Attachment A

Reno Bottoms UMRR-HREP Project Environmental Assessment and Supplemental Environmental Assessment

Reno Bottoms Habitat Rehabilitation and Enhancement Project

Feasibility Report and Integrated Environmental Assessment

Upper Mississippi River Restoration Program

US Army Corps of Engineers®
St. Paul District

St. Paul District Army Corps of Engineers
Project Sponsor: U.S. Fish and Wildlife Service
Mississippi River: Miles 671-682
June 2023

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Executive Summary

This Feasibility Study Report with Integrated Environmental Assessment investigates the feasibility of alternative measures to address problems and opportunities associated with the Reno Bottoms Habitat Restoration and Enhancement Project (Project), part of the Upper Mississippi River Restoration (UMRR) Program.

The 14,000-acre Reno Bottoms site is located at the border of Minnesota and Iowa in a backwater area of Pool 9 of the Mississippi River between Lock and Dams 8 and 9. The main channel of the Mississippi River flows along the eastern side of Reno Bottoms. The land is owned by the Federal government and managed by the US Fish and Wildlife Service's Upper Mississippi River National Wildlife and Fish Refuge (Refuge). The Refuge was established by Congress to provide habitat for many 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 important and unique floodplain forest, marsh wetland, side channel, and backwater lake habitat of the Reno Bottoms project area has experienced significant degradation over the last century and is predicted to further degrade over the coming decades. Several factors including: altered hydrology, historic and current land use, invasive species, disease, and herbivory have reduced the resilience and diversity of the forest community. Degradation of backwater and channel habitats in the Reno Bottoms study area has also occurred because of increased flooding, sediment deposition, and side channel development.

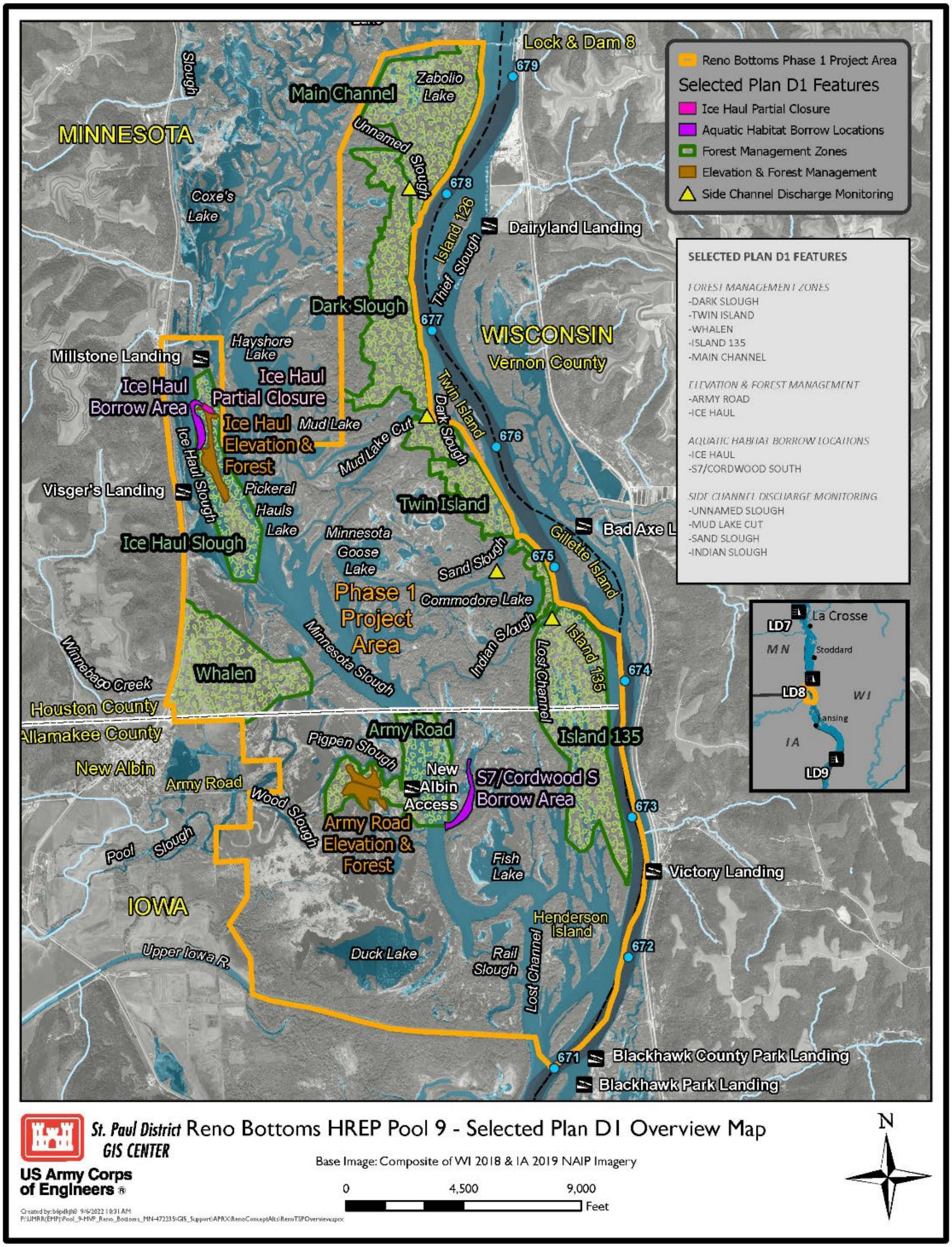
The primary objective of the project is to protect, enhance, restore, or create naturally regenerating, resilient, and diverse bottomland forest habitat, prioritizing connectivity to existing bottomland forest habitats and expanding interior forest conditions. Bottomland forest habitat is vital to wildlife such as birds, mammals, amphibians, insects, and reptiles that rely on the floodplain for food, shelter, rest, or breeding and enhancing forest habitat directly benefits those species. The two secondary objectives are a) protect, enhance, restore, or create backwater habitats, and provide flow conditions and sediment dynamics that will benefit native fish and mussel populations that live in or depend on, those habitats and b) protect, enhance, restore, or create flowing channel habitats to provide flow conditions and sediment dynamics that will benefit native fish and mussels that live in, or depend on, those habitats. Priority was placed on achieving the primary forestry objective while simultaneously considering ways to achieve secondary objectives in a manner that supported and complemented the primary objective.

The Project Delivery Team identified a variety of measures that could be taken to achieve project objectives, including water level management structures, forest management actions, and geomorphic modifications, including elevation of the floodplain forest. The measures were combined in various logical combinations to form 13 alternative project plans.

The results of the National Environmental Policy Act analysis, incremental cost analysis, habitat evaluation, and criteria evaluation (effectiveness, completeness, cost-effectiveness, acceptability, constructability) were all considered in the decision-making process. The "best-buy" Alternative D1 "Keystone Features with Aquatic Diversity" best met the study objectives, is the national ecosystem restoration plan, the max benefits plan across all benefit categories and is supported by the Project Sponsor, the US Fish and Wildlife Service. For those reasons, Alternative D1 was identified as the Recommended Plan.

The Recommended Plan, shown in Figure ES-1, would increase the quality and extent of floodplain forest habitat and expand fisheries overwintering habitat within the study area. Work would include forest management of 546 acres, elevation enhancement and forest management of 56 acres, construction of a partial closure at Ice Haul Slough inlet, overwintering habitat creation over 27 acres, and side and interior channel discharge monitoring. The Recommended Plan addresses project objectives and would be 100% federally funded. Total project first cost is $39 million in FY 23 price levels (total, fully funded project cost estimate of $43.6 million), with 228 average annual habitat unit gain, and a cost of $6,248 per average annual habitat unit. The Recommended Plan was designed to be resilient under future conditions and incorporates highly effective restoration measures to restore high quality and valuable floodplain forest to the Upper Mississippi River.

Figure ES-1: Reno Bottoms Habitat Restoration and Enhancement Project Recommended Plan



RENO BOTTOMS HABITAT REHABILITATION AND ENHANCEMENT PROJECT

FEASIBILITY REPORT AND

INTEGRATED ENVIRONMENTAL ASSESSMENT

MISSISSIPPI RIVER

HOUSTON COUNTY, MINNESOTA

ALLAMAKEE COUNTY, IOWA

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Report Acronym List

Acronym	Definition
AAHU	Average Annualized Habitat Unit
APE	Area of Potential Impact
Aquatic HEP	Bluegill Habitat Suitability Index Model
ATV	All-Terrain Vehicle
BMP	Best Management Practice
CE/ICA	Cost Effectiveness Analysis and Incremental Cost Analysis
CEQ	Council Of Environmental Quality
CO_2	Carbon Dioxide
Council	Mn Lessard-Sams Outdoor Heritage Council
CY	Cubic Yards
dbh	Diameter At Breast Height
DO	Dissolved Oxygen
E.O.	Executive Order
EA	Environmental Assessment
ECB	Engineering Construction Bulletin
EIS	Environmental Impact Statement
EJ	Environmental Justice
EJSCREEN	EPA Environmental Justice Screening and Mapping Tool
EOP	Environmental Operating Principles
EPA	Environmental Protection Agency
ER	Engineering Regulation
ESA	Endangered Species Act
FDS	Fayette-Dubuque-Stonyland
FONSI	Finding of No Significant Impact
Forest HEP	Upper Mississippi River System Floodplain Forest Habitat Model
FSM	Forest Succession Model
FWWG	Fish and Wildlife Work Group
FY	Fiscal Year
GIS	Geographic Information Systems
GLO	General Land Office
HEP	Habitat Evaluation Procedure
HGM	Hydrogeomorphic
HNA-II	Second Habitat Needs Assessment
HREP	Habitat Rehabilitation and Enhancement Project
HSI	Habitat Suitability Index
HTRW	Hazardous, Toxic, and Radioactive Waste
HU	Habitat Unit
IDNR	State of Iowa's Department of Natural Resources
IDNR	Iowa Department of Natural Resources
IPaC	Information for Planning and Consultation
lentic	Lake-Like, Still Water
lotic	Flowing Water
LTRM	Long Term Resource Management
MNDNR	State of Minnesota's Department of Natural Resources

MOA	Memorandum of Agreement
MVD	Mississippi Valley Division
NAVD 88	North American Datum of 1988
NED	national economic development
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NESP	Navigation and Environmental Sustainability Program
NHPA	National Historic Preservation Act
NLEB	Northern Long-Earred Bat
NRHP	National Register of Historic Places
O&M	Operation & Maintenance
OMRR&R	Operation, Maintenance, Repair, Rehabilitation, And Replacement
OSE	Other Social Effects
Outputs	Quantified Habitat Benefits
P&S	Plans and Specifications
PCB	Polychlorinated biphenyls
PDT	Project Development Team
PER	performance evaluation report
PIR	Reno Bottoms Forest Restoration Project Implementation Report
PR&G	USACE Planning Guidance Notebook
Project	Reno Bottoms Habitat and Restoration Project

RECONS	Regional ECONomic System
RED	Regional Economic Development
Refuge	Upper Mississippi River National Wildlife and Fish Refuge
RRF	River Resources Forum
SAV	Submersed Aquatic Vegetation
RP	Recommended Plan
SSC	Suspended Sediment Concentrations
TLP	Thin Layer Placement
TSP	Tentatively Selected Plan
TSS	Total Suspended Solids
UMR	Upper Mississippi River
UMRR	Upper Mississippi River Restoration
UMRS	Upper Mississippi River System
Upper Impounded Reach	Pools 1-13 on the Mississippi River
USACE	US Army Corps of Engineers
Corps	St. Paul District US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey
UTV	Utility Terrain Vehicle
WER	Water Exchange Ratios
WIDNR	Wisconsin Department of Natural Resources
WRDA	Water Resources Development Act

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. WRDA 1999 Section 509 (Public Law 106-53) reauthorized the UMRR 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 the US Army Corps of Engineers (USACE) with the authority to plan, design, and construct HREPs and is the authority under which this study is being conducted.

1.2 Study Purpose and Scope

The Reno Bottoms HREP Feasibility Report with Integrated Environmental Assessment (EA) evaluates the proposal for the Reno Bottoms HREP (Project) within the UMRR program. The Feasibility Report and Integrated EA meets USACE planning guidance and National Environmental Protection Act (NEPA) requirements and provides provide planning, engineering, and construction details of the selected rehabilitation plan.

This main report summarizes the multidisciplinary efforts and analysis that led to the identification of the Recommended Plan. The report includes considerations of design, construction, operations, and maintenance; a cost estimate; a monitoring plan to gage restoration performance; real estate requirements; environmental effects; and a 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 Reno Bottoms HREP included a team from the USACE St. Paul District (Corps), US Fish and Wildlife Service (USFWS), the State of Minnesota's Department of Natural Resources (MNDNR), the State of Wisconsin's Department of Natural Resources (WIDNR), and the State of Iowa's Department of Natural Resources (IDNR). Technical support in modeling and forest response analysis was also provided by the United States Geological Survey (USGS).

Table 1-1 and Table 1-2 list individuals who played an active role in the planning of the Reno Bottoms project.

Table 1-1. Corps Project Delivery Team.

Name	Role
Angela Deen	Program/Project Manager
Jill Bathke	Planner/Study Manager
Paul Morken	Civil Engineer
Jon Hendrickson	Technical Lead, Hydraulics and Hydrology Engineer (Retired September 2022)
Ryan Frykman	Technical Lead (November 2022)
Emily Moe	Hydraulics and Hydrology Modeler
Alex Le	Climate Change Modeler
Sally Swenson	Cost Engineer
Megan McGuire	Biologist
Trevor Cyphers	Biologist
Dan Kelner	Mussel Biologist
Andy Meier	Forester
Luke Schmidt	Geotechnical Engineer
Brad Perkl	Archeologist
Kevin Hanson	Cartographer
Jacquie Kovarik	Cartographer
Natalie Mcglinch	Economist
John Henderson	Construction
Eduardo Torrens-Bonano	Civil Engineer/Surveys
Ashley Woods	Geology and HTRW
Kevin Berg	Mississippi River Recreation Section Manager

Table 1-2. Agency Partners Project Delivery Team.

Name	Role, Agency
Taylor Huinker	Hydrologist, MNDNR
Lucas Youngsma	Hydrologist, MNDNR
Neil Rude	Biologist, MNDNR
Kirk Hansen	Mississippi River Habitat Coordinator, IDNR
Brenda Kelly	Project Contact/Wildlife Biologist, WIDNR
Jeff Janvrin	Biologist, WIDNR
Kendra Pednault	District Manager, USFWS
Wendy Woyczik	Deputy District Manager, USFWS
Billy Reiter-Marolf	Wildlife Biologist, USFWS
Jeffery Butler	Forester, USFWS & Audubon
Steve Winter	Wildlife Biologist, USFWS
Nick Utrup	Fish and Wildlife Biologist, USFWS
James Myster	RHPO/Archaeologist, USFWS
Heidi Keuler	Fish Habitat Biologist, USFWS
Sharonne Baylor	Environmental Engineer, USFWS
Bruce Henry	Forest Ecologist, USFWS
Molly Van Appledorn	Researcher/Ecologist, USGS
Nate DeJager	Principal investigator/Team Lead, USGS
Enrika Hlavacek	Researcher, USGS

1.4 Decisions

1.4.1 U.S. Army Corps of Engineers

Because the proposed project is funded by the Corps, 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 finding of no significant impact (FONSI) or whether an Environmental Impact

Statement (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

The U.S. Fish and Wildlife Service is the project sponsor. Because the project would be located on land managed by the Upper Mississippi River National Wildlife and Fish 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 has been integral in the decision-making process for the Feasibility Report.

The Regional Director will also determine:

- USFWS approval for the selected alternative for potential implementation and if the USFWS will assume operation and maintenance responsibilities.
- 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.

Before any work is commenced under a construction contract, the Corps 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 States

Decisions to be made by the States of Minnesota and Iowa include archeological and cultural impacts review and a no-rise certification. The States of Minnesota and Iowa have been partnering agencies in the decision-making process for the Feasibility Report. The State of Wisconsin has also been a partnering agency, but no work is proposed within the State boundary. This project would seek 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, all three state partnering agencies as well as the USFWS and USGS are on the RRF.

1.5 Project Selection Process

1.5.1 Eligibility Criteria

In January 1986, a *General Plan* for implementation of the UMRR Program was completed. Programmatic updates of the *General Plan* for budget planning and policy development are accomplished through Annual Addenda. Coordination with affected States (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) and the USFWS during the preparation of the *General Plan* and Annual Addenda led to an examination of the *Comprehensive Master Plan* (*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 of WRDA 1986.

The *Master Plan* report and the Section 1103 of WRDA 1986 authorizing legislation does not pose explicit constraints on the kinds of projects to be implemented under the UMRR-HREP. However, the First and Second Annual Addendums provide guidance on the eligibility criteria for HREP projects. The Reno Bottoms HREP is consistent with that eligibility criteria as it has "a direct relationship…between the project and the central problem as defined by the Master Plan" (First Annual Addendum) and would include backwater dredging, island construction, and side channel closures (from the Second Annual Addendum).

1.5.2 Project Selection

Projects are nominated for inclusion in the St. Paul District's habitat restoration program by a State natural resource agency or the USFWS, based on agency management objectives. To assist the Corps in the selection process, the States and USFWS have agreed to use the expertise of the Fish and Wildlife Work Group (FWWG) of the 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 Corps and each agency officially notifies the Corps of its views on the ranking. The Corps 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 Reno Bottoms HREP was first identified in October 2017 by the FWWG for consideration in USACE's St. Paul District habitat projects program. The study was funded and began in 2019. The Factsheet and updated priority list can be referenced in Appendix A, Correspondence & Coordination.

1.6 Study Area

The 14,000-acre Reno Bottoms study area is located within the Upper Mississippi River National Wildlife and Fish Refuge (Refuge) in Houston Co, Minnesota and Allamakee Co, Iowa. It is located completely within Pool 9 between river miles 671-682 (Figure 1-1). The area is bounded on the west by the Canadian Pacific Railroad, on the east by the main Mississippi River navigation channel, on the north by the Lock and Dam 8 dike, and on the south by the Upper Iowa River. The closest communities to the project area are New Albin, Iowa and Reno, Minnesota.

Reno Bottoms is a mix of marsh wetlands, floodplain forests, side channels, and backwater lakes that provide important habitat and recreational opportunities. The mixed habitat resembles what the Mississippi River looked like prior to lock and dam construction and provides a unique opportunity to rehabilitate and preserve a portion of the Upper Mississippi River.

The forest, marsh, backwaters, and flowing water areas provide vital habitat to many fish and wildlife. Reno Bottoms is a stop on the internationally important Mississippi River migratory bird flyway. This globally significant migratory flyway is used by 40% of North America's waterfowl and shorebirds and is also an important migration corridor for raptors and neotropical songbirds and insects, including the monarch butterfly. Dabbling ducks gather in the shallow backwaters. Birders of all ages enjoy watching and listening for a wide variety of birds including bald eagles, red-shouldered hawks, prothonotary warblers, and great blue herons.

Floodplain forests and wetlands provide habitat to frogs, toads, wood ducks, woodpeckers, and river otters. The backwater lakes provide important dabbling duck, muskrat, bass, and panfish habitat.

Reno Bottoms is a locally well-visited location for various outdoor activities. Within the Bottoms, there are four public boat launches (from north to south: Reno Landing, Millstone Landing, Visger's Landing, and New Albin Landing) that serve as water access for a variety of activity such as: fishing, kayaking, canoeing, and bird watching. There are an additional six public launches on the main channel of the Upper Mississippi River, immediately east of the project site. During winter, ice houses and ice fishing occurs throughout the project area, especially around Ice Haul Slough and Hayshore Lake. There is no tracking of individual recreation participation or permits for individuals required to use the project site. States may require permits for large groups or fishing tournaments. The FWS requires a permit for commercial activities, although none have been issued in Reno Bottoms.

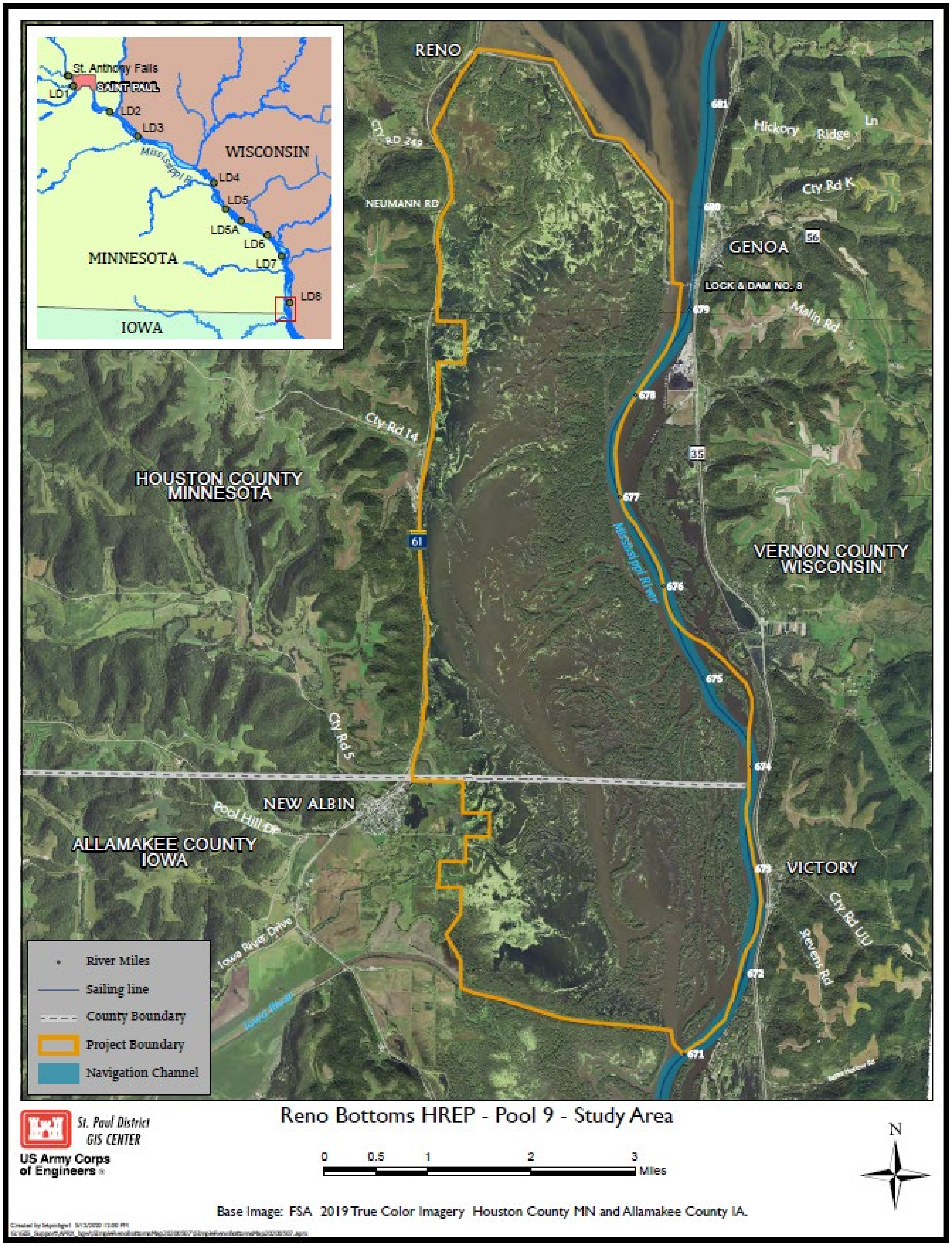


Figure 1-1. Reno Bottoms Initial Study Area.

1.6.1 Upper Mississippi River National Wildlife and Fish Refuge

Established in 1924, the Refuge encompasses more than 244,500 acres across 261 miles of the river valley from Wabasha, MN, to Rock Island, IL (U.S. Fish and Wildlife Service, 2019). The Refuge is divided into four districts: Winona, LaCrosse, McGregor (in which the Reno study area is located), and Savanna Districts.

Created as a refuge for fish, wildlife, and plants and a breeding place for migratory birds, the Refuge encompasses one of the largest blocks of floodplain habitat in the lower 48 states. Bordered by steep wooded bluffs that rise 100 to 600 feet above the river valley, the Mississippi River corridor and refuge offer scenic beauty and uniquely productive fish and wildlife habitat. Refuge habitat includes broad pools, islands, braided channels, extensive bottomland forest, floodplain marshes and occasional sand prairie. These habitats are critical to mammals, waterfowl, songbirds and raptors, amphibians, and reptiles.

In 2021, 192 active bald eagle nests were documented in Pool 9 (USFWS unpublished data). As of 2014, there were 12 active great blue heron nesting colonies with 2,681 nests (unpublished refuge data). The Refuge and the Mississippi River within it support 119 fish species that, in turn, support a strong commercial and recreational fishery (USFWS, 2006).

At the top of Pool 9 of the Refuge, the Reno Bottoms Research and Natural Area is a Special Designated Area within the Refuge. As a Special Designated Area, Reno Bottoms is uniquely identified in its contribution to the preservation of examples of significant natural ecosystems. It is also a research area where “ecological observation and studies can be conducted with minimal disturbance, and natural process can evolve without significant human intervention.”

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

1.7.1 Reno Bottoms Navigation and Ecosystem Sustainability Program Study

In 2011, the Corps completed the *Reno Bottoms Forest Restoration Project Implementation Report* (PIR). It presented a proposal for the restoration of forested floodplain habitat in the Reno Bottoms area. The PIR provided a description of the restoration project’s recommended management alternative, justifies its implementation, establishes ecosystem restoration goals and specific performance indicators by which to measure the project’s success, and includes a monitoring plan and a timeline for the demonstration of project completion. The PIR was developed in coordination with the Navigation and Environmental Sustainability Program (NESP), a long-term program of navigation improvements and ecological restoration for the UMRS. NESP was authorized by Congress as H.R.1495 (Water Resources Development Act of 2007). Five alternatives, including a No-Action Alternative, were identified, and evaluated. Action alternatives included eradication and control of reed canary grass, establishment of forest cover via artificial and natural tree regeneration (establishment of young trees), enhancement of topographic diversity and establishment of forest cover, and a combination of the various actions. The Reno HREP Project Development Team (PDT) relied on the information presented in the PIR for background information on the site and in the identification of potential measures to address habitat problems at the project site. All the measures included in the PIR are also incorporated and evaluated in this Report.

1.7.2 Lock and Dam 8 Embankment Modifications, Navigation and Ecosystem Sustainability Program Project Y1, Interim Report, 2010

Navigation and Ecosystem Sustainability Program (NESP) funds were used to investigate flow modifications at the Lock and Dam 8 embankment to restore more natural hydrology in Reno Bottoms. An interim report dated 30 September 2010 resulted from this. One-dimensional (HEC-RAS) and two-dimensional (ADH) modeling was done to simulate the effects of embankment modifications. Initially the modeling focused on increasing flows through the existing spillways in the Lock and Dam 8 embankment. This was followed by modeling to investigate the effects of reducing flows through the embankment and at two side channels that enter Reno Bottoms further upstream along the main channel. Some of the products and findings of the NESP study that were relevant to the current Reno Bottoms HREP included:

- A data-base of water surface elevation in Reno Bottoms versus discharge at Lock and Dam 8 was developed by installing stage gages at locations in Reno Bottoms that were accessible by roadway so that local observers could read the gages on a regular basis.
- A data base of measured discharge and water exchange ratios through lateral connections between the main channel and Reno Bottoms. This included measured flows at the culverts and side channels.
- Simulation of the 1930 (pre-lock) reference condition hydrology in Reno Bottoms indicated that for low to average flow conditions, the inflows through Running and Pickerel Sloughs were similar to existing conditions, but then increased significantly for higher flows.

1.7.3 Hydrogeomorphic Workshop for the Reno Bottoms Area

A hydrogeomorphic (HGM) workshop for the Reno Bottoms Area was held on September 28th and 29th, 2009 in New Albin, Iowa. The workshop was conducted using a contract between the Corps and HDR Engineering, who subcontracted the work to Greenbrier Wetland Services out of Missouri (Heitmeyer et al. 2009). This was towards the end of the NESP study so data and modeling results from the NESP study were used in the workshop along with the combined knowledge of over 20 river professionals from federal and state agencies familiar with Reno Bottoms. Some of the main changes/alterations to the system identified by workshop attendees included:

- Expanded side cuts with head cutting of channels
- Overall “wetter” condition, with more frequent, prolonged, growing season flooding and soil saturation
- Gradual shift in communities to wetter types that resulted in decreased forest and correspondingly increased marsh, wet meadow, and aquatic habitats.
- Declines in diversity of communities, at least in the forest component
- Sedimentation in some floodplain areas, including some slough channels and old depressions
- A shift in the stage-discharge curve from pre-lock conditions to existing conditions so that for a given discharge water surface is higher during low-flow periods and lower during the high-flow periods

The attendees identified objectives and measures to restore Reno Bottoms. These were focused on restoring natural hydrology similar to pre-lock conditions, restoring healthy and diverse floodplain forest communities, and restoring backwater, marsh, and slough habitat. At this point in time the focus was still on restoring more natural hydrology, with flows through the Lock and Dam 8 embankment similar to pre-lock conditions.

1.7.4 Lessard Sams Ice Haul Fish Habitat Project

The MN Lessard-Sams Outdoor Heritage Council (Council) is responsible for providing annual funding recommendations to the MN legislature that directly relate to the restoration, protection, and enhancement of wetlands, prairies, forests, and habitat for fish, game, and wildlife, and that prevent forest fragmentation, encourage forest consolidation, and expand restored native prairie. The Council recommended and the legislature approved funding for restoration work at Reno Bottoms in North Ice Haul Slough, adjacent to Millstone Landing. Work includes forest elevation/enhancement and habitat dredging. State environmental assessments are underway, but the approximate work boundary is shown in Figure 1-2. Work would commence approximately 2024-2025.

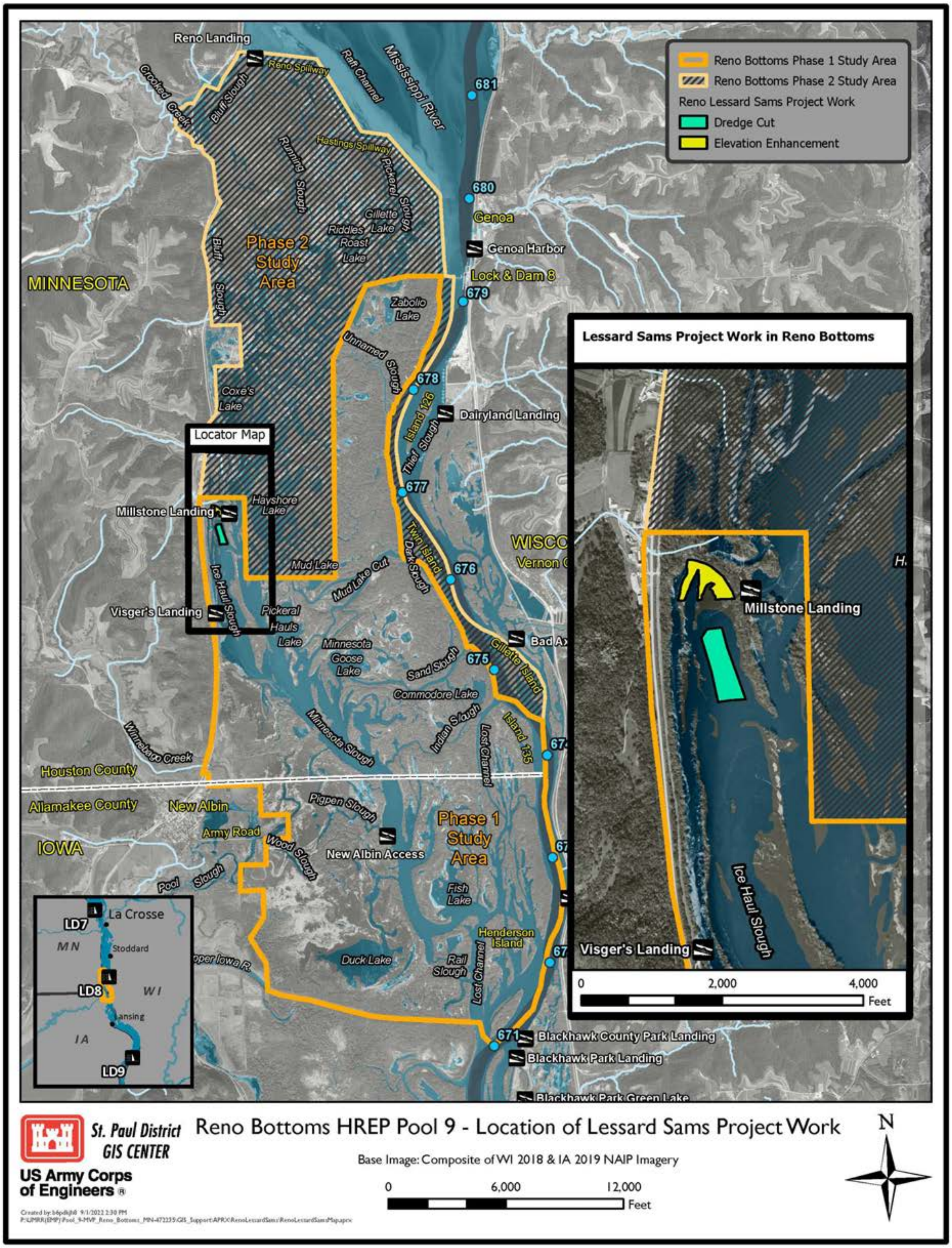


Figure 1-2. MN Department of Natural Resources, Lessard Sams Project Area.

1.8 Resource Significance

Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (Water Resources Council 1983) 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 is 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 Refuge in 1924 (PL 268) to provide a refuge for fish, wildlife and plants and a breeding place for migratory birds. It encompasses one of the largest blocks of floodplain habitat in the lower 48 states. In addition to Congress, many other governmental entities, agencies, non-profit, and private organizations have recognized the significance of the Refuge. The Upper Mississippi River Floodplain Wetlands, which the refuge protects, have been designated a Wetland of International Importance (Secretariat of the Convention on Wetlands 2020), and portions of the refuge in each of the four states (IA, IL, MN, WI), along with Trempealeau National Wildlife Refuge, have been designated Important Bird Areas (https://www.audubon.org/important-bird-areas).

In a Nation endowed with magnificent water resources, the UMRS stands apart as the leading example of multi-purpose river management in the United States. Federal, state, and local agencies and institutions have demonstrated tangible support for the restoration of the backwater ecosystem. In 1986, Congress designated the UMRS as both a "…nationally significant ecosystem and a nationally significant navigation system…" (Section 1103 WRDA 1986).

The National Research Council's Committee on Restoration of Aquatic Ecosystems targeted the Upper Mississippi River as one of only three large river-floodplain ecosystems for targeted restoration. In addition, the Upper Mississippi River Conservation Committee recognized the importance of the floodplain forest to the fish and wildlife of the river.

Non-profit and private organizations also have recognized the significance of this resource. In a 2022 Report, American Rivers identified the larger Mississippi River as one of the most endangered rivers in the US. In doing so, it recognized the river as an internationally important river ecosystem.

> *The river and its 30-million-acre floodplain provide vital habitat for more than 870 species of fish and wildlife, including dozens of rare, threatened and endangered species. The Mississippi River is a critically important global migration corridor for more than 325 bird species, dozens of migratory fish and even pollinators such as the monarch butterfly. The Mississippi River has brought cultural and economic wealth to people since they first settled along the river. The largest pre-colonial settlement in North America thrived along the banks near present day East St. Louis, Illinois. Cahokia was a major metropolitan center the size of contemporary London in the 11th and 12th Centuries. Today, nearly 20 million people live in the 123 counties that border the Mississippi River. The Mississippi watershed covers 41 percent of the contiguous United States and provides drinking water to more than 50 municipalities. The river is also a crucial economic engine, generating more than $400 billion in ecosystem services annually and supporting 1.3 million jobs. It provides a water source for industry, a significant transportation route for grain and cargo, a recreational destination for tourists, bicyclists, boaters, hunters, anglers and birders, and transports sediment and nutrients that, at appropriate levels, help Gulf Coast wetlands and fisheries thrive.*

1.8.2 Public Recognition

The Refuge also provides environmental education, wildlife recreational opportunities, and interpretive programming for residents and visitors. The public can visit the Refuge at the four visitor contact stations: Winona, La Crosse, McGregor, and Savanna District Office and one located at the Lost Mound Unit of the Refuge District locations. The nearest location to the study area is the McGregor Office located in Prairie du Chien, WI.

Additionally, the Refuge prioritizes the following activities for members of the public: hunting, fishing, bird watching, photography, wildlife observation, nature interpretation and environmental education. Commercial use of the Refuge consists of hunting, wildlife observation and fishing guides, commercial trappers, recreational fish float operators and commercial fishing. Commercial navigation passes through the Refuge. Accurate quantification of public activity on the Refuge and, more specifically, at the study area is difficult due to the multiple points of free public access.

The public recognizes the Refuge and the Reno Bottoms as a nationally, regionally, and locally significant resource. In general, there is a wide range of uses of the Refuge and the study area, which extends beyond the Upper Mississippi River watershed and directly impacts public welfare and the long-term ecological health of the region. The Refuge hosts over 3.7 million annual visits for hunting, fishing, wildlife observations, and other recreation.

There are a variety of outdoor recreational opportunities on the Refuge including but not limited to: camping, boating, year-round fishing, and winter sports. There are over 250 boat landings along the 261-mile Refuge. Reno Bottoms is a particular attraction for canoeists and kayakers in the Refuge as it provides an isolated backwater experience. Fishing occurs year-round, apart from spring ice break-up. Reno Bottoms is also one of the best places to spy the elusive Prothonotary Warbler and other species that thrive in the floodplain forest. In addition, one of the Tundra Swans’ favorite resting and feeding areas sits just on the northern border of the Reno Bottoms, drawing visitors from all over the world.

Various public not-for-profit groups exist to support the continued protection of habitat and recreational opportunities at Reno Bottoms, including the over 800 member Friends of Pool 9 group, the Minnesota Audubon Society, and the Friends of the Upper Mississippi River.

1.8.3 Technical Recognition

To identify habitat needs for the UMRS, the Second Habitat Needs Assessment (HNA-II) effort used 12 indicators to quantify the basic structure and function of the Upper Mississippi River. The indicators provide an objective and scientifically sound analysis of the basic structure and function of the UMRS ecosystem. Habitat needs were defined by comparing individual indicators to the conditions desired by management agencies. Per HNA-II,

> *Floodplain forests, wet meadows, and other desirable habitats are not currently in a preferred state …due to invasive species, such as reed canary grass (Phalaris arundinacea), a loss of species diversity, and a lack of regeneration of desirable tree species. Invasive species are accounted for in the diversity calculation, providing higher diversity values in lower quality habitat areas.*
>
> *…This indicator* [Floodplain Vegetation Diversity] *showed a decline in forest area and diversity, other non-aquatic areas (i.e., wet-meadow), and pool-wide distribution which indicates that regeneration may be limiting. The River Teams identified a habitat need to establish more community diversity (i.e., wet meadow, scrub shrub, etc.), not just forest.*

The HNA-II Report highlighted the importance of floodplain forest habitat in Pool 9 for river management agencies and to the health of the UMRS. Further, the 2022 Ecological Status and Trends of the Upper Mississippi and Illinois Rivers report indicates that the long-term trend for forest cover throughout impounded portions of the Upper Mississippi River is a decline in forest cover, with a 6.4% decrease between 1989 and 2010 (De Jager and Rohweder 2022).

UMRR management agencies have also identified floodplain forests as a top management priority, including the two agencies with land management responsibilities in the study area. The 2012 Upper Mississippi River Systemic Forest Stewardship Plan, developed by USACE foresters in St. Paul, Rock Island and St. Louis Districts and supported by all partner agencies within the UMR, identified several negative trends expected within 50 years, including a loss in forest diversity and overall forest cover as forests age and mature trees die (Guyon et al. 2012).

Finally, the Refuge, in which the study area occurs, recognized in their 2006 Comprehensive Conservation Plan (U.S. Fish and Wildlife Service 2006) that,

> *If current trends continue, there could be a marked loss of forest within the Refuge and elsewhere in the river floodplain.*

In the 2019 Refuge Habitat Management Plan, the Refuge further identified bottomland forest (equivalent to floodplain forest) and a number of wildlife species associated with bottomland forests as priority Resources of Concern because of expected loss of forest diversity and cover due to altered hydrology and invasive species (U.S. Fish and Wildlife Service 2019).

2 Problem Identification

2.1 Factors Influencing Habitat

Changes in climate and land use have altered the magnitude, duration, and timing of high-water events and are likely the main drivers of habitat change in the study area. The following section addresses the factors that influenced habitat changes in the Reno Bottoms study area.

2.1.1 Land Use Change

Pre 1800s: Prior to European settlers moving into the Midwest, Indigenous communities gathered, hunted, fished, and lived in the Upper Mississippi River valley, including areas of the Refuge (Figure 2-1). Substantial land-use changes 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.

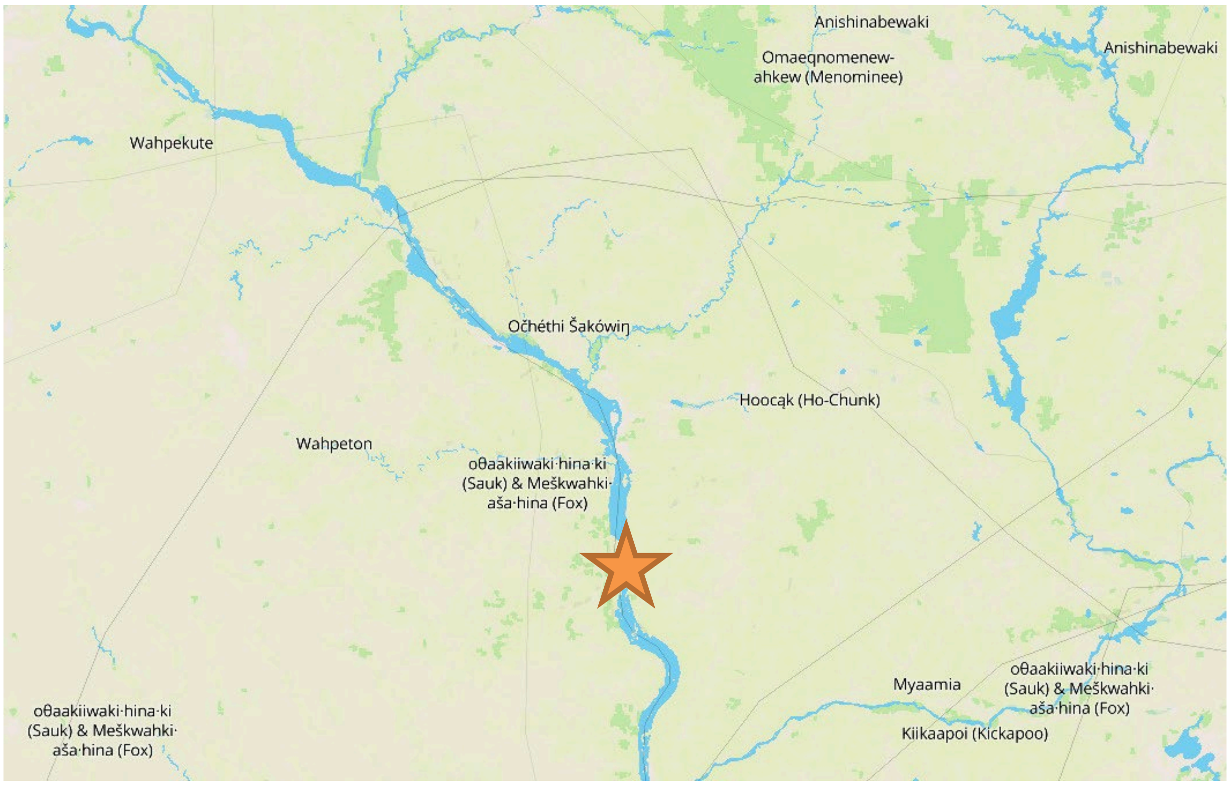


Figure 2-1. Approximate Indigenous territories before European settlement, location of Reno Bottoms noted with orange star (https://native-land.ca/).

Early-mid 1800s-1930s: In the early 1800's the United States negotiated treaties with the Dakota/Sioux Bands with the goal of their removal to allow for greater European settlement. In 1830, due to starvation, disease, and crop failure, and with deception on the part of the United States, Dakota chiefs signed over a significant swath of Dakota/Sioux lands, a small part of which included the study area. In the decades following the ceding of lands, forests were cleared for use as steamboat fuel, to make pasture for grazing and haying, and for other human uses at a significant rate not seen prior to the 1830s.

1930s-Today: The federal government acquired land for construction of the lock and dams and to accommodate the flooding that would occur due to damming. Lands were also acquired for the Refuge. The transfer of land from private to federal ownership led to the reestablishment of forest and other habitats on lands that had been grazed and cropped. The construction of the dams flooded areas that had previously been only seasonally flooded, shifting habitats to wetter types. Many areas that had been forest, shrub, or wet meadow became aquatic shallow, deep or open water wetlands.

2.1.2 Climate Change

Climate factors that pose the great risk to the project features are flood duration and frequency due to their effects on the days of inundation during the growing season for floodplain forest and to overwintering fish habitat during the winter months. The climate change assessment done for this project (in accordance with Engineering Construction Bulletin (ECB) No. 2018-14 (USACE 2018)) indicated a statistically significant upward trend in peak annual streamflow with the Mann-Kendall and Spearman Rank Order tests since record keeping began in the late 1930s.

Available climate change literature suggests a warmer and wetter climate in the future which is in agreement with the CHAT projection that was analyzed. The results of the climate change analysis were accounted for as part of the feasibility design by selecting annual flow rates from 1965 to 2019, which was a wet period, to improve project feature resilience under potenential increased inundation. In addition to fluctuations in climate, flow and water surface elevation can be influenced by long-term geomorphic change and changes to lock and dam operating plans. Discharge can be influenced by changes in upstream water storage due to dam construction, or changes in land-use. These other factors make it difficult to determine the role of climate change in affecting the hydrologic signal at the project scale. For additional details on the climate change analysis completed for this study please see Appendix F, Hydraulics and Hydrology.

2.1.3 Altered Hydrology in Study Area

2.1.3.1 Effects of Locks and Dams

Construction of the locks and dams increased water surface elevations in the lower reaches of each navigation pool immediately upstream of each lock and dam but caused a decrease in water surface elevations immediately downstream of each lock and dam (Chen and Simons 1986, Cumulative Effects Study 2000). This decrease was attributed to bed degradation and an increase in the downstream conveyance area after inundation. A comparison of pre-lock and dam water surface profiles to existing water surface profiles, and comparisons of stage-discharge relationships at the Lock and Dam 8 tailwater gage and the Lansing Control point gage, indicates that this decrease was approximately one foot in Upper Pool 9 for bank full events.

Delineation of side channels indicate an increase in channel size since lock and dam construction. What were seasonal channels, became permanent channels that expanded in width. An examination of aerial photos from 2003, 2010, and 2015 indicates possible widening of side channels, though differences in water surface elevation for each of the aerial photos, photo resolution, and uncertainty in delineating bank lines make it difficult to determine erosion rates. Figure 2-2 is an example of the work done by the St. Paul District Geographic Information Systems (GIS) Center. It shows the 2003, 2010, and 2015 bankline-delineations at Mud Lake Cut superimposed on 1929 pre-inundation imagery. As can be seen, Mud Lake Cut was not a continuous channel in 1929 but has eroded and expanded to become the largest channel entering Reno Bottoms. Locations of side channels and other hydrologic features within the initial study area boundary can be seen in Figure 2-3.

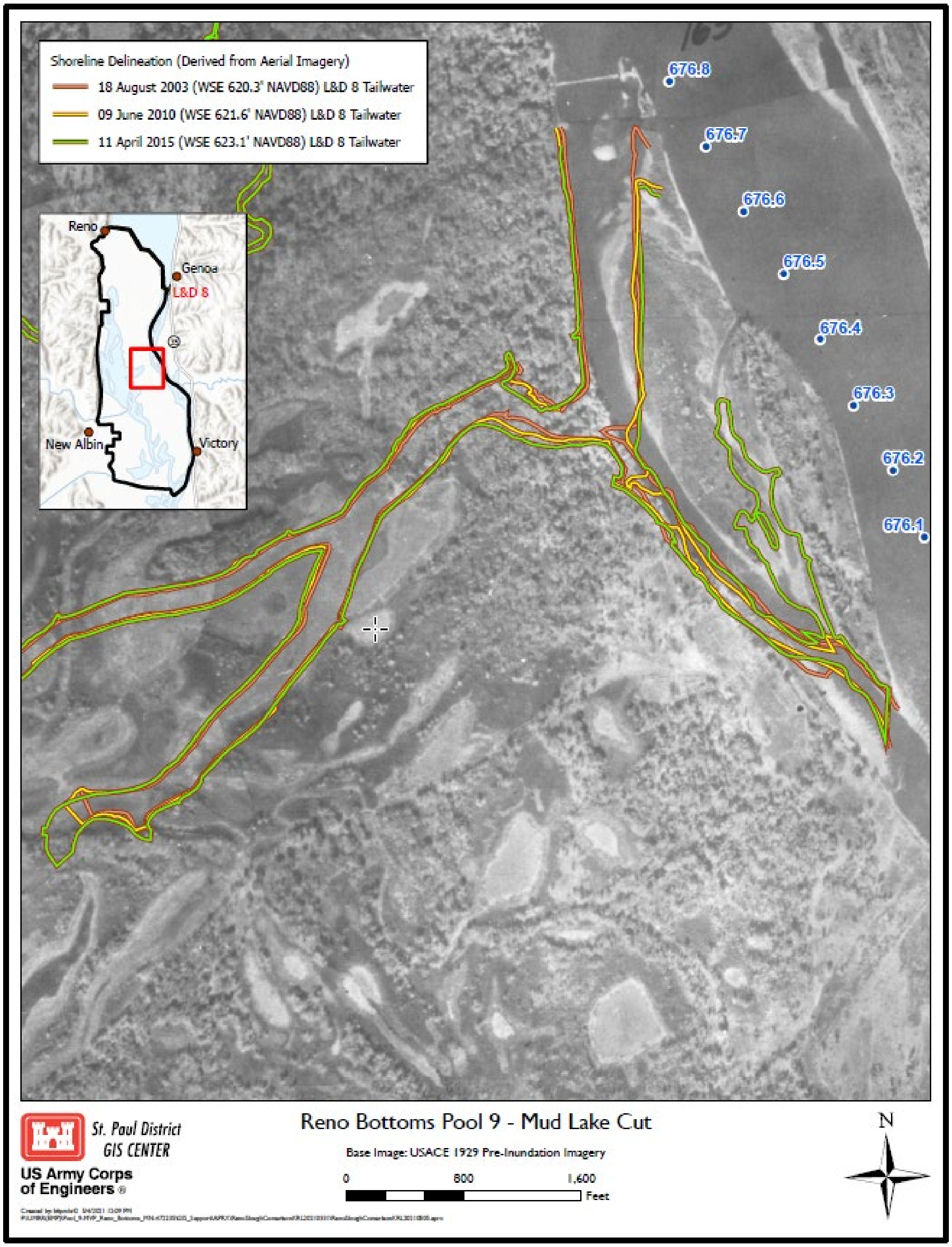


Figure 2-2. Mud Lake Recent Shoreline Delineations Superimposed on 1929 pre-Inundation Imagery.

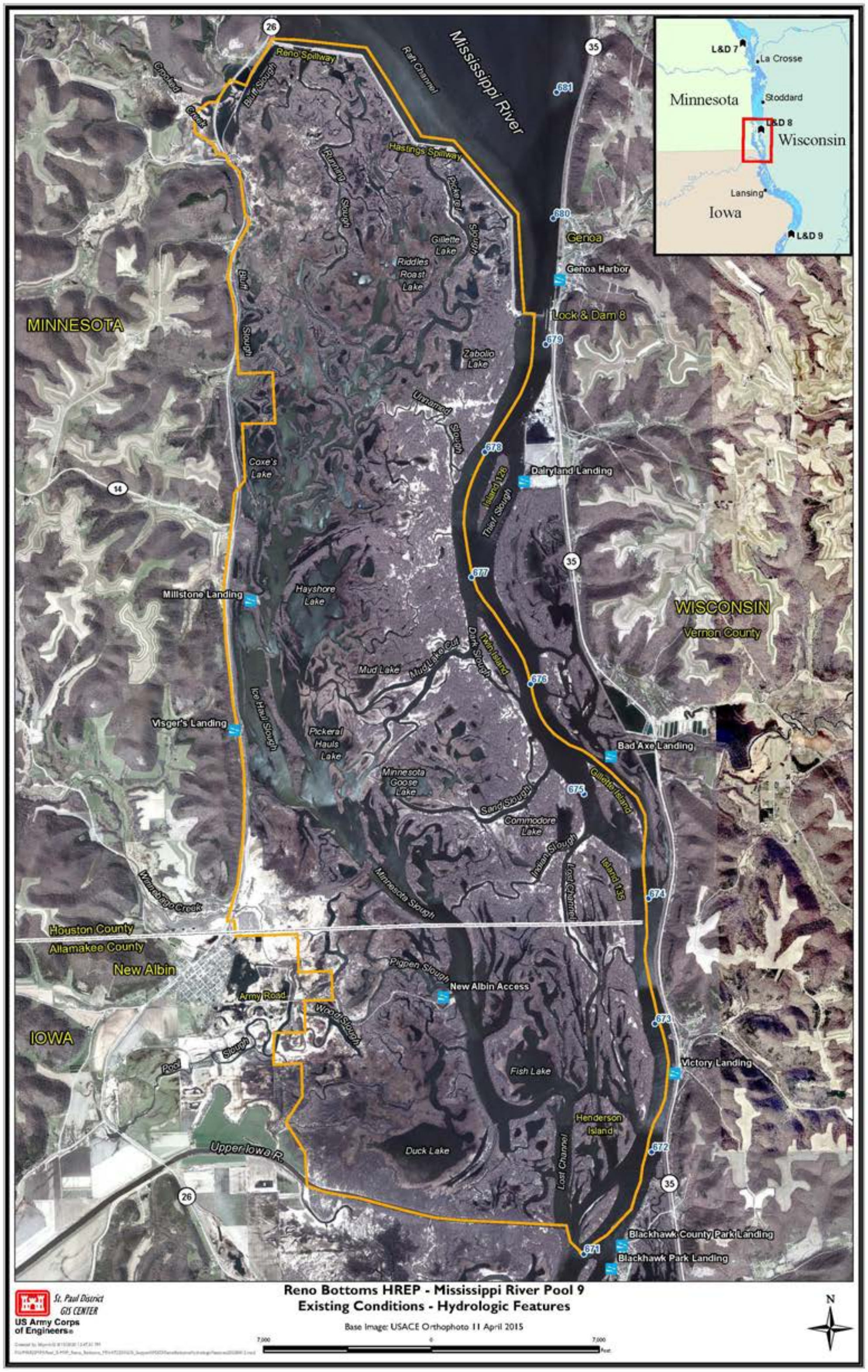


Figure 2-3. Hydrologic features within the initial study boundary of Reno Bottoms.

In 1970, a 30-inch corrugated metal culvert was installed through the Reno Spillway to provide aerated water to Running Slough and downstream backwaters. The headwall of the culvert is an arched, flat-bottomed opening, 65 inches wide by 45 inches high that provides for the installation and removal of stop logs. Around the mid-1970s, a corrugated metal culvert with similar dimensions was installed through the Hastings spillway to provide flow to Pickerel Slough. Discharge measurements obtained in Running and Pickerel Slough, indicate that the average discharge through the Reno and Hastings Spillways are 107 cfs and 52 cfs respectively. Significant flow variation occurs and is probably related to inlet conditions at each culvert which is affected by the lock and dam operating curve, woody debris accumulation, and the influence of wind-driven waves on mean water surface elevation at the inlet of each culvert.

Stage gage data collected in 2005 and 2006 indicates that water surface elevations are elevated in Running and Pickerel Sloughs for low flow conditions indicating that the culvert flow may have increased water surface elevation in upper Reno Bottoms, upstream of the Phase 1 area. However, there was no impact at higher flows.

Monitoring of discharge at side channels between the main channel and Reno Bottoms indicates that the water exchange ratios (WER) at these sites has continued to increase from 2005 to 2019. Figure 2-4 shows a plot of WER for the culverts and the largest lateral connections to Reno Bottoms. Based on numerical modeling done for this project, water surface elevations within Reno Bottoms do not appear to be greatly affected by the increasing WER. Model simulations of partial closure structures at four of the side channels indicated that a significant reduction in side-channel flow was achievable, but this resulted in only a minor (0.25') reduction in water surface elevations. The primary factor affecting water surface elevations within the Reno Bottoms is the water surface elevation of the main channel at the downstream boundary Reno Bottoms. At that downstream boundary, outflow from Reno Bottoms occurs through multiple secondary channels.

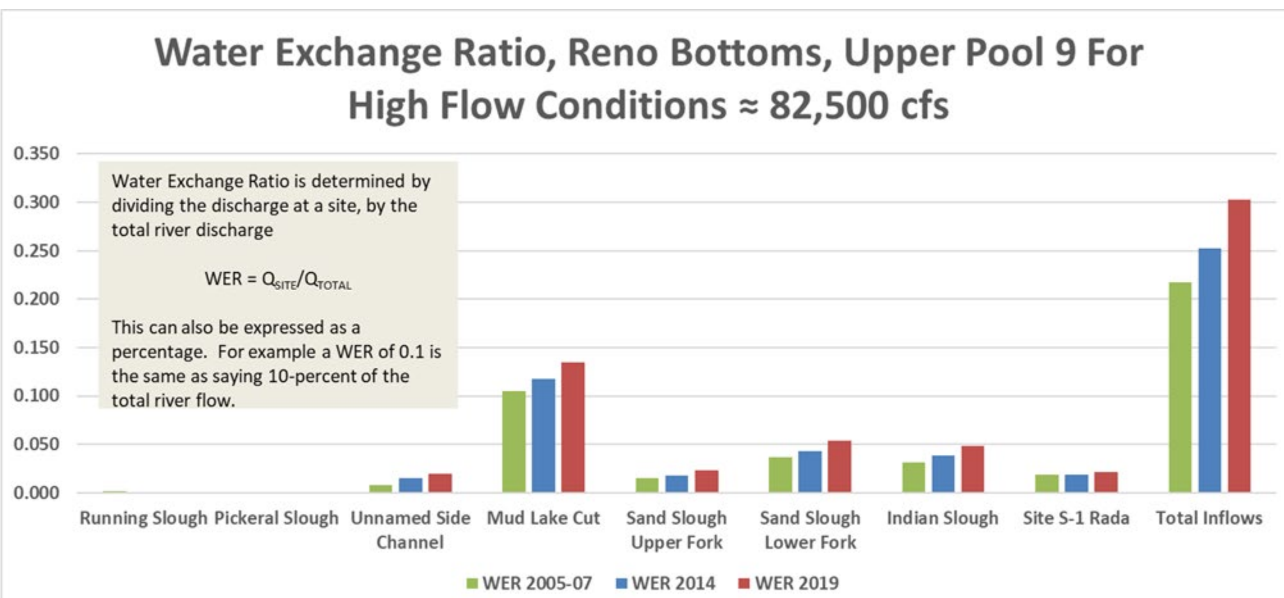


Figure 2-4. Water Exchange Ratios for Lateral Connections Between the Main Channel and Reno Bottoms.

2.1.3.2 Channelization of Winnebago Creek

Prior to 1960, Winnebago Creek flowed north into Minnesota Slough after entering the Mississippi River Valley at Highway 26 on the west side of the study area. In 1960, the City of New Albin, Iowa constructed a diversion ditch that channelized Winnebago Creek easterly to Minnesota Slough (Pool Slough HREP Hydraulics Appendix, 1999). Channelization and the creation of spoil banks cut off two relic distributary channels of the Upper Iowa River and resulted in the formation of a delta at the mouth of the creek where it entered Minnesota Slough. By 1991, this delta extended most of the way across Minnesota Slough, and although it was somewhat porous, some water from upstream was probably re-routed to the east (Figure 2-5). In the 1990s Winnebago Creek avulsed, abandoning its straightened channel, and began flowing southeast towards Army Road. The delta at Minnesota Slough, no longer receiving sediment from Winnebago Creek, began to erode and eventually a continuous channel through what was the delta formed. The impact of the Winnebago Creek channelization and delta formation on water surface elevations over time is uncertain, though it probably caused some increase in water surface elevations. Gage data obtained in 2006, indicates an increase in elevation through this reach (New Albin gage to Millstone gage) of 0.4 to 0.5 feet. Numerical modeling indicates an increase in waster surface elevation through this reach on the order of 0.3’. Complicating any conclusions is the fact that the Mud Lake Cut and Sand Slough deltas also are encroaching into this area. Tree mortality near the channelized Winnebago Creek reach, the Whalen Tract, suggests at least a localized effect on water surface elevations (A Meier, pers com, 2022).

Figure 2-5. 1991 Image Showing Winnebago Creek Channelization and Delta Encroachment into Minnesota Slough.

2.1.3.3 Effects on Floodplain Forests

The distribution of floodplain vegetation is driven primarily by surface and soil water dynamics. Small changes in these dynamics can dramatically shift floodplain vegetation communities. Because of the decrease in the stage-discharge relationship for bankfull events, initial impacts of the locks and dams in the 1930s and 1940s were drastic, with significant shifts in floodplain vegetation in lower pool areas from areas dominated by forest to areas dominated by open water. In the decades following the installation of the locks and dams, forest in mid-pool areas continued to decline, converting more slowly in lower elevation areas to marsh habitats. Only forests in upper pool areas were relatively unaffected by the installations of the locks and dams, though reduced flows immediately below the dams certainly had some impact. One positive impact of the locks and dams was the acquisition of agricultural land within the floodplain by Federal agencies, and much of this land converted back to forest at that time. However, the total acreage of new forest was still much less than the total forest area lost to inundation in lower- and mid-pool.

However, current forest health is impacted less by the presence of the locks and dams than it is by changing hydrology in the system. Increasing total river flows within recent decades have had increasingly significant impacts on floodplain vegetation. Increased water surface elevations associated with the increased flow rates on the river have resulted in longer and more frequent periods of flood stress for trees due to chronic inundation. Higher frequencies of growing season flooding have also led to tree decline and death over the last three or four decades, with exceptionally high water between 2016 and 2019 causing widespread mortality throughout the lower elevation forested areas in the interior of Reno. Generally, low elevation forests that have been killed by chronic high water in the study area have converted to marsh or wet meadow habitat types.

Tree regeneration is also impacted by altered hydrology, and small seedlings are particularly vulnerable to even short periods of overtopping. In general, natural regeneration of trees is mostly absent within Reno, and it is thought that in many areas chronic high water during the growing season is preventing seedlings from getting tall enough to avoid overtopping. Once overtopped, seedlings generally die, so high growing season water levels are almost certainly preventing effective establishment of new tree seedlings. Thus, altered hydrology related to increased flows has probably caused a shift to higher elevation forests dominated by increasingly older trees without a viable cohort of regeneration. In areas with no viable regeneration, conversion to herbaceous (non-tree) cover types is also likely to occur though at a slower rate than in areas killed by flooding.

2.1.4 Altered Successional Pathways

As with much of the UMRS, floodplains within the study area have been greatly impacted by human activity beyond hydrologic changes. Prior to federal acquisition in the early 1900s, all of the land within the study area was privately owned, with numerous farmsteads, roads, and even small towns. Based on surveys and aerial photos from the 1920s and 1930s, many areas within Reno Bottoms were cleared agricultural fields, and it is almost certain that many areas were used for cutting hay, pasturing livestock (Figure 2-6) and collecting wood for construction and fuel. Abandonment of agricultural fields resulted in the establishment of large areas of dense silver maple and cottonwood forest in some cases, but in other cases, previously established herbaceous vegetation in pastures and hayfields likely prevented effective regeneration.

Figure 2-6. Mississippi River Bottom pasture, Mississippi River Pool 8, circa 1900.

In addition, two of the most common tree species that are somewhat shade tolerant, American elm and green ash, have been virtually eliminated by the Dutch elm disease (*Ophiostoma novo-ulmi*) and the emerald ash borer (*Agrilus planipennis*). Apart from the immediate impacts of the loss of current trees of these species from the canopy, the long-term impacts are likely much more severe. Silver maple and cottonwood are not very shade tolerant, so young silver maple do not tend to grow in the shade of mature trees, whereas elm and ash can. The loss of these two tree species effectively eliminates any shade-tolerant component from lower elevation silver maple-dominated forest and, as a result, conversion from forest to non-forest cover types becomes much more likely once current canopy trees die.

Finally, several aggressive herbaceous plant species are thought to be more prevalent in the study area than they were historically. Historic agricultural land use promoted forage grasses over woody vegetation, including the now widespread reed canary grass (*Phalaris arundinacea*). There is an ongoing debate as to whether reed canary grass populations in the UMR are native or exotic, but, regardless of its status as a native or non-native species, it is an aggressive invader of declining floodplain forest sites. It is able to form dense cover with a thick rhizome layer that effectively prevents other vegetation from establishing. It can persist in some shade, so it gradually invades disturbed forest areas and, as the forest canopy dies, becomes the dominant vegetation. Other herbaceous vegetation behaves invasively as well, including stinging nettle (*Urtica dioica*) and wood nettle (*Laportea canadensis*). Both species capture the forest understory or forest canopy gaps and prevent woody vegetation from establishing, much like reed canarygrass.

Woody invasive species, such as common buckthorn (*Rhamnus cathartica*), a shrub, and black locust (*Robinia pseudoacacia*), a tree, are scattered on higher elevations but do not seem to have been major drivers of forest composition to date, though their impacts may increase into the future.

Herbivory of tree seedlings by deer, as well as herbivory of tree saplings and large trees by beavers also impacts forest communities. However, it is unclear whether these impacts are different from what they would have been historically. There is widespread evidence of increased deer densities throughout the Upper Midwest, but no comprehensive population estimates have been made within the study area. Anecdotally, beaver populations are also expanding along with associated impacts on floodplain forests, though their numbers may have been higher before the North American fur trade than they are now.

2.1.5 Problem Summary

The loss of keystone tree species, historic land use, invasive herbaceous species expansion, tree herbivory and disease, and altered hydrology have shifted the successional pathways that historically allowed for resilient forests. As a result, the forest habitat in Reno Bottoms today is under severe threat and it is expected that loss of forest will continue to occur in many areas over the next fifty years. Forest areas lost in the last few decades is also unlikely to regenerate to forest. The loss of forest will reduce the extent and quality of habitat for a wide range of wildlife species that depend on floodplain forests for survival.

Changes in climate, construction of the locks and dams, and changes in land-use have altered the hydrology in the study area. More water is flowing into Reno Bottoms through side channels. In some situations, this flow degrades aquatic habitat. Additional flow can lead to increased connectivity between lentic (lake-like) and lotic (flowing) habitats. The increased connectivity can result in lentic habitats being transformed to lotic habitats. Many species of fish require lentic habitats during all seasons but particularly during the winter when they conserve energy by locating to areas with minimal or no flow. Any amount of water velocity during the winter months increases the energy demands of fish by requiring them to maintain their position in the water column. Increased flows carry increased amounts of sediment into the study area. There are large deltas where side channels reach the interior of the Reno complex. Mud Lake Cut and Sand Slough in particular have large deltas that have impinged upon the flowing habitat in Minnesota Slough. Sedimentation across the entire study area also decreases the depths of backwater lakes (lentic habitat). As lakes become shallower, overwintering habitat quality decreases. The reduced water volume cannot maintain the necessary dissolved oxygen (DO) levels and temperatures that fish require to survive the winter months.

In summary, the primary problem facing Reno Bottoms floodplain forests is a failure of forests to regenerate. Restoration measures should focus on facilitating natural and artificial regeneration of trees to ensure forest viability for the project period. Additionally, aquatic habitat is degrading due to increased flows and sedimentation throughout the project area. Without action, desired forest and aquatic habitat conditions in the study area will continue to degrade.

2.2 Estimated Future Without-Project Conditions

The Future Without Project condition is the forecasted condition of the study area for the next 50 years (2028-2077) assuming that no significant action is taken to address the resource problems identified above. More detail on historic and current conditions can be found throughout Section 4.

Based on the information discussed above, without action, the floodplain forest habitat and the aquatic habitat in the study area is expected to continue to degrade, with substantial loss of total forest habitat acres across the study area. Both erosion and deposition are geomorphic processes occurring in Reno Bottoms with the net effect being increased water exchange ratios between the main channel and Reno Bottoms. This trend is expected to continue for some time into the future, increasing sediment loads to Reno Bottoms. This trend, whether it continues or stabilizes at some point in the future, is expected to result in significant amounts of inflow to, and sediment deposition within, Reno Bottoms, including within Ice Haul Slough. These future conditions will dramatically reduce the quality and extent of floodplain forest, flowing water (lotic), and still water (lentic) habitat within Reno Bottoms. This in turn would result in adverse effects to hunting, resting, feeding, and nesting areas that support a wide variety of birds, insects, fish, amphibians, mollusks, and reptiles (including both state and federally listed species) that are integral to the health and ecosystem of the UMRS.

3 Plan Formulation

Plan formulation for the Reno Bottoms 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 a plan. The basis for plan selection 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.

3.1.1 Problem Statement

The important and unique floodplain forest and fish and wildlife habitat of the Reno Bottoms project area has experienced significant degradation over the last century and is predicted to further degrade over the coming decades. Several factors including altered hydrology, historic and current land use, invasive species, disease, and herbivory has reduced the resilience and diversity of the forest community. Degradation of backwater and channel habitats in the Reno Bottoms study area has also occurred as a result of increased flooding, sediment deposition, and side channel development.

3.1.2 Opportunities

Habitat rehabilitation opportunities identified for the Reno Bottom HREP include:

- Increase in the variety of tree species of different age classes
- Stabilize side channel widening
- Reduce inflows into the Reno Bottoms study area
- Minimize sedimentation of backwater lentic sites
- Minimize island erosion
- Reduce invasive species
- Build upon restoration potential of MN DNR's Ice Haul Slough fish habitat project
- Utilize backwater fines and channel granular material in forest habitat elevation
- Utilize dead or dying trees for fish habitat
- Increase habitat for Refuge Species of Concern
    - Forest habitat: red-shouldered hawk, prothonotary warbler, cerulean warbler, transient neotropical migrant passerines, and tree-roosting bats
    - Lentic and lotic habitat: fluvial-dependent native mussels, fluvial-dependent native fish, limnophilic native fish, and limnophilic native mussel

3.2 Objectives and Constraints

3.2.1 Project Objectives

The objectives for the Reno Bottom HREP are based on the project's problems and opportunities. USACE planning guidance ER 1105-2-100 provides guidance for developing objectives. The planning guidance specifies the objectives must be clearly defined; 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 (2028-2077).

Primary Objective:
Protect, enhance, restore, or create naturally regenerating, resilient, and diverse bottomland forest habitat, prioritizing connectivity to existing bottomland forest habitats and expanding interior forest conditions.

Secondary Objectives:
a) Protect, enhance, restore, or create backwater habitats, and provide flow conditions and sediment dynamics that will benefit native fish and mussel populations that live in, or depend on, those habitats.

b) Protect, enhance, restore, or create flowing channel habitats to provide flow conditions and sediment dynamics that will benefit native fish and mussels that live in, or depend on, those habitats.

The PDT and a majority of the interagency partners agreed that priority would be placed on achieving the primary forestry objective while simultaneously considering ways to achieve secondary objectives in a manner that supports and complements the primary objective. In instances where secondary objectives could be achieved when they are not in support of or complementing the primary objective would be evaluated by the Project Sponsor and the PDT to determine if they are appropriate for further integration into the project plan.

Specific performance targets that will measure the success of restoration related to each objective are outlined in Appendix K, Monitoring and Adaptive Management.

3.2.2 USFWS Management Objectives

The Refuge also has National Wildlife Refuge System, Upper Mississippi River, and Reno Bottoms HREP-specific goals and objectives. These goals were used to develop project-specific goals and objectives for the Reno HREP. Specifically, awareness of species-specific goals and the high priority of forest rehabilitation for the Refuge helped guide the development of study objectives and evaluation of the effectiveness of various alternatives. Those goals and objectives are included in their entirety in Appendix A, Correspondence & Coordination.

3.2.3 Constraints and Considerations

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.

Two institutional planning constraints were identified for the Reno HREP study. The first was to avoid or minimize impacts to flood stages. Specifically, restoration measures could not increase flood stages and adversely affect private property or infrastructure. The second constraint was to avoid or minimize impacts to the federally-authorized navigation channel within the Mississippi River. Those constraints guided and set boundaries on the formulation and evaluation of alternatives.

Other factors that were considered by the team in the planning process included:

- Environmental considerations: Measures should be consistent with applicable federal, state, and local laws. Compliance and coordination with applicable laws such as the Clean Water Act, Endangered Species Act (ESA), and National Historic Preservation Act (NHPA), among others, requires environmental impacts to be minimized and avoided, as much as possible. Therefore, the following constraints are considered when analyzing alternatives:
    - Avoid impacts to federally threatened and endangered species
    - Minimize waterbird and migratory bird impacts
    - Avoid adverse impacts to cultural resources
- Construction and implementation considerations:
    - Consider bidding, staging, and access to reduce restoration risks
    - Restoration measures should be designed to minimize operation and maintenance for the sponsor

3.3 Reno Modeling Approach

The inter-agency team developed and used several models to evaluate each alternative’s ability to meet project objectives and to ensure the selection of a project that is resilient under future conditions.

3.3.1 Two-Dimensional Hydraulic Modeling

A two-dimensional hydraulic model was calibrated to measured stage and discharge data in the Reno Bottoms area. The model was run for 14 different steady state total discharge conditions with water depths at each cell in the model determined for all 14 discharge conditions (Figure 3-1). Depth-discharge regression relationships were then developed for each cell in the model and were used to determine at what discharge a given cell would be submerged by water. The daily discharge record at the nearby Lock and Dam 8 was used to determine inundation statistics for each cell in the model. Days of inundation per year was calculated and a total flood duration map of each cell was developed for each year in the analysis and became input to the Floodplain Forest Succession model. More information on the two-Dimensional Hydraulic modeling can be found in Appendix F, Hydraulics and Hydrology.

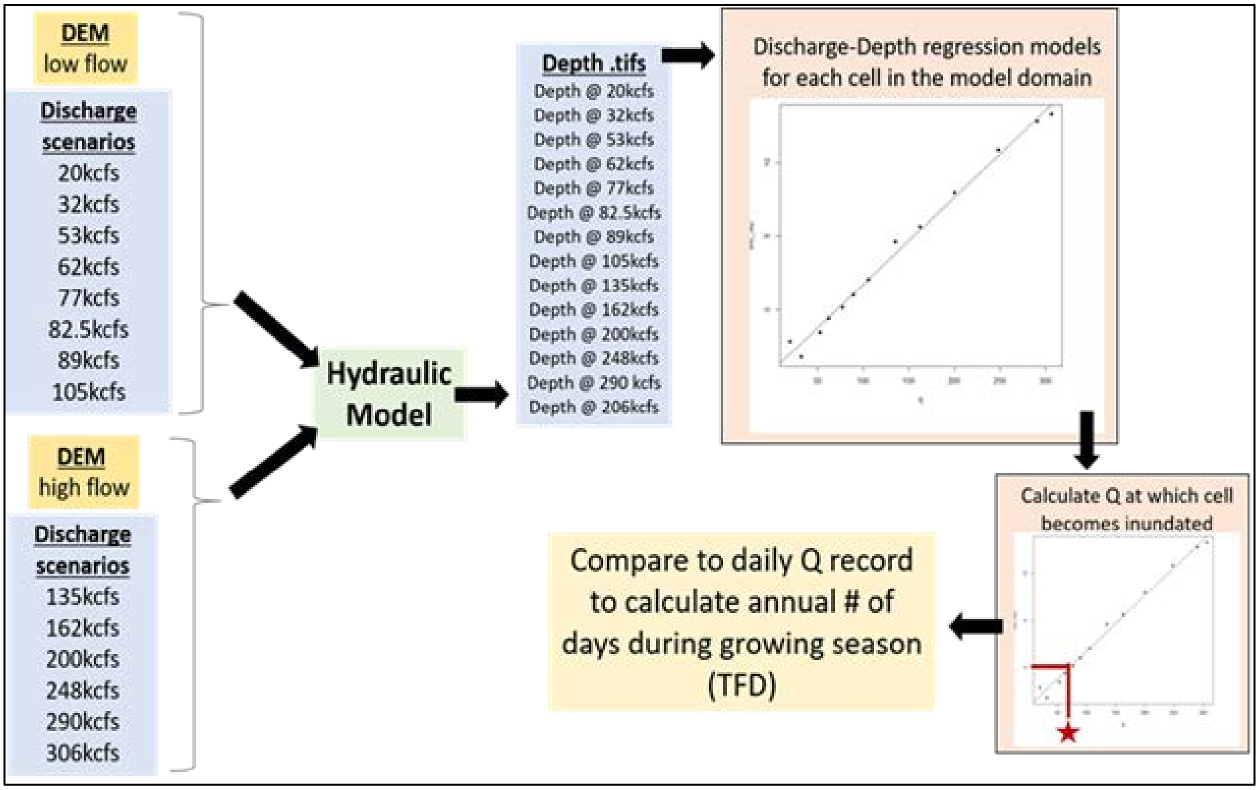


Figure 3-1. Visual explanation of how site-specific stage and discharge readings were calibrated in a 2D hydraulic model for Forest Succession Model input.

3.3.2 Forest Habitat Modeling

The Reno project is the first HREP in the Corps St. Paul District to have a floodplain forest-focused primary objective. Because forests develop over long time spans and forest dynamics vary substantially with differences in tree age, tree species, site hydrology, competition between trees and other vegetation, and a wide range of other factors, this project provided an opportunity to utilize a newly approved forest succession modeling framework to quantify resource responses to management in the context those complex interactions.

For this project, site-specific forest inventory and hydraulic modeling was used to calibrate the LANDIS-II Forest Succession Model in the Upper Mississippi River System (FSM), (De Jager et al. 2018, De Jager et al. 2019, approved for regional use 3 June 2022). The FSM was run twice; the first run included partial measures and initial hydraulic modeling while the second run included final measures and hydraulic modeling. Resulting outputs were then used to provide a quantitative measure of long-term (10 – 100 year) forest change with and without implementation of project measures. Appendix D, Habitat and Forest Modeling provides a thorough summary of the background and implementation of the FSM. Appendix F, Hydraulics and Hydrology provides a summary of the hydrology and hydraulics data. This future condition modeling allowed for a refined and rigorous approach in the development of proposed measures, potentially increasing project resiliency.

3.3.3 Habitat Evaluation

3.3.3.1 Upper Mississippi River System Floodplain Forest Habitat Model (Forest HEP)

The resulting FSM outputs were compared against project goals and objectives for alternative selection and were used to calculate spatially explicit Habitat Evaluation Procedure (HEP) scores for habitat benefit evaluation. The recently approved Upper Mississippi River System Floodplain Forest Habitat Model was chosen to assess forest habitat benefits for the project. This model provides a mechanism to assess the intrinsic quality of forest habitats based on standard metrics used in forest inventory and health assessment. This assessment can be further applied to quantify changes in habitat quality from forest management actions.

The FSM outputs are spatially explicit raster files of tree biomass by species and age class for each timestep of the model and each scenario, resulting in thousands of individual raster files. Because the Floodplain Forest HEP model requires inputs related to specific variables related to forest health (canopy cover, invasive species, structural diversity, etc.), these biomass and age class specific rasters were processed and summarized to input into the Forest HEP equations to calculate Habitat Suitability Index (HIS) scores for the study area, see Appendix D, Habitat and Forest Modeling for details.

3.3.3.2 Bluegill Habitat Suitability Index Model (Aquatic HEP)

The approved Bluegill Habitat Suitability Index Model (Aquatic HEP) was used to evaluate the benefits of design alternatives to backwater fish habitat. This model has been applied to numerous UMRR program studies in the past. High model scores have generally been accepted as an indicator of quality backwater habitat for many overwintering fish. Even though the model was developed to measure optimal winter habitat conditions for the bluegill, many other species such as largemouth bass, smallmouth bass, black crappie, gizzard shad, and a number of other species, have been shown to respond favorably to similar conditions (Sheehan et al. 1990). Therefore, the model was chosen not only as a good indicator for quality bluegill winter habitat but also for backwater winter fish habitat in general.

The model requires the inputs of four variables: 1) the percentage of water depth greater than 4 feet; 2) dissolved oxygen levels; 3) winter water temperature; and 4) winter current velocities. Bathymetry was used to calculate variable 1, while water quality data was used to calculate variables 2, 3, and 4. See Appendix D, Habitat and Forest Modeling for details.

3.4 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 for the Reno HREP were developed to address study area problems, meet study objectives, and to capitalize upon study area opportunities. Measures are the building blocks of alternative plans. Figure 3-2 shows a brief overview summary of how the PDT went from identification of measures to the selection of a plan.

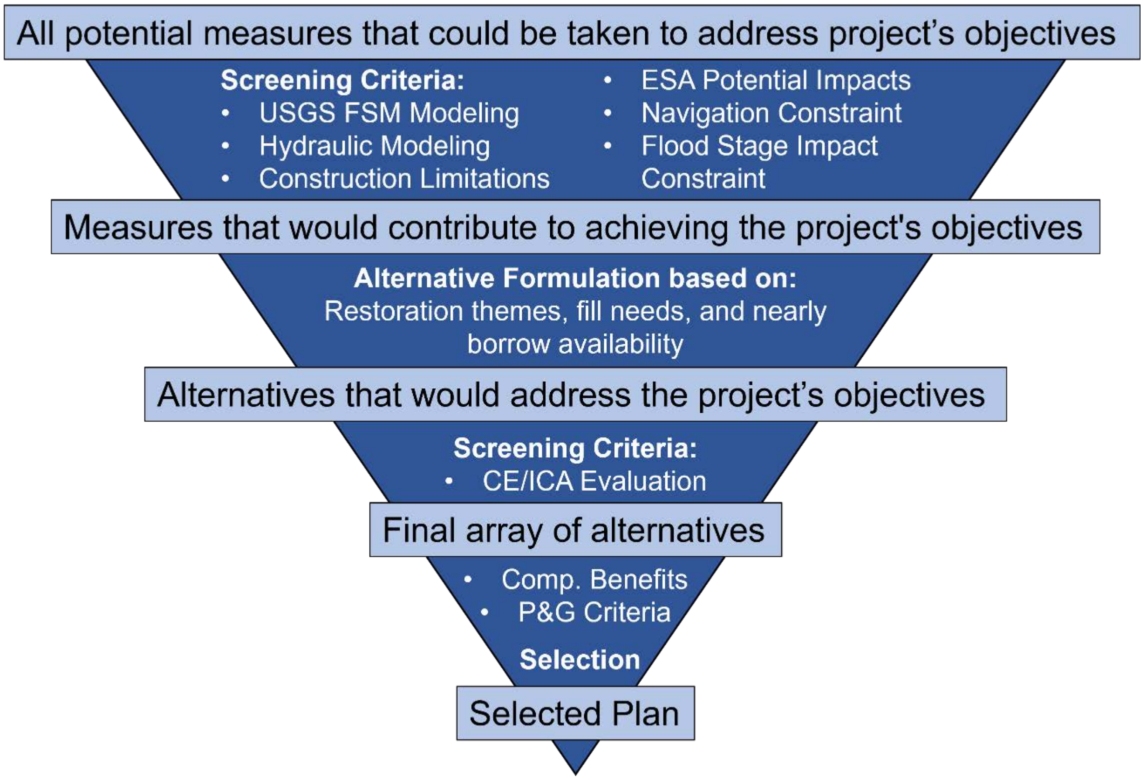


Figure 3-2. Summary of Plan Formulation Process used for the Reno HREP.

3.4.1 Project Phasing

When UMRR HREPs are first developed as Fact Sheets (see Section 1.5) a project location is proposed that generally corresponds to the problems and opportunities initially identified. This serves as a starting point for the additional scoping of the project by the PDT once a formal feasibility study begins. This area is subject to refinement as additional information is gathered.

During the iterative Reno HREP planning process, it was determined that separating the study into two phases would allow for the evaluation of different problems and opportunities.

A phase is a standalone HREP that is part of a larger vision or plan for an area's natural resources. Each phase requires a separate feasibility report to be approved before moving into construction. This report will cover Phase 1, which is a smaller study area than the original Fact Sheet; the boundary is shown on Figure 3-3. A study area is the area evaluated during the Feasibility Study within impacts to resources could occur.

A second phase could evaluate problems and opportunities in the northern Reno Bottoms area that was included in the original Fact Sheet. A future phase could also include features that were screened out in Phase 1 as they relate to meeting a different set of project objectives.

Because the decision on phasing occurred later in feasibility, some maps in this Report show the full extent of Reno Bottoms identified in the HREP's fact sheet. However, direct, indirect, or cumulative project impacts to significant resources were only evaluated within the Phase 1 boundary.

