paul District contacted the Shakopee Mdewakanton Sioux community in Scott County as part of the planning process. The cultural resources director for the Shakopee Mdewakanton Sioux participated in a site visit to the study area 20 November 2018.

USACE also conducted two site visits of the study area in the fall of 2018 to conduct preliminary shovel testing. Cultural surveys, to include deep soil testing, will be conducted in 2019 before a compliance determination can be made regarding the project.

Bald and Golden Eagle Protection Act: The Bald and Golden Eagle Protection Act prohibits anyone from taking, possessing, or transporting an eagle, or the parts, nests, or eggs of such birds without prior authorization. Disturbing an eagle to a degree that causes, or is likely to cause injury to an eagle, decrease productivity, or cause nest abandonment are considered forms of take. Activities that directly or indirectly lead to take are prohibited without a permit.

Two active bald eagle nests are located in the study area. The nest closest to project features is located adjacent to the proposed Fisher Lake structure. The USFWS recommends maintaining a buffer of at least 660 feet between project activities and active eagle nests. However, the location of access dredging through the Fisher Lake outlet is within the 660 feet of a nest. Alternate routes over 660 feet from the nest are not practicable. Construction in this area will be scheduled outside of the nesting timeframe (nesting typically occurs between February 1 – July 15). Assistance from USFWS staff would be used to monitor eagle behavior at this nest during construction activities.

Clean Water Act: The Clean Water Act (CWA; 33 USC §1251 et seq.) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States and is administered by USACE. A Section 404(b)(1) Evaluation has been prepared for the project and is available in Appendix B, *Clean Water Act Compliance*.

Section 401 water quality certification is required for actions that may result in a discharge of a pollutant into waters of the United States to ensure that the discharge complies with applicable water quality standards. MPCA issued a Section 401 water quality certification waiver which can be found in Appendix B, *Clean Water Act Compliance*.

Endangered Species Act: There are two federally-listed species that are believed or known to occur within the study area, (see Section 4.5.1). A no effect determination was made for the RPBB and a may affect, not likely to adversely affect determination was made for the NLEB.

USACE implemented the USFWS Section 4(d) Rule streamline consultation process for NLEB. FWS did not respond within 30 days, therefore no further consultation is required.

Fish and Wildlife Coordination Act: In compliance with the Fish and Wildlife Coordination Act, project plans have been coordinated with the USFWS and the MNDNR.

National Environmental Policy Act (NEPA): This document has integrated the content required of a NEPA environmental compliance document. A range of alternatives have been presented and the significance of the projects impacts have been evaluated. The document will be distributed to agencies, the public, and other interested parties to gather any comments or concerns. If no substantial effects to the environment are found during the comment period or moving forward with the project design, a FONSI will be signed by the St. Paul District Commander.

Table 17: Compliance Review With All Applicable Environmental Regulations and Guidelines

Environmental Requirement	Compliance[1]
Federal Statutes	
Archaeological and Historic Preservation Act	TBD
Bald and Golden Eagle Protection Act of 1940, as amended	Full
Clean Air Act, as amended	Full
Clean Water Act, as amended	Full
Coastal Zone Management Act, as amended	N/A
Endangered Species Act of 1973, as amended	Full
Federal Water Project Recreation Act, as amended	Full
Fish and Wildlife Coordination Act, as amended	Full
Land and Water Conservation Fund Act of 1965, as amended	Full
Migratory Bird Treaty Act of 1918, as amended	Full
National Environmental Policy Act of 1969, as amended	Full
National Historic Preservation Act of 1966, as amended	TBD
National Wildlife Refuge Administration Act of 1966	Full
Noise Pollution and Abatement Act of 1972	Full
Watershed Protection and Flood Prevention Act	N/A
Wild and Scenic Rivers Act of 1968, as amended	N/A
Farmland Protection Policy Act of 1981	N/A
Executive Orders, Memoranda	
Floodplain Management (E.O. 11988)	Full
Safeguarding the Nation from the Impacts of Invasive Species (E.O. 13112)	Full
Protection and Enhancement of Environmental Quality (E.O. 11514)	Full
Protection and Enhancement of the Cultural Environment (E.O. 11593)	Full
Protection of Wetlands (E.O. 11990)	Full
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 30 Aug 1976)	Full
Environmental Justice (E.O. 12898)	Full