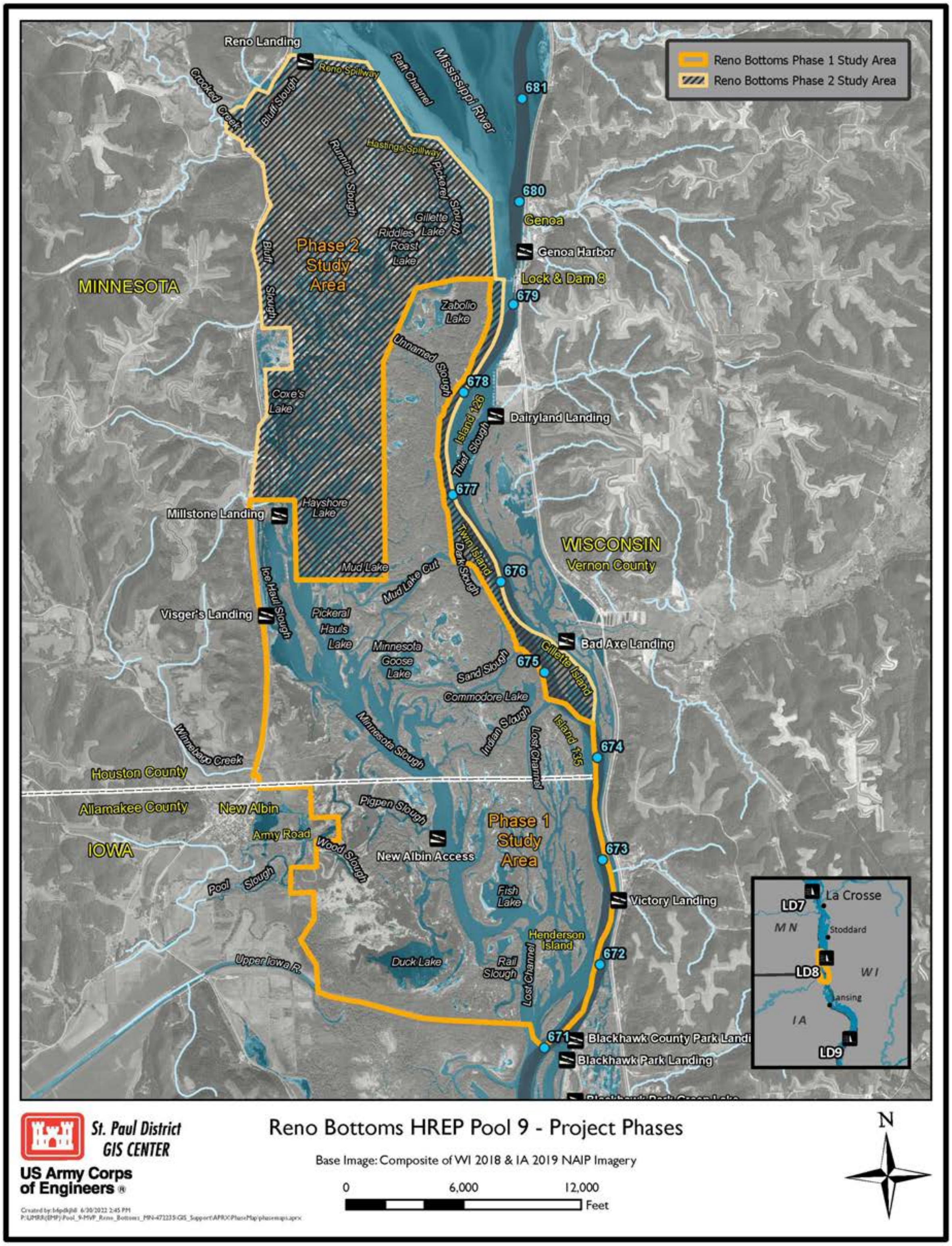


Figure 3-3. Reno Bottoms HREP Phases.

3.4.2 Measures Identified

Measures and measure locations for the HREP were identified in two primary ways. Standard HREP methods and methods identified in the Reno Bottom's Factsheet and NESP PIR were identified early in the planning process. Measures were also derived from prior studies, the NEPA public scoping process, and from the multidisciplinary, interagency PDT. Site visits in 2019 and 2020 also led to the identification of possible measures. An array of measures developed for the study area are summarized in Table 3-1.

Table 3-1. All measures considered

Measure	Description
No Action	**No structural or non-structural action**
Thin Layer Placement (TLP)	Hydraulic or mechanical placement of sand material (sourced from access or habitat dredging in the study area or from main channel) to raise the bottom elevation of backwater islands between one and two feet
Island Enhancement/ Building	Hydraulic or mechanical placement of sand or granular material (sourced from access or habitat dredging in the study area or from main channel) to raise the bottom elevation of backwater islands greater than two feet
Channel Reroute	Reroute of interior channels to redirect sediment dispersal and natural transport processes
Bank Protection	Armoring of island riverbanks
Habitat Dredging	Dredge for overwintering habitat for fish or improve mussel habitat & provide sediment source for forest elevation measures such as thin layer placement or island enhancement
Access Dredging	Dredge to facilitate access to areas to construct project features & provide a sediment source for forest elevation measures such as thin layer placement or island enhancement
Side Casting	Side casting of dredged material along access dredging to increase shoreline elevation for willow forest community
Sediment Deflector	Deflect sediment settling from dredged habitat or existing habitat
Channel Closure	Closure of interior side channels to reduce flow from the main channel, could include a gated structure or plugging (completely or partially) existing undesirable outlets
Side Channel Closure	Reduction of flow to in-channel habitats by partial or full closures of inlets using rock-lined closures
Planting and Seeding	Tree species planting and seeding across existing and proposed (island enhancement/ building) floodplain forest
Vegetation Control and Planting	Chemical and mechanical management of invasive plants and other competing vegetation, soil preparation, tree planting and seeding
Forest Thinning	Forest canopy thinning to improve structural diversity

Almost all the potential measure locations were sited across the study area based on early pre-modeling rationale described in Table 3-2. The PDT took a comprehensive approach to siting of measures across the initial 14,000-acre Reno study area.

The strategy for siting forest management measures (vegetation control, planting, and canopy manipulation) in such a large, forested area was developed through a series of discussions within the Reno Bottoms PDT and a forestry subgroup within that PDT. Eight target forest endpoints were developed that would fulfill the primary project objective. For each endpoint, a set of metrics was identified that could be quantified using the current forest inventory data to assess forest conditions relative to target endpoints. The goal of this process was to classify the landscape into areas which, based on current conditions, may benefit from management actions intended to improve forest conditions within the study area. Using these metrics, a total of 4,033.7 acres of current forest area (71% of the 2010 forested area) and 1,060.5 acres of forest expansion in currently non-forested areas were delineated for further evaluation and measure siting.

Figure 3-4 shows all the forest management measures across the study area. Figures 3-5 (overview map) and 3-6 through 3-11 show all the geomorphic and water level management measure locations sited across the initial Reno Bottoms study area before screening, with one exception. Rail Slough habitat dredge area was identified later in the study when additional sources of island enhancement material were needed for analysis.

Table 3-2. Reno Measures and rationale for siting within the project area

Measure Type	Siting Rationale	Locations
Geomorphic Measures (change in bottom elevation to enhance habitat)		
Thin Layer Placement (TLP) *Modeled in FSM*	Locations which could support higher elevation floodplain forest and could be accessed by water or road to place material (less than 2' of fill)	**1,041 acres:** GIS analysis identified forest areas that could be raised up to 2' resulting in creation of new forest or enhancement of existing forest. Those areas were then refined by interagency discussion on access and constructability
Island Enhancement/ Building *Modeled in FSM*	Locations which could support higher elevation floodplain forest and could be accessed by water or road to place material (greater than 2' of fill)	**1,221 acres:** Best professional judgement of interagency team, in conjunction with GIS site-specific data on high tree mortality to identified areas which would benefit from elevation beyond 2'
Channel Reroute	Locations where quality in-channel habitat could be preserved or enhanced by lowering sediment input by rerouting side channels	**1 location**: Sand Slough
Bank Protection	Locations of high velocity which show evidence of high rates of bank erosion or locations could experience high rates of bank erosion because of actions	**1 Location**: Dark Slough
Habitat or Access Dredging	Locations adjacent to forest elevation where dredging would either (1) create a larger volume of water with proper levels of dissolved oxygen to support in-channel habitat or (2) be necessary to allow for construction access. In both situations, dredged material would provide sediment source for thin later placement or island enhancement.	**13 Locations:** Cordwood S, Coordwood N, Winnebago, Twin Island, Lobe SW of Fish Lake, Fish Lake, Gillette Island, Indian Slough, Ice Haul Slough, Visger's Landing, Commodore Lake, Goose Lake, Rail Slough
Side Casting	Locations adjacent to habitat or access dredging where material could be side cast to support a willow plant community	**1 Location (with various options identified within those locations)**: MN Slough
Sediment Deflector	Locations where quality in-channel habitat could be preserved or enhanced by lowering sediment input through the use of sediment deflection	**4 Locations:** Lessard Sams, Mud Lake Cut, Goose Lake/Sand Slough, Fish Lake

Measure Type	Siting Rationale	Locations
Water Management Measures (change in water elevation to enhance habitat)		
Channel Closure *Modeled in FSM*	Side channels which could be closed, partially or fully, to reduce the amount of inflow into the Reno Bottoms backwater	**5 Locations:** Mud Lake*, Unnamed*, Sand Slough*, Indian Slough*, * ***These four closures are dependent on each other. Closing only one slide channel would likely increase discharge on downstream side channels.
Partial Closure	Inlets to backwater habitats where inflows could be reduced via the placement of a rock inflow	**1 Location:** Ice Haul Slough* *Ice Haul Slough rock partial closure is dependent on Ice Haul Slough habitat dredging.
Forest Management Measures (change in forest plant communities to enhance habitat)		
Vegetation Control and Planting (including Forest Expansion) *Modeled in FSM*	Areas identified using 2018-20 forest inventory data with less than desirable canopy conditions, include low canopy density, low species, age, or structural diversity, or no viable regeneration present. Areas also selected with significant forest health threats, such as emerald ash borer or invasive plants	**4,253.3 Acres**: Throughout the study area* *3,492.8 acres in current forest areas and 760.5 acres in forest expansion areas
Forest Thinning *Modeled in FSM*	Areas identified using 2018-20 forest inventory data with low vertical and horizontal structural diversity	**2,626.9 Acres**: Throughout the study area

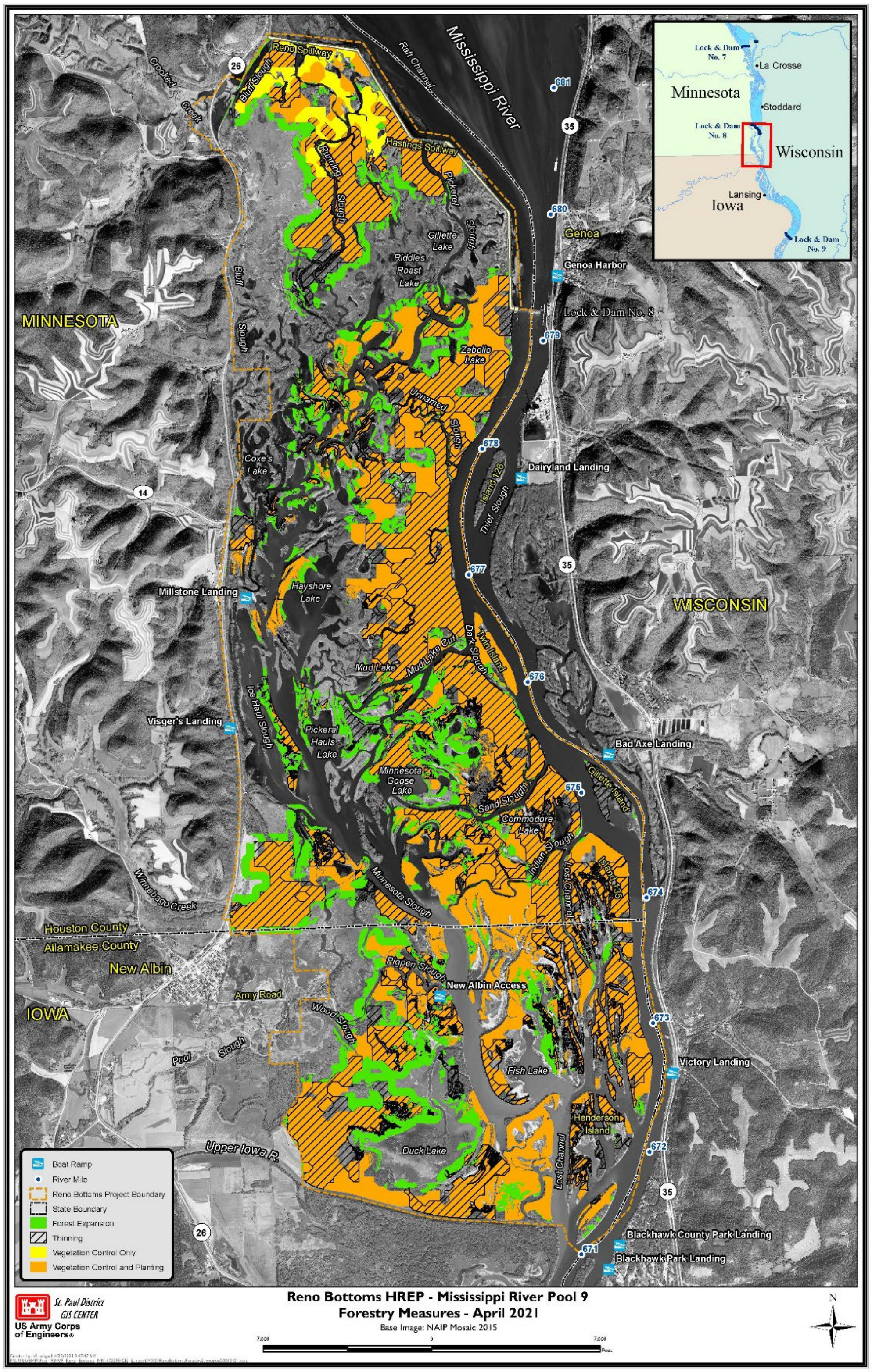


Figure 3-4. All potential forest measure locations prior to screening.

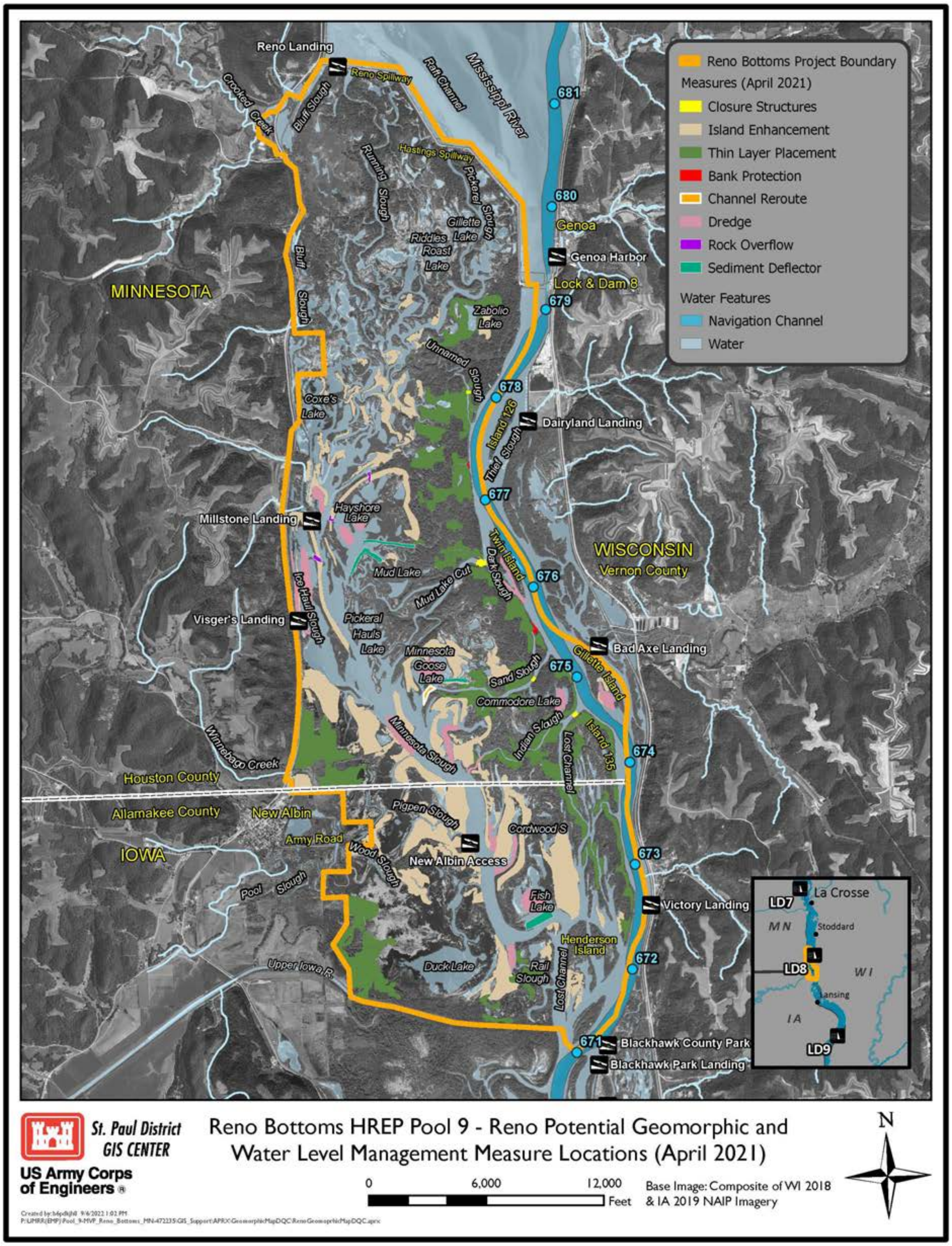


Figure 3-5. All potential geomorphic and water level management measure locations prior to screening

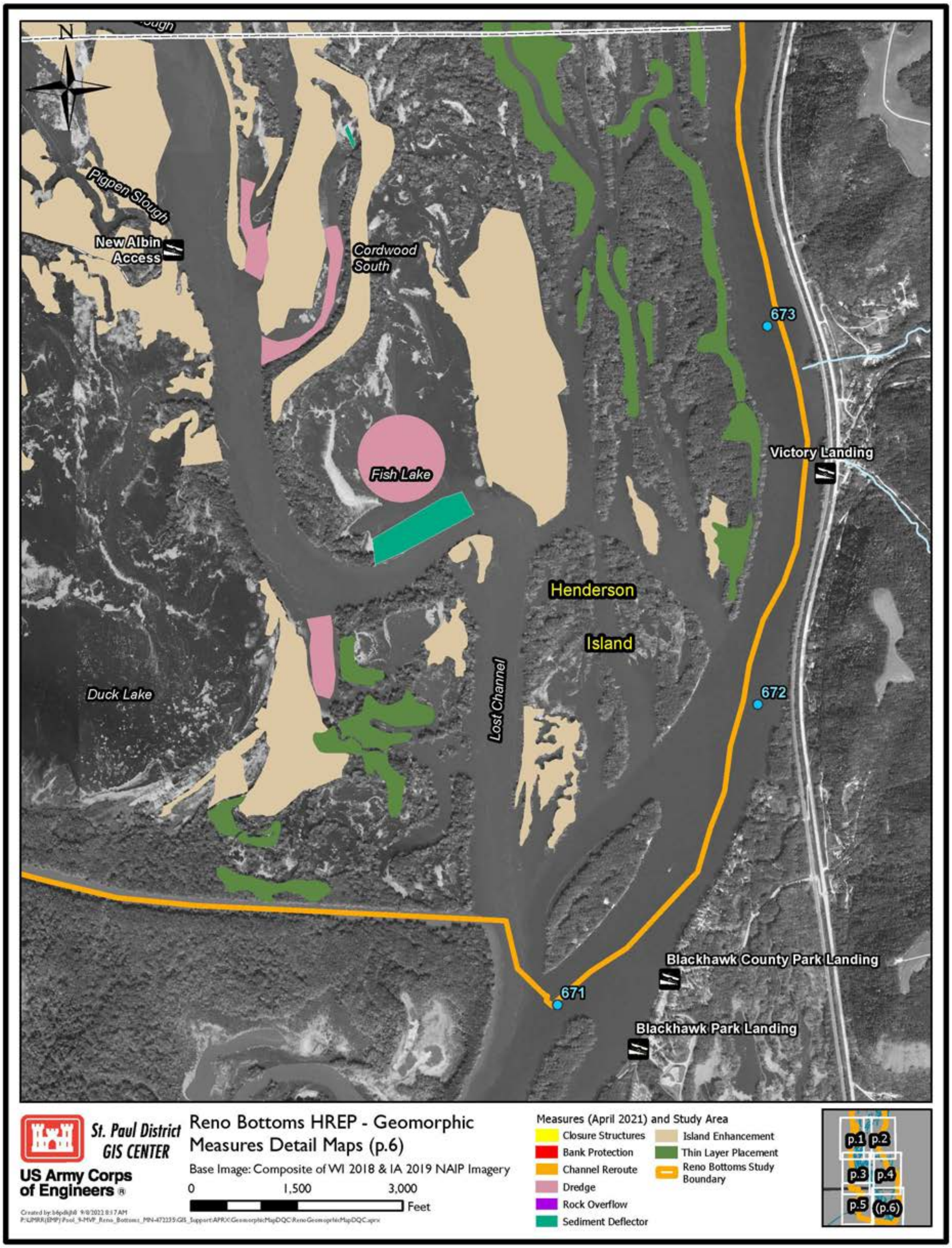


Figure 3-6. Southeast Reno Geomorphic Measures, Details.

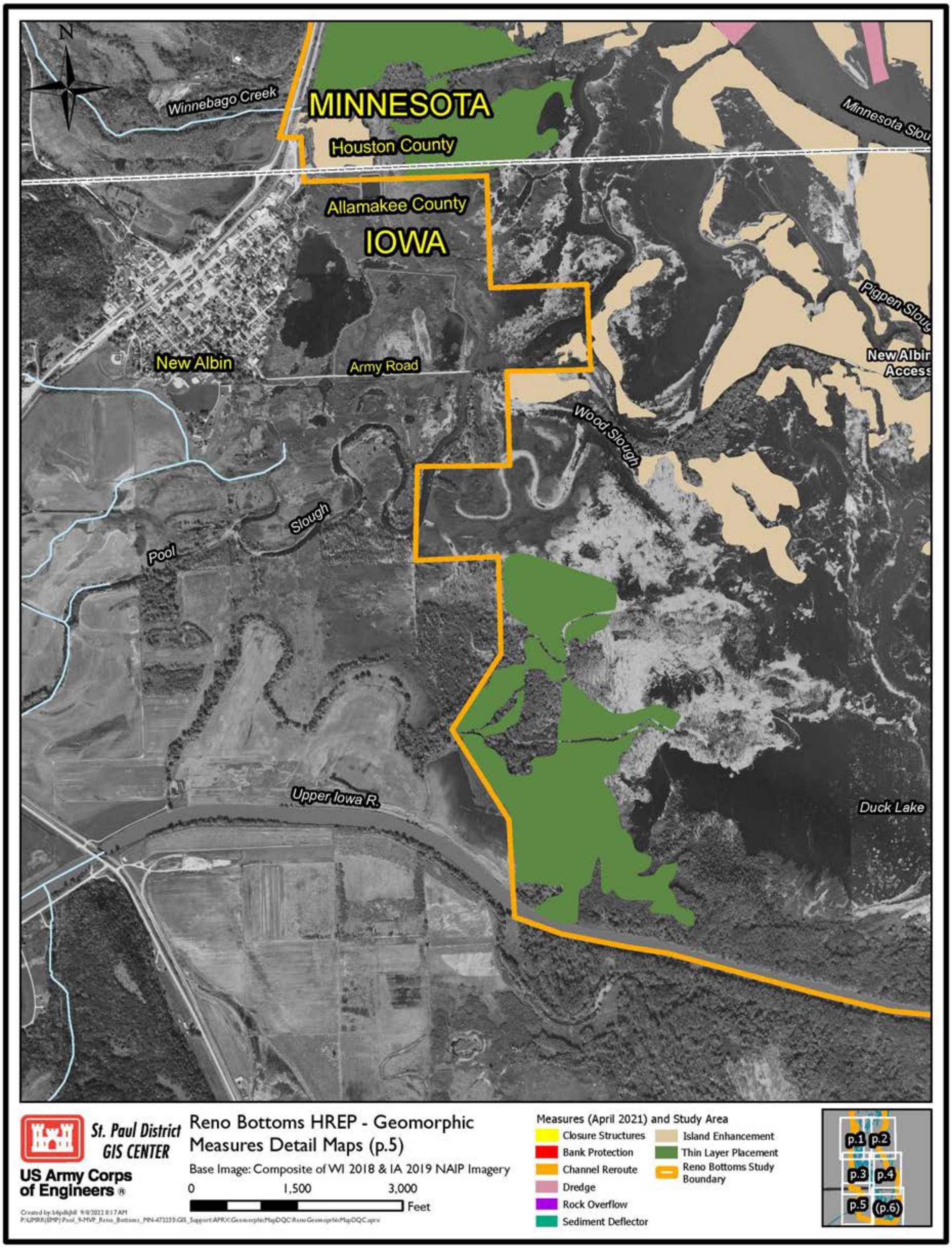


Figure 3-7. Southwest Reno Geomorphic Measures, Details.

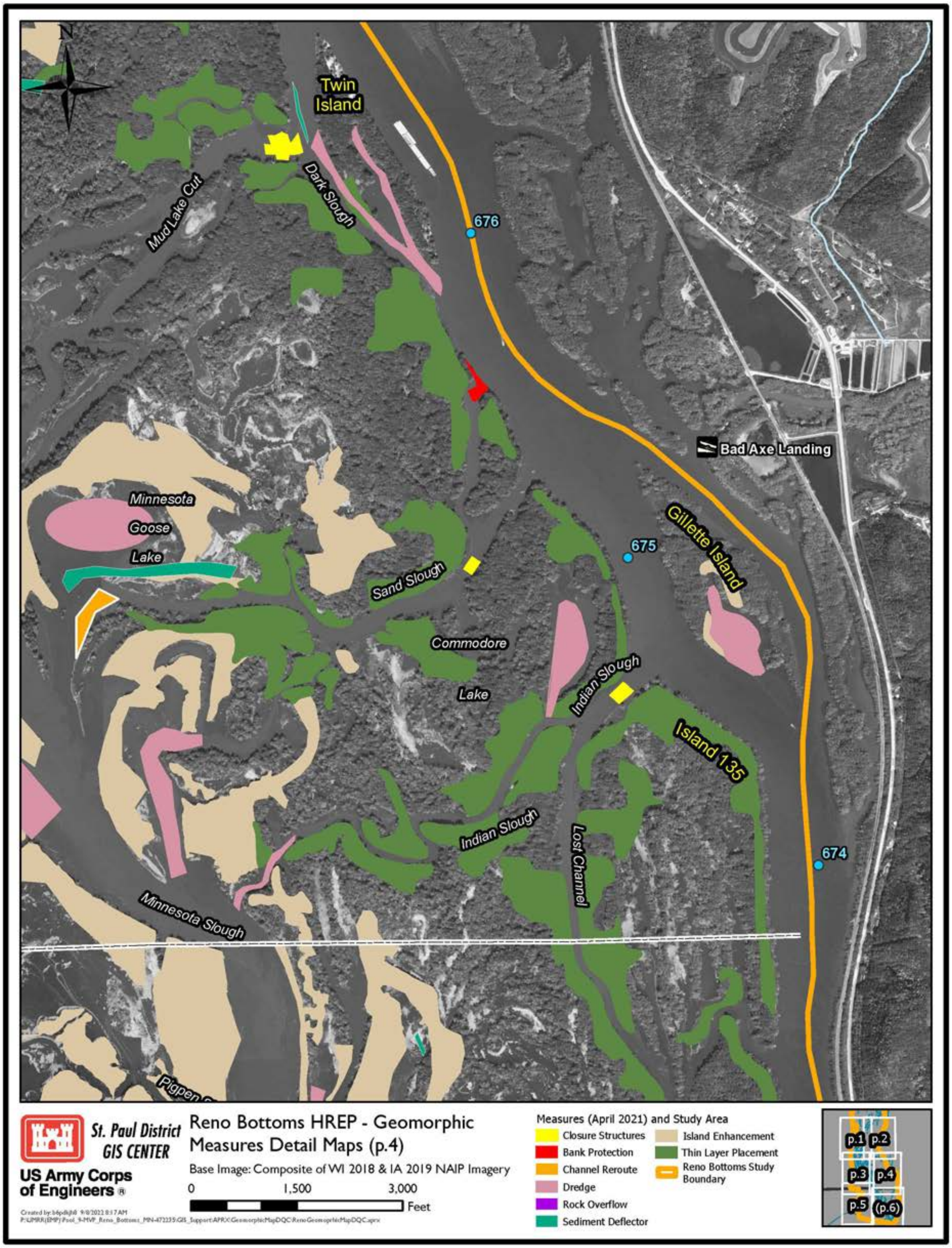


Figure 3-8. Middle-east Reno Geomorphic Measures, Details.

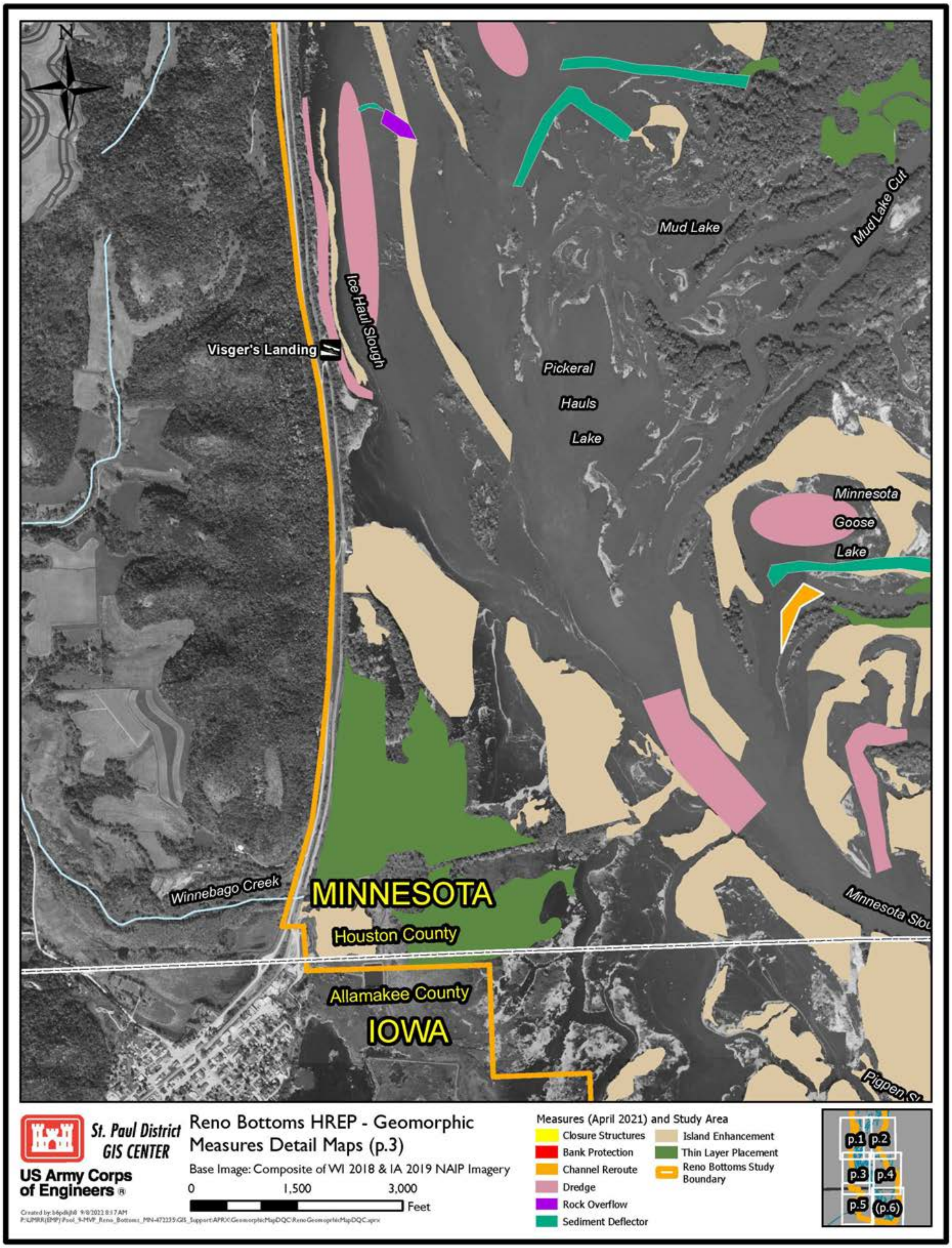


Figure 3-9. Middle-west Reno Geomorphic Measures, Details.

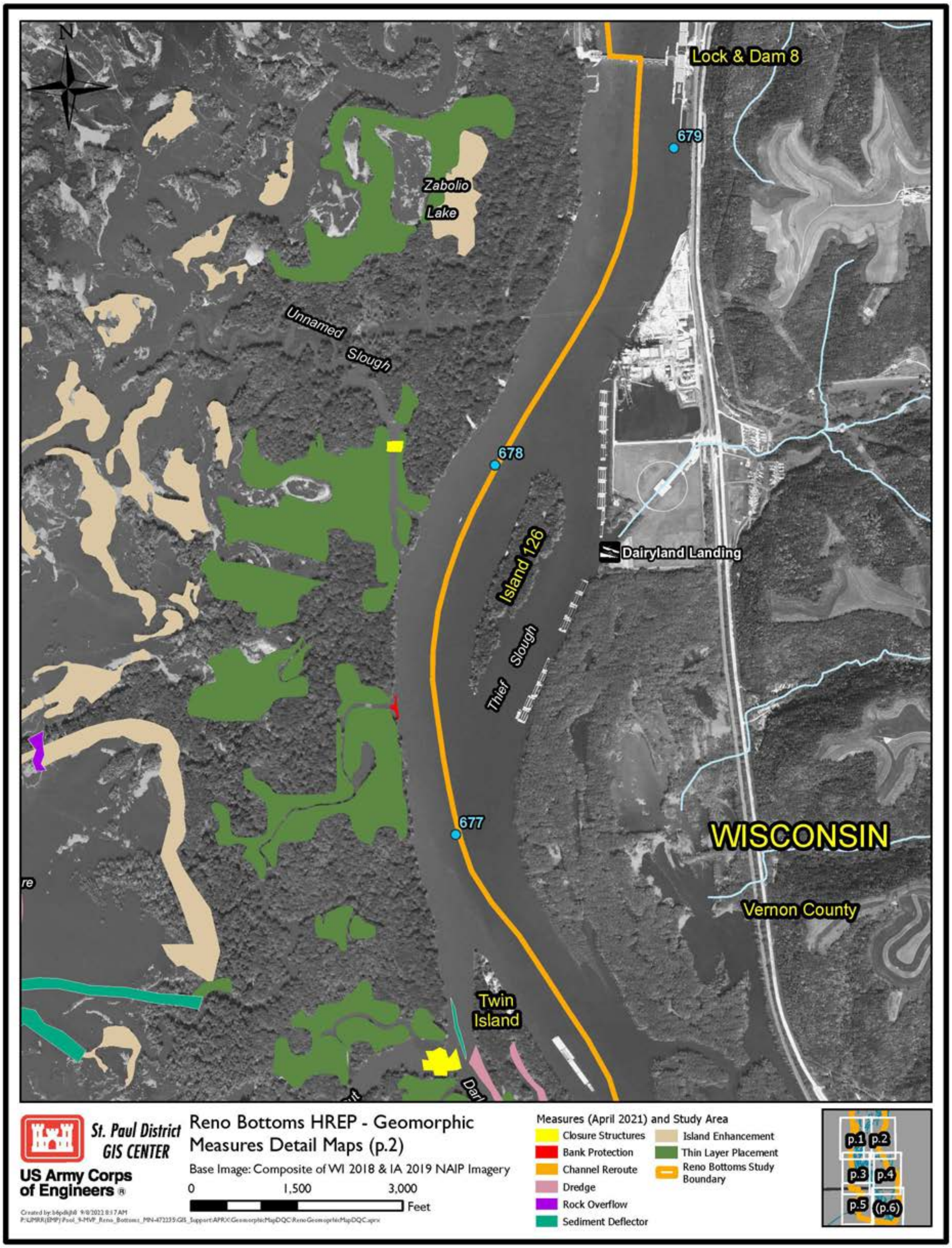


Figure 3-10. Northeast Reno Geomorphic Measures, Details.

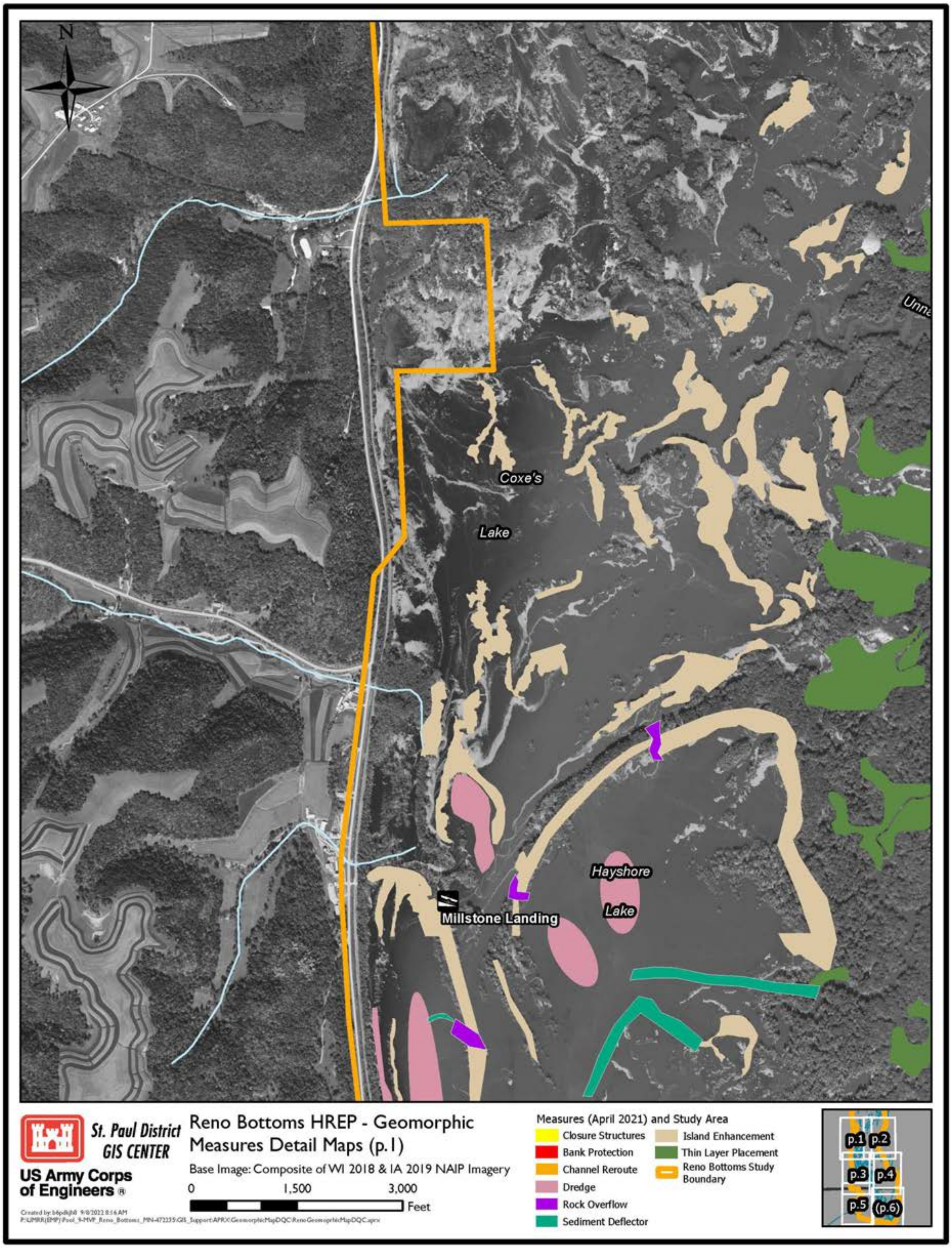


Figure 3-11. Northwest Reno Geomorphic Measures, Details.

3.4.3 Measure Screening

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 benefits. The purpose of this screening is to remove measures that do not support the planning objectives. Screening does 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 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.

For the Reno HREP, the evaluation criteria identified in USACE Planning Guidance Notebook (ER 1105-2-100) and by the Water Resources Council in 2014, also known as the PR&G criteria, as well as a constructability and access criteria were used to aid in the screening of measures and selection of a plan. These criteria are defined below.

- <u>Completeness</u> - 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.
- <u>Effectiveness</u> - Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified objectives.
- <u>Efficiency</u> - 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.
- <u>Acceptability</u> - 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. Planning constraints and considerations identified in Section 3.2.3 fall under this criterion.
- <u>Constructability/Access</u> – This was aimed at addressing the following practical questions to ensure project success:
    - *Can the measure or alternative be accessed?*
    - *Can the measure or alternative be constructed?*
    - *What lessons learned from three decades of HREP implementation could be considered to increase understanding of impacts, costs, and methods?*

Measures were screened against selected criteria in the planning process and alternative plans developed were also screened against the same criteria in a later iteration of the planning process.

The flowchart shown in Figure 3-12 identifies the how the PDT utilized the forest models and their output in initial screening of measures. Between FSM model run one and two, some measure locations were refined with a smaller footprint in recognition of modeled flood stage impacts and conditions observed in a site visit in 2021.

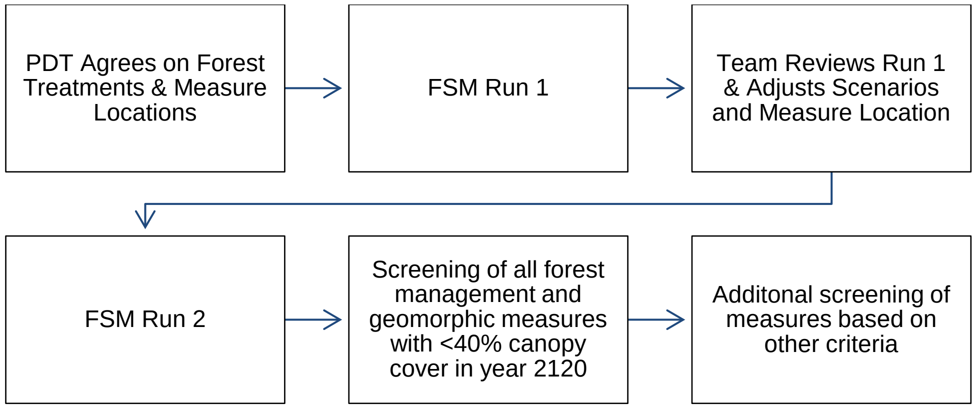


Figure 3-12. Forest modeling approach.

3.4.3.1 Modeling of Measures to Inform Effectiveness Evaluation

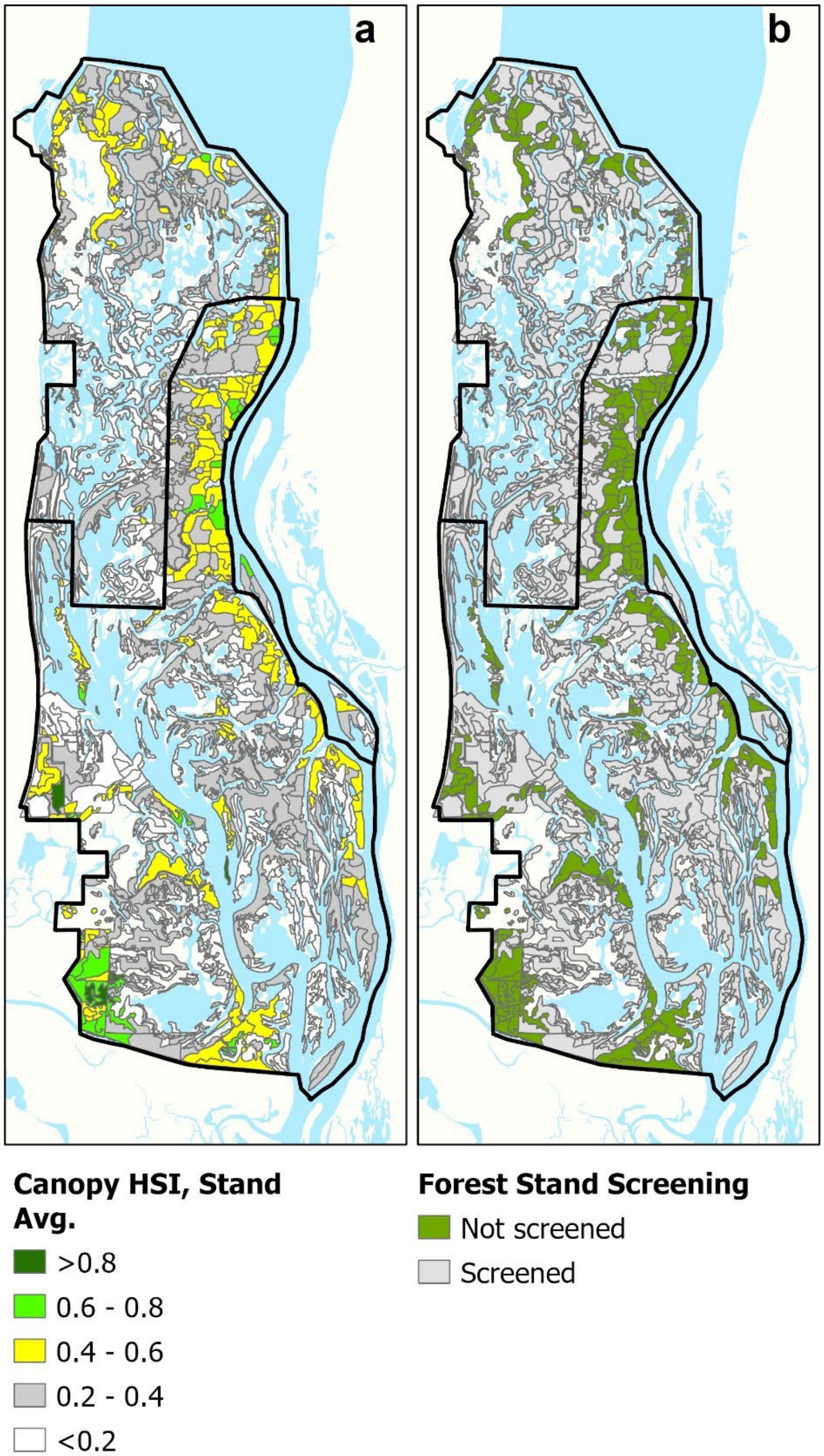
The FSM was the primary tool used for initial screening of project features, though only those with a potentially quantifiable impact on forest habitat were modeled (See note in column 1 of Table 3-2). Due to the potentially interacting effects of the various measures, the FSM was run with dozens of scenarios. Each scenario included a unique combination of measures to capture all possible relevant combinations. A no-action scenario was also run which included no measures. When a measure was included in a scenario, all features associated with that measure were modeled. For example, the scenario that included geomorphic and water management features but no forest management measures were run with all island enhancement, thin layer placement, and closure features.

Because the FSM models forest growth relative to annual inundation, all geomorphic features included in the model run were converted into a single elevation layer based on target elevations assigned by the PDT for each feature. As part of this process, the island enhancement and thin layer placement features were merged into a single layer and were considered together throughout the remainder of the evaluation process as forest elevation enhancement. Though the process for selecting thin layer placement and island enhancement feature locations was different, both approaches targeted elevations that would be at 20 days of annual inundation or less. The two measures mostly differed in their starting elevations, with the thin layer placement areas being higher. The target elevations for both measures were similar.

3.4.3.2 Screening of Measure Locations with <40% Canopy Cover in Year 2120

To facilitate evaluation of the output of the FSM model (which consisted of thousands of 90 m^2 pixels, an area of approximately 2 acres), an existing USACE forest stand layer was used to create higher-level summaries of the data. These stands represent the smallest viable forest management units and are thus more relevant for management.

For initial screening, FSM outputs were averaged for Percent Canopy (Forest HEP Variable 1) at the stand level in model year 100 under the full measures scenario (all forest management + elevation enhancement + partial closures, Figure 3-13, panel a). Percent canopy was used for initial screening because it is a basic indicator of presence or absence of forest. Year 100 (2120) was used at this point because it provided a better estimate of long-term forest viability than year 50 due to the slow growth of forests, though year 50 was used for all subsequent habitat evaluation and benefit calculations. The PDT agreed that a measure location that provided less than the 40% canopy cover would not be an effective or efficient location. For that reason, the team screened all forest management and geomorphic features that would provide less than 40% canopy cover in year 2120 based on FSM results (Figure 3-13, panel b).



To select the optimal set of measures in each forest stand, the final forest HEP score was calculated for each set of management scenarios modeled in the FSM and those scores were tabulated by stand. The scenario with the highest HEP lift relative to the no project scenario for the stand was selected as the preferred measure. In cases with similar scores between two scenarios but a significantly higher cost for one scenario over the other, the lower cost scenario was retained. As a result, TLP was effectively screened from the project because in all cases where TLP and forest management were modeled in the same location, forest management alone gave nearly equivalent lift as TLP at a substantially lower cost.

Figure 3-13. Average Forest HEP Variable 1 HSI by stand for all measures scenario at modeled year 100 (a) and stands remaining after screening out stand average HSI <0.4 (b).

3.4.3.3 Screening of Additional Measure Locations

Additional measure locations were screened based on the screening criteria, see Table 3-3. Many measure locations were screened as they were not acceptable in terms of compliance with applicable laws or regulations. For example, mussel beds were found during site visits with high diversity of species and state and federally listed species. Relocating mussels over a large extent of Minnesota Slough would be cost-prohibitive in almost all situations. Not moving the mussel species would likely result in an adverse effect to federally listed species. That outcome was not acceptable to both the Refuge and the larger project team. The inability to access dredge throughout much of the Reno Bottoms backwater also made access a significant consideration and as such, resulted in the screening of features that could not be accessed by land or water *without* access dredging in Minnesota Slough. Relocation of mussels in smaller areas, such as the area encompassing the partial closure of Ice Haul Slough (<2 acres), were determined to be cost effective and acceptable and were not screened.

Further, early modeling of measure extents and locations showed flood stage rise. There was significant need to reduce placement of fill material along Minnesota Slough and adjacent islands and floodplain forest habitat. Therefore, the team attempted to minimize additional fill placement in this area when considering alternatives.

The measures retained for further consideration (island enhancement, habitat dredging, channel closures, side channel closures, planting and seeding, vegetation control and planting) were derived from the planning objectives for the project, and are the most complete, effective, efficient, and acceptable within the range of measures considered in locations modeled to benefit either or both in-channel or floodplain forest habitat.

While not screened, the USFWS shared information showing that while Fish Lake has potential for greater overwintering habitat, it is currently an above average location for native fish overwintering. Fish Lake is also a location within Reno Bottoms with high quality native and diverse emergent wetland habitat. A large expansion of the extent of overwintering habitat could result in negative secondary impacts to the existing healthy and diverse aquatic habitat within Fish Lake (e.g. negative changes to Fish Lake’s hydraulics or water quality or a reduction in emergent wetland habitat). For those reasons, the extent of habitat dredging was reduced within Fish Lake to minimize potential for adverse effects to emergent wetland and existing native fish habitat.

Table 3-3. Rationale for Measure Screening & Screened Locations

Measure Type	Criteria Used for Screening & Screened Locations
Geomorphic Measures (change in bottom elevation to enhance habitat)	
Forest Elevation (Formerly Thin Layer Placement and Island Enhancement/ Building)	Not efficient, limited access, and limited borrow material in proximity. Locations (2): Whalen, Duck Lake Not efficient, limited access, and limited borrow material in proximity. Location (1): Duck Lake Not effective, complete, and efficient. Locations (2): Mud Lake, Goose Lake Not effective, complete, and efficient. All thin layer placement locations.
Channel Reroute	Not efficient, limited access, and not acceptable (potential for secondary mussel impacts). Location (1): Sand Slough
Habitat or Access Dredging	Not efficient and acceptable (potential for mussel impacts). Location (1): Goose Lake Not efficient or effective and a lack of access. Location (1): Commodore Lake and (2) Visger's Landing Not acceptable (potential for mussel impacts) and lack of access. Locations (2): Lobe SW of Fish Lake, Winnebago Not effective, complete, and efficient. No need for sediment. After USGS FSM modeling, it was determined that optimal treatment for the forest zones along the main channel of the Mississippi River would not include any thin layer placement or island building. Locations (2): Gillette Island, Twin Island.
Side Casting	Not acceptable (flood stage impacts) and limited access. Location (1): MN Slough side casting locations.
Sediment Deflector	Not efficient, effective, complete, and or acceptable (flood stage impacts). Locations (4): Lessard Sams, Mud Lake Cut, Goose Lake/Sand Slough, Fish Lake
Water Management Measures (change in water elevation to enhance habitat)	
Channel Closure	Not efficient or effective, and limited access. Location (1): Fish Lake
Forest Management Measures (change in forest plant communities to enhance habitat)	
Forest Thinning	Not effective or efficient. All forest thinning was screened after USGS FSM Modeling. All zones that included stand manipulation/thinning saw an average 7% *decrease* in habitat units. Including thinning in forest management increased costs by 20%.
Vegetation Control and Planting (including Forest Expansion)	Not efficient, limited access. Location (1): Duck Lake

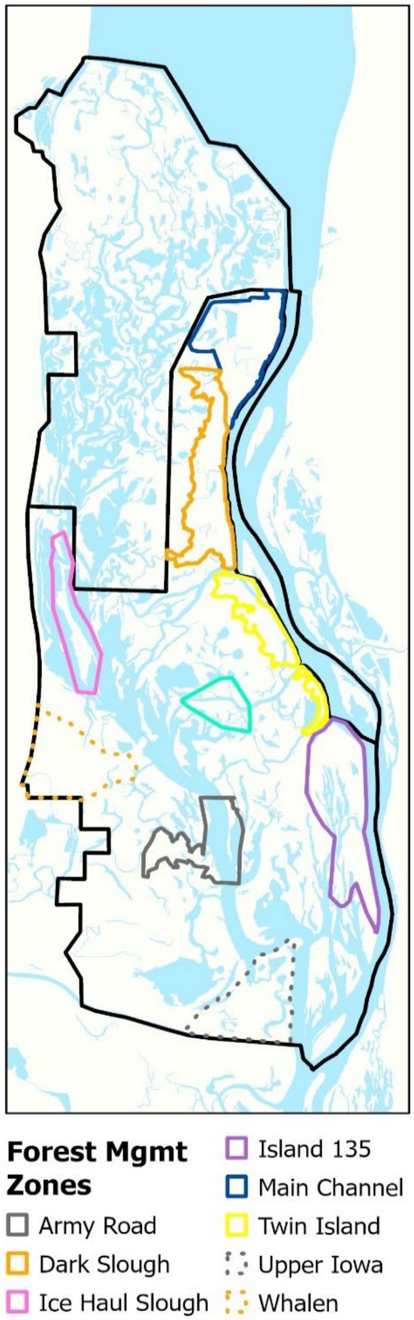


Figure 3-14. Forest management zones, aggregated from stands retained after screening.

3.5 Formulation of Alternatives

Alternative development is an iterative process with many inputs. 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.

The hydrologic analysis of the study area, specifically the flood stage impact analysis, was the most influential factor in the development of alternatives for forest elevation areas. The Corps must demonstrate the Recommended Plan would not result in a rise to flood stage within the States of MN and IA; therefore, it was paramount that all alternatives did not result in flood stage impacts. Previously modeled flood stage impacts required the PDT to minimize the extent of various forest elevations and consider locations where forest elevation would have the greatest habitat benefit.

For forest management measures, the forest stands that were retained in the screening process were aggregated into a set of forest management zones, shown in Figure 3-14. The final HSI for each zone was then calculated based on the average HSI across all forest within that zone (details in Appendix D, Habitat and Forest Modeling).

In zones where forest elevation was included as an optimal measure, the amount of fill needed for forest zones were calculated. The team then calculated (1) the amount of fill that would be necessary for each remaining island enhancement zone and (2) the amount of material that could be obtained from various nearby habitat dredging borrow locations.

The reason for considering fill and nearby borrow availability early in alternative formulation was two-fold. It was imperative that material needs could be appropriately balanced. Flood stage impacts significantly constrained the amount of material that could be placed on islands. Due to flood stage impacts, there were more places to beneficially dredge material than options to place that material to benefit forest. Further, the location of mussel beds with federal Endangered Species Act (ESA) listed mussel species would have made it cost-prohibitive and unacceptable to access dredge in Minnesota Slough, limiting placement site options.

With all this information the team then formulated alternatives, see flow chart in Figure 3-15.

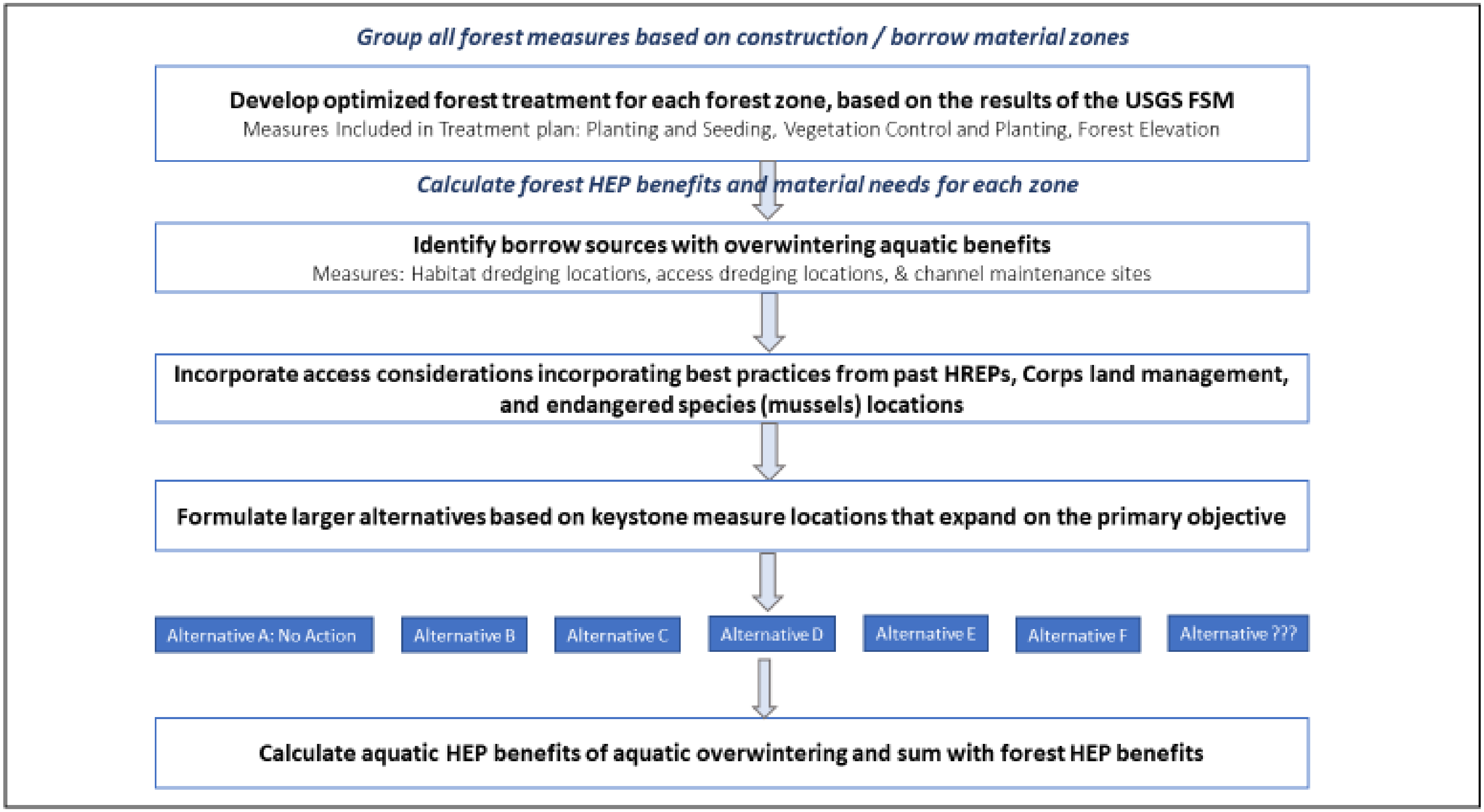


Figure 3-15. Plan Formulation Strategy.

The combinations of remaining measures amounted to 13 different alternatives, including the No Action Alternative (Alternative A), as shown in Figure 3-16. The team formulated alternatives based on restoration themes: forest benefit focus (Alternative B), keystone measures (Alternative C), keystone with additional aquatic diversity (Alternative D), forest optimal elevation (Alternative E), state and sponsor resource goals (Alternative F), and maximum aquatic and forest benefits (Alternative G) (see Table 3-4). Using these six themes, the PDT reasonably maximized ecological outputs compared to cost, while also incorporating practical construction and borrow material considerations. From alternatives A through G the project area increases in acres.

In recognition of the primary forest objective, keystone areas of Army Road (elevation measure) and Dark Slough, Main Channel, Twin Island, and Whalen (forest management measures) were identified. Those areas were determined by the PDT as important forest habitat areas that should be included in all action alternatives to minimally meet the main project objective. The five keystone areas all have a high restoration potential when considering key forest parameters. Keystone areas would increase forest patch size by connecting to larger blocks of contiguous forest within the study area and all have opportunities to enhance regeneration and species and structural diversity. The PDT also ensured all keystone features were accessible by road or water with no need for access dredging. S7/Coordwood South was also included in Alternative C "Keystone" as a borrow source was necessary for the Army Road elevation.

The second variation of each action alternative starting with Alternative C (C2, D2, E2, F2, and G2) include partial side channel closures. At the time of alternative formulation, it was not clear the effectiveness and efficiency of the side channel closures on various backwater habitats and having them as a variation of each alternative would allow their additional benefits to be clearly evaluated.

Table 3-4. Themes and descriptions of alternatives.

A. No Action Alternative	**B. Forest Management & Monitoring**	**C. Keystone**	**D. Keystone + Aquatic Diversity**	**E. Forest Optimal Elevation**	**F. Agency Concurrence Alternative**	**G. Maximum Forest & Aquatic Benefits**
	Theme: forest benefit focus Description: Forest management only, no sediment removal or placement	Theme: keystone areas to minimally meet both objectives Description: highest priority restoration areas based on PDT input and habitat gains modeled in forest modeling	Theme: keystone areas with additional aquatic diversity Description: same as Alt C but with the addition of high priority Ice Haul Slough aquatic habitat measure, Ice Haul Island forest elevation, and Ice Haul Partial Closure	Theme: maximized forest benefits Description: same as Alt C but with the addition of a high priority Upper Iowa forest elevation	Theme: State and sponsor resource goals Description: plan includes partnering agency and sponsor's highest priority restoration areas	Theme*:* maximum aquatic and forest benefits Description: maximum habitat benefits for all of Phase 1 study area with known project constraints access limitations

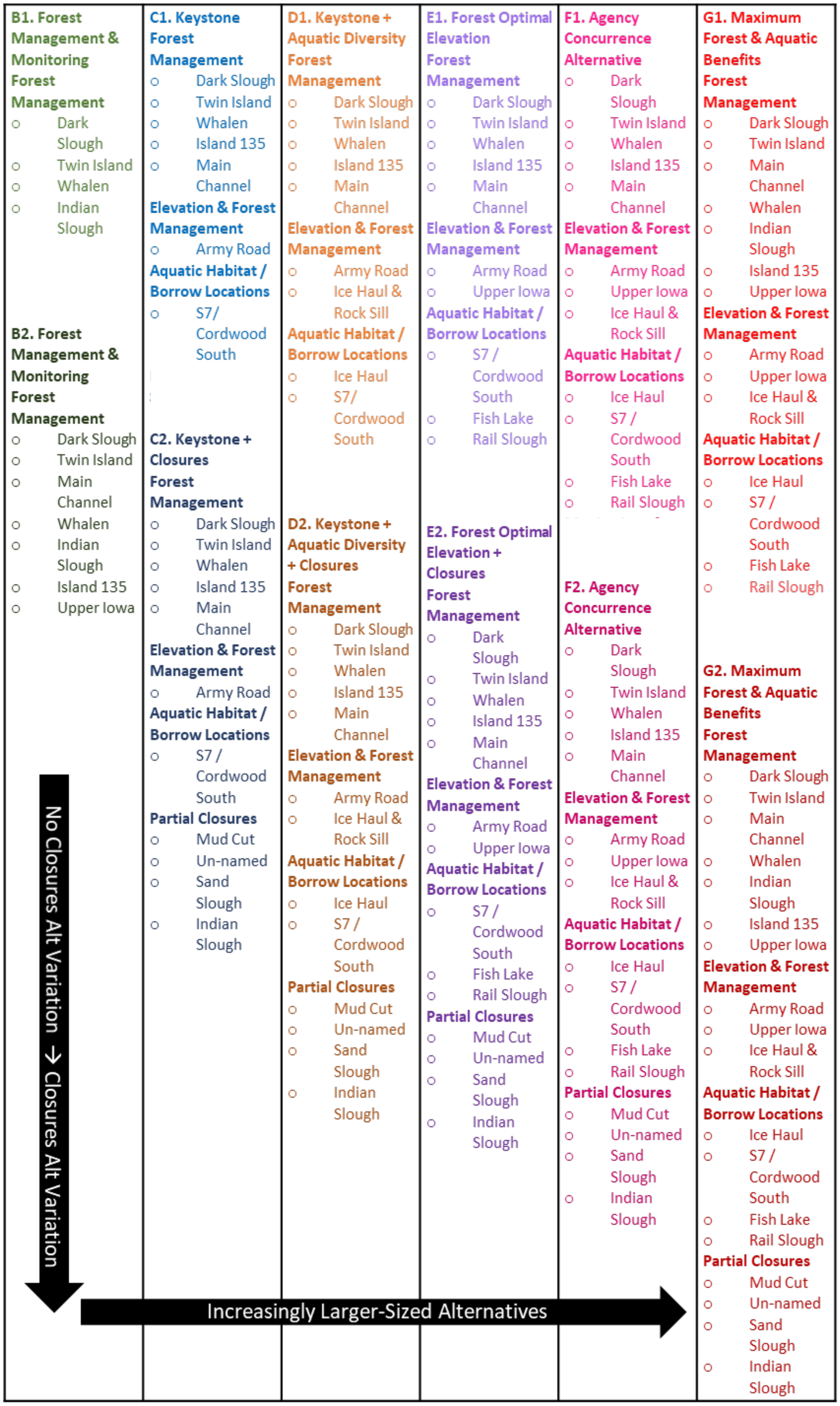


Figure 3-16. Formulated Array of Alternatives.

3.6 Evaluation and Comparison of Alternatives

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

3.6.1 Ability of Alternatives to Meet Project Objectives

The PDT evaluated how well the various alternatives met the project objectives. The team developed alternatives based on modeled habitat changes; therefore, is not surprising that all the action alternatives minimally met the primary forest objective. However, the extent to which they met the primary objective differs. From Alternatives B1 to G1 there are additional areas included in the alternatives which would protect, enhance, restore, or create naturally regenerating, resilient, and diverse bottomland forest habitat. A larger project footprint would meet the forest objectives to a greater extent, depending on which forest management areas are included in the alternatives and where elevation of the floodplain forest would occur.

None of the action alternatives would fully meet secondary objective B (briefly stated, improvement of running water habitat). However, indirectly, under all action alternatives, the continued establishment of floodplain forests will indirectly but diffusely improve water quality and provide flood attenuation benefits. The presence of floodplain forests reduces overland flow and minimizes sediment transport, benefiting lake and wetland and running water habitat across Reno Bottoms. Under Alternative A, the No-Action, forests within Reno Bottoms will fail to regenerate (See Section 2.1) and floodplain forest viability would be significantly diminished, thus also reducing the ecosystem services floodplain forests provide to aquatic habitat.

As discussed in Section 3.3, to quantify habitat benefits of the proposed alternatives, two Habitat Evaluation Procedures (HEP) were used, the Bluegill Model (Aquatic HEP) and the Upper Mississippi River System Floodplain Forest Habitat Model (Forest HEP). 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). Table 3-5 shows a summary of benefits (both forest and aquatic) for each measure location and can be useful to understand the differences in the alternatives and the benefits they would provide. Table 3-6 contains a summary of costs and benefits associated with each alternative.

Table 3-5. Benefits by habitat type for measures included in alternative development.

Total Lift for Measure Locations by Habitat Type (AAHUs)				
Location	**Measure(s)**	**AAHU GAINS**	**Floodplain Forest AAHU Gains**	**Aquatic AAHU Gains**
Dark Slough	Forest Management	13.87	13.87	n/a
Twin Island	Forest Management	9.85	9.85	n/a
Main Channel	Forest Management	9.98	9.98	n/a
Whalen	Forest Management	14.42	14.42	n/a
Indian Slough	Forest Management	2.09	2.09	n/a
Island 135	Forest Management	21.15	21.15	n/a
Upper Iowa	Forest Management	3.86	3.86	n/a
Army Road	Coordwood Slough Habitat Dredging, Army Road Elevation and Army Road Forest Management	31.63	13.63	18.00
Upper Iowa	Fish Lake Habitat Dredging, Rail Slough Habitat Dredging, Upper Iowa Elevation, and Upper Iowa Forest Management	38.23	17.23	21.00
Ice Haul	Ice Haul Habitat Dredging, Ice Haul Elevation, Ice Haul Forest Management, Ice Haul Partial Closure	128.48	12.48	116.00
Mud Cut, Un-named, Sand Slough, and Indian Slough	Partial Closures	n/a	n/a	n/a

Table 3-6. Aquatic and Forest Benefits and Costs for All Alternatives.

Alternative	Total Cost (Millions)	Average Annual Equivalent Cost	AAHU Gains	Floodplain Forest AAHU Gains	Aquatic AAHU Gains	$/ AHHU
A- No Action	$0	$0	0	0	0	$0
B1	$5.45	$183,000	40.24	40.24	0	$4,558
B2	$11.6	$372,000	74.23	74.23	0	$5,011
C1	$21.16	$712,000	99.91	81.91	18.00	$7,122
C2	$33.58	$1,130,000	99.91	81.91	18.00	$11,307
D1	$39.29	$1,321,000	228.39	94.39	134.00	$5,784
D2	$51.93	$1,747,000	228.39	94.39	134.00	$7,647
E1	$36.36	$1,223,000	142.00	103.00	39.00	$8,611
E2	$48.97	$1,647,000	142.00	103.00	39.00	$11,599
F1	$54.49	$1,832,00	270.48	115.48	155.00	$6,775
F2	$67.31	$2,264,000	270.48	115.48	155.00	$8,370
G1	$54.91	$1,847,000	272.57	117.57	155.00	$6,775
G2	$67.74	$2,278,000	272.57	117.57	155.00	$8,358

Alternative B1 and B2- Alternatives B1 and B2 would provide a total of 40 and 74 AAHU gains, respectively over the no action alternative. Both alternatives minimally meet the primary objective by providing forest management (seeding, planting, vegetation control), although Alternative B2 provides greater floodplain forest habitat gain over a larger area. There would be no forest elevation under these alternatives. Alternative B1 and B2 do not have benefits that would directly address secondary objectives.

Alternative C1- Alternative C1 would provide a total of 100 AAHU gain over the no action alternative. This alternative includes the keystone forest elevation and management areas. Army Road forest area is adjacent to other bottomland forest and upland forests would be elevated. Rehabilitation of Army Road area forest would expand resilient forest habitat. The combination of forest elevation and management more fully fulfills the primary forest objective over Alternatives B1 and B2. Borrow material for elevation of Army Road would come from Cordwood South/S7. Habitat dredging of Coordwood South/S7 would provide minimal achievement of secondary objective A as the dredge location would provide overwintering habitat for native fish populations, providing a total of 18 AAHU aquatic habitat gain over the No-Action Alternative.

Alternatives D1 and E1- The primary difference between Alternatives D1 and E1 is the forest elevation areas and corresponding habitat dredged locations. Both Alternatives include Army Road forest elevation described in Alterative C1.

Alternative D1 also includes Ice Haul Island elevation and Ice Haul Slough borrow site/ overwintering habitat (a total 116 AAHU gain over the no action). As a narrow island, Ice Haul would provide less connectivity to the interior forest and forest conditions. However, with the partial closure of Ice Haul Slough, the overwintering benefits to native fish would be maintained and protected to a greater extent than other overwintering habitat sites and as such the aquatic habitat benefits are greater than any other habitat dredge area.

Conversely, Alternative E1 includes the Upper Iowa forest elevation area which would expand bottomland forest connectivity and expand higher quality forest conditions to a greater extent than Ice Haul Slough Island elevation. Fish Lake and Rail Slough habitat dredging included in E1 would provide 21 AAHU gains over the no action.

Overall, while Alternative D1 would provide 9 less AAHU less forest benefits than E1, it provides greater aquatic habitat benefits (secondary objective A). The inclusion of Ice Haul Slough habitat dredging in D1 would provide greater overwintering and fish habitat gains than Alternatives C1 and E1. Both Alternatives E1 and D1 fully meet the primary objective and secondary objective A.

Alternative F1 and G1- These alternatives would provide a larger area of forest rehabilitation work and include all three forest elevation areas of Ice Haul, Army Road, and Upper Iowa. The main difference between F1 and GI are the two additional forest management zones included in Alternative G1. Those areas would greatly expand regenerating and resilient bottomland forest. Alternative G1 would highly achieve the primary forestry objective and moderately achieve secondary objective A (a total of 273 AAHU gain over no action). Alternative F1 would have similar outcomes (a total of 270 AAHU gain over no action) across the study area.

Alternatives C2, D2, E2, F2, and G2

Main channel closures were included in five alternatives (C2, D2, E2, F2, and G2). As previously indicated, all four main channel partial closures are dependent measures. Removing one or more of the closures would result in negative secondary effects to lotic habitat in the other side channels due to increases in discharges in sloughs without closures.

At the time of alternative formulation, it was expected the closures would have some measurable benefit to the floodplain forest habitat. However, after modeling was complete (2D hydraulic modeling, FSM, and HEP evaluation) it was determined that side channel closures would not reduce the water surface elevation of bankfull events enough to result in measurable benefits to the floodplain forest or achievement of the primary forest objective.

The side channel closures reduced water surface elevation within Reno Bottoms by 0.25’ for the bankfull events that are the primary driver of floodplain forest mortality. This is a relatively small reduction compared to the natural variation in water surface elevation that occurs for bankfull events. For existing conditions, the bankfull water surface elevation is 5 to 6 feet higher than low flow conditions. If closures were implemented, inundation of the low elevation floodplain forest in Reno Bottoms would not be reduced significantly.

The current understanding of floodplain forest mortality, and the assumption in the floodplain forest succession model, is that floodplain forests respond to water elevations, not river discharge. Hydraulic model simulations done for this study indicated that water elevations are primarily a function of the total river flow with little influence from the amount of side channel inflows. The floodplain forest succession model and HEP analysis mirrored the hydraulic modeling indicating little benefit due to the partial closures, and thus no achievement of the primary objective. Average annual habitat units with and without partial closures were the same. While side channel closures would reduce some incremental percentage of sedimentation into the Reno aquatic habitat, they do not result in positive habitat gains to the forest community.

The partial closures in Alternatives C2-G2 would have secondary benefits to lotic and lentic habitat (the secondary project objective) by reducing sedimentation in some backwater areas, reducing delta growth, and reducing erosion of the channel banks. However, within the context of this project’s objectives, these benefits are diffuse and distributed among the study area’s aquatic habitat. Lotic or lentic benefits achieved because of the closures were not quantitatively modeled because additional data would need to be collected to accurately predict rates and locations of erosion and deposition over the next fifty years. Because the project’s primary objective is to restore floodplain forest, it was determined that additional information should not be collected as part of this study but could be collected and used in habitat quantification under a study with aquatic habitat as a primary objective.

To address the concern over side channel erosion and migration, monitoring of main channel sloughs and interior channels was recommended for inclusion in a Recommended Plan’s monitoring plan. Monitoring would include, at a minimum, four to five sets of discharge measurements at previously measured cross sections to establish a base line condition representing 2023-2024. Flow responds to geomorphic processes like erosion and deposition and monitoring changes in flow into the side channels could inform future restoration work under Phase 2 or a different study authority.

3.6.2 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). 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.

This process identifies which alternatives or combinations of measures 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.

Costs were annualized over a 50-year period of analysis at an interest rate of 2.25% for Fiscal Year (FY) 2022. These costs included initial construction with mobilization and demobilization, contingency (35%), planning, engineering, and design (32%), and construction management (32%) above the actual estimated cost for construction. Additionally, for rough cost comparison, operation and maintenance and adaptive management costs were both estimated at 3% of total costs. Interest during construction was also 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 are displayed in Figures 3-17 through 3-19. The incremental cost per unit of output (habitat benefits) for Best Buy plans are displayed in Figure 3-17 (note, the “Cost” column is average annualized cost).

Of the 13 generated plans, seven plans were considered cost effective, three 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 yield more output for less money.

Plan	Plan Description	Cost	TotalAAHUGAINS	Cost Effective
No Action Plan	Default No Action Plan	$0.00	0	Best Buy
B1	Forest Mgt & Monitoring	$183,410.98	40.24	Best Buy
B2	Forest Mgt & Monotoring (Expanded	$371,988.47	74.23	Best Buy
C1	Keystone Features	$711,525.80	99.91	Cost Effective
C2	Keystone Features w/ Closures	$1,129,668.52	99.91	Non-Cost Effective
D1	Keystone Features & Aquatic Diversi	$1,321,117.44	228.39	Best Buy
D2	Keystone Features & Aquatic Diversi	$1,746,501.50	228.39	Non-Cost Effective
F1	Agency Concurrence Features	$1,832,409.53	270.48	Cost Effective
F2	Agency Concurrence Features w/ Clc	$2,263,867.22	270.48	Non-Cost Effective
G1	Max Forest & Aquatic Benefits	$1,846,617.43	272.57	Best Buy
G2	Max Forest & Aquatic Benefits w/ Cl	$2,278,243.89	272.57	Non-Cost Effective
E1	Forest Optimal Elevation	$1,222,817.89	142	Cost Effective
E2	Forest Optimal Elevation w/ Closure:	$1,647,034.24	142	Non-Cost Effective

Figure 3-17. Alternative rough average annual cost and benefit summary.

After reviewing the CE/ICA analysis, the team screened alternatives C1, E1, F1. Although they were cost-effective, they were not the most efficient nor did they give the greatest increase in output for the least increase in cost. The alternatives with side channel closures (C2, D2, E2, F2, and G2) were also not cost-effective. Because this is an ecosystem restoration project, all project features must achieve a cost-effective environmental effect compared to other project features. For that reason, Alternatives C2, D2, E2, F2, and G2 were screened.

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. Five best-buy plans were identified: Alternative A (No-Action), Alternative B1 (forest management and monitoring), Alternative B2 (forest management and monitoring expanded), D1 (keystone features with aquatic diversity), and G1 (maximum forest and aquatic benefits).

Evaluation of the best buy plans B1, B2, D1, and G1 in comparison to the No-Action Alternative allowed the PDT to make well-informed decision regarding project scale and features. Progressing through the increasing levels of output helped determined whether the increase in output (habitat units) was worth the additional cost. In the evaluation of the four action best buy plans, “break points” or significant increases or jumps in incremental cost per output were identified in the second-to-last column in the stair-step progression from left to right in Figure 3-19.

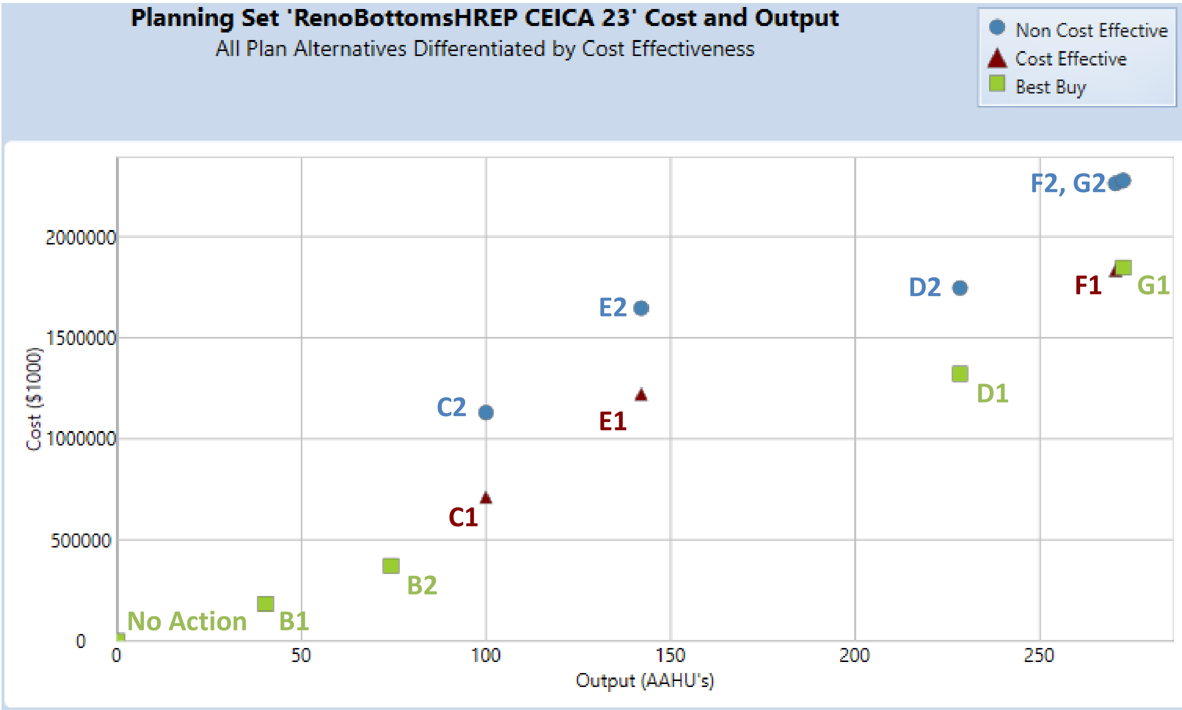


Figure 3-18. CE/ICA analysis of all alternatives.

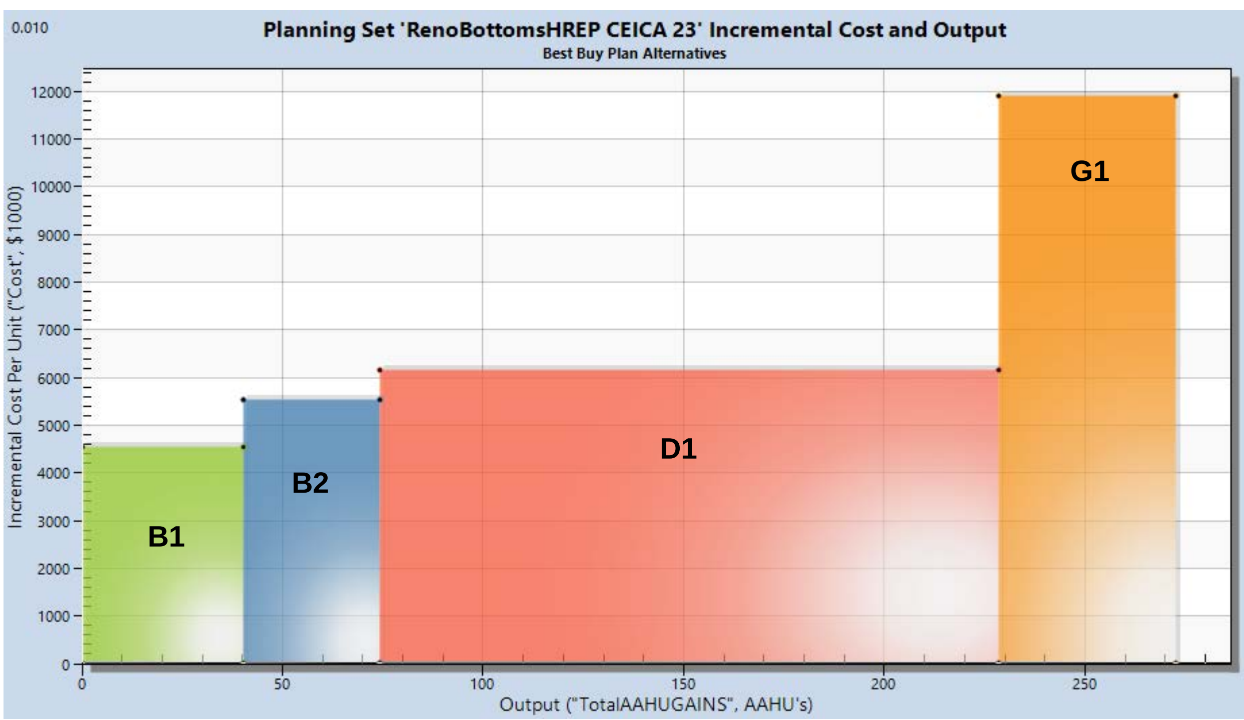


Figure 3-19. Incremental cost and output results for the best buy plans.

The No-Action Alternative, A, does not improve or maintain the ecosystem resources within the study area. No action would have no financial cost to the federal government but would result in a decrease in habitat functions and values over the study period (see Section 4 for additional analysis). The existing study area provides 1,001 average annual habitat units for the 50-year period of analysis. Of these average annual habitat units, 908 are forest habitat and 93 are aquatic habitat. Habitat value is predicted to decline slightly over time due to sedimentation of backwaters and ongoing forest mortality. This alternative does not meet any of the project objectives.

Alternative B1 would provide a total of 40 AAHU gain over the no action alternative for a cost of $5.5 million (or $183,000, annually), see Table 3-7. Moving right on the Figure 3-18, over Alternative B1, Alternative B2 would provide an additional 34 AAHU for ~$1,000 more annually.

Moving right on Figure 3-18 again, Alternative D1 would provide an additional 154 AAHU over Alternative B2 for ~$600 annually for those additional habitat gains. Due to the extent of habitat benefits provided over Alternatives B1 and B2, the PDT felt that incremental cost increase of Alternative D1 was well-worth the worth the additional investment. Alternative D1 would provide 228 AAHUs at a cost of approximately $5,700/AAHU.

Alternative G1 would provide the greatest habitat gains of any alternative with 273 AAHUs (Table 3-7). However, there is a high cost associated with the habitat gains. For the additional 45 AHHU gained over Alternative D1, it would cost an *additional* $6,000 annually for each additional habitat unit (see Figure 3-18). This additional cost/HU is not efficient and would be pushing the upper limits of cost per HREP for the UMRR program. The *net* benefits, including cost, for G1 are not greater than D1. While Alternative G1 would achieve project objectives to a greater extent than Alternative D1, it was determined that the additional cost was not worth the additional habitat benefits achieved for the desired project scale and environmental restoration within the context of this HREP.

In summary, the increase in habitat benefits for Alternative D1 over the best buy plans B1 and B2 was determined to be worth the additional cost. The additional benefits of Alternative G1 were determined to not be worth the significant increase in incremental cost per output. Therefore, following CE/ICA analysis, Alternatives B1, B2, and G1 were screened from further analysis. Factoring in costs, Alternative D1 reasonably maximizes habitat benefits.

Table 3-7. Results of CE/ICA for Best Buy Plans, Rough Costs.

Alternative	Net average annual habitat units	Total cost plus OMRR&R and Adaptive Management	Annualized Cost	$/AAHU
A: No Action	N/A	$0	$0	$0
B1: Forest Management and Monitoring	40 AAHU	$5.5 Million	$183,000	$4,558
B2: Forest Management and Monitoring, Expanded	74 AAHU	$11.2 Million	$372,000	$5,011
D1: Keystone + Aquatic Diversity	228 AAHU	$39.3 million	$1.3 million	$5,784
G1: Maximum Forest & Aquatic Benefits	273 AAHU	$54.9 million	$1.9 million	$8,358

3.6.3 Comprehensive Benefits

The Corps is required to comprehensively evaluate and provide a complete accounting, consideration, and documentation of the total benefits of alternatives a full array of benefit categories: national economic development, regional economic development, environmental quality, and other social effects. Alternatives are assessed to determine if they have net benefits in total and by type. Judgement was done in collaboration with non-federal partners and in consideration of other study interests and stakeholders, using available data, analysis, input from peer review, and professional judgment. For this comprehensive benefit analysis, Alternative A (no action) and Alternative D1 were evaluated. As documented below, Alternative D1 maximizes net total benefits across all benefit categories and net benefits consistent with the study purpose.

3.6.3.1 National Economic Development Account

The national economic development (NED) account displays changes in the economic value of the national output of goods and services.

This project does not have significant beneficial or adverse NED effects. The quantified NED effects are total project cost and project operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). For Alternative D1 rough parametric costs were estimated at $39.3 million dollars (FY 22).

Alternative A, No-Action Alternative, would result in no project expenditure associated and would have no positive or negative impact on national output of goods and services.

3.6.3.2 Regional Economic Development Account

The regional economic development (RED) account registers changes in the distribution of regional economic activity that result from each alternative plan. Evaluations of regional effects are to be carried out using nationally consistent projections of income, employment, output, and population. USACE and Michigan State University have developed a regional economic impact modeling tool, RECONS (Regional ECONomic System), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities The RECON model was run for Alternative D1. As the costs of action alternatives varied, regional benefits would also vary. However, the percentage of Federal expenditure to regional benefits would be largely equivalent and not useful as criteria for comparison.

Alternative D1 would have a positive impact on the regional economy. With a total cost expenditure of $36.9 million[1], the implementation of Alternative D1 would support a total of 262.0 full-time equivalent jobs, $15,390,238 in labor income, $21,235,883 in the gross regional product, and $36,182,130 in economic output in the local impact area. More broadly, these expenditures support 648.7 full-time equivalent jobs, $44,404,110 in labor income, $61,958,948 in the gross regional product, and $101,810,916 in economic output in the nation. Table 3-8 summarizes these results.

Table 3-8. Reno Bottoms Habitat Rehabilitation & Enhancement Report Regional Economic Development (RED) Summary.

Area	Output	Jobs*	Labor Income	Value Added
Local				
Direct Impact	$27,626,719	201.5	$13,400,670	$17,299,272
Secondary Impact	$8,555,410	60.5	$1,989,568	$3,936,611
Total Impact	$36,182,130	262.0	$15,390,238	$21,235,883
State				
Direct Impact	$32,877,913	260.8	$18,740,431	$22,707,394
Secondary Impact	$31,132,826	164.0	$10,875,329	$17,608,677
Total Impact	$64,010,738	424.8	$29,615,759	$40,316,071
US				
Direct Impact	$38,694,700	360.0	$24,414,275	$27,494,911
Secondary Impact	$63,116,216	288.7	$19,989,835	$34,464,037
Total Impact	$101,810,916	648.7	$44,404,110	$61,958,948

* Jobs are presented in full-time equivalence (FTE)

[1] This number is the total cost using the refined cost estimate for D1 and does not match the parametric rough cost estimate shown in Table 3-6.

Alternative A, No-Action Alternative, would result in no project expenditure associated and would have no positive or negative regional impact. See Appendix C, Economics and Social Considerations for more information.

3.6.3.3 Environmental Quality Account

The Environmental Quality accounts for non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of ecosystem restoration plans.

The Corps objective in ecosystem restoration is to contribute to national ecosystem restoration (NER) via increases in the net quantity and/or quality of desired ecosystem resources. Contributions to national ecosystem restoration, NER outputs, are increases in the net quantity and/or quality of desired ecosystem resources. The $6,700 per AAHU created by D1 is efficient in achieving the ecosystem restoration objectives. The latest St. Paul District HREP approved in 2021 yielded an average annual cost of $6,600 per AAHU was deemed justifiable. See Appendix D, Habitat and Forest Modeling, for full details on the calculation of net ecosystem benefits completed using HEP and HSI models.

Qualitatively, Alternative D1 would represent a significant expansion of forest restoration work within the UMRR. There has never been a HREP with this extent of forest measures or forest work which has been targeted to provide the greatest habitat gain while considering access and constructability. The alternative covers a wide geographic area of Reno Bottoms, thus increasing resiliency of design under a wide variety of future conditions. Alternative D1 is also a mix of traditional forest management actions and forest elevation to support various floodplain forest tree species. Aquatic overwintering benefits provided by borrow sites complement the forest actions and would serve to support a native fish population. The monitoring work at the side channels would allow for a more complete understanding of the geomorphology of Reno Bottoms. Data collected would support a potential future study of sedimentation and erosion and potential additional lotic and lentic rehabilitation work at Reno. Alternative A would result in a decrease in habitat functions and values, throughout the site. Expected changes to the ecological, cultural, and aesthetic resources under both Alternative A and D1 are described fully in the NEPA analysis in Section 4.

Selecting the 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 alternative plan that reasonably maximizes the benefits in relation to cost and meets the overall planning objectives is Alternative D1, the NER plan.

3.6.3.4 Other Social Effects Account

The Other Social Effects (OSE) account addresses plan effects from perspectives that are relevant to the planning process but are not reflected in the other three accounts. Per the recent Policy Directive "Comprehensive Documentation of Benefits in Decision Document" (5 January 2021) the PDT relied on the expertise of the interagency team and other local experts to determine OSE. Per guidance, teams can, at a minimum, consider urban, rural and community impacts; life, health, and safety factors; displacement; and long-term productivity under OSE.

Alternative D1 is consistent with regional and State planning for the area. The State of MN has funded overwintering habitat work north of the Ice Haul Slough borrow site/overwintering habitat extent (Figure 3-20). Alignment with this state-funded restoration work would increase the restoration potential of the HREP. If the state-planned restoration work is not implemented, the Ice Haul overwintering and forestry work are stand-alone high quality restoration sites (accounting for 60% AAHU gains of D1) and would achieve all the habitat benefits identified in this report.

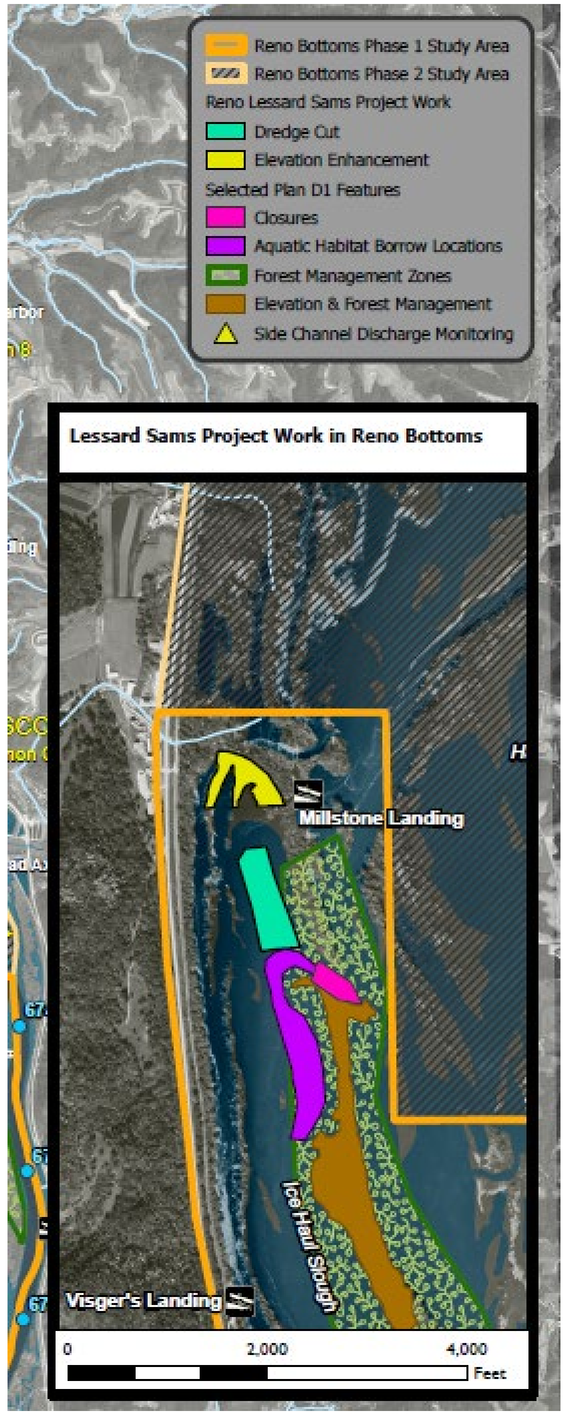


Figure 3-20. Planned MN-funded overwintering habitat restoration work.

There are no notable life or safety factors that would be affected by either Alternative A or D1. With additional trees and higher biodiversity of the forest, Alternative D1 would store additional carbon long term, providing incremental but diffuse socio-economic benefits over Alternative A. Long-term, overwintering and forest habitat would be more productive habitat for a wide variety of both local native and migrating species. Managed and elevated forest zones or only managed forest zones could potentially serve as a passive and natural native seed source for adjacent floodplain forest; thereby increasing genetic variability and resiliency vital to a healthy forest.

There would also be recreational benefits associated D1. Creating additional overwintering and floodplain habitat would likely increase fishing, canoeing, boating, and bird watching recreational users traveling from the tri-state area, thus positively affecting OSE factors. There would likely be incremental local and possibly regional benefits due to increases in local hotel stays, purchases from local stores (such as bait, tackle, boating and canoe supplies, and food).

These benefits cannot be quantified as there is no current baseline data of recreational use of the project area. However, observational data from completed HREPs support that there would likely be a small, incremental benefits from primary and secondary effects of increased recreation of the study area.

3.7 Recommended Plan

Based on the discussion in Section 3, along with supporting data, Alternative D1- Keystone Features was determined to be the both the NER plan and the plan with the maximum benefits across all categories. This plan is shown in Figure 3-21. Alternative D1 meets project objectives and constraints, reasonably maximizes benefits while passing tests of cost-effectiveness, constructability, completeness, effectiveness, efficiency, and acceptability. Alternative D1 would increase high quality floodplain forest habitat and expand overwintering habitat within the study area. For these reasons, Alternative D1 was identified as the Recommended Plan (Recommended Plan).

Measures included in the D1 plan include:

- Forest management of 546 acres (Dark Slough, Twin Island, Whalen, Island 135, and Main Channel forest zones as well as Ice Haul Island and Army Road adjacent outside of elevation features)
- Construction of a 0.2-acre partial closure at Ice Haul Slough inlet
- Elevation enhancement and forest management of 56 acres (Ice Haul Island and Army Road forest zones)
- Borrow dredging and overwintering habitat creation over 27 acres (Ice Haul Slough and Cordwood S)

A cost summary is included in Table 3-9. A refined cost estimate was completed following identification of the Recommended Plan using the Micro-Computer Aided Cost Estimating System, and Total Project Cost System to determine Present Value costs. As such the parametric cost numbers from early alternative development and evaluation do not match the cost summary shown in Table 3-9 and the remainder of the report.

Table 3-9. Cost Summary for Recommended Plan

Cost Item	Cost
Project First Cost	$39 million
Project Total Cost (Fully-Funded)	$43.6 million
Interest During Construction (5 year construction)	$1.44 million
Operation and Management and Rehabilitation, annually	$1,678
Adaptive Management and Monitoring (First Cost)	$1.79 million
Average Annual Total Construction Cost	$1.42 million
Average Annual Habitat Unit (AAHU) Gain	228 AAHU
Total Average Annual Cost / AAHU	$6,248

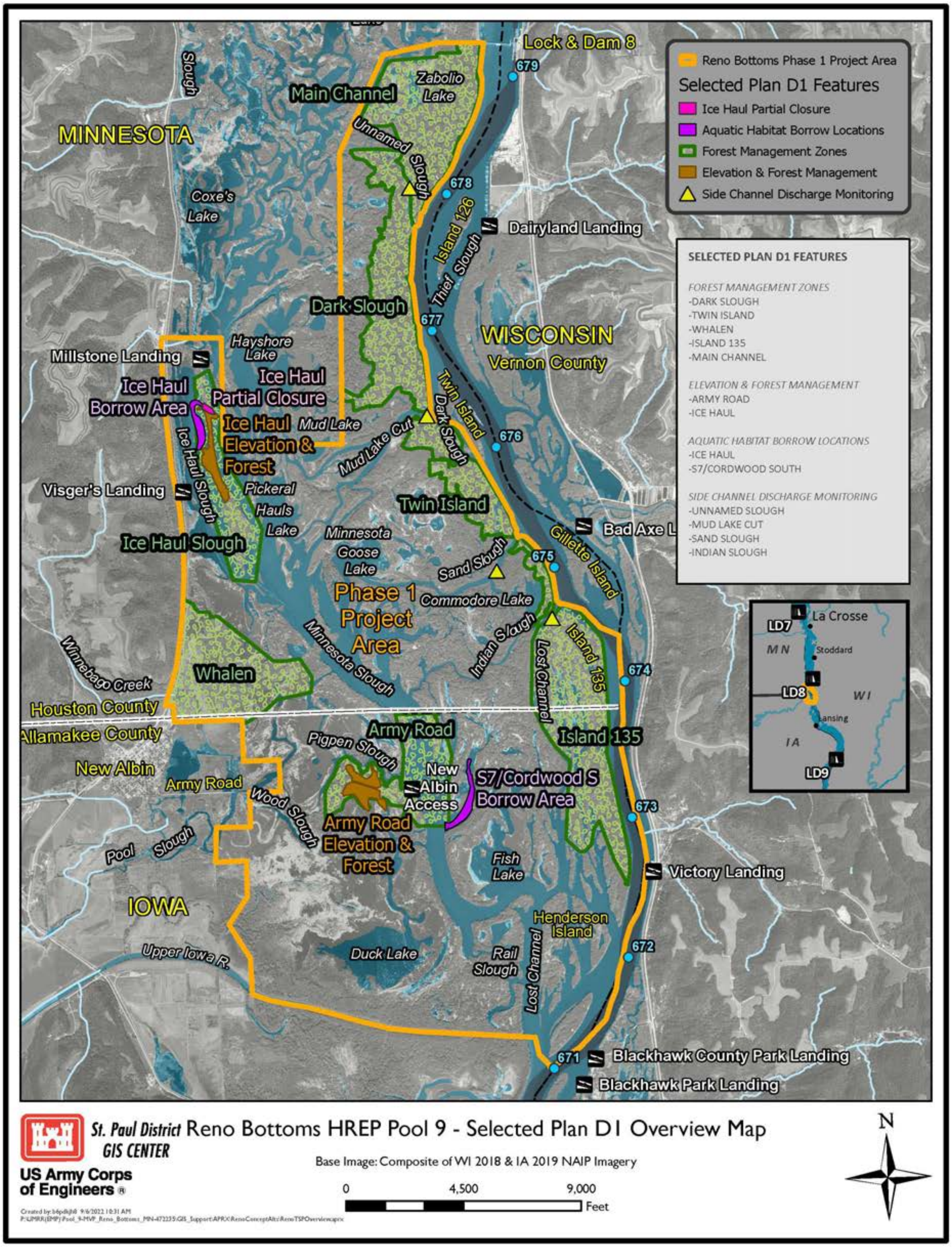


Figure 3-21. Recommended Plan, Alternative D1.

3.7.1 Plan Features

Each of the proposed project features included in the Recommended Plan, Alternative D1, the are described in Figure 3-10.

Table 3-10: Summary of Main Project Features

Feature Type	Features	Description
Forest Management	o Army Road o Dark Slough o Twin Island o Whalen o Ice Haul o Island 135 o Main Channel	Forest management actions: site preparation (tilling and discing of soil in place) to facilitate natural regeneration, herbaceous and woody vegetation control (chemical and mechanical) and targeted planting of trees. Design would vary with location within each zone.
Elevation	o Army Road o Ice Haul	Elevation of forest using fine and granular material dredged from on-site locations. Additional granular needs for the granular base at Army Road may come from nearby channel cuts. Material would be placed via hydraulic or mechanical dredging.
Partial Closure	o Ice Haul Inlet	Partial closure of the Ice Haul South inlet to reduce inflows and sediment transport into fish overwintering habitat.
Aquatic Habitat & Borrow	o Ice Haul o Cordwood South	Borrow locations that also would provide overwintering habitat for fish.

3.7.2 Design Considerations and Quantities

The Project has been developed to a feasibility level of design. Design details are included in Appendix J- Civil Engineering and Appendix K- Adaptive Management and Monitoring. As with all feasibility level studies, these details would be refined in the Plans and Specifications Stage.

Design quantities are based on topographical and bathymetry surveys performed by USACE. Several bathymetric surveys were taken throughout Reno Bottoms in 2018-2019. Any conversions of data from the mean sea level 1912 vertical datum was converted to the NAVD88 datum by applying a sloped conversion factor of -0.68 feet at Lock and Dam 8 and -0.69 feet at Lock and Dam 9. This conversion slope was provided by the St. Paul District survey section.

3.7.2.1 Ice Haul Partial Closure

The proposed partial closure at Ice Haul Slough would be similar to other partial closure designs installed in the UMRS. Rock would be placed to constrict the existing channel to reduce flows to levels that meet velocity and residence time criteria for overwintering habitat. Concept plan drawing of the Ice Haul Partial Closure is shown in Figure 5-2. See Appendix J, Civil Engineering, for details. The partial closure would have a channel opening with a 10-foot bottom width, a bottom elevation of 618.0, and 1V:3H side slopes that rise up to elevation 624.5. Rock at elevation 624.5 would be extended from the structure to tie in with high ground on the north side and the Ice Haul Island feature on the south side.

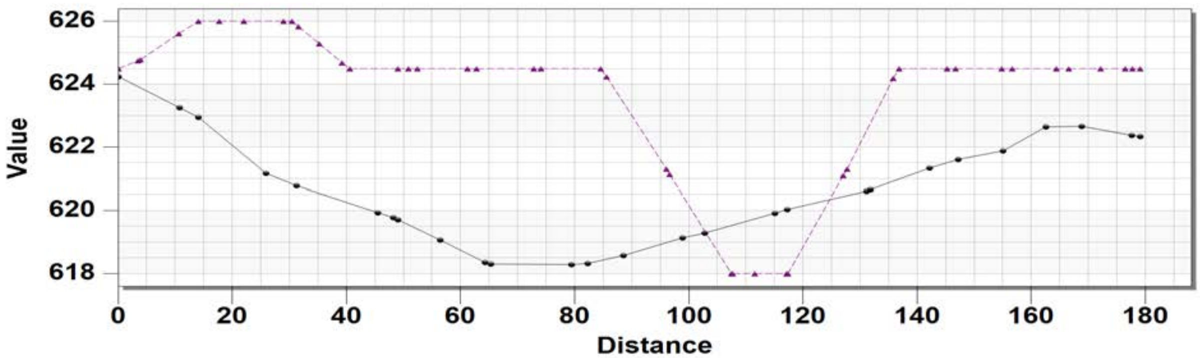


Figure 5-2: Ice Haul Slough Partial Closure Structure Cross Section, existing black line with round points, proposed is purple line with triangle points.

3.7.2.2 Habitat Dredging

Habitat dredging of Ice Haul and Cordwood South are designed with an average depth of 6 feet with an expected range of 4-8 feet depth to provide a range of overwintering habitat for fish. Approximately 40% of the dredged area in each site would be 8 feet deep.

- Cordwood South Habitat Dredging: ~222,500 cubic yards (CY) fines removal over approximately 15.1 acres. See Figure 5-2 for location information.
- Ice Haul Habitat Dredging: ~ 171,600 CY fines removal over approximately 11.7 acres. See Figure 5-3 for location information.
- Ice Haul Partial Closure – Bottom Elev = 618, Sides are 624.5, Bottom Width = 10’, Side Slope = 1V:3H, Length (upstream to downstream) = 40’ riprap. The structure would be extended laterally to tie in with higher ground.

3.7.2.3 Forest Elevation

Elevation of forest using fine and granular material dredged from Ice Haul Slough and Cordwood S. Material would be placed via hydraulic or mechanical dredging. The elevation to achieve less than 20 days of inundation during the growing season (April 1 to September 30) is approximately 626.0 (NAVD 88). Decreasing the days of inundation would improve floodplain forest quality and species diversity.

Increasing the elevation would reduce the risk that future wetter conditions might affect project success, however this had to be balanced with project cost and flood stage impacts.

- Army Road Elevation: 626 feet design elevation. A three-foot average material placement depth (~222,500 CY fines with a ~30,374 CY granular base). See Figure 3-22 for location information.
- Ice Haul Island Elevation: 626 feet design elevation. A two-and-a-half-foot average material placement depth (~171,600 CY fines, no granular base). See Figure 3-23 for location information.

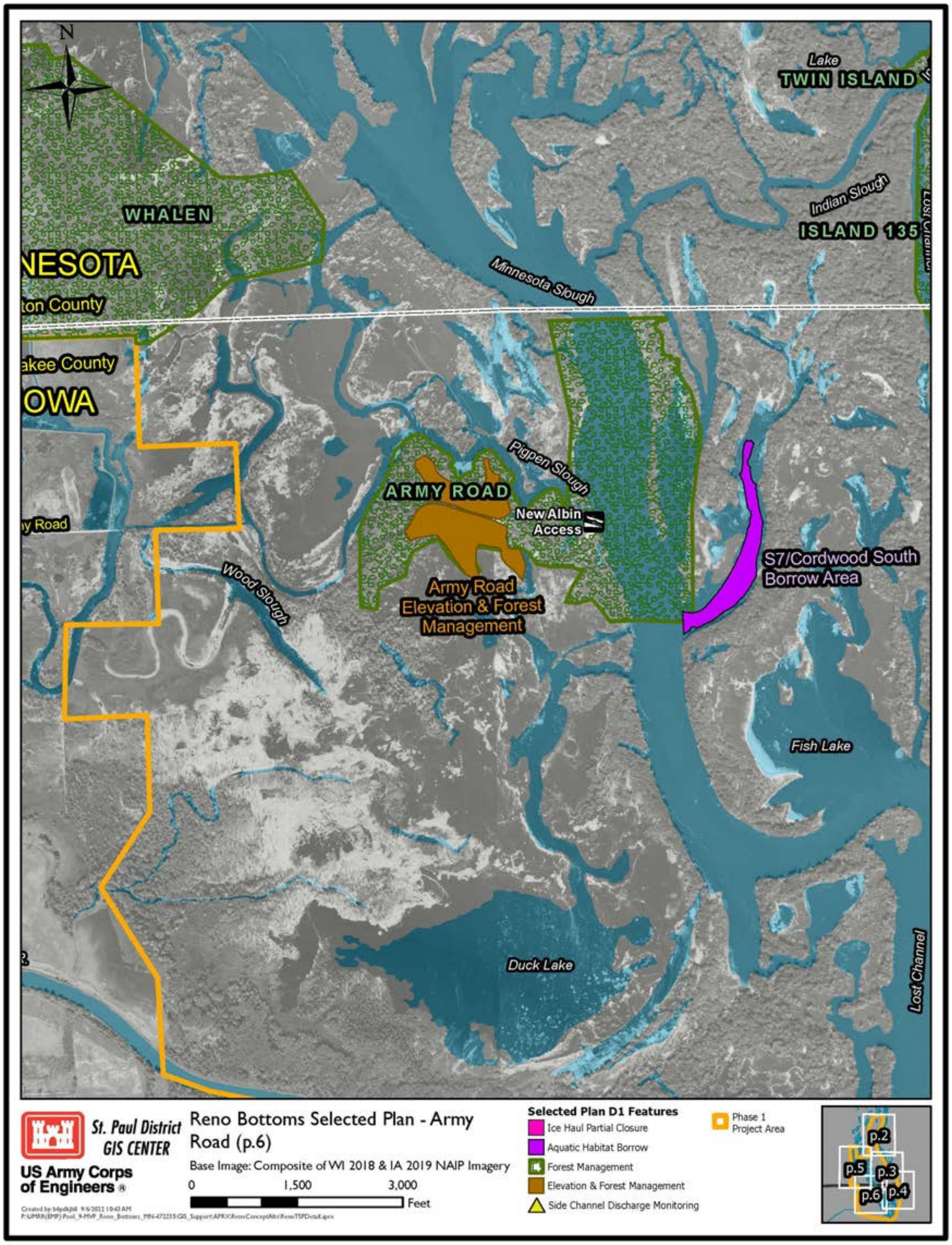


Figure 3-22. Army Road Elevation.

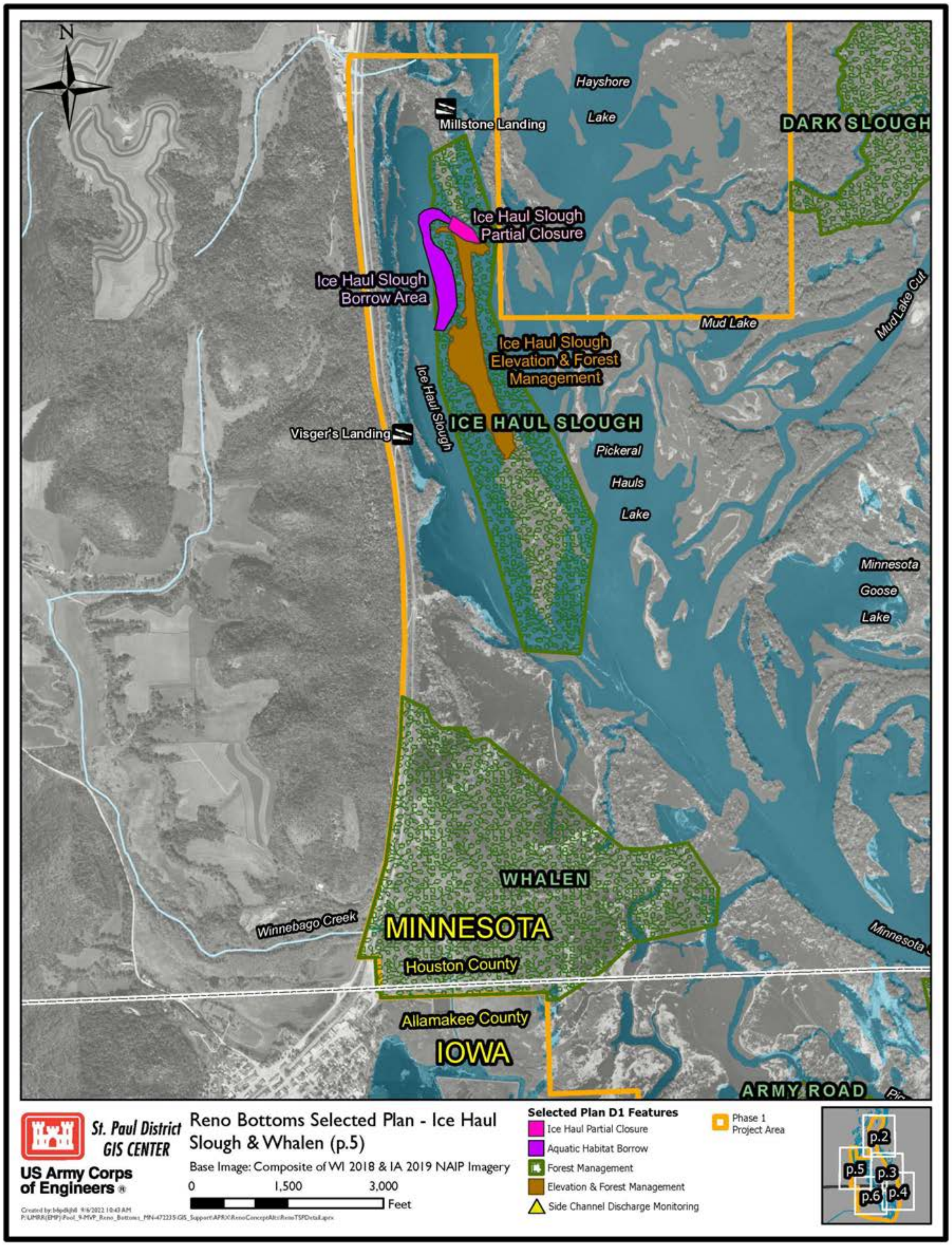


Figure 3-23. Ice Haul Slough Work Area.

3.7.2.4 Forest Management

Forest management prescriptions would be developed for the alternative zones in the Recommended Plan using the St. Paul District's – Environmental Section's standard operational forest management plan development process. Initial steps of this process were completed as part of this feasibility report (goal development, landscape-level prioritization, forest inventory and inventory data analysis) so the design phase would begin with standard reconnaissance walks and prescription development. Once prescriptions are completed during the Plans and Specifications Stage, they would be combined into a single management plan for the project area including a work plan for the area that includes all anticipated management actions for the project period.

A detailed monitoring plan would also be included in the forest management plan that incorporates the requirements of the project's Adaptive Management Plan (Appendix K). The work plan would then be developed into single or multiple scopes of work for contract implementation. Summaries of actions which would be taken under vegetation control and planting, chemical vegetation control, mechanical vegetation control, and planting are below. Site preparation actions for forest management activities are shown in Table 3-11.

<u>Vegetation Control and Planting (including Forest Expansion)</u>

Vegetation Control and Planting includes a range of forest management activities intended to promote the establishment of desirable vegetation. Desirable vegetation would vary depending on the site potential in a given location and may be either woody vegetation or native herbaceous vegetation, or both. Treatments for Forest Expansion are the same as for Vegetation Control and Planting, except that Forest Expansion would occur in locations that are not currently forested.

Vegetation control may be completed using chemical or mechanical means, or a combination of chemical and mechanical. Vegetation control may be implemented on its own, primarily to eliminate invasive vegetation or to reduce competition with desired vegetation that is already established. Vegetation control may also be used prior to or in association with planting or seeding to create an appropriate site condition for establishment of desired vegetation and to maintain optimal growth conditions for planted vegetation following plant establishment.

<u>Chemical Vegetation Control</u>

Chemical vegetation control treatments would utilize products such as herbicides to control invasive species and undesirable native species, pesticide to control insect pests on planted trees and/or herbaceous vegetation, fertilizer to enhance the growth of planted trees and/or herbaceous vegetation and browse repellent to protect planted trees from herbivory by wildlife. Chemical application may be implemented by hand using handheld or backpack sprayers. Applications may also be conducted using mechanical equipment, such as utility terrain vehicles (UTVs), tractors, skidders, or marsh masters. Pesticides would be selected based on location (upland vs aquatic) and efficacy against the target species. All pesticides used would be registered by the U.S. Environmental Protection Agency (EPA) as well as the state where the proposed work would be conducted. All pesticide label instructions would be followed.

<u>Mechanical Vegetation Control</u>

Mechanical vegetation control would remove undesired vegetation with hand tools, such as saws and pruners, and power equipment, such as brush saws, mowers, UTVs, tractors, or skid steers with attached grass or brush mowers, forestry mulchers or other implements for clearing vegetation. Other heavy equipment, including skidders, marsh masters, or bulldozers may also occasionally be used. This activity usually focuses on removing competing grasses, forbs, and shrubs. It may also include removing vines that are harming trees. Small tree seedlings and saplings (<3-inches in diameter at breast height) may be mowed, felled or girdled as part of mechanical vegetation control, though such removals would primarily be focused on non-native invasive woody species (including, but not limited to, common buckthorn (Rhamnus cathartica), glossy buckthorn (Frangula alnus), bush honeysuckles (Lonicera spp.), white mulberry (Morus alba) and black locust (Robinia pseudoacacia)).

Planting

Planting consists of various management activities to establish vegetation, including trees, shrubs, and herbaceous vegetation (grasses and forbs). These activities include site preparation, planting, and seeding, including seeding through natural regeneration. Site preparation consists of several intentional soil disturbance activities: bedding, mounding, discing, scarification, and subsoil disturbance, including subsoiling and use of a vibratory plow. A description of each activity can be found in the table below.

This measure also includes planting trees, shrubs, and herbaceous vegetation. Planting may occur with hand tools or by using power augers to dig holes. In some cases, heavy equipment such as tractors or bulldozers may be used for tree planting. Seeding of herbaceous vegetation, such as cover crops or forest understory plants, may occur by hand scattering, from an all-terrain vehicle (ATV) or tractor with either mounted or pull behind seeders or spreaders, or possibly by plane or drone. These activities may occur on unvegetated ground, such as a newly constructed island or dredge material placement site, in the understory of an existing forest (e.g. underplanting tree seedlings), or in non-forested terrestrial areas with adequate elevation to support trees (Forest Expansion). This measure includes various activities for protecting trees from damage, typically from herbivory and weed competition. Protection includes stem protection around the trunks, mats around the roots for weed suppression, and bud caps on the tops to prevent browse.

Table 3-11. Forest Management Site Preparation Activities.

	Activity	**Description**
Site preparation	Bedding	Placement of linear elevated beds to create suitable microsites for seedling regeneration.
	Mounding	Placement of elevated mounds to create suitable microsites for seedling regeneration.
	Discing	Use of a disc or other mechanical equipment to loosen the upper soil layers to promote seedling establishment.
	Scarification	Mechanical exposure of bare mineral soil. This is usually accomplished by dragging an implement or tree top across the surface of the soil.
	Subsoiling	Use of a subsoiling implement to break up compacted soil or plow pans or to sever roots to prevent transfer of disease.

3.7.2.5 Access Routes

Various land and water access routes are proposed to accommodate construction of project features. These access routes are shown on Figure 3-24.

Ice Haul Slough Work Area

The presence of mussel beds throughout Minnesota Slough has hindered water access to the Ice Haul Slough work area. Access to ice haul could be achieved via a temporary construction road and access pad (200 feet by 50 feet) from Millstone Landing southward along the existing peninsula (Figure 3-24). The temporary access road would be constructed with sand or gravel material obtained from a local quarry. Once all work at Ice Haul Slough is completed, including the Lessard-Sams Ice Haul Fish Habitat Project, the road and access pad would be removed, or incorporated into the Ice Haul Slough Forest Management Area. The existing road and ramp at Millstone Landing that would be used for access has deteriorated over time due to flooding and everyday use. To account for this degradation and accommodate the construction equipment necessary for this project, additional material (roughly a one-foot raise) would be placed on the existing road and ramp to repair it to its original condition. Once project construction is finished any damages to the Millstone Landing ramp and road would be fixed.

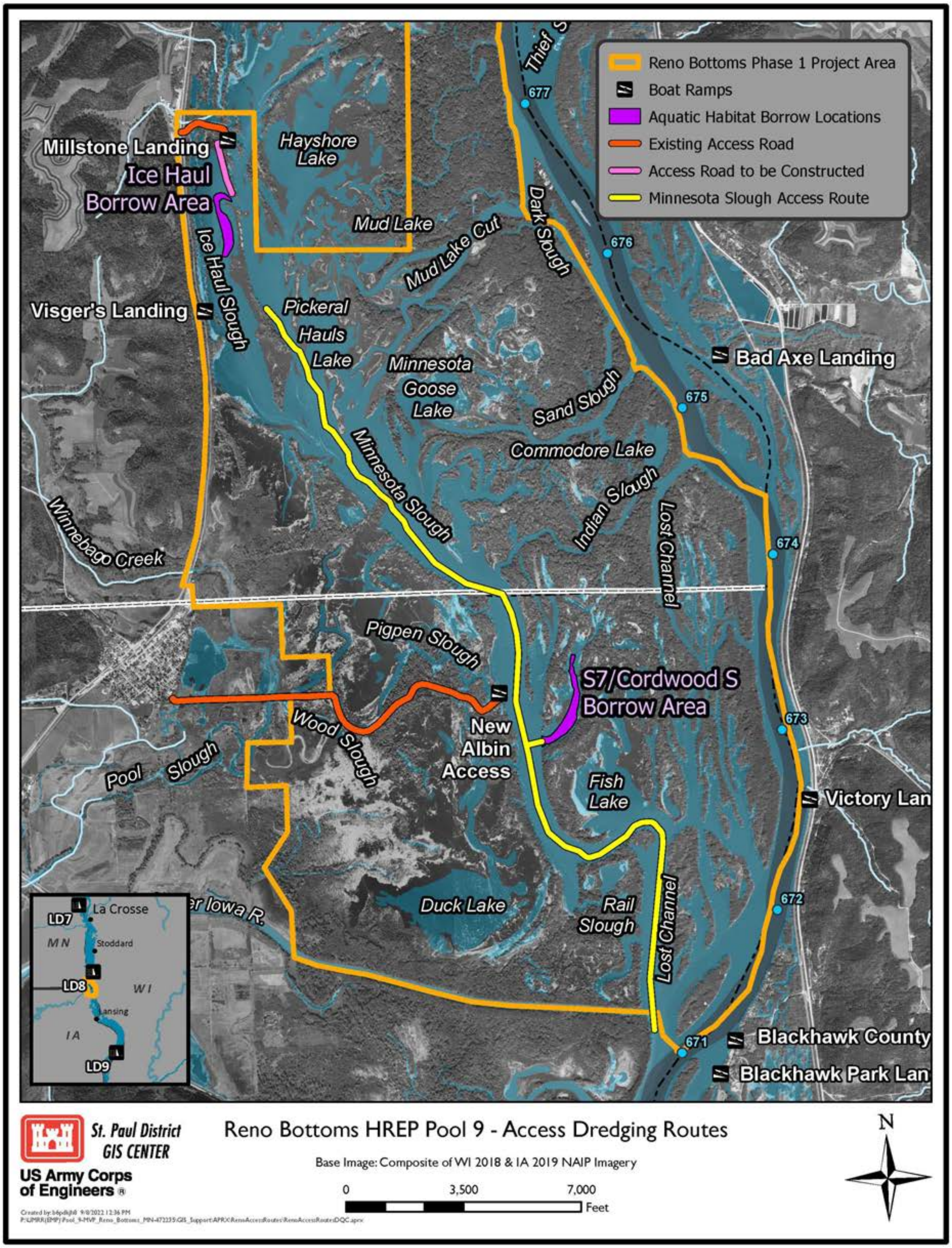


Figure 3-24. Reno Recommended Plan Access Routes.

4 Assessment of Existing Resources and Environmental Consequences of the Recommended Plan

This chapter identifies the existing conditions of the resources for the Reno Bottoms 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 would have an important direct, indirect, or cumulative effect (CEQ 1997).

The Recommended Plan (Alternative D1) and No-Action Alternative are the primary actions evaluated and discussed in this section. The eleven other action alternatives have been screened (see Section 3.6). However, those 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 3.6) 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

Existing conditions – Pool 9 of the Mississippi River is recognized as having generally fair to good water quality conditions relative to other pools on the Mississippi River. However, water quality data summarized by the WIDNR in Pool 9 suggest numbers slightly within or exceeding recommended water quality guidelines (Table 4-1).

Table 4-1. Water quality data (mean and range) for selected parameters in Pools 8 and 9 in comparison to established guidelines.

	Total Phosphorus (mg/L)	Chlorophyll a (□/L)	Total Nitrogen (mg/L)	Summer Total Suspended Solids (mg/L)	Dissolved Oxygen (mg/L)
Guidelines	0.01 – 0.08[a]	10 – 30[b]	0.6 – 2.18[a]	<25[c]	>5.0[d]
Pool 9[e]					
Mean	0.15	29.2	2.3	41.6	10.7
Range	0.04 – 0.35	0.3 – 154.0	0.6 – 5.7	7.0 – 171.0	3.4 – 20.0

[a] Source of procedures described for determining this: USEPA 2000; Smith et al. 2003.
[b] Source: Dodds et al. 1998.
[c] Source: summer average; Upper Mississippi River Conservation Committee 2003.
[d] Source: Upper Mississippi River Basin Association 2004.
[e] Source: WIDNR water quality data; 1977 – 2012.

The average summer total suspended solids (TSS) value (41.6 mg/L) for pool 9 exceeds the guidelines established by the Upper Mississippi River Conservation Committee of 25 mg/L. However, this is probably due to the time period used which is 1977 to 2012. Total suspended sediment values at many gages in this reach of the UMR tended to be higher in 1970s and

1980s than present day values. More recent measurements obtained between 1997 and 2004 in Pool 8 from the Long Term Resource Management (LTRM) Element of the UMRR indicate TSS concentrations that are typically less than 30 mg/L, with many days having concentrations less than 25 mg/L. Suspended sediment concentrations (SSC) measured at the McGregor, Iowa USGS gage from 1975 to 2002 indicate a downward trend over time with average annual SSC approaching 25 mg/L for the years 1994 to 2002.

In 2003, the Upper Mississippi River Conservation Committee recommended light penetration-related water quality criteria to protect and sustain submersed aquatic vegetation (SAV) in the UMR. Specific summer average (May 15 to Sept. 15) criteria for TSS (25 mg/L). Data from the Minnesota Pollution Control Agency stream monitoring program shows that the average total suspended solids in the main channel of the Mississippi River just east of the study area averaged 30 mg. This reach of the river slightly exceeds the recommended average criteria, with some readings above and some below the recommended standards. Suspended sediment measurements are typically better in backwater lakes than in the main channel during low flow conditions. During high flow conditions, the entire study area becomes inundated and water quality conditions are similar throughout the floodplain. Side channels flowing from the main channel bring heavier sediment into the backwater in bedload. This material is hard to measure as it is not suspended. Partner agencies have noted increases in delta size and unstable geomorphology where the side channels meet with the interior of the study area and drop their bedload.

Ideal overwintering conditions in backwater lakes are no velocity, dissolved oxygen (DO) of at least 5 mg/L, and temperatures over 4 degrees C. Generally, shallow lakes with little water exchange have lower DO while deeper lakes have better DO. Connectivity between backwaters and flowing channels increases velocities and decreases temperature as cold waters are brought into the lentic areas. WI DNR winter water quality measurements show that most of the backwater lakes in the study area meet DO and velocity criteria for overwintering fish, but few backwater met temperature criteria. All backwaters in the study area were below the ideal 4C, with most being under 2C. Visgers Lake, Sheephead Slough, and an unnamed lake between Sand and Indian Slough were some of the areas that did not meet the DO criteria.

The Wisconsin DNR lists this reach of the Mississippi River as impaired for mercury and Polychlorinated biphenyls (PCBs) contamination in fish tissue and total phosphorus. The Minnesota Pollution Control Agency lists this reach as impaired for mercury and PCBs in fish tissue, but all water quality standards for aquatic life are met.

Impacts of No-Action– Without action, the water quality of the study area would be relatively similar to existing conditions. Suspended sediment and bedload would enter the study area from the Mississippi River main channel. Deltas would continue to grow and channels would experience some erosion and migration. It is possible that some backwater lakes would become more connected to side channels due to breakthroughs. If breakthroughs occur, the winter water quality of these lentic areas would be degraded. However, it is difficult to predict if and when such geomorphological changes might occur. In general, the water quality of the study area would be similar to existing conditions with some growth in delta areas.

Impacts of the Recommended Plan – The Recommended Plan would have temporary, short-term adverse impacts to water quality by increasing turbidity in the immediate project area where construction and excavation occur. Silt curtains and other Best Management Practices (BMPs) would be used to contain the sediment plumes and localize impacts. The partial closure at the Ice Haul inlet would reduce flow into the backwater, reducing velocities and increasing temperatures within the area, which would improve water quality for overwintering fish. The partial closure has been designed to allow some flow to continue entering the backwater to ensure that dissolved oxygen levels do not fall too low. Improvements to water quality characteristics for overwintering fish communities would lead to long-term beneficial impacts for those populations. The project would have minor beneficial effects to surface water quality.

4.2 Geology and Soil Substrate

Existing conditions – The most significant geological event explaining the nature of the Mississippi River within Pool 9 occurred at the end of the Pleistocene glaciations approximately 10,000 years ago. Tremendous volumes of glacial meltwater, primarily from the Red River Valley's glacial Lake Agassiz, eroded the pre-glacial Minnesota and Mississippi River valleys. As meltwaters diminished, the deeply eroded river valleys aggraded substantially to about the present-day levels. Prior to impoundment, the broad floodplain of the river included depressions, secondary channels, natural levees, islands, and shallow lakes. Since impoundment, a relatively thin veneer of silts, clays, or sands has been deposited over most of the river bottom within the pool. The sedimentation of fines (clay and silt) is generally greater in the slow-moving backwater areas than in the major side channels and main channel portions of the impounded area.

In the bluffs of the Upper Mississippi Valley along Pool 9 are exposed Lower Paleozoic sedimentary rocks, dominantly carbonates (limestones and dolomites) and sandstones, overlain by unconsolidated materials of Quaternary (Upper Cenozoic) age loess of the earlier glacial advances. This stretch is part of the Driftless Area that was not covered by advances of the Wisconsin ice sheet. In the stretch from Lynxville, Iowa north to Reno, Minnesota, the units exposed in the base of the bluffs are Cambrian age sandstones from the Dresbach Formation (Lower Cambrian) in the north, to the Jordan Formation (Upper Cambrian) to the south. Overlaying the Jordan Sandstone in the Lower Ordovician age Prairie du Chien Formation, is a predominantly dolomite sequence generally divided into the Oneota and Shakopee Formations.

The principle parent materials of soils in the drainage basin associated with Pool 9 are the loess, alluvium, and glacial drift. Loess over bedrock or over clay loam till is the major historical parent material of Pool 9 and associated uplands. The principle soil associations of the Pool 9 area are the Fayette and Fayette-Dubuque-Stonyland (FDS). The FDS association generally contains a higher percentage of shallow limestone soils on steep, stony land than the Fayette soil association. The sediment load carried into Pool 9 by the Upper Iowa River accumulates in backwater areas and in the navigation channel. The major soil type of upland peninsulas in Pool 9 is silt loam. The soil is light colored and is built up on black buried soil with some layers of sand in the areas. The bottomland soils are flooded nearly every year during the spring thaw or after heavy rains prior to the growing season.

Sediment quality is generally good in Pool 9. Main channel sediments are primarily medium to coarse sands with only trace amounts (generally less than 3-percent by weight) of silts and clays. Sand, silt, and clay sediments are found within defined secondary channels, while finer silt and clay materials are found in marshy backwater areas. Levels of pesticides and other chlorinated hydrocarbons are generally below detection limits in all main channel sediments and are detected at low levels in backwaters. Sullivan and Moody (1996) conducted a pre and post 1993 flood (1991 and 1994) longitudinal (Pools 1 through 11) survey of contaminants. In this study, a comparison of the data to the Ontario Ministry of Environment and Energy's Sediment Quality Guidelines was made. Nitrogen was found above Ontario's lowest effect level guidelines both pre and post flood but was typical of concentrations in adjacent pools. PCBs and chlorinated pesticides were found at low levels, below Ontario's lowest effect level guideline.

Metal concentrations were found at concentrations within the expected ranges for backwater sediments on the Upper Mississippi River.

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

Impacts of the Recommended Plan – The Recommended Plan would move sediment from backwater lakes to islands. This would restore both the backwaters and islands to conditions more like historic conditions. Soil would be disturbed during construction of the island enhancement and the forest management. Soil may be used to create berms to dewater the dredged material. Soils would also be disturbed during tree planting via manual and mechanical equipment. Soil would also be disturbed for tree and herbaceous seeding and planting restoration activities such as discing, raking, or turning. These activities allow seeds to reach mineral soil and germinate. The plan would have temporary minor adverse impacts to soils and longer term minor beneficial impacts to soils as the landscape would be restored to a more natural and resilient condition.

4.2.1 Hazardous, Toxic, and Radioactive Waste (HTRW)

Existing conditions – A Phase I HTRW analysis was conducted in 2021 and 2022, in accordance with ER-1165-2-132, Water Resource Policies and Authorities HTRW Guidance for Civil Works Projects (see Appendix E, Geotechnical Engineering and Water Quality, for the full report). Based on the desktop search and on-site inspection, this assessment revealed that there were no recognized environmental conditions. There is a potential de minimis condition of nitrogen and phosphorus from effluent violations from the New Albin Wastewater Treatment plant, in the stream sediments along Army Road, however, they are not identified as a recognized environmental condition. Therefore, USACE does not recommend a Phase II assessment.

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

4.3 Invasive Species

Existing conditions – Some of the invasive species in the study area are reed canary grass, (*Phalaris arundinaceae* L.), emerald ash borer (*Agrilus planipennis*), Dutch elm (*Ulmus hollandica*), common buckthorn (*Rhamnus cathartica*), purple loosestrife (*Lythrum salicaria*), Japanese hops (*Humulus japonicus*), Eurasian water milfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*), zebra mussel (*Dreissena polymorpha*), and quagga mussels (*Dreissena bugensi*), bighead carp (*Hypophthalmichthys nobilis*), silver carp (*H. molitrix*), grass carp (*Ctenopharyngodon idella*), black carp (*Mylopharyngodon piceus*), rusty crayfish (*Orconectes rusticus*), and other species.

In lower elevation forests, reed canarygrass is a strong competitor and inhibits establishment of silver maple, green ash, cottonwood, willow, and American elm, resulting in conversion of areas that may otherwise have been forest to treeless wetlands dominated by reed canarygrass (Ramano 2010, Thomsen et al. 2012). Dutch elm disease, caused by an exotic pathogen, led to substantial losses of American elms in North America and floodplains (Dunn 1986), and in a similar fashion invasive emerald ash borer (*Agrilus planipennis*) is killing green ash (Liebhold et al. 2013), resulting in two significant floodplain species experiencing significant decline.

Impacts of No-Action– Moderate adverse impacts to the floodplain forest are expected to occur as reed canary grass, black locust, and other invasive species increase their range throughout the project area. The conversion of forest to dense monotypic patches of reed canary grass would decrease the availability of important forest habitat. Other invasive species (e.g., zebra mussels, Eurasian milfoil, etc.) would be expected to have impacts similar in intensity to what is found in the project area currently.

Impacts of the Recommended Plan – Invasive terrestrial species would be removed as part of the forest management measures. In addition, the planting of diverse tree species would add resilience to the forest and would ensure a closed canopy, which helps prevent the establishment of reed canary grass and Japanese hops, which tend to colonize open patches of the forest. Other invasive species would remain at similar levels compared to the No-Action Alternative. The plan would have slightly reduced the level of invasive species on the project site.

4.4 Aquatic Habitat

Existing conditions – The study area contains a mosaic of flowing channels and associated deltas, backwater lakes, and wetlands with a variety of plant communities. The aquatic resources in the study area have been adversely affected by the increased frequency and duration of high-water events. Both erosion and deposition are occurring in Reno Bottoms with the net effect being increased water exchange ratios between the main channel and Reno Bottoms based on measurements obtained in 2005, 2014, and 2019. This increase in flow has caused bank erosion along the side channels and increased sedimentation where the flowing channels enter lentic backwater areas. These convergences are marked by depositional deltas that reduce depths of backwaters. In addition to side channel sedimentation, suspended sediment enters the project area when the main channel overtops its natural levees and flows across the area during flood events. In general, backwaters have been filling in at around half a centimeter per year with deeper areas filling in faster than shallow areas. Wetlands in the project area are also impacted by sedimentation and invasive species.

Impacts of No-Action – Aquatic habitat decline is expected to continue for some time into the future, increasing sediment loads to Reno Bottoms. At some point, the trend of increasing water exchange rates would reach equilibrium and then begin to decrease as the deltas expand and obstruct flow, although the timeframe of when this would occur is unknown. This decrease in flows has been measured at several side channels entering other backwaters.

This trend, whether or not it continues or stabilizes at some point in the future, is expected to result in significant amounts of inflow and sediment deposition within Reno Bottoms. Reno Bottoms, during floods, has a lower velocity than the adjacent main channel and side channels, which convey sediment into Reno. The result of this is sediment deposition, which would continue to negatively impact lentic habitats in Reno Bottoms.

The existing habitat quality of the two backwaters in the Recommended Plan are relatively low. The habitat suitability index for Ice Haul is 0.10 (out of a max of 1.0), due to low water temperature, high velocity, and shallow depths. The habitat suitability index for Cordwood is 0.40 (out of a max of 1.0), due to shallow depths, moderate water temperature, and low dissolved oxygen.

Impacts of the Recommended Plan – The Recommended Plan would improve aquatic habitat in two backwater areas by increasing the water depth, reducing velocities, and raising winter water temperatures. This action would restore the function of these backwater lakes as overwintering sites. The overwintering bluegill habitat suitability index showed significant improvement in habitat quality for the two backwater sites. The Ice Haul site shows significant increase in habitat quality due to dredging and the partial closure, which improves water quality throughout the site. Cordwood has an increase in habitat quality due to the increased depth from dredging, though the habitat increase is not as great as in Ice Haul because the water quality is already of moderate quality. The full details of the habitat analysis can be found in Appendix D. The project would have substantial beneficial effects to the aquatic habitat within the limits of the construction project features. Outside of the two backwater dredging features, some areas of lotic and lentic aquatic habitat in Reno Bottoms would remain degraded due to sedimentation and altered hydrology due to the limitation of the project to address all aquatic habitats in the project area.

4.5 Floodplain Forest Habitat

Existing conditions –

Historic Forest Cover

The Reno Bottoms study area has historically been predominantly forested. The earliest records, based on maps approximated from General Land Office (GLO) survey records from the early- to mid-1800s, show approximately 10,406 acres of forest, or 74% of the study area (Figure 4-1). This estimate is likely a slight over-estimate as maps from the Minnesota GLO surveys do not show river channels, and the main river channels were present at the time of those initial surveys. Mississippi River Commission maps from the 1890s show a total of 8,333 acres of forest, a drop of 25% from the time of Euro-American settlement (Figure 4-1). Much of the landcover change by the 1890s was driven by agricultural development and utilization of timber. Lock and dam construction in the 1930s and 1940s also affected the floodplain forest, as reduced flows immediately below the dams may have affected the forest in Reno Bottoms, as discussed in Section 2.1.3.3.

By 1975, forest land cover had further declined to 50% of the study area, while by 2010, the total forest land cover had declined to 40% of the study area and totaled 5,061 acres. Between the time of Euro-American settlement and 2010, total forest cover had declined by 4,571 acres.

However, certain areas within the study area have retained continuous forest cover since Euro-American settlement. The most northern portion of the study area is classified as a USFWS Research Natural Area and is considered as a reference area for historic forest conditions in the upper portion of the UMR. Though other areas have remained forested, particularly along the UMR main channel, significant post-settlement activity in these areas has likely had a much greater impact on current forest conditions due to the ease of access from the main channel.

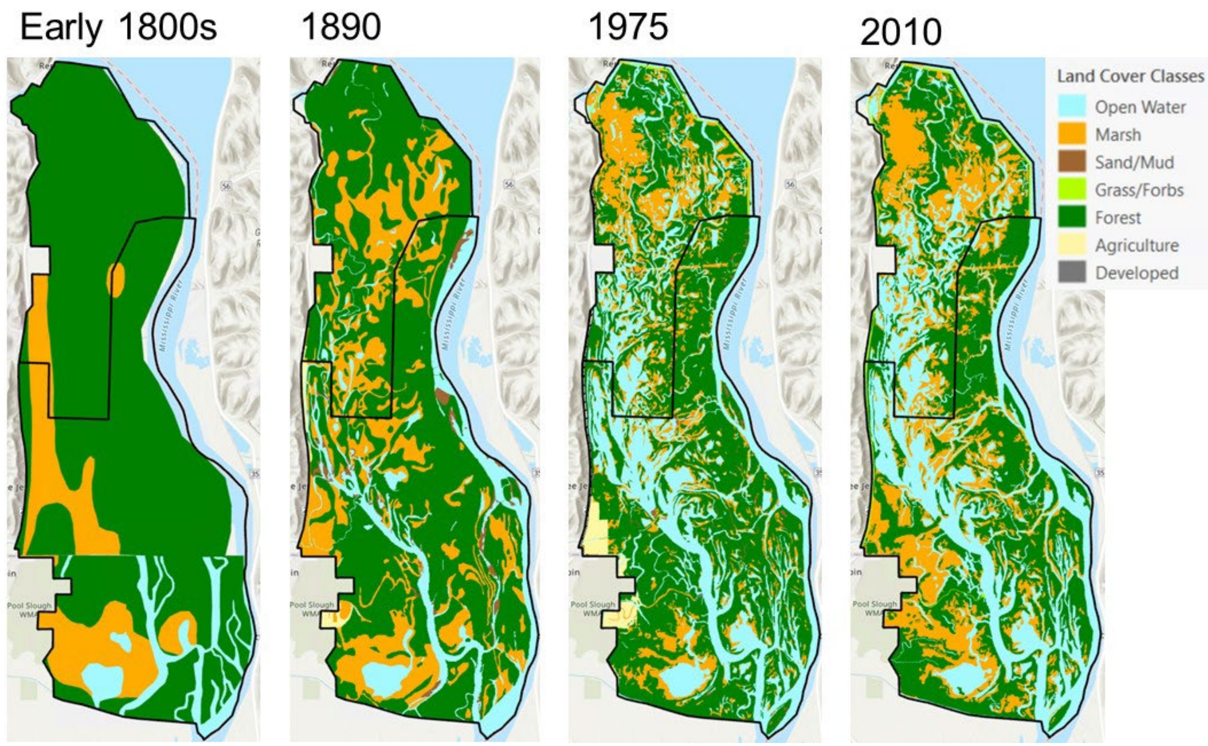


Figure 4-1. Reno Bottoms study area landcover change, early 1800s to 2010. Note that the early 1800s dataset is comprised of two separate GLO datasets for Iowa and Minnesota and with different summary scales.

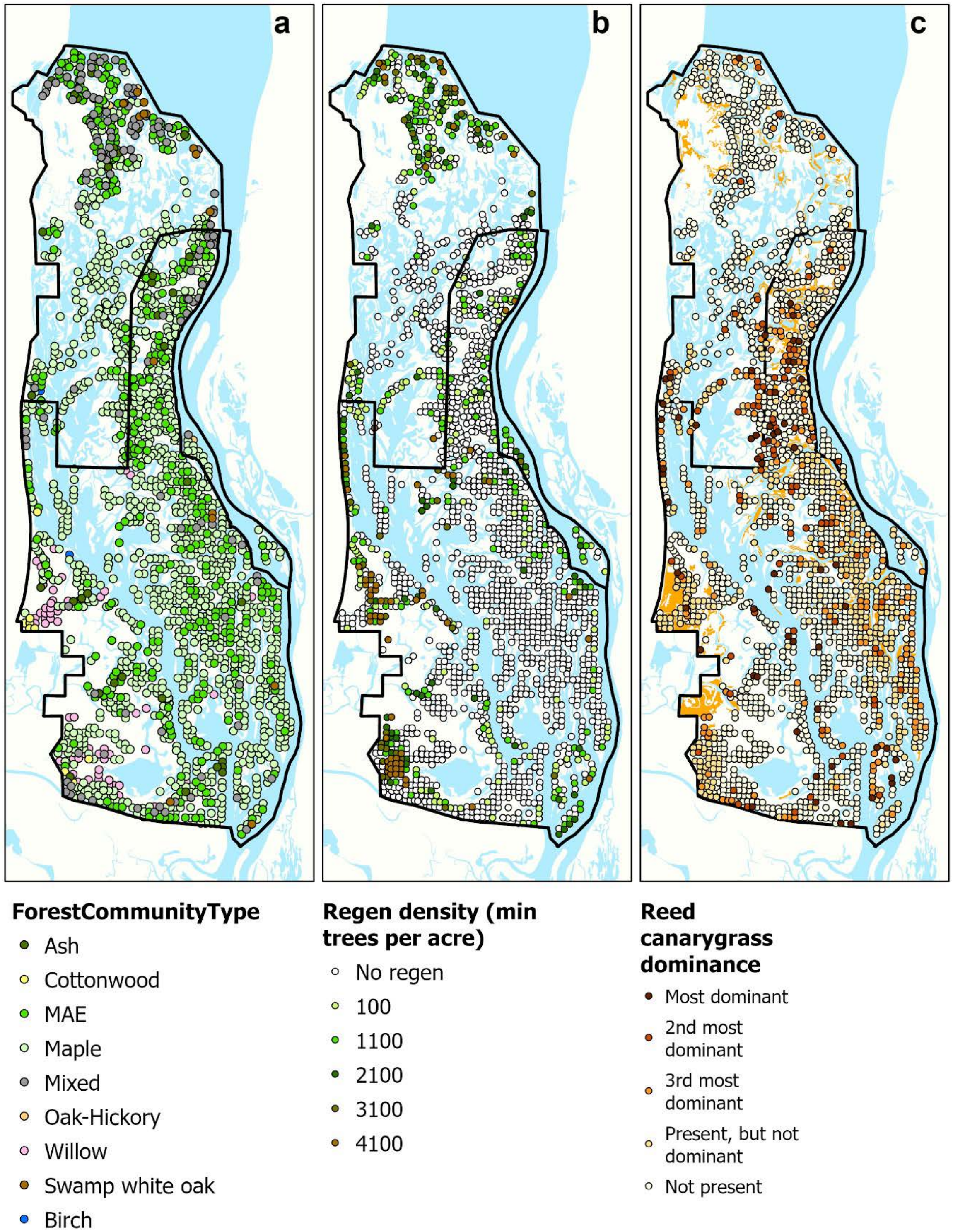


Figure 4-2. 2018-2020 forest inventory data summaries showing the distribution of forest community types (a), tree regeneration density (b) and reed canarygrass (c) within the study area.

All forest cover types provide valuable habitat, however wetter forest types tend to have lower tree species diversity than more mesic forest types. The wettest sites are dominated by willow, the next wettest by silver maple. These sites are flooded over 60 days during an average growing season, and few tree species can survive such wet conditions. Thus, many of these forests are dominated by a single species—either willow or silver maple. Slightly drier areas support silver maple, green ash, and elm, while the highest sites in the project area support mixed forests including swamp white oak, cottonwood, and hackberry. These higher sites still experience yearly flooding, but the shorter flood length allows a greater diversity of tree species. The areas that acres that are currently forested within the study area are heavily dominated by silver maple forest. Out of the 2,005 forest inventory plots collected between 2018 and 2020 across the entire study area, 65.4% were classified as silver maple dominated (Figure 4-2). Maple-ash-elm comprised an additional 16.8% of plots. Higher diversity mixed forest and oak dominated types made up about 7% of plots. No other community types made up more than 5% of the total inventory plots. The highest diversity plots were concentrated in the northern portion of the study area with a few locations in in the northeast along the main river channel, while willow-dominated plots were isolated to areas in the southwest of the study area. All forest types described above are considered wetlands based on the frequency of saturated soils and plant species.

Resilient forests with sustainable population structures are characterized by a diverse distribution of trees across size classes. Young trees, from saplings to small diameter pole-sized trees (<12” diameter at breast height (dbh)), provide a regeneration cohort to replace older canopy trees while also providing important habitat for wildlife species dependent on young forests. Old canopy trees with large diameters provide critical habitat for wildlife species dependent on old forest characteristics, while also providing seed for future forests. A balance of trees of different ages and sizes is critical for long-term forest resilience.

Across much of the study area, size class structures are heavily dominated by very large trees (Figure 4-3), with trees under 12 inches dbh making up less than 10% of the tree basal area in the study area. In the most common forest types, maple and maple-ash-elm, trees larger than 18 inches dbh constitute just below 75% of the total tree basal area. In addition, regeneration is largely absent across the entire project area. Based on rough ages from tree cores within the study area, the average age of silver maple trees in the study area is over 75 years old, and less than 10% of trees are less than 60 years old. Given that silver maple, which is the dominant species across the study area, has a longevity of 120 -150 years, the vast majority of trees in the maple dominated communities are nearing the end of their life span with little indication of a viable cohort of young trees to replace them.

A further indicator of the unsustainable condition of the current forest community across the study area is the widespread distribution of the aggressive native and non-native herbaceous vegetation, including reed canary grass (*Phalaris arundinacea*) and stinging nettle (*Urtica dioica*) (Figure 4-4). Generally, higher densities of aggressive herbaceous vegetation occur in areas with more open canopies. This, in turn, inhibits most natural tree regeneration in areas with more available sunlight, so areas with gradually opening canopies and aggressive herbaceous vegetation present would slowly convert from forest to non-forest cover.

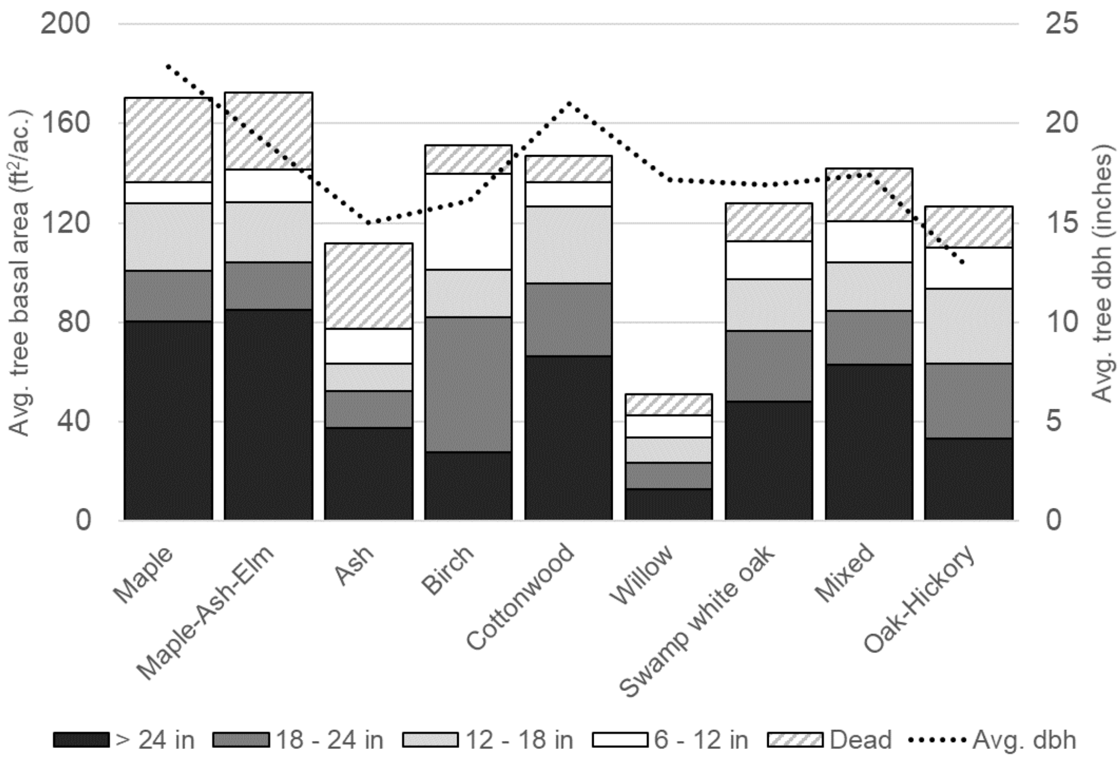


Figure 4-3. Size class distributions for trees in the Reno Bottoms study area by general forest community type. Average dbh represents the average dbh for all trees within that forest community type in the study area.

Figure 4-4. Forest canopy gap invaded by stinging nettle in Reno Bottoms, with no viable trees.

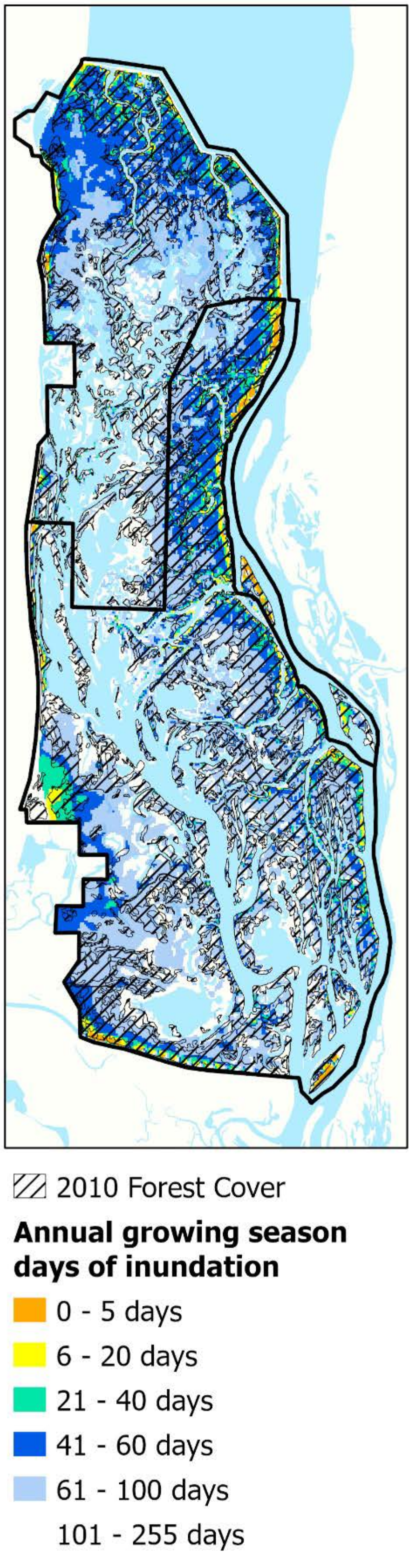


Figure 4-5. Annual growing season days of inundation.

A critical underlying factor defining the potential forest community distribution in a floodplain is the hydrology in a given location. For the UMRS, annual growing season days of inundation has generally been seen as the metric that most effectively captures the relevant hydrologic conditions that structure forests. Sites with less than 20 days of annual inundation are generally associated with higher diversity forests, and any areas with higher levels of annual inundation tend to be at elevations that are vulnerable to disturbance from periodic flood events. Beyond 60 days of inundation, only silver maple and willow can survive, and even those species may be lost under certain flooding scenarios (Bouska et al. 2022). More importantly, establishment of tree regeneration in areas with high levels of flooding is nearly impossible. Tree seedlings that are completely submersed below floodwaters die much more quickly than seedlings with leaves that are out of the water, and saturated soils greatly inhibit tree growth. Therefore, tree seedlings in very wet areas grow more slowly and are thus less likely to grow tall enough between inundation events to survive.

Progressively increasing river flows over the last thirty or forty years (see Sections 2.1 and 4.4) have resulted in higher and higher levels of annual inundation within Reno Bottoms floodplains forests. Chronic high water in the study area resulted in slow declines of forest in the 1990s and 2000s, with an acute mortality event impacting hundreds of acres occurring between 2016 and 2019. Though a much higher proportion of the study area may have had the potential to support forest in the past, under current hydrologic conditions, the vast majority of the area classified as forest in 2010 occurs in locations with 60 days or more of inundation (Figure 4-5). Of the remaining forest area, the majority of the potentially high diversity forest areas occur adjacent to the main channel on natural levees and historic dredge placement sites. The majority of the area with intermediate inundation ranges and, therefore, continued potential for lower-diversity silver maple dominated forest, also occurs in a strip along the main river channel as well as in scattered locations along the edge of the floodplain.

Impacts of No-Action– Without action, the floodplain forest habitat in the study area is expected to continue to degrade, with substantial loss of forest habitat.

Forests covered just over 5,600 acres within the study area in 2010, the most recent year for which data are available. Based on forest succession modeling described in this section and in Appendix D, Habitat and Forest Modeling), it is anticipated that by 2070, about 120 acres additional acres of forest will be lost, see Figure 4-6. By 2120, however, the total anticipated forest loss is projected at nearly 1,000 acres – at total of 18% of the 2010 forest area. This estimate is based on hydrology reflective of the last 30 years. However, if the system continues to get wetter, higher levels of forest loss are likely.

Low Elevation Forests

It is anticipated that unprecedented growing season flooding and chronic high water surface elevations will continue in the study area into the foreseeable future, and likely for the 50-year duration of the project. As a result, continued tree mortality and conversion to marsh and aquatic habitat is likely in low elevation areas in the interior of the study area within the project period (Figure 4-6).

Mid and High Elevation Forests

On higher elevation sites less vulnerable to flood induced canopy mortality, factors associated with alterations to natural successional pathways will also result in loss of forest quality and forest cover during the project period. Succession is the process by which forest trees transition from young, fast-growing trees that require full sunlight to dominance by slower growing trees that can survive in shade. High elevation areas dominated by short-lived silver maple and cottonwood will gradually degrade, with the development of more and more open canopies as older trees die and increasing dominance by aggressive herbaceous species in the understory. Unlike in lower elevation areas, extensive loss of forest is not expected on high elevation sites by 2070, though habitat quality will decline substantially in many of these areas. However, by 2120 degradation in higher elevation areas is expected to lead to complete forest loss. See Appendix D, Habitat and Forest Modeling for full details. These model runs extend beyond the 50-year planning horizon but serve a set of data for consideration and demonstrate one likely trend for the forests within Reno into the future.

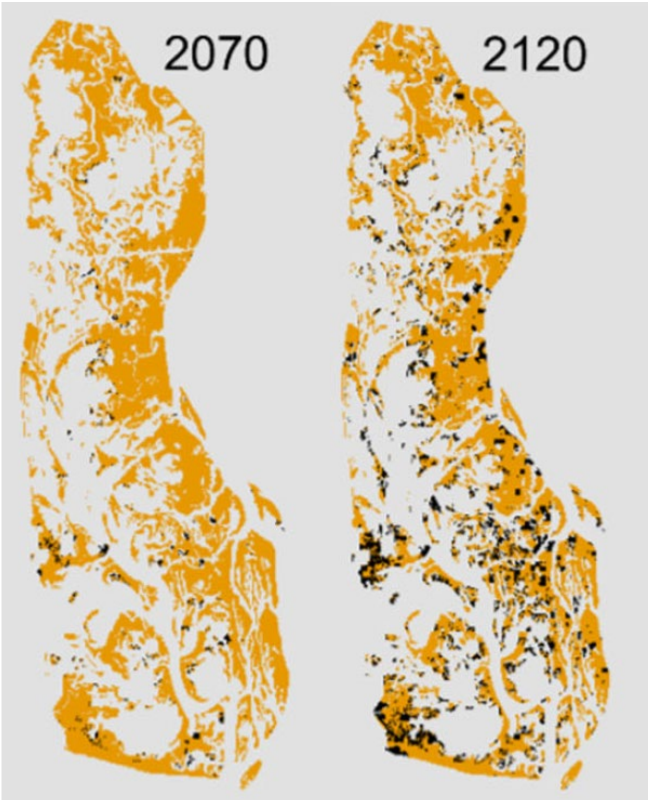


Figure 4-6. Predicted forest loss by 2070 and 2120 in the study area based on forest succession modeling. Orange represents remaining forest, black represents forest loss (From Bouska et al. 2022).

Impacts of the Recommended Plan – With the Recommended Plan, substantial forest loss is still expected to occur in lower elevation areas due to chronically high-water levels. Management of low elevation forest loss would likely not be effective under future Upper Mississippi River conditions. However, the Recommended Plan would result in retention and enhancement of forest cover and quality in higher elevation areas and on island enhancement features. The Recommended Plan results in a substantially higher total acreage of quality forest within the study area. The project would have substantial beneficial effects on forest habitat.

4.6 Fish and Wildlife

Existing conditions – The floodplain forest and shallow aquatic areas in Pool 9 provide critical habitat for a wide array of birds including, waterfowl, songbirds, shorebirds, and raptors. Pool 9 lies within the Mississippi flyway, an important bird migration route that connects central Canada to the region surrounding the Gulf of Mexico. The UMR floodplain provides critical resting areas and food sources for migratory birds while traveling to northern nesting grounds in the spring and to southern overwintering locations in the fall.

During these seasons, waterfowl, such as ring-necked ducks (*Aythya collaris*), canvasbacks (*Aythya* valisineria), bufflehead (*Bucephala albeola*), common goldeneye (*Bucephala clangula*), ruddy duck (*Oxyura jamaicensis*), and scaup (*Aythya affinis*) use the deeper areas of the backwaters, while mallards (*Anas platyrhynchos*), widgeon (*Anas americana*), blue-winged teal (*Anas discors*), green-winged teal (*Anas carolinensis*), gadwall (*Mareca strepera*), northern pintail (*Anas acuta*), northern shoveler (*Spatula clypeata*), and wood duck (*Aix sponsa*) use the shallower areas. High waterfowl use has been observed from weekly surveys conducted by the

USFWS in the spring and fall (although numbers of birds can be highly variable across sites and seasons). Anecdotal accounts of waterfowl use in Pool 9 suggest heavy use by mallards, American coot (*Fulica americana*), and Canada Goose (*Branta canadensis*), and diving ducks. Pool 9 also provides nesting and foraging habitat for many bird species. Some of these species spend the entire year in the area, while others migrate into the area at various times of the year.

The floodplain forest of the UMR provides important nesting sites and forage for a number of neotropical migratory birds. Neotropical migrants are birds that nest in the United States or Canada and winter in the tropical regions of Mexico, Central America, South America or the Caribbean. Many neotropical migrants have experienced sharp declines in population which has prompted support from a number of private citizens, public agencies, businesses, and environmental organizations. Neotropical migrants are an important part of the ecosystem and have benefits to agricultural (LandOwner Resource Centre 2000) and tourism industries (EPA 2002). Over forty neotropical migrants nest in or near the UMR floodplain in Iowa (Ehresman 2003). Forest-interior species which breed in the bottomland forests of the UMR include blue-gray gnatcatcher (*Polioptila caerulea*), veery (*Catharus fuscescens*), wood thrush (*Hylocichla mustelina*), warbling vireo (*Vireo gilvus*), yellow-throated vireo (*Vireo flavifrons*), northern parula (*Setophaga Americana*), American redstart (*Setophaga ruticilla*), prothonotary warbler (*Protonotaria citrea*), yellow-throated warbler (*Setophaga dominica*), cerulean warbler (*Setophaga cerulean*), acadian flycatcher (*Empidonax virescens*), red-eyed vireo (*Vireo olivaceus*), Kentucky warbler (*Geothlypis Formosa*), summer tanager (*Piranga rubra*), scarlet tanager (*Piranga olivacea*), and eastern wood-pewee (*Contopus virens*)(Grettenberger 1991).

In addition, many raptors use the river valley as a flyway, and a number of these species, such as eagles, hawks, and owls, over-winter in these floodplain areas. Foremost among these is the bald eagle (*Haliaeetus lecocephalus*), which is protected under the federal Bald and Golden Eagle Protection Act. Eagles have increased dramatically over the last 30+ years and were recently de-listed from the federal list of threatened species. In 2021, 192 active bald eagle nests were documented in Pool 9 (USFWS unpublished data). Although eagle nests in Pool 9 occasionally are located over water, most are found away from the immediate shoreline in large areas of undisturbed, mature, old growth timber with an open and discontinuous canopy. Preferred nesting sites are usually tall, prominent trees, with an open structure and stable limbs that allow easy approach from the air. There are many bald eagle nests located in the study area with two nests near the Army Road elevation enhancement area (see Appendix M, Eagle Nest Map Plates). Some eagles live in the area year-round, with winter use being highest in ice-free areas. Many other eagles migrate along the Mississippi River, which acts as an important migration corridor.

Ninety-five species of fish have been collected from Pool 9 (Steuck et al. 2010), 38 of which are known to occur in its main tributary, the Upper Iowa River. Common game fish that use main channel habitat include walleye (*Sander vitreus*), sauger (*Sander Canadensis*), smallmouth bass (*Micropterus dolomieu*), and white bass (*Morone chrysops*). Freshwater drum (*Aplodinotus grunniens*) and channel catfish (*Ictalurus punctatus*) are common commercial species that use this main channel habitat. Commercial species found in backwaters include common carp (*Cyprinus carpio*), bigmouth buffalo (*Ictiobus cyprinellus*), and catfish species, while typical backwater sport fish include northern pike (*Esox Lucius*), largemouth bass (*Micropterus salmoides*), black and white crappie (*Pomoxis annularis* and *Pomoxis nigromaculatus*) and bluegill (*Lepomis macrochirus*). Several species of non-game minnows, darters, and shiners inhabit the backwaters and side channel areas as well. Catfish, buffaloes, and carp are the primary fish of commercial interest.

White-tailed deer (*Odocoileus virginianus*) use the area as a food source and wintering area. Many small carnivores such as red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), and weasel (genus *Mustela*) also use the area. Larger carnivores such as bobcat (*Lynx rufus*) and coyote (*Canis latrans*) are infrequent visitors but have been reported. Smaller mammals such as beaver (*Castor Canadensis*), muskrat (*Ondatra zibethicus*), shrews (family *Soricidae*), moles (family *Talpidae*), bats (family *Vespertillionidae*), eastern cottontail rabbits (*Sylvilagus floridanus*), squirrels (family *Sciuridae*), and mice species (family *Cricetidae*) are relatively common in the area.

The floodplain of Pool 9 provides habitat for several amphibian and reptile species. Common species typically found in off channel areas of the floodplain include fox snake (*Pantherophis vulpinus*), tiger salamander (*Ambystoma tigrinum*), American toad (*Anaxyrus americanus*), gray treefrog (*Hyla versicolor*), green frog (*Lithobates clamitans*), snapping turtle (*Chelydra serpentine*), painted turtle (*Chrysemys picta*), common map turtle (*Graptemys geographica*), Eastern hognose snake (*Heterodon platirhinos*), and northern leopard frog (*Lithobates pipiens*). There are no known amphibian or reptile surveys in the study area. Amphibians and reptiles typical for Pool 9 would be expected to inhabit the study area.

Bald Eagles

Bald eagle (*Haliaeetus leucocephalus*) numbers have increased dramatically throughout much of the UMR in recent years (Fetherston et. al 2020). Reno Bottoms contains a number of active eagle nests with eagles that use the area year-round. Substantial bald eagle use occurs during winter and is highest where the river is ice-free and contains adequate perch sites. Bald eagles are protected under the Bald and Golden Eagle Protection Act. Typical bald eagle nesting runs from December – July throughout the UMR. This nesting period includes nest building, egg laying/incubation, hatching/rearing of young and fledging of young. See Appendix M, Eagle Nest Map Plates for maps of known, active eagles' nests as of 2022.

Impacts of No-Action– 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 fewer acres of high-quality habitat which would result in less wildlife utilizing the area. The loss of floodplain forest described above would negatively impact many classes of wildlife. The ongoing sedimentation and increased flows described above would negatively impact fish, amphibians, herptiles, and other classes of wildlife.

Impacts of the Recommended Plan – The Recommended Plan would result in short-term minor adverse effects to wildlife as animals would leave the area during construction due to activity and noise. After construction, wildlife would return. The Recommended Plan would result in substantial long-term beneficial effects for wildlife due to habitat improvement.

Bald Eagles

The refuge regularly enforces a buffer of at least 660 feet around active bald eagle nests whereby activities within that buffer are restricted or prohibited. In some instances, the refuge has allowed activities to occur within 660 feet of an active bald eagle nest but has required monitoring to determine if the activities were disturbing the eagles. These instances occurred when the refuge or district manager believed the nature of the activities would result in a relatively low risk of disturbance, and activities could be quickly halted or modified to eliminate disturbance and prevent nest abandonment. The Corps will coordinate with refuge staff during project design to determine if these measures are appropriate for any of the active bald eagle nest in the project area. If these measures are determined to be appropriate, further coordination will occur to determine the level and type of activity that will be allowed by the refuge, who will conduct the monitoring, and what actions will be taken if disturbance of nesting bald eagles occurs.

4.7 Federally Listed Threatened and Endangered Species

Existing conditions – USACE consulted the USFWS Information for Planning and Consultation (IPaC) website on November 16, 2022 (Table 4-2) to identify the potential presence of federally listed threatened and endangered species within the defined project action area. Of these species, the sheepnose, northern wild monkshood, and eastern prairie fringed orchid are very unlikely to occur within the study area.

Table 4-2. USFWS federally-listed endangered and threatened wildlife and plants for the study area (https://ipac.ecosphere.fws.gov/).

Common Name	Scientific Name	Group	Federal Status
Higgins Eye	*Lampsilis higginsii*	Mussels	Endangered
Sheepnose Mussel	*Plethobasus cyphyus*	Mussels	Endangered
Northern Long-Eared Bat	*Myotis septentrionalis*	Mammal	Threatened
Tricolored Bat	*Perimyotis subflavus*	Mammal	Proposed Endangered
Monarch Butterfly	*Danaus plexippus*	Insect	Candidate
Northern Wild Monkshood	*Aconitum noveboracense*	Flowering Plants	Threatened
Eastern Prairie Fringed Orchid	*Platanthera leucophaea*	Flowering Plants	Threatened

Northern monkshoodand eastern prairie fringed orchid have been identified in areas near the project but not in the project area. Northern wild monkshood (*Aconitum noveboracense*) is a threatened plant species found on shaded to partially shaded cliff, algific talus slopes, or cool streamside sites. Northern wild monkshood has been found to occur in Wisconsin, Iowa, Ohio, and New York. This species is noted by its very distinctive blue hood-shaped flowers (USFWS 2007). There are no known populations of this species within the Project area footprint. The niche mixture of shades cliff required for is not known to exist on the islands within the direct Project area or footprint. The Eastern prairie fringed orchid requires high quality habitat with robust vegetation diversity. The species occurs in a wide variety of habitat, from mesic prairies, sedge meadows, marshes and even bogs (USFWS 2004).

The northern long-eared bat (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. The northern long-eared bat is relatively widespread. It is listed as a threatened species because populations are being sharply reduced by a fungal pathogen that causes white-nose syndrome. The pathogen causes the bat to come out of hibernation prematurely. In the eastern United States, northern long-eared bat populations have been reduced by more than 90 percent. According to the USFWS there are no known northern long-eared bat hibernaculum in Allamakee County (USFWS 2022 (IPAC)). However, because of the mature trees found in the study area, northern long-eared bats may be found roosting on the site.

The tricolored bat (*Perimyotis subflavus*) is a small insectivorous bat that is distinguished by its unique tricolor fur that often appears yellowish to nearly orange. The tricolored bat tends to hibernate in caves, mines and tunnels, specifically in deeper portions of the hibernacula where temperatures and humidity are higher (Hazard 1982). This species was once common throughout central and eastern United States but has recently been heavily impacted by white-nose syndrome, resulting in an estimated 90% decline in species numbers. To combat this steady decline the USFWS submitted the tricolored bat for listing on 14 September 2022, giving the species a proposed endangered status under ESA. Based on a 12-month finding petition, the species could then be listed as endangered if the review deems it necessary. Similar to NLEB, the tricolored bat could utilize mature trees found throughout the study area for roosting.