[1] The compliance categories used in this table were assigned according to the following definitions:
a. Full - All requirements of the statute, E.O., or other policy and related regulations have been met for the current stage of planning.
b. Partial - Some requirements of the statute, E.O., or other policy and related regulations remain to be met for the current stage of planning.
c. Noncompliance (NC) - Violation of a requirement of the statute, E.O., or other policy and related regulations.
d. Not Applicable (N/A) - Statute, E.O., or other policy and related regulations not applicable for the current stage of planning.
[2] 401 water quality certification required.
[3] Full compliance to be achieved with the District Engineer's signing of the Finding of No Significant Impact.

8.2 Coordination, Public Views, and Comments

USACE distributed a Communication Flyer to potentially interested stakeholders and agencies in the summer of 2018 regarding the beginning of a feasibility study in the area (a copy can be viewed in Appendix A, *Correspondence and Coordination*).

The USFWS, the project sponsor, supports the Recommended Plan. Letters of support for the project can be found in Appendix A, *Correspondence and Coordination*.

USACE released the draft feasibility report and integrated environmental assessment for the project for public review in February 2019. Overall, no comments were received during the comment period that would impact plan selection; a summary is included in Appendix A, *Correspondence & Coordination*.

A public meeting was held in Bloomington, MN, at the Minnesota Valley National Wildlife Refuge Visitor on February 12, 2019 to present the TSP and field questions from the public. Three members of the public attended the meeting. No significant concerns with the project were raised at the meeting.

9 RECOMMENDATION

The Recommended Plan is Alternative 11, which includes one double bay stoplog structure (Blue Lake), five single bay stoplog structures (Interlake, Fisher Lake, Rice Lake, Secondary Outlet, and Continental Grain Marsh), a plug at Continental Grain Marsh, and access dredging and construction road improvements to each structure.

Because the project is located on national wildlife refuge lands, project costs would be 100-percent Federal in accordance with Section 906(e) of the WRDA of 1986, Pub. L. 99-662, 33 U.S.C. § 2283(e). The estimated project first cost at current price levels is $5,943,000 (including sunk general design costs). Upon completion, the USFWS would be responsible for OMRR&R at an estimated annual cost of $18,200. The Recommended Plan also includes monitoring and adaptive management, which could total up to $128,000, for which USACE would be responsible. Total average annual project costs amount to $250,000.

The expected outputs of the Recommended Plan include the enhancement of 2,000 acres of lake and wetland habitat. The Recommended Plan will contribute 255 average annual habitat units for fish and wildlife over the 50-year period of analysis to the National Environmental Quality Account at an average annual cost of $981 per average annual habitat unit.

I have weighed the accomplishments to be obtained from the Bass Ponds, Marsh, and Wetland Habitat Rehabilitation and Enhancement Project against the cost and have considered the alternatives, impacts, and scope of the proposed project. Therefore, I recommend that the Bass Ponds, Marsh, and Wetland Habitat Rehabilitation and Enhancement Project for habitat restoration and enhancement in the Minnesota Valley National Wildlife Refuge be approved for construction.

The recommendations contained herein reflect the information available at this time and current department policies governing formulation of individual projects under the continuing authorities UMRR Program. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works continuing authorities program nor the perspective of higher review levels within the Executive Branch.

Samuel L. Calkins
Colonel, Corps of Engineers
District Commander

10 FINDING OF NO SIGNIFICANT IMPACT

Regional Planning and

Environment Division North

DRAFT FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act, Endangered Species Act, Clean Water Act, National Historic Preservation Act, Executive Orders, and other environmental laws and regulations, the St. Paul District, Corps of Engineers, has assessed the environmental impacts of the following project.

BASS PONDS, MARSH, AND WETLAND HABITAT REHABILITATION AND ENHANCEMENT PROJECT

MINNESOTA RIVER, MINNESOTA

Congress authorized the UMRR Program in Section 1103 of the WRDA of 1986, as amended in the WRDA of 1999 (Public Law 106-53), 33 U.S.C. § 652, for planning, construction, and evaluation of fish and wildlife HREPs.