The monarch butterfly is known for long-distance migrations based on the presence of milkweed (their larval host plant). This species overwintering sites in Mexico and California have indicated a decline, which has led to a petition by several groups to the USFWS for listing under the ESA of 1973, as amended (USFWS 2020). USFWS found that adding the monarch butterfly to the list of threatened and endangered species is warranted but precluded by work on higher-priority listing actions, therefore the species becomes a candidate for listing. Candidate species are not protected by the take prohibitions of Section 9 of ESA.

Two federally listed mussel species could potentially be found in the project area, sheepnose (*Plethobasus cyphyus*) and Higgins eye. However, sheepnose has not been collected within the project area in recent history. A skimmer dredge mussel survey was conducted 23 to 26 August 2021 within proposed project features including access routes to evaluate impacts to mussels including federally listed species (Figure 4-7). A total of 1,664 live mussels representing 23 species were collected along 33 skimmer dredge transects. Two live Higgins eye individuals were collected, one each along Transect 1 and 19, respectively. Transect 1 was within Minnesota Slough along a proposed access route and Transect 19 was along the UMR main channel shoreline where bank protection was proposed. Dive mussel surveys were also conducted in 2002-03 within the project area (see Figure 4-8). A total of 2,842 live mussels representing 24 species were collected including four live Higgins eye at Sites 59, 63, and 67. Site 59 was near Transect 1 and Sites 63 and 67 were within the lower reach of Minnesota Slough.

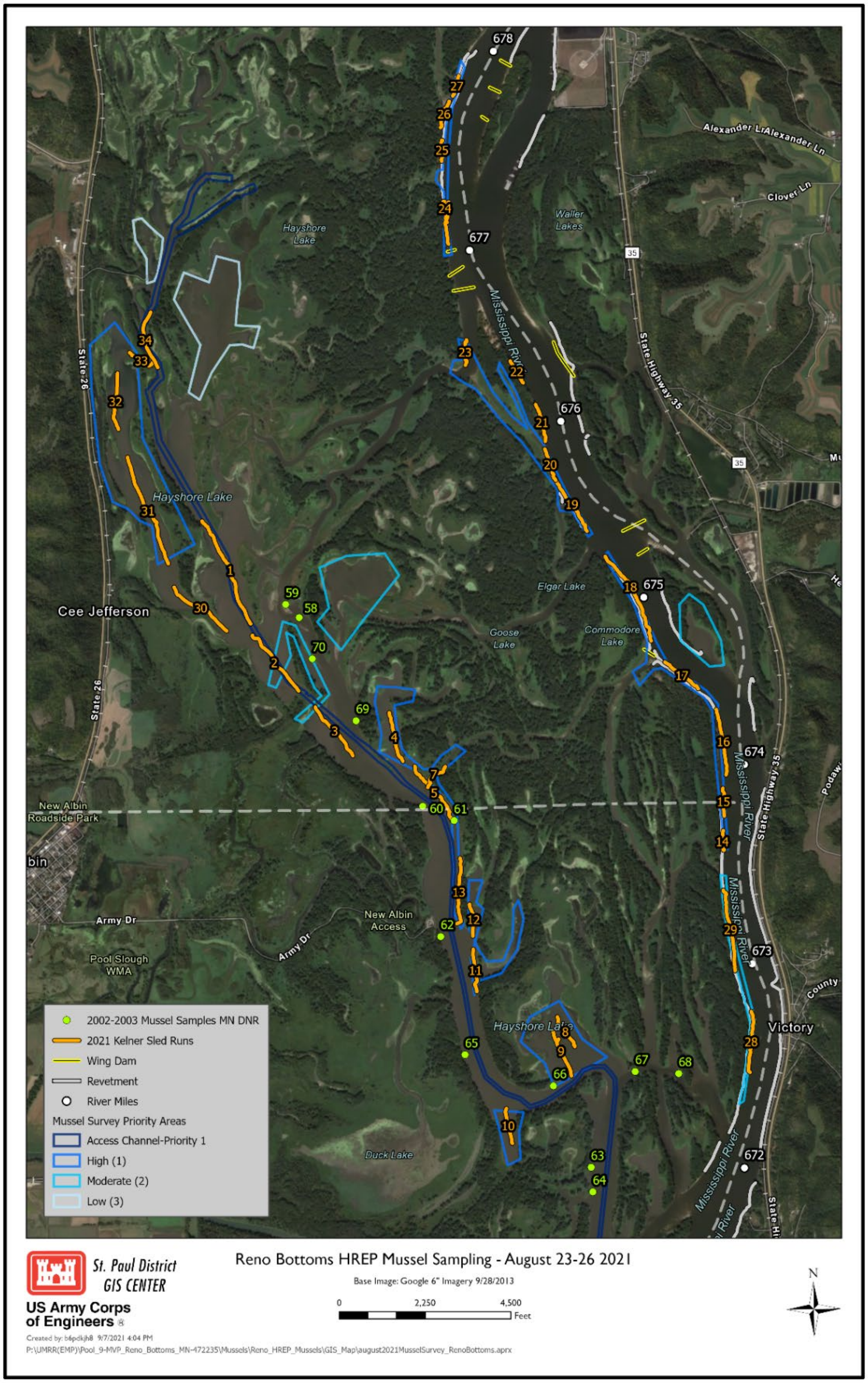


Figure 4-7. Summer 2021 Mussel Sample Locations and Results.

Impacts of the Recommended Plan – The Recommended Plan may affect but is not likely to adversely affect Higgins eye and listed bat species (NLEB and tricolored bats). Project construction would require tree removal for access roads, landing pads, and within the project footprint.

On 29 November 2022, the USFWS announced a final rule to reclassify the NLEB as endangered under the ESA. Any implementation of the Recommended Plan would happen after NLEB is listed as endangered. Additionally, the tricolored bat was submitted for listing on 14 September 2022, giving it a proposed endangered status under ESA. The actions of the Selected Pan will not impact any known hibernacula or roosting trees within 0.25 miles of the project area. To construct the project, tree clearing is likely to occur at the elevation and forestry management features of Ice Haul Island and Army Road and the temporary access road near Millstone Landing. It is anticipated that less than two acres of trees will be cleared for access and implementation. To avoid any potential take of NLEB or other proposed bat species (i.e., tricolored bat), tree clearing would avoid pup roosting season and be completed between 1 November to 31 March. The Corps has determined that our activities may affect but are not likely to adversely affect NLEB or tricolored bat because impacts associated with tree clearing activities would be discountable or unlikely to occur.

The construction of the Recommended Plan has the potential to impact mussels directly by smothering with rock or dredged material used to construct project features or removal of mussels by dredging. To avoid these effects to listed mussels, dredging and barge access would be restricted in the high-quality mussel bed in Minnesota Slough to avoid mussel impacts including impacts to Higgins eye. A substantial mussel bed containing at least 16 live species including Higgins eye occurs here. Water depths within this area are generally <5ft under normal pool elevation which makes impacts to mussels here from barge traffic carrying granular and/or fine material upstream from the main channel or the New Albin Access via Minnesota Slough for project construction at Ice Haul Island and other upper reach areas unavoidable. Water depths within Minnesota Slough downstream of this area to the main channel are adequate (>9ft) for barge traffic and wouldn't be expected to impact mussels as access dredging wouldn't be needed. However, to avoid impacts to mussels including Higgins eye, the Corps has decided to restrict any barge access through this shallow area during construction of the project by designating the area an "Exclusion Zone". No access dredging will be allowed, light loading and/or use during high water events will also not be allowed. The only allowable means to transport granular material to Ice Haul Island through this area will be from a floating pipeline set in place by small work boats (e.g., flat bottom Jon boat) which are not expected to impact the river bed and mussels. Other options will be to transport granular material via truck or rail from upstream via Millstone or Visger's landing. Higgins eye have also been collected from the two surveys but are in areas where project features or access routes are not planned and no adverse effects are expected from project construction. To avoid impacts to listed mussel species during the implementation of the Ice Haul partial closure, a mussel relocation would be performed within this features footprint. The relocation would be completed with divers and mussels would be relocated to a suitable mussel bed near the Ice Haul partial closure footprint. Therefore, it is the Corps' determination that the project may affect but is not likely to adversely affect Higgins eye. Any effects would be discountable and extremely unlikely to occur. The Corps has requested concurrence on this determination from the FWS (see Appendix A). It is not expected that sheepnose mussel would be present in the area and as such, the Recommended Plan would have no effects on this species. No sheepnose mussel individuals were collected in the project area in the 2021 survey nor any other survey in recent history.

Pool 9 has milkweed present, so the Project area acts as a potential summer breeding and migratory route for the monarch butterfly. The Recommended Plan is not anticipated to negatively impact local milkweed or other diverse flowering plants that monarchs rely on, as much of the disturbed terrestrial land within the Project area contains invasive plant species. Being that the species is mobile, it can avoid construction activities associated with the Recommended Plan. The project is anticipated to have no effect on this candidate species. The project team would consult with the USFWS to determine ways to reduce potential effects to candidate species if necessary. There are no known extant populations of Eastern prairie fringed orchid within the direct project area or project footprint because many of the existing islands within the project area are overtaken by reed canary grass. Project features would not be constructed on high quality plant communities, so this species would not be present at project features. High quality native plant communities would be avoided during project implementation. For this reason, the Recommended Plan would have no effect on Northern wild monkshood (Aconitum noveboracense), and Eastern prairie fringed orchid (Platanthera leucophaea).

The USFWS concurred with the Corps ESA determination on 16 December 2022. ESA coordination and concurrence is available in Appendix A. The Corps will revisit ESA determinations during project design and initiate further consultation if any listings or determinations have changed prior to the construction of the Recommended Plan.

4.8 State Listed Species

Existing conditions –

The Natural Heritage Databases were used to develop a list of state-listed species found within one mile of the project boundary, shown in Tables 4-3, 4-4, and 4-5. The project may affect state listed species. As a Federal agency, the Corps does not request or obtain state endangered species permits for taking individuals of state listed species. However, as part of its NEPA analysis, the Corps evaluates effects to state listed species for its activities. The Corps seeks to avoid and minimize impacts to the extent practicable.

Table 4-3. Iowa Listed Species in the Project Vicinity.

Common Name	Scientific Name
Bald Eagle	Haliaeetus leucocephalus
Bluntnose Darter	Etheostoma chlorosoma
Chestnut Lamprey	Ichthyomyzon castaneus
Dion Skipper	Euphyes dion
King Rail	Rallus elegans
Pirate Perch	Aphredoderus sayanus
Pugnose Minnow	Opsopoeodus emiliae
Red-shouldered Hawk	Buteo lineatus
Sweet Indian Plantain	Cacalia suaveolens
Water Starwort	Callitriche heterophylla

Table 4-4. Wisconsin Listed Species in the Project Vicinity.

Common Name	Scientific Name
Abbreviated Underwing Moth	Catocala abbreviatella
American Eel	Anguilla rostrata
Bald Eagle	Haliaeetus leucocephalus
Black Buffalo	Ictiobus niger
Blanchard's Cricket Frog	Acris blanchardi
Blue Sucker	Cycleptus elongatus
Bluntnose Darter	Etheostoma chlorosoma
Cerulean Warbler	Setophaga cerulea
Clustered Broomrape	Orobanche fasciculata
Columbine Dusky Wing	Erynnis lucilius
Dragon Wormwood	Artemisia dracunculus
Fawnsfoot	Truncilla donaciformis
Goldeye	Hiodon alosoides
Gorgone Checker Spot	Chlosyne gorgone
Gray Ratsnake	Pantherophis spiloides
Higgins Eye	Lampsilis higginsii
Lake Sturgeon	Acipenser fulvescens
Monkeyface	Theliderma metanevra

Common Name	Scientific Name
Mud Darter	Etheostoma asprigene
Ottoe Skipper	Hesperia ottoe
Paddlefish	Polyodon spathula
Pallid Shiner	Hybopsis amnis
Peregrine Falcon	Falco peregrinus
Pickerel Frog	Lithobates palustris
Prothonotary Warbler	Protonotaria citrea
River Redhorse	Moxostoma carinatum
Rock Pocketbook	Arcidens confragosus
Royal River Cruiser	Macromia taeniolata
Shoal Chub	Macrhybopsis hyostoma
Six-lined Racerunner	Aspidoscelis sexlineata
Skipjack Herring	Alosa chrysochloris
Smooth Coil	Helicodiscus singleyanus
Smooth Softshell	Apalone mutica
Timber Rattlesnake	Crotalus horridus
Wartyback	Quadrula nodulata
Washboard	Megalonaias nervosa
Wing Snaggletooth	Gastrocopta procera
Wood Turtle	Glyptemys insculpta

Table 4-5. Minnesota Listed Species in the Project Vicinity.

Common Name	Scientific Name
American Eel	Anguilla rostrata
Bell's Vireo	Vireo bellii
Black Buffalo	Ictiobus niger
Black Sandshell	Ligumia recta
Blanchard's Cricket Frog	Acris blanchardi
Blue Sucker	Cycleptus elongatus
Bluntnose Darter	Etheostoma chlorosoma

Common Name	Scientific Name
Butterfly	Ellipsaria lineolata
Catchfly Grass	Leersia lenticularis
Cattail Sedge	Carex typhina
Christmas Fern	Polystichum acrostichoides
Clasping Milkweed	Asclepias amplexicaulis
Common Gallinule	Gallinula galeata
Ebony Spleenwort	Asplenium platyneuron

Common Name	Scientific Name
Fawnsfoot	Truncilla donaciformis
Flat Floater	Utterbackiana suborbiculata
Glade Mallow	Napaea dioica
Gophersnake	Pituophis catenifer
Gray's Sedge	Carex grayi
Green Dragon	Arisaema dracontium
Higgins Eye	Lampsilis higginsii
Lake Sturgeon	Acipenser fulvescens
Mississippi Silvery Minnow	Hybognathus nuchalis
Monkeyface	Theliderma metanevra
Muskingum Sedge	Carex muskingumensis
North American Racer	Coluber constrictor
Old Field Toadflax	Nuttallanthus canadensis
One-flowered Broomrape	Orobanche uniflora
Paddlefish	Polyodon spathula
Pallid Shiner	Hybopsis amnis
Peregrine Falcon	Falco peregrinus

Common Name	Scientific Name
Pirate Perch	Aphredoderus sayanus
Purple Cliff Brake	Pellaea atropurpurea
Red-shouldered Hawk	Buteo lineatus
Rock Pocketbook	Arcidens confragosus
Round Pigtoe	Pleurobema sintoxia
Skipjack Herring	Alosa chrysochloris
Spike	Eurynia dilatata
Stream Parsnip	Berula erecta
Swamp White Oak	Quercus bicolor
Sweet-smelling Indian plantain	Hasteola suaveolens
Upland Boneset	Eupatorium sessilifolium
Warmouth	Lepomis gulosus
Wartyback	Quadrula nodulata
Washboard	Megalonaias nervosa
Western Harvest Mouse	Reithrodontomys megalotis
Western Ratsnake	Pantherophis obsoletus
Yellow Bass	Morone mississippiensis
Yellow Sandshell	Lampsilis teres

Mussel surveys conducted in 2002-03 and in 2021 resulted in eight mussel species listed for protection in Minnesota and/or Iowa. State listed mussel species that occur within the project area include, rock pocketbook (*Arcidens confragosus*), butterfly (*Ellipsaria lineolata*), washboard (*Megalonaias nervosa*), round pigtoe (*Pleurobema sintoxia*), monkeyface (*Quadrula metanevra*), wartyback (*Quadrula nodulata*), strange floater (*Strophitus undulatus*), and fawnsfoot (*Truncilla donaciformis*).

Impacts of No-Action– The no action plan would result in minor adverse effects on state-listed species. As forest areas continue to convert to invasive species, many species would have less habitat area and lower habitat quality. Fish that use backwater sites would also have lower quality habitat as backwaters fill in with sediment. Overall, habitat for state-listed species would decline and likely have minor adverse effects on the species.

Impacts of the Recommended Plan – The construction of the project has the potential to impact mussels including state listed species directly by smothering with rock or dredged material used to construct project features or removal of mussels by access dredging. Indirect impacts from resuspended sediment from propellers along access routes, access dredging, and construction of the features with heavy equipment would temporarily impact mussels. Impacts to state listed species are not expected to have long term adverse impacts to populations of the species within UMR Pool 9. Once the project is completed, long term beneficial impacts to mussels including state listed species are expected given improved aquatic habitat conditions from reduced sedimentation and improved water quality.

The Recommended Plan would have temporary minor adverse effects to some state-listed wildlife species as animals would leave the area during construction due to activity and noise. After construction, wildlife would return. Plants within the construction area would be killed by equipment and material placement. The project team will coordinate with the state agencies to determine what practices can be used during construction to avoid and minimize these impacts. The Recommended Plan would result in substantial long-term beneficial effects for wildlife due to habitat improvement. State-listed species would benefit from this habitat improvement including improved forest habitat and improved aquatic habitat.

4.9 Air Quality

Existing conditions– The EPA 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 national standard criteria for each of the six contaminants, it is called an "attainment area"; those areas that do not meet the criteria are called "nonattainment areas." Houston and Allamakee Counties are classified as an attainment area for each of the six contaminants and is therefore not a region of impaired ambient air quality (EPA 2022). This designation means that the study area has relatively few air pollution sources of concern.

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

Impacts of the Recommended Plan – Minor, temporary increases in airborne particulates are anticipated because of mobilization and use of construction equipment to implement the Recommended Plan. Construction equipment would likely include but not limited to barges, bulldozers, excavators, and dump trucks. This minor, temporary impact is anticipated to last during the construction of the Recommended Plan. Increased airborne particulates would likely be highest during the active construction season (i.e., April – November) each year. Frequent inspections of construction equipment would be made during construction to ensure equipment is properly functioning and not releasing unnecessary amounts of emissions. The Project area air quality is considered relatively clean as it is considered an attainment area for the six contaminates evaluated by the USEPA. Project implementation is far enough away from the general public that this minor impact would be negligible.

4.10 Noise

Existing conditions – The study area has low noise levels. Most noise is natural with some human noise from the adjacent railroad track, roads, navigation and private vessels.

Impacts of No-Action– 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.

4.11 Historic Properties and Cultural Resources

Existing conditions – Cultural resources are a major component of the Upper Mississippi River Valley and are integral, nonrenewable elements of the physical and cultural landscape. Collectively, the archaeological record indicates continual human occupation along the river for approximately 13,000 years. Cultural resources are located throughout the pool and across a wide variety of landforms. Seventeen cultural resource sites are located within the project's Area of Potential Effect (APE). Significant cultural resources, like those present within the APE, contribute to our knowledge of the past and remain important areas to Native American communities. Preserving and preventing degradation of these important assets is one of the responsibilities of the Corps and other agencies.

Archaeological investigations have been ongoing along the Upper Mississippi River and in the Pool 9 locality for over a century (e.g., Boszhardt 1995, Jalbert and Kolb 2003, Keyes 1928, Lewis 1889, Orr n.d., Thomas 1894). Early research in the area was conducted by antiquarians focused on upland sites around the pool and was centered on the contents of burial mounds and who built them. As professional investigations ensued, a variety of academic and cultural resource management driven projects for road construction and other development activities were conducted (e.g., Penman 1984; Stanley and Stanley 1986, Wedel 1959). However, significant investigations within the floodplain did not commence until 1975 (Benn 1976). Since then, the Corps and the USFWS have sponsored several cultural resource investigations within the pool for various projects, including dredged material placement sites, flood control features, shoreline surveys, erosion monitoring programs as well several literature-based overviews, such as site inventories, geomorphic mapping, shipwreck locations and navigation features (e.g., Benn and Lee 2005; Blikre and Benn 2008; Boszhardt 1992, 1995; Boszhardt and Moffat 1994; Jalbert and Kolb 2003, Jensen 1992; Gnabasik 1993; Madigan and Schirmer 2001; Overstreet et al. 1983; Pearson 2003; Perkl 2002; Vogel et al. 2003, Withrow 1983).

Cultural resource sites within the Pool 9 locality exist on a variety of landforms, including uplands, terraces, islands, the river floodplain (e.g., natural levees, alluvial fans), and within the river channel. Identified cultural resources include precontact single artifact finds, lithic and artifacts scatters, village sites, rock shelters, caves, petroglyphs, burials and burial mounds. Historic cultural resources include fur trade sites, early American town sites, farmsteads, mills, cemeteries, clamming sites, historic standing structures, shipwrecks and river navigation structures (e.g., wing dams). Several cultural resource sites within Pool 9 have been listed on the NRHP or are eligible to be listed on the NRHP. The assortment of cultural resource sites within and proximal to the Pool 9 locality have contributed to our knowledge of the cultural history of this region of the Upper Mississippi River (e.g., Alex 2000; Benn 1979; Birmingham et al. 1997; Gibbon 2012; Logan 1976; Theler and Boszhardt 2003).

Most of the previously identified cultural resources within the APE are situated within the main channel (e.g., wing dams and historic shipwrecks) or along the shorelines of the side channels East Ice Haul and Minnesota sloughs. These shoreline sites were identified by artifacts exposed along eroding shorelines. Ongoing erosion is evident from recent field observations and quantified at 21HU156, where at least 26 feet of shoreline retreat has occurred since construction of Lock and Dam 9 in the 1930s and subsequent operation/maintenance of the 9-Foot Channel Project (Blikre and Benn 2008). Sites 21HU156 and 13AM357 were evaluated and the Corps considers these sites as potentially eligible for listing on the National Register of Historic Places (GLARC undated).

Impacts of No-Action– It is likely that erosion would continue to threaten cultural resources throughout the APE and Pool 9 under the future without project.

Impacts of the Recommended Plan – A Phase I cultural resources survey was completed in September/October 2022 for the Recommended Plan extent. Geomorphological investigations identified Dredge Spoil, Levee-Crevasse Splay Complex, Island and Point Bar, Flood Basin, Colluvial Apron, and Upper Iowa River/Winnebago Creek Fluvial Fan landforms. The northernmost portion of the project area along the main channel contained thick historic dredge deposits. Further south along the river channel and on most of the inland subareas, a buried A horizon lay beneath thick layers of alluvium, some of which may date to the historic era. The majority, if not all, of the riverbank has been extensively eroded.

The Ice Haul Slough and Army Road Subareas contained vertical accretion floodplain deposits characterized by heavy clay content. The Whalen Subarea in the southwestern part of the project area contained fluvial fan landforms and has the highest potential for intact buried archaeological deposits. Project features proposed in these areas will not disturb deeply buried soil horizons.

The Phase I archaeological investigation recorded two archaeological sites. Site 21HU0219 is a small precontact lithic scatter found on the surface of the shoreline in secondary contexts. This site lacks integrity and does not meet criteria for listing on the National Register of Historic Places (NRHP). Site 13AM650, a concrete foundation remnant and associated light historic artifact scatter, is located south of and outside of the current project area. This site was not tested, remains unevaluated and will not be impacted by the Project.

Previously identified cultural resources within the APE will not be impacted by proposed project features. None of the proposed features overlap with sites 21HU160, a historic shipwreck, or with 21HU157, a historic shell midden. Proposed forest management features will avoid site 13AM68/21HU19, the New Albin Mound Group, and 21HU156, a NRHP eligible precontact artifact scatter.

The survey expanded the boundaries of previously recorded Site 13AM359 based on the occurrence of artifacts exposed along the shoreline. The site's eligibility for the NRHP remains unevaluated. Forest management features in this area will avoid the site, as well as nearby sites 13AM356, 13AM357 (eligible for the NRHP), and 13AM358 that are outside of the APE. However, a no wake zone will be enacted along Minnesota Slough to reduce potential shoreline erosion during project construction.

The Corps has determined that the Recommended Plan will have No Adverse Effect to historic properties. While the project would avoid impacts to cultural resources within the APE, it is unknown if there would be changes to erosional conditions to cultural resources. The Minnesota State Historic Preservation Office (SHPO) concurred with the determination on 22 March 2023. The Iowa SHPO concurred with the determination on 15 May 2023.

4.12 Socioeconomic Setting

Existing conditions – The closest communities to the project area are New Albin, Iowa (population 503) Reno, Minnesota (population 411) and Genoa, Wisconsin (population 253). LaCrosse, WI is the largest city in the general vicinity, a 30-minute drive from New Albin.

Population: Population levels in recent decades have been relatively stable for the project counties while the states of Minnesota, Iowa, and Wisconsin as a whole have grown steadily. The trends from 2000 to 2020 are presented in Table 4-6.

Employment: Important industries in the local economy in terms of employment include education, agriculture, and retail. Recent county unemployment rates have been significantly less than national averages. In 2020, the unemployment rate in Houston County was 1.3%, Allamakee County was 1.8%, and in Vernon County it was 2.3%. For the same time period the nation's unemployment rate was 3.4%.

Income: Per capita income for the counties lags significantly behind that of their respective states and even more so behind the U.S. However, while the U.S. per capita income is higher, the overall poverty rate is also higher than the counties (Table 4-7).

Table 4-6. County and State Population Trend 2000 – 2020.

Location	2000	2010	2020	% Change 2000-2020
Minnesota	4,919,479	5,303,925	5,706,494	16%
Houston Co., MN	19,718	19,027	18,843	-4%
Iowa	2,926,324	3,046,355	3,190,369	9%
Allamakee Co., IA	14,675	14,330	14,061	-4%
Wisconsin	5,363,675	5,686,986	5,893,718	9%
Vernon Co., WI	28,056	29,733	30,714	9%

Table 4-7. Per Capita Income and Poverty Rate by County/State (2020).

	Allamakee	Iowa	Houston	Minnesota	Vernon	Wisc.	U.S.
Per capita Income	28,546	33,021	33,546	38,881	27,192	34,450	35,384
Poverty Rate	10.9%	11.1%	6.4%	9.3	11.9%	10.8%	11.4

Source: census.gov

Transportation: Transportation corridors bound both sides of the floodplain in this vicinity of Pool 9. This includes a rail line and state highway on either side of the river (WI-35 and IA-26). In addition, the river serves as a corridor for commercial navigation of barge traffic via the 9-foot navigation channel as authorized by Congress. Barge traffic transports a wide variety of essential goods on the UMRS. Agricultural commodities, petroleum products, and coal are the leading cargoes, with farm products accounting for approximately half the total tonnage shipped.

Recreation: Reno Bottoms is used heavily by hunters, fishers, boaters, bird watchers, canoeists, and kayakers. The Reno Bottom canoe trail can be completed in segments from 3 to 14 miles. Within the Bottoms, there are four public boat launches (from north to south: Reno Landing, Millstone Landing, Visger's Landing, and New Albin Landing).

Impacts of No-Action– Minor long-term adverse effects to socioeconomic resources would be expected. Human use of the study area would likely decline due to the degraded state of ecosystem resources.

Impacts of the Recommended Plan – In the short-term construction activities would likely disturb recreational activities but would also create short-term employment and business opportunities. Construction of the island enhancement features is expected to occur over two to three years. Implementation of forest management features is expected to occur over 7-10 years. The project would impact access through the Millstone Landing and the New Albin Landing as the contractor would use these landings for construction access. Some of the construction methodology would be left up to the contractor's discretion. If the contractor uses floating pipes for hydraulic dredging, the pipelines would impact boating along the pipeline route, which could be in Minnesota Slough or other aquatic areas. In general, recreation in the project area would experience more short-term adverse impacts as the public would need to avoid the construction areas. Depending on construction methods, the project may require granular material to be brought to the Ice Haul feature via truck. This would impact local communities with additional traffic, noise, and air pollution from truck traffic. Around one thousand truck tips would be required to bring granular material to Ice Haul Island via land access. This would be a minor short-term adverse impact to the local communities. Construction activities would likely have a minor short-term beneficial impact on the local economy via additional economic activity and employment. In the long-term, habitat improvement would increase wetland wildlife and fish populations and diversity. This would, in turn, increase outdoor recreational opportunities including bird watching, hunting, and fishing.

4.13 Environmental Justice

Existing conditions – Environmental justice (EJ) is defined as the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies, with no group bearing a disproportionate burden of environmental harms and risks.

Several Executive Orders direct federal agencies to identify and address any disproportionately high adverse human health or environmental effects of federal actions to minority (communities of color) and/or low-income populations:

- Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 16, 1994)
- Executive Order 13985: Advancing Racial Equity and Support for Underserved Communities through the Federal Government (January 20, 2021)
- Executive Order 13990: Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis (January 20, 2021)
- Executive Order 14008: Tackling the Climate Crisis at Home and Abroad (January 27, 2021)

Environmental justice concerns may arise from impacts on the chemical, biological and physical environment, such as human health or ecological impacts on communities of color and/or low-income populations, and Indian tribes or from related social or economic impacts. The Council of Environmental Quality (CEQ) guidance on conducting EJ analyses in NEPA documents (CEQ, 1997) and Promising Practices for EJ Methodologies in NEPA Reviews (CEQ, 2016) indicate that a minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population or other appropriate unit of geographic analysis. The CEQ guidance also recommends utilizing the Census Bureau’s poverty measures in determining low-income populations. For EJ analysis, low-income is considered a percent of census tract’s population in households where household income is at or below 200% of the Federal poverty level.

An evaluation of EJ impacts was conducted using a two-step process. As a first step, the affected area was evaluated using the EPA Environmental Justice Screening and Mapping Tool (EJSCREEN) and CEQ’s Climate and Economic Justice Screen Tool (beta version) to determine whether it contains a concentration of communities of color and/or low-income populations.

Using EJSCREEN, a 2.5-mile radius was created around the study area to capture affected areas, including portions of Houston County, MN, Vernon County, WI, and Allamakee County, IA. The tool identified a 3% value for communities of color in the affected area which is lower than the 50 percent threshold. This value is not meaningfully greater than the general population of the state average (14 percentile) and EPA regional average (13 percentile). The Corps further evaluated the Census tract mapping for communities of color and did not identify a minority population in the affected area. The low-income populations in the MN, WI, and IA affected area counties (30%) are above the 20% threshold and are similar to the general state populations (27 percentile) and EPA regional average (57 percentile).

To further refine the analysis, the census tracts were evaluated to determine the status of low-income populations immediately adjacent to the study area. By utilizing census data, low-income populations that may not have been revealed when looking at the broader EJSCREEN information could be analyzed. In addition, comparison of low-income populations among different parts of the study area could more accurately be conducted to ensure that potential disproportionate impacts within the Study area itself were considered. The Corps identified a low-income population is located to the east of the study area in and near to Viroqua, WI and to the south in Waukon, IA. The nearest community in Viroqua is located 19.5 miles away, as the crow flies.

The CEQ tool was also used per EO 14008. This tool identifies communities that are disadvantaged in one or more categories of criteria *if* the census tract is above the threshold for one of more environmental or climate indicators *and* the census tract is above the threshold for socioeconomic indicators. Census tracts for MN (27055020900), (55123960700) WI, and IA (19005960100 and 19005960200) used in the CEQ tool did not identify disadvantaged communities in the 2.5 mile radius of the three states.

Impacts of the No-Action: The No Action alternative is not anticipated to disproportionally affect environmental justice areas of concern. There would be no measurable negative effects on human health, environmental, climate-related, and other impacts on communities as a result of not taking action.

Impacts of the Recommended Plan: Island construction and dredging activities have historically occurred throughout Pool 9 and the larger Upper Mississippi River. Channel maintenance would continue adjacent to the study area within the Mississippi River main channel. There are no residential areas within the study area and thus, activities associated with the Recommended Plan and any associated disturbances would not generally be near residences. In addition, given that Corps has determined that project features do not impact flood heights, the Project is not expected to impact areas in the floodplain. Because of these considerations, the Corps has determined that the Recommended Plan is not anticipated to disproportionally affect environmental justice areas of concern. There would be no measurable negative effects on human health, environmental, climate-related, and other impacts on communities as a result of the Recommended Plan.

4.14 Greenhouse Gases

Existing conditions – 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. Trees 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.

Impacts of the No-Action: The No-Action Alternative would not result in any material impact to greenhouse gases when compared to existing conditions.

Impacts of the Recommended Plan: Project construction would result in some release of greenhouse gases as equipment burns fossil fuels. This minor short-term adverse effect would be offset by the minor long-term beneficial effect of forest protection and restoration. The forested areas created and enhanced by the Recommended Plan would have a beneficial long-term effect on greenhouse gases. Approximately 700 acres of floodplain forest would be created or enhanced as part of the Recommended Plan. In an EPA estimate, an average acre of U.S. forest sequesters 0.85 metric tons of CO_2 annually (EPA 2018). Using this estimate, the forests restored at the Reno Bottoms HREP would sequester 595 metric tons of CO_2 each year.

4.15 Summary of Consequences

The Recommended Plan would result in positive long-term benefits to floodplain forest, aquatic habitat, fish, and wildlife in and around the Reno Bottoms project area. The project may affect but is not likely to adversely affect Higgins eye and listed bat species (NLEB and tricolored bats). Construction of the project would cause short-term adverse effects to water quality, air quality, aesthetics, wildlife habitat, and public use. Long-term benefits to habitats would far outweigh the short-term impacts. No significant negative social or economic impacts would result. The project would cause minor benefits to recreation. Based on the current understanding of extent of historic properties in the study area, no historic properties are anticipated to be adversely impacted by the proposed action. Environmental consequences of the proposed action are summarized in Table 4-8.

Table 4-8. Environmental Assessment Matrix for the Recommended Plan.

	No-Action Alternative							Recommended Plan						
	BENEFICIAL				ADVERSE			BENEFICIAL				ADVERSE		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. Social Effects														
1. Noise Levels				X								T		
2. Aesthetic Values				X								T		
3. Recreational Opportunities					X					X		T		
4. Transportation				X							X			
5. Public Health and Safety				X							X			
6. Community Cohesion (Sense of Unity)				X							X			
7. Community Growth and 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						T				
6. Business Activity				X						T				
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								T		
2. Terrestrial Habitat						X			X					
3. Wetlands						X			X					
4. Aquatic Habitat						X			X					
5. Habitat Diversity and Interspersion						X			X					
6. Biological Productivity					X					X				
7. Surface Water Quality					X					X		T		
8. Water Supply				X							X			
9. Groundwater				X							X			
10. Soils				X						X		T		
11. Threatened or Endangered Species					X							T		
D. Cultural Resource Effects														
1. Historic Architectural Values				X							X			
2. Prehistoric & Historic Archeological Values				X							X			

T = Temporary effect

4.16 Cumulative Effects

Cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. 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.

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 Reno Bottoms HREP followed these 11 steps (Table 4-94-9).

Table 4-9. 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.

A Clean Water Act Section compliance evaluation has been prepared and is included in Appendix B of this report. A draft FONSI is attached in Appendix L. If it is determined and Environmental Impact Statement is not required, the FONSI would 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 and Forest Modeling*, of this report.

There would be little to no cumulative effects to operation and maintenance of the 9-Foot Navigation Channel, commercial traffic, commercial and residential development, agricultural practices, point and nonpoint source pollution, and watershed management as a result of this project or past and future UMRR projects.

Programmatic cumulative effects to the Pool 9 environment may include beneficial changes in floodplain forests, fisheries, and invasive species.

4.16.1 Programmatic Cumulative Effects

Several UMRR and Operation & Maintenance (O&M) projects in Pool 9 have been constructed, are currently being constructed, or are anticipated for construction in the future. In all, over 14,644 acres of floodplain habitat would be directly affected with implementation of all past, existing, and potential projects in Pool 9 (Table 18).

Table 4-10 shows the UMRR HREP projects previously constructed in the Pool 9 of the Mississippi River.

Table 4-10. UMRR Pool 9 HREP Projects.

Project	Year construction completed/ proposed for construction	Acres affected (est)
Blackhawk Park	1990	82
Cold Springs	1994	30
Lansing Big Lake	1996	6420
Bank Stabilization	1999	1,300
Pool 9 Island	1995	410
Pool Slough	2006	620
Small scale drawdown	1997	80
Hummingbird Slough	2002	297
Capoli Slough	2013	2,035
Harpers Slough	2017	2,200
Conway Lake	2022	1,170
	Total	**14,644**

In addition to the projects above, the MNDNR is planning a restoration project in the project area—the 15-acre Lessard-Sams Outdoor Heritage Council project described in Section 1.7.4.

While the effects of the Recommended Plan alone appear to be minor, when looking at a poolwide or regional scale the total amount of acres benefited from ecological restoration in Pool 9 are more reflective of their cumulative significance. It is estimated that 14,644 acres have previously benefited or will benefit from ecosystem restoration and enhancement in Pool 9.

The cumulative effects of HREPs are being monitored and reported through the LTRM element of the UMRR in targeted pools (U.S. Geological Survey 1999; Johnson and Hagerty 2008). In addition, the status and trends of the UMRR Program are summarized and provided in a Report to Congress every six years (USACE 1997, 2004, 2010, 2016, 2022). The indices of primary interest involve water quality, aquatic vegetation, hydrology, sedimentation and habitat diversity, and land cover types and land use. The 2022 Status and Trends Report (Houser, ed. 2022) notes a significant decrease in forest cover, interior forest, and core forest in the Upper Impounded Reach. On the other hand, significant increases in lentic fishes have been observed. The many habitat restoration projects contribute to this long-term trend.

4.16.2 Cumulative Effects to Floodplain Forest

The structure and function of the UMR floodplain forest changed dramatically after the construction of the locks and dams. Floodplain forests in the UMRS cover only a small portion of the area than they did before European settlement (Nelson et al. 1994; Yin et al. 1997). Dam operations have artificially created sustained high water which permanently inundated thousands of acres of floodplains and caused a shift to more flood tolerant vegetation in many areas. In most cases, oak-hickory communities have been replaced by stands of silver maple (Yin et al. 1997). Silver maple are estimated to make up approximately 80 percent of the UMRS floodplain forest (Status and Trends Report 1999). Despite relatively little change in land use and dam operations, the extent of floodplain forest has continued to decline. See Section 4.5 for more details. The Upper Impounded Reach (Pools 1-13) experienced a 6 percent decline in forest cover from 1989 to 2010 (Houser, ed. 2022).

Impacts of No-Action– The density, diversity, and quality of the bottomland forests would continue to decline in Pool 9, as seems to be the general pattern throughout the Upper Impounded Reach of the UMRS. The existing silver maple dominated stands would continue to mature with little understory recruitment. As the trees age and undergo senescence, they would likely be replaced with dense patches of reed canary grass in many areas.

Impacts of the Recommended Plan– The Recommended Plan would enhance over 500 acres of floodplain forests in the study area by increasing species diversity and by allowing the existing forests to persist into the future. The Recommended Plan would also create 56 acres of newly forested areas.

The 556 acres of forest created and enhanced by the Recommended Plan would provide tremendous value to the area. The Recommended Plan encompasses an area many times greater than any previous floodplain forest restoration project in the St. Paul District. Cumulatively with previous restoration projects, the Recommended Plan would have a substantial beneficial effect on floodplain forest.

4.16.3 Cumulative Effects to Fisheries

The availability of backwater overwintering fish habitat is a limiting factor for many populations of fish in the UMRS. Even within the same pool, overwintering areas are essentially isolated, as conditions between sites significantly reduce the ability of some fish species to carry out the necessary metabolic functions to survive.

Impacts of No-Action– The backwater overwintering fish habitat in the study area has declined over the years. However, some small pockets of marginal habitat do exist. The quality and quantity of backwater overwintering habitat is also declining throughout Pool 9 with similar patterns of increased flow and sedimentation, except where previous restoration projects have enhanced habitat. Over time, the aquatic habitat in the study area is expected continue to decline along with many other backwaters throughout the pool, with some exceptions such as areas restored in past HREPs and would no longer contribute to overwintering in Pool 9.

Impacts of the Recommended Plan—Habitat dredging and the construction of a partial closures preventing flow to those areas would restore overwintering in Cordwood Slough and Ice Haul Lake. Many of the other HREPs shown in the table above have also restored backwater habitat. Cumulatively, the restoration projects increase the amount habitat available to backwater overwintering species and increase the overall carrying capacity of fish that utilize this type of habitat in Pool 9.

5 Recommended Plan

The results of the NEPA analysis, incremental cost analysis, PR&G criteria evaluation, comprehensive benefits 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 Reno Bottoms PDT concluded that the alternative plan that best meets the project objectives is Alternative D1: Keystone Features with Aquatic Diversity. This alternative is cost-effective and justified as a “best buy” plan. Alternative D1 is also the NER Plan and the max benefits plan across all categories. For those reasons, Alternative D1 (Figure 5-1) was identified as the Recommend Plan (Recommended Plan).

The Recommended Plan is supported by the Project Sponsor, USFWS, and the three partnering states of WI, MN, and IA (Appendix A, Correspondence & Coordination) and was supported by Mississippi Valley Division during the Tentatively Selected Plan milestone briefing held on July 18, 2022.

This section documents key construction, operation, maintenance, repairs, rehabilitation, and replacement considerations. The project schedule and initial cost estimates are provided. The project has been developed to a detailed feasibility level of design. Further details would continue to be refined in the Plans & Specifications Stage.

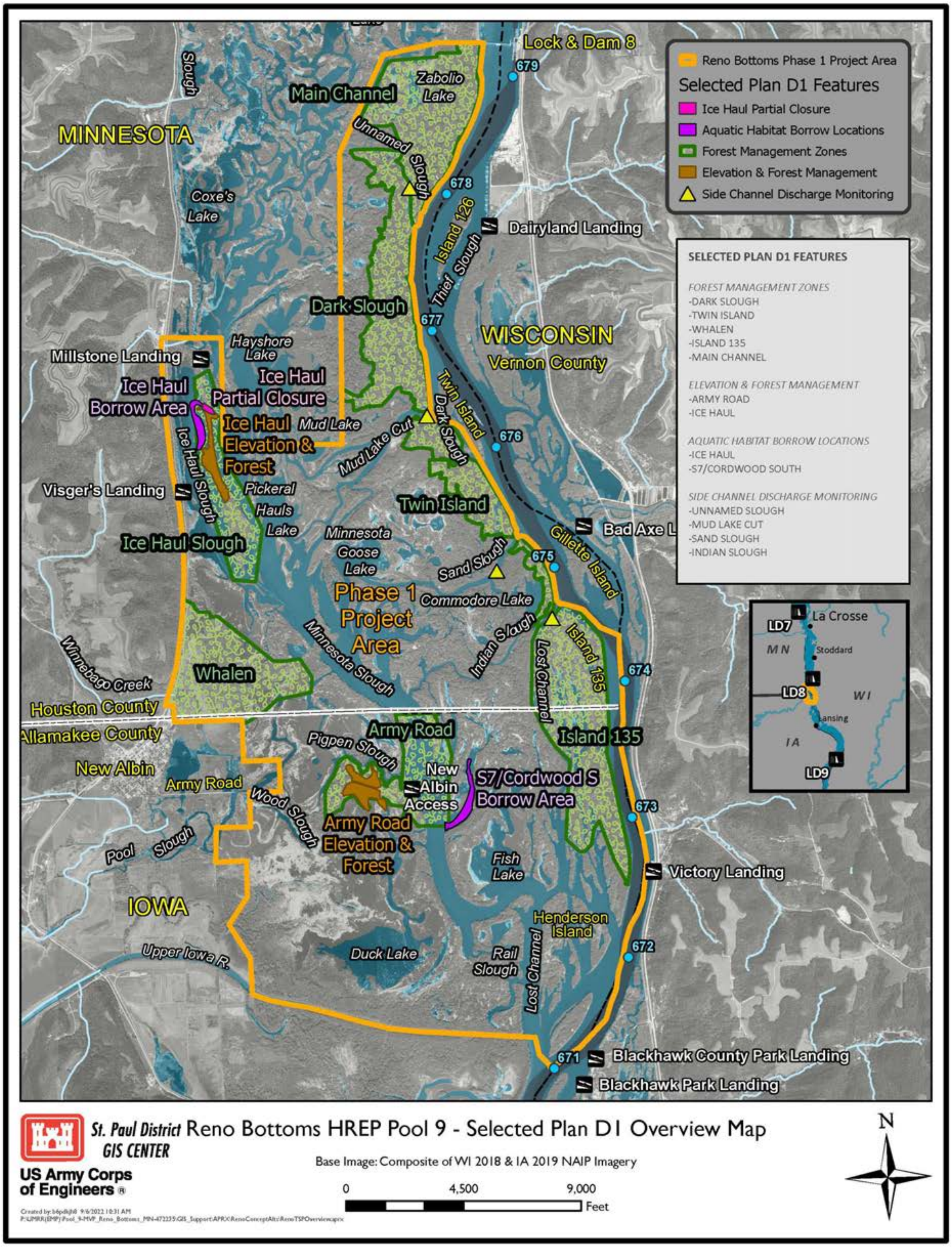


Figure 5-1. Reno Bottoms HREP Recommended Plan.

5.1 Resource Significance

Alternative D1 would meet many goals and objectives of the Refuge. Specifically, the Recommended Plan directly addresses the Refuge's bottomland forest objectives and would create habitat for associated priority resources of concern relevant to the Reno Bottoms study area, including: red-shouldered hawk, cerulean warbler, prothonotary warbler, transient neotropical migrant passerines, tree-roosting bats. Through forest management and elevation, the health and habitat of midwestern wooded floodplains would be protected and enhanced, directly addressing Refuge's goals. On a national level, the Recommended Plan would contribute to the vision of the National Wildlife Refuge System Improvement Act, passed by Congress in 1997. The Recommended Plan would put wildlife first by enhancing and conserving the habitat critical to their survival and health and would ensure the health of the floodplain forest and overwintering habitat within the project area. See Appendix A, Correspondence and Coordination for more details on the USFWS's National and Refuge-specific goals.

The plan would further provide institutional and public significance goals by maintaining and improving the aquatic ecosystem while avoiding significant adverse impacts. Missions of the three states' resource agencies (MNDNR, IDNR, and WIDNR) all specifically address management of forests, wetlands, waterways and healthy fish and wildlife populations which would be a key outcome of the Recommended Plan.

Review of technical importance of the best buy alternatives, supported the selection of Alternative D1. Technical importance can be described in terms of one of more of the following criteria: scarcity, representativeness, status and trends, connectivity, limiting habitat, and biodiversity. The Upper Mississippi River system is a critical migratory corridor for as much as 40 percent of North American waterfowl. The floodplain forests of the Upper Mississippi River system provide nesting and migratory habitat for as many as 180 bird species, and bird abundances along the river system can be double that of adjacent upland area (Houser, 2022). However, floodplain forest extent within the Upper Mississippi River is decreasing do to flood inundation duration and invasive species, as discussed in Sections 2.1 and 4.5. Increasing forest regeneration and reducing forest loss a large, relatively contiguous forest area as proposed in the Recommended Plan, would maintain the floodplain forest in the Upper Mississippi River and increase the quality habitat for species that rely on it. Rehabilitation and management of bottomland forests included in the Recommended Plan in the project area would directly contribute to over 600 acres of floodplain forest improvement and conservation. Increasing habitat, in turn, increases the potential for increased or maintained biodiversity (both vegetation and wildlife) under future conditions.

5.2 Resource Agency Support

The project sponsor, the USFWS, supports D1 over the other Best Buy plans as it meets all the project objectives, addresses the problems across the entire study area addressed in this feasibility study. Project partners in this study (the States of Minnesota, Wisconsin, and Iowa) also endorsed all components of D1. The State of Wisconsin supported D2 which includes all of the D1 features plus partial closures. Additionally, all forest elevation features have been modeled and meet no-rise criteria for the States of Minnesota and Iowa.

5.3 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.

5.4 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 process. 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.

5.5 Real Estate Considerations

All project features would be constructed on Refuge lands owned by the USFWS or land owned by the U.S. Army Corps of Engineers. Per the July 2001 Amended Cooperative Agreement between the USFWS and the Corps, the USFWS is responsible for managing fish and wildlife on Corps provided lands that are within the USFWS Refuge. Staging area(s) for construction would be determined during development of plans and specifications.

Upon completion of construction, the USFWS would accept responsibility for the project in accordance with Section 107(b) of the Water Resources Development Act of 1992, 33 U.S.C. § 652(e)(7)(A). The operation and maintenance responsibilities of the USFWS would be addressed in a Memorandum of Agreement (MOA) between the USFWS and USACE.

Because the project is located on Refuge or Corps lands, project costs would be 100-percent federal in accordance with Section 906(e) of Public Law 99-662, 33 U.S.C. § 2283(e). See Appendix H, Real Estate Plan, for additional real estate considerations.

5.6 Project Cost Summary

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

Figure 5-1 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 2023.

Table 5-1. Recommended Plan Project First Cost.

Account	Item	Cost ($)	Contingency (%)	Contingency ($)	Project First Cost ($)
6	Construction	$20,626,000	Varies	$5,473,000	$26,100,000
30	Planning, Engineering, and Design, including Adaptive Mgmt and Monitoring	$7,137,000	22%	$1,570,000	$8,707,000
31	Construction Mgmt	$2,992,000	39%	$1,167,000	$4,159,000
	Totals	**$ 30,755,000***	**26.4%**	**$ 8,210,000***	**$ 38,966,000***

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

5.7 Project Performance

The project performance assessment would 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 includes: repeated site prep and vegetation control measures, replanting of trees, or stabilization or repair of island features. Monitoring and adaptive management may extend for up to ten years following project completion and would be mostly federally funded with some work contributions from state resource agencies as state budget and work planning allows. Monitoring activities to evaluate each of the project's 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 would be responsible for determining ecological success for the ecosystem restoration projects it constructs and would draft the final performance evaluation report (PER). USACE would also be responsible for vegetation monitoring and data analysis.

USFWS would be responsible for periodically inspecting the partial closure and documenting any inspection findings. If collected by the USFWS for their own Refuge purposes, bird monitoring and data analysis would be provided to USACE with a write-up of the bird monitoring methods and results for incorporation into the PER.

5.7.1 Channel Monitoring

Five sets of discharge measurements from low flow to high flow conditions would be done in approximately 35 to 40 sites in Reno Bottoms including side channels, interior channels, and several main channel locations. This would require approximately two years to complete. The purpose of this is to establish existing conditions water exchange ratios between the main channel and Reno Bottoms and between water bodies within Reno Bottoms. The water exchange ratio (WER) is simply the ratio of site discharge to total river discharge. This data would be compared to previous sets of discharge measurements obtained in 2005-07, 2014, and 2019 to determine the trajectory of water exchange ratios-increasing or decreasing. The data would also be used for future model calibration, future studies, and to estimate the impacts of sediment loads in Reno Bottoms.

5.8 Operation, Maintenance, Repair, Rehabilitation, and Replacement

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 I). The USFWS is expected to maintain the project per the terms outlined in the Memorandum of Agreement.

The purpose of assigning OMRR&R costs is to ensure commitment and accountability by the project sponsor. The present value and estimated average annual OMRR&R costs for USFWS are estimated to be ~$1,700 annually. Those costs include site investigations, maintenance and repair of rock rip rap the partial closure (an estimated cost of up to 20% of the installation cost for the closure) over the estimated 50-year design life. Maintenance of the completed Recommended Plan would be similar to work currently undertaken by the Refuge. Generally, expected maintenance would include removal of debris from the Ice Haul Partial Closure. The project sponsor may choose to continue forest management activities, but this is not considered O&M and was not part of the cost estimate.

USFWS would be responsible for 100 percent of the operation and maintenance of the project features even though no operation of project features is anticipated for this HREP. Repair, rehabilitation, and replacement considerations may extend outside the 50-year period of analysis.

5.9 Plan Implementation

The schedule for the feasibility study is documented in Table 5-2. After the feasibility report is approved, and an MOA is executed with USFWS, the PDT would initiate Plans & Specifications. The Preconstruction Engineering and Design phase is pending funding and would include refinements to the design of the Recommended Plan. This schedule assumes that funds would be available when needed to prepare plans and specifications and undertake construction. Generally, the Plans and Specifications Stage continues for two years. Project construction is anticipated to be completed in five years.

Table 5-2. Estimated Project Schedule.

Requirement	Scheduled Date
Submit draft Feasibility Report and EA to MVD, USACE	October 2022
Submit final Feasibility Report and EA to MVD, USACE	February 2023
Begin Plans and Specifications	March 2023
Complete Plans and Specifications	June 2024
Advertise for Bids	July 2024
Award Contract (FY24)	September 2024
Begin Construction	Spring 2025
Complete Construction	Fall 2029
Complete Adaptive Management and Monitoring (10 years)	2039

5.10 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 water level management and forest management in the UMR, the *UMRR Design Handbook*, 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 Reno Bottoms study area included implementation and outcome risks as identified below.

Implementation

- Moderate Risk
    - Limited by floodplain tree seed and sapling availability for large scale planting. Risk would be managed by completing forestry actions over several years to space out demand for seeds and saplings.
    - Planting and seeding of trees is time sensitive and conditions are generally only acceptable for a few weeks in the spring and fall. Unfavorable weather conditions during these times can make planting and seeding challenging. Risk would be managed by having a range of areas available for planting and contract options that allow for fall or spring planting in case one season is not viable.
    - There are unknowns with exactly how much material would be needed to raise the floodplain forest to the target elevations. Therefore, there may be a need to adjust aquatic habitat size to adjust for placement availability in implementation. Risk would be managed by identifying primary and secondary habitat dredge zones in Plans and Specifications Stage to ensure that key habitat depths and benefits are achieved.

- Construction restrictions (See Section 5.11) for specific species and hunting have the high potential to interrupt construction windows and limit the length of time work could be completed. This risk would be managed by working with resource agencies to identify options to work in the greatest practicable construction window under agreed-upon set of protective conditions.
- Low Risk
    - High water could limit access during construction. Risk would be managed by extending construction window by one year.

Outcome

- Moderate Risk
    - Flooding or drought may adversely impact tree plantings or fines placement. Risk would be managed by monitoring flow conditions and impacts to study area. Tree mortality would be mitigated by monitoring and replanting if necessary.
- Low Risk
    - Herbivory of local wildlife (e.g., deer, voles, beavers) resulting in a loss of tree seedlings.

None of the project measures are believed to be burdened by significant risk or uncertainty regarding the eventual success of the proposed rehabilitation work.

5.10.1 Climate Change

For the Reno Bottoms study, a two-dimensional hydraulic model was calibrated to measured stage and discharge data in the Reno Bottoms area. The model was run for 14 different steady state total discharge conditions with water depths at each cell in the model determined for all 14 discharge conditions. Depth-discharge regression relationships were then developed for each cell in the model and were used to determine at what discharge a given cell would be submerged by water. The daily discharge record at the nearby Lock and Dam 8 was used to determine inundation statistics for each cell in the model. Days of inundation per year was calculated using the regression equation and a total flood duration map of each cell was developed for each year in the analysis and became input to the Floodplain Forest Succession model. Both the Army Road and the Ice Haul Slough forest elevation areas have existing elevations of 623 to 624 feet (NAVD 88).

Experts in floodplain habitat creation and maintenance were consulted when designing the Recommended Plan’s features to incorporate innovative, resilient features into the feasibility design that can withstand higher flows (and higher water surface elevations) and potentially greater periods of inundation. For this project the target days of inundation for the growing season was 20 days although an elevation of 626.0 feet more precisely translated to 18.2 days during the growing season (April 1 to September 30), the nonstationarity that was detected truncated the reference data and this value was updated to 19.9 days which still meets the original objective. Since a statistically significant trend shows increasing flow conditions over the life of the project this design elevation may see increased days of inundation over time however due to flood stage impacts as a constraint this design elevation and footprint were optimized for resilience while meeting the floodplain constraint. Additionally the days of inundation design elevation may account for wetter future conditions because the flow data from which this elevation was derived was during a wet period. Project features designed under average conditions may underperform during the 50-year project life if climate trends continue however if floodplain forest features are successfully established early they may be naturally resilient to wetter conditions similar to how existing floodplain forestry persists even if there’s little diversity or new growth. Overall, even if conditions become wetter and the design elevation later translates to a higher number of days of inundation the project features will still add diversity and improve habitat compared to a without project alternative. Remaining residual risks due to climate change are summarized in Table 5-3.

Table 5-3. Residual Risk Due to Climate Change to Reno Bottoms.

Project Feature	Trigger	Hazard	Harm	Qualitative Likelihood Rating	Justification for Rating
Floodplain Forest	Increased discharge and associated water surface elevation	Discharge in the project area is projected to be greater than what was observed in the past, this will increase the duration of inundation	Long durations of inundation can be detrimental in the establishment of young seedlings during the growing season	Moderate	Average annual flow started increasing within the most recent decade and future flows are projected to increase. The selected design elevation exceeds existing conditions where there is established forest. Seedlings will be planted at a determined elevation for increased chances of survivability.
Overwintering Fish Habitat (Habitat Dredging / Partial Closure)	Increased discharge and associated water surface elevation	Increased discharge could flood overwintering fish habitat	The introduction of cold water may cause the fish to flee the area	Low	No evidence of peak trends increasing in the project area. The study area is shallow and many areas ice over during the winter. Habitat dredging provides shelter for fish to escape colder temperatures and high velocities higher in the water column.

5.11 Construction Implementation

How features 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 applicable State permits and/or water quality certification condition.

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.

5.11.1 Construction Schedule

The length of the schedule was determined to allow the contractor to construct during low water conditions and/or winter construction over five construction seasons. Forest management activities are expected to occur over four years (consecutively with forest elevation, habitat dredging and partial closure construction). The complete project duration is assumed to be five years.

5.11.2 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 – No access dredging in Minnesota Slough (or any other channels) allowed north of the MN/IA border in the project area due to presence of mussel beds. Bathymetry in Minnesota Slough from State Line to Ice Haul are from 2018 and 2019. Bathymetric surveys downstream of the state line are from 1997 to 1999 and are out of date. Existing bathymetric surveys should be verified, and new surveys should be obtained during PED to confirm that the Army Road area can be accessed without dredging.

Access to Ice Haul Slough Work Area- Due to the presence of mussel beds potentially harboring state and federally listed species, access to Ice Haul work area is limited to a temporary construction road and access pad. Access to Ice Haul could be achieved via a temporary construction road and access pad (200 feet by 50 feet) from Millstone Landing southward along the existing peninsula. The description and rationale for this temporary access road is discussed in 3.7.2.5. A second construction method to consider during development of plans & specifications is to use a hydraulic dredge and floating pipeline in Minnesota Slough to pump material to Ice Haul Island from a site downstream of the mussel beds. If a pipeline is used over the mussel bed, impacts to the mussels must be avoided. The pipe cannot be allowed to rest on the bed of the river in high quality mussel bed locations. The pipe must either float over the riverbed or be located along the shoreline of the channel outside the mussel bed.

Mussels – Impacts to state and federally listed mussel species must be avoided to the extent possible. One mussel bed potentially harboring state and federally listed species at the head of Ice Haul Slough cannot be avoided. To minimize impacts to this mussel bed, mussels may be relocated from project feature footprints in this area by divers immediately prior to use. Mussels would be relocated to a mussel bed within proximity to the site. The mussel bed in Minnesota Slough will be shown as an exclusion zone for barge traffic and access dredging, as indicated by the red circles shown in Figure 5-2. A floating pipeline set in place by small work boats (e.g. flat bottom Jon boat) would be permitted in this exclusion zone.

Tree Clearing – Any tree clearing necessary to construct the Recommended Plan, including the temporary road and access pad, would be limited to 1 November to 31 March. This would avoid potential impacts to bat roosting trees during their active season. Less than two acres of trees, in total, will be cleared for access and implementation.

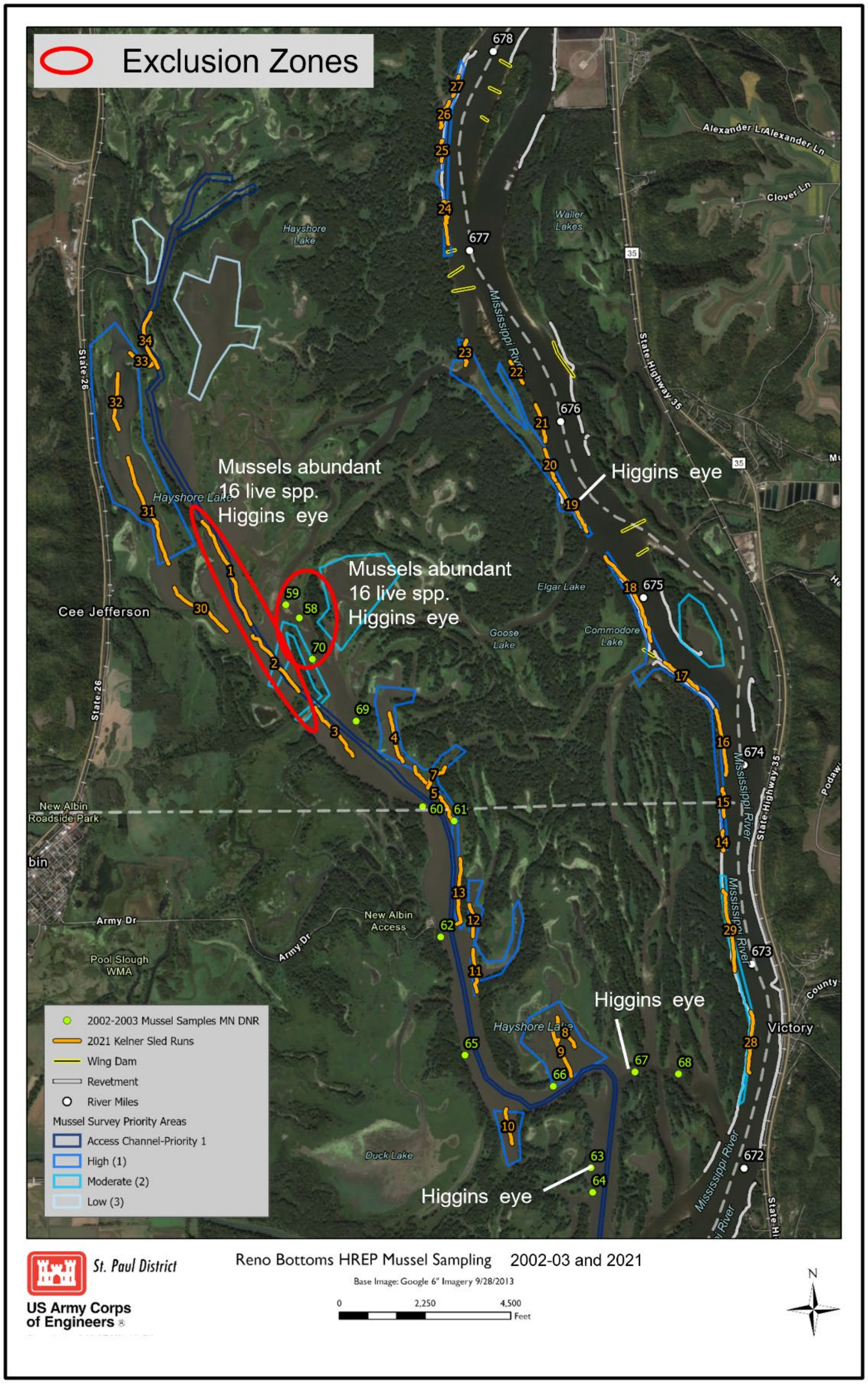


Figure 5-2. Mussel construction exclusion zone (red circles).

Bald Eagles – Generally, the contractor would be required to maintain a buffer of at least 660 feet between construction activities and any active nest, see Appendix M, Eagle Nest Map Plates for maps of known, active eagles' nests as of 2022. Complete bald eagle work restrictions and construction specifications would be developed during the plans & specifications stage in conjunction with partnering agencies and the refuge.

Pool Slough No Entry Sanctuary- Whalen and parts of Army Road zone are closed from October 1 to the end of the State's duck hunting season (generally ice over). These closed areas will be shown on final plans during the plans and specifications stage.

Non-game wildlife exclusion– The Corps would complete coordination with the MN and IA resource agencies to ensure short-term effects to state-listed species are minimized to the greatest extent practicable.

Sensitive shoreline no wake and avoidance zone- To minimize wave action and shoreline erosion, the Corps would require a no-wake zone for all contractor barge or boat traffic through a portion of Minnesota Slough (approximate limits shown on Figure 5-3). Construction boats and barges would also be required to maintain a 15' buffer from the western shoreline in that zone.

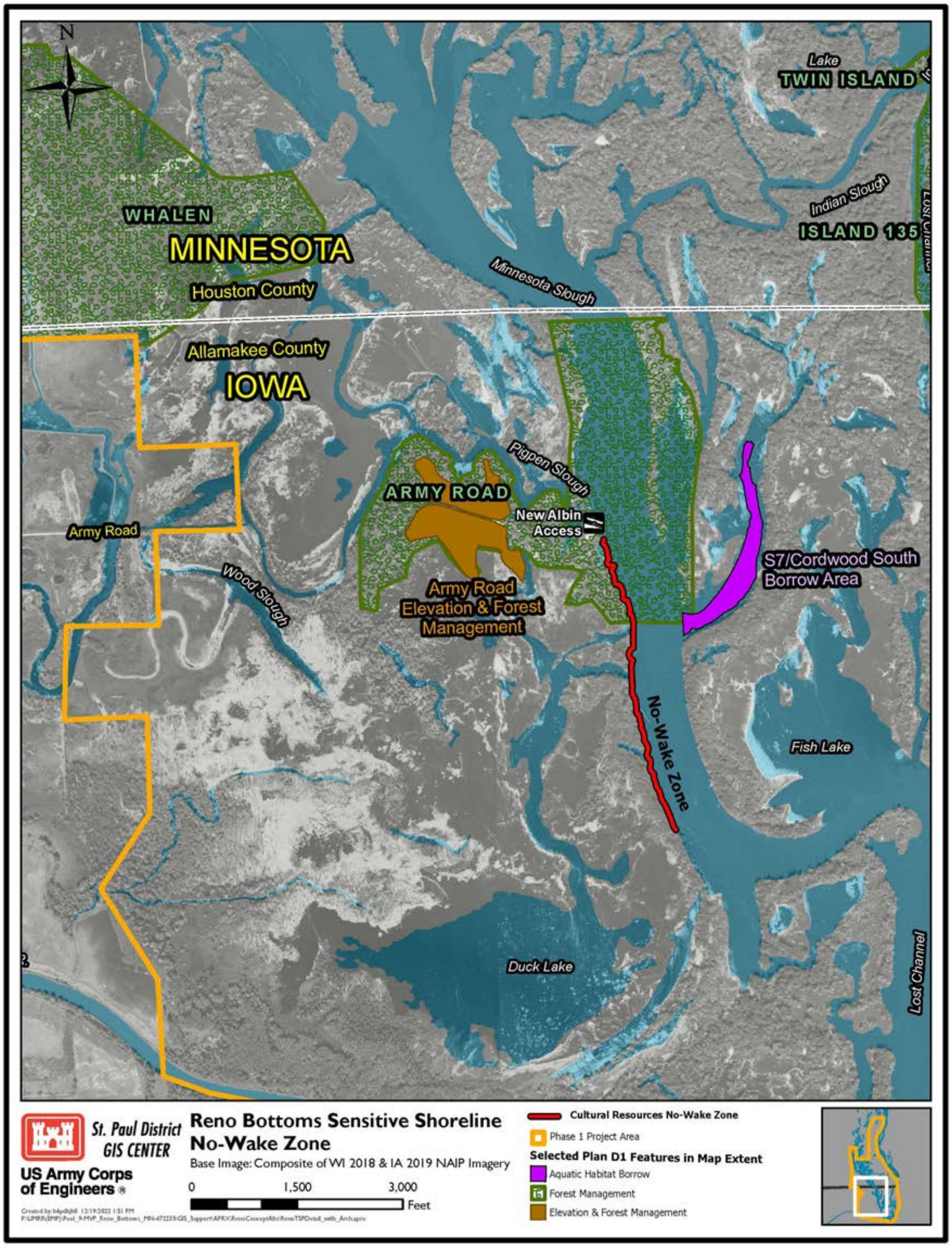


Figure 5-3. Sensitive shoreline construction no-wake zone.

6 Summary of Environmental Compliance and Public Involvement

The planning for the Reno Bottoms HREP has been an interagency effort involving the St. Paul District, the USFWS, IDNR, WIDNR, and the MNDNR. Interagency meetings and site visits were held on a frequently 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.

This draft Feasibility Report and EA will be 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.

6.1 Environmental Compliance and Permitting

Additional federal permits or certifications required for this project would include:

- USFWS Special Use Permit. This permit is required for construction work on refuge lands and would be coordinated and obtained at each construction stage. Special conditions may be included within this permit that further reduce impacts to refuge resources.

- Section 401 Water Quality Certification. The Minnesota Pollution Control Agency is the administering agency for Section 401 water quality certification in the State of MN. The IA Department of Natural Resources is the administering agency for Section 401 water quality certification in Iowa. Both states have issued water quality certifications for Nationwide Permits 27 and 33 (see Appendix B, Clean Water Act Compliance). If construction activities extend beyond the permit expiration date for the 2022 Nationwide Permits, the Corps would reevaluate compliance with the re-issued Nationwide Permits 27 and 33 and associated 401 water quality certifications. If, for any reason, the Corps no longer complies with the terms and conditions of the Nationwide Permit 27 and 33, an individual 404(b)(1) analysis will be completed, and individual Section 401 water quality certifications will be requested from the States of MN and IA.

- No-Rise Certification. This certification is required to certify that the project would not impact the floodway width or 100-year flood elevation (will not raise or lower by more than 0.00 feet) on the Mississippi river. A no-rise certification would be obtained during the plans and specifications stage from both the States of MN and IA.

Prior to report completion, the St. Paul District would likely determine that the proposed activity is in compliance with all environmental laws and regulations, including the Endangered Species Act, Clean Water Act, NEPA, NHPA, and the Bald and Golden Eagle Protection Act.

6.2 Environmental Laws and Regulations

This document is an integrated environmental assessment. A highlight of compliance with the major environmental laws and regulations follows and is summarized in Table 6-1.

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.

Table 6-1. Compliance Review with All Applicable Environmental Regulations and Guidelines.

Environmental Requirement	Compliance[1]
Federal Statutes	
Archaeological and Historic Preservation Act	Partial
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	Partial [2]
National Historic Preservation Act of 1966, as amended	Full
National Wildlife Refuge Administration Act of 1966	Full
Noise Pollution and Abatement Act of 1972	Full
Watershed Protection and Flood Prevention Act	Full
Wild and Scenic Rivers Act of 1968, as amended	N/A
Farmland Protection Policy Act of 1981	N/A
Executive Orders (E.O.), 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] Full compliance to be achieved with the District Engineer's signing of the Finding of No Significant Impact.

6.3 Coordination, Public Views, and Comments

6.3.1 Agency Coordination

The USFWS, the project sponsor, supports the Recommended Plan. A letter of support for the project is included in Appendix A, Correspondence and Coordination.

6.3.2 Tribal Coordination

Native American coordination was initiated for the Reno Bottoms project and formal letters were sent to six communities with current or historical connections to the study area: the Ho Chunk Nation, Winnebago Tribe of Nebraska, the Iowa Tribe of Kansas and Nebraska, the Iowa Tribe of Oklahoma, the Sac and Fox Tribe of the Mississippi in Iowa (Meskwaki), and the Sac and Fox Nation. The Winnebago of Nebraska requested to consult on the project and the Corps will be sharing information on the Recommended Plan with the Tribe at the same time as public review of this draft Report. Documentation and additional information on Tribal coordination can be found in Appendix A, Correspondence and Coordination.

6.3.3 Public Coordination

Due to the COVID pandemic, in person meetings during early scoping were not possible. To engage with the public, in 2020 and 2021, the Corps created YouTube videos summarizing the study, its goals and objectives and requested public input. Signs were also placed at nearby boat launches and FWS Refuges to solicit public input and provide study information. Locations of the public outreach videos and flyers can be viewed in Appendix A – Correspondence and Coordination.

USACE released the draft feasibility report and integrated environmental assessment for public review from 25 October 2022, through 28 November 2022. The report and an updated project website were shared via social media during the open public comment period. During the public notice period, the Corps held an in-person open house on 3 November 2022 in New Albin, Iowa. The open house was attended by 21 persons and Corps as well as USFWS and State staff discussed the Tentatively Selected Plan, details of the draft feasibility study, and the opportunity to comment on the plan. A total of six public comments were submitted to the Corps PDT during the 2022 public review period. No changes to the Recommended Plan were made because of public comments. The most common public comment was related to the elevation of the road to Millstone Landing to facilitate water rescues in high water. The Corps PDT is coordinating with the Corps Recreation manager responsible for management of Millstone Landing to determine resources available to further increase road elevation. Public comments and team responses can be viewed in Appendix A – Correspondence and Coordination.

7 Recommendation

The Recommended Plan is Alternative D1, Keystone Features with Aquatic Diversity. This alternative would increase the quality and extent of floodplain forest habitat and expand overwintering habitat within the study area. Alternative D1 was designed to be resilient under future conditions and incorporates both established forest management and water level management actions to restore high quality and valuable floodplain forest to the Upper Mississippi River. The Recommended Plan addresses all project objectives and is supported by the project sponsor, the US Fish and Wildlife Service, and three partnering states of Iowa, Minnesota, and Wisconsin.

Because the project is located on federal land managed by the U.S. Fish and Wildlife Service (USFWS) for fish and wildlife purposes, 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 FY23 price levels is $39 million (including sunk general design costs). Upon completion, the USFWS would be responsible for OMRR&R at an estimated annual cost of ~$1,700. The Recommended Plan also includes monitoring and adaptive management, which USACE would be responsible for up to $1,787,000. Total average annual project costs amount to $1.42 million.

Work would include forest management of 546 acres, elevation enhancement and forest management of 56 acres, construction of a partial closure at Ice Haul Slough inlet, overwintering habitat creation over 27 acres, and side and interior channel discharge monitoring. The Recommended Plan will contribute towards national ecosystem restoration through an annual average of 228 habitat units for fish and wildlife over the 50-year period of analysis at an average annual cost of $5,659 per average annual habitat unit.

I have weighed the accomplishments to be obtained from the Reno Bottoms Habitat Rehabilitation and Enhancement Project against the cost and have considered the alternatives, impacts, and scope of the proposed project. I recommend that the Reno Bottoms Habitat Rehabilitation and Enhancement Project for habitat restoration and enhancement in the Upper Mississippi River National Wildlife and Fish 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.

Eric Swenson
Colonel, Corps of Engineers
District Commander

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US Army Corps of Engineers®
St. Paul District

Draft Supplemental Environmental Assessment

Reno Bottoms
Habitat Rehabilitation and Enhancement Project

Modifications to the Reno Bottoms Feasibility Report and Integrated Environmental Assessment

NEPA ID: SEAX-202-00-B6P-1729257447

February 2025

Draft Supplemental Environmental Assessment

Modifications to the Reno Bottoms Feasibility Report and Integrated Environmental Assessment

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1 Introduction

1.1 Background

This is a supplemental Environmental Assessment to the original Reno Bottoms Feasibility Report with Integrated Environmental Assessment. The original Feasibility Report investigated the feasibility of alternative measures to address problems and opportunities associated with the Reno Bottoms Habitat Restoration and Enhancement Project (Project), part of the Upper Mississippi River Restoration (UMRR) Program.

The 14,000-acre Reno Bottoms site is located at the border of Minnesota and Iowa in a backwater area of Pool 9 of the Mississippi River between Lock and Dams 8 and 9. The main channel of the Mississippi River flows along the eastern side of Reno Bottoms. The land is owned by the Federal government and managed by the US Fish and Wildlife Service's Upper Mississippi River National Wildlife and Fish Refuge (Refuge). The Refuge was established by Congress to provide habitat for many 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 important and unique floodplain forest, marsh wetland, side channel, and backwater lake habitat of the Reno Bottoms project area has experienced significant degradation over the last century and is predicted to further degrade over the coming decades. Several factors including: altered hydrology, historic and current land use, invasive species, disease, and herbivory have reduced the resilience and diversity of the forest community. Degradation of backwater and channel habitats in the Reno Bottoms study area has also occurred because of increased flooding, sediment deposition, and side channel development.

The primary objective of the Project is to protect, enhance, restore, or create naturally regenerating, resilient, and diverse bottomland forest habitat, prioritizing connectivity to existing bottomland forest habitats and expanding interior forest conditions. Bottomland forest habitat is vital to wildlife such as birds, mammals, amphibians, insects, and reptiles that rely on the floodplain for food, shelter, rest, or breeding and enhancing forest habitat directly benefits those species. The two secondary objectives are a) protect, enhance, restore, or create backwater habitats, and provide flow conditions and sediment dynamics that will benefit native fish and mussel populations that live in or depend on, those habitats and b) protect, enhance, restore, or create flowing channel habitats to provide flow conditions and sediment dynamics that will benefit native fish and mussels that live in, or depend on, those habitats. Priority was placed on achieving the primary forestry objective while simultaneously considering ways to achieve secondary objectives in a manner that supported and complemented the primary objective.

The features included in the original Project are shown in Figure 1 . These features would increase the quality and extent of floodplain forest habitat and expand fisheries overwintering habitat within the study area. Features include forest management of 546 acres, elevation enhancement and forest management of 56 acres, construction of a partial closure at Ice Haul Slough inlet, overwintering habitat creation over 27 acres, and side and interior channel discharge monitoring.

Detailed engineering and design studies conducted since the completion of the Integrated Feasibility Report and Environmental Assessment (IFR/EA) in 2023 have resulted in several proposed modifications to the Project. The proposed modifications identified since the IFR/EA include: (1) additional improvements to Millstone Landing and Army Road to enable construction of other features and provide improved public access post construction (2) shoreline protection around the Ice Haul Island (including a culturally sensitive area)and a small shoreline protection segment in the Army Road project area to prevent future erosion of the island enhancement features (3) temporary closure of Millstone landing during construction activities to ensure public safety during construction activities and (4) Four optional temporary locations for use during construction for project related work/staging/stockpile activities as shown in Figure 2 to enable construction of other features project features~~.~~

A Supplemental Environmental Assessment (SEA) has been prepared to address the potential effects associated with the proposed modifications. The project has been reviewed for compliance with the Clean Water Act under section 404 and Section 401. The original project features were addressed under Nationwide Permit (NWP) 27 and NWP 33. The Minnesota Pollution Control Agency is the administering agency for Section 401 water quality certification in the State of MN. The IA Department of Natural Resources is the administering agency for Section 401 water quality certification in Iowa. Both states have issued water quality certifications for Nationwide Permits 27 and 33. In preparing this SEA, the Corps evaluated the effects for the purposes of the NWPs and has concluded that the full project with the additional activities addressed here are still within those activities authorized under NWP's 27 and 33. Nationwide Permits 27 and 33 as well as the associated state issued 401 certifications can be found in the original project record. Information presented in the IFR/EA dated June 2023 is incorporated by reference.

This environmental review indicates that while the proposed modifications would result in some changes in the location, timing, and magnitude of effects on some resources, there would not be an appreciable change in the overall types and scope of impacts from what was described in the IFR/EA.

1.2 Purpose and Need

The project seeks to restore hydrologic, geomorphic, and ecological conditions and processes in the project site. The project's primary objective is to protect, enhance, restore, and create naturally regenerating, resilient, and diverse bottomland forest habitat, prioritizing connectivity to existing bottomland forest habitats and expanding interior forest conditions. The project's secondary objective is to protect, enhance, restore, and create a) backwater habitats and provide flow conditions and sediment dynamics that will benefit native fish and mussel populations that live in, or depend on, those habitats and b) flowing channel habitats to provide flow conditions and sediment dynamics that will benefit native fish and mussels that live in, or depend on, those habitats.

Following the completion and approval of the IFR/EA, the team discovered new resource concerns within the project area that had not been previously addressed. These additional concerns included poor existing road conditions, erosion rates that were higher than initially anticipated, potential safety risks to the public during construction near Millstone Landing, and the possible need for extra temporary work staging areas.

1.3 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. WRDA 1999 Section 509 (Public Law 106-53) reauthorized the UMRR 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 the US Army Corps of Engineers (USACE) with the authority to plan, design, and construct HREPs and is the authority under which this study is being conducted.

1.4 Related National Environmental Policy Act (NEPA) Documentation

U.S. Army Corps of Engineers. 2023. Reno Bottoms Habitat Rehabilitation and Enhancement Project Feasibility Report and Integrated Environmental Assessment. 144 pp.

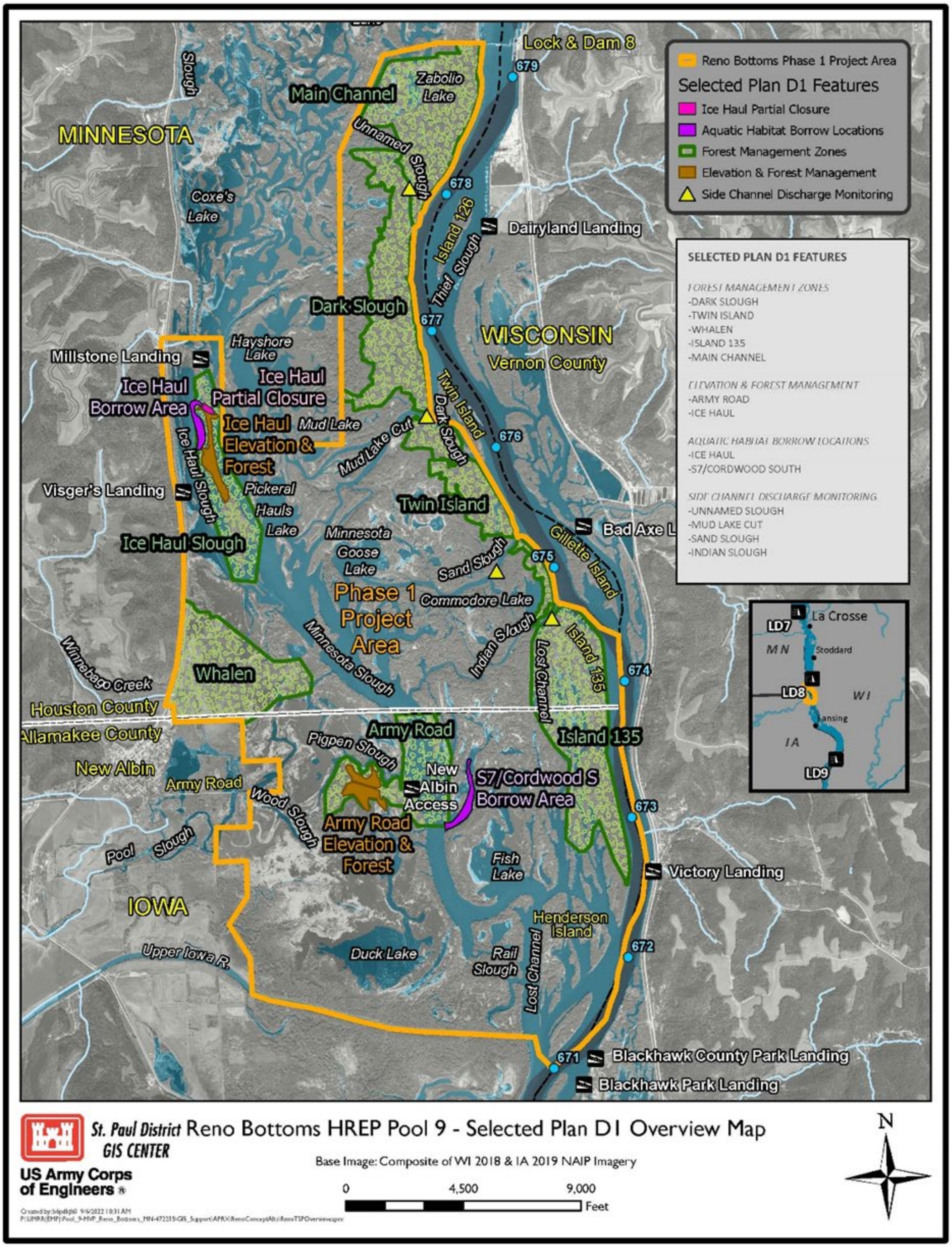

Figure 1. Original Recommended Plan as presented in the 2023 IFR/EA

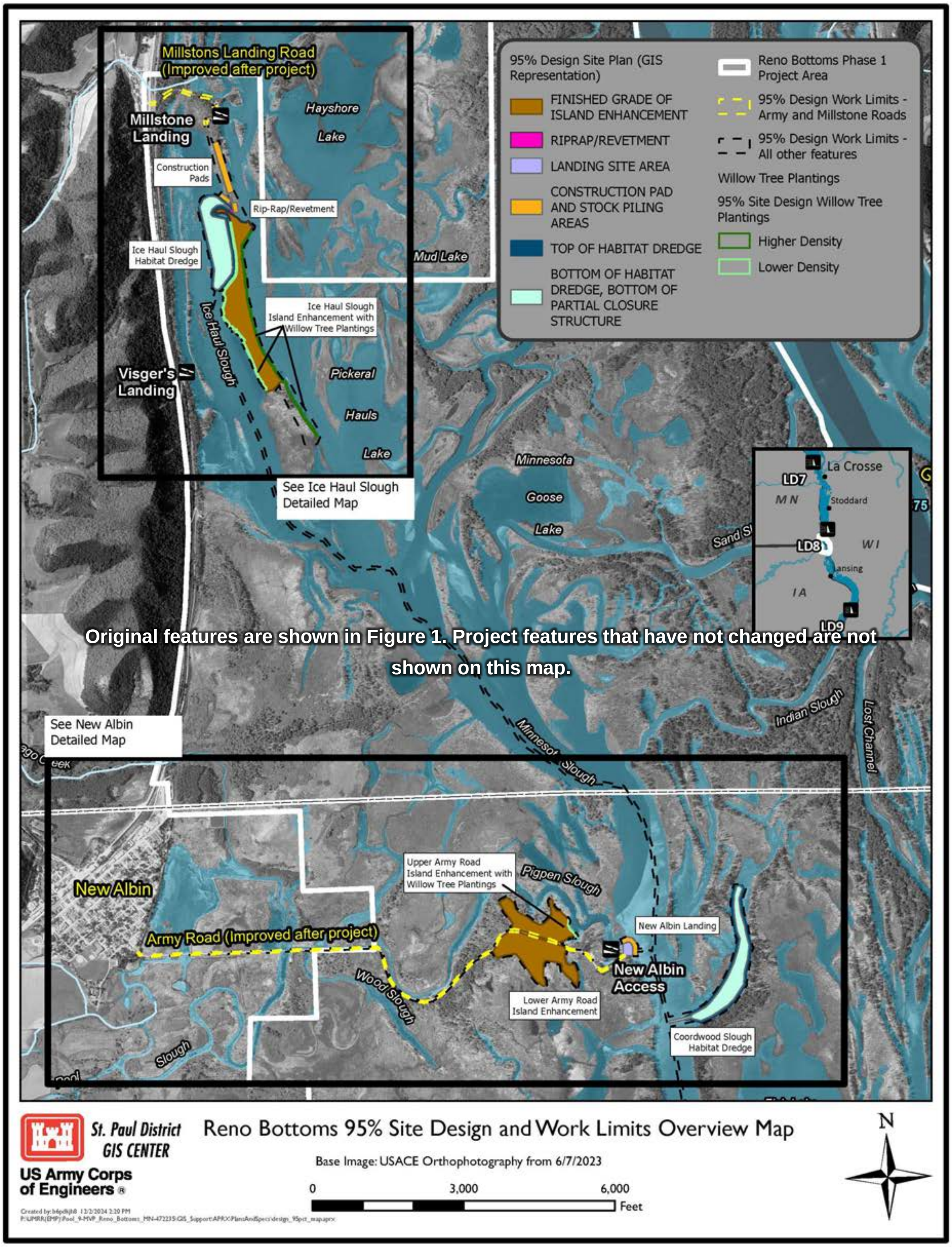

Figure 2. Overview of updated project features.

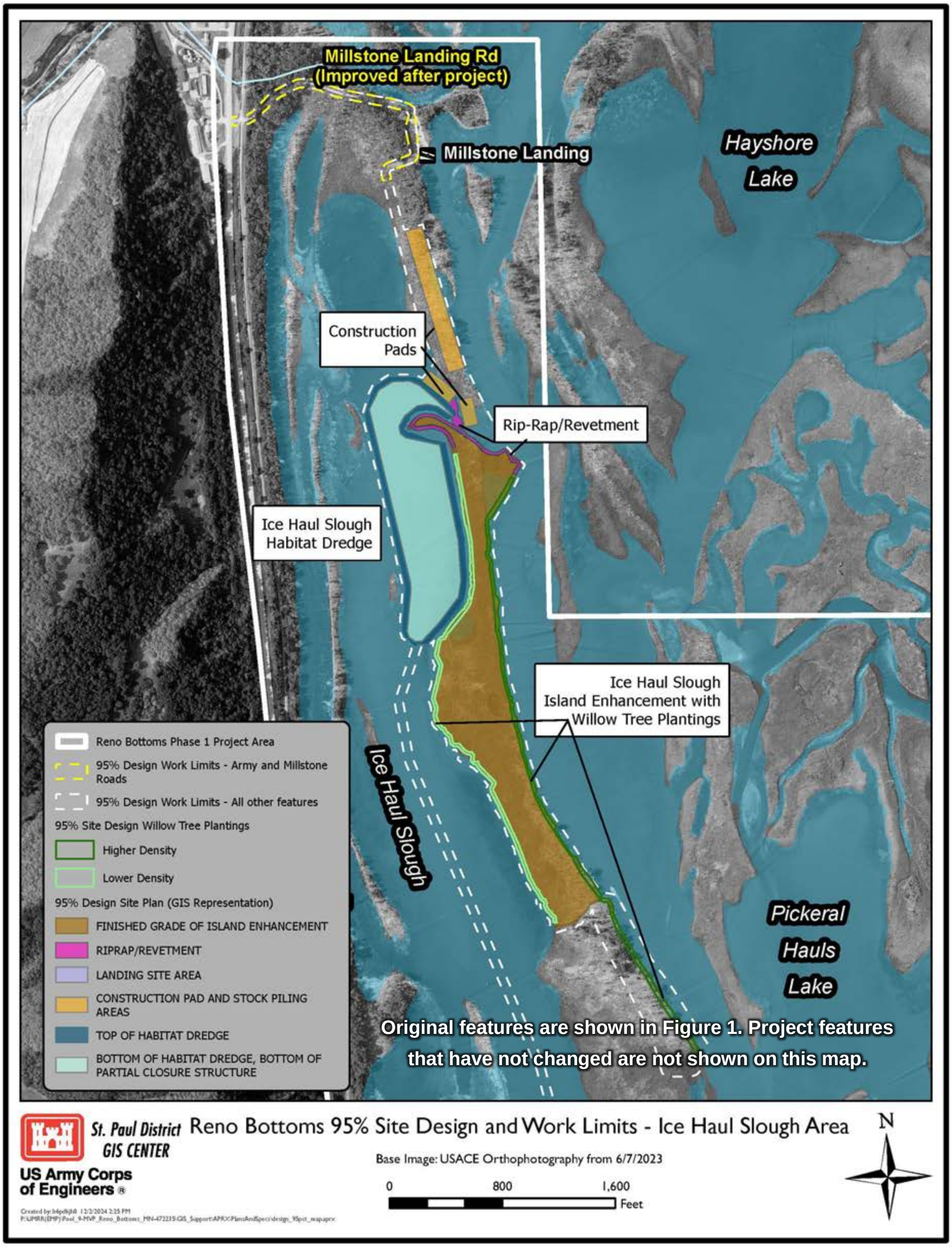

Figure 3. Updated project features Ice Haul Slough project area.

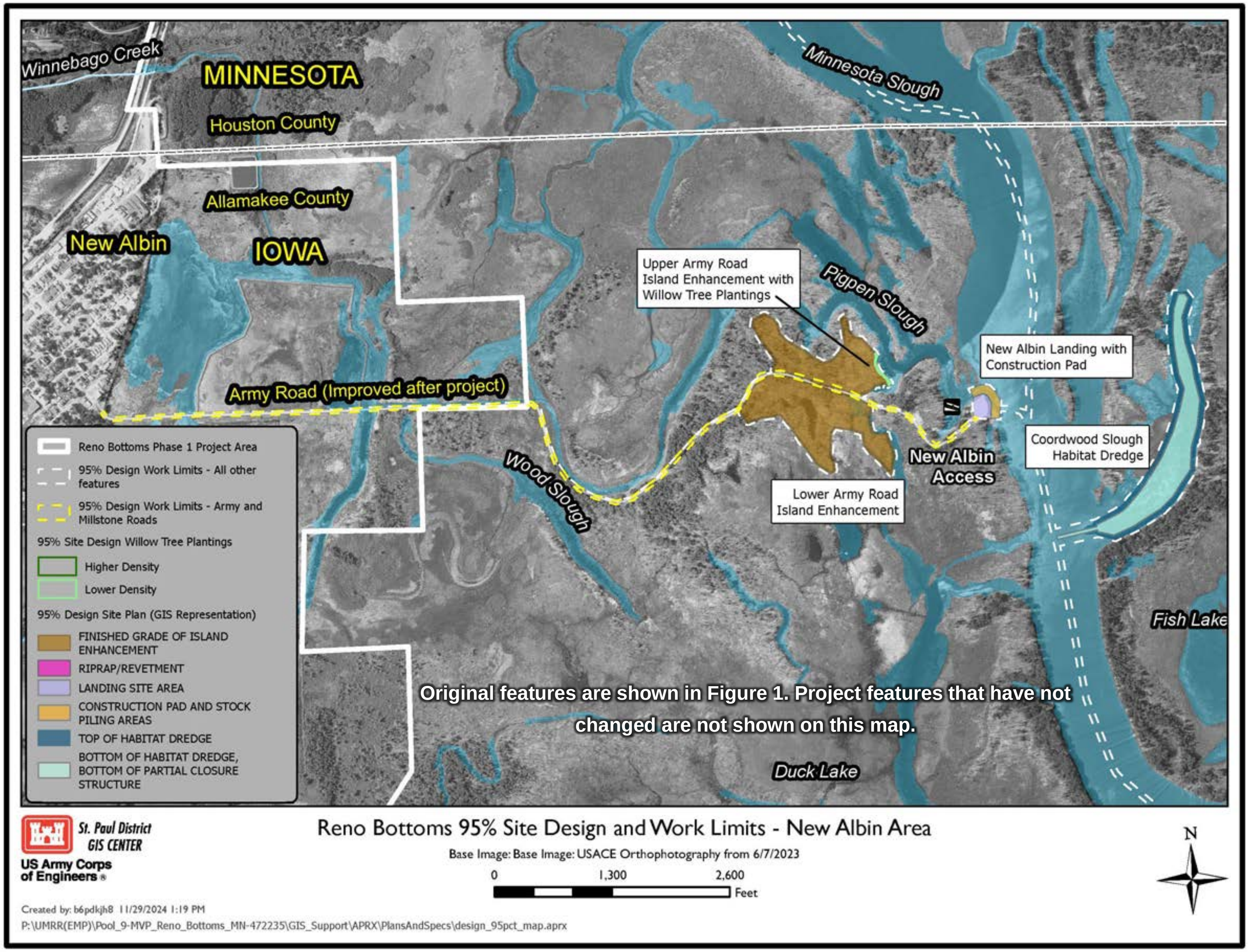

Figure 4. Updated project features New Albin project area.

2 Alternatives

2.1 No Action Alternative

The No Action Alternative would be to proceed with the Recommended Plan as described in the IFR/EA and shown in Figure 1.

2.2 Proposed Alternative

The proposed alternative consists of the features in the Recommended Plan with the following new features identified since the IFR/EA (Figure 2): (1) additional improvements to Millstone Landing and Army Road necessary for construction access to other proposed features (2) shoreline protection using willow plantings around the Ice Haul Island project area. This activity also protects a culturally sensitive area within the Ice Haul Island project area which is experiencing erosion from natural processes (3) temporary public closure of Millstone landing for safety, during construction activities and (4) temporary work staging pads.

The proposed alternative also includes refinements to three features which were included in the original IFR/EA. Those features include (1) temporary access road (2) island elevation enhancement and (3) aquatic habitat and borrow areas.

New Features:

Improvements to Existing Roads

Millstone Landing Road –

Millstone Landing Road is owned and maintained by the Army Corps of Engineers. For construction of the Ice Haul partial closure structure as well as the Ice Haul elevation enhancement and forest improvement activities, this road requires an elevation increase of 20 inches. Improvements will be limited to the existing road and include minimal widening from 12 feet to 15 feet and placement of a maximum of 20” of additional gravel on top. These improvements to Millstone Landing Road will be left in place after project completion providing for improved public access.

Army Road –

The Army Road is jointly owned by the Iowa DNR, the USFWS, and the Army Corps of Engineers. As part of the project, this road will undergo upgrades, including an elevation increase, to maintain its stability and accessibility after the surrounding land is elevated as part of the Island enhancement project. The improvements will be permanent, providing long-term benefits for public access. The upgrades will be targeted to areas of need, affecting only a limited section of Army Road.

Shoreline Protection

After the initial Reno Bottoms IFR/EA was approved, a Value Engineering Study (VE) was conducted to explore potential project improvements and cost-saving measures. The final report highlighted the benefits of adding shoreline protection to two key areas: Ice Haul Island and a short segment of shoreline along the Upper Army Road Island Enhancement Area. These areas were reviewed during the original project planning, but during the VE study it was discovered that the erosion being caused by recreational boat traffic was a greater concern than previously thought.

Notably, the shoreline erosion occurring around Ice Haul Island is also impacting a culturally sensitive area. While reviewing the VE report the project team determined that adding willow stakes to these areas would be an efficient way to address this erosion problem. Willows will be planted around the island to provide natural stabilization and protection. The willow cuttings will be sourced from local sites to ensure genetic diversity while leveraging the benefits of locally adapted species. These cuttings will be planted as stakes at a depth that promotes rooting and establishment of individual plants (as shown in Figure 3).

Using the same design principles, a small section of shoreline in the Army Road project area will also receive willow stakes for shoreline protection (as illustrated in Figure 4). This targeted approach aims to mitigate erosion and preserve the integrity of these sensitive areas.

Temporary Public Access Closure

Millstone Landing will be temporarily closed to public access during project construction activities, which are expected to begin in late summer 2025 and continue into 2026. This closure is necessary to ensure public safety while construction work is being carried out. However, if the contractor is not operating for a consecutive period of 7 days, the landing will be opened to the public during that time, allowing public use of the landing when construction is not taking place.

For the initial road closure at the beginning of the project, notice will be posted at the road entrance no shorter than 30 days in advance. Intermittent closure notices will be clearly posted at the road entrance no less than 7 days prior to closure. When the road will be open for public access during extended periods (30 calendar days or greater) the contractor must post the estimated date of the next closure to ensure the public is aware when construction activities will resume. The exact dates for the closure and reopening of the landing will be determined by the contractor's schedule. Visger’s Landing in Minnesota, Dairyland and Bad Axe Landing’s in Wisconsin and New Albin Access in Iowa, are the next closest public landings to Millstone Landing. It would be reasonable to expect that those locations will receive heavier than usual visitation while Millstone Landing is closed.

Temporary Work Staging Pads

Four optional locations (refer to Figure 2, Figure 3, and Figure 4) have been identified and cleared for use during construction for project related work/staging/stockpile activities. Construction pads will have maximum dimensions of 250-feet by 100-feet with 1V:3H slopes.

The proposed temporary work staging pads are to be placed on public lands and within the project boundaries. These temporary disturbance areas are incidental to the work and are to be removed after the related feature’s construction is complete.

Refinements of Original Features:

Temporary Access Road

A temporary access road referred to as Ice Haul temporary access road was identified and described in the IFR/EA. As previously described this temporary access road would be needed to provide construction access of equipment and materials to the Ice Haul Island Enhancement Area. The existing area where the temporary road would be built is partially tree covered wetland. The proposed temporary road would be approximately 2,100- linear feet providing access between Millstone Landing and the Ice Haul Slough closure structure. Due to the soft nature of the soils in the area it is estimated that construction would require 24 inches of granular subbase topped with 24 inches of aggregate. The proposed width of the road is 15 feet and with 1V:2H side slopes.

This temporary access road is anticipated to be used during more than one construction season. After completion of project features the temporary access road area would be restored to pre-construction elevation +/- 3-inches, the upper layer of aggregate would be removed, fine fill would be placed, and the area would be seeded and restored to pre-project conditions.

The refinement to the design of the Ice Haul temporary access road is limited to the decision that the materials reclaimed from the temporary road during decommissioning will be used to improve the parking area of Millstone Landing.

<u>Island Elevation Enhancement</u>

In both Upper and Lower Army Road Island Elevation Enhancement areas, dead standing trees would be felled and incorporated into the island during elevation enhancement.

Live trees would be selected in the Island enhancement project areas for leaving in place. These trees would provide important future wildlife snag habitat. When possible, downed trees would be crushed prior to incorporation into the island. Incorporation of woody material in island elevation enhancement would provide important organic material inputs and future topographical variation as buried wood materials degrade, resulting in a more natural environment at the Army Road and Ice Haul sites. In areas where it would be beneficial, trees may be piled into small piles and buried. When these piles degrade, they would result in topography capable of providing seasonal wetland habitat. Additional seasonal wetland habitat would benefit frogs and other herptile species.

The refinement to the original design is limited to the options identified for disposal of felled woody debris in these areas. The three options identified are: (1) crushing the debris before incorporating it into the island, (2) arranging logs in a single layer before covering them with sediment, and (3) creating small piles of crushed debris before burying them with sediment. A key benefit common to all three options is the incorporation of woody material into the island elevation enhancement, which introduces essential organic matter and future topographical diversity as the buried wood degrades, ultimately creating a more natural environment at the Army Road and Ice Haul sites.

The approach of creating small piles of debris and burying them offers an additional advantage: increased topography. As the woody debris piles break down, they will form small depressions that will function as vernal pools, providing crucial seasonal wetlands that will support frogs, other herptile species, and a diverse range of wildlife.

<u>Aquatic Habitat and Borrow</u>

This SEA does not propose any new dredging activities. All dredging activities were previously identified and described in the IFR/EA.

The refinement to the original design related to dredging activities primarily involves the division of larger overwinter project areas into smaller sub-areas, which have been prioritized for dredging. Dredging will only occur to the extent necessary to obtain materials for island enhancement, and the actual dredging area may be smaller than the maximum area initially identified in the EA. However, the dredging depths will remain as designed, ensuring the creation of suitable fish wintering habitat with depths ranging from 4 to 8 feet, and an average depth of 6 feet.

The dredge areas in Cordwood Slough and Ice Haul Slough are specifically designed to provide optimal conditions for fish overwintering habitat. Each of these areas has the potential to provide up to 15 acres of habitat, supporting the needs of fish populations during the winter months

2.3 Other Alternatives Considered

Alternatives to the Recommended Plan were evaluated in Section 3 of the IFR/EA. This SEA addresses proposed modifications project access routes and habitat features. As this SEA is intended to be a concise document, alternatives considered and dismissed, as well as the analysis of those alternatives, are addressed in the IFR/EA. The No Action and Proposed Alternatives are described above.

3 Affected Environment and Environmental Consequences

The affected environment and environmental consequences are described in detail in Section 4 of the IFR/EA. This section will provide any additional information that has become available and describe any differences in the affected environment and environmental consequences due to project modifications since the 2023 Environmental Assessment. Unless stated otherwise, the effects discussed below are only those of the features being added or modified. Effects that have not changed from the original IFR/EA activities are not discussed.

3.1 Physical Setting

3.1.1 Geology and Soil Substrate

No change from what is described in the IFR/EA.

3.1.2 Substrate and Contaminants

No change from what is described in the IFR/EA. All proposed dredge locations are the same as were identified in the IFR/EA and there is no new soil disturbance activities proposed outside of the originally defined project area. Therefore, the Proposed Alternative would have no measurable effects on contaminants in the long term.

3.1.3 Hydrologic and Hydraulic Conditions

No change from what is described in the IFR/EA. Results of the flood stage impacts analysis show that the features of the proposed project meet the FEMA no rise requirement as defined by the Iowa DNR and the Minnesota DNR. The No Rise certifications for both Iowa and Minnesota can be found in Appendix E: Hydraulics and Hydrology.

3.1.4 Water Quality

No change from what is described in the IFR/EA.

3.1.5 Air Quality and Greenhouse Gases

Policy regarding analysis of Greenhouse Gases (GHG) has changed since the IFR/EA was written. To provide the full analysis as required, this SEA will analyze the GHG emissions for the entire project compared to a no project alternative.

There are currently no Federal Greenhouse Gases (GHG) emission thresholds. Therefore, a GHG significance threshold to assess impacts is not proposed. Rather, in compliance with NEPA implementing regulations, the anticipated emissions as well as their associated social costs are disclosed for each alternative without expressing a judgment as to their significance.

On January 9, 2023, the CEQ released NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change. This guidance provides details for how federal agencies can incorporate GHG and climate change considerations into the NEPA process, including assessing and reducing impacts from GHG emissions or incorporating climate resiliency considerations into alternatives. While the Climate Change Guidance is considered “interim,” it is effective immediately, while CEQ seeks public comment on the guidance.

As discussed in this guidance, when conducting climate change analyses in NEPA reviews, agencies are recommended to consider the potential effects of a proposed action on climate change, including by assessing both direct and indirect GHG emissions and reductions from the proposed action, quantifying the baseline (no-action) emissions, and the effects of climate change on a proposed action and its environmental impacts. The guidance further recommends that greenhouse gas emissions should be quantified for the gross and net emissions for each chemical species (i.e., methane, nitrous oxide, etc.) and summarized as carbon dioxide equivalent (CO2e) and social cost of greenhouse gases. The guidance also emphasizes the "rule of reason" which states that the depth of the GHG analysis should be commensurate to the amount of greenhouse gases emitted.

Baseline GHG Emissions for the State of Iowa

The most recent report for GHG emissions for the state of Iowa focuses on calendar year 2022. GHGs included in the inventory are carbon dioxide (CO_2), methane (CH4), nitrous oxide (N_2O), perfluorocarbons (PFC), hydrofluorocarbons (HFC), and sulfur hexafluoride (SF_6). Total gross GHG emissions were 124.22 million metric tons (MMt) carbon dioxide equivalent (CO2e) which was a 3.21 percent decrease from 2021 (Table 1). The decrease was largely attributed to a decrease in emissions from power plants, mobile combustion, and industrial processes. Carbon dioxide was the GHG emitted in the highest amounts in Iowa, accounting for 63.06% of all GHG emissions nearly all of which is from fossil fuel combustion and transportation. Methane and nitrous oxide were emitted in smaller amounts and the main contributor was agriculture. Industrial processes were the main contributors of HFCs, PFCs and SF_6 (Iowa Department of Natural Resources, 2023).

Table 1. 2022 Gross GHG Emissions by Pollutant (MMt CO2e) for the State of Iowa

Pollutant	**MMt CO2e**	**Percent**
CO_2	78.63	63.06
CH_4	18.80	15.08
N_2O	25.66	20.58
HFC/PFC/SF_6	1.59	1.28
Total	**124.68**	**100**

Baseline GHG Emissions for the State of Minnesota

The most recent report for GHG emissions for the state of Minnesota focuses on calendar year 2022. GHGs included in the inventory are carbon dioxide (CO_2), methane (CH4), nitrous oxide (N_2O) and Fluorinated gases (consisting of: HFC-125, HFC-134a, HFC-143a, HFC-32, HFC-23, HFC-236fa, PFC-116, PFC-14, SF6, NF3, Perfluorocyclobutane and other HFCs and PFCs). Total gross GHG emissions were 125.37 million metric tons (MMt) carbon dioxide equivalent (CO2e) which was a 0.1 percent increase from 2021 (Table 2). The increase was largely attributed to an increase in emissions from the energy sector. Carbon dioxide was the GHG emitted in the highest amounts in Minnesota, accounting for 74.25% of all GHG emissions nearly all of which is from fossil fuel combustion and transportation. Methane and nitrous oxide were emitted in smaller amounts and the main contributor was agriculture. Industrial processes were the main contributors of HFCs, PFCs and SF_6 (United States Environmental Protection Agency, 2023).

Table 2. 2022 Gross GHG Emissions by Pollutant (MMt CO2e) for the State of Minnesota.

Pollutant	**MMt CO2e**	**Percent**
CO_2	96.17	74.25
CH_4	12.93	9.98
N_2O	17.37	13.41
Fluorinated Gases	3.05	2.36
Total	**129.52**	**100**

Social Cost of Greenhouse Gases

The 2023 CEQ guidance recommends including calculation of social cost of greenhouse gas (SC-GHG) in NEPA documents to disclose the potential future costs to society stemming from the carbon emitted by a project. Per this guidance, SC-GHG is not required for use in a cost-benefit analysis and was not used in the economics analysis for computing a cost-benefit ratio (CEQ 2023). To calculate social costs of GHGs, we used a cost of $57 per metric ton of CO2 as recommended by the White House's Greenhouse Gas Interagency Work Group.

Estimating Greenhouse Gases

Gases that contribute to climate change are CO_2, CO, N_2O, and CH_4. Emissions of these gases were estimated using the South Coast Air Quality Management District Off-road Mobile Source Emission Factors (Scenario Years 2007 – 2025) for construction equipment anticipated to be used during project construction (SCAQMD 2023). CO_2 is the reference gas for climate change, as it is the GHG emitted in the highest volume. The effect of each GHG on global warming is the product of the mass of their emissions and their global warming potential (GWP). The GWP of a gas indicates how much the gas is predicted to contribute to global warming relative to the amount of warming that would be predicted to be caused by the same mass of CO_2. For example, methane and nitrous oxide are substantially more potent GHGs than CO_2, with GWPs of 25 and 298 times that of CO2 respectively, which has a GWP of 1.

The construction activities included in this SEA are expected to use similar construction equipment, as will be needed for the activities included in the original IFR/EA. These activities would be completed in the same construction timeframe as the IFR/EA activities. Estimated emissions and social costs of greenhouse gasses are shown below in Table 3. Because this GHG analysis is looking specifically at the activities covered under the SEA , this analysis will compare the No Action Alternative which would be the IFR/EA approved activities, to the IFR/EA selected alternative plus the additional SEA proposed activities. No Action Alternative would result in in approximately 5,904 metric tons of CO_2/year with a social cost of $716,274. The additional activities included in the Action Alternative are limited to hand collecting and planting willow stakes and possible construction of up to four temporary construction pads. These activities would create a negligible increase in GHG emissions. See Appendix D: Greenhouse Gas Analysis for details.

Table 3. Comparison of Greenhouse Gases Emissions and Social Costs.

	No Action Alternative	Action Alternative
Estimated Total Emissions of GHG (metric tons CO_{2e}/year)	12,566	negligible increase
Social Cost of GHGs[1]	$716,274	negligible increase

[1] Social Cost of GHG = CO_{2e} x $57

All GHG emissions are in compliance with US Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS) Table 4.

Table 4. Project gas emissions compared to the EPA NAAQS yearly limits.

	ROG	CO	NOx	SOx	PM
Peak Daily Emissions (lbs/day)	8.620	47.190	66.990	0.190	1.360
Total Project Emissions (Tons)	2.873	15.729	22.332	0.062	0.001
EPA NAAQS Yearly Significance Thresholds (Tons)	100	100	100	100	100
Project Emissions Exceed Federal Yearly Threshold?	**No**	**No**	**No**	**No**	**No**

3.2 Natural Resources

3.2.1 Aquatic Habitat

No change from what is described in the IFR/EA.

3.2.2 Terrestrial Habitat

Tree clearing has increased since the original design, from less than 2 acres to approximately 60 acres. This change is primarily due to a change in how standing dead trees within the island enhancement project areas will be handled. Originally the dead standing trees were planned to be left standing, however it was determined that incorporating the dead trees into the island enhancement would provide greater long-term benefits. All island enhancement areas will have native vegetation established either through seeding, planting, or staking of hardwood cuttings.

Establishment of the 60 acres of floodplain forest habitat would have beneficial effects on terrestrial habitat.

3.2.3 Wetlands

The original IFR/EA did not account for necessary improvements to Millstone Landing Road, which are now being proposed. The current road is approximately 12 feet wide and varies in width. To ensure safe and stable access, the proposed plan involves minimal widening to a maximum of 15 feet, along with the addition of a layer (20 inches or less) of aggregate material to the road surface. This improvement will require a small amount of permanent fill, resulting in an additional 0.1 acre of filled area, to raise the road grade and enhance safety.

As previously stated in the IFR/EA, the construction process may cause minor adverse effects to wetlands due to excavation and fill activities, as well as temporary effects from sediment resuspension and settlement.

It's worth noting that the aquatic habitats, floodplain forests, and other wetland types in the project area are currently declining in health. Invasive species, such as reed canary grass, and increased flooding are contributing to the loss of floodplain forests and the degradation of lentic habitats, which are essential for overwintering fish. However, implementing this project is expected to have an overall net positive impact on wetlands. The project will improve wetland diversity and functionality, restore the habitat value of lentic habitats, and ultimately benefit the ecosystem.

3.2.4 Biological Productivity and Habitat Diversity

No change from what is described in the IFR/EA.

3.2.5 Fish

No change from what is described in the IFR/EA.

3.2.6 Wildlife

The shoreline erosion protection feature, utilizing willow planting, will have a minor yet positive impact on local wildlife by preserving floodplain habitat and providing nesting and shelter opportunities for birds, small mammals, and insects.

3.2.7 Federally Listed Threatened and Endangered Species

Consultation for the original project as proposed in the IFR/EA was conducted on 29 November 2022. The result of this consultation was a determination of may affect but is not likely to adversely affect Higgins eye and listed bat species (NLEB and tricolored bats). This determination is still valid, and all measures agreed to under that consultation are still being applied. Agreed to measures included: timing restriction for tree removal activities to avoid impacts to bat species, identifying an “exclusion zone” in an area of Minnesota slough containing a high density of mussels to avoid impacts to mussels present, and performing mussel relocation within the footprint of the Ice Haul partial closure structure.

Additional consultation limited to the added activities covered in this SEA, was completed on January 13, 2025. This consultation was completed using the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) website. The IPaC website was used to identify changes in the potential presence of federally listed threatened and endangered species within the action area compared to 2023 (Table 5). No critical habitat for any of these species exists in or near the project area.

Table 5. Federally listed species.

	Scientific Name	**Common Name**	**Status**	**2023**	**2024**
Mammals	*Myotis septentrionalis*	Northern Long-Eared Bat	Threatened	X	
	Perimyotis subflavus	Tricolored Bat	Proposed Endangered		X
Mussels	*Lampsilis higginsii*	Higgins Eye	Endangered	X	X
	Simpsonaias ambigua	Salamander Mussel	Proposed Endangered		X
	Plethobasus cyphus	Sheepnose Mussel	Endangered	X	X
Insects	*Danaus Plexippus*	Monarch Butterfly	Proposed Threatened	X	X
Plants	*Aconitum noveboracense*	Northern Wild Monkshood	Threatened	X	
	Platanthera leucophaea	Eastern Prairie Fringed Orchid	Threatened	X	X

Tree clearing was included in the second consultation because of the increase in acreage from 2 acres to approximately 60 acres of trees. Because of this tree removal the project may affect but is not likely to adversely affect tricolored bats. Anticipated effects to the species from tree removal were consulted with USFWS under Section 7 of the Endangered Species Act 16 USC §1533(d), through the IPaC website one January 13, 2025. USFWS replied with a verification letter the same day. USFWS did not further respond with any disagreement within the 30 days; therefore, no further consultation is required. To avoid potential impacts to NLEB and tricolored bats, no tree clearing will occur during the bats active season which is from April 1 through November 15.

No new activities covered under the SEA have the potential to affect mussel species. The result is the determination that activities covered under the SEA will have no effect on mussel species.

After completion of consultation for the IFR/EA activities the listing status of Monarch butterflies was changed from Candidate, to Proposed Threatened. All project activities were considered for affects to Monarch butterflies during the second consultation process which occurred on January 13, 2025. Pool 9 has milkweed present, so the Project area acts as a potential summer breeding and migratory route for the monarch butterfly. The Recommended Plan is not anticipated to negatively impact local milkweed or other diverse flowering plants that monarchs rely on, as much of the disturbed terrestrial land within the Project area contains invasive plant species. Being that the species is mobile, it can avoid construction activities associated with the Recommended Plan. The project is anticipated to have no effect on this Proposed Threatened species.

There are no known extant populations of eastern prairie fringed orchid within the direct project area or project footprint because many of the existing islands within the project area are overtaken by reed canary grass. Project features would not be constructed on high quality plant communities, so this species would not be present at project features. High quality native plant communities would be avoided during project implementation. For this reason, the Recommended Plan would have no effect on northern wild monkshood (Aconitum noveboracense), and eastern prairie fringed orchid (Platanthera leucophaea).

The USFWS concurred with the Corps ESA determination regarding potential effects of SEA activities on Federally listed species on 13 January 2025. ESA coordination and concurrence is available in Appendix A. The Corps will revisit ESA determinations prior to project construction and reinitiate consultation if reinitiation conditions are met.

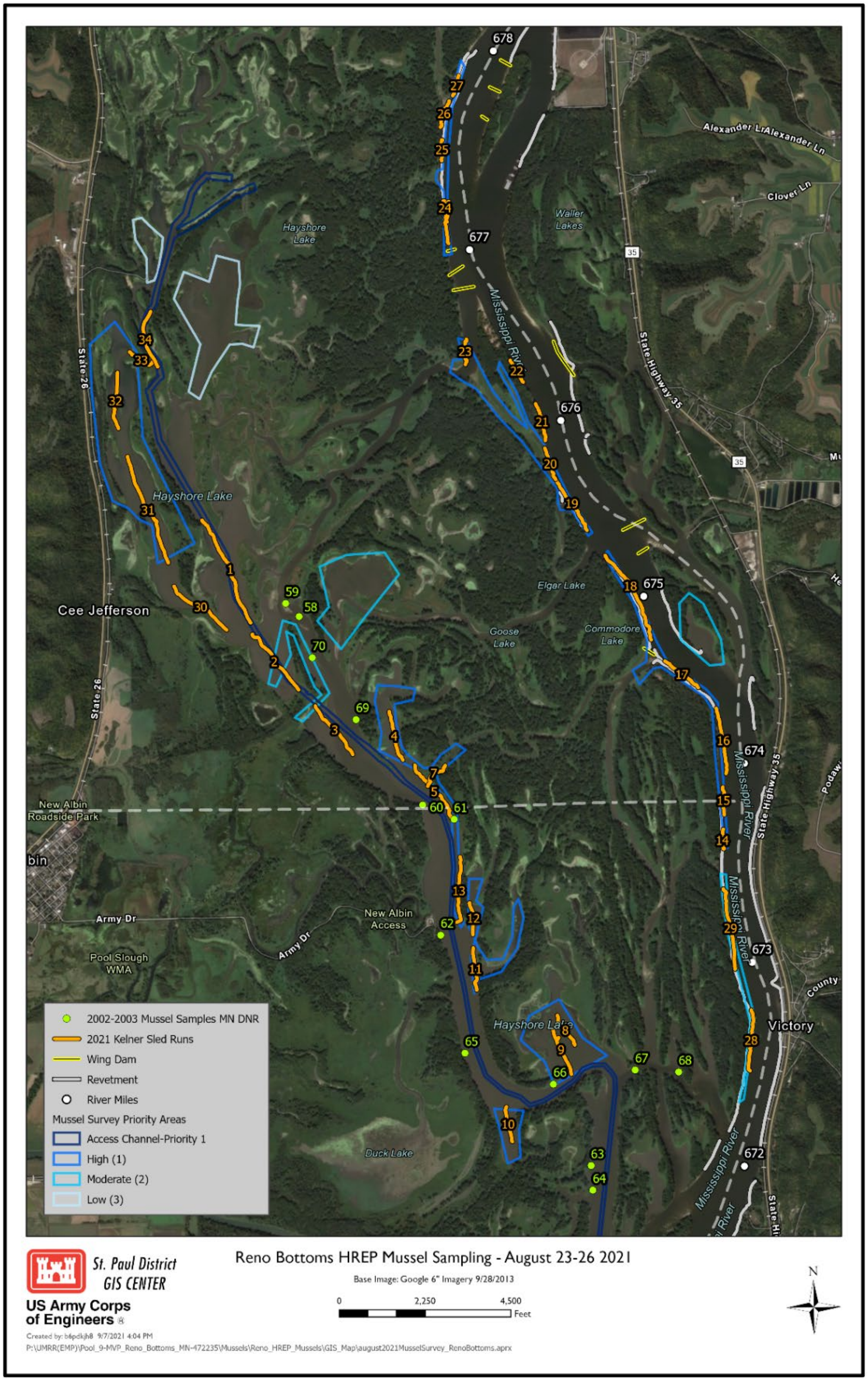

Figure 5. Summer 2021 mussel sample locations and results.

3.2.8 State Listed Species

No change from what is described in the IFR/EA. The Natural Heritage Databases for Iowa and Minnesota were used to develop a list of state-listed species found within one mile of the project boundary, shown in Table 6 and Table 7. The project may affect state listed species. As a Federal agency, the Corps does not request or obtain state endangered species permits for taking individuals of state listed species. However, as part of its NEPA analysis, the Corps evaluates effects to state listed species for its activities. The Corps seeks to avoid and minimize impacts to the extent practicable.

Table 6. Iowa state listed species.

	Scientific Name	**Common Name**	**Status**
Birds	*Buteo lineatus*	Red-shouldered Hawk	Sensitive
	Haliaeetus leucocephalus	Bald Eagle	Endangered
	Rallus elegans	King Rail	Endangered
Fish	*Aphredoderus sayanus*	Pirate Perch	Endangered
	Etheostoma chlorosoma	Bluntnose Darter	Threatened
	Ichthyomyzon castaneus	Chestnut Lamprey	Sensitive
	Opsopoedus emiliae	Pugnose Minnow	Sensitive
Insects	*Euphyes dion*	Dion Skipper	Sensitive
Plants	*Cacalia suaveolens*	Sweet Indian Plantain	Threatened
	Callitriche heterophylla	Water Starwort	Sensitive

Table 7. Minnesota state listed species.

	Scientific Name	**Common Name**	**Status**
Birds	*Buteo lineatus*	Red-shouldered Hawk	Special Concern
	Falco peregrinus	Peregrine Falcon	Special Concern
	Gallinula galeata	Common Gallinule	Special Concern
	Vireo bellii	Bell's Vireo	Special Concern
Fish	*Acipenser fulvescens*	Lake Sturgeon	Special Concern
	Alosa chrysochloris	Skipjack Herring	Endangered
	Anguilla rostrata	American Eel	Special Concern
	Aphredoderus sayanus	Pirate Perch	Special Concern
	Cycleptus elongatus	Blue Sucker	Special Concern
	Etheostoma chlorosoma	Bluntnose Darter	Special Concern
	Hybognathus nuchalis	Mississippi Silvery Minnow	Special Concern
	Hybopsis amnis	Pallid Shiner	Endangered
	Ictiobus niger	Black Buffalo	Threatened
	Lepomis gulosus	Warmouth	Special Concern
	Morone mississippiensis	Yellow Bass	Special Concern
	Polyodon Spathula	Paddlefish	Threatened
Mammals	*Pantherophis obsoletus*	Western Harvest Mouse	Special Concern
Mussels	*Arcidens confragosus*	Rock Pocketbook	Endangered
	Ellipsaria lineolata	Butterfly	Threatened
	Eurynia dilatata	Spike	Threatened
	Lampsilis higginsii	Higgins Eye	Endangered
	Lampsilis teres	Yellow Sandshell	Endangered
	Ligumia recta	Black Sandshell	Special Concern
	Megalonaias nervosa	Washboard	Endangered
	Pleurobema sintoxia	Round Pigtoe	Special Concern

	Quadrula nodulata	Wartyback	Threatened
	Theliderma metanevra	Monkeyface	Threatened
	Truncilla donaciformis	Fawnsfoot	Threatened
	Utterbackiana suborbiculata	Flat Floater	Special Concern
Reptiles/ Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog	Endangered
	Coluber constrictor	North American Racer	Special Concern
	Pantherophis obsoletus	Western Ratsnake	Threatened
	Pituophis catenifer	Gophersnake	Special Concern
Plants	*Arisaema dracontium*	Green Dragon	Special Concern
	Asclepias amplexicaulis	Clasping Milkweed	Threatened
	Asplenium platyneuron	Ebony Spleenwort	Special Concern
	Berula erecta	Stream Parsnip	Threatened
	Carex grayi	Gray's Sedge	Special Concern
	Carex muskingumensis	Muskingum Sedge	Special Concern
	Carex typhina	Cattail Sedge	Special Concern
	Eupatorium sessilifolium	Upland Boneset	Threatened
	Hasteola suaveolens	Sweet-smelling Indian plantain	Endangered
	Leersia lenticularis	Catchfly Grass	Threatened
	Napaea dioica	Glade Mallow	Threatened
	Nuttallanthus canadensis	Old Field Toadflax	Special Concern
	Orobanche uniflora	One-flowered Broomrape	Threatened
	Pellaea atropurpurea	Purple Cliff Brake	Special Concern
	Polystichum acrostichoides	Christmas Fern	Endangered
	Quercus bicolor	Swamp White Oak	Special Concern

3.3 Cultural Resources

Proposed activities under the SEA are not located within the footprint of any historic properties except willow stake planting along the shoreline of Ice Haul Slough. Willow stake planting is not as immediately effective as stone armoring; however, willow stake plantings require minimal ground disturbance and provide a more natural look to the shoreline. As erosion has likely modified the limits of the National Register of Historic Places (NRHP) eligible site, it is assumed that the minimal ground disturbance associated with the willow stake plantings has the potential to impact the site. No cultural materials were visible along the shoreline in August 2024, yet materials were seen as recently as 2021. However, as the willows will stabilize the shoreline and reduce future loss of the archaeological site, the Corps has made the determination of ‘No Adverse Effect to Historic Properties.’

This determination was coordinated with the Minnesota SHPO, the USFWS, Sac and Fox Nation, Oklahoma, Sac and Fox Tribe of the Mississippi in Iowa (Meskwaki Nation), Iowa Tribe of Kansas and Nebraska, Ho-Chunk Nation of Wisconsin, Iowa Tribe of Oklahoma, and the Winnebago Tribe of Nebraska on 30 September 2024. The USFWS concurred with the Corps Determination on 2 October 2024, and the Minnesota SHPO concurred on 5 November 2024. There have not been any tribal responses.

3.4 Socio-economic Setting

The closest communities to the project area are New Albin, Iowa (population 432) Reno, Minnesota (population 431) and Genoa, Wisconsin (population 753). La Crosse, WI (population 52,680) is the largest city in the general vicinity, a 30-minute drive from New Albin.

Population levels in recent decades have been relatively stable for the project counties while the states of Minnesota, Iowa, and Wisconsin as a whole, have grown steadily. The trends from 2000 to 2020 are presented in Table 8.

Table 8. County and State Population Trend 2000 – 2020.

Location	2000	2010	2020	% Change 2000-2020
Minnesota	4,919,479	5,303,925	5,706,494	16%
Houston Co., MN	19,718	19,027	18,843	-4%
Iowa	2,926,324	3,046,355	3,190,369	9%
Allamakee Co., IA	14,675	14,330	14,061	-4%
Wisconsin	5,363,675	5,686,986	5,893,718	9%
Vernon Co., WI	28,056	29,733	30,714	9%

Per capita income for the counties lags significantly behind that of their respective states and even more so behind the U.S. However, while the U.S. per capita income is higher, the overall poverty rate is also higher than the counties in Table 9.

Table 9. Per Capita Income and Poverty Rate by County/State (2020).

	Allamakee	Iowa	Houston	Minnesota	Vernon	Wisc.	U.S.
Per capita Income	28,546	33,021	33,546	38,881	27,192	34,450	35,384
Poverty Rate	10.9%	11.1%	6.4%	9.3	11.9%	10.8%	11.4

Source: census.gov

3.4.1 Noise

No substantial change from what is described in the IFR/EA. The additional project features covered by this SEA will use the same construction equipment as would already be operating in the project area and will be occurring at the same time and in the same project area, as the already approved project features. The change in noise level will not be discernable from what would already be produced due to the IFR/EA approved construction activities.

3.4.2 Recreation

Construction activities analyzed in the IFR/EA will cause a substantial increase in traffic which would result in a potential risk to public safety if Millstone Landing were not closed to the public during peak construction activity. The need to temporarily close Millstone Landing is not a result of the additional activities proposed in the SEA but is being implemented due to recognition of the public safety risk caused by the activities covered under the IFR/EA.

Millstone Landing boat ramp is a popular access point for the public recreating on the Mississippi river. Because this landing is heavily used by the public, the temporary closure which is necessary to ensure public safety would be expected to result in heavier than normal traffic at the four alternate landings' closest to Millstone Landing.

Project implementation would result in short-term minor adverse impact to recreation, and a long-term minor beneficial effect on recreation. In the short-term, construction activities would disturb recreational activities around the project area due to temporary ramp closures as well as construction activities. In the long-term, the proposed project would result in habitat improvements that would enhance recreational opportunities. Project features would increase aquatic habitat quality for fish, waterfowl, and plants. This would, in turn, increase outdoor recreational opportunities including bird watching, hunting, fishing, and paddling.

3.4.3 Transportation

No substantial change from what is described in the IFR/EA. The additional project components evaluated in this SEA will utilize the same construction equipment and take place concurrently with the already authorized project features in the same area. As a result, the impact on traffic levels will be negligible and indistinguishable from the effects of the construction activities approved in the IFR/EA.

However, it is anticipated that the temporary closure of Millstone Landing will lead to increased traffic at nearby boat landings during the closure period, as users may be redirected to these alternative locations.

3.4.4 Employment

No change from what is described in the IFR/EA.

3.4.5 Commercial Navigation

No change from what is described in the IFR/EA.

3.4.6 Environmental Justice

No change from what is described in the IFR/EA.

4 Cumulative Effects

The proposed modifications described herein do not appreciably change the cumulative impacts from what was described in the IFR/EA (Table 10). The effects noted for the No Action Alternative include those of the original Proposed Alternative in the 2023 IFR/EA. The Proposed Alternative outlined here would result in additional incremental effects. However, none of the incremental effects would collectively rise to the level of a significant effect.

Table 10. Environmental Assessment Matrix.

	No Action Alternative							**Proposed Alternative**						
	BENEFICIAL				ADVERSE			BENEFICIAL				ADVERSE		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. Social Effects														
1. Noise Levels					ST							ST		
2. Aesthetic Values					ST							ST		
3. Recreational Opportunities			X		ST					X		ST		
4. Transportation				X						X		ST		
5. Public Health and Safety				X							X			
6. Community Cohesion (Sense of Unity)				X							X			
7. Community Growth and				X							X			

Development														
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			ST							ST				
6. Business Activity			ST							ST				
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					ST							ST		
2. Terrestrial Habitat		X							X					
3. Wetlands		X							X					
4. Aquatic Habitat		X							X					
5. Habitat Diversity and Interspersion		X							X					
6. Biological Productivity			X							X				
7. Surface Water Quality			X		ST					X		ST		
8. Water Supply				X							X			
9. Groundwater				X							X			
10. Soils			X		ST					X		ST		
11. Threatened or Endangered Species					ST							ST		
D. Cultural Resource Effects														
1. Historic Architectural Values				X							X			
2. Precontact & Historic Archeological Values				X							X			

X = Long-term effects; ST = Short-term effects.

5 Environmental Compliance

5.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA; 42 USC § 4321 et seq.) establishes the broad national framework for protecting our environment. NEPA's basic policy is to assure proper consideration to the environment prior to undertaking any major federal action. Two alternatives have been presented and the significance of the project's 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 significant impacts to the environment are found, a Finding of No Significant Impact (FONSI) will be signed by the St. Paul District commander.

5.2 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.

A survey was conducted in April 2024 to document the numerous bald eagle nests in the study area (Figure 6). Detailed maps of the known nests in relation to the Ice Haul Slough and New Albin project areas can be seen in Figure 7 and Figure 8. The Bald and Golden Eagle Protection Act recommends maintaining a buffer of at least 660 feet between project activities and active eagle nests. The Special Use Permit obtained from the Upper Mississippi National Wildlife Refuge requires that the 660 ft. disturbance avoidance buffer be applied to all active eagle nests. Construction in areas within this buffer of active nests would be scheduled outside of the nesting timeframe (nesting typically occurs between January 15 – June 15). Yearly surveys will be conducted to identify active nests. Active nests may vary from year to year.

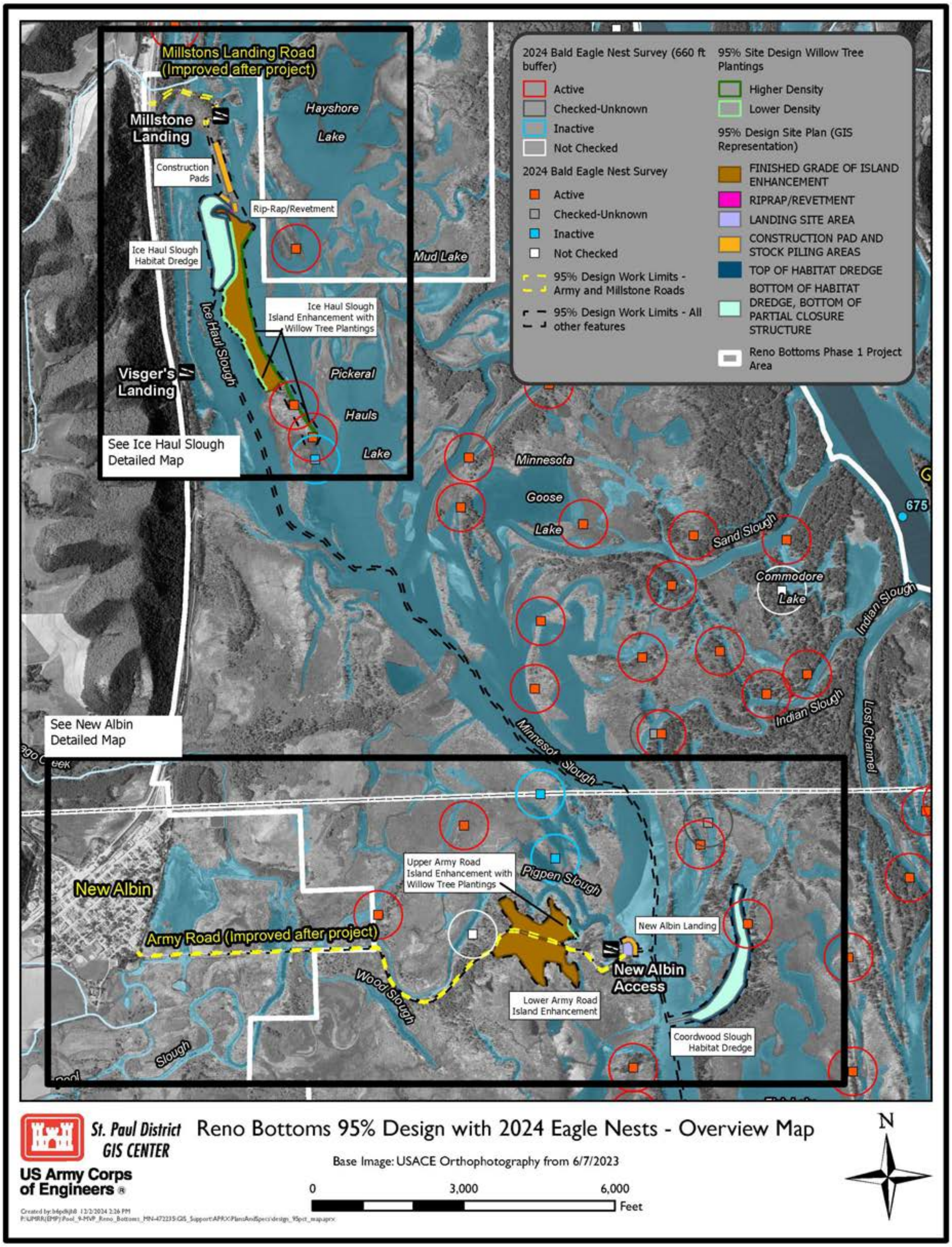

Figure 6. Overview of Project Area with Known Eagle Nests and Buffers.

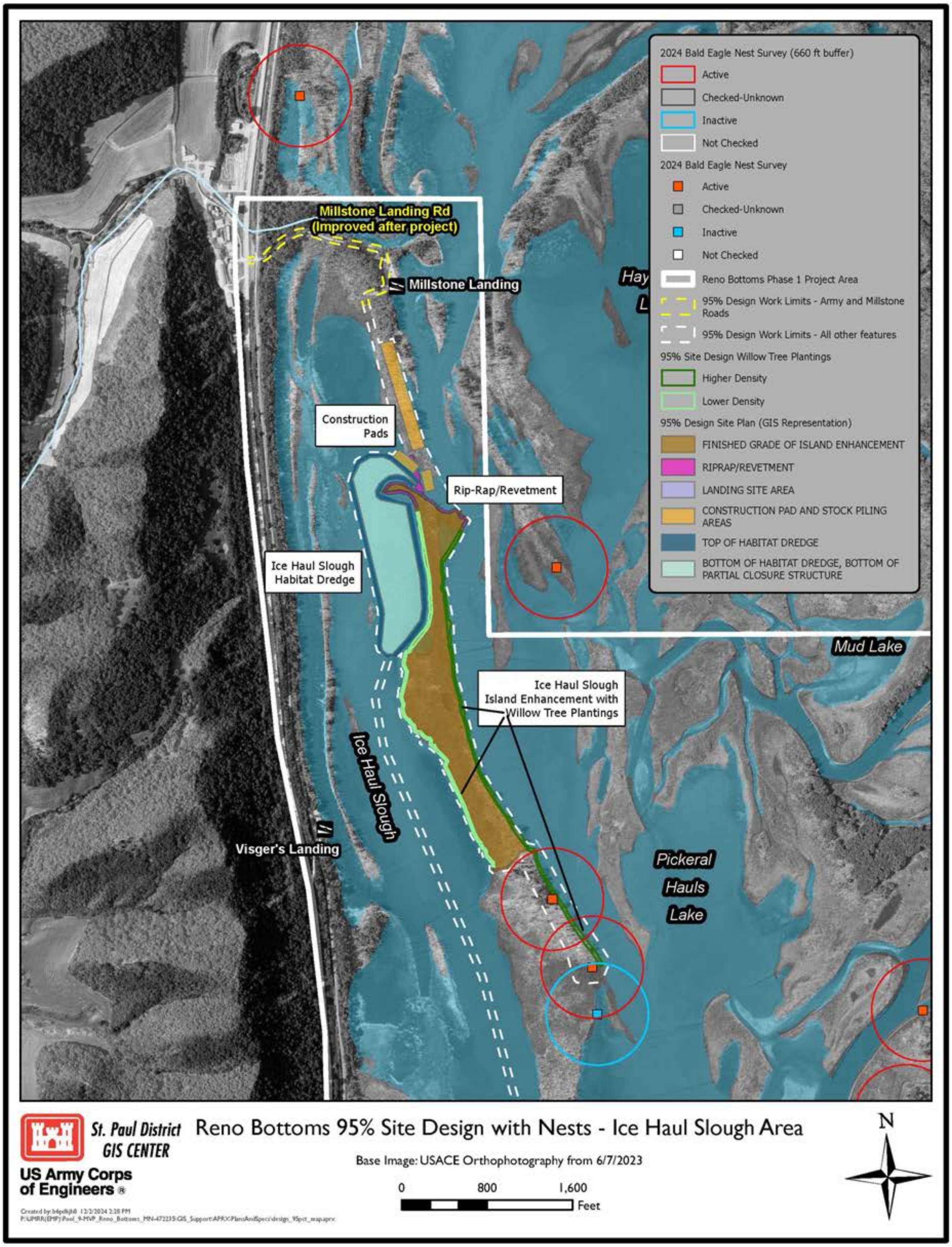

Figure 7. Ice Haul Slough Project Area with Known Eagle Nests and Buffers

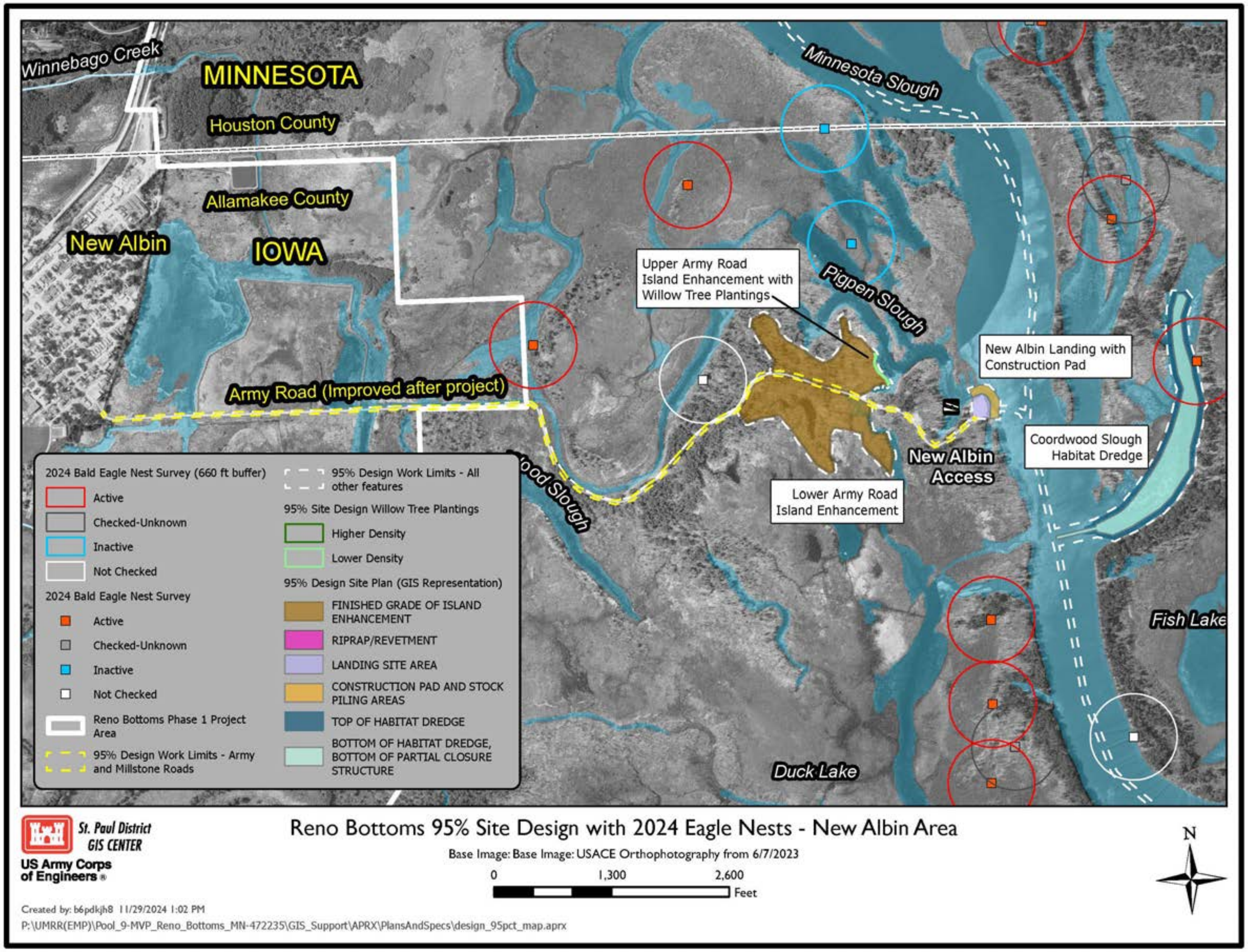

Figure 8. New Albin Project Area with Known Eagle Nests and Buffers.

5.3 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. The Corps does not issue permits to itself but complies with the provisions of the Act. Activities in this SEA are addressed under the same Nationwide Permits (NWP 27 and NWP 33) as the activities analyzed in the original FEA.

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. The Minnesota Pollution Control Agency is the agency responsible for issuing Clean Water Act Section 401 water quality certification. Activities in this SEA are addressed under the original FEA Section 401 water quality certification evaluation (Appendix B).

5.4 Endangered Species Act

The Endangered Species Act (16 USC § 1531 et seq.) provides for the conservation of threatened and endangered plants and animals and the habitats in which they are found. There are three federally listed species and two species proposed for federal listing that are listed for the action area.

Consultation for the original project as proposed in the IFR/EA was conducted on 29 November 2022. The result of this consultation was a determination of may affect but is not likely to adversely affect Higgins eye and listed bat species (NLEB and tricolored bats). This determination is still valid, and all measures agreed to under that consultation are still being applied.

The additional SEA project features were consulted on through IPaC on January 13, 2025, and determined that they may affect but are not likely to adversely affect the Tricolored bat. Determinations for the potential effects of the SEA project features on remaining federally listed species are no effect on: Higgins eye, salamander mussel, sheepnose mussel and eastern Prairie fringed orchid.

The SEA project may affect but is not likely to adversely affect tricolored bats as 60 acres of trees would be partially to mostly cleared within the project area. To avoid potential impacts to bats, no tree clearing will occur between April 1 – November 15. Anticipated effects to the species from tree removal was consulted with USFWS under Section 7 of the Endangered Species Act 16 USC §1533(d), through the IPaC website one November 13, 2024. USFWS replied with a verification letter the same day.

5.5 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA; 16 USC 661–667e) requires federal agencies to coordinate with the U.S. Fish and Wildlife Service and applicable state agencies when a stream or body of water is proposed to be modified. The proposed project was coordinated with U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, Iowa Department of Natural Resources, and the Wisconsin Department of Natural Resources during feasibility and throughout the plans and specification phase.

5.6 National Historic Preservation Act

The National Historic Preservation Act (NHPA) of 1966, as amended by Public Law 96-515 (94 Stat. 2987), established national policy for historic preservation, authorized the Secretary of the Interior to expand and maintain a National Register of Historic Places, and created the Advisory Council on Historic Preservation. Section 106 specifies that federal agencies, must consider the effect of the action on any property included in or eligible for the National Register of Historic Places.

No change from what is described in the IFR/EA with the exception of willow stake planting as a site protection measure along the shoreline of archaeological site 21HU156. The Corps has made the determination that the willow stake planting would have No Adverse Effect to Historic Properties. This determination was coordinated with the Minnesota SHPO, the USFWS, Sac and Fox Nation, Oklahoma, Sac and Fox Tribe of the Mississippi in Iowa (Meskwaki Nation), Iowa Tribe of Kansas and Nebraska, Ho-Chunk Nation of Wisconsin, Iowa Tribe of Oklahoma, and the Winnebago Tribe of Nebraska on 30 September 2024. The USFWS concurred with the Corps Determination on 2 October 2024, and the Minnesota SHPO concurred on 5 November 2024. There have not been any tribal responses.

Table 11. Compliance with Environmental Protection Statutes and Other Environmental Requirements.

Environmental Requirement	Compliance[1]
Federal Statutes	
Archaeological and Historic Preservation Act	FULL
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	NA
Endangered Species Act of 1973, as amended	FULL
Farmland Protection Policy Act of 1981	NA
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	PARTIAL [2]
National Historic Preservation Act of 1966, as amended	FULL
National Wildlife Refuge Administration Act of 1966	FULL
Noise Pollution and Abatement Act of 1972	FULL
Watershed Protection and Flood Prevention Act	FULL
Wild and Scenic Rivers Act of 1968, as amended	NA
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 Cultural Environment (E.O. 11593)	FULL
Protection of Wetlands (E.O. 11990)	FULL
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 30 August 1976)	FULL

[1] The compliance categories used in this table were assigned according to the following definitions:

a. Full – All requirements of the statute, EO, or other policy and related regulations have been met for the current stage of planning.
b. Partial – Some requirements of the statute, EO, 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, EO, or other policy and related regulation
d. Not Applicable (N/A) – Statute, EO, or other policy and related regulations not applicable for the current stage of planning.

[2] Full compliance to be achieved with the District Engineer’s signing of the Finding of No Significant Impact.

6 Distribution and Review of the Draft Supplemental Environmental Assessment

A public notice of availability of the Draft Environmental Assessment was published on Day, Month, 2024 on the Corps’ website: http://www.mvp.usace.army.mil/Home/PublicNotices.aspx. The public comment period ended on Day, Month, 2024 and all comments received, including responses from the Corps are included in the Environmental Coordination and Public Review Comments section (Appendix A).

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USFWS. (2024, 09 04). *US Fish and Wildlife Service ECOS*. Retrieved from Western regal fritillary (Argynnis idalia occidentalis): https://ecos.fws.gov/ecp/species/12017

USFWS. (2024, 09 04). *US Fish and Wildlife Service ECOS*. Retrieved from Western Prairie Fringed Orchid (Platanthera praeclara): https://ecos.fws.gov/ecp/species/1669

USFWS. (2024, 09 04). *US Fish and Wildlife Service ECOS*. Retrieved from Dakota Skipper (Hesperia dacotae): https://ecos.fws.gov/ecp/species/1028

USFWS. (2024, 09 04). *US Fish and Wildlife Service ECOS*. Retrieved from Northern Long-eared Bat (Myotis septentrionalis: https://ecos.fws.gov/ecp/species/9045

USFWS. (2024, 09 04). *US Fish and Wildlife Service ECOS*. Retrieved from Monarch butterfly (Danaus plexippus): https://ecos.fws.gov/ecp/species/9743

USFWS. (2025, January 13). *US Fish and Wildlife Service - IPaC*. Retrieved from IPac - Information for Planning and Consultation: https://ecos.fws.gov/ipac

Attachment B

Examples of Typical Floodplain Forest Seed Mix and Stabilization Mix

Permanent seed species and mixtures shall be proportioned by weight as follows:

SEED MIX 1

Common Name	**Botanical Name**	**Seeding Rate (pounds per acre)**
Riverbank Wild Rye	Elymus riparius	0.28
Silky Wild Rye	Elymus villosus	0.3
Slender Wheatgrass	Elymus trachycaulus	1.78
Virginia Wild Rye	Elymus virginicus	3.24
Switchgrass	Panicum virgatum	1.95
Fowl Bluegrass	Poa palustris	0.25
Swamp Milkweed	Asclepias incarnata	0.06
Sneezeweed	Helenium autumnale	0.06
Great Blue Lobelia	Lobelia siphilitica	0.02
Cutleaf Coneflower	Rudbeckia laciniata	0.04
Blue Vervain	Verbena hastata	0.15
Common Ironweed	Vernonia fasciculata	0.07
Oats/Winter Wheat	Avena sativa/Triticum aestivum	25

SEED MIX 2

Common Name	Botanical Name	Seeding Rate (pounds per acre)
Riverbank Wild Rye	Elymus riparius	0.28
Silky Wild Rye	Elymus villosus	0.3
Slender Wheatgrass	Elymus trachycaulus	1.78
Virginia Wild Rye	Elymus virginicus	3.24
Switchgrass	Panicum virgatum	1.5
Fowl Bluegrass	Poa palustris	0.25
Swamp Milkweed	Asclepias incarnata	0.12
Sneezeweed	Helenium autumnale	0.1
Great Blue Lobelia	Lobelia siphilitica	0.05
Cutleaf Coneflower	Rudbeckia laciniata	0.04
Blue Vervain	Verbena hastata	0.15
Common Ironweed	Vernonia fasciculata	0.07
Oats	Avena sativa	25
Cardinal Flower	Lobelia cardinalis	0.02
Sweet Joe Pye Weed	Eutrochiuym purpureum	0.19
Wild Bergamont	Monarda fistulosa	0.23
Showy Goldenrod	Solidago speciosa	0.05
Indiangrass	Sorghastrum nutans	1
White Wild Indigo	Baptisia alba	0.5

Attachment C

Reno Bottoms LSOHC Project Floodplain Forest Management and Planting Plan developed by USACE Foresters in Coordination with the UMRNWFR

Millstone Bay Dredge Placement Reforestation

p09c07u001RNIH.2020.01

1 Prescription Area Description

Ownership and Management

All stands within the prescription area are owned by the US Army Corps of Engineers (USACE) and incorporated into the Upper Mississippi River National Wildlife and Fish Refuge per the 2001 Cooperative Agreement between USACE and the US Fish and Wildlife Service (USFWS). All areas are classified in the 2021 USACE/USFWS Land Allocation/Land Classification plan as Multiple Use – Wildlife Management.

This prescription is the follow-up revegetation work to be conducted upon newly placed dredged materials to be dredged as part of the MN DNR Lessard-Sams Millstone Bay project and is dependent upon the completion of that project to be implemented.

Area Boundaries

The northern boundary of the area is the gravel access road for the Millstone Boat Landing just east of the project area. The eastern boundary follows the line of living trees between Millstone Landing and the project area. The southern boundary is not physically demarcated on the ground and follows an east west line from the southeast to the southwest corner of the project area. The western boundary follows the edge of a higher elevation ridge with nearly total tree mortality back to the gravel access road.

FMG Area Designator(s)

P09c07u001RNIH.COE

Acreage

5.3 acres

Site Access

The site is accessible by land.

Current Vegetation

This site was subject to severe tree mortality due to chronic flooding over multiple growing seasons in the 2010s and is currently dominated by dead silver maple snags in various stages of decay. Scattered living trees remain but at very low densities. Live vegetation is dominated by early successional grasses and forbs that established after flooding with very little tree regeneration. Following the MN DNR material placement and follow up planting treatments, it is anticipated that the site will be populated with newly seeded native wet meadow forbs and natural tree regeneration dominated by cottonwood and willow. Based on similar previous projects, this natural regeneration could range from sparse to 30,000+ stems per acre depending on the timing of final herbaceous seeding and seed production in the spring following herbaceous seeding.

Prior Management

There is no known prior management on the site since Federal acquisition.

Avg Annual Inundation
Current average annual growing season days of inundation (based on the Van Appledorn inundation model) averages 57.7 days (st. dev. 12.3) within the treatment area. There are very small patches within the area that are below 30 days, but the vast majority of the area is over 40 days of annual inundation.

The primary objective of the MN DNR material placement it to raise elevation across the treatment area such that the area is generally below 30 days in annual average inundation.

Treatment Areas
- Cluster Planting (3.7 ac): The majority of the placement area will be planted with cluster plantings of oaks and other uncommon species to increase the density of mast producing trees and to increase diversity.

- Shrub and Willow (1.6 ac): An approximately 30 foot buffer strip will be planted along the southern and western edge of the treatment area with willow cuttings and flood tolerant shrubs

Limitations or Constraints
Final determinations of planting design will not be able to be made until material placement is complete and an initial evaluation of natural regeneration and herbaceous vegetation is complete.

Flooding and wet soils may also impact timing of planting treatments.

2 Management Objectives

Short-term
- Establish native woody vegetation on the site at regeneration densities >2,000 stems per ac.

- Increase densities of longer-lived hard mast producing species above the densities generally present on the site – target establishment of 100 stems per acre of hard mast producing species (primarily swamp white oak and bur oak)

- Increase tree and shrub diversity relative to adjacent stands; including additional light seeded species (river birch, cottonwood, willow) and soft-mast producing shrubs – target establishment of a minimum of 200 stems per acre of soft-mast producing shrubs and 500 stems per acre of non-silver maple light-seeded species (including natural regeneration)

Long-term
- Maintain as diverse forest with a major hard mast component, with a minimum of 30 hard mast producing trees per acre.

3 Silvicultural Prescription

Treatments
Treatments are designed to supplement anticipated natural regeneration with species that are not likely to be present in the natural regeneration and to increase species diversity on the site. Because it is anticipated that natural regeneration will be high on the site, subsequent planting densities will be lower to focus on increasing diversity rather than capturing the site.

Cluster Planting

Cluster planting will consist of planting of approximately six 0.046 acre clusters of trees and shrubs per acre. Each cluster will include 9 3-gallon containerized tree seedlings, 16 bareroot tree seedlings, and 24 bareroot shrub seedlings (Figure 1). Containerized trees shall be planted at a 15 x 15 ft spacing. Four out of the six clusters per acre will be hard mast clusters. Each hard mast cluster will have 5 containerized swamp white oak (*Quercus bicolor*), 2 containerized bur oak (*Q. macrocarpa*) and 2 containerized southern pin oak (*Q. palustris*). Within the matrix of containerized trees, an additional 16 bareroot tree seedlings will be planted at a 7.5 x 7.5 ft spacing. Bareroot trees will be 6 swamp white oak, 5 bur oak and 5 southern pin oak. The remaining two clusters per acre will be diversity clusters. For diversity clusters, there will be 3 containerized river birch (*Betula nigra*), 3 containerized American sycamore (*Platanus occidentalis*), 2 containerized silver maple (*Acer saccharinum*) and An outer ring of 24 bareroot redosier dogwood (*Cornus stolonifera*), gray dogwood (*Cornus racemosa*) and buttonbush (*Cephalanthus occidentalis*) seedlings shall be planted at a 7.5 ft spacing 7.5 feet outside the outer planted trees. The total number of trees and shrubs for cluster plantings will be 54 containerized trees, 96 bareroot trees and 144 bareroot shrubs per acre. Clusters will be located preferentially in areas where natural regeneration is sparse or absent.

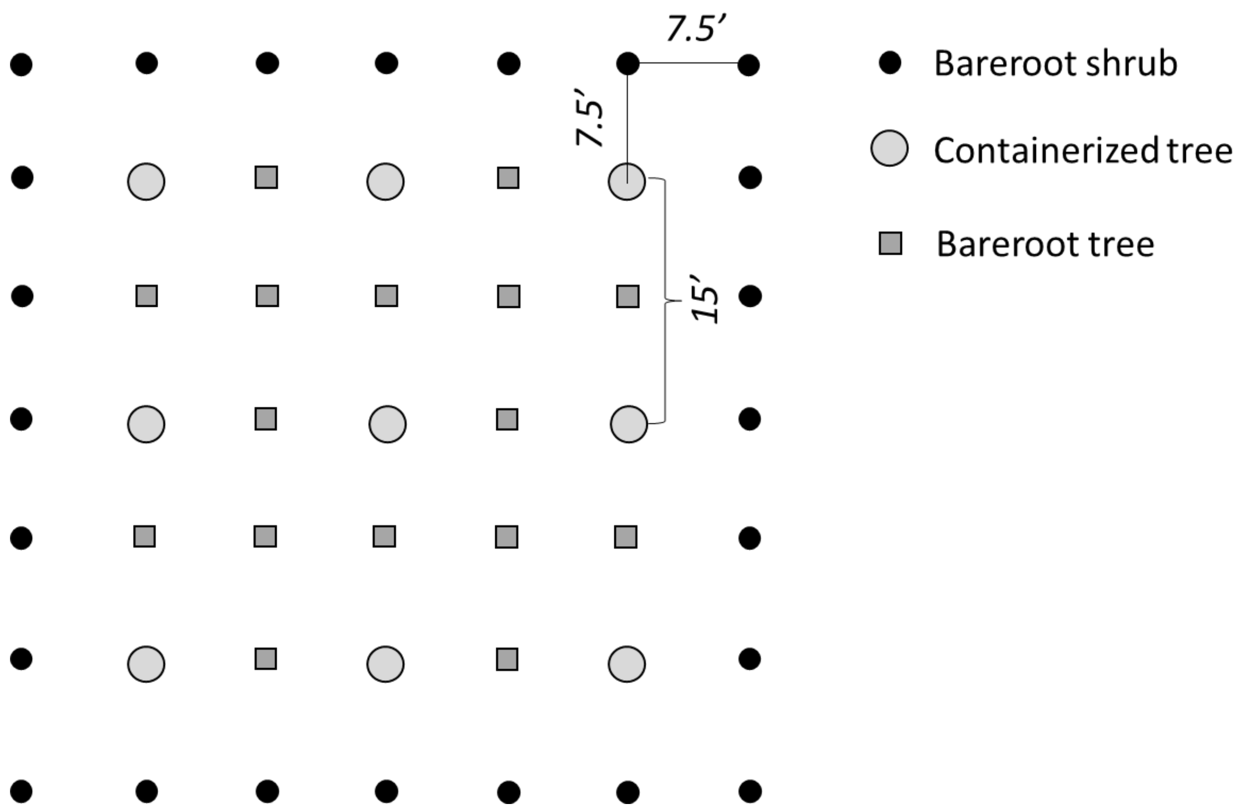


Figure 1. Diagram for cluster planting.

Shrub and Willow Planting

This planting will consist of a mix of shrubs and large willow cuttings to supplement and expand the willow cuttings planted to stabilize the exterior of the island within a 30 foot buffer on the waterward side of the placement area. Willow cuttings will be sandbar willow with a minimum height of 48" and a minimum basal diameter of 1". Large willow cuttings will be planted at a spacing of approximately 10 feet by 15 x 15 feet (approximately 194 stems per acre) and will be planted to a depth such that at least 50% of the cutting is below the soil surface. Cuttings will be collected within the immediate vicinity of the planting area and will be planted within 24 hours of being collected during the dormant season in the fall or spring. Shrubs will be the same mix of species as for the cluster plantings (redosier dogwood, gray dogwood and buttonbush) and will be planted as a mix of bareroot and containerized seedlings at a density of 302 stems per acre. Containerized seedlings will be 1 to 3 gallon container size and should constitute about one-third of the planted stems.

Invasive Species Management

Invasive species on constructed floodplain forest features have not been a major issue on similar projects in the past 10 years. However, in the initial years of maintaining the planting, if reed canary grass (*Phalaris arundinacea*), black locust (*Robinia pseudoacacia*), Japanese hops (*Humulus japonicus*), buckthorn (*Rhamnus cathartica*), or other unwanted non-native terrestrial invasive or noxious species are encountered on the site, they will be controlled to prevent establishment.

Timing of Treatments

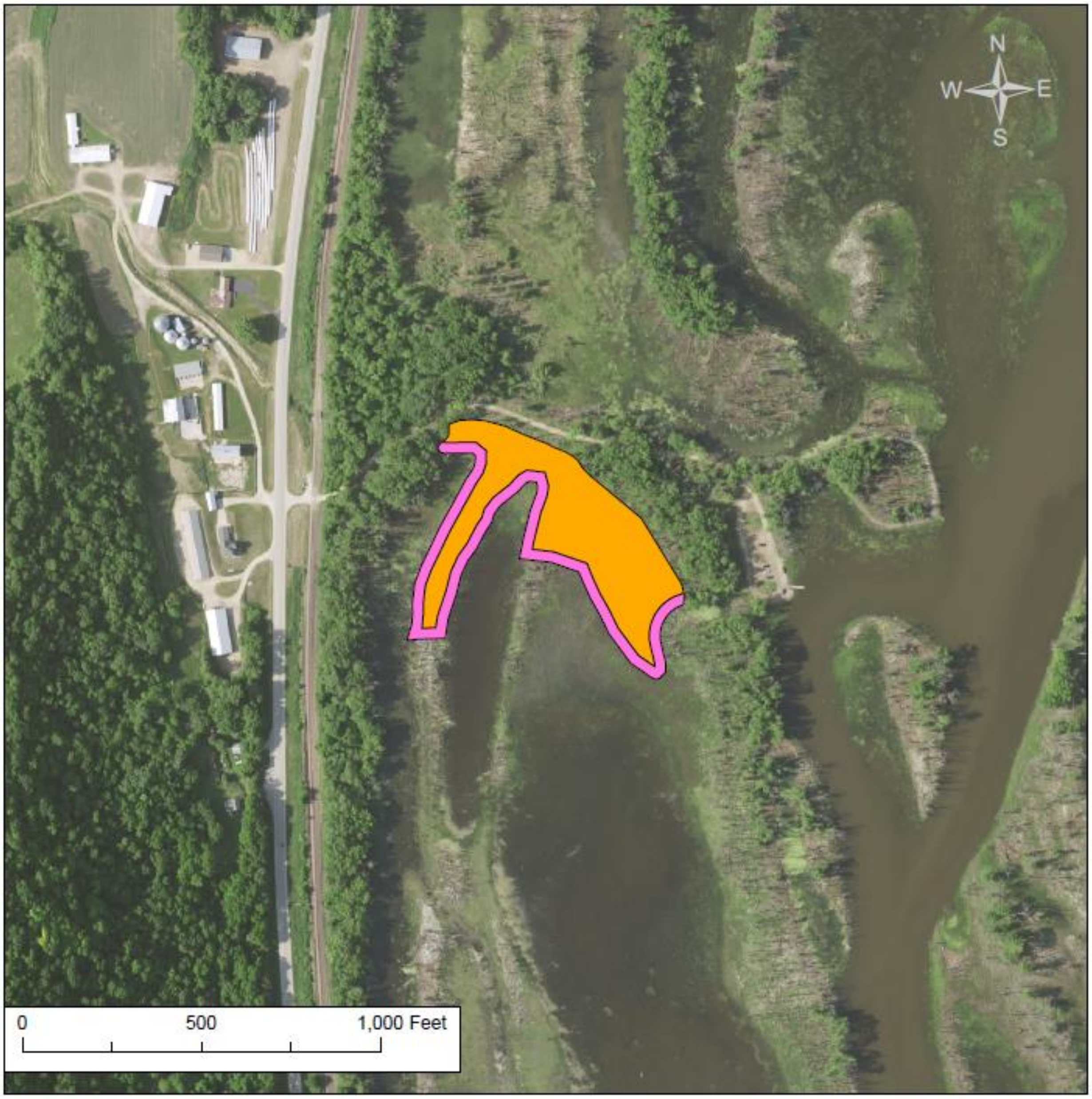
Planting treatments will be initiated either between October 15 and December 15 of the year following completion of placement or April 1 to May 30 in the second year following the completion of placement. This delay is designed to allow for an evaluation of natural regeneration and customization of planting prescriptions based on the presence and distribution of natural regeneration. Follow-up vegetation control treatments will be conducted for up to three growing seasons as needed to ensure establishment of planted stems.

Equipment

All tree planting work will be completed with hand equipment. Follow-up vegetation control may be conducted with herbicide applied via backpack sprayers or mechanically with weed whackers or walk behind brush mowers.

Site Impacts

No site impacts are anticipated from this prescription.



Cluster Planting
Shrub and Willow

Date: 9/11/2025

Millstone Bay Placement Revegetation p09c07u001RNIH.COE

US Army Corps of Engineers
St Paul District
Rec and Nat Res Branch
Environmental Section

Map Center: 43.539°, -91.279°

Spatial Reference: NAD 1983 UTM Zone 15N

Attachment D

Dredging Volume and Area Calculations

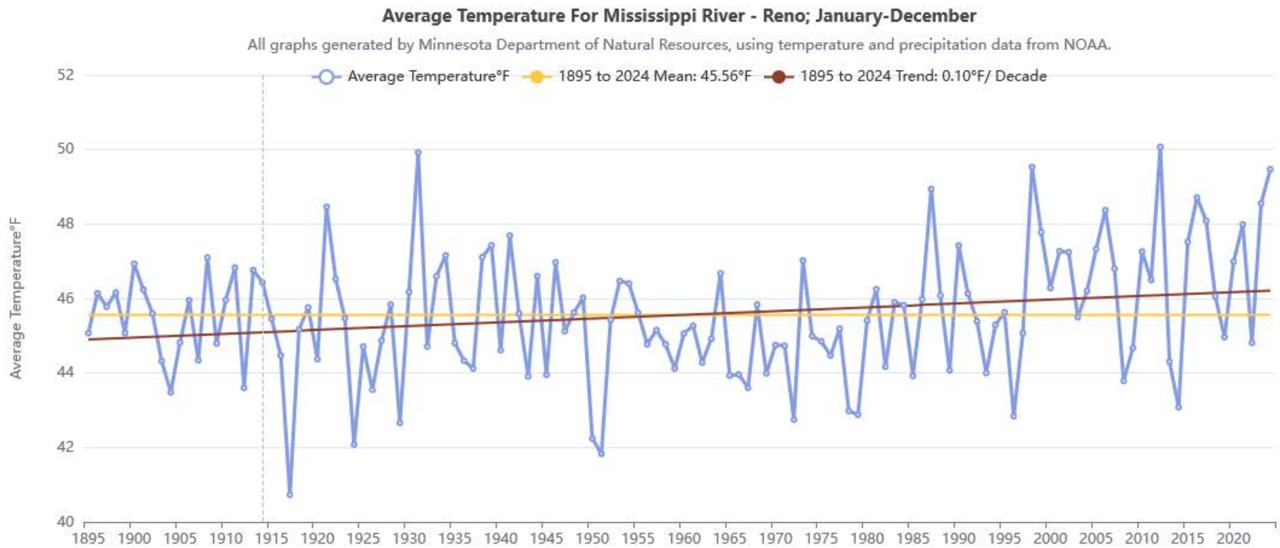
Attachment C Table 1. Example table of outputs calculated in an excel spreadsheet to calculate dredging metrics and volumes with variable inputs depending on project size, material type, depth of dredging, etc. Fixed, adjustable (ADJ.), and calculated (CALC.) values are represented under each variable. Screenshot below shows image of spreadsheet in excel.