The Bass Ponds, Marsh, and Wetland HREP evaluated 45 alternatives in detail, including the No-Action Alternative, to find a cost effective plan that best met the project goals and objectives. The proposed project alternative, at a first cost of approximately $5,866,000, includes the construction of 6 WLM structures, associated rock-lined overflow channels, 1 earthen ditch plug, access dredging, and access road improvements to the structures. This plan would improve submergent and emergent aquatic vegetation on approximately 1,000 acres of aquatic and wetland habitat, and improve habitat for migratory waterbirds and waterfowl.

An integrated Feasibility Report and EA and 404(b)1 Evaluation was prepared and sent out for agency and public review. A public meeting will also be held to solicit input. No major issues are expected.

This FONSI is based on the following factors: the proposed project would have long-term beneficial impacts on the aquatic and wetland environment, as well as recreational opportunities; short-term minor adverse impacts on the aquatic and terrestrial environment, recreation, noise, air, and water quality during construction; minor beneficial impacts to the economic and social environment; and may affect the federally listed northern long-earned bat, but will not result in prohibited take.

The environmental review process indicated that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement will not be prepared.

_____
Date

SAMUEL L. CALKINS
Colonel, Corps of Engineers
District Commander

11 LITERATURE CITED

Devendorf, R.D. 2013. A Dabbling Duck Migration Model for the Upper Mississippi River. U.S. Army Corps of Engineers, St. Paul District.

U.S. Environmental Protection Agency. 2015. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013. U.S. Environmental Protection Agency, Office of Atmospheric Programs, Washington, DC.

2018. Minnesota Nonattainment/Maintenance Status of Each County by Year for All Criteria Pollutants. https://www3.epa.gov/airquality/greenbook/anayo_mn.html. Accessed November 15, 2018.

Lower Minnesota River Watershed District. 2018. Draft Watershed Management Plan.

Minnesota Pollution Control Agency. 2011. Revisiting the Minnesota River Assessment Project. An Evaluation of Fish and Invertebrate Community Progress. https://www.pca.state.mn.us/sites/default/files/lrwq-s-2sy11.pdf.

2017. Lower Minnesota River Watershed Monitoring and Assessment Report. https://www.pca.state.mn.us/sites/default/files/wq-ws3-07020012b.pdf.

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

2000. Planning Guidance Notebook, ER1105-2-100.

2004. Long Meadow Lake Habitat Rehabilitation and Enhancement Project. Definite Project Report and Integrated Environmental Assessment (SP-26). https://www.mvr.usace.army.mil/Portals/48/docs/Environmental/EMP/HREP/MVP/LongMeadowLake/LongMeadowLakeappend.pdf

2012a. Rice Lake Habitat Rehabilitation and Enhancement Project, Project Evaluation Report. Environmental Management Program for the Upper Mississippi River System. https://www.mvr.usace.army.mil/Portals/48/docs/Environmental/EMP/HREP/MVP/RiceLakeMN/RiceLakeMN_PER_2012.pdf.

2012b. Environmental Design Handbook. Chapter 5. Localized Water Level Management. Upper Mississippi River Restoration Environmental Management Program.

2018. U. S. Army Corps of Engineers. U.S. Army Corps of Engineers Climate Hydrology Assessment (ECB 2018-14). Climate Preparedness and Resilience Community of Practice. Washington, D.C, 2018.

U.S. Fish and Wildlife Service. 1980. Habitat Evaluation Procedures. https://www.fws.gov/policy/ESMindex.html.

2018a. Minnesota Valley National Wildlife Refuge Habitat Management Plan. Bloomington, MN.

2018b. Townships Containing Documented Northern Long-eared Bat Maternity Roost Trees and/or Hibernacula in Minnesota. Updated 1 April 2018. Online at: http://files.dnr.state.mn.us/eco/ereview/minnesota_nleb_township_list_and_map.pdf (Accessed 17 September 2018).

2018c. Rusty Patched Bumble Bee Map. Online at: https://www.fws.gov/midwest/endangered/insects/rpbb/rpbbmap.html (Accessed 17 September 2018).

Water Resource Council. 1983. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.