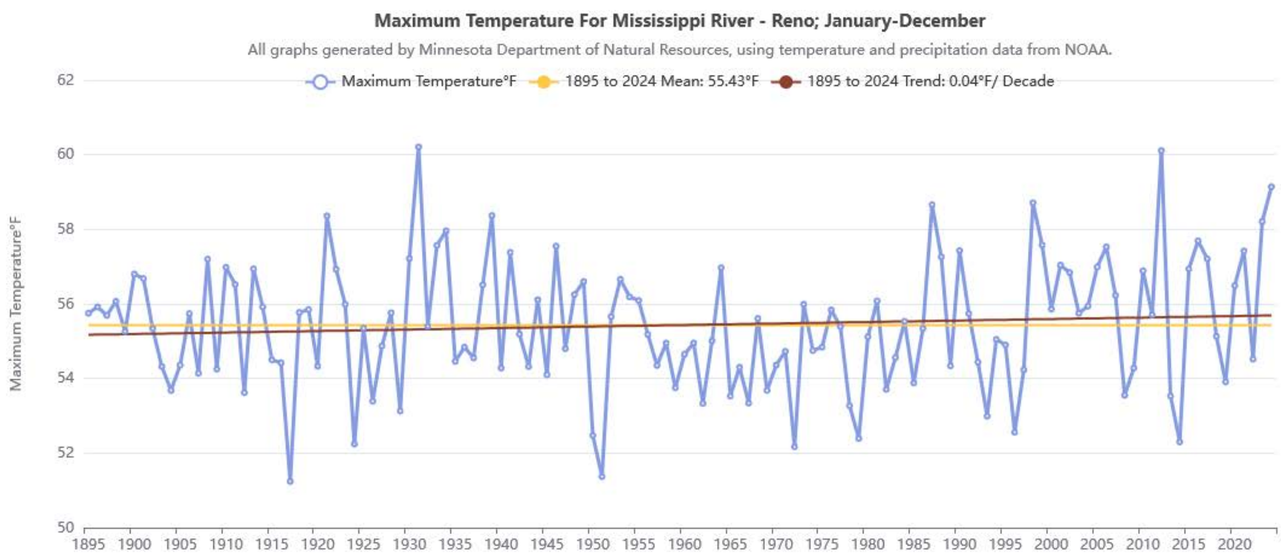
Water Depth (ft)	Dredge Depth (ft)	Dredge Area (surface acres) CALC.	Dredge Area (bottom surface acres) CALC.	Dredge Volume (cu yd) CALC.	Dredge Volume (cu ft) CALC.	Acre Feet of Dredging CALC.	Dredge Surface Length (ft) CALC.	Dredge Surface Width (ft) FIXED	Acre Foot (cu yd) FIXED	Fill Area (acres) FIXED	Forest Elevation Raise (ft) ADJ.	Fill (cubic yards post shrinkage) FIXED	Shrinkage (% of total) ADJ.	Side Slope of Dredge Cut ADJ.
10	9	2.98	1.61	32723.7	883540.9	20.28	436.3	270	1613	5.41	3	26178.99	.8	5
9	8	3.22	1.92	32723.7	883540.9	20.28	480.1	270	1613	5.41	3	26178.99	.8	5
8	7	3.54	2.30	32723.7	883540.9	20.28	537.1	270	1613	5.41	3	26178.99	.8	5
7	6	3.98	2.81	32723.7	883540.9	20.28	613.6	270	1613	5.41	3	26178.99	.8	5
6	5	4.62	3.51	32723.7	883540.9	20.28	721.3	270	1613	5.41	3	26178.99	.8	5

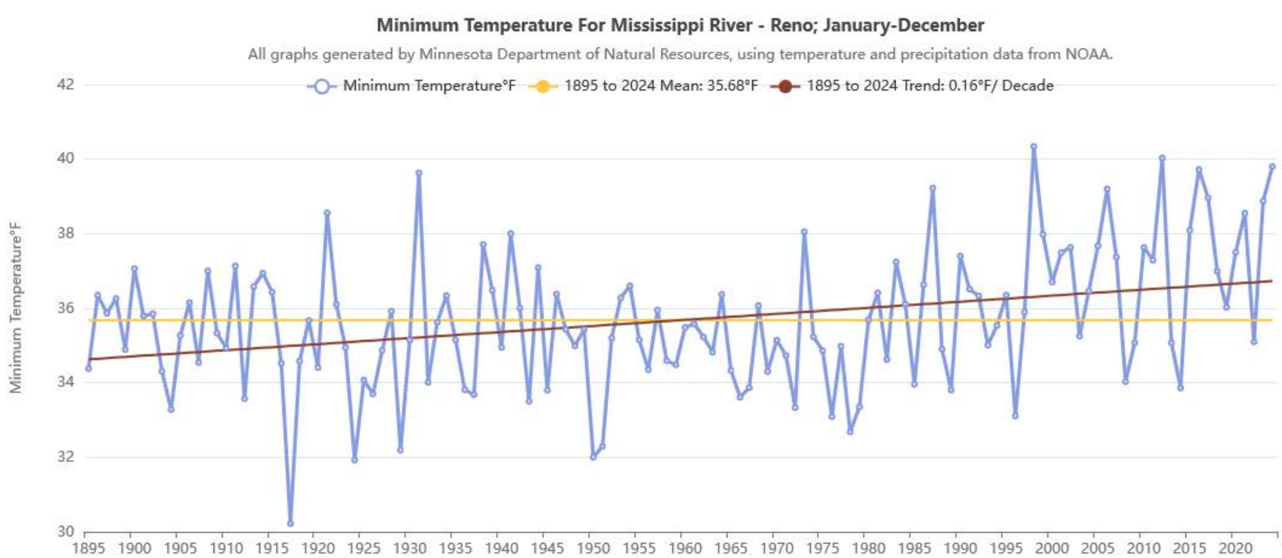
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Water Depth (ft) max	Dredge Depth (ft) max	Dredge Area (acres-SA)	Dredge Area (acres bottom)	Dredge Volume (cu yd)	Dredge Volume (cu ft)	Acre Feet of Dredge	Length (ft)	Depth (ft)	Surface Width (ft)	Bottom Width (ft)	Adjusted Dredge Length Surface	Adjusted Dredge Length Bottom
2	10	9	2.983366736	1.617010331	32723.7375	883540.9125	20.2875	436.3165	9	270	180	481.3165	391.3165
3	9	8	3.224288917	1.920000067	32723.7375	883540.9125	20.2875	480.1852785	8	270	190	520.1852785	440.1852785
4	8	7	3.546117382	2.305357841	32723.7375	883540.9125	20.2875	537.1069377	7	270	200	572.1069377	502.1069377
5	7	6	3.989070732	2.813354371	32723.7375	883540.9125	20.2875	613.5700781	6	270	210	643.5700781	583.5700781
6	6	5	4.62556542	3.516453979	32723.7375	883540.9125	20.2875	721.2578878	5	270	220	746.2578878	696.2578878
7													
8													
9												>900 ft = Bad	
10												Too Long	
11												For Millstone	
12													
13													
14	Acre Foot (cuyd)	1613											
15	Fill Area (acres)	5.41											
16	Elevation Raise (+ft)	3	Adjustable										
17	Fill CuYd	26178.99											
18	Shrinkage (% of total)	0.8	Adjustable										
19	Side Slope	5	Adjustable										

Attachment E

Climate Change Projections in the Proposed Project Area, Reno Bottoms, Houston County, Minnesota

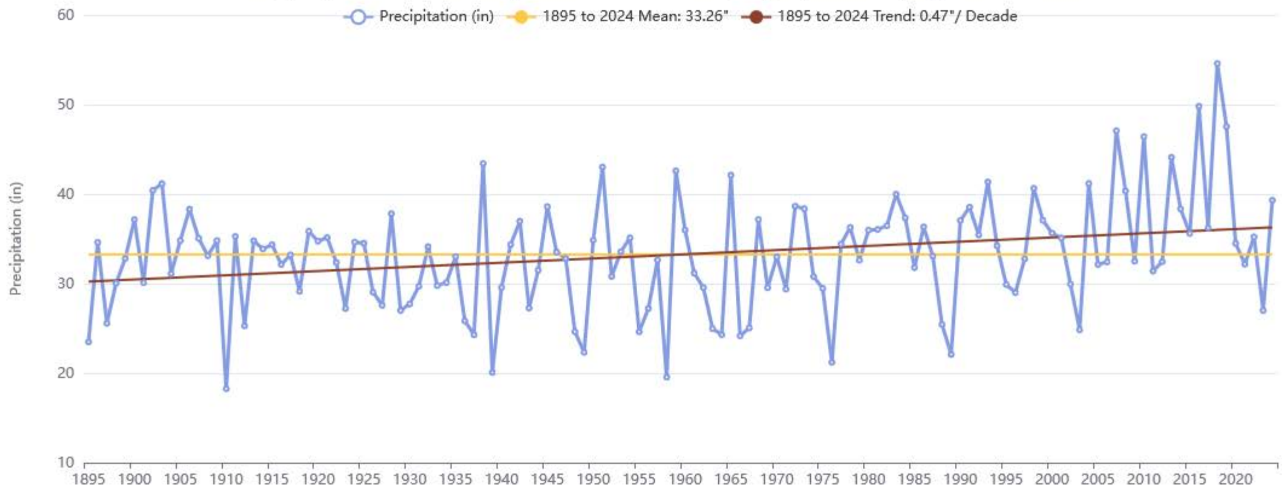

Average Temperature For Mississippi River - Reno; January-December
All graphs generated by Minnesota Department of Natural Resources, using temperature and precipitation data from NOAA.
Average Temperature°F
1895 to 2024 Mean: 45.56°F
1895 to 2024 Trend: 0.10°F/ Decade
Average Temperature°F
52
50
48
46
44
42
40
1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020


Maximum Temperature For Mississippi River - Reno; January-December
All graphs generated by Minnesota Department of Natural Resources, using temperature and precipitation data from NOAA.
Maximum Temperature°F
1895 to 2024 Mean: 55.43°F
1895 to 2024 Trend: 0.04°F/ Decade
Maximum Temperature°F
62
60
58
56
54
52
50
1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020


Minimum Temperature For Mississippi River - Reno; January-December
All graphs generated by Minnesota Department of Natural Resources, using temperature and precipitation data from NOAA.
Minimum Temperature°F
1895 to 2024 Mean: 35.68°F
1895 to 2024 Trend: 0.16°F/ Decade
Minimum Temperature°F
42
40
38
36
34
32
30
1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020

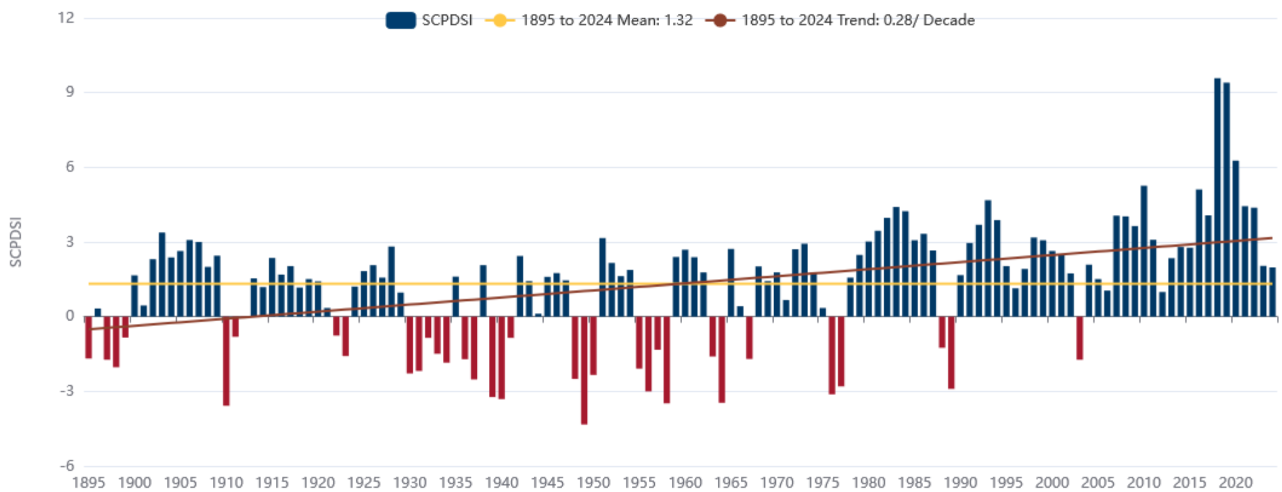
Precipitation For Mississippi River - Reno; January-December

All graphs generated by Minnesota Department of Natural Resources, using temperature and precipitation data from NOAA.



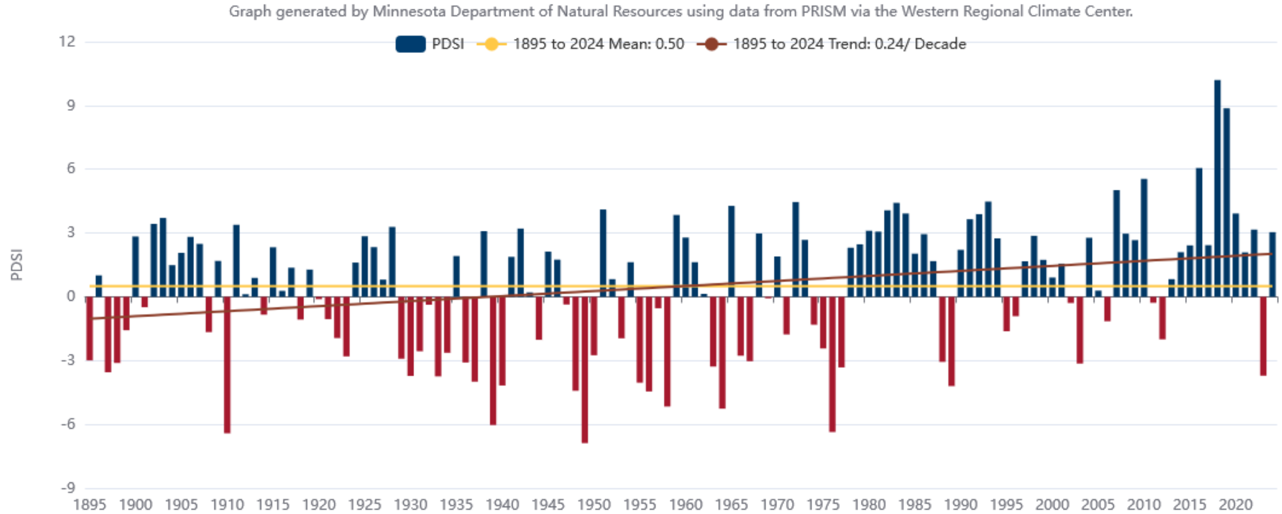
SC Palmer Drought Severity Index (SCPDSI) For Mississippi River - Reno; December

Graph generated by Minnesota Department of Natural Resources using data from PRISM via the Western Regional Climate Center.



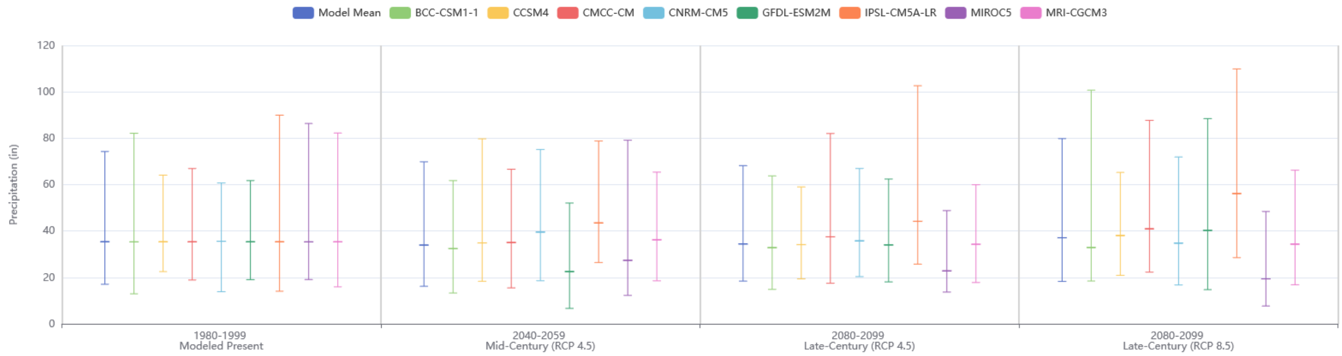
Palmer Drought Severity Index (PDSI) For Mississippi River - Reno; December

Graph generated by Minnesota Department of Natural Resources using data from PRISM via the Western Regional Climate Center.



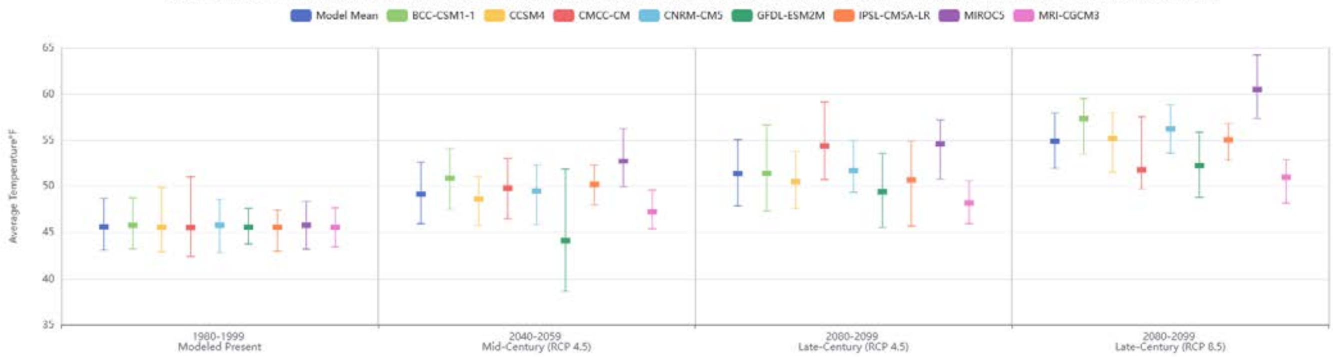
Recent and Projected Future Precipitation For Mississippi River - Reno; January-December

Graph generated by Minnesota Department of Natural Resources using data from University of Minnesota climate modeling. These values may differ from those published in national and global climate assessments.



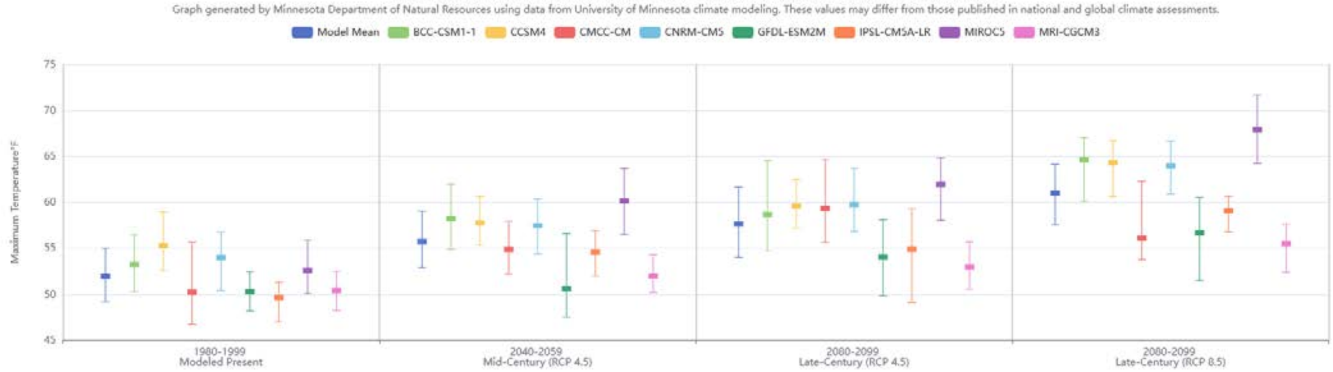
Recent and Projected Future Average Temperature For Mississippi River - Reno; January-December

Graph generated by Minnesota Department of Natural Resources using data from University of Minnesota climate modeling. These values may differ from those published in national and global climate assessments.



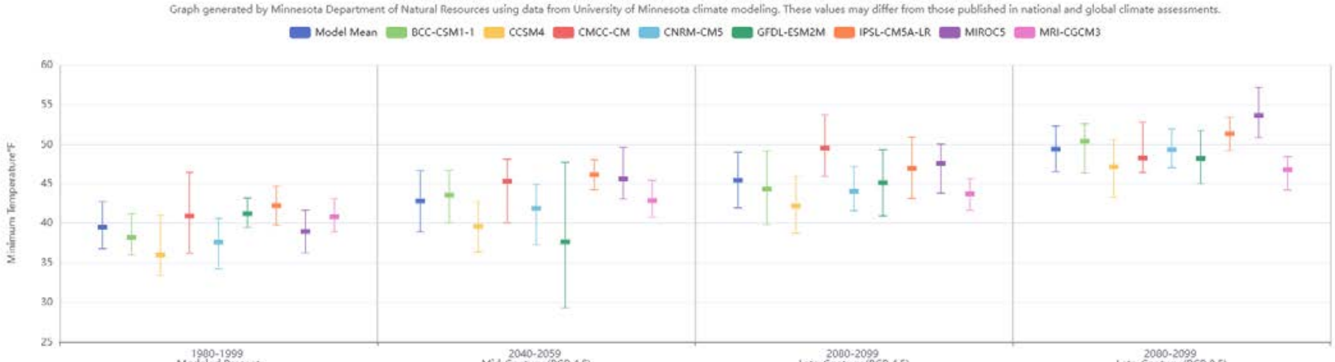
Recent and Projected Future Maximum Temperature For Mississippi River - Reno; January-December

Graph generated by Minnesota Department of Natural Resources using data from University of Minnesota climate modeling. These values may differ from those published in national and global climate assessments.



Recent and Projected Future Minimum Temperature For Mississippi River - Reno; January-December

Graph generated by Minnesota Department of Natural Resources using data from University of Minnesota climate modeling. These values may differ from those published in national and global climate assessments.



DEPARTMENT OF NATURAL RESOURCES

Climate Explorer Metadata

Document Version: 1

Date: 04/09/2021

Notes: This is the original document, describing data used in Climate Explorer tool, at [website]

Contents:

Information for “Historical” portal

Purpose

Graph and analyze year-to-year variations and longer-term trends in Minnesota’s climate. Creates a time series of climate data of one value per year, based on the area, range of months, range of years, and climate variable selected.

Data background

Gridded datasets at 5 km or 4 km resolution, with geometrically-averaged values determined by area(s) selected for a given variable and monthly period, by year, for range of years selected. Two data sources:

Temperature: 5 km gridded monthly values (can be summarized as multi-month periods). Available as *Average*, *Maximum*, and *Minimum Temperature*, representing the monthly or multi-month mean of the daily average, daily high (maximum), or daily low (minimum) temperatures. Data from NOAA National Centers for Environmental Information (https://www.ncdc.noaa.gov/monitoring-references/maps/us-climate-divisions.php#grdd).

Precipitation: 5 km gridded monthly values (can be summarized as multi-month periods), representing the monthly or multi-month sum (total) precipitation. Data from NOAA National Centers for Environmental Information (https://www.ncdc.noaa.gov/monitoring-references/maps/us-climate-divisions.php#grdd)

PDSI and SCPDSI (Palmer Drought Severity Index and “Self-Calibrating” Palmer Drought Severity Index): 4 km gridded derived products based on monthly temperature and precipitation data produced by PRISM (http://www.prism.oregonstate.edu/), and accessed through the Western Regional Climate Center (https://wrcc.dri.edu/wwdt/about.php). Available only as single monthly value per year.

Timeframes

Temperature and precipitation: single monthly value per year, or aggregated multiple-month values spanning durations of 2 - 12, 18, 24, 36, 48, and 60 months, plus annual and year-to-date values. All temperature values averaged and all precipitation values summed over selected months. Year-to-date is January through most-recent complete month, typically available by the 10th day of the present month. When selection overlaps end/beginning of year, value is plotted as belonging to the final year of range.

PDSI and SCPDSI: Available only as single monthly value per year; multi-month aggregations not available.

Years and months available: All variables available January 1895 through most recent month.

Information for "Projected (Future)" portal

Purpose

Graph and analyze climate projections for mid-century (2040-2059) and late-century (2080-2099; low and high emissions), and compare to the modeled recent-past (1980-1999). Graphs the average and range for each 20-year period/scenario and for each model, based on the area, portion of the year, and climate variable selected.

Data background

General circulation global climate models obtained from CMIP5 (Coupled Model Intercomparison Project, Phase 5; see: https://pcmdi.llnl.gov/mips/cmip5/), and dynamically-downscaled to ~ 10 km resolution using Weather Forecasting & Research (WRF) model, at University of Minnesota, in service of project described at: https://conservancy.umn.edu/handle/11299/209130.

Timeframes

Each downscaled model was run for three time frames, producing a total of four scenarios: Modeled Present (1980-99); Mid-Century (2040-2059) at Representative Concentration Pathway (RCP) 4.5; Late-Century (2080-2099) at RCP 4.5; and Late-Century (2080-2099) at RCP 8.5.

Model Definitions

Term	Definition
RCP	Representative Concentration Pathway: A greenhouse gas concentration scenario used by the Intergovernmental Panel on Climate Change in the fifth Assessment Report.
RCP 4.5	An intermediate scenario in which emissions decline after peaking around 2040.

Term	Definition
RCP 8.5	An extreme, or worst-case scenario in which emissions continue rising through the 21st century.

Originating General Circulation Model Information

Model Name	Description	Institution
Model Mean	Average of all models listed below	See below
BCC-CSM1-1	Climate System Model, Beijing Climate Center	China Meteorological Administration (China)
CCSM4	Community Climate System Model	Department of Energy/University Corporation for Atmospheric Research (USA)
CMCC-CM	Coupled Ocean-Atmosphere Model	Centro Euro-Mediterraneo per Cambiamenti Climatici (Italy)
CNRM-CM5	Climate Model 5	National Centre for Meteorological Research / Centre Europeen de Recherche et Formation Avancees en Calcul Scientifique (France)
GFDL-ESM2M	Earth System Model (Modular ocean)	NOAA Geophysical Fluid Dynamics Laboratory (US)
IPSL-CM5A-LR	Climate Model 5A, Low Resolution	Institut Pierre-Simon Laplace (France)
MIROC5	Model for Interdisciplinary Research On Climate	Atmosphere and Ocean Research Institute (The University of Tokyo), National Institute for Environmental Studies, and Japan Agency for Marine-Earth Science and Technology (Japan)
MRI-CGCM3	Coupled General Circulation Model 3	Meteorological Research Institute (Japan)

Graph and Data Definitions

Term	Definition
Lowerrange ("Lower Range")	The lowest value for of each 20-year period/scenario, given the area, variable, and month(s) selected.

Term	Definition
Mean	The average value of each 20-year period/scenario, given the area, variable, and month(s) selected.
Median	The middle value of each 20-year period/scenario, given the area, variable, and month(s) selected. Because 20 is an even number, the median represents the average of the two middle values (i.e., the 10th smallest and 10th largest).
Upperrange ("Upper Range")	The highest value of each 20-year period/scenario, given the area, variable, and month(s) selected.

Attachment F

Minnesota State Historic Preservation Office Approval Correspondence and Archaeological Survey Report

DEPARTMENT OF ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

5/13/2025

VIA EMAIL ONLY

Subject: SHPO Comment on Project Submission

Project Activity: Dredging Project

Project Description: Reno Bottoms Restoration; Dredging and placement of dredged material for habitat improvement

City/Township: Jefferson Twp.

County: Houston

Township/Range/Section: T101 R4 S23

SHPO Number: 2025-0558

Thank you for the opportunity to comment on the project submission received on 2/4/2025. We have reviewed the project in accordance with the responsibilities outlined for the State Historic Preservation Officer under Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108) and its implementing federal regulations, "Protection of Historic Properties" (36 CFR Part 800).

Based on available information, we conclude that a finding of **No Historic Properties Affected** is appropriate for this project.

If you have any questions regarding our comment letter, please send them to ENReviewSHPO@state.mn.us and reference the SHPO number.

Sincerely,

Amy Spong
Deputy State Historic Preservation Officer

Prepared by Bear Creek Archeology, Inc. and Emmons & Olivier Resources, Inc.

Prepared for Minnesota Department of Natural Resources

PHASE I CULTURAL RESOURCES INVENTORY FOR THE RENO BOTTOMS RESTORATION PROJECT, HOUSTON COUNTY, MINNESOTA

water ecology community

PHASE I CULTURAL RESOURCES INVENTORY FOR THE RENO BOTTOMS RESTORATION PROJECT, HOUSTON COUNTY, MINNESOTA

Environmental Review & Technical Services Master Contract Program for Environmental-Review Related Services – Master Contract T-Number: 19AER

ARPA Permit: DACW37-4-25-0004

EOR-0037-0099

BCA 3619

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MANAGEMENT SUMMARY

This report presents the results of a Phase I cultural resources inventory by Bear Creek Archeology, Inc. and Emmons & Olivier Resources, Inc. for the proposed Minnesota Department of Natural Resources' Reno Bottoms Restoration Project in Houston County, Minnesota. The project area is located in the NE¼ of Section 23, T101N, R4W. This area is between Minnesota State Highway 26 and Millstone Boat Landing, directly south of the access road leading to the boat landing and covers approximately 8.1 ha (3.3 ac). Access to the project area will be along these roads, and all materials will be staged and stored within the project area. At the time of the survey on November 7, 2024, the project area was within an overgrown wooded area with water-tolerant grasses and standing water along the southern portion. An archival review identified no previously recorded archeological sites or inventoried properties within the project area and determined that the nearby plot for archeological site 21HU0007 is erroneous, as data in the site file indicate this site is actually some 250 m away from the current project area on a higher landform. No residences or other built features are depicted on the available nineteenth- and twentieth-century maps or twentieth-century aerial photographs. One map indicates that the project area was once a sod farm, which resulted in the removal of the upper soil horizons from the area. A review of the aerial images also indicates that much of the project area is frequently under water, especially following the construction of the lock and dam system.

A field investigation, which consisted of a geomorphological investigation and a pedestrian visual inspection of the area, indicated that the project area was comprised of recently deposited alluvium overlying poorly drained truncated subsoils and areas of deep deposits of recent alluvium. Additionally, no historic features were observed during the surface examination. Based on these findings, the project area was determined to have low to negligible archeological site potential and no subsurface testing was conducted. BCA recommends no further cultural resources investigations for the project area.

Information contained in this report relating to the nature and location of archeological sites is considered private and confidential and not for public disclosure in accordance with Section 304 of the National Historic Preservation Act (54 USC § 307103); 36 CFR Part 800.6(a)(5) of the Advisory Council on Historic Preservation's rules implementing Sections 106 and 110 of the National Historic Preservation Act; Section 9(a) of the Archaeological Resource Protection Act (54 USC § 100707).

INTRODUCTION

This report presents the results of a Phase I cultural resources inventory conducted by Bear Creek Archeology, Inc. (BCA) and Emmons & Olivier Resources, Inc. (EOR) for the proposed Minnesota Department of Natural Resources' Reno Bottoms Restoration Project in Houston County, Minnesota. This Phase I archeological resources inventory was conducted in accordance with the National Historic Preservation Act (Advisory Council on Historic Preservation 2004, 2016) and the Secretary of the Interior's standards for the identification of historic properties (National Park Service [NPS] 1983), the investigation meets or exceeds the guidelines for Minnesota archeological investigations, as outlined in the *State Archaeologist's Manual for Archaeological Projects in Minnesota* (Anfinson 2011). This report details the information-gathering process concerning cultural resource properties that may exist in or near the project area, provides descriptions of cultural resources when encountered, their natural contexts, and recommendations concerning the potential impact of the proposed development on existing cultural resources. The investigation included archival research, landform evaluations, and a field investigation, which included a geomorphic assessment. The fieldwork portion of this investigation was conducted by BCA personnel on November 7, 2024. Fieldwork, data analyses, and report production were completed by BCA personnel under the supervision of the principal investigator. The resulting field notes and other records generated by BCA during this project are housed at BCA's office in Cresco, Iowa.

PROJECT LOCATION AND DESCRIPTION

The proposed Reno Bottoms Restoration Project area is located in south-eastern Minnesota within the Rochester Till Plain Physiographic Region (Wright 1972; Figure 1) and the Southeast Riverine Archaeological Resource Region (Region 3; Anfinson 1990; Figure 2). Positioned along the floodplain of the Mississippi River, the project area is within the NE¼, Section 23, T101N, R4W, Houston County, Minnesota (Figure 3). The project area is between Minnesota State Highway 26 and the Millstone Boat Landing, directly south of the access road leading to the boat landing and covers approximately 8.1 ha (3.3 ac; Figure 4). Access to the project area will be via the existing developed road running on the northern edge of the restoration site. Staging and storage will be on site.

The purpose of the project is to reduce and control invasive species (primarily Reed canary grass [Phalaris arundinacea L.) pressure on the local landscape by establishing a tree canopy to shade out targeted species. Because of wetland conditions on-site, trees will be planted on 8-to-10-inch tall, 6-to-8-feet wide berms (or beds). The beds will be formed using on-site soils. Once constructed, 0.5-inch caliper native tree stock with an average height of 3 to 5 feet will be placed on the berms every 20 to 30 feet in 10-inch wide, 7.5-inch-deep holes on top of the constructed berm. A 4-by-4-foot photodegradable polypropylene barrier mat will be placed around the tree trunk to reduce weed competition and pressure. Impacts to archeological resources could occur during grading and grubbing to install the berms and excavation of the holes for the nursery stock.

The proposed Reno Bottoms Restoration Project area is on land owned and managed by the U.S. Army Corps of Engineers (USACE). An Archaeological Resource Protection Act (ARPA) permit was obtained from the USACE before the start of the field investigations (Permit No. DACW37-4-25-0004; Appendix A). Funds for the restoration effort are through the Minnesota Department of Natural Resources.

INVESTIGATION PREMISES

The purpose of this investigation is to document the cultural resources within the project area at the Phase I level of investigation. The goals of the Phase I survey are based on the Secretary of the Interior's Standards and Guidelines for the Identification of Archeological Properties (NPS 1983:44716–44728). These standards are summarized and annotated within the *State Archaeologist's Manual for Archaeological Projects in Minnesota* (Anfinson 2011).

Phase I surveys are intended to provide basic data on the occurrence, location, and identification of cultural resources within a given area. The survey strategy of this Phase I investigation was based on an analysis of the project area and the landforms within it. Archeological sites are integrated into the environment by natural surficial and formation processes and may be viewed not only as cultural remains but also as geologic deposits. Geological processes condition the geographic and pedologic character of a region, and an awareness of these site formation processes is fundamental to any evaluation of the archeological record. Landform and soil attributes have a strong influence on the presence, absence, and distribution of the plant and animal populations utilized by human groups. Geological processes affect not only the patterns of human habitation and environmental exploitation but are also largely responsible for the preservation, destruction, and manipulation of the archeological record. Therefore, archeological sites should be viewed as a product of both cultural and geological processes (Bettis and Green 1991).

This perspective on site location considers both the geological processes and cultural interactions of an area, allowing archeologists to use landform modeling to ascertain site potential within a given region (Bettis and Benn 1984; Bettis and Thompson 1981). Such an approach also proves useful in investigator recognition of post-settlement alluvium (PSA), made land, plowzones (Ap horizons), and other disturbances that may have modified the area under investigation.

As a tool of cultural resource management, this type of landform modeling is critical to the development and implementation of survey strategies. More sensitive strategies toward geomorphological context allow the investigator to focus on those areas where the probabilities of site occurrence are highest. This reduces or eliminates the cost of surveying areas where sites should not sensibly occur in situ (e.g., made land, heavily disturbed areas, and landforms consisting entirely of recent alluvium, etc.). Informed survey strategies such as those outlined above allow for the determination of the depth and distribution of subsurface tests necessary for the detection of buried cultural resource deposits. Additionally, the nature of the proposed impacts can be assessed in terms of the landforms present.

GENERAL INVESTIGATION METHODOLOGY

Before beginning the fieldwork, site and previous survey records databases maintained by the Minnesota Office of the State Archaeologist and the Minnesota State Historic Preservation Office (SHPO) were examined to determine if previously reported properties were recorded within or near the project area. To check for potential historic properties and non-extant structures, digital copies of the 1853 General Land Office (GLO) maps, late nineteenth- and early twentieth-century maps, and 1937–2022 aerial photographs stored on the BCA server were also consulted.

Also, preceding fieldwork, a utility locate request was made. As part of the fieldwork, a geomorphic review was conducted to assess the landform context of the survey area. A ¾" hand probe was used to inspect subsurface deposits and monitor the depth of the alluvium and other modern impacts. Representative soil profiles were recorded for each landform, supplemented by visual assessments of the project area. All soil cores were contained within the project area boundary. A submeter accurate GPS was used to record the locations of soil cores and other data. Field notes and photographs are on file at BCA. Field investigations were then conducted as needed based on the findings of the archival review and geomorphological evaluation and followed the guidelines for archeological investigations in Minnesota offered by the *State Archaeologist's Manual for Archaeological Projects in Minnesota* (Anfinson 2011).

ENVIRONMENTAL CONTEXT AND LANDFORM MODELS

As part of the preparation for conducting this Phase I survey, information regarding the surficial geology of the project area and the larger region that it is in was reviewed. The following summarizes some of those data.

Physiographic and Archeological Regions

The project area is located within the Rochester Till Plain (Wright 1972; Figure 1) and the Southeast Riverine Archaeological Resource Region (Region 3; Anfinson 1990; Figure 2) regions of south-eastern Minnesota. The Rochester Till Plain consists of a broad region blanketed in glacial till and outwash, although the most recent Wisconsinan advances did not cover the area. The region is described as generally "featureless" and is dominated by an elevated expanse that ranges from flat to gently undulating (Winchell and Upham

1884:348; Wright 1972:577). Exceptions to the lack of topographic relief that generally characterizes the region occur near the Mississippi River in the form of deeply dissected tributaries. The deeply dissected valleys along the Mississippi River give the eastern edge of the region a mountainous look (Wright 1972:578). Paleozoic sedimentary rocks mantled by colluvium or loess outcrop along the valley slopes of creeks and rivers throughout the eastern portion of the region. Conversely, the creeks and rivers that drain the western part of the region tend to be hemmed by broad and shallow valleys.

The Southeast Riverine Archaeological Resource Region (Region 3; Figure 2) was not covered by ice during the most recent Late Wisconsinan glacial advance, but some secondary glacial deposits are present in the region. These deposits are comprised of outwash terraces along some drainages and loess deposits in the uplands. Numerous streams dissect the region, but no natural lakes are found in the region's interior. The vegetation of the area consists of mixed gallery forests (Gibbon et al. 2002). During the late Holocene, elm, ash, and cottonwood bordered streams and rivers, while maple, elm, and basswood occupied uplands bordering streams and rivers. The balance of the region was occupied by oak savannah and prairie (Gibbon et al. 2002). In general, the soils of the region transition from medium-textured prairie and prairie border soils in the west to finer-textured forest and prairie soils formed on loess over Paleozoic bedrock in the east (Gibbon et al. 2002). The upland and riverine environments of this region offered a diverse suite of both plant and faunal resources to prehistoric and historic peoples in the region. Evidence for the human occupation of the region extends back to the Paleoindian tradition.

Landform Sediment Assemblages and Predictive Modeling

The landform sediment assemblage (LSA) model of the upper Mississippi River valley maps most of the project area as Undifferentiated Vertical Accretion deposits (IVU) and the far northwestern portion as Tributary Alluvial Fan (TAF), both of which are interpreted as having been deposited sometime between the early to late Holocene (ca. 9,500 BP–1,800 AD; Madigan and Schirmer 2001). The IVU is a unit of the Minor and Inactive Channel LSA group and consists of recent sediment deposited during highwater flood episodes that overlies alluvium from when the paleochannels were active during the Holocene (Madigan and Schirmer 2001:44). The TAF is a unit of the Tributary Stream LSA group, that is formed from the alluvium carried by tributaries as they enter the valley and deposit that sediment onto the landforms along the valley's margin (Madigan and Schirmer 2001:48–49). The archeological potential of both of these LSAs is highly variable; and is dependent on variables such as drainage conditions, and the amount of reworking of the sediments by later fluvial activities (Madigan and Schirmer 2001:45, 51). The Madigan and Shirmer LSA model covered a very large area, and a smaller-scale model was produced by David W. Benn during an earlier nearby BCA project (Blikre and Benn 2008) that includes the portion of the floodplain covered by the current project area. Benn's modeling is based on the LSA model produced for the Rock Island District (Bettis et al. 1996) and uses that terminology. The following text is derived from that project's report.

The project area is in a portion of the upper Mississippi floodplain dotted with backwater lakes through which multiple sloughs (abandoned channels) flow. The larger, round lakes and ponds present in portions of the floodplain are indicative of middle Holocene landforms transected by the tributary stream, while the linear lakes and intermingled sloughs are typical of late Holocene landforms. Variable thicknesses of recent alluvium cover many of these lower landforms.

Middle Holocene Mississippi Channel Belt (EMHOL2). This LSA is a sub-unit of the EMHOL LSA, representing channel, meanderbelt, and island deposits of the middle Holocene time period (ca. 8,000–5,000 BP; Benn and Anderson 1995). It encompasses low-relief, slightly undulating, poorly drained, linear to broadly arcuate surfaces on the Mississippi floodplain. Where unrestricted by artificial levees, high-stage Mississippi River floodwaters overtop portions of this landform. The EMHOL2 is inset below the Wisconsinan terraces and cut out by the Late Holocene Channel Belt (LAHOL) LSA. Sloughs and shallow lakes border all sides of the earlier EMHOL1 and less so for the EMHOL2. Prior to the lock and dam construction and the subsequent flooding of the bottoms, these backwaters were active side-channels of the Mississippi River. Perennial tributary streams flow into and around the EMHOL2 on their courses toward the Mississippi River. On USGS 7.5' topographic maps, the EMHOL2 LSA appears as low-relief areas that contain some shallow closed depressions (lakes). The EMHOL2 has more pronounced swells and swales, as well as arcing, ridged shorelines, and wetlands, reflecting lateral accretion topography that is less mantled than that of the earlier EMHOL1.

Generally, the EMHOL2 basal deposits of more than 3.5 m (11.5 ft.) thickness consist of fine sand and silt loam overlain by organic enriched, gleyed fine-grained channel fill (silty clay loam). The channel fill is capped by slightly coarser-grained deposits (loam) of Late Holocene alluvium. This sequence represents a lengthy episode of valley alluviation during the Middle Holocene period. Periods of landscape stability (and soil formation) interrupted this alluviation record at the end of the Middle Holocene period and throughout the Late Holocene period, resulting in one or more buried soils. Stratified soil sequences are part of the Odessa Soil Sequence (Benn et al. 1988). The near-surface (first) buried soil often shows profile development indicative of landscape stability for the last 1,500–2,000 years, the age of Late Woodland cultural deposits normally found within this soil (Benn and Anderson 1995). Soil profile 1 from the project area (Appendix B) exhibits PSA overlying a truncated soil at roughly 120 cm below the surface, which is characteristic of late EMHOL2 deposits. Gleyed horizons at the bottoms of these soil profiles are not usually found in this landform due to its typically well-drained sediments, but this reach of the river seems to have a perennially high-water table that even preceded the construction of the lock and dam system.

The archeological potential of the EMHOL2 is varied and hazardous to postulate with any certainty because speculations are based on insufficient archeological survey coverage from a wide range of Mississippi River pools, especially for buried components. The 1994–1995 geomorphological reconnaissance and archeological survey in Lake Odessa produced a total of six sites in 202.3 ha (500 ac) for a high site density of 2.6% on the EMHOL1 (Benn 1996; Benn and Anderson 1995). The EMHOL2 LSA was predicted to have a "high" surface potential and "high-moderate" subsurface potential down to 1.5 m (Benn 1996). Artifactual finds from 13LA30 in Lake Odessa indicate that the depth of subsurface potential on the EMHOL2 could be extended to 2.5 m or more at some locations. The EMHOL2 in the current project area appears to have a gleyed lower soil profile. Poorly drained landforms like this were not attractive to prehistoric hunters and gatherers, nor were they extensively occupied or utilized by historic settlers.

Tributary Fan (TRIFA). TRIFA LSA encompasses all landforms and deposits related to major tributary rivers on the Mississippi floodplain and in the lower reaches of the tributary valleys. This LSA is the least studied and most poorly understood of the major LSAs in the Upper Mississippi Valley. TRIFA surfaces are slightly elevated above the Mississippi River floodplain, but the Mississippi River and tributary rivers seasonally flood portions of them. This LSA appears to interfinger with the EMHOL2 LSA in the project area. TRIFA contains abandoned channels, oxbow lakes, scroll-bar complexes, natural levees, crevasse splays, and flood basins associated with tributary streams.

The broad-scale pattern of the TRIFA LSA is roughly fan-shaped and emanates from the tributary valley. Deposits within the TRIFA LSA are quite variable but usually consist of 1–2 m of fine-grained alluvium grading downward to fine sand and sometimes pebbly sand alluvium. The fine-grained mantle is thinner or absent on natural levees, splays, and ridges of recently abandoned scroll bar complexes. Abandoned channels have thick, fine-grained fills, some of which contain zones of detrital organics, peat, or muck. These organic zones contain Holocene paleoecological records, but the records tend not to be as complete as those found in the larger abandoned Mississippi channels in EMHOL LSA. Soil Profile 2 from the current project area (Appendix B) was consistent with these descriptions and exhibited stacked zones of sand and clay, with the sand size increasing with depth. The archeological potential of TRIFA seems to vary with the nature of its sedimentology. Well-drained deposits, especially natural levees, and older deposits, have "moderate" potential, but poorly drained deposits of the late prehistoric period contain few recorded sites and are judged to have "low" archeological potential. This TRIFA dates to the historic and modern periods, and is still building today with fresh layers of PSA.

Project Area Soils and Landscape Analysis

According to the Natural Resources Conservation Service (Soil Survey Staff 2021, 2024a, 2024b) and Soil Survey of Houston County (Carlson 1989), the entire project area is mapped as Comfrey silty clay loam, channeled (1860). The Comfrey soil series is formed in poorly drained loamy alluvium within floodplains. When relatively undisturbed, this series consists of organic-rich A horizons above gleyed B and C horizons. The Comfrey series is classed as a hydric soil, and soils of this nature generally are considered to have low archeological site potential.

The project area is situated along the western floodplain of the Mississippi River (Figures 2, 3, and 6). The lidar imagery (Figure 6) reveals disturbance along the northern boundary of the project area, which is associated with the access drive that connects to the boat landing. Outside of this, the lidar also indicates that partially filled channel scars are present within the project area. These disturbances and low areas suggest reduced potential for intact archeological deposits within the project area. Understory vegetation is mainly grasses, above which are scattered soft woods. Many of the trees in the project area are dead.

ARCHIVAL REVIEW RESULTS

Before fieldwork, information regarding previously recorded archeological sites and inventoried historic properties within or near the project area was obtained from the Minnesota SHPO record database and the Minnesota OSA online portal. The available maps and aerial photographs were also examined as part of the archival review.

Previously Recorded Sites and Inventoried Properties

The archival search identified no recorded archeological sites and no inventoried properties within the project area. A wider search revealed four recorded archeological sites, two potential sites, and no inventoried architectural properties within a 1.6 km (1 mi) radius of the project area. The actual and potential archeological sites consist of two Alpha sites and four archeological sites. The four archeological sites include a mound site (21HU0007) on the terrace west of and above the floodplain. 21HU0007 was recorded based on an entry in *The Aborigines of Minnesota* (Winchell 1911:83), that compiles the records and fieldnotes of Alfred J. Hill, T. H. Lewis, and J. V. Brower. An erroneous topographic map plot of 21HU0007 suggests that the site is directly north of the proposed project area; however, the description of the site states that it is "26 feet above the slough" and on "a rather large terrace" (Koenen 2024a). Also, the lidar and aerial imagery that accompany the 21HU0007 form, place the site approximately 250 m to the northwest of the current project area, on the west side of State Highway 26. Most to all of this area has been removed by quarrying. The other three sites (21HU0156, 21HU0157, and 21HU0158) were identified eroding out from the banks along Ice Haul Slough and Minnesota Slough during a survey of Pool 9 (Boszhardt 1995). The three sites eroding from the slough banks are about 1,770 m south of the current project area and are unevaluated for the National Register of Historic Places (NRHP; Boszhardt 1994a–c). 21HU0156 contains two vertically and horizontally separate shell middens. Diagnostic artifacts from the Early through Late Woodland are present at 21HU0156 (Boszhardt 1995:19–21). 21HU157 and 21HU158 are both historic shell middens, and 21HU158 also includes a concrete block and sandstone foundation (Boszhardt 1995:26–27).

The two Alpha sites are an area described as containing burial mounds, 21HUv (Koenen 2024b), and the Twin Peak Complex, 21HUcl (Koenen 2022). Alpha site 21HUv refers to the same mound complex as 21HU0007, citing the same entry in *The Aborigines of Minnesota* (Winchell 1911:83). However, the plotted location of 21HUv is somewhat north of 21HU0007, placing the Alpha site plot approximately 450 m north of the current project area. Again, the information about these mounds indicate their presence on the terrace west of the floodplain. Alpha site 21HUcl is based on an entry in one of Ellison Orr's volumes of archeological reports that he provided to Effigy Mounds National Monument (Orr 1940:8–11). This is the reported location of a mound group and a rockshelter that contains rock art. Although there has not been a formal examination of this area since Orr was there in 1929, the location of the Alpha site plot appears to be accurate due to his detailed description. This area is positioned on the ridge overlooking the river valley, approximately 1,000 m to the south of the current project area.

The LSA model previously described in this report was produced as a result of an earlier archeological survey (Blikre and Benn 2008) that was conducted north of the current project area. That survey located only a single archeological site positioned within a better drained landform than is present in the current project area.

Historic Maps

The 1853 GLO map, two county plat maps (Ogle and Company 1896; Webb Publishing Company 1931), and the topographic map produced in preparation for the construction of the lock and dam system (Brown 1929–1931) were examined to identify potential non-extant historic properties within or directly adjacent to the project area (Figures 7–9). No potential buildings or structures are depicted on any of these maps. These maps indicate that floodplain drainageways, ponds, and other wet areas are common in and around the project area. The 1931 map (Figure 9) indicates that the project area was within Mathilda Luttchens' River Side Sod Farm prior to the construction of the lock and dam and this land use resulted in in removal of the upper soil horizons in the project area (see Geomorphic Evaluation). The 1929–1931 Brown map marks out the area of the sod field but does not show any related features.

Aerial Photographs

Aerial photographs dating from 1937–2022 were examined to determine if any non-extant buildings or structures were located within the project area and to gain a better understanding of landscape changes and land use practices since the early twentieth century. The 1937 aerial photograph (Figure 10) depicts the project area as either denuded or covered in grass, presumably the result of sod farm activities. After the lock and dam was built, the project area is covered by mixed vegetation and much of it is often underwater (Figure 11). The 1991 aerial photograph shows that the boat launch to the east of the project area and the access road have been established (Figure 12).

SURVEY RESULTS

The entire project area was subject to an intensive Phase I cultural resources survey by BCA personnel on November 7, 2024. The fieldwork consisted of a pedestrian surface examination of all of the project area that was above water. During the surface visual inspection, a geomorphic evaluation was also conducted.

Project Area Setting

At the time of field investigation, the project area was within a very gently to gently sloping (1–5%) overgrown wooded area with water-tolerant grasses and standing water across the southern portion of the project area with <10% ground surface visibility (Figures 4, and 14–20). No structures were present within the project area at the time of the survey.

Geomorphic Evaluation

A geomorphic evaluation of the project area was conducted utilizing visual assessments and the extraction of soil cores to evaluate the archeological potential of different landforms within the project area. Consistent with the landscape evaluation, the project area was found along a poorly drained floodplain along the bank of the Mississippi River (Figures 4 and 6). Three soil cores were extracted throughout the project area, two of which were recorded as representative soil profiles (SP). SP 1 was recorded in the northeastern portion of the project area, revealing recent alluvium abruptly overlying the truncated remnants of a poorly drained floodplain landform. The absent upper horizons of the now buried soil are interpreted to be due to the activities of Mathilda Luttchens' River Site Sod Farm that was present here during the early twentieth century (Figure 9). Factoring in the effects of repeated sod removal, this profile was consistent with the EMHOL2 LSA. Due to the poorly drained nature of this landform and the removal of the upper soil horizons, the project area is interpreted to possess a low to negligible chance of containing intact prehistoric cultural deposits. A similar profile was observed in the north-central portion of the project area. SP 2, recorded in the northwestern portion of the project area, revealed a series of stacked sand and clay horizons. The sand became more coarse with depth, and the clay became more saturated and plastic with depth, and at a depth of 200 cm, the probe could no longer penetrate the bands of course sand. This profile was found to be consistent with the young, far distal portion of the TRIFA LSA and is interpreted to possess low to negligible potential to contain intact prehistoric archeological deposits. Representative soil profiles are presented in Appendix A, with landforms and soil core locations reproduced in Figure 4. At the time of the survey, the southern portions of the project area were water-covered, and these low areas were not visually examined during the pedestrian survey and were not cored.

Archeological Survey

The surface of the project area was visually examined during a pedestrian survey. No evidence of the mound site 21HU0007 was identified within the current project area during the survey and it has been demonstrated that the topographic map plot that suggests this site is immediately north of the current project area is incorrect (see Archival Review). Based on the geomorphic evaluation and historic land use, the project area was interpreted to possess low to negligible potential for intact archeological deposits given its disturbed and poorly drained nature. Likely, if any cultural materials were ever present, they were removed as layers of sod were cut and trucked away. Additionally, no cultural features or materials were noted during the pedestrian visual examination. Because of the low potential of the landforms to contain in situ buried cultural deposits, and the lack of surface indications for historic features or sites, no subsurface testing was conducted within the project area.

SUMMARY AND RECOMMENDATIONS

This Phase I cultural resources inventory was conducted by BCA and EOR for the proposed Minnesota Department of Natural Resources Reno Bottoms Restoration Project in Houston County, Minnesota. The project area is between Minnesota State Highway 26 and the Millstone Boat Landing, directly south of the access road leading to the boat landing and covers approximately 8.1 ha (3.3 ac). At the time of the survey on November 7, 2024, the project area was within an overgrown wooded area with water-tolerant grasses and standing water along the southern portions. An archival review identified no previously recorded archeological sites or inventoried properties within or adjacent to the project area. One site is plotted immediately north of the project area, but this plot has been determined to be incorrect. The archival review also determined that the project area was formerly a sod farm, which resulted in the removal of the upper soil horizons as successive plantings and cuttings of sod were made. A review of historic and modern aerial images indicated that much of the project area is frequently underwater.

A field investigation, which consisted of a pedestrian surface survey and a geomorphological investigation, indicated that most of the project area is comprised of recently deposited alluvium overlying poorly drained Middle Holocene Mississippi Channel Belt (EMHOL2) subsoils and a small area of young, distal Tributary Fan (TRIFA) deposits. The surface horizons of the EMHOL2 are absent, presumably due to sod farm activities and this truncated EMHOL2 landform is overlain by recent alluvium. The TRIFA consists of recent alluvium, which is typical of the outer extent of a fan. Both landforms were determined to have low to negligible archeological site potential and no features or sites were observed during the surface survey. Therefore, no subsurface testing was conducted. BCA recommends no further cultural resources investigations for the project area.

No archeological investigation method can guarantee the discovery of all sites or cultural resource materials. If any cultural resource materials not found in the investigation are encountered during the implementation of the proposed construction project, the SHPO should be contacted immediately. It is the responsibility of the developer to protect cultural resources from disturbance until a professional examination can be made or until clearance to proceed is authorized by the State Historic Preservation Office or a designated representative.

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FIGURES

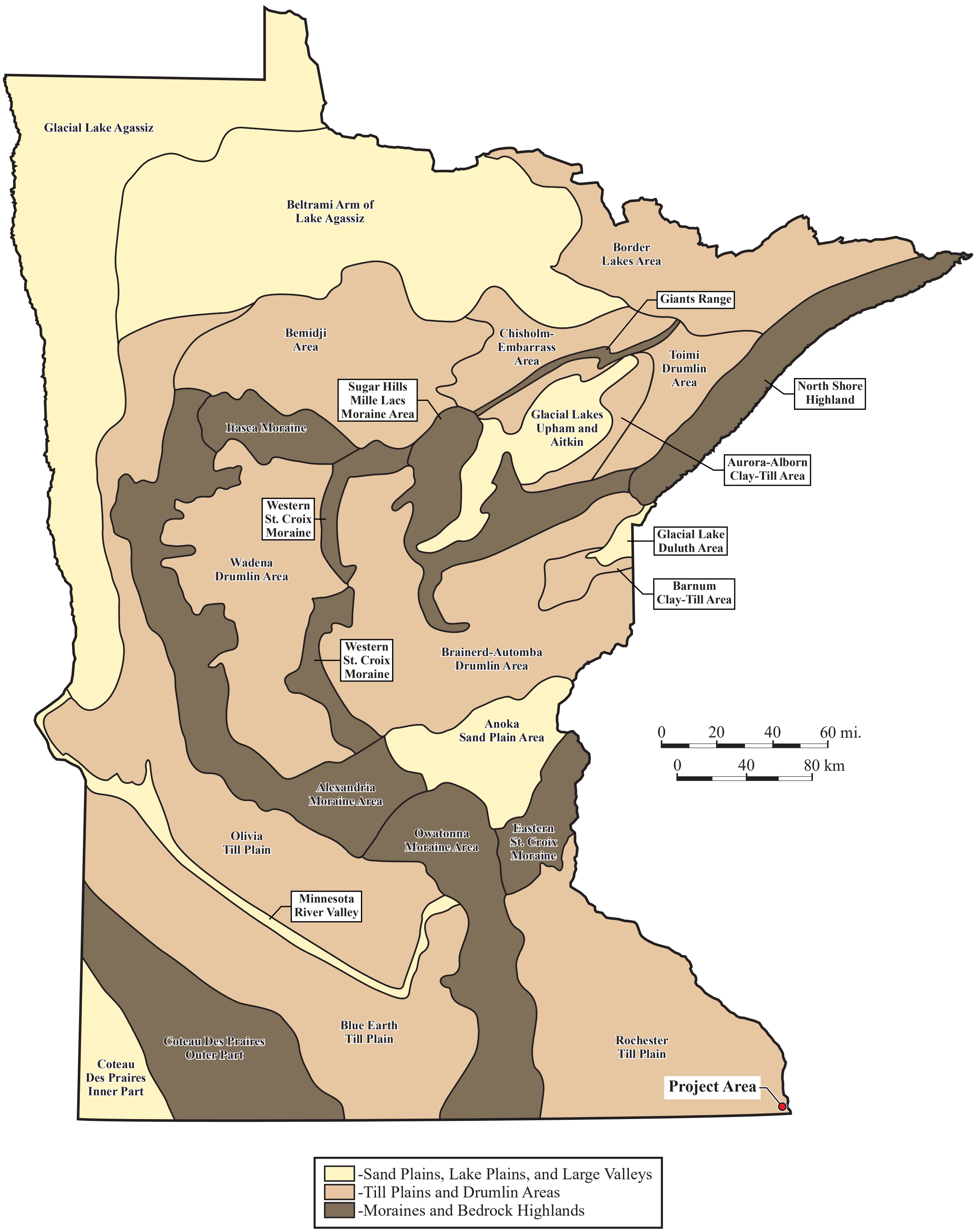

Figure 1. Physiographic location of the project area (adapted from Wright 1972).

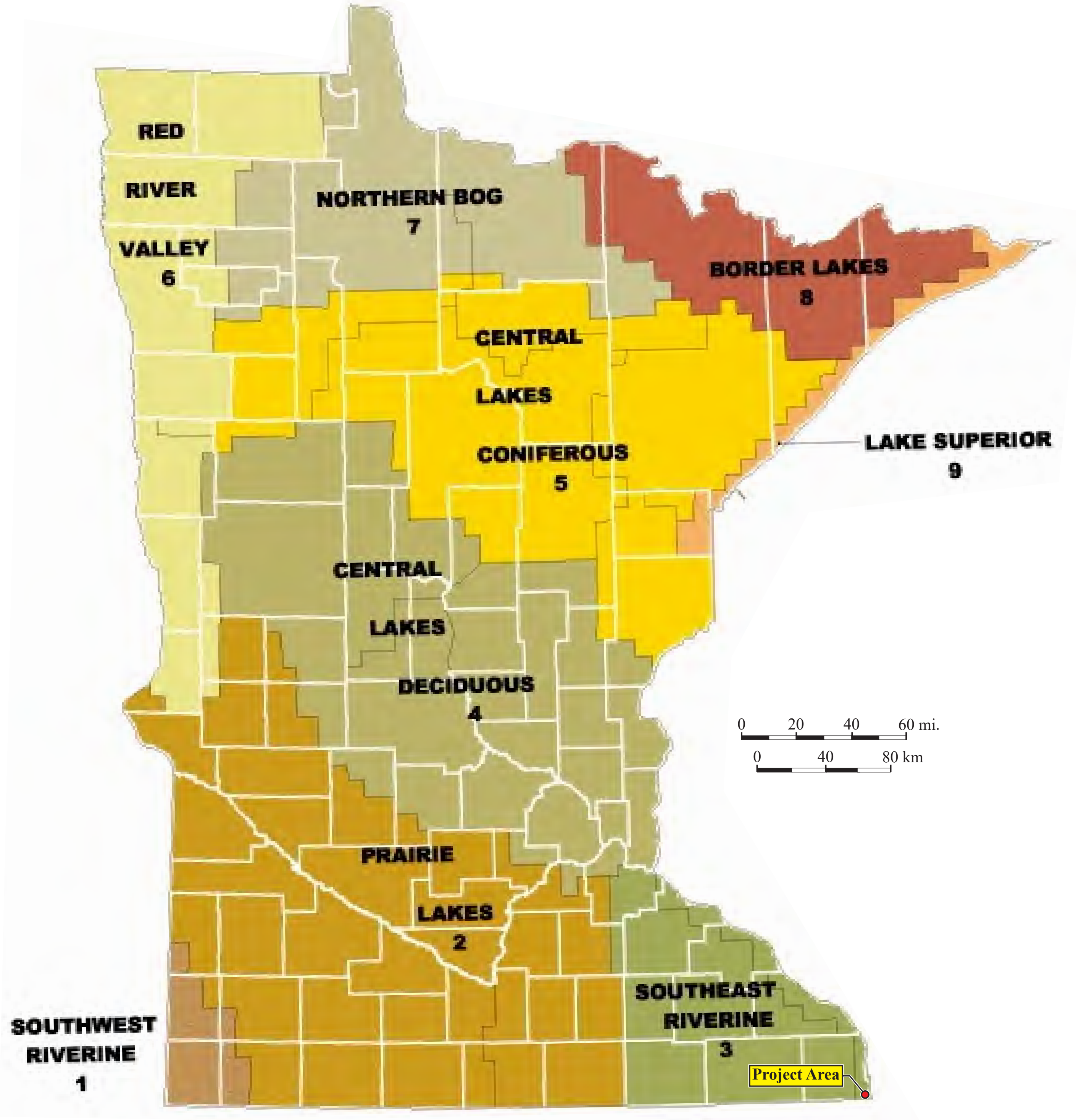

Figure 2. Minnesota Archaeological Resource Regions (Anfinson 1990).

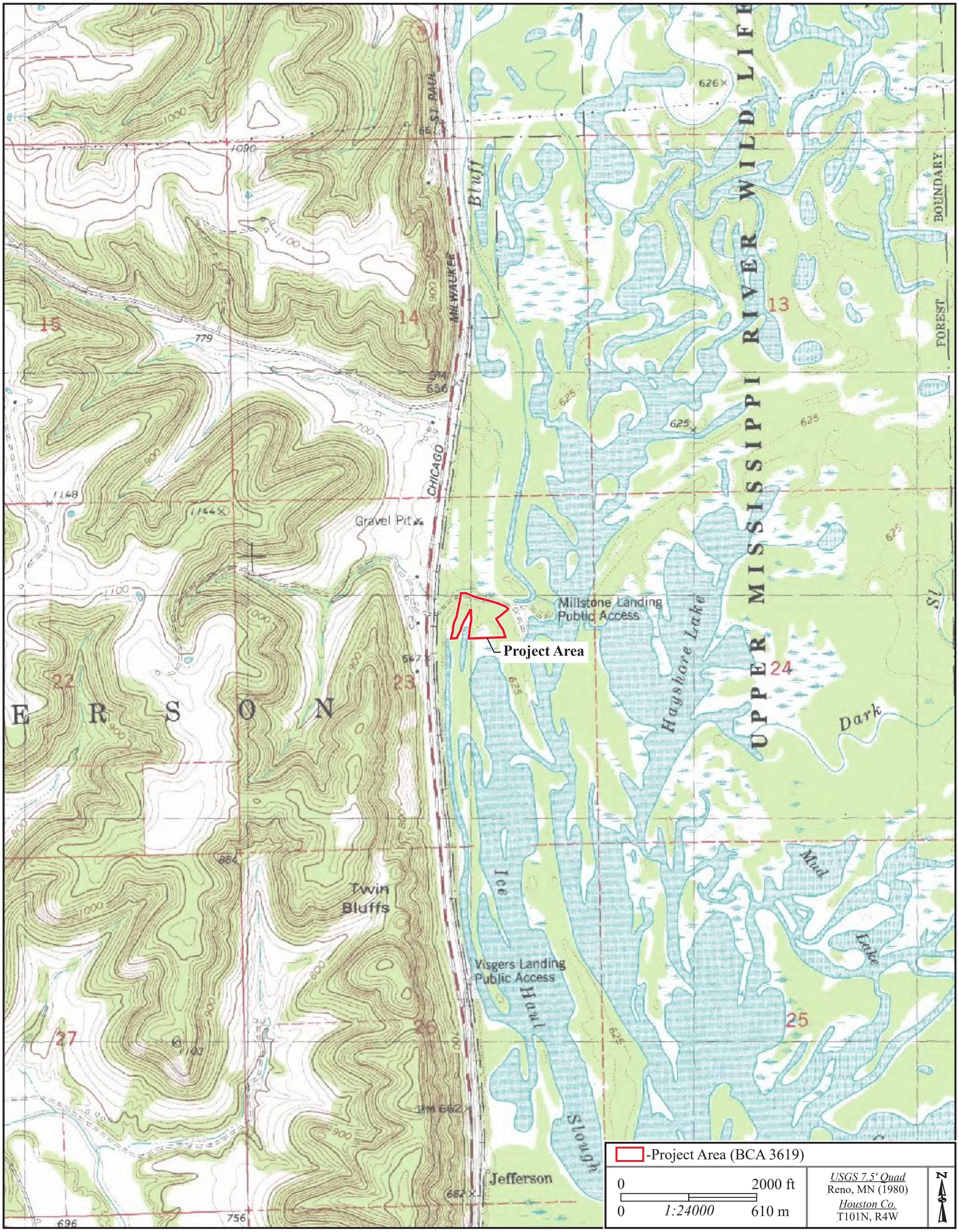

Figure 3. Topographic coverage of the project area.

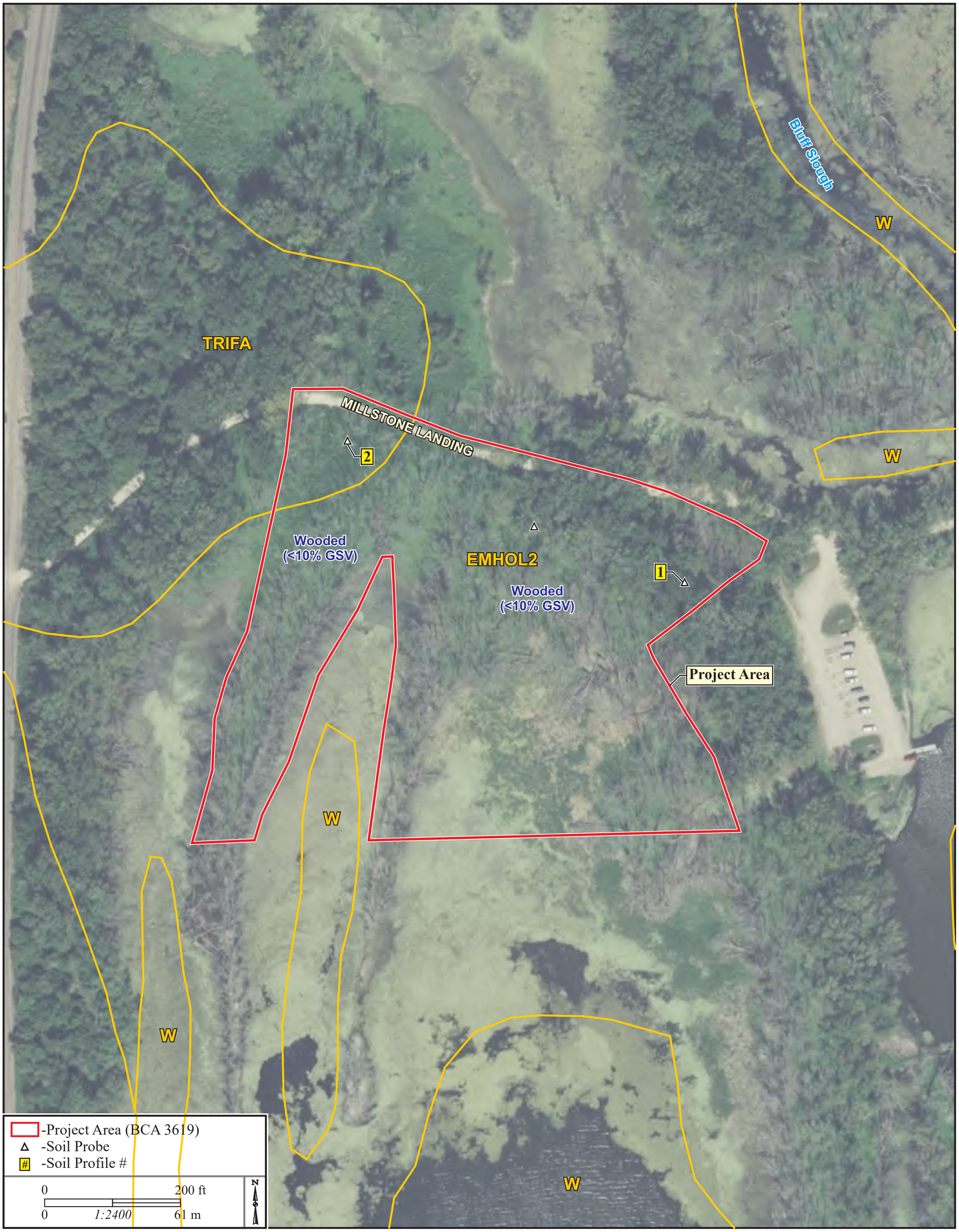

Figure 4. Scale map of the project area.

Figure 5. Soil map of the project area (Soil Survey Staff 2021).

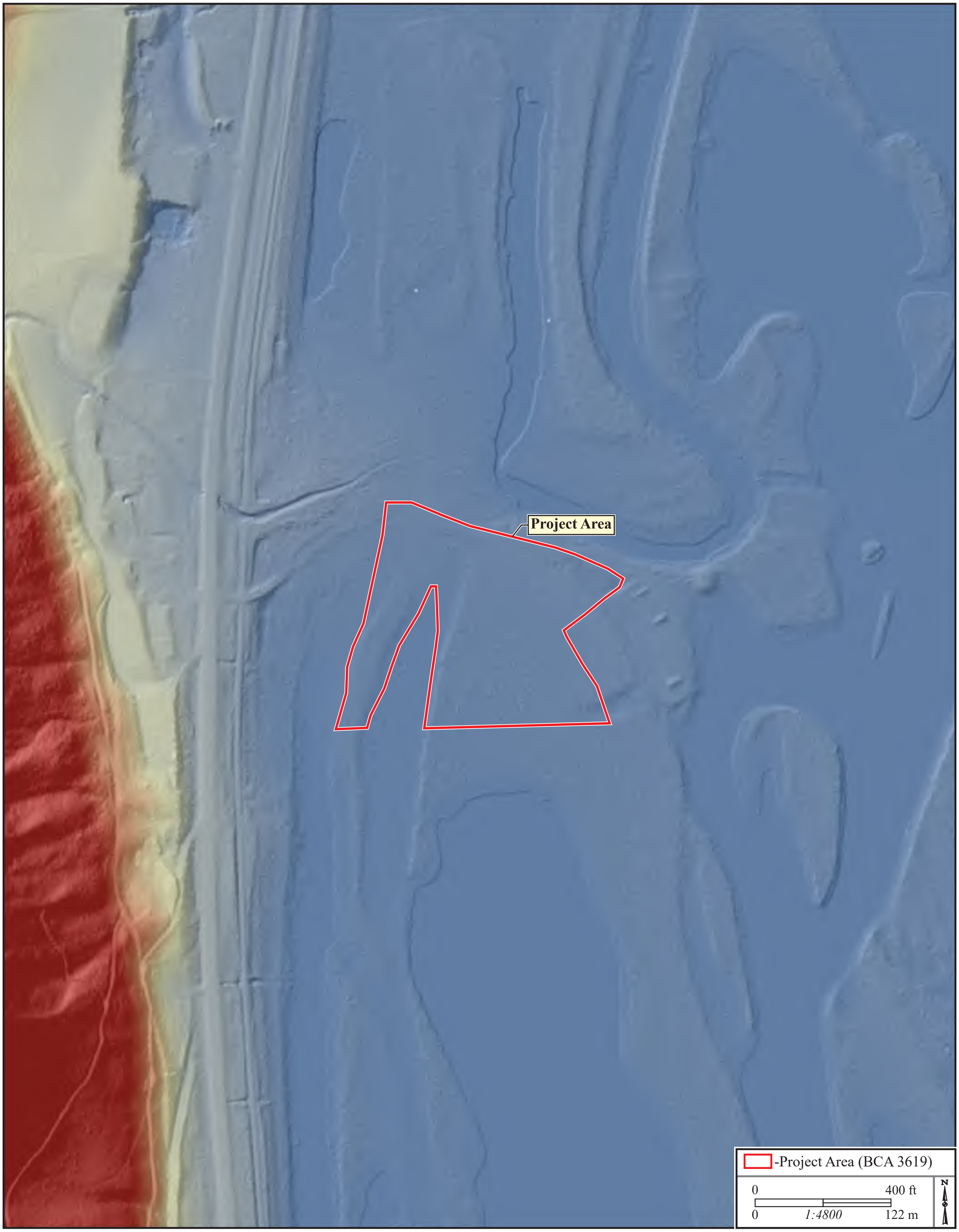

Figure 6. Lidar image of the project area.

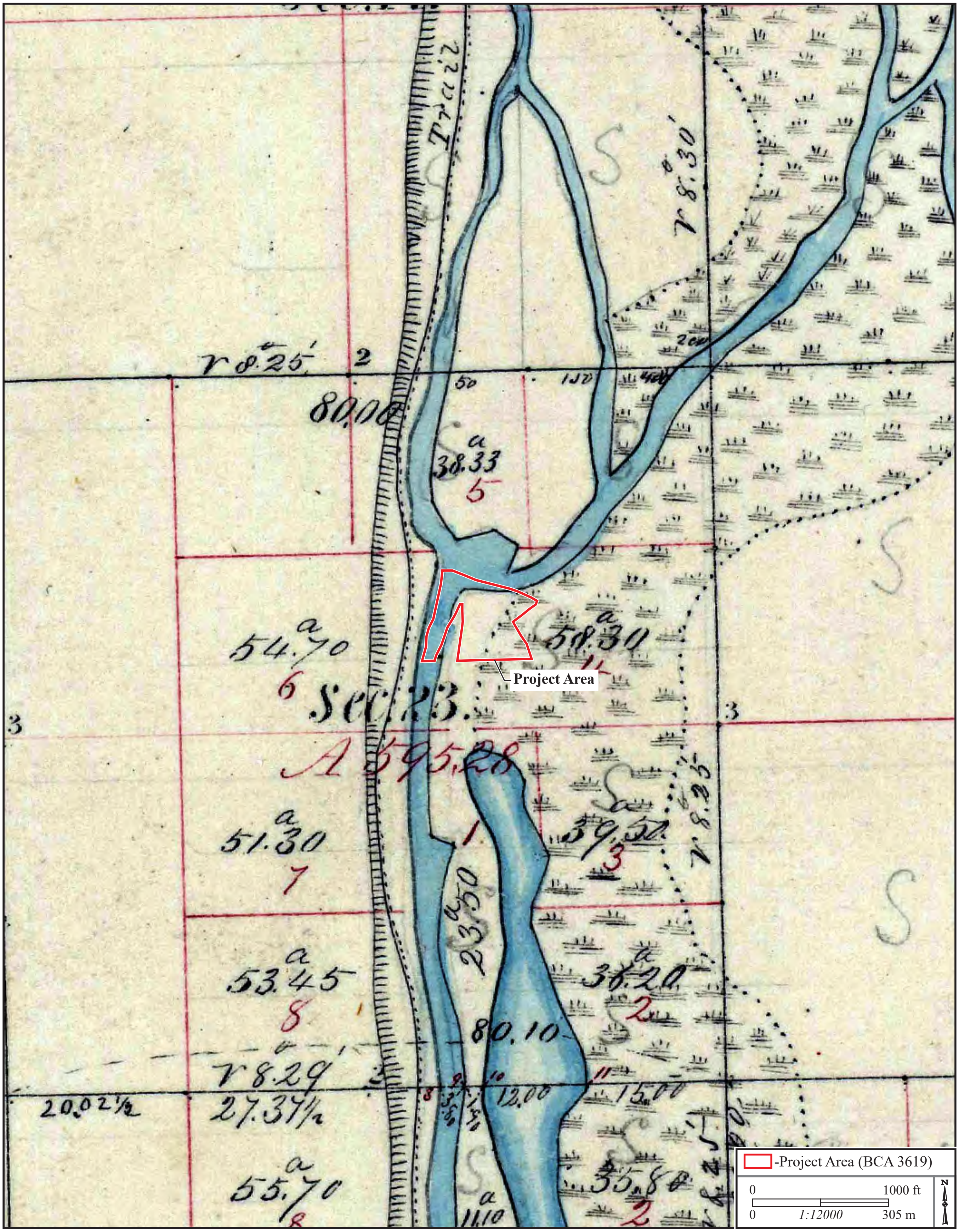

Figure 7. 1853 map of the project area (GLO).

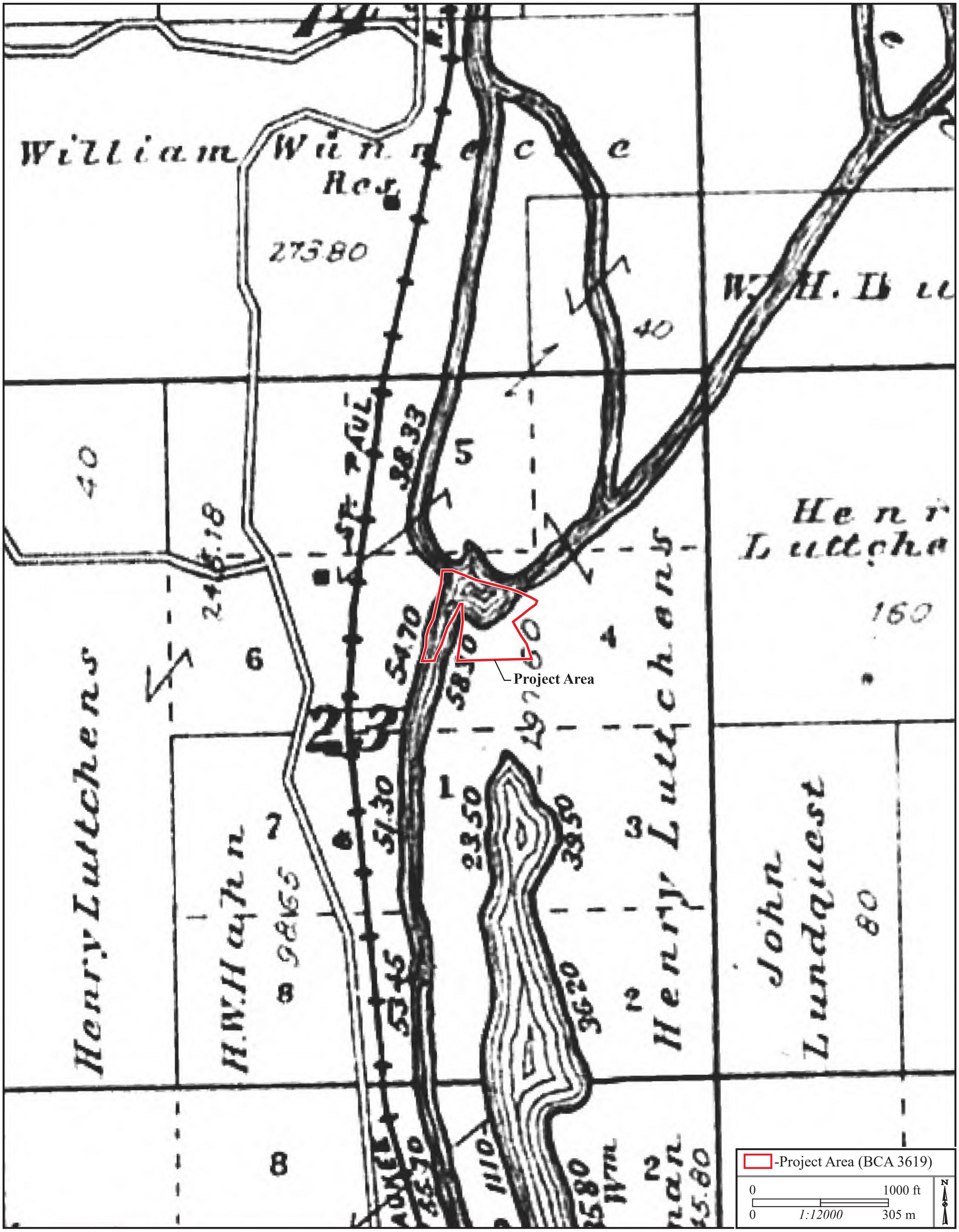

Figure 8. 1896 map of the project area (Ogle and Company).

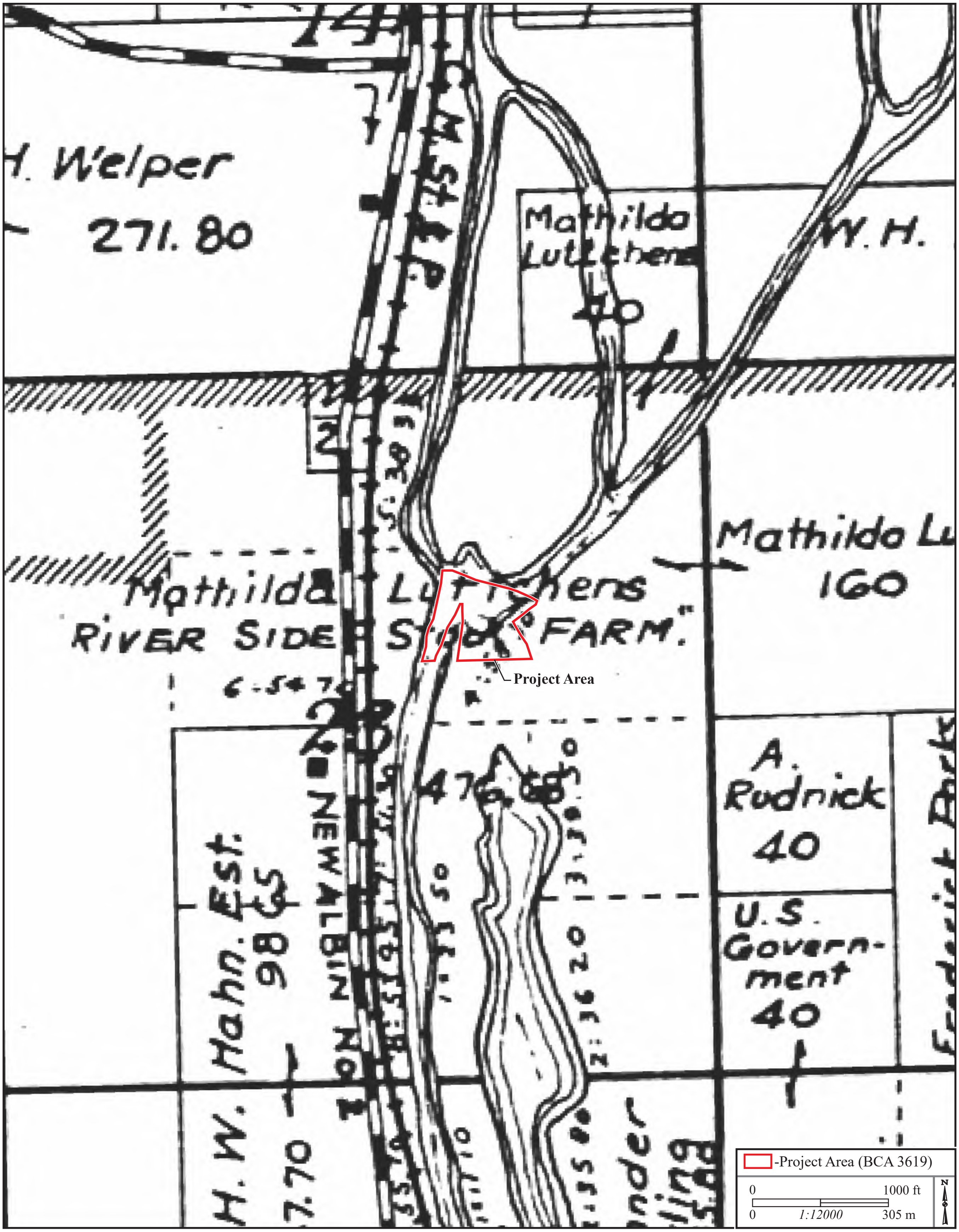

Figure 9. 1931 map of the project area (Webb Publishing Company).

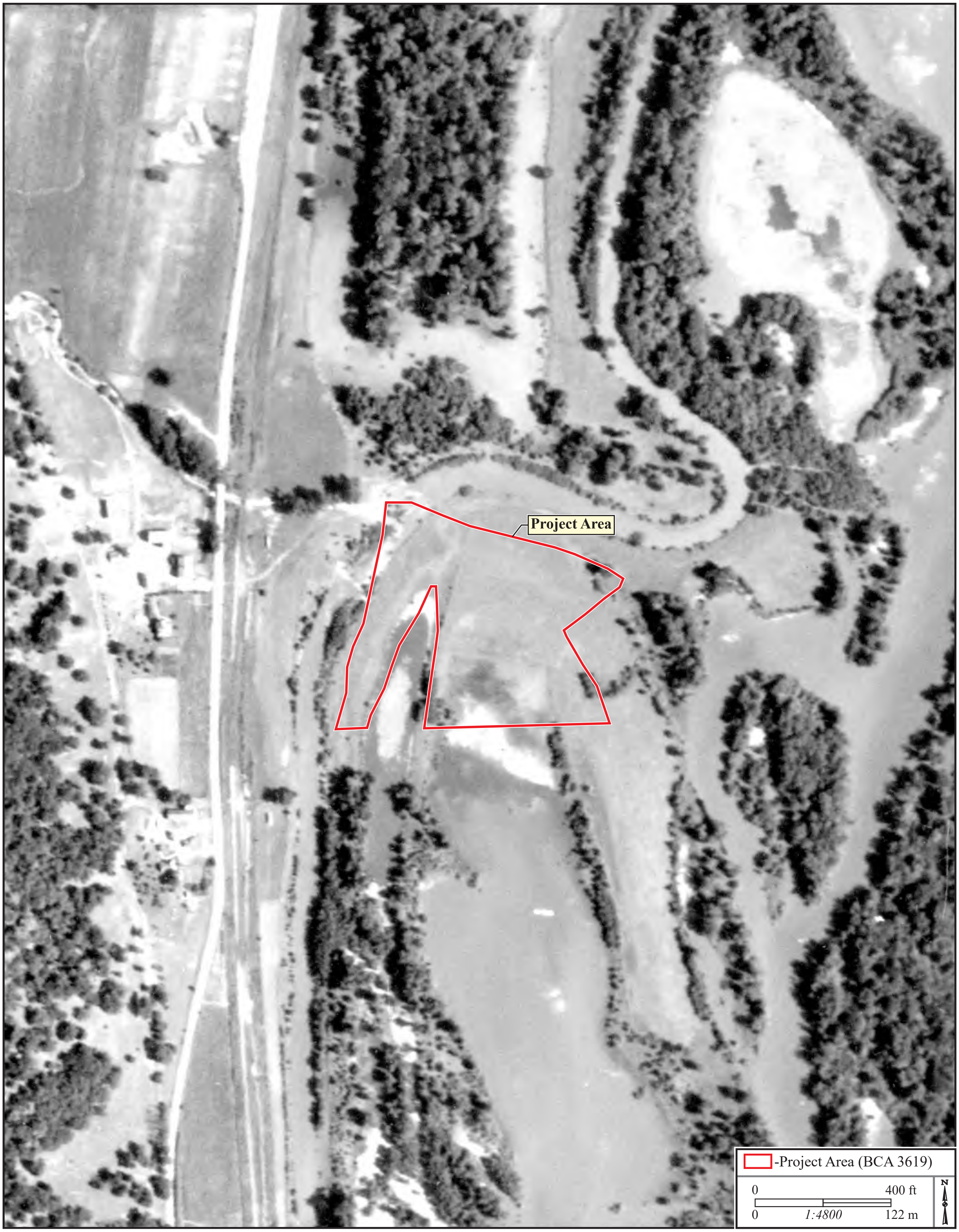

Figure 10. 1937 aerial photograph of the project area.

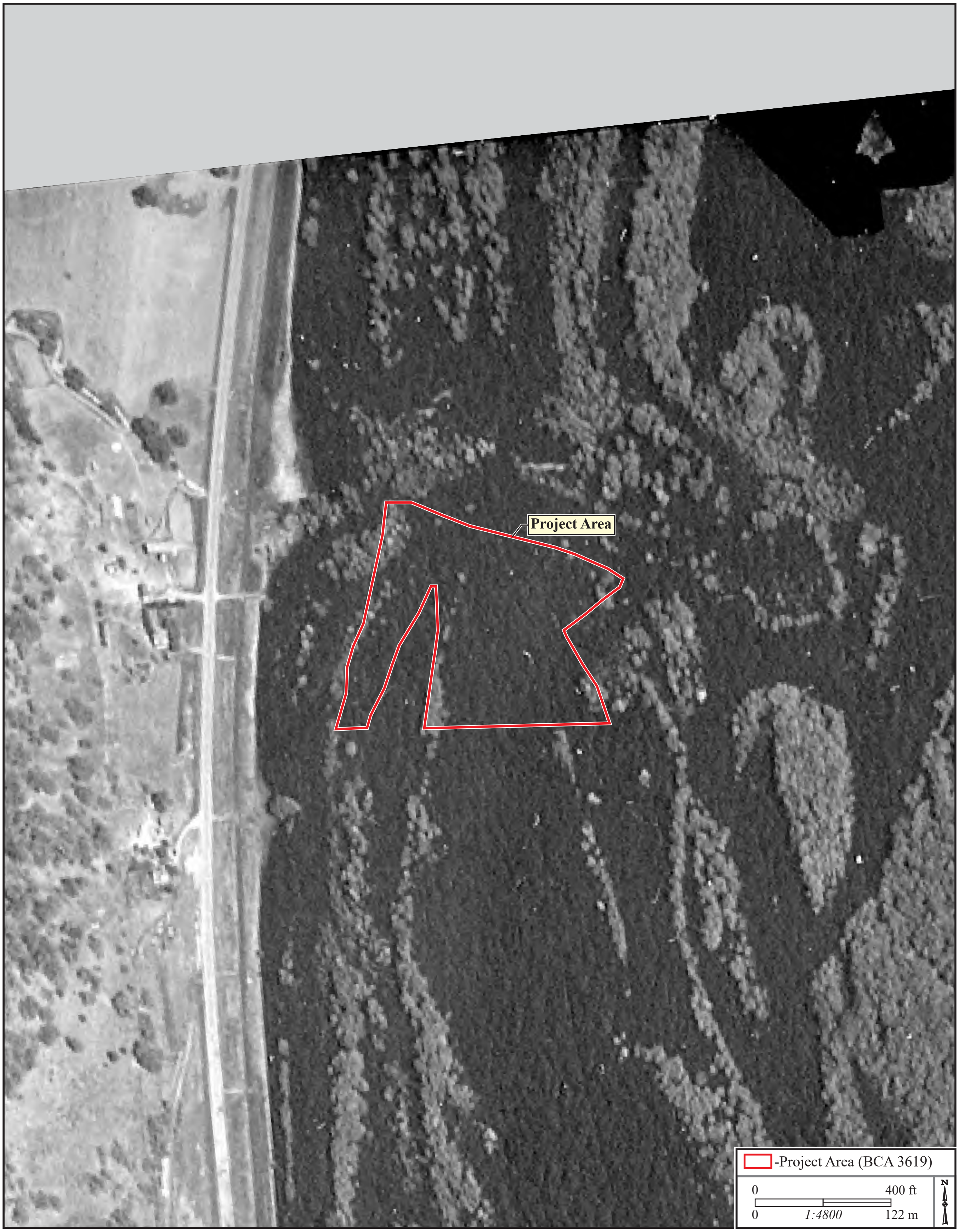

Figure 11. 1952 aerial photograph of the project area.

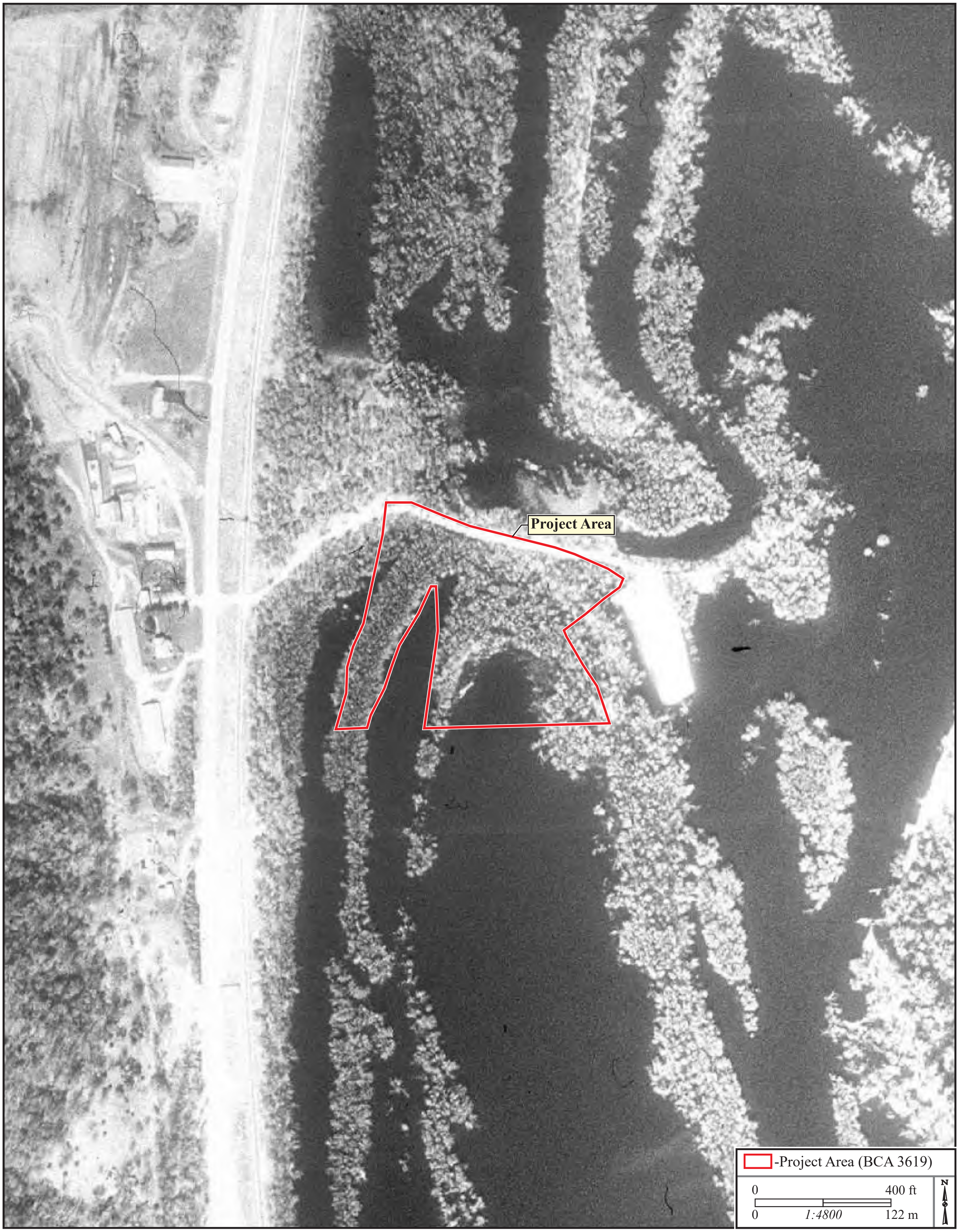

Figure 12. 1991 aerial photograph of the project area.

Figure 13. 2003 aerial photograph of the project area.

Figure 14. Eastern portion of the project area. View to the west (11/07/24).

Figure 15. Eastern portion of the project area near SP 1. View to the south (11/07/24).

Figure 16. Central portion of the project area. View to the southwest (11/07/24).

Figure 17. Western portion of the project area. View to the northeast (11/07/24).

Figure 18. Western portion of the project area near SP 2. View to the south (11/07/24).

Figure 19. Millstone Landing access road along the northern boundary of the project area. View to the east (11/07/24).

Figure 20. Millstone Landing access road along the northern boundary of the project area. View to the west (11/07/24).

APPENDIX A
Archaeological Resources Protection Act Permit

DEPARTMENT OF THE ARMY

ARCHAEOLOGICAL RESOURCES PROTECTION ACT PERMIT

NAME OF PROJECT OR INSTALLATION: Reno Bottoms Restoration Project

(Please use this number when referring to this permit.).

NO. DACW37-4-25-0004

To conduct work upon public lands owned or controlled by the Department of the Army under the Archaeological Resources Protection Act (93 Stat. 721, 16 U.S.C. 470aa-11) approved October 31, 1979 and the regulations thereunder (32 CFR 229).

1. PERMIT ISSUED TO: DATE: 2024-11-01

Bear Creek Archeology, Inc.

2. NAME, ADDRESS AND OFFICIAL STATUS OF PERSON:

a. In general charge:

Derek V. Lee, Director, Bear Creek Archeology, PO Box 347, 24091 York Street, Cresco, Iowa

b. In actual direct charge:

Sarah E. Schultz, Principal Investigator, Bear Creek Archeology, PO Box 347, 24091 York Street, Cresco, Iowa

3. UNDER APPLICATION DATE:

4. AUTHORIZES:

Phase I archeological investigations, including hand coring for geomorphological identification and auger testing for deep site discovery and sampling

5. ON LANDS DESCRIBED AS FOLLOWS:

8.1 acre area in Houston County Minnesota with Millstone Landing Road along northern boundary and State Highway 26 to west. Area is in the SW1/4, NE1/4, Sec. 23, T101N, R4W.

6. FOR PERIOD:

1-30 November 2024

7. MATERIALS COLLECTED UNDER THIS PERMIT WILL BE DEPOSITED FOR PERMANENT PRESERVATION IN THE

Curatorial facility to be designated by the USACE

OR IN OTHER ACCREDITED INSTITUTIONS UNDER SUITABLE LOAN AGREEMENTS. A COPY OF A CURRENT, VALID CURATION AGREEMENT MUST BE KEPT ON FILE WITH DISTRICT COMMANDER.

8. CONDITIONS

This permit is subject to the provisions of the Archaeological Resources Protection Act approved October 31, 1979, and the regulations, thereunder, including 32 CFR 229.7 as to Indian lands, and the following conditions:

a. Archaeological resources shall be analyzed and recorded in the field as much as possible. Collection of cultural resource material solely for later laboratory analysis is discouraged. The grantee will specify in the application when laboratory analysis is anticipated.

b. Collections of archaeological resources, artifacts and other material removed from public lands under the provisions of this permit remain the property of the United States Government and may be recalled at any time for use of the Department of the Army or other agencies of the Federal Government.

c. The following individual(s) are authorized to be in direct charge of field work conducted under this permit:

(1) Sarah E. Schultz

(2) Lowell Blikre

(3) __________

d. The person(s) in direct charge of field work shall be on-site at all times when work is in progress. Failure to comply with permit stipulations will result in removal of subject's name(s) from the approved list of persons-in-direct charge.

e. During the course of the activities conducted under this permit, the District Commander, or his representative shall have access to the study area of this permit, and during or after completion of this work shall have the right to inspect all artifacts or other materials removed.

f. At least three copies of all published journal articles (reprints) and other published or unpublished reports and manuscripts resulting from work conducted under this permit shall be filed with the Commander.

g. Upon request, all field notes, records, photographs, and other data related to this permit shall be made accessible to the COE Archaeologist for review.

h. Temporary stakes and/or flagging used to identify sites shall be removed upon completion of the project unless otherwise authorized.

i. Vehicular activity shall be restricted to existing roads and trails unless otherwise authorized. Care shall be exercised to avoid directly or indirectly increasing access or potential vandalism to cultural resource sites.

j. Disturbed areas shall be kept to a minimum size consistent with the purpose of the study.

k. Permittee shall take adequate precautions to prevent livestock, wildlife, and the public from injury in any pit or trench.

l. All test holes shall be backfilled.

m. Living trees shall not be cut or otherwise damaged, unless authorized by the District Commander.

n. Proper precaution shall be taken at all times to prevent and suppress fires. The permittee shall be held responsible for suppression costs for any fires on public lands caused through negligence of the permittee or his authorized representatives. No burning shall be allowed without specific permission.

o. Improvements such as fencing, reservoirs, or other improvements within the permit area shall not be disturbed unless prior written approval is obtained from the District Commander. Any improvement disturbed shall be left in its original or better condition, as determined by the District Commander.

p. The permittee shall be responsible for cleaning up all camp and work sites before leaving the area. Caution shall be taken to prevent littering and pollution on public lands or on adjoining properties. Refuse shall be carried out and deposited in approved disposal areas.

q. In the event that the land in question is under lease or outgrant to a third party, the permittee shall obtain approval and permission from the third party and shall fully compensate the third party for damages caused by the activities of the permittee.

r. The District Commander reserves the right to terminate this permit at any time.

s. Possession or use of firearms on the permit area is prohibited.

t. The United States shall not be responsible for damages to property or injuries to persons which may arise from or be incident to the use and occupation of the said premises, or for damages to the property of the permittee, or for injuries to the person of the permittee (if an individual), or for damages to the property or injuries to the person of the permittee's officers, agents, servants, or employees, or others who may be on said premises at the invitation of any one of them, arising from governmental activities, and the permittee shall hold the United States harmless from any and all such claims except for claims arising out of the negligence or willful misconduct of the Government

u. **SPECIAL CONDITIONS**, as marked X in aprropriate box on attached sheet.

9. PRELIMINARY REPORT: Within approximately 8 weeks of the conclusion of field work a preliminary report of work performed under this permit, illustrated with representative photographs and listing new and significant collected materials should be furnished the District Commander.

IN WITNESS WHEREOF: I have hereunto set my hand by the authority of the Secretary of the Army.

SOMMERLAND.KEVIN.J.1231189048 Digitally signed by SOMMERLAND.KEVIN.J.1231189048 Date: 2024.11.01 13:40:18 -05'00'

SPECIAL CONDITIONS

☒ a. This permit shall not be exclusive in character, and there is hereby reserved unto the Government the right to use, lease or permit the use of said land or any part thereof for any purpose.

☒ b. Other institutions may be engaged in archaeological research in the general area covered by this permit, and in case there should be conflict with respect to a site not specifically designated in a permit, the parties concerned shall reach agreement between themselves as to which shall work the site.

☒ c. Transportation in Department of the Army vehicles cannot be furnished, except in cases where no extra expense to the Department is involved.

☒ d. All costs shall be borne by the permittee.

☒ e. The exploration or excavation of any Indian grave or burial ground on lands under the jurisdiction of the Department of the Army is restricted solely to qualified archaeologists. No Indian grave or burial ground may be investigated without permission of the governing council of Indians concerns, which supplemental authority must be promptly recorded with the official in charge of the designated area.

☒ f. All excavated areas shall be restored by filling in the excavation and otherwise leaving the area in a near to original condition as practicable.

☒ g. The permittee shall conduct all operations in such a manner as to prevent the erosion of the land, pollution of the water resources, and damage to the watershed, and to do all things necessary to prevent or reduce to the fullest extent the scarring of the lands.

☒ h. Any findings of mined or processed precious metals or other treasure trove in the area covered by this permit are the exclusive property of the Government and shall not be removed from the site without specific written permission from the Department of the Army.

☒ i. 1______ Copies of the final report, accompanied by a completed Defense Technical Information Center (DTIC) report, DD Form 1473, will be submitted to the District Commander.

☒ j. Before undertaking any work on lands administered by the Department of the Army, clearances should be obtained from the official in charge of the area.

☒ k. Before undertaking any work on Indian tribal lands or any individually owned trust or restricted Indian lands, clearance should be obtained from the Bureau of Indian Affairs official having immediate jurisdiction over the property.


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Bear Creek Archeology, Inc., based in Cresco, Iowa, provides a wide range of cultural resource management and historic preservation services to clients in the north-central region of the United States. Since its inception in 1988, BCA has successfully completed over 3,400 projects, including the Phase I survey of more than 100,000 acres, during which we located and recorded more than 3,870 archeological sites. Additionally, BCA has recorded and provided National Register of Historic Places recommendations for over 5,000 buildings and structures in both rural and urban settings. Our projects have included the Phase II testing of 225 sites, both historic and precontact, and the Phase III data recovery of 54 sites. BCA is also fully equipped to handle construction monitoring and emergency salvage operations.

Our experienced staff work closely with our clients, State Historic Preservation Offices, other government agencies, and Native American groups from project initiation to completion. We were one of the first cultural resource management firms in the region to apply geomorphological principles; landform identification and modeling guide our approach to each archeological project. Similarly, historic and social contexts are incorporated into our projects involving historic properties. Precision GIS technology is used in virtually all of our projects, allowing the production of highly accurate maps for report publication and to meet the needs of our client for preservation and project planning.

BCA has the capacity to carry out every aspect of multiple projects simultaneously giving us the scheduling flexibility to meet our clients' needs. Our staff include several Principal Investigators and Project Archeologists who directly supervise our projects from start to finish and we have the crew and equipment necessary to perform fieldwork at a number of locations concurrently. BCA's laboratory is designed to meet the specific requirements of artifact handling and storage. This laboratory is a secure and organized environment for processing, analysis, and short-term curation of artifacts. All artifact processing, analysis, and report preparation (other than sub-consultant tasks) occur at our Cresco facility.

In the field, BCA utilizes Trimble GeoExplorer GeoXT and GeoXH sub-meter GNSS receivers for GPS data collection. In addition, total station equipment may be used including a Trimble S6 DR 300+ 3" robotic station or TopCon total stations (GTS-255 and GTS-235W). Other field equipment includes high-resolution digital cameras, laptop computers, Garmin GPS receivers, and tablets. BCA has the printing and report preparation capacity to facilitate all stages of production for both small and large-scale projects. Other electronic hardware assets include dual-monitor configurations, high-resolution flatbed scanners, digitizers, and digital measuring devices. Barcode scanners are used to track artifacts and other materials through the analysis process. A host of current software (e.g., Microsoft Office Professional, ArcMap with extensions, CorelDraw, Corel PhotoPaint, Adobe Acrobat, Adobe Creative Suite, Visual Basic, Python) is utilized to manage and complete projects efficiently as well as to facilitate coordination with clients. Our equipment meets the needs of all phases of cultural investigation and allows BCA to field several fully equipped crews. Our administrative staff has the demonstrated organizational skills to simultaneously manage a large number of employees and multiple projects.

SARAH E. SCHULTZ
PRINCIPAL INVESTIGATOR/ARCHEOLOGIST

EDUCATION: Master's Experimental Archaeology, University of Exeter, Exeter, United Kingdom, 2019
B.A., Archaeology and Art, University of Wisconsin-La Crosse, Wisconsin, 2015

SUMMARY OF EXPERIENCE: Ms. Schultz has experience as a field tech on Phase I, II, and III archeological projects dealing with Woodland, Oneota, and historic artifacts, as well as Project Archeologist and Primary Investigator experience on various Phase I projects dealing with Woodland, Oneota, and historic artifacts. She published one article in the Wisconsin Archeologist in 2016 and presented work at the EXARC conference in 2021 and the Midwest Archeological Conference in 2022. She has worked in Wisconsin, Minnesota, Iowa, and Illinois. Additional experience includes research and experimental replication of prehistoric pottery, washing and cataloguing artifacts, providing tours of a museum and lab, excavating human remains, monitoring construction sites, photographing and photoshopping images of artifacts for reports, GIS mapping and production of maps for reports, and inventorying and maintaining field equipment. Ms. Schultz joined BCA in 2019 as a project archeologist and began serving as a principal investigator in 2022.

SELECT PROJECTS:

2024 Phase I Cultural Resource Investigation for the Silver Queen Wind Farm Project in Carroll and Crawford Counties, Iowa, for Western EcoSystems Technology, Inc., Golden Valley, Minnesota.

2024 Phase I Archeological Survey for the Wellhouse Replacement Project at the Black River Correctional Center, Black River Falls, Wisconsin for Foth Infrastructure & Environment, LLC, Madison Wisconsin.

2024 Phase I Cultural Resources Investigation for the Little Beaver Creek Sanitary Sewer Extension Route Change Project in Polk County, Iowa, for Foth Infrastructure & Environment, LLC, Johnston, Iowa.

2023 Phase I Cultural Resources Investigation of Approximately 18.9 Acres for the County Road 1000 N Solar Farm in Champaign County, Illinois, for Ebenezer Management, LLC, Dayton, Iowa.

2023 Phase I Cultural Resources Investigation of Approximately 18.6 Acres for the East Main Street Solar Farm in Vermillion County, Illinois, for BTB Energy Solutions, Ingleside, Illinois.

2023 Phase I Cultural Resources Investigation for a proposed Solar Array Project in Rochester Township, Olmsted County, Minnesota, for Donald and Pamela Burns, Rochester Minnesota.

2022 Phase I Archeological Survey for proposed Electrical Distribution Line Replacement Project Spanning .2 Km (.1 Mi) in Sumner Township, Fillmore County, Minnesota for MiEnergy Cooperative, Rushford Village, Minnesota.

2022 Phase I Cultural Resources Investigation for the proposed IAB55901 Garwin BL MP 1.91 HDD_01118352 Project Carlton Township, Tama County, Iowa, for Merjent, Inc., Minneapolis, Minnesota.

2022 Phase I Archeological Survey for the proposed Heartland Mitigation Bank Project, Eddyville And Pleasant Townships, Monroe County And Eddyville Township, Wapello County, Iowa, for Emmons & Olivier Resources, Inc., St. Paul, Minnesota.

2021 Phase I Cultural Resource Investigation for the Lakota Wetland Mitigation Bank Project, Oakland Township, Franklin County, Iowa, for Emmons & Olivier Resources, Inc., St. Paul, Minnesota.

2021 Phase I Cultural Resources Investigation for the proposed IAB56901-MP35.88(57.54) Decorah Ground Bed Installation_01136406, Springfield Township, Winneshiek County, Iowa, for Merjent, Inc., Minneapolis.

2021 Phase I Cultural Resource Survey for the proposed 250th Street Bridge Replacement Over Dry Mill Creek in Read Township, Clayton County, Iowa, for Origin Design, Dubuque, Iowa.

2020 Phase I Cultural Resources Investigation for BMP ER-484-489 and 492-Gorsch, Dayton Township, Iowa County, Iowa, for English River Watershed Management Authority, Kalona, Iowa.

2020 Phase I Cultural Resource Investigation for the Linn Grove Park Dam Removal Project, Linn Grove Township, Buena Vista County, Iowa, for Emmons & Olivier Resources, Inc., Boone, Iowa.

LOWELL BLIKRE
ASSISTANT DIRECTOR/PRINCIPAL INVESTIGATOR

EDUCATION: M.A., Anthropology, Northern Arizona University, Flagstaff, Arizona, 1993
B.A., Anthropology, University of North Dakota, Grand Forks, North Dakota, 1986

SUMMARY OF EXPERIENCE: Mr. Blikre is a professional archeologist with more than 40 years of experience in all phases of archeological research throughout the Upper Midwest and Northern Plains. He has contributed to over 600 Phase I, Phase II, and Phase III investigations since coming to BCA in 1993. His experience includes landform identification, devising archeological survey sampling methods, site testing, data recovery, architectural recording, and the analysis of prehistoric stone artifacts and historic artifacts. Mr. Blikre formerly conducted overview and assessments of cultural resource management programs at Air Force Bases in the Rocky Mountains, Plains, and Midwest states for the National Park Service. Prior to joining Bear Creek Archeology, Mr. Blikre was an employee of the University of North Dakota, Department of Anthropology and also worked briefly in the Southwest.

SELECT PROJECTS:

2024 Phase II Archeological Testing of 11BR1, 11BR344, 11BR579–581 for the LaGrange Lock Project, USACE Rock Island District, Brown and Cass Counties, Illinois for Stanley Consultants, Inc., Austin TX.

2024 Phase IA Cultural Resources Reconnaissance Survey and Archival Review Pechman Creek Delta, Johnson County, Iowa for RES Great Lakes, LLC, Bellaire, TX.

2024 Extended Phase I Archeological Investigation for the Proposed South Silver Lake Development in the City of Lake Park, Dickinson County, Iowa, for Silver Lake Growth, LLC, Spirit Lake, IA.

2023 Phase I Cultural Resources Investigation of Approximately 315 ha (778.4 ac) for the La Grange Lock Project, USACE Rock Island District, Brown and Cass Counties, Illinois for Stanley Consultants, Inc., Austin TX.

2020-22 Phase I Archeological Survey of 3,605 Acres within the Iowa Army Ammunition Plant, for U.S. Army, Middletown, Iowa.

2020 Geoarcheological Investigations along a 10.6 km portion of Iowa Drive within the Upper Iowa River and Mississippi River valleys.

2019 Phase III Data Recovery at 13LN1024 within the City of Cedar Rapids, Iowa, for Stanley Consultants, Inc., Muscatine, IA.

2019 Phase I Archeological Survey, US Highway 30 Missouri Valley Bypass Location Study Area, Harrison County, Iowa, for HDR Engineering, Inc., Omaha, NE.

2018 Phase II Archeological Testing of 13LN1202, Linn County, Iowa, for Martin Marietta Materials, Inc., Des Moines, IA.

2017 Phase III Data Recovery on 13LN1035 within the City of Cedar Rapids, Linn County, Iowa, for Stanley Consultants, Inc., Muscatine, IA.

2017 Phase III Cultural Resource Mitigation of Archeological Site 21CP68 at the City of Montevideo, Chippewa County, Minnesota, for St. Paul District Corps of Engineers, St. Paul, MN.

2016 Phase I Cultural Resource Survey of Proposed Borrow Areas and Site 21WS27 for the Marsh Lake Ecosystem Restoration, Swift County, Minnesota, for St. Paul District Corps of Engineers, St. Paul, MN.

2016 Phase I Archeological and Geomorphological Investigations, Brandon Road Lock and Dam, Will County, Illinois, for Rock Island District Corps of Engineers, Rock Island, IL.

2015 Phase III Data Recovery Excavations at the Yaremko Site (13WD134) Woodbury County, Iowa, for Iowa Department of Transportation, Ames.

2015 Phase II Archeological Testing of Sixteen Sites within the Proposed U.S. Highway 61 — Wapello Reconstruction Corridor, Louisa County, Iowa, for Iowa Department of Transportation, Ames.

2015 Phase I Cultural Resource Survey and Supporting Geomorphological Investigation, Upper Mississippi River Navigation Pool 20 Dredged Material Placement Site, Lewis County, Missouri, for Rock Island District Corps of Engineers, Rock Island, IL.

2014 Phase I Archeological and Geomorphological Survey for the Beaver Island Habitat Rehabilitation and Enhancement Project, Clinton County, Iowa, for Rock Island District Corps of Engineers, Rock Island, IL.

2013 Phase I Cultural Resource Survey and Landform Modeling for the U.S. Highway 61 Wapello Reconstruction Project, Louisa County, Iowa, for Iowa Department of Transportation, Ames.

2011 Phase III Data Recovery Excavations at the Wiggenjost Site (13LE741) U.S. Highway 61, Fort Madison Bypass, Lee County, Iowa, for Iowa Department of Transportation, Ames.

2011 Shoreline Survey of the Lower 80 Miles of the Illinois River, Brown, Pike, Morgan, Scott, Calhoun, Green, and Jersey Counties, Illinois, for St. Louis District Corps of Engineers, St. Louis, MO.

APPENDIX B
Soil Profiles

DESIGNATION: Soil Profile (SP) 1
LANDSCAPE POSITION: EMHOL2 LSA
SLOPE:0–2%
PARENT MATERIAL: alluvium
VEGETATION: wooded, <10% ground surface visibility (GSV)
METHOD: hand probe
DATE DESCRIBED: 11/7/24
DESCRIBED BY: S. Schultz
COMMENTS: Soil profile was recorded along the northeastern portion of the project area. The soil core indicated a significant amount of recent alluvium above truncated poorly drained EMHOL 2 subsoils. The truncated soil is presumed to be the result of the pre-lock-and-dam use of the area as a sod farm and the overlying sediment was deposited after the construction of the lock and dam system. Due to the poorly drained nature of these subsoils, there is low to negligible chance of encountering intact prehistoric materials along these landforms.

Depth (cm)	Soil Horizon	Description
		Post-Settlement Alluvium
0–120	C	Very dark grayish brown (2.5Y 3/2) loam, very weak, very fine granular structure; abrupt boundary.
		Middle Holocene Mississippi Channel Belt (EMHOL2) LSA
120-220	Bg1	Dark olive brown (2.5Y 3/3) clay; moderate, medium prismatic structure; plastic; wet; few, fine, faint dark yellowish brown (10YR 4/6) redoximorphic concretions; gradual boundary.
220-280	Bg2	Dark olive brown (2.5Y 3/3) clay; moderate, medium prismatic structure; plastic; wet; few, fine, faint dark yellowish brown (10YR 4/6) redoximorphic concretions; few, fine, faint manganese concretions; gradual boundary.
280-380	BCg	Dark gray (5Y 4/1) clay; massive structure; few, fine, faint gray (10YR 6/1) redoximorphic depletions; plastic; wet; clear boundary.
380-400	Cg	Gray (5Y 5/1) sandy clay; large gravels mixed in, increasing in size and density with depth.

DESIGNATION: SP 2
LANDSCAPE POSITION: TRIFA LSA
SLOPE:0–2%
PARENT MATERIAL: alluvium
VEGETATION: wooded, <10% GSV
METHOD: hand probe
DATE DESCRIBED: 11/7/24
DESCRIBED BY: S. Schultz
COMMENTS: Soil profile was recorded along the northwestern portion of the project area. The soil core indicated a significant amount of deeply buried recent banded alluvium. Due to this, there is low to negligible chance of encountering intact prehistoric materials along these landforms.

Depth (cm)	Soil Horizon	Description
		Tributary Fan (TRIFA) LSA
0–200	C	Banded layers of loose light yellowish brown (10YR 6/4) sand and dark gray (5Y 4/1) plastic clay. End due to suction/impenetrable coarse sands.

Attachment G

USFWS Information for Planning and Consultation (IPaC) Letters

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 08/01/2024 20:36:52 UTC
Project Code: 2024-0124972
Project Name: Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

This response has been generated by the Information, Planning, and Conservation (IPaC) system to provide information on natural resources that could be affected by your project. The U.S. Fish and Wildlife Service (Service) provides this response under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*.).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Please refer to refer to our Section 7 website for guidance and technical assistance, including step-by-step instructions for making effects determinations for each species that might be present and for specific guidance on the following types of projects: projects in developed areas, HUD, CDBG, EDA, USDA Rural Development projects, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

We recommend running the project (if it qualifies) through our **Minnesota-Wisconsin Federal Endangered Species Determination Key (Minnesota-Wisconsin ("D-key"))**. A demonstration video showing how-to access and use the determination key is available. Please note that the Minnesota-Wisconsin D-key is the third option of 3 available d-keys. D-keys are tools to help Federal agencies and other project proponents determine if their proposed action has the potential to adversely affect federally listed species and designated critical habitat. The Minnesota-Wisconsin D-key includes a structured set of questions that assists a project proponent in determining whether a proposed project qualifies for a certain predetermined consultation outcome for all federally listed species found in Minnesota and Wisconsin (except for the northern long-eared bat- see below), which includes determinations of “no effect” or “may affect, not likely to adversely affect." In each case, the Service has compiled and analyzed the best available information on the species’ biology and the impacts of certain activities to support these determinations.

If your completed d-key output letter shows a "No Effect" (NE) determination for all listed species, print your IPaC output letter for your files to document your compliance with the Endangered Species Act.

For Federal projects with a “Not Likely to Adversely Affect” (NLAA) determination, our concurrence becomes valid if you do not hear otherwise from us after a 30-day review period, as indicated in your letter.

If your d-key output letter indicates additional coordination with the Minnesota-Wisconsin Ecological Services Field Office is necessary (i.e., you get a “May Affect” determination), you will be provided additional guidance on contacting the Service to continue ESA coordination outside of the key; ESA compliance cannot be concluded using the key for “May Affect” determinations unless otherwise indicated in your output letter.

Note: Once you obtain your official species list, you are not required to continue in IPaC with d-keys, although in most cases these tools should expedite your review. If you choose to make an effects determination on your own, you may do so. If the project is a Federal Action, you may want to review our section 7 step-by-step instructions before making your determinations.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **no effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.
2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see below) – then project proponents must determine if proposed activities will have **no effect** on or **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain Life History Information for Listed and Candidate Species on our office website. If no impacts will occur to a species on the IPaC species list (e.g., there is no habitat present in the project area), the appropriate determination is **no effect**. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

3. Should you determine that project activities **may affect** any federally listed, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

Northern Long-Eared Bats
Northern long-eared bats occur throughout Minnesota and Wisconsin and the information below may help in determining if your project may affect these species.

This species hibernates in caves or mines only during the winter. In Minnesota and Wisconsin, the hibernation season is considered to be November 15 to March 31. During the active season (April 1 to November 14) they roost in forest and woodland habitats. Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches dbh for northern long-eared bat that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, northern long-eared bats could be affected.

Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas,
- Trees found in highly developed urban areas (e.g., street trees, downtown areas),
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees, and
- A monoculture stand of shrubby vegetation with no potential roost trees.

If IPaC returns a result that northern long-eared bats are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** this species **IF** one or more of the following activities are proposed:

- Clearing or disturbing suitable roosting habitat, as defined above, at any time of year,
- Any activity in or near the entrance to a cave or mine,
- Mining, deep excavation, or underground work within 0.25 miles of a cave or mine,
- Construction of one or more wind turbines, or
- Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on the northern long-eared bat. Concurrence from the Service is not required for **No**

Effect determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

If any of the above activities are proposed, and the northern long-eared bat appears on the user's species list, the federal project user will be directed to either the range-wide northern long-eared bat D-key or the Federal Highways Administration, Federal Railways Administration, and Federal Transit Administration Indiana bat/ Northern long-eared bat D-key, depending on the type of project and federal agency involvement. Similar to the Minnesota-Wisconsin D-key, these d-keys helps to determine if prohibited take might occur and, if not, will generate an automated verification letter. Additional information about available tools can be found on the Service's northern long-eared bat website.

Whooping Crane

Whooping crane is designated as a non-essential experimental population in Wisconsin and consultation under Section 7(a)(2) of the Endangered Species Act is only required if project activities will occur within a National Wildlife Refuge or National Park. If project activities are proposed on lands outside of a National Wildlife Refuge or National Park, then you are not required to consult. For additional information on this designation and consultation requirements, please review "Establishment of a Nonessential Experimental Population of Whooping Cranes in the Eastern United States."

Other Trust Resources and Activities

Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. It is the responsibility of the project proponent to survey the area for any migratory bird nests. If there is an eagle nest on-site while work is on-going, eagles may be disturbed. We recommend avoiding and minimizing disturbance to eagles whenever practicable. If you cannot avoid eagle disturbance, you may seek a permit. A nest take permit is always required for removal, relocation, or obstruction of an eagle nest. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds **-** The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers **-** Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts.

Transmission Lines **-** Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's Wind Energy Guidelines. In addition, please refer to the Service's Eagle Conservation Plan Guidance, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

State Department of Natural Resources Coordination

While it is not required for your Federal section 7 consultation, please note that additional state endangered or threatened species may also have the potential to be impacted. Please contact the Minnesota or Wisconsin Department of Natural Resources for information on state listed species that may be present in your proposed project area.

Minnesota

Minnesota Department of Natural Resources - Endangered Resources Review Homepage

Email: Review.NHIS@state.mn.us

Wisconsin

Wisconsin Department of Natural Resources - Endangered Resources Review Homepage

Email: DNRERReview@wi.gov

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
(952) 858-0793

PROJECT SUMMARY

Project Code: 2024-0124972

Project Name: Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)

Project Type: Disposal - Beneficial Use

Project Description: Reno area (see map), size (see map), scope is essentially aquatic habitat dredging and using that dredged material beneficially to elevate floodplain forest habitat to establish higher elevation naturally regenerating floodplain forest. Dredged aquatic habitat will provide critical overwintering habitat for fishes. Timing of construction would be 2026 2027

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@43.53633045,-91.27872023831898,14z

Counties: Houston County, Minnesota

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ This species only needs to be considered if the project includes wind turbine operations. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

CLAMS

NAME	STATUS
Higgins Eye (pearlymussel) *Lampsilis higginsii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5428	Endangered
Salamander Mussel *Simpsonaias ambigua* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6208	Proposed Endangered
Sheepnose Mussel *Plethobasus cyphyus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6903	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

The following FWS National Wildlife Refuge Lands and Fish Hatcheries lie fully or partially within your project area:

FACILITY NAME	ACRES
UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE https://www.fws.gov/our-facilities?$keywords="%5C%22UPPER+MISSISSIPPI+RIVER+NATIONAL+WILDLIFE+AND+FISH+REFUGE%5C%22"	20,732.346

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence ( )

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season ( )

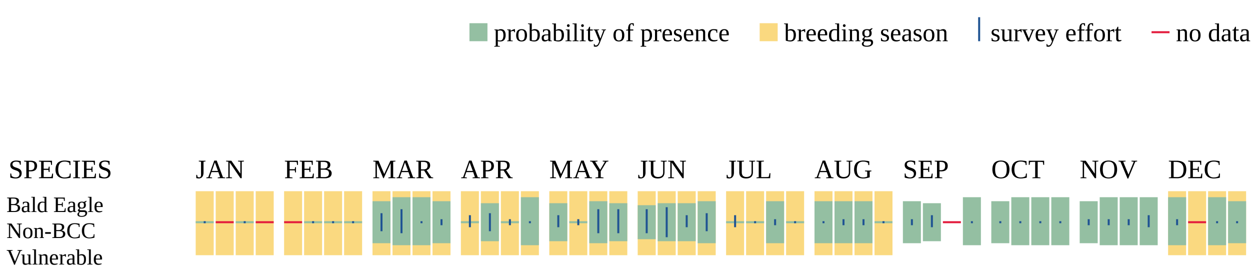
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)

A week is marked as having no data if there were no survey events for that week.



Golden Eagle
Non-BCC
Vulnerable

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10561	Breeds elsewhere

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Cerulean Warbler *Setophaga cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 22 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Grasshopper Sparrow *Ammodramus savannarum perpallidus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8329	Breeds Jun 1 to Aug 20

NAME	BREEDING SEASON
Henslow's Sparrow *Centronyx henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence ( )

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

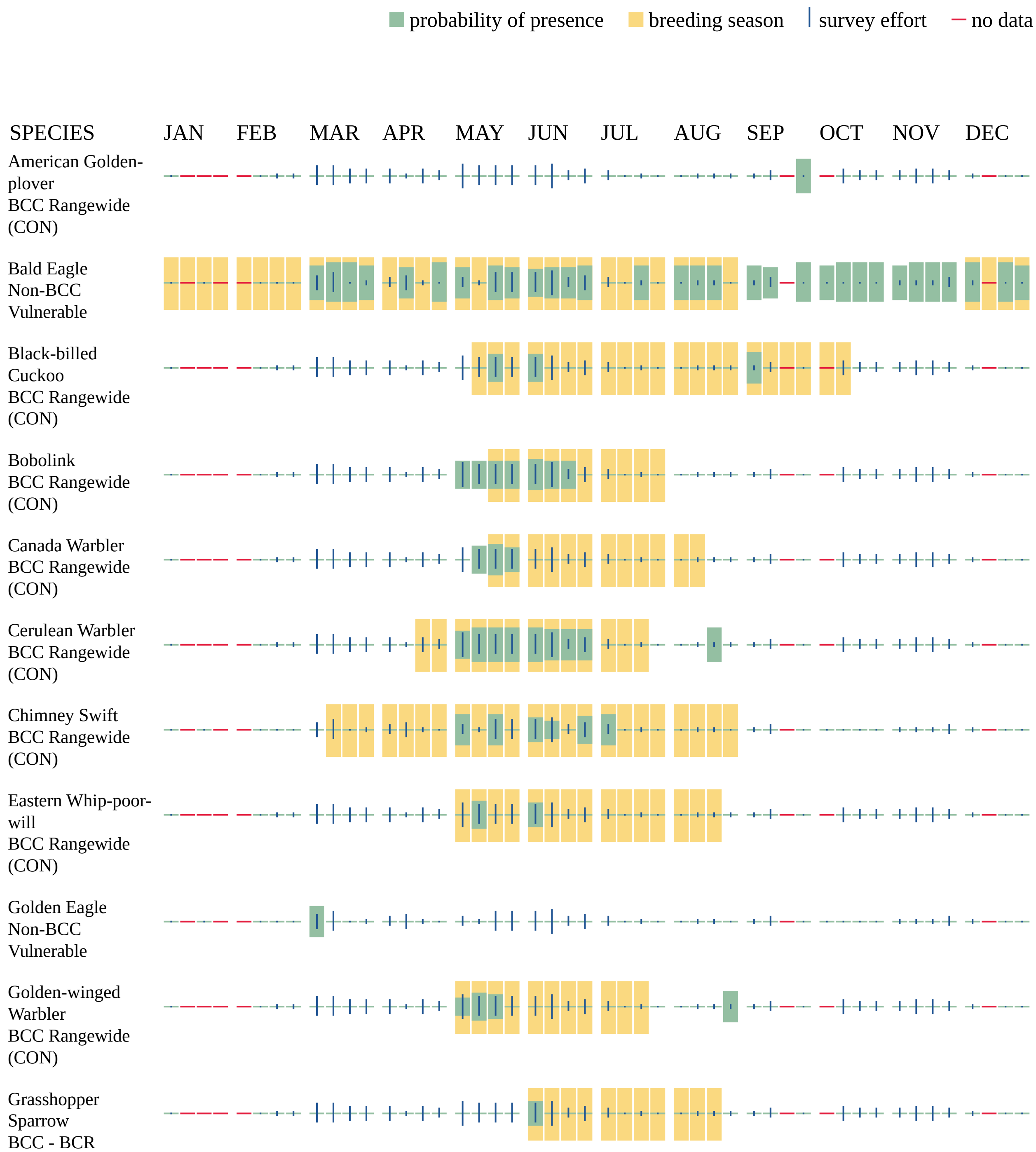
Breeding Season ( )

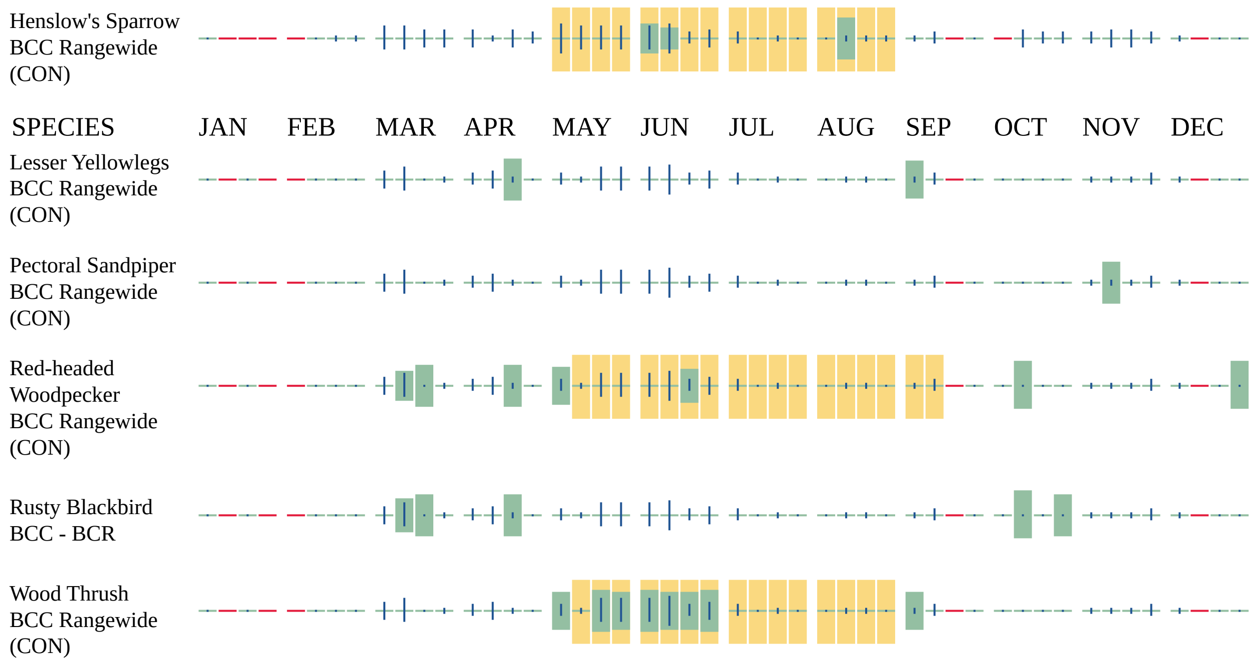
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1C
- PSS1C

FRESHWATER POND

- PABH
- PUBH

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1F

RIVERINE

- R2ABHh
- R2UBH

IPAC USER CONTACT INFORMATION

Agency:	Minnesota Department of Natural Resources
Name:	Neil Rude
Address:	1801 S. Oak Street
City:	Lake City
State:	MN
Zip:	55041
Email	neil.rude@state.mn.us
Phone:	6512994025

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 08/01/2024 20:44:31 UTC
Project code: 2024-0124972
Project Name: Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)

Subject: Consistency letter for 'Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)' for specified threatened and endangered species that may occur in your proposed project location consistent with the Minnesota-Wisconsin Endangered Species Determination Key (Minnesota-Wisconsin DKey).

Dear Neil Rude:

The U.S. Fish and Wildlife Service (Service) received on **August 01, 2024** your effect determination(s) for the 'Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)' (Action) using the Minnesota-Wisconsin DKey within the Information for Planning and Consultation (IPaC) system. You have submitted this key to satisfy requirements under Section 7(a)(2). The Service developed this system in accordance of with the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C 1531 et seq.).

Based on your answers and the assistance of the Service's Minnesota-Wisconsin DKey, you made the following effect determination(s) for the proposed Action:

Species	**Listing Status**	**Determination**
Higgins Eye (pearlymussel) (*Lampsilis higginsii*)	Endangered	May affect
Monarch Butterfly (*Danaus plexippus*)	Candidate	No effect
Salamander Mussel (*Simpsonaias ambigua*)	Proposed Endangered	May affect
Sheepnose Mussel (*Plethobasus cyphyus*)	Endangered	May affect
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	NLAA
Whooping Crane (*Grus americana*)	Experimental Population, Non-Essential	May affect

<u>Determination Information</u>

Consultation with the Service is not complete. Further consultation with the Minnesota-Wisconsin Ecological Services Field Office is required for those species with a determination of

"May Affect," listed above. Please email our office at TwinCities@fws.gov and attach a copy of this letter, so we can discuss methods to avoid or minimize potential adverse effects to those species.

Additional Information

Sufficient project details: Please provide sufficient project details on your project homepage in IPaC (Define Project, Project Description) to support your conclusions. Failure to disclose important aspects of your project that would influence the outcome of your effects determinations may negate your determinations and invalidate this letter. If you have site-specific information that leads you to believe a different determination is more appropriate for your project than what the Dkey concludes, you can and should proceed based on the best available information.

Future project changes: The Service recommends that you contact the Minnesota-Wisconsin Ecological Services Field Office or re-evaluate the project in IPaC if: 1) the scope or location of the proposed Action is changed; 2) new information reveals that the action may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the Action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occurs, additional consultation with the Service should take place before project changes are final or resources committed.

Species-specific information

Freshwater Mussels: Freshwater mussels are one of the most critically imperiled groups of organisms in the world. In North America, 65% of the remaining 300 species are vulnerable to extinction (Haag and Williams 2014). Implementing measures to conserve and restore freshwater mussel populations directly improves water quality in lakes, rivers, and streams throughout Minnesota and Wisconsin. An adult freshwater mussel filters anywhere from 1 to 38 gallons of water per day (Baker and Levinton 2003, Barnhart pers. comm. 2019). A 2015 survey found that in some areas, mussels can reduce the bacterial populations by more than 85% (Othman et al. 2015 in Vaughn 2017). Mussels are also considered to be ecosystem engineers by stabilizing substrate and providing habitat for other aquatic organisms (Vaughn 2017). In addition to ecosystem services, mussels play an important role in the food web, contributing critical nutrients to both terrestrial and aquatic habitats, including those that support sport fish (Vaughn 2017). Taking proactive measures to conserve and restore freshwater mussels will improve water quality, which has the potential to positively impact human health and recreation in the States of Minnesota and Wisconsin.

Federally listed mussels may be present in the Action area. Projects may adversely affect listed mussels if they permanently affect local hydrology, directly impact a stream (e.g., stream/road crossings, new stormwater outfall discharge, dams, other in-stream work, etc.), and/or indirectly impact a stream or riparian zone (e.g., cut and fill, horizontal directional drilling, construction, vegetation removal, discharge, etc.). Please coordinate with the Minnesota-Wisconsin Ecological Services Field Office to further evaluate effects of the Action on Federally listed mussels.

Bald and Golden Eagles: Bald eagles, golden eagles, and their nests are protected under the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d) (Eagle Act).

The Eagle Act prohibits, except when authorized by an Eagle Act permit, the "taking" of bald and golden eagles and defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The Eagle Act's implementing regulations define disturb as "… to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

The following species and/or critical habitats may also occur in your project area and **are not** covered by this conclusion:

- Northern Long-eared Bat *Myotis septentrionalis* Endangered

Coordination with the Service is not complete if additional coordination is advised above for any species.

Mussel References

Baker, S.M. and J. Levinton. 2003. Selective feeding by three native North American freshwater mussels implies food competition with zebra mussels. Hydrobiologia 505(1):97-105.

Haag, W. R. and J.D. Williams, 2014. Biodiversity on the brink: an assessment of conservation strategies for North American freshwater mussels. Hydrobiologia 735:45-60.

Morowski, D., L. James and D. Hunter. 2009. Freshwater mussels in the Clinton River, southeastern Michigan: an assessment of community status. Michigan Academician XXXIX: 131-148.

Othman, F., M.S. Islam, E.N. Sharifah, F. Shahrom-Harrison and A. Hassan. 2015. Biological control of streptococcal infection in Nile tilapia Oreochromis niloticus (Linnaeus, 1758) using filter-feeding bivalve mussel Pilsbryoconcha exilis (Lea, 1838). Journal of Applied Ichthyology 31: 724-728.

Vaughn, C.C. 2017. Ecosystem services provided by freshwater mussels. Hydrobiologia DOI: 10.1007/s10750-017-3139-x.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)

2. Description

The following description was provided for the project 'Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)':

> Reno area (see map), size (see map), scope is essentially aquatic habitat dredging and using that dredged material beneficially to elevate floodplain forest habitat to establish higher elevation naturally regenerating floodplain forest. Dredged aquatic habitat will provide critical overwintering habitat for fishes. Timing of construction would be 2026 2027

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@43.53633045,-91.27872023831898,14z

QUALIFICATION INTERVIEW

1. This determination key is intended to assist the user in evaluating the effects of their actions on Federally listed species in Minnesota and Wisconsin. It does not cover other prohibited activities under the Endangered Species Act (e.g., for wildlife: import/export, Interstate or foreign commerce, possession of illegally taken wildlife, etc.; for plants: import/export, reduce to possession, malicious destruction on Federal lands, commercial sale, etc.) or other statutes. Additionally, this key DOES NOT cover wind development, purposeful take (e.g., for research or surveys), communication towers that have guy wires or are over 450 feet in height, aerial or other large-scale application of any chemical (such as insecticide or herbicide), and approval of long-term permits or plans (e.g., FERC licenses, HCP's).

   Click **YES** to acknowledge that you must consider other prohibitions of the ESA or other statutes outside of this determination key.

   Yes
2. Is the action being funded, authorized, or carried out by a Federal agency?

   Yes
3. Are you the Federal agency or designated non-federal representative?

   Yes
4. Does the action involve the installation or operation of wind turbines?

   No
5. Does the action involve purposeful take of a listed animal?

   No
6. Does the action involve a new communications tower?

   No
7. Does the activity involve aerial or other large-scale application of ANY chemical, including pesticides (insecticide, herbicide, fungicide, rodenticide, etc)?

   No
8. Will your action permanently affect local hydrology?

   Yes

9. Does your project have the potential to impact the riparian zone or indirectly impact a stream/river (e.g., cut and fill; horizontal directional drilling; construction; vegetation removal; pesticide or fertilizer application; discharge; runoff of sediment or pollutants; increase in erosion, etc.)?

   Note: Consider all potential effects of the action, including those that may happen later in time and outside and downstream of the immediate area involved in the action.

   Endangered Species Act regulation defines "effects of the action" to include all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. (50 CFR 402.02).

   Yes

10. Will your action disturb the ground or existing vegetation?

    Note: This includes any off-road vehicle access, soil compaction (enough to collapse a rodent burrow), digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application (herbicide, fungicide), vegetation management (including removal or maintenance using equipment or prescribed fire), cultivation, development, etc.

    Yes

11. Will your action include spraying insecticides?

    No

12. Does your action area occur entirely within an already developed area?

    Note: Already developed areas are already paved, covered by existing structures, manicured lawns, industrial sites, or cultivated cropland, AND do not contain trees that could be roosting habitat. Be aware that listed species may occur in areas with natural, or semi-natural, vegetation immediately adjacent to existing utilities (e.g. roadways, railways) or within utility rights-of-way such as overhead transmission line corridors, and can utilize suitable trees, bridges, or culverts for roosting even in urban dominated landscapes (so these are not considered "already developed areas" for the purposes of this question). If unsure, select NO..

    No

13. [Semantic] Does the project intersect the Salamander mussel AOI?

    Automatically answered
    Yes

14. Have you determined that the action will have no effect on individuals within the whooping crane nonessential experimental population (NEP)?

    No

15. Does the action occur within a National Wildlife Refuge or National Park?

    Note: For the purposes of section 7 of the Act, we treat nonessential experimental populations (NEPs) as threatened species when the NEP is located within a National Wildlife Refuge (NWR) or National Park (NP), and therefore section 7(a)(1) and the consultation requirements of section 7(a)(2) of the Act apply in NWRs and NPs. Section 7(a)(1) requires all Federal agencies to use their authorities to conserve listed species. Section 7(a)(2) requires that Federal agencies consult with the Service before authorizing, funding, or carrying out any activity that would likely jeopardize the continued existence of a listed species or adversely modify its critical habitat.

    Yes
16. [Hidden Semantic] Does the action area intersect the monarch butterfly species list area?

    Automatically answered

    Yes
17. Under the ESA, monarchs remain warranted but precluded by listing actions of higher priority. The monarch is a candidate for listing at this time. The Endangered Species Act does not establish protections or consultation requirements for candidate species. Some Federal and State agencies may have policy requirements to consider candidate species in planning. We encourage implementing measures that will remove or reduce threats to these species and possibly make listing unnecessary.

    If your project will have no effect on monarch butterflies (for example, if your project won't affect their habitat or individuals), then you can make a "no effect" determination for this project.

    Are you making a "no effect" determination for monarch?

    No
18. Is this project funded, authorized, or carried out by the U.S. Fish and Wildlife Service?

    No
19. [Hidden semantic] Does the action intersect the Tricolored bat species list area?

    Automatically answered

    Yes
20. The tricolored bat was proposed for listing as endangered on September 13, 2022. During winter, tricolored bats hibernate in caves, abandoned mines, and abandoned tunnels ranging from small to large in size. During spring, summer and fall months, they roost primarily among leaf clusters of live or recently dead deciduous/hardwood trees.

    What effect determination do you want to make for the tricolored bat (Only make a "may affect" determination if you think the project is likely to jeopardize the continued existence of the species)?

    2. “May affect – not likely to adversely affect”

IPAC USER CONTACT INFORMATION

Agency: Minnesota Department of Natural Resources
Name: Neil Rude
Address: 1801 S. Oak Street
City: Lake City
State: MN
Zip: 55041
Email neil.rude@state.mn.us
Phone: 6512994025

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 08/01/2024 21:03:02 UTC
Project code: 2024-0124972
Project Name: Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)

Federal Nexus: yes
Federal Action Agency (if applicable): Minnesota Department of Natural Resources

Subject: Federal agency coordination under the Endangered Species Act, Section 7 for 'Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)'

Dear Neil Rude:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on August 01, 2024, for 'Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)' (here forward, Project). This project has been assigned Project Code 2024-0124972 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements may not be complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (DKey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid.***

Determination for the Northern Long-Eared Bat

Based upon your IPaC submission and a standing analysis completed by the Service, your project has reached the determination of "May Affect, Not Likely to Adversely Affect" the northern long-eared bat. Unless the Service advises you within 15 days of the date of this letter that your

IPaC-assisted determination was incorrect, this letter verifies that consultation on the Action is complete and no further action is necessary unless either of the following occurs:

- new information reveals effects of the action that may affect the northern long-eared bat in a manner or to an extent not previously considered; or,
- the identified action is subsequently modified in a manner that causes an effect to the northern long-eared bat that was not considered when completing the determination key.

15-Day Review Period

As indicated above, the Service will notify you within 15 calendar days if we determine that this proposed Action does not meet the criteria for a "may affect, not likely to adversely affect" (NLAA) determination for the northern long-eared bat. If we do not notify you within that timeframe, you may proceed with the Action under the terms of the NLAA concurrence provided here. This verification period allows the identified Ecological Services Field Office to apply local knowledge to evaluation of the Action, as we may identify a small subset of actions having impacts that we did not anticipate when developing the key. In such cases, the identified Ecological Services Field Office may request additional information to verify the effects determination reached through the Northern Long-eared Bat DKey.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Higgins Eye (pearlymussel) *Lampsilis higginsii* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Salamander Mussel *Simpsonaias ambigua* Proposed Endangered
- Sheepnose Mussel *Plethobasus cyphyus* Endangered
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered
- Whooping Crane *Grus americana* Experimental Population, Non-Essential

You may coordinate with our Office to determine whether the Action may affect the species and/or critical habitat listed above. Note that reinitiation of consultation would be necessary if a new species is listed or critical habitat designated that may be affected by the identified action before it is complete.

If you have any questions regarding this letter or need further assistance, please contact the Minnesota-Wisconsin Ecological Services Field Office and reference Project Code 2024-0124972 associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)

2. Description

The following description was provided for the project 'Reno Bottoms Floodplain Forest and Aquatic Habitat Restoration (Lessard Sams)':

> Reno area (see map), size (see map), scope is essentially aquatic habitat dredging and using that dredged material beneficially to elevate floodplain forest habitat to establish higher elevation naturally regenerating floodplain forest. Dredged aquatic habitat will provide critical overwintering habitat for fishes. Timing of construction would be 2026 2027

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@43.53633045,-91.27872023831898,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of "may affect, but not likely to adversely affect" for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. The action area does not overlap with an area for which U.S. Fish and Wildlife Service currently has data to support the presumption that the northern long-eared bat is present. Are you aware of other data that indicates that northern long-eared bats (NLEB) are likely to be present in the action area?

   Bat occurrence data may include identification of NLEBs in hibernacula, capture of NLEBs, tracking of NLEBs to roost trees, or confirmed NLEB acoustic detections. Data on captures, roost tree use, and acoustic detections should post-date the year when white-nose syndrome was detected in the relevant state. With this question, we are looking for data that, for some reason, may have not yet been made available to U.S. Fish and Wildlife Service.

   No

3. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer 'yes' if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

4. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes

5. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

6. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   Yes
7. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No
8. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No
9. Have you determined that your proposed action will have no effect on the northern long-eared bat? Remember to consider the effects of any activities that would not occur but for the proposed action.

   If you think that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, answer "No" below and continue through the key. If you have determined that the northern long-eared bat does not occur in your project's action area and/or that your project will have no effects whatsoever on the species despite the potential for it to occur in the action area, you may make a "no effect" determination for the northern long-eared bat.

   Note: Federal agencies (or their designated non-federal representatives) must consult with USFWS on federal agency actions that may affect listed species [50 CFR 402.14(a)]. Consultation is not required for actions that will not affect listed species or critical habitat. Therefore, this determination key will not provide a consistency or verification letter for actions that will not affect listed species. If you believe that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, please answer "No" and continue through the key. Remember that this key addresses only effects to the northern long-eared bat. Consultation with USFWS would be required if your action may affect another listed species or critical habitat. The definition of Effects of the Action can be found here: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

   No
10. [Semantic] Is the action area located within 0.5 miles of a known northern long-eared bat hibernaculum?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

11. Does the action area contain any caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating northern long-eared bats?

    No

12. Does the action area contain or occur within 0.5 miles of (1) talus or (2) anthropogenic or naturally formed rock crevices in rocky outcrops, rock faces or cliffs?

    Yes

13. Have you received written confirmation from the local Ecological Services Field Office that the talus rock crevices in the action area are not likely to contain hibernating northern long-eared bats and/or that the proposed action would not affect those habitat types or northern long-eared bats that may use them? If so, upload the field office confirmation and continue with the key.

    No

14. Will the proposed action result in the cutting or other means of knocking down, bringing down, or trimming of any trees suitable for northern long-eared bat roosting?

    Note: Suitable northern long-eared bat roost trees are live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities.

    Yes

PROJECT QUESTIONNAIRE

Will all project activities by completed by November 30, 2024?

No

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the inactive (hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

5

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

5

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the active (non-hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

0

Will all potential northern long-eared bat (NLEB) roost trees (trees ≥3 inches diameter at breast height, dbh) be cut, knocked, or brought down from any portion of the action area greater than or equal to 0.1 acre? If all NLEB roost trees will be removed from multiple areas, select ‘Yes’ if the cumulative extent of those areas meets or exceeds 0.1 acre.

Yes

Enter the extent of the action area (in acres) from which all potential NLEB roost trees will be removed. If all NLEB roost trees will be removed from multiple areas, entire the total extent of those areas. Round up to the nearest tenth of an acre.

5

For the area from which all potential northern long-eared bat (NLEB) roost trees will be removed, on how many acres (round to the nearest tenth of an acre) will trees be allowed to regrow? Enter ‘0’ if the entire area from which all potential NLEB roost trees are removed will be developed or otherwise converted to non-forest for the foreseeable future.

5

Will any snags (standing dead trees) ≥3 inches dbh be left standing in the area(s) in which all northern long-eared bat roost trees will be cut, knocked down, or otherwise brought down?

Yes

IPAC USER CONTACT INFORMATION

Agency: Minnesota Department of Natural Resources
Name: Neil Rude
Address: 1801 S. Oak Street
City: Lake City
State: MN
Zip: 55041
Email neil.rude@state.mn.us
Phone: 6512994025

Attachment H

Natural Heritage Information System (NHIS) Review, MN DNR
MCE-2022-00358 and MCE-2022-00358-02

Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

November 20, 2022
Correspondence # MCE 2022-00358

Neil Rude
MN Department of Natural Resources

RE: Natural Heritage Review of the proposed Reno LSOH,
T101N R4W Section 23; Houston County

Dear Neil Rude,

As requested, the Minnesota Natural Heritage Information System has been reviewed to determine if the proposed project has the potential to impact any rare species or other significant natural features. Based on the project details provided with the request, the following rare features may be impacted by the proposed project:

Ecologically Significant Areas

- The Minnesota Biological Survey (MBS) has identified a Site of *Moderate* Biodiversity Significance that encompasses the entire proposed project area. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *Moderate* contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery. This site includes several delineated Silver Maple – (Virginia Creeper) Floodplain Forest native plant communities, which are considered imperiled in Minnesota. Actions to minimize disturbance may include, but are not limited to, the following recommendations:
  - Minimize vehicular disturbance in the MBS Site (allow only vehicles/equipment necessary for construction activities);
  - Do not park equipment or stockpile supplies in the MBS Site;
  - Do not place spoil within MBS Site or other sensitive areas;
  - Use effective erosion prevention and sediment control measures;
  - Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species;

- As much as possible, operate within already-disturbed areas;
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible; and
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern are birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas.

MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be viewed using the Minnesota Conservation Explorer or they can be downloaded from DNR Quick Layers. Please contact the NH Review Team if you need assistance accessing the data. Reference the MBS Site Biodiversity Significance and Native Plant Community websites for information on interpreting the data.

- If the Wetland Conservation Act (WCA) is applicable to this project, please note that one or more Native Plant Communities in the vicinity of the project may qualify as a "rare natural community" under this Act. Minnesota Rules, part 8420.0515, subpart 3 states that a wetland replacement plan for activities that modify a rare natural community must be denied if the local government unit determines the proposed activities will permanently adversely affect the natural community.

State-listed Species

- Pallid shiner (*Hybopsis amnis*), a state-listed endangered species, has been documented in the vicinity of the proposed project. This small fish species is found in large to medium-sized rivers in moderate to swift currents downstream of sand and gravel bars, and also in slower-moving waters such as sloughs. This species spawns from late May through July. Minnesota's Endangered Species Statute (Minnesota Statutes, section 84.0895) and associated Rules (Minnesota Rules, part 6212.1800 to 6212.2300 and chapter 6134) prohibit the take of threatened or endangered species without a permit. **If the project area contains suitable spawning habitat, work within the water needs to be avoided from late May through July 31st.** Consult with the NH Review Team (Reports.NHIS@state.mn.us) if this is not feasible, as further action may be needed.

- Black Buffalo (*Ictiobus niger*), a state-listed threatened fish species, was documented in the vicinity of the proposed project. This species is found in the sloughs, backwaters, and impoundments of large rivers and spawns from April through mid-June. **If the project area contains suitable spawning habitat, work within the water needs to be avoided from April 1st through mid-June.** Consult with the NH Review Team (Reports.NHIS@state.mn.us) if this is not feasible, as further action may be needed.

- Paddlefish (*Polyodon spathula*), both state-listed threatened fish species have been documented in the vicinity of the proposed project site. As the proposed project area does not contain adequate spawning habitat, impacts to this species while spawning are not anticipated.

The EAW should address whether the proposed project has the potential to negatively impact these fish species including if the project area has the potential to contain suitable spawning habitat. If so, describe any measures that will be taken to avoid or minimize disturbance.

- Catchfly grass (*Lerrsia lenticularis*), a state-listed threatened species, and Gray's sedge (*Carex grayi*), muskingum sedge (*Carex muskingumensis*), green dragon (*Arisamea dracontium*), and swamp white oak (*Quercus bicolor*), all state-listed species of special concern, have been documented in the vicinity of the proposed project. These plant species are found in floodplain forests within the Mississippi River valley and are tolerant of flood events.

  As catchfly grass has been documented in the vicinity of the proposed project, **a qualified surveyor is required to conduct a botanical survey in any potential habitat that will be impacted by the proposed project**. A habitat assessment may be needed if potential habitat is unknown. Surveys must be conducted by a surveyor on the attached list and follow the standards contained in the Rare Species Survey Process and Rare Plant Guidance. Project planning should take into account that any botanical survey needs to be conducted during the appropriate time of the year, which may be limited. Please consult with the NH Review Team (Reports.NHIS@state.mn.us) regarding this process.

- Timber rattlesnakes (*Crotalus horridus)*, a state-listed threatened species, have been reported from the vicinity of the proposed project and may be encountered on site. In Minnesota, the ideal habitat for this species is forested bluffs, south-facing rock outcrops, and bluff prairies, particularly in the Mississippi River Valley. Nearby forests, prairies, and agricultural lands are used as summer feeding grounds. Two necessary habitat components are open areas for thermoregulation, and dens for overwintering. The dens are often located on steep, south or west-facing hillsides with rock outcroppings and ledges. Timber rattlesnakes emerge from their dens in late April to early May and return to them in late September to early October. In the spring and fall, timber rattlesnakes are active during the day; while during the hottest months of summer, they are mostly active at night.

  Timber rattlesnake mortality in Minnesota is most commonly caused by poaching, vehicle collisions, and habitat destruction. The loss of a single adult, especially a female, can impact the population significantly. As such, crews working in the area should be advised that if they encounter any snakes, the snakes should not be disturbed. The use of erosion control blanket shall be limited to 'bio-netting' or 'naturalnetting' types, and specifically not products containing plastic mesh netting or other plastic components. Also, be aware that hydro-mulch products may contain small synthetic (plastic) fibers to aid in their matrix strength. These loose fibers could potentially re-suspend and make their way into Public Waters. As such, please review mulch products and do not allow any materials with synthetic (plastic) fiber additives in areas that drain to Public Waters. Be aware, there are also other species of snakes in the area that will mimic rattlesnakes. Contact the DNR Regional Nongame Wildlife Specialist, Bridgette Timm (bridgette.timm@state.mn.us), if timber rattlesnakes are encountered on-site or if you have any questions regarding this species.

- Please visit the DNR Rare Species Guide for more information on the habitat use of these species and recommended measures to avoid or minimize impacts. For further assistance with these species, please contact the appropriate DNR Regional Nongame Specialist or Regional Ecologist.

Federally Protected Species

- Several mussel species including Higgins eye (*Lampsilis higginsii*), a federally and state-listed endangered species, have been documented downstream of the proposed project. Mussels are particularly vulnerable to deterioration in water quality, especially increased siltation. As such, effective erosion prevention and sediment control practices must be implemented and maintained throughout the duration of the proposed project. In order to determine the potential for a take of state-protected mussels, **a qualified surveyor (see enclosed list) will need to conduct a mussel survey and/or relocation in any potential mussel habitat prior to construction**.

  The surveyor will need to obtain a permit from the DNR Endangered Species Coordinator,) before conducting any mussel surveys and will need to follow established survey protocol. The extent of the mussel survey should include all areas of the riverbed that will be directly impacted by excavation, placing of fill or riprap, driving of equipment, or dewatering; as well as any areas downstream that will receive sediment from project activities. Please send the results of all survey work to the DNR Endangered Species Environmental Review Coordinator, Lisa Joyal (Lisa.Joyal@state.mn.us or 651-259-5109). **No work in the riverbed shall occur until potential impacts to mussels have been resolved** to the satisfaction of the DNR's Endangered Species Coordinator, Bridget Henning-Randa.

- To ensure compliance with federal law, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online Information for Planning and Consultation (IPaC) tool.

Environmental Review and Permitting

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance. Sufficient information should be provided so the DNR can determine whether a takings permit will be needed for any of the above protected species.

- Please include a copy of this letter and the MCE-generated Final Project Report in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location and project description provided with the request. If project details change or the project has not occurred within one year, please resubmit the project for review within one year of initiating project activities.

The Natural Heritage Review does not constitute project approval by the Department of Natural Resources. Instead, it identifies issues regarding known occurrences of rare features and potential impacts to these rare features. For information on the environmental review process or other natural resource concerns, you may contact your DNR Regional Environmental Assessment Ecologist.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources.

Sincerely,

Samantha Bump

Samantha Bump
Natural Heritage Review Specialist
Samantha.Bump@state.mn.us

Cc: Melissa Collins and Bridgette Timm

DEPARTMENT OF NATURAL RESOURCES

Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

July 23, 2025

Neil Rude
Fisheries and Wildlife

RE: Natural Heritage Review of the proposed Reno LSOH: Clone Of 2022-00358,
T101N R4W Section 23; Houston County

Dear Neil Rude,

For all correspondence regarding the Natural Heritage Review of this project please include the project ID **MCE-2022-00358-02** in the email subject line.

As requested, the Minnesota Natural Heritage Information System has been reviewed to determine if the proposed project has the potential to impact any rare species or other significant natural features. Based on the project details provided with the request, the following rare features may be impacted by the proposed project:

Ecologically Significant Areas

- The Minnesota Biological Survey (MBS) has identified a Site of *Moderate* Biodiversity Significance that includes the proposed project area. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *Moderate* contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery. This Site includes mapped Silver Maple – (Virginia Creeper) Floodplain Forest (FFs68a) which has a state conservation rank of Vulnerable to Extirpation (S3). The DNR recommends that the project be designed to avoid impacts to these ecologically significant areas. Actions to avoid or minimize disturbance include, but are not limited to, the following recommendations:
    - As much as possible, operate within already-disturbed areas.
    - Avoid native plant communities ranked S1, S2, or S3.
    - Minimize vehicular disturbance in the MBS Site (allow only vehicles/equipment necessary for construction activities).
    - Do not park equipment or stockpile supplies in the MBS Site.
    - Use effective erosion prevention and sediment control measures.
    - Inspect and clean equipment prior to operation and follow recommendations to prevent the spread of invasive species.

- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern are birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas.

MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be viewed using the Explore page in Minnesota Conservation Explorer (MCE) or they can be downloaded from DNR Quick Layers. Reference the MBS Site Biodiversity Significance and Native Plant Community websites for information on interpreting the data. To receive a list of MBS Sites of Biodiversity Significance and DNR Native Plant Communities in the vicinity of your project, create a Conservation Planning Report using the Explore Tab in MCE.

- The backwater sloughs of the Mississippi River in and around the proposed project have been identified as Lakes of *Outstanding* Biological Significance. Lakes of Biological Significance were ranked as *Outstanding, High, or Moderate* based on unique plant and animal presence. These sloughs contain several rare species. In addition to the aquatic species in the State-Listed Species section below, there are records of pirate perch (*Aphredoderus gibbosus*), blue sucker (*Cycleptus elongatus*), warmouth (*Lepomis gulosus*), and yellow bass (*Monroe mississippiensis*)., all state-listed fish species of special concern.

- If the Wetland Conservation Act (WCA) is applicable to this project, please note that one or more Native Plant Communities in the vicinity of the project may qualify as a "rare natural community" under this Act. Minnesota Rules, part 8420.0515, subpart 3 states that a wetland replacement plan for activities that modify a rare natural community must be denied if the local government unit determines the proposed activities will permanently adversely affect the natural community. If the proposed project includes a wetland replacement plan under WCA, please contact your DNR Regional Ecologist for further evaluation. Please visit WCA Program Guidance and Information for additional information, including the Rare Natural Communities Technical Guidance.

State-listed Species

- A rare plant survey was conducted in the proposed project area in September 2024. Catchfly grass (*Leersia lenticularis*), state-listed as threatened, was documented in the project area. Minnesota's Endangered Species Statute (Minnesota Statutes, section 84.0895) and associated Rules (Minnesota Rules, part 6212.1800 to 6212.2300 and chapter 6134) prohibit the take of threatened or endangered species without a permit. The EAW should address whether the proposed project has the potential to impact this species and describe any measures that will be taken to avoid or minimize disturbance.

- Pallid shiner (*Hybopsis amnis*), a state-listed endangered species, has been documented in the vicinity of the proposed project. This small fish species is found in large to medium-sized rivers in moderate to swift currents downstream of sand and gravel bars, and in slower-moving waters such as sloughs. This species spawns from late May through July. **If the project area contains suitable spawning habitat, work within**

the water needs to be avoided from late May through July 31st. Consult with the NH Review Team (Review.NHIS@state.mn.us) if this is not feasible, as further action may be needed.

- Black buffalo (*Ictiobus niger*), a state-listed threatened fish species, was documented in the vicinity of the proposed project. This species is found in the sloughs, backwaters, and impoundments of large rivers and spawns from April through mid-June. **If the project area contains suitable spawning habitat, work within the water needs to be avoided from April 1st through mid-June.** Consult with the NH Review Team (Review.NHIS@state.mn.us) if this is not feasible, as further action may be needed.

- Timber rattlesnakes (*Crotalus horridus*), a state-listed threatened species, have been documented in the vicinity of the proposed project. Given the presence of these rare snakes, we recommend that the use of erosion control mesh, if any, be limited to wildlife-friendly material. Please remember that state law and rules prohibit the destruction of threatened or endangered species, except under certain prescribed conditions. As such, crews working in the area should be advised that if they encounter any snakes, the snakes should not be disturbed.

- Please visit the DNR Rare Species Guide for more information on the habitat use of these species and recommended measures to avoid or minimize impacts.

Federally Protected Species

- Several mussel species including Higgins eye (*Lampsilis higginsii*), a federally and state-listed endangered species, have been documented downstream of the proposed project. Mussels are particularly vulnerable to deterioration in water quality, especially increased siltation. As such, effective erosion prevention and sediment control practices must be implemented and maintained throughout the duration of the proposed project. In order to determine the potential for a take of state-protected mussels, **a qualified surveyor (see enclosed list) will need to conduct a mussel survey and/or relocation in any potential mussel habitat prior to construction**.

  Surveys must follow the Rare Species Survey Process and the MN Mussel Survey and Relocation Protocol. Visit the Natural Heritage Review page for a list of certified surveyors and more information on this process. Alternatively, in situations where a survey is not feasible, the applicant can assume presence of state-protected mussels and apply for a permit to take with mitigation. Please consult with Review.NHIS@state.mn.us if you have questions regarding the survey process or EndangeredSpeciesPermits.dnr@state.mn.us if you have questions regarding the permit to take process. **No work in the riverbed shall occur until potential impacts to mussels have been resolved** to the satisfaction of the DNR's Endangered Species Coordinator, Bridget Henning-Randa (Bridget.Henning-Randa@state.mn.us).

- To ensure compliance with federal law, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online Information for Planning and Consultation (IPaC) tool

Environmental Review and Permitting

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance. Sufficient information should be provided so the DNR can determine whether a permit to take will be needed for any of the above protected species.

- Please include a copy of this letter and the MCE-generated Final Project Report in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's native plant communities, rare species, and other rare features. However, the NHIS is not an exhaustive inventory and does not contain the locations of all rare features in the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location and project description provided with the request. **If project details change or the project has not occurred within one year, please resubmit the project for review within one year of initiating project activities.** Resubmit by selecting *Clone Project as Draft* on the project page in MCE.

The Natural Heritage Review does not constitute project approval by the Department of Natural Resources. Instead, it identifies issues regarding known occurrences of rare features and potential impacts to these rare features. Visit Natural Heritage Review for additional information regarding this process, survey guidance, and other related information. For information on the environmental review process or other natural resource concerns, please contact your DNR Regional Environmental Assessment Ecologist.

Thank you for consulting us on this matter and for your interest in preserving Minnesota's rare natural resources.

Sincerely,

James Drake

Natural Heritage Review Specialist
james.f.drake@state.mn.us

Cc: Melissa Collins, Jennie Skancke, Amanda Weise

Attachment I

Pre-project Coordination with USFWS UMRNWFR for Project Goals and Considerations for the Reno Bottoms Area (UMRR-HREP)

UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE

Reno Bottoms HREP

**U.S. FISH AND WILDLIFE SERVICE,
NATIONAL WILDLIFE REFUGE SYSTEM, AND
UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE
GOALS AND OBJECTIVES**

Contact: Stephen Winter, Wildlife Biologist
Prepared October 2019, Updated July 18, 2022

U.S. Fish and Wildlife Service and National Wildlife Refuge System Goals and Objectives

Broad goals and objectives are provided by legislation that guides management of the National Wildlife Refuge System including the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Improvement Act of 1997 16 U.S.C. 668dd to 668ee (Refuge Administration Act). These define the Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge provided such use is compatible with the major purposes for which the refuge was established. The landmark National Wildlife Refuge System Improvement Act, passed by Congress in 1997, prepared the way for a renewed vision for the future of the refuge system whereby:

- Wildlife comes first.
- Refuges are cornerstones for biodiversity and ecosystem-level conservation.
- Lands and waters of the System are biologically healthy.
- Refuge lands reflect national and international leadership in habitat management and wildlife conservation.

Important provisions of this legislation and the subsequent policies to carry out its mandates include:

- The establishment of a Broad National Policy for the Refuge System whereby each refuge shall be managed to fulfill the mission and its purposes.

- Directing the Secretary of the Interior to:

  - Provide for the conservation of fish, wildlife, and plants within the System.

  - Ensure biological integrity, diversity, and environmental health of the System for the benefit of present and future generations.

  - Carry out the mission of the System and purposes of each refuge; if conflict exists between these, refuge purposes take priority.

    - Ensure coordination with adjacent landowners and the states.

- Providing Compatibility of Uses Standards and Procedures whereby new or existing uses should not be permitted, renewed, or expanded unless compatible with the mission of the System or the purpose(s) of the refuge, and consistent with public safety.

- Planning whereby each unit of the Refuge System shall have a Comprehensive Conservation Plan completed by 2012.

- Compatibility Policy whereby no use for which the Service has authority may be allowed on a unit of the Refuge System unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the national wildlife refuge. Managers must complete a written compatibility determination for each use, or collection of like uses, that is signed by the manager and the Regional Chief of Refuges in the respective Service region.

- Biological Integrity, Diversity and Environmental Health Policy whereby the Service is directed in the Refuge Improvement Act to "ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans…" The biological integrity policy helps define and clarify this directive by providing guidance on what conditions constitute biological integrity, diversity, and environmental health (BIDEH); guidelines for maintaining existing levels; guidelines for determining how and when it is appropriate to restore lost elements; and guidelines in dealing with external threats to BIDEH. The policy also provides guidance for the conservation and management of a broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems.

Upper Mississippi River National Wildlife and Fish Refuge
Purpose, Goals, and Objectives

The specific legislation establishing the Upper Mississippi River National Wildlife and Fish Refuge was the Upper Mississippi River Wild Life and Fish Refuge Act of 1924 and the stated purposes of the refuge in that legislation were:

- "...a refuge and breeding place for migratory birds included in the terms of the convention between the United States and Great Britain for the protection of migratory birds, concluded August 16, 1916, and…

- …to such extent as the Secretary of Agriculture may by regulations prescribe, as a refuge and breeding place for other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and aquatic plants, and…

- …to such extent as the Secretary of Commerce may by regulations prescribe as a refuge and breeding place for fish and other aquatic animal life."

The Upper Mississippi River National Wildlife and Fish Refuge Comprehensive Conservation Plan (USFWS 2006) identified several relevant Goals and Objectives, including:

- Environmental Health Goal: We will strive to improve the environmental health of the Refuge by working with others.

- Wildlife and Habitat Goal: Our habitat management will support diverse and abundant native fish, wildlife, and plants.

    - Management practices will restore or mimic natural ecosystem processes or functions to promote a diversity of habitat and minimize operations and maintenance costs. Mimicking natural processes in an altered environment often includes active management and/or structures such as drawdowns, moist soil management, prescribed fire, grazing, water control structures, dikes, etc.

    - Maintenance and operation costs of projects will be weighed carefully because annual budgets are not guaranteed.

    - Terrestrial habitat on constructed islands and other areas needs to best fit the natural processes occurring on the river, which in many cases will allow for natural succession to occur.

    - If project features in Refuge Closed Areas serve to attract the public during the waterfowl season, spatial and temporal restrictions of uses may be required to reduce human disturbance of wildlife.

    - The esthetics of projects in context of visual impacts to the landscape should be considered in project design.

Each refuge is required to complete a Habitat Management Plan that includes an identification of Resources of Concern associated with that refuge. Service policy (620 FW 1) defines Resources of Concern as:

> "All plant and/or animal species, species groups, or communities specifically identified in refuge purpose(s), System mission, or international, national, regional, state, or ecosystem conservation plans or acts. For example, waterfowl and shorebirds are a resource of concern on a refuge whose purpose is to protect "migrating waterfowl and shorebirds." Federal or State threatened and endangered species on that same refuge are also a resource of concern under terms of the respective endangered species acts."

Furthermore, the comprehensive list of Resources of Concern associated with a refuge is refined to a subset known as Priority Resources of Concern. A set of Refuge Priority Resources of Concern have been identified by the Upper Mississippi River National Wildlife and Fish Refuge

(U.S. Fish and Wildlife Service 2019) and they serve in part to represent refuge priorities when the refuge engages in the planning and execution of partnership activities such as Upper Mississippi River Restoration (UMRR) Habitat Rehabilitation and Enhancement Projects (HREP).

Upper Mississippi River National Wildlife and Fish Refuge
Reno Bottoms HREP-specific Objectives and Priority Resources of Concern

Using the Refuge's Habitat Management Plan (U.S. Fish and Wildlife Service 2019) and the Reno Bottoms HREP Fact Sheet (Upper Mississippi River Restoration 2018) as a foundation, the Refuge has identified primary and secondary objectives it believes are appropriate for the Reno Bottoms HREP, and the Refuge priority resources of concern (ROC) that would be relevant to those objectives.

Refuge objectives and associated Priority ROC relevant to the Reno Bottoms study area are identified in Tables 1 and 2.

Table 1: Refuge Primary Objectives and Priority ROC within the Reno Bottoms HREP Study Area

Primary Objective	Priority Resources of Concern
Protect, enhance, restore, and/or create bottomland forest in areas where it currently exists, as well as areas adjacent to or in close proximity to currently existing bottomland forest.	• Red-shouldered hawk • Cerulean warbler • Prothonotary warbler • Transient neotropical migrant passerines • Tree-roosting bats • Midwestern wooded swamps and floodplains

Table 2: Refuge Secondary Objectives and Priority ROC within the Reno Bottoms HREP Study Area

Secondary Objective	Priority Resources of Concern
Protect, enhance, restore, and/or create lotic habitats to maintain flow conditions and sediment dynamics that will benefit fluvial-dependent native fish and mussels.	• Fluvial-dependent native mussels, migratory fluvial-dependent native fish
Protect, enhance, restore, and/or create deep lentic habitats and maintain flow conditions and sediment dynamics that will benefit limnophilic native fish and mussel populations.	• Limnophilic native fish, limnophilic native mussels

References

U.S. Fish and Wildlife Service. 2006. Upper Mississippi River National Wildlife and Fish Refuge Comprehensive Conservation Plan. U.S. Fish and Wildlife Service. Fort Snelling, Minnesota. 168 pp + Appendices A–G.

U.S. Fish and Wildlife Service. 2019. Upper Mississippi River National Wildlife and Fish Refuge Habitat Management Plan. U.S. Fish and Wildlife Service. Bloomington, MN. 127 pp + Appendices A–F. Available at https://ecos.fws.gov/ServCat/Reference/Profile/115578

Upper Mississippi River Restoration. 2018. Reno Bottoms HREP Fact Sheet. U.S. Army Corps of Engineers, St Paul District. 8 pp.

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Attachment J

Geotechnical Boring Logs and Sediment Contaminant Analysis

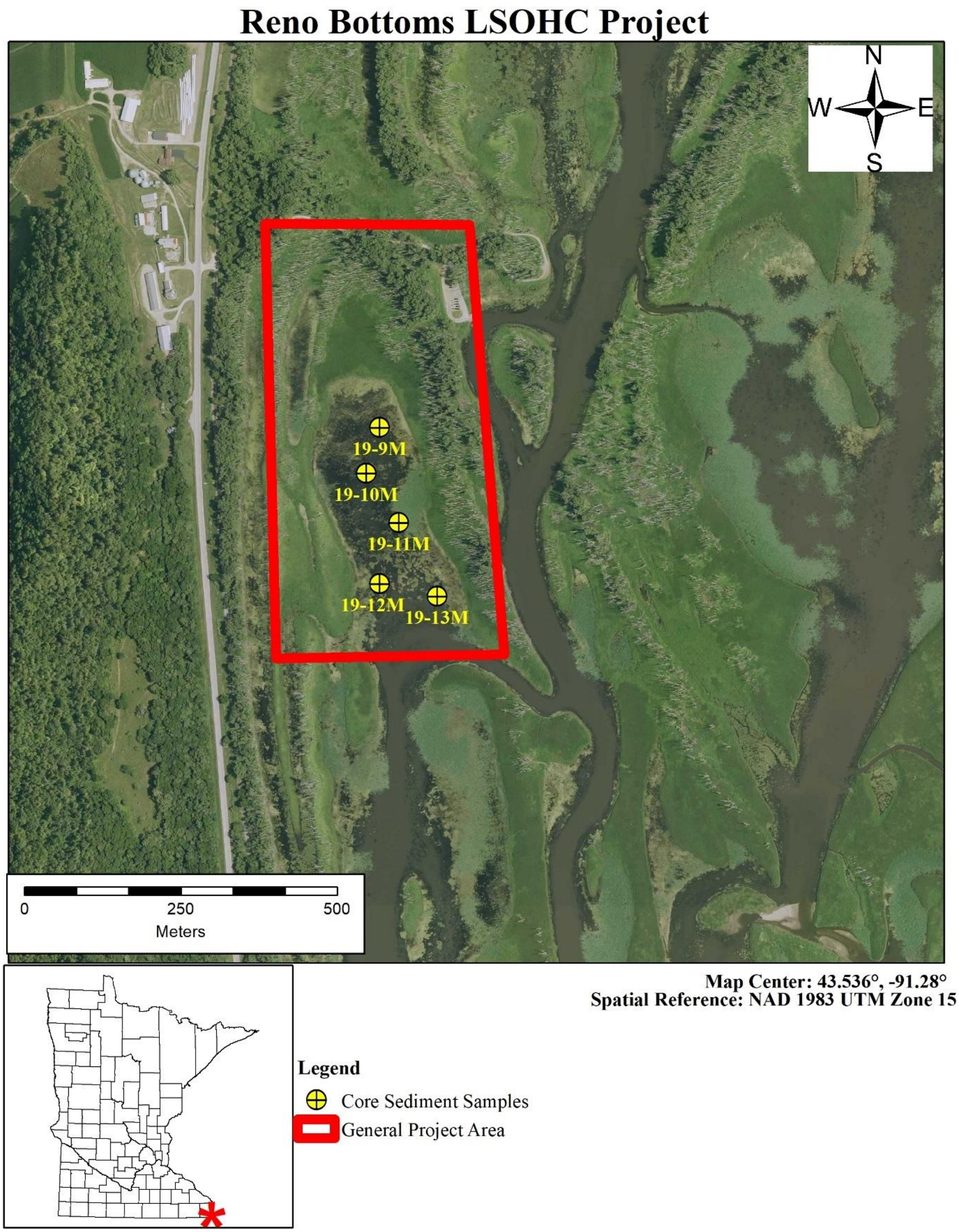

Figure J1. Core sediment sample locations in the general project area collected by USACE in 2019.

2019 Reno Bottoms Sediment Samples			Sample Site				19-9M, SN1		19-10M, SN1		19-11M,SN1		19-12M,SN1		19-13M,SN1	
			Pool				9		9		9		9		9	
			LAB Number				008553-01		008553-02		008553-03		008553-04		008553-05	
			Lab				ARDL, Inc.		ARDL, Inc.		ARDL, Inc.		ARDL, Inc.		ARDL, Inc.	
			Depth													
			Date collected				10/7/2019		10/8/2019		10/8/2019		10/8/2019		10/8/2019	
				MPCA SQT I	MPCA SQT II	MPCA August 2016 Residential/ Recreational Soil Reference Value (SRV)	Results	flag	Results	flag	Results	flag	Results	flag	Results	flag
PAH (Method 8270, SIM)	ug/kg		Naphthalene	180	560	81000	5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
	ug/kg		Acenaphthylene	5.9	130		5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
	ug/kg		Acenaphthene	6.7	89	1300000	5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
	ug/kg		Fluorene	77	540	850000	1.67	J	1.2	J	2.11	J	1.25	J	1.54	J
	ug/kg		Phenanthrene	200	1200		2.08	JB	1.38	JB	2..66	JB	2.06	JB	1.73	JB
	ug/kg		Anthracene	57	850	6500000	5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
	ug/kg		Fluoranthene	420	2200	510000	2.33	J	4.93	<	3.47	J	3.46	J	2.65	J
	ug/kg		Pyrene	200	1500	44000	2.13	J	4.93	<	4.29	J	3.58	J	2.65	J
	ug/kg		Benzo[a]anthracene	110	1100		5.91	<	4.93	<	1.77	J	1.95	J	1.31	J
	ug/kg		Chrysene	170	1300		5.91	<	4.93	<	1.42	J	1.48	J	5.45	<
	ug/kg		Benzo[b]fluoranthene				2.27	J	4.93	<	3.86	J	3.04	J	2.8	J
	ug/kg		Benzo[k]fluoranthene				5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
	ug/kg		Benzo[a]pyrene	150	1500	1000**	1.19	J	4.93	<	1.99	J	1.95	J	1.46	J
	ug/kg		Benzo[e]pyrene				5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
	ug/kg		Indeno[1,2,3-cd]pyrene				1.62	J	4.93	<	1.49	J	1.71	J	5.45	<
	ug/kg		Dibenzo[a,h]anthracene	33	140		5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
	ug/kg		Benzo[g,h,i]perylene				1.49	J	4.93	<	1.75	J	1.68	J	1.21	J
	ug/kg		2-Methylnaphthalene	20	200	39000	5.91	<	4.93	<	6.2	<	4.96	<	5.45	<
PESTICIDES (8081/8082)	ug/kg		Hexachlorobenzene			230	5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		O,P'-DDE				5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		Chlordane, trans-			950*	5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		Chlordane, cis-			950*	5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		P,P'-DDE			22000	5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		O,P'-DDD				5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		Dieldrin	1.9	62	110	5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		O,P'-DDT				5.91	<Q	4.98	<Q	6.2	<Q	4.88	<Q	5.6	<Q
	ug/kg		P,P'-DDD			19000	5.91	<	4.98	<	6.2	<	4.88	<	5.6	<
	ug/kg		P,P'-DDT			7300	5.91	<Q	4.98	<Q	6.2	<Q	4.88	<Q	5.6	<Q
PCBS (8081/8082)	ug/kg		Aroclor 1016				118	<	99.8	<	124	<	97.8	<	112	<
	ug/kg		Aroclor 1221				118	<	99.8	<	124	<	97.8	<	112	<
	ug/kg		Aroclor 1232				118	<	99.8	<	124	<	97.8	<	112	<
	ug/kg		Aroclor 1242				118	<	99.8	<	124	<	97.8	<	112	<
	ug/kg		Aroclor 1248				118	<	99.8	<	124	<	97.8	<	112	<
	ug/kg		Aroclor 1254				118	<	99.8	<	124	<	97.8	<	112	<
	ug/kg		Aroclor 1260			810***	118	<	99.8	<	124	<	97.8	<	112	<
Inorganics	mg/kg		Arsenic	9.8	33	9	2.554	J	1.45		1.87		1.87		2.26	
	mg/kg		Cadmium	0.99	5	1.6	0.562	B	0.35	B	0.459	B	0.409	B	0.524	B
	mg/kg		Chromium	43	110	23000	29		17.3		24.6		21.8		27.3	
	mg/kg		Chromium, +6			11	0.73	<	0.59	<	0.7	<	0.58	<	0.67	<
	mg/kg		Copper	32	150	2200	18.6		9.48		15.3		14.2		17.6	
	mg/kg		Lead	36	130	300	11.8		6.55		9.94		9.24		11.7	
	mg/kg		Manganese			2100	111		95.4		131		111		149	
	mg/kg		Mercury	0.18	1.1	3.1	0.0402	J	0.024		0.0288		0.0285		0.0389	
	mg/kg		Nickel	23	49	170	29		11.9		17.1		12.9		20	
	mg/kg		Zinc	120	460	4600	84.2		43.3		71.8		61.6		85.4	
	mg/kg		Cyanide, total				1.8	<	1.4	<	1.7	<	1.4	<	1.5	<
	mg/kg		Kjeldahl nitrogen				1630		1050		2130		922		1130	
	mg/kg		Nitrogen, ammonia				4.7		8.95		18.4		12.4		7.25	
	%		Moisture (Gravimetric)				43.7		32		45.6		32		39.7	
	mg/kg		Phenol IC			3500	4.1	<	3.6	<	3.6	<	2.5	<	3.1	<
	mg/kg		Phosphorus, total				403		339		389		272		320	
	%		Solids, total				56.3		68		54.4		68		60.3	
	%		Total Volatile Solids				5.2		3.4		6		3.8		4.4	
	mg/kg		Total Organic Carbon				39000		12000		22000		13000		20000	
PARTICLE SIZE % FINER	SAND	coarse	4				99		100		100		100		100	
			10				98		100		100		100		100	
		medium	20				97		99		100		98		99	
			40				96		99		99		95		98	
		fine	60				96		98		98		91		98	
			140				95		85		95		82		97	
	SILT	clay	200				95		77		93		77		96	
Particle Size	%		Gravel													
	%		Sand													
	%		Silt													
	%		Clay													

J - Indicates an estimated value. This flag is used either when estimating a concentration or this flag indicates analyte(s) associated with a DOD-QSM specified non-compliance pertaining to matrix QC criteria.
< - Indicates compound was analyzed for but not detected. The sample quantitation limit has been corrected for weight, dilution and/or percent moisture.
Q- This flag indicates analyte(s) associated with a DOD-QSM specified non-compliance pertaining to calibration or control QC criteria.
B- This flag is used when the analyte is found in the blank as well as the sample. It indicates analyte(s) associated with a DOD-QSM specified non-compliance pertaining to matrix QC criteria.
* SRV is for Total Chlordane
** Benzo(a)pyrene Equivalents
*** Total PCBs

19-9M

07 OCT 2019

SPT D_{10} MC LL PL

W.S. 629.3

G.S. 619.9

614.0

AIR — **0' TO 0.2'** DECK

0.2' TO 1.5' AIR

WATER — **1.5' TO 10.9'** WATER

CL — **10.9' TO 15'** (CL) SILTY CLAY, V. SOFT, SATURATED, TR. SHELL FRAGMENTS, SL. SPONGY, BROWNISH GRAY. **(ALLUVIUM)**

CH — **15' TO 16.8'** (CH) FAT CLAY, SOFT, SATURATED, TR. ROOTLETS, BROWNISH GRAY. **(ALLUVIUM)**

NOTES:

1. BORING OBTAINED FROM A FLOATING PLANT
2. WATER SURFACE EL. ESTIMATED BY PRORATED LOCK AND DAM 8 TAILWATER GAUGE
3. HOLE STABILIZED WITH 4-INCH PIPE CASING TO EL. 615.8
4. PULLED CASING AND ALLOWED HOLE TO COLLAPSE TO GROUND SURFACE
5. SAMPLES TESTED FOR CHEMICAL CHARACTERIZATION

19-10M

08 OCT 2019

SPT D_{10} MC LL PL

W.S. 629.5

G.S. 619.4

614.0

AIR — **0' TO 0.2'** DECK

0.2' TO 1.5' AIR

WATER — **1.5' TO 11.6'** WATER

CL — **11.6' TO 15'** (CL) SILTY CLAY, V. SOFT, SATURATED, TR. ROOTLETS, TR. WOOD, BROWNISH GRAY. **(ALLUVIUM)**

CH — **15' TO 17'** (CH) CLAY, SOFT, SATURATED, SL. LAMINATED, TR. ROOTLETS, BROWNISH GRAY. **(ALLUVIUM)**

NOTES:

1. BORING OBTAINED FROM A FLOATING PLANT
2. WATER SURFACE EL. ESTIMATED BY PRORATED LOCK AND DAM 8 TAILWATER GAUGE
3. HOLE STABILIZED WITH 4-INCH PIPE CASING TO EL. 617
4. PULLED CASING AND ALLOWED HOLE TO COLLAPSE TO GROUND SURFACE
5. SAMPLES TESTED FOR CHEMICAL CHARACTERIZATION

19-11M

08 OCT 2019

SPT D_{10} MC LL PL

G.S. 629.5

G.S. 618.8

614.0

AIR — **0' TO 0.2'** DECK

0.2' TO 1.5' AIR

WATER — **1.5' TO 12.2'** WATER

CL — **12.2' TO 17'** (CL) SILTY CLAY, V. SOFT TO SOFT, SATURATED, TR. ROOTLETS, BROWNISH GRAY. **(ALLUVIUM)**

NOTES:

1. BORING OBTAINED FROM A FLOATING PLANT
2. WATER SURFACE EL. ESTIMATED BY PRORATED LOCK AND DAM 8 TAILWATER GAUGE
3. HOLE STABILIZED WITH 4-INCH PIPE CASING TO EL 617.0
4. PULLED CASING AND ALLOWED HOLE TO COLLAPSE TO GROUND SURFACE
5. SAMPLES TESTED FOR CHEMICAL CHARACTERIZATION

19-12M

08 OCT 2019

SPT D_{10} MC LL PL

W.S. 629.5

G.S. 618.7

614.0

AIR — **0' TO 0.2'** DECK

0.2' TO 1.5' AIR

WATER — **1.5' TO 12.3'** WATER

CL — **12.3' TO 14.8'** (CL) SILTY CLAY, V. SOFT, SATURATED, TR. ROOTLETS, GRAY. **(ALLUVIUM)**

CL — **14.8' TO 15.5'** (CL) SANDY CLAY, SOFT, SATURATED, GRAY. **(ALLUVIUM)**

CH — **15.5' TO 17'** (CH) SILTY CLAY, SOFT, SATURATED, TR. ROOTLETS, BROWNISH GRAY. **(ALLUVIUM)**

NOTES:

1. BORING OBTAINED FROM A FLOATING PLANT
2. WATER SURFACE EL. ESTIMATED BY PRORATED LOCK AND DAM 8 TAILWATER GAUGE
3. HOLE STABILIZED WITH 4-INCH PIPE CASING TO EL. 616
4. PULLED CASING AND ALLOWED HOLE TO COLLAPSE TO GROUND SURFACE
5. SAMPLES TESTED FOR CHEMICAL CHARACTERIZATION

19-13M

08 OCT 2019

SPT D_{10} MC LL PL

W.S. 629.5

G.S. 619.9

614.0

AIR — **0' TO 0.2'** DECK

0.2' TO 1.5' AIR

WATER — **1.5' TO 11.1'** WATER

CL — **11.1' TO 11.8'** (CL) SILTY CLAY, V. SOFT, SATURATED, DARK GRAY. **(ALLUVIUM)**

CH — **11.8' TO 17'** (CH) SILTY CLAY, SOFT, SATURATED, TR. ROOTLETS, STICKY, BROWNISH GRAY. **(ALLUVIUM)**

NOTES:

1. BORING OBTAINED FROM A FLOATING PLANT
2. WATER SURFACE EL. ESTIMATED BY PRORATED LOCK AND DAM 8 TAILWATER GAUGE
3. HOLE STABILIZED WITH 4-INCH PIPE CASING TO EL. 617.0
4. PULLED CASING AND ALLOWED HOLE TO COLLAPSE TO GROUND SURFACE
5. SAMPLES TESTED FOR CHEMICAL CHARACTERIZATION

DRILLING LOG | DIVISION MVD | INSTALLATION St. Paul District | Hole No. 19-9M | SHEET 1 OF 3 SHEETS

1. PROJECT: Reno Bottoms
2. LOCATION (Coordinates or Station): See Drawing Pg 3
3. DRILLING AGENCY: US-CE-C
4. HOLE NO. (as shown on drawing and file number): ML-1
5. NAME OF DRILLER: Colin Riddick
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 16.8'
10. SIZE AND TYPE OF BIT: 3" Chopper Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NAVD 1988
12. MANUFACTURER'S DESIGNATION OF DRILL: Jerk Line
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 Bucket | UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION ~~GROUND~~ WATER: Surface 629.3
16. DATE HOLE: STARTED 10/7/2019 | COMPLETED 10/7/2019
17. ELEVATION TOP OF HOLE: Approx 630.8
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
631.8	0.0		Top of Deck			
630.6	0.2		Air			Boring obtained from floating plant
	0.5					
	1.0					Elevation from Pool 8 gage
629.3	1.5		Water			Location N 4821873 E 639077 UTM-15 NAD 83 Obtained from professional grade handheld GPS
	2.0					
	3.0					Alconox wash with river rinse
	4					
	5.0					
	6.0					
	7.0					
	8.0					
	9.0					
621.8	10.0					

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PROJECT: Reno Bottoms | HOLE NO. 19-9M

Hole No. 19-9M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 2 OF 3 SHEETS

1. PROJECT Reno Bottoms
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (as shown on drawing and file number)
5. NAME OF DRILLER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR Atwood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
620.8	0		(continued) Water			
619.9	0.9 / 11.0	CL	Silty Clay (CL) Very soft Low plasticity Saturated Trace shells SL. spongey Brownish Grey	2½×3 POUND	Env SM 19-9-1 10.9'-16.8'	@ 1600
	12.0					
	13.0			R 3.1		Set 4" Casing to 15.0' and Clean out with 3" Chopper Bit.
	14.0			2½×3 POUND		
615.8	15.0	CH	Clay (CH) Soft High plasticity Saturated Trace rootlets Brownish Grey			
	16.0			R 2.8		Pulled Casing and allowed hole to Collapse
614.0	16.8	BOH				

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

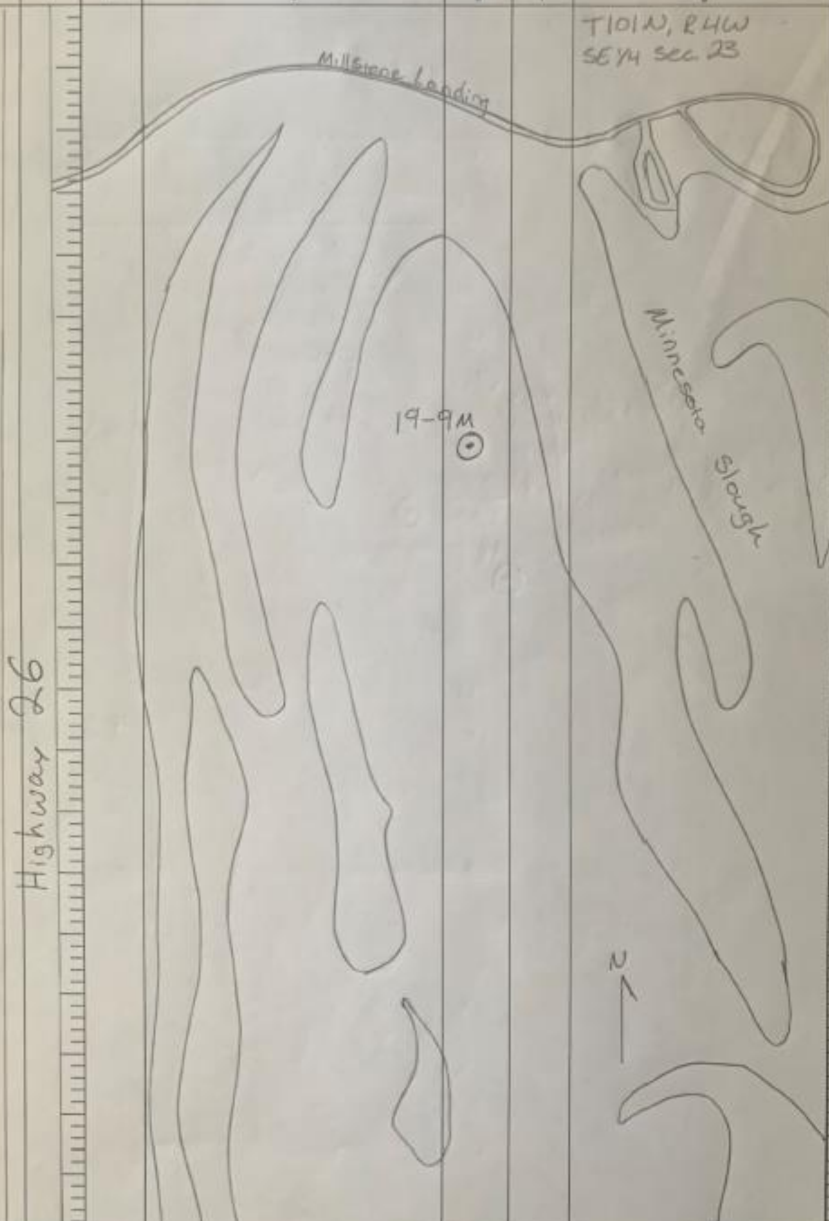
PROJECT Reno Bottoms | HOLE NO. 19-9M

Hole No. 19-9M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 3 OF 3 SHEETS

1. PROJECT Reno Bottoms	10. SIZE AND TYPE OF BIT [illegible]
2. LOCATION (Coordinates or Station) See Drawing	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
3. DRILLING AGENCY US-CE-C	12. MANUFACTURER'S DESIGNATION OF DRILL Jack Line
4. HOLE NO. (as shown on drawing and file number) ML-1	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED: 1 Batch — UNDISTURBED: —
5. NAME OF DRILLER Colin Riddick	14. TOTAL NUMBER CORE BOXES —
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Surface 629.3
7. THICKNESS OF OVERBURDEN —	16. DATE HOLE — STARTED 10/7/19 — COMPLETED 10/7/19
8. DEPTH DRILLED INTO ROCK —	17. ELEVATION TOP OF HOLE ~630.5
9. TOTAL DEPTH OF HOLE 16.8	18. TOTAL CORE RECOVERY FOR BORING — %
	19. SIGNATURE OF INSPECTOR [illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						T101N, R4W SE1/4 Sec. 23



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PROJECT Reno Bottoms | HOLE NO. 19-9M

Hole No. 19-10M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 3 SHEETS

1. PROJECT Reno Bottoms	10. SIZE AND TYPE OF BIT 3" Chopper Bit
2. LOCATION (Coordinates or Station) See Drawing Pg. 3	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
3. DRILLING AGENCY US-CE-C	12. MANUFACTURER'S DESIGNATION OF DRILL Jerk Line
4. HOLE NO. (as shown on drawing and file number) ML-3	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 Barch; UNDISTURBED —
5. NAME OF DRILLER Colin Riddick	14. TOTAL NUMBER CORE BOXES —
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ___ DEG. FROM VERT.	15. ELEVATION GROUND WATER Surface 629.5
7. THICKNESS OF OVERBURDEN —	16. DATE HOLE: STARTED 10/8/19; COMPLETED 10/8/19
8. DEPTH DRILLED INTO ROCK —	17. ELEVATION TOP OF HOLE Approx 631.0
9. TOTAL DEPTH OF HOLE 17.0'	18. TOTAL CORE RECOVERY FOR BORING — %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
631.0	0.0					Boring Obtained from Floating Plat
630.8	0.2		Top of Deck			
	1.0		Air			Elevation From Pool & Genoa gage
629.5	1.5					Location N 4821806 E 639056 UTM-15 NAD 83 Obtained from professional grade handheld GPS
	2.0					
	3.0					Alconox wash with River rinse
	4.0		Water			
	5.0					
	6.0					
	7.0					
	8.0					
	9.0					
621.0	10.0					

Hole No. 19-10M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 2 OF 3 SHEETS

1. PROJECT Reno Bottoms	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (as shown on drawing and file number)	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
621.0	10.0		(continued)			
	11.0		Water			
619.4	11.6			3x2½		
	12.0		Silty Clay (CL)	P		
			Very soft	O		
			Low plasticity	U		
			Saturated			
	13.0	CL	Trace wood frag.	N	Comp Finish	@930
			Trace rootletts	D	19-10-1	
			Brownish Grey		11.6'–17.0'	
				R2.0		Set Casing to 14.0' and
	14.0			3x2½		clean out with 3"
						chopper Bit
				P		
616.0	15.0			O		
			Clay (CH)	U		
			Soft	N		
			High Plasticity			
			Faint laminations			
			Trace rootletts	D		
	16.0	CH	Brownish Grey			
			Saturated			
				R3.0		
614.0	17.0	BOH				Pulled Casing and allowed hole to Collapse

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Reno Bottoms

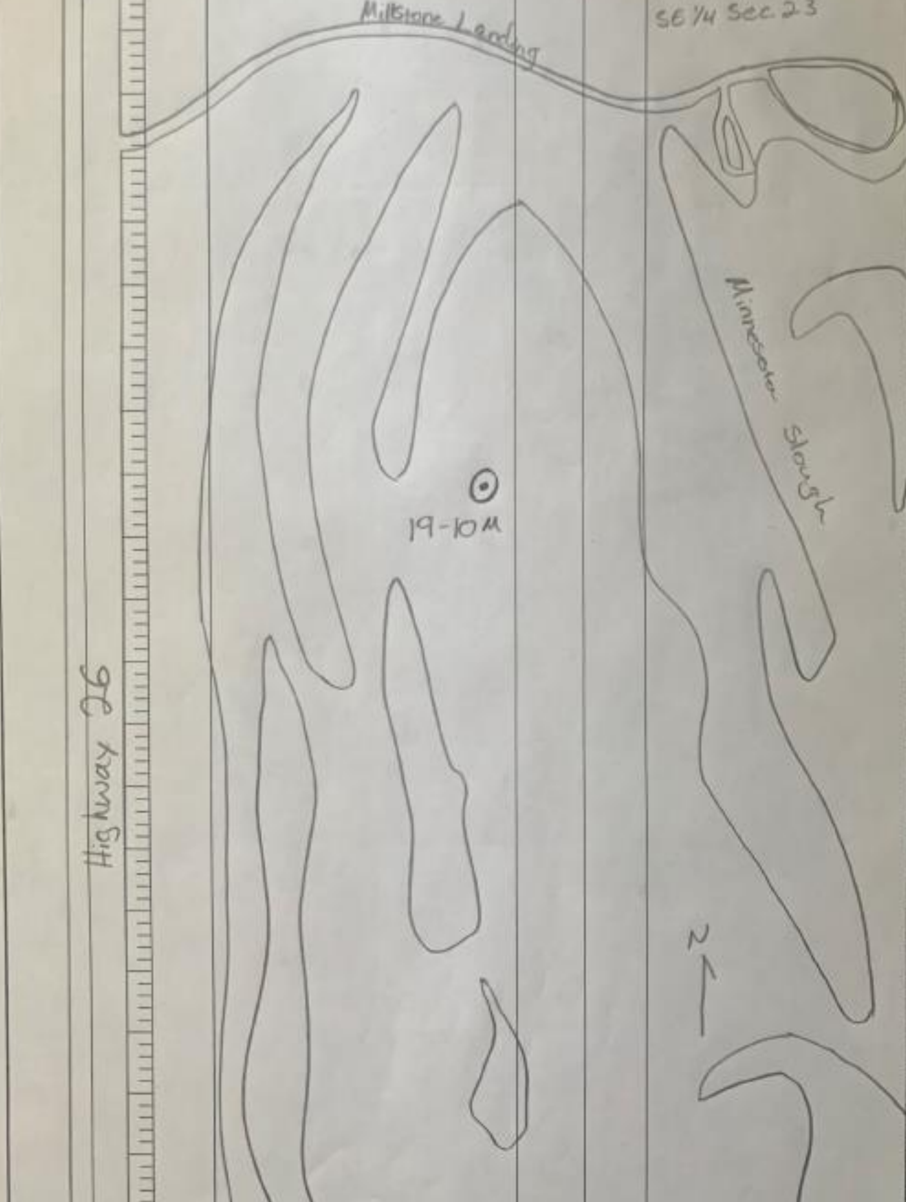
HOLE NO. 19-10M

Hole No. 19-10M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 3 OF 3 SHEETS

1. PROJECT: Reno Bottoms
2. LOCATION (Coordinates or Station): See Drawing
3. DRILLING AGENCY: US-CE-C
4. HOLE NO. (as shown on drawing and file number): ML-3
5. NAME OF DRILLER: Colin Riddick
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 17.0
10. SIZE AND TYPE OF BIT: 3" Chopper Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL: Jerk Line
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 Batch; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: Surface 629.5
16. DATE HOLE: STARTED 10/8/19; COMPLETED 10/8/19
17. ELEVATION TOP OF HOLE: Approx 631.0
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						T101N, R4W SE 1/4 Sec. 23



Hole No. 9-11M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 3 SHEETS

1. PROJECT: Reno Bottoms	10. SIZE AND TYPE OF BIT: 3" chopper bit
2. LOCATION (Coordinates or Station): See Drawing Pg. 3	11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NAVD 88
3. DRILLING AGENCY: US-CE-C	12. MANUFACTURER'S DESIGNATION OF DRILL: Jerk Line
4. HOLE NO. (as shown on drawing and file number): ML-2	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 Batch; UNDISTURBED —
5. NAME OF DRILLER: Colin Riddick	14. TOTAL NUMBER CORE BOXES: —
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION ~~GROUND~~ WATER: Surface 629.5
7. THICKNESS OF OVERBURDEN: —	16. DATE HOLE: STARTED 10/8/19; COMPLETED 10/8/19
8. DEPTH DRILLED INTO ROCK: —	17. ELEVATION TOP OF HOLE: Approx 631.0
9. TOTAL DEPTH OF HOLE: 17.0'	18. TOTAL CORE RECOVERY FOR BORING: — %
	19. SIGNATURE OF INSPECTOR: Atwood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
631.0	0.0		Top of Deck			Boring detained from Floating Plant
630.8	0.2		Air			
	1.0					Elevation from Pool & Green gage
629.5	1.5		Water			
	2.0					Location N 4821721 E 639108 UTM-15 NAD 83. Obtained from professional grade handheld GPS
	3.0					Alconox Wash with River rinse
	4.0					
	5.0					
	6.0					
	7.0					
	8.0					
	9.0					
621.0	10.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Reno Bottoms | HOLE NO. 19-11M

Hole No. 9-11 M

DRILLING LOG	DIVISION NCD	INSTALLATION St. Paul District	SHEET 2 OF 3 SHEETS

1. PROJECT: Peno Bottoms
2. LOCATION (Coordinates or Station):
3. DRILLING AGENCY:
4. HOLE NO. (as shown on drawing and file number):
5. NAME OF DRILLER:
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE:
10. SIZE AND TYPE OF BIT:
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED / COMPLETED
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Atwood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
621.0	10.0		(continued)			
	11.0		Water			
	12.0					
607.8	12.2		Silty Clay (CL)	3x2½		
			Very soft to soft	P O U D	Comp GWSM 19-1-1 12.2'-17.0'	@1030
	13.0	CL	Med. plasticity			
			saturated			
			Trace rootlets			
			Brownish Grey	R18		Set Casing to 14' and clean out with 3" Chopper Bit
	14.0			3x2½		
	15.0			P O U D		
	16.0	CL				
				R20		
614.0	17.0	BOH				Pulled Casing and allowed hole to Collapse

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

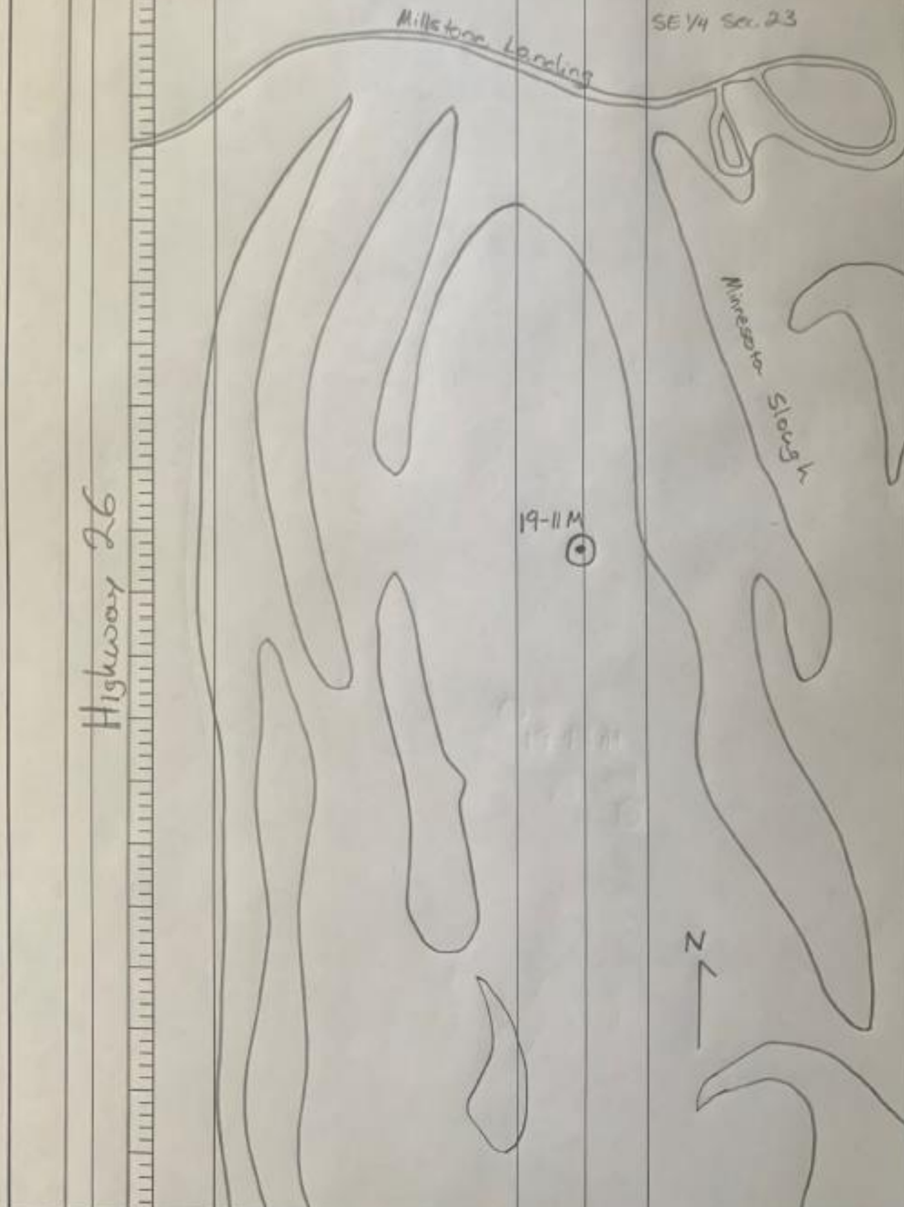
PROJECT: Peno Bottoms | HOLE NO. 9-11 M

Hole No. 19-11 M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 3 OF 3 SHEETS

1. PROJECT Reno Bottoms	10. SIZE AND TYPE OF BIT 3" Chopper Bit
2. LOCATION (Coordinates or Station) See Drawing	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
3. DRILLING AGENCY US-CE-C	12. MANUFACTURER'S DESIGNATION OF DRILL Jerk Line
4. HOLE NO. (as shown on drawing and file number) ML-2	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 1 Bucket — UNDISTURBED —
5. NAME OF DRILLER Colin Riddick	14. TOTAL NUMBER CORE BOXES —
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Surface 629.5
7. THICKNESS OF OVERBURDEN —	16. DATE HOLE — STARTED 10/8/19 — COMPLETED 10/8/19
8. DEPTH DRILLED INTO ROCK —	17. ELEVATION TOP OF HOLE 631.0
9. TOTAL DEPTH OF HOLE 17.0'	18. TOTAL CORE RECOVERY FOR BORING — %
	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						T101N, R4W SE 1/4 Sec. 23



ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Reno Bottoms

HOLE NO. 19-11 M

Hole No. 19-12-M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 3 SHEETS

1. PROJECT Reno Bottoms	10. SIZE AND TYPE OF BIT 3" Chopper Bit
2. LOCATION (Coordinates or Station) See Drawing Pg. 3	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
3. DRILLING AGENCY US-CE-C	12. MANUFACTURER'S DESIGNATION OF DRILL Jerk Line
4. HOLE NO. (as shown on drawing and file number) ML-4	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 1 Bucket — UNDISTURBED —
5. NAME OF DRILLER Colin Riddick	14. TOTAL NUMBER CORE BOXES —
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Surface 629.5
	16. DATE HOLE — STARTED 10/8/19 — COMPLETED 10/8/19
7. THICKNESS OF OVERBURDEN —	17. ELEVATION TOP OF HOLE Approx 631.0
8. DEPTH DRILLED INTO ROCK —	18. TOTAL CORE RECOVERY FOR BORING — %
9. TOTAL DEPTH OF HOLE 17.0'	19. SIGNATURE OF INSPECTOR Awood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
631.0	0.0		Top of Deck			Boring obtained from floating plant
630.8	0.2					
	1.0		Air			Elevation from Pool 8 gage
629.5	1.5					
	2.0					Location N 4821623 E 639077 UTM-15 NAD 83 Obtained from professional grade handheld GPS
	3.0		Water			
						Alconox Wash with River Rinse
	4.0					
	5.0					
	6.0					
	7.0					
	8.0					
	9.0					
621.0	10.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Reno Bottoms

HOLE NO. 19-12-M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	Hole No. 19-12M SHEET 2 OF 3 SHEETS

1. PROJECT Reno Bottoms	10. SIZE AND TYPE OF BIT 3" Chopper Bit
2. LOCATION (Coordinates or Station) See Drawing Pg. 3	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
3. DRILLING AGENCY US-CE-C	12. MANUFACTURER'S DESIGNATION OF DRILL Jerk Line
4. HOLE NO. (as shown on drawing and file number) ML-4	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 1 Batch — UNDISTURBED —
5. NAME OF DRILLER Colin Riddick	14. TOTAL NUMBER CORE BOXES —
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Surface 629.5
	16. DATE HOLE — STARTED 10/8/19 — COMPLETED 10/8/19
7. THICKNESS OF OVERBURDEN —	17. ELEVATION TOP OF HOLE Approx 631.0
8. DEPTH DRILLED INTO ROCK —	18. TOTAL CORE RECOVERY FOR BORING — %
9. TOTAL DEPTH OF HOLE 17.0'	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
621.0	10.0		(continued)			
	11.0		Water			
	12.0					
618.7	12.3	CL	Silty Clay (CL) Very soft Low to Med plasticity Trace Rootlets Saturated Grey	3x20½ P O U N D		
	13.0					
	14.0					
616.2	14.8	CL	Sandy Clay (CL) Soft Saturated Low Plasticity Grey	R 28 3x2½ P	Comp Env Sam 19-04 12.3' - 17.0'	@1130 Set Casing to 15' and clean out w/3" Chopper Bit
	15.0					
615.5		CH	Silty Clay (CH) Soft Med Plasticity Trace Rootlets Saturated Brownish Grey	O U N D R 22		
	16.0					
614.0	17.0	BOH				Pulled casing and allowed hole to collapse

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Reno Bottoms

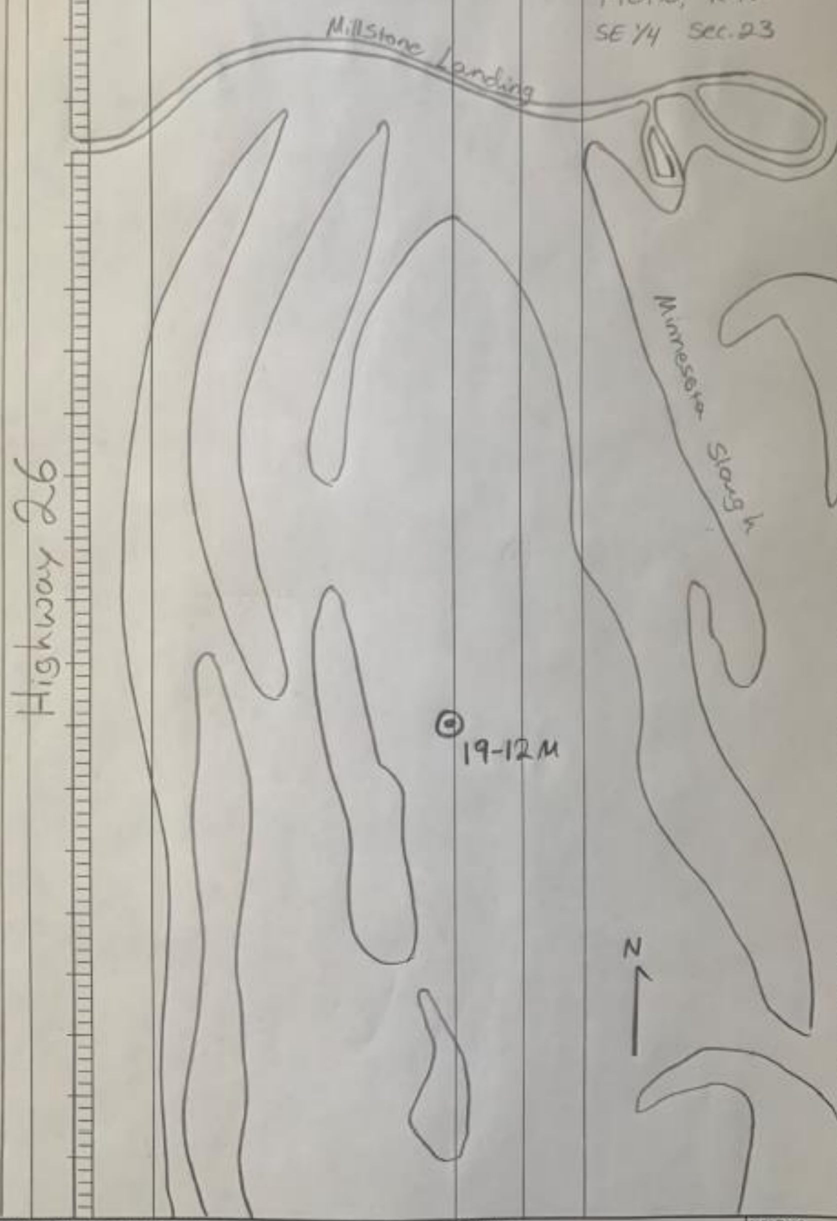
HOLE NO. 19-12M

Hole No. 19-12M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 3 OF 3 SHEETS

1. PROJECT	Reno Bottoms
2. LOCATION (Coordinates or Station)	See Drawing
3. DRILLING AGENCY	US-CE-C
4. HOLE NO. (as shown on drawing and file number)	ML-4
5. NAME OF DRILLER	Colin Riddick
6. DIRECTION OF HOLE	☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	—
8. DEPTH DRILLED INTO ROCK	—
9. TOTAL DEPTH OF HOLE	17.0'
10. SIZE AND TYPE OF BIT	3' Chopper Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL	Jerk Line
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN	DISTURBED: 1 Bucket; UNDISTURBED: —
14. TOTAL NUMBER CORE BOXES	—
15. ELEVATION ~~GROUND~~ WATER	Surface 629.5
16. DATE HOLE	STARTED: 10/8/19; COMPLETED: 10/8/19
17. ELEVATION TOP OF HOLE	Approx 631.0
18. TOTAL CORE RECOVERY FOR BORING	— %
19. SIGNATURE OF INSPECTOR	AWood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						T101N, R4W SE 1/4 Sec.23



ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT	HOLE NO.
Reno Bottoms	19-12-M

Hole No. 19-13M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 1 OF 3 SHEETS

1. PROJECT: Reno Bottoms
2. LOCATION (Coordinates or Station): See Drawing B.3
3. DRILLING AGENCY: US-CE-C
4. HOLE NO. (as shown on drawing and file number): ML-5
5. NAME OF DRILLER: Colin Riddick
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: —
8. DEPTH DRILLED INTO ROCK: —
9. TOTAL DEPTH OF HOLE: 17.0'
10. SIZE AND TYPE OF BIT: 3" Chopper Bit
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): NAVD 88
12. MANUFACTURER'S DESIGNATION OF DRILL: Jerk Line
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 1 Bench; UNDISTURBED —
14. TOTAL NUMBER CORE BOXES: —
15. ELEVATION GROUND WATER: Surface 629.5
16. DATE HOLE: STARTED 10/8/19; COMPLETED 10/8/19
17. ELEVATION TOP OF HOLE: 631.0
18. TOTAL CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: Atwood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
631.0	0.0		Top of Deck			Boring obtained from floating plant
630.8	0.2		Air			Elevation determined by Pool 8 gage
	1.0					
629.5	1.5		Water			Location N 4821603 E 639169 UTM-15 NAD 83 obtained from professional grade hand held GPS
	2.0					
	3.0					Alconox wash with River rinse
	4.0					
	5.0					
	6.0					
	7.0					
	8.0					
	9.0					
621.0	10.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: Reno Bottoms

HOLE NO. 19-13M

Hole No. 19-13M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 2 OF 3 SHEETS

1. PROJECT Reno Bottoms
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (as shown on drawing and file number)
5. NAME OF DRILLER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ______ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR A. Wood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
621.0	10.0		(continued) Water			
	11.0					
619.9	11.1	CL	Silty Clay (CL) Very soft Saturated Dark Grey	3x2 1/2 P		
619.2	11.8					
	12.0	CH	Silty Clay (CH) Soft High plasticity Trace rootlets Saturated · Brownish Grey Sticky	O U N D		
	13.0				Cond Env SW 19-13-1 11.8'-17.0'	@ 1330
				R 2.8 3x2 1/2		Set Casing to 14.0' and Clean out with 3" Chopper Bit.
	14.0			P		
	15.0			O U		
	16.0	CH		N D		
				R 3.0		
614.0	17.0	BOH				Pulled Casing and allowed hole to Collapse

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

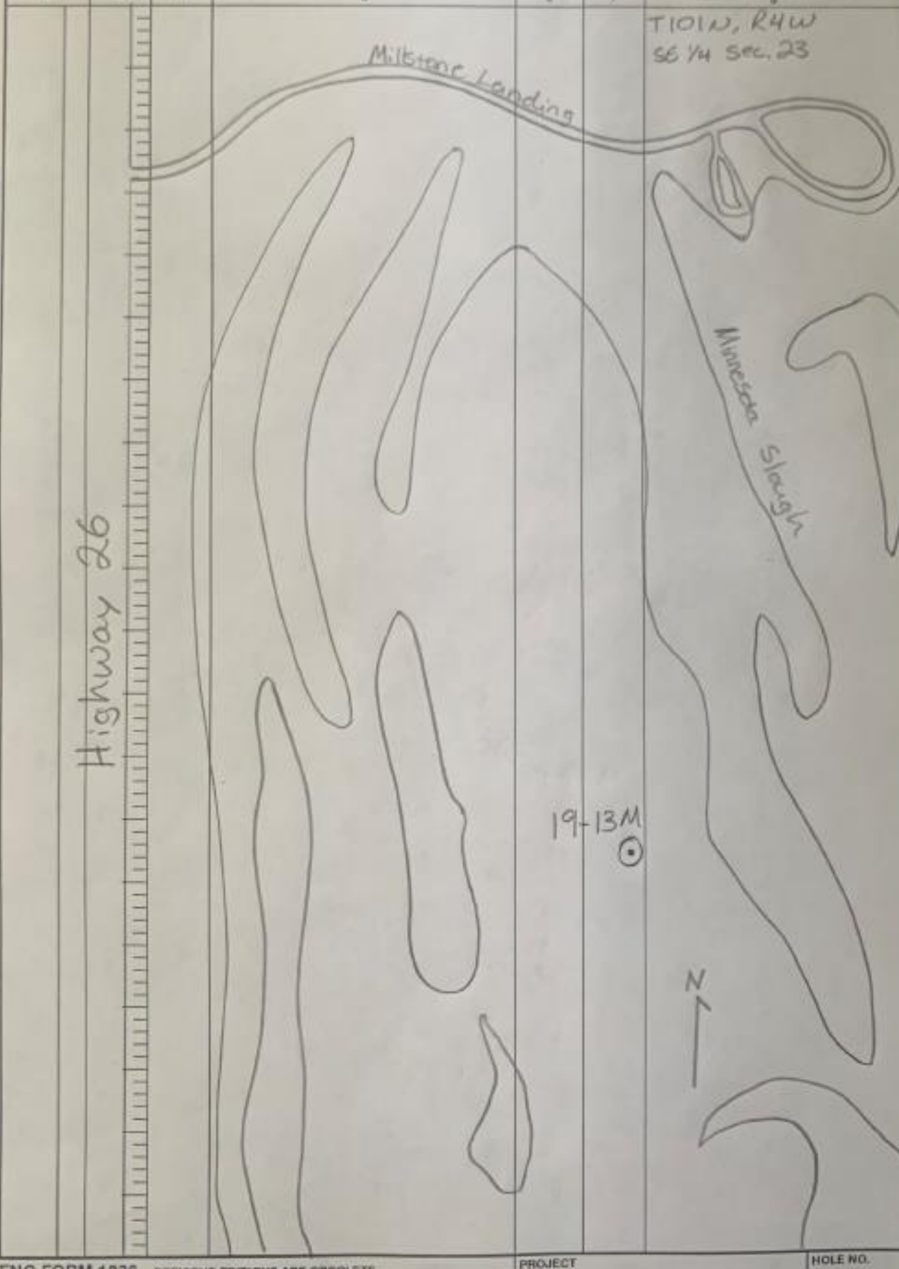
PROJECT Reno Bottoms | HOLE NO. 19-13M

Hole No. 19-13 M

DRILLING LOG	DIVISION MVD	INSTALLATION St. Paul District	SHEET 3 OF 3 SHEETS

1. PROJECT Reno Bottoms	10. SIZE AND TYPE OF BIT 3" Chopper Bit
2. LOCATION (Coordinates or Station) See Drawing	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) NAVD 88
3. DRILLING AGENCY US-CE-C	12. MANUFACTURER'S DESIGNATION OF DRILL Jerk Line
4. HOLE NO. (as shown on drawing and file number) ML-5	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 1 Batch — UNDISTURBED —
5. NAME OF DRILLER Colin Riddick	14. TOTAL NUMBER CORE BOXES —
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER Surface 629.5
	16. DATE HOLE — STARTED 10/8/19 — COMPLETED 10/8/19
7. THICKNESS OF OVERBURDEN —	17. ELEVATION TOP OF HOLE Approx 631.0
8. DEPTH DRILLED INTO ROCK —	18. TOTAL CORE RECOVERY FOR BORING — %
9. TOTAL DEPTH OF HOLE 17.0'	19. SIGNATURE OF INSPECTOR Atwood

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						T101N, R4W SE 1/4 Sec. 23



ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT Reno Bottoms

HOLE NO. 19-13M

Attachment K

Floodplain No-Rise Analysis (Preliminary Project Concept) and Coordination

Email correspondence with Salam Murtata (MNDNR):

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Monday, February 14, 2022 12:37 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Cc: amelia.meiners@co.houston.mn.us; Lehman, Nicole (DNR) <nicole.lehman@state.mn.us>; Weiss, Jeff (DNR) <Jeff.Weiss@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Neil,

This is correct. We could justify the minimal 0.01-ft increase based on velocity reduction (energy gradient). The dredging and filling is good to go based on the limits you sent us (locations and elevations). I am copying Amelia (Houston Floodplain Administrator) and Nicole (area Hydrologist for Houston County).
Our analysis is a recommendation for the County of Houston to approve the activity.
Thanks!
Salam

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Monday, February 14, 2022 12:01 PM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

Is the dredge area rise not a problem… It appears it causes an elevation rise of 0.007ft, which is above .005 and rounded to .01ft? Maybe I'm looking at this wrong, but it shows the existing dredge area is 634.9349 and dredged model under either fill scenario is 634.9356 correct?

Is it a wash because there was actually a decline in WSE/stage because of the fill? E.g., Fill caused stage decrease, but dredge caused a rise, but was still a net decrease for the area?

Sorry if I'm not understanding this correctly.

Please let me know

Thanks

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Monday, February 14, 2022 10:25 AM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Good Morning Neil,

To follow-up on your last e-mail, I copied the Water Surface Elevation below to four decimal points to show the subtle changes. The stage triggering a rise above 0.00-ft is 0.004-ft. Usually FEMA rounds up 0.005-ft to 0.01-ft. In this case, we looked at the energy gradient and velocities to accept at the State level minimal rise of 0.01-ft. When looking at the 627.5-ft fill, the stage actually goes down when compared with the 626.5-ft rise. This is due to increase in velocity. But in general the fill area proposed is not significant enough when compared with the whole Mississippi River cross-section.

At the same time, it is important to account for any change above 0.00-ft.

Please let me know if you have any questions. I am glad it worked out!!!

Thanks!
Salam

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
LaCrosseToLD10	Existing	100-yr Base	Plan1	248139.00	592.31	634.9976		635.11	0.000062	3.37	98097.50	14461.25	0.11
LaCrosseToLD10	626.5-ft fill	100-yr Base	dredge-cut	248139.00	592.31	634.9922		635.11	0.000064	3.42	94943.20	14461.21	0.11
LaCrosseToLD10	627.5-ft fill	100-yr Base	dredge-cut-627.5	248139.00	592.31	634.9918		635.11	0.000064	3.43	94310.90	14461.20	0.11
LaCrosseToLD10	676.579	100-yr Base	Plan1	248196.00	587.06	634.9349	613.73	635.04	0.000071	3.44	96758.90	14414.47	0.12
LaCrosseToLD10	Dredging	100-yr Base	dredge-cut	248196.00	587.06	634.9356	613.73	635.04	0.000069	3.39	98924.00	14414.49	0.12
LaCrosseToLD10		100-yr Base	dredge-cut-627.5	248196.00	587.06	634.9356	613.73	635.04	0.000069	3.39	98924.00	14414.49	0.12

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Friday, February 11, 2022 7:54 AM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

Very great news. Much appreciated for the quick turnaround.

MN Floodstage impact triggering is 0.005ft rise correct, and not 0.01 (maybe rounding?)? Just for clarification then there was no rise at all? Or was a rise under a certain level (e.g., 0.001) not detectable? Was there any detectable difference between 626.5 and 627.5?

If you want to discuss in a call we can set something up too. I want to make sure my ducks are in a row on this before I trudge forward with project.

Thanks

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Thursday, February 10, 2022 5:11 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Cc: Weiss, Jeff (DNR) <Jeff.Weiss@state.mn.us>; Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Good Afternoon Neil,

I ran the two proposed conditions with the 626.5-ft (NAVD88) and 627.5-ft (NAVD88) fill elevations, both with dredging down to 614-ft (NAVD88). The results show that the effects of dredging and fill based on the specified range and locations have minimal effects on the base flood elevation. Below is the table summarizing the results (Output elevations are in ft-NGVD29).

River Station	Effective/Existing Water Surface Elevation	Proposed Water Surface Elevation (Fill = 626.5 (NAVD88)	Proposed Water Surface Elevation (Fill = 627.5 (NAVD88)	Energy Gradient (Existing)	Energy Gradient Line (Fill = 626.5 NAVD88)	Energy Gradient Line (Fill = 627.5 NAVD 88	Velocity (Existing)	Velocity (Fill = 626.5 (NAVD88)	Velocity (Fill = 627.5 (NAVD 88
Fill-Cross-section	635.00	634.99	634.99	635.11	635.11	635.11	3.37	3.42	3.43
Dredge-Cross-section	634.93	634.94	634.94	635.04	635.04	635.04	3.44	3.39	3.39

*There is no change in cross-sections beyond the dredging and filling
* Please note that WSEL values are in NGVD29

According to State floodplain and FEMA requirements, there should not be any rise above 0.00-ft in a detailed study area. So for the 0.01-ft rise in the dredging cross-section, we determined that, since there was no increase in gradient energy and a decrease in velocity, the activity within the specified limits meet the no-rise criteria. Usually we can make that assumption if rise limits are minimal.

Let me know if you have any questions or need further information.
Thanks!
Salam

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

DEPARTMENT OF NATURAL RESOURCES

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Monday, February 7, 2022 1:44 PM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

For the fill location we feel like the minimum elevation raise should be to 626.5 ft (NAVD88). But could you run a second model with 627.5 (NAVD88)?

For the dredge depth, the bed of the backwater dredge area should be 614 (NAVD88). You shouldn't have to change that elevation at this point if you run models for 626.5 and 627.5 fill height.

This should give me the ballpark I need. If it triggers floodstage impacts, we'll have to adjust and run lower elevations, etc.

Let me know if you have any questions.

Thanks

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Friday, February 4, 2022 5:21 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Thanks Neil! The 619.37 (NGVD29) or 619.47 (NAVD88) is within range, which is actually reassuring from a modeling standpoint. So that elevation will be considered the baseline, where your dredged elevation will compare to it. If it is deeper, it will have some minimal effect in reducing the water surface elevation. So it will be interesting how the fill will balance it upstream. I can definitely, run few scenarios to compare a range. Also, since this section of river is delineated as detailed study area, the rise should not be more than 0.00-ft per FEMA's requirement. It can be 0.004-ft or less.

I look forward to the elevations. Thanks!
Salam

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

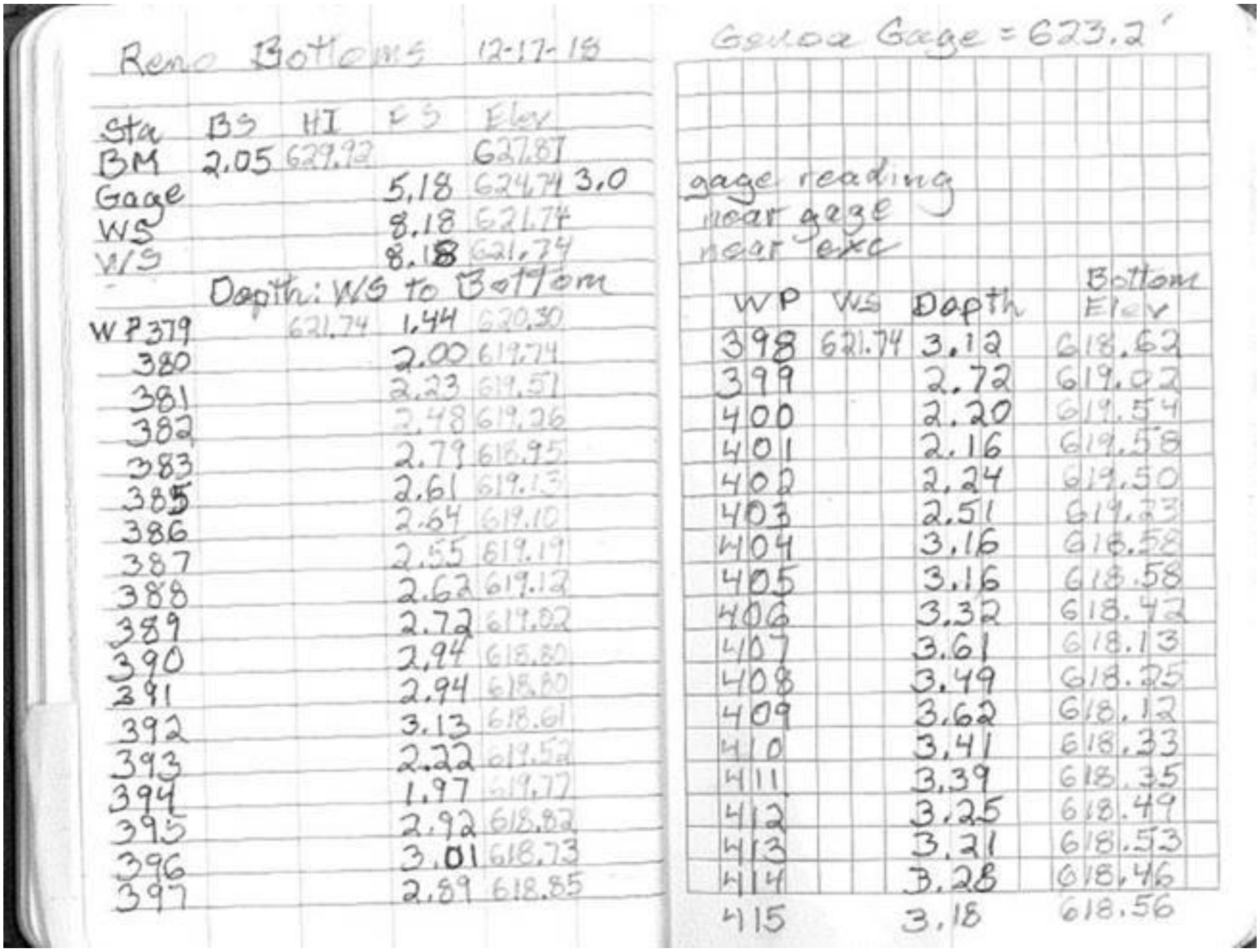
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

DEPARTMENT OF
NATURAL RESOURCES

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Friday, February 4, 2022 2:31 PM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

That number of 619.37 sounds right based on our field collections of the dredging area a couple years ago with our office's Total Station GPS/Elevation. I'm not sure off hand what datum our number are in, but the lowest bed elevation we found was 618.12 in that area (see picture—Bottom Elevation).



Reno Bottoms 12-17-18

Sta	BS	HI	FS	Elev
BM	2.05	629.92		627.87
Gage			5.18	624.74 3.0
WS			8.18	621.74
W/S			8.18	621.74

Depth: WS to Bottom

WP379		621.74	1.44	620.30
380			2.00	619.74
381			2.23	619.51
382			2.48	619.26
383			2.79	618.95
385			2.61	619.13
386			2.64	619.10
387			2.55	619.19
388			2.62	619.12
389			2.72	619.02
390			2.94	618.80
391			2.94	618.80
392			3.13	618.61
393			2.22	619.52
394			1.97	619.77
395			2.92	618.82
396			3.01	618.73
397			2.89	618.85

Genoa Gage = 623.2'

gage reading
near gage
near exc

WP	WS	Depth	Bottom Elev
398	621.74	3.12	618.62
399		2.72	619.02
400		2.20	619.54
401		2.16	619.58
402		2.24	619.50
403		2.51	619.23
404		3.16	618.58
405		3.16	618.58
406		3.32	618.42
407		3.61	618.13
408		3.49	618.25
409		3.62	618.12
410		3.41	618.33
411		3.39	618.35
412		3.25	618.49
413		3.21	618.53
414		3.28	618.46
415		3.18	618.56

So what you provided now is pretty close and could be datum error, or old model data. This area wasn't dredged to my knowledge, so natural fill/scouring may have caused the slight difference.

I will get the elevations for bottom of dredge cut and fill location. Need to confer with a couple people first.

Since this modelling is somewhat preliminary, how difficult is it to run a couple models with different fill elevations (e.g., 626, 627ft)? I'm using this as a guideline going forward for project development/plans/specs and I'd like to know what elevation would trigger floodstage impacts. Then we can refine the final model once plans and specs are defined.

I'm somewhat under the assumption the dredge depth (assuming deeper than current bed elevation) will not likely affect the model/floodstage impacts. For example, if fill elevation was set to 626 and dredge depth was 614 or something like 610? Just for my own understanding.

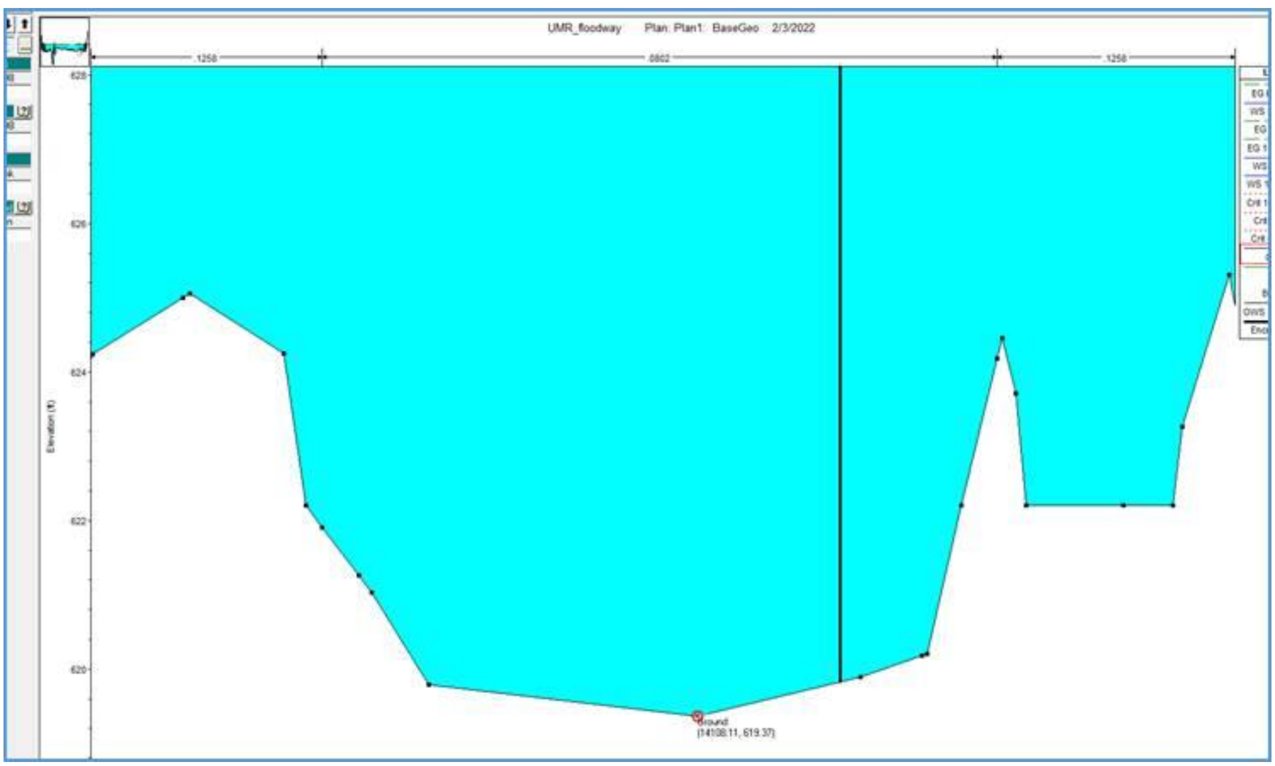
Thanks for all the help on this!

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Thursday, February 3, 2022 5:15 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Thanks Neil! I look forward to the two elevations: dredged elevation and fill elevations.

The elevation of the dredged area at the point shown is 619.37-ft (NGVD29), which is close to the upper range. This is based on the time the cross-section was surveyed before the model was developed. There may have been some dredging taking place later to decrease the elevation or other reasons for sediment build-up. But we can use it to represent our existing conditions, since it is the effective model. Then the proposed model will be based on the new elevations of the dredged and fill areas. I can use your shapefile width to adjust the new elevations. Then we can run the model and compare results of both conditions. This way it is a straight-forward exercise ☺



Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688

Email: salam.murtada@state.mn.us

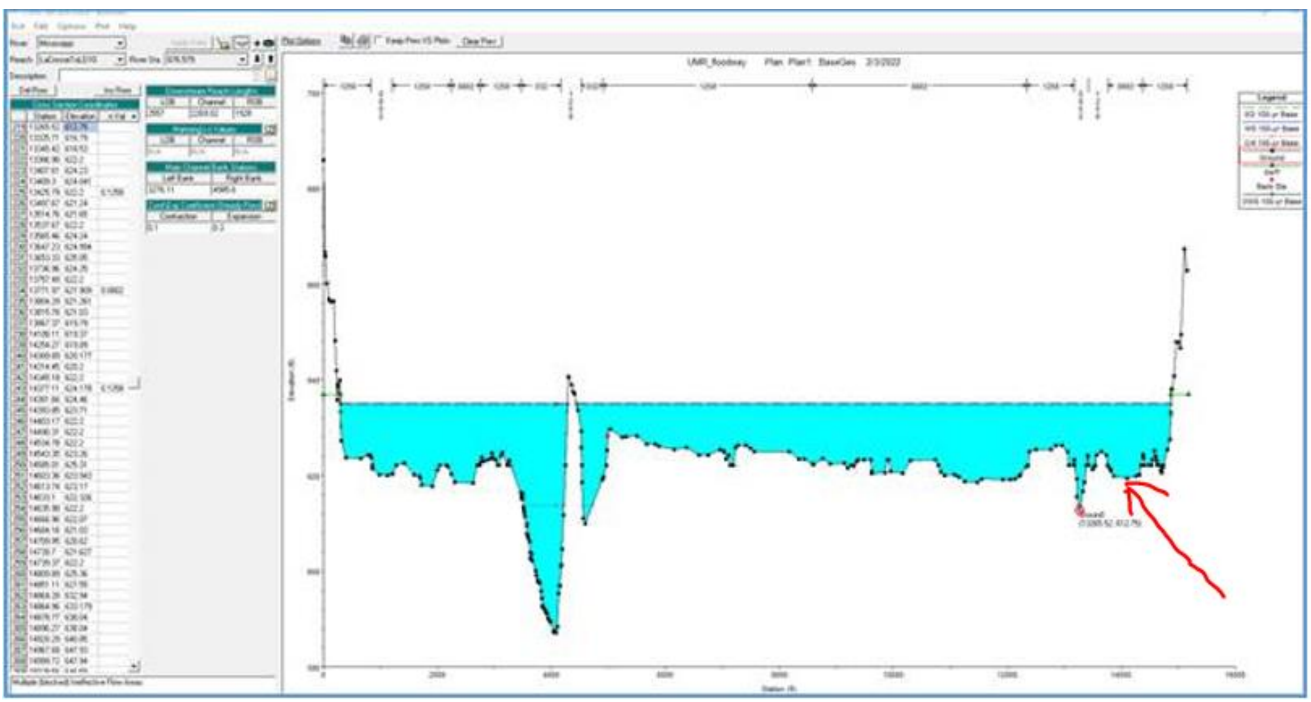
DEPARTMENT OF
NATURAL RESOURCES

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Thursday, February 3, 2022 3:34 PM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

Thanks for getting back to me!

It is hard to tell from the image quality for the cross section, but based on depths and my knowledge of the area, I think the red dot is actually located in the channel to the east of the dredge area. The dredge area is largely shallow, but the channel to the east is deep and I think that represents where the dot is? See image below.



I may be wrong, but the base of the dredge area should be around 616-618, but from my knowledge of the area its not 612 (which would mean the depth of the backwater dredge area is nearly 8ft).

You are definitely correct that the area will be in the flow zone during 100yr floods. Do you have an elevation of the fill area at the black cross section? For a reference point.

I will get some final elevations for you in the correct datum. I need to talk to a forester from the US Army Corps first. But lets hone in the area first to make sure there are no errors.

Thanks a ton on this! Really appreciated, glad to see it moving forward so quickly. Good Work

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Thursday, February 3, 2022 2:15 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

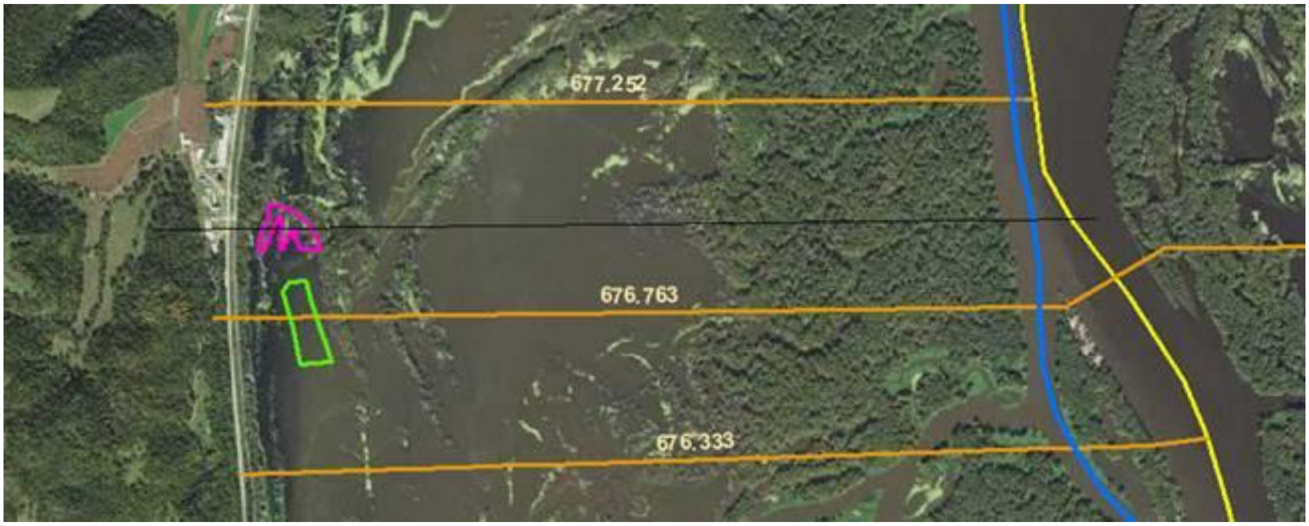
Neil,

Thanks for the shapefiles you sent. The dredging area shown in green falls right on a cross-section, which is shown in the second figure. It looks like the dredging will take place right on where the red dot is shown, which according to the model has an invert elevation of 612.75 (NGVD29) or 612.85 (NAVD88).

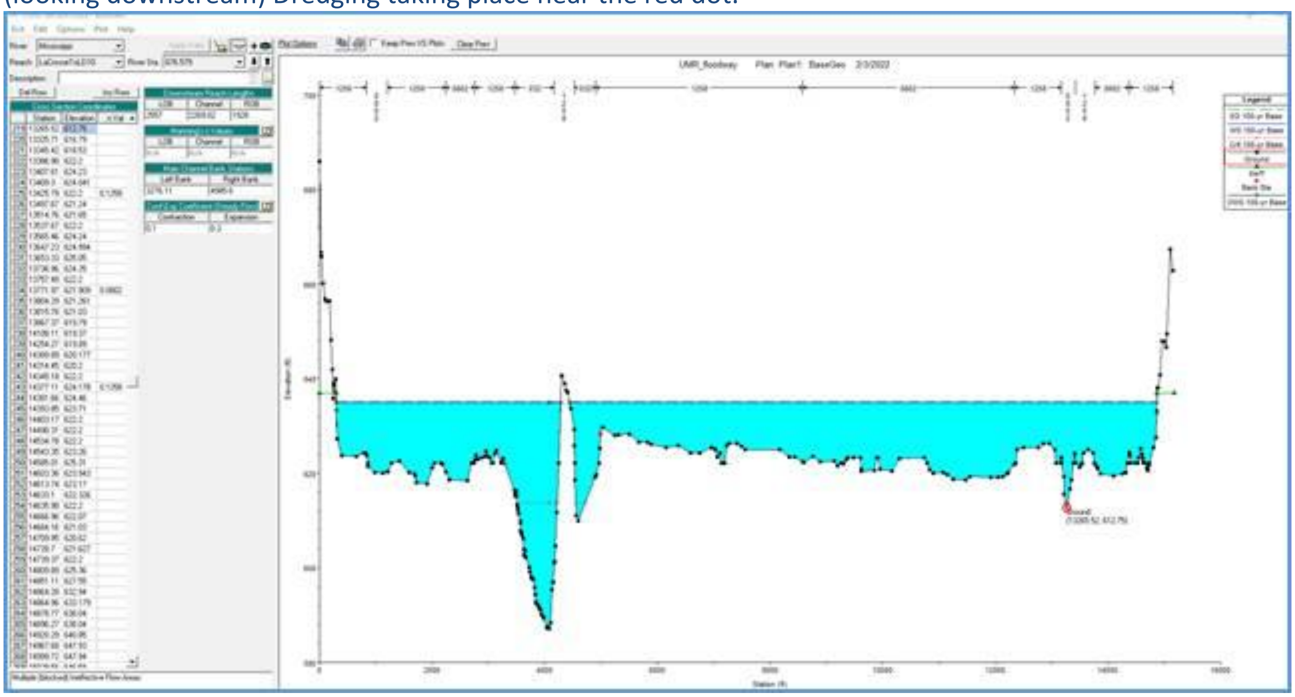
The fill is shown in pink, for which we need to extend a new cross-section in the model, which we can interpolate between the two adjacent cross-sections.

I just need to know the final elevations. What will be the dredged elevation and fill elevation so that I can make these adjustments? I was hoping that the work will take place within an ineffective flow zone to where it does not matter. But it looks like the whole cross-section will carry flow for the 100-YR storm, meaning the whole area including the islands will be overtopped during the major storm.

Thanks!
Salam



(looking downstream) Dredging taking place near the red dot.



Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Monday, January 31, 2022 1:19 PM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

I'm checking in to determine if those shapefiles I sent you will suffice, or if you need something different?

Thanks

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Monday, January 24, 2022 3:55 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Thanks Neil for the information! I will follow-up with any questions that come-up.
Salam

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Monday, January 24, 2022 3:54 PM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

I’m not much of an GIS pro, and I couldn’t figure out how to have the correct NAVD88 or elevations. I have the shapefiles for the dredge cut and the elevation enhancement. Let me know if they work for you (see attached).

Elevation Enhancement should be modeled to 626ft (~3ft above existing low elevation point in that polygon).
Dredge Cut should be modeled to 614ft (low water surface elevation is 620ft, and we’d like to make a 6ft deep backwater).

I understand this is somewhat crude, but let me know if you have any questions, comments, or what other data you might need from me.

Thanks

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Monday, January 24, 2022 1:04 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Neil,

NAVD88 would be preferable over NGVD29, although they are probably the same at your location ☺
As far as the planar coordinates, just specify them. But they could be County, State or UTM.

Thanks!
Salam

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

DEPARTMENT OF NATURAL RESOURCES

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Monday, January 24, 2022 10:46 AM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

Is there a particular datum you want for the elevations, e.g., navd88?

Thanks

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Wednesday, January 19, 2022 5:51 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Neil,

Can you send the plans, shapefiles and elevations via e-mail or ftp link ? Do you have also proposed elevations, after dredging and filling? I can start putting them in a designated share folder as we assess and plan forward.
Salam

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

DEPARTMENT OF NATURAL RESOURCES

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Wednesday, January 19, 2022 1:02 PM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

Thanks for the prompt response!

I have general plans for the project, and shapefiles that show the fill/dredge area. I do have elevations (at least pretty good ones) for the locations that the project is on.

I am in a bit of limbo here, because I need to know if my general plans for the project would trigger floodstage impacts or not…If no, then I can proceed with completing the EAW and what not. If it does trigger impacts, I will need to rethink my inks and come up with a different plan. So this could be considered 'preliminary' modelling, that will likely be slightly refined once a final plan is solidified.

Let me know what you hear from Jeff.

Thanks again

NPR

From: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Sent: Wednesday, January 19, 2022 12:30 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Cc: Weiss, Jeff (DNR) <Jeff.Weiss@state.mn.us>
Subject: RE: Flood Stage Impact Modeling: MS River LSOH Project

Neil,

Thanks for contacting me about the project. I am also copying Jeff on this e-mail, since he coordinates these types of technical requests. Jim Solstad retired few years ago.

The good thing is there is a model developed for Mississippi River, that should include your area. So the model can be used to make the changes you mentioned in the first e-mail. Do you have plans and GIS shapefiles that show the areas to be excavated and fill added? Also, information about existing and proposed elevations for the dredged and filled areas would be needed to assess the effects of the project on the 100-yr WSEL (1% annual chance elevation).

Thanks!
Salam

Salam, Murtada, P.E., P.H., CFM
Hydrologist | Lake Ecology Unit | Division of Ecological and Water Resources

Minnesota Department of Natural Resources
500 Lafayette Road

St. Paul, MN 55155
Phone: 651-259-5688
Email: salam.murtada@state.mn.us

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Wednesday, January 19, 2022 11:38 AM
To: Murtada, Salam (DNR) <salam.murtada@state.mn.us>
Subject: FW: Flood Stage Impact Modeling: MS River LSOH Project

Salam-

I am contacting you regarding my inquiry below. Kevin Stauffer said you conducted the hec-ras on the Gorman Creek project. I was curious if it is possible to have this done for a different project (see below). I have tried a few different outlets, but haven't been able to get a response.

Let me know what you think, or please point me in the direction of who to contact.

Thanks

NPR

Neil Rude
Mississippi River Specialist/Asst. Area Supervisor

Minnesota Department of Natural Resources
1801 S. Oak Street
Lake City, MN 55041
Phone: 651-299-4025
Email: neil.rude@state.mn.us

Attachment L

Mussel Survey Coordination with MN DNR Staff and NHIS Requirement

Email correspondence from Bridget Henning-Randa (MNDNR):

From: Henning-Randa, Bridget (DNR)
To: Rude, Neil (DNR)
Subject: RE: Mussel Survey: MCE# 2022-00358
Date: Friday, October 18, 2024 12:46:01 PM
Attachments: image001.png
image002.png

Hi Neil,

Thanks for following up. I checked in with our NHIS staff on their interpretation and agree that you can proceed without a mussel survey.

Thanks,
Bridget

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Friday, October 18, 2024 12:40 PM
To: Henning-Randa, Bridget (DNR) <Bridget.Henning-Randa@state.mn.us>
Subject: RE: Mussel Survey: MCE# 2022-00358

Perhaps we could set up a call to discuss this early next week?
Thanks
NPR

From: Rude, Neil (DNR)
Sent: Tuesday, October 15, 2024 10:19 AM
To: Henning-Randa, Bridget (DNR) <Bridget.Henning-Randa@state.mn.us>
Subject: Mussel Survey: MCE# 2022-00358

Bridget-

Attached NHIS report indicates a survey for endangered mussels is needed in the project area for a Lessard Sams project that is dredging a shallow backwater to enhance aquatic habitat, and restore floodplain forest by raising elevations using the dredge material.

I have had discussions with MN DNR Mussel folks at CAMP in Lake City.

Kate Holcomb and her staff indicated that they felt a survey was not necessary based on the habitat characteristics of the area, and previous knowledge.

See image of email (can forward discussion if you'd like):

RE: Mussel Survey for Lessard Sams Project...or a letter?

Holcomb, Kathryn (DNR)
To Rude, Neil (DNR)
Cc Sietman, Bernard (DNR); Secrist, Zeb (DNR); Holcomb, Jordan (DNR); Schroeder, Zoe (DNR)
Retention Policy AllMail_180 (6 months) Expires 4/12/2025

Reply | Reply All | Forward
Mon 10/14/2024 1:41 PM

Start your reply all with: Yes, please proceed. | Sounds good to me. | I am fine with it. | Feedback

Hi Neil,

Based on available survey data and our experience surveying in the Mississippi River, the chances of finding listed species in this project area is very low. We do not feel a mussel survey is needed. Let us know if Bridget is OK with proceeding without a survey.

Thanks!
Kate

Will this be sufficient for the NHIS letter requirements?

Please let me know what you think.
I look forward to your response.
Thanks
NPR
Neil Rude
Mississippi River Habitat Specialist
Minnesota Department of Natural Resources
1801 S. Oak Street
Lake City, MN 55041
Phone: 651-299-4025
Email: neil.rude@state.mn.us

Email correspondence from Kathryn Holcomb (MNDNR):

From: Holcomb, Kathryn (DNR)
To: Rude, Neil (DNR)
Cc: Sietman, Bernard (DNR); Secrist, Zeb (DNR); Holcomb, Jordan (DNR); Schroeder, Zoe (DNR)
Subject: RE: Mussel Survey for Lessard Sams Project...or a letter?
Date: Monday, October 14, 2024 1:41:03 PM
Attachments: image006.png
image007.png
image008.png
image009.png
image010.png
image011.png

Hi Neil,
Based on available survey data and our experience surveying in the Mississippi River, the chances of finding listed species in this project area is very low. We do not feel a mussel survey is needed. Let us know if Bridget is OK with proceeding without a survey.
Thanks!
Kate

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Monday, October 14, 2024 9:34 AM
To: Holcomb, Kathryn (DNR) <Kathryn.Holcomb@state.mn.us>
Cc: Sietman, Bernard (DNR) <bernard.sietman@state.mn.us>; Secrist, Zeb (DNR) <zeb.secrist@state.mn.us>; Holcomb, Jordan (DNR) <Jordan.Holcomb@state.mn.us>; Schroeder, Zoe (DNR) <Zoe.Schroeder@state.mn.us>
Subject: RE: Mussel Survey for Lessard Sams Project...or a letter?

NHIS is from Dec 2022. MCE# 2022-00358
The message from Davis was a previous example of what was done, but not for this project.
Map attached.

Image below is an engineering schematic from a different project showing bathymetry (very shallow—1-2ft at Low control pool). Red is approximate dredge area.
Let me know what other information might be helpful.
NPR

From: Holcomb, Kathryn (DNR) <Kathryn.Holcomb@state.mn.us>
Sent: Friday, October 11, 2024 3:53 PM
To: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Cc: Sietman, Bernard (DNR) <bernard.sietman@state.mn.us>; Secrist, Zeb (DNR) <zeb.secrist@state.mn.us>; Holcomb, Jordan (DNR) <Jordan.Holcomb@state.mn.us>; Schroeder, Zoe (DNR) <Zoe.Schroeder@state.mn.us>
Subject: RE: Mussel Survey for Lessard Sams Project...or a letter?

Hi Neil,

Apologies for the slow reply! I will look into this with the survey team and get back to you as soon as possible.

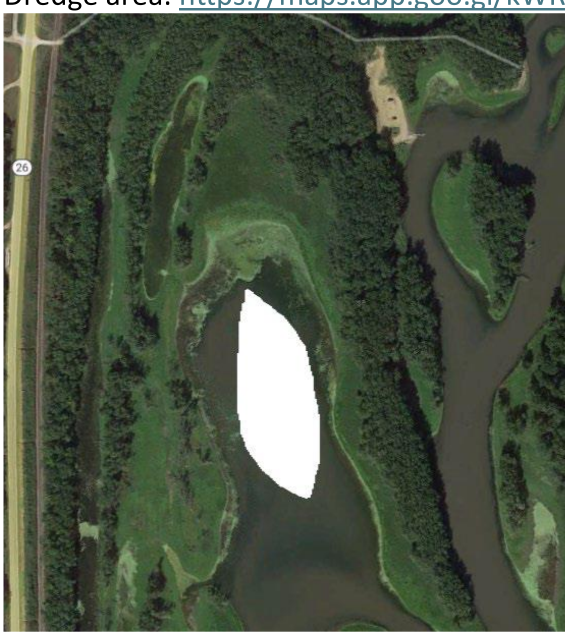
In the meantime, could you please clarify a few things:

What is the date of the NHIS review?

Did Bridget receive the message that Mike Davis thought that mussels would not be negatively impacted? If so, did this not change Bridget's mind about the need for a mussel survey?

Could you send us any existing documents with more details and schematics related to this project?
Thanks!
Kate

From: Rude, Neil (DNR) <Neil.Rude@state.mn.us>
Sent: Tuesday, October 8, 2024 10:16 AM
To: Holcomb, Kathryn (DNR) <Kathryn.Holcomb@state.mn.us>
Subject: Mussel Survey for Lessard Sams Project...or a letter?
Kate-
Fisheries has a project to improve aquatic habitat by dredging and placing the dredge material on the floodplain to raise elevations to enhance floodplain forest/natural regeneration.
As part of the NHIS process a survey is required for the project. Fisheries has done these type projects in the past (dredging) in backwaters. We have just gotten a letter from CAMP saying mussels are not impacted by project because dredging is occurring in non bed areas.
This area is a backwater in upper pool 9. Its about 1-2ft of silty soils with some vegetation. I've never seen a mussel in the location. USACE/Kelner did sled runs in the nearby area where there is flowing channel and found some, but our project wouldn't impact or go through that area. The
corps is doing a project adjacent to this one and devised an access route to minimize impacts to any possible mussels---MN equipment would follow that path.
See what we've done in the past below, and also the NHIS letter.
I can support any cost you guys might need for the survey if you deem its necessary through my funding.
I'd like to knock this out before this winter…I know that might be a tighter schedule.
Summer/fall flew past me with a bunch of other project stuff.
Let me know what you think and I'd like to open a discussion.
Dredge area: https://maps.app.goo.gl/kWRNMRGpXspjQPZu5



Screenshot of M. Davis email for other project:

mussels and dredging in the Pritchards area

DM Davis, Mike J (DNR)
To Dieterman, Daniel M (DNR)

Reply | Reply All | Forward | ...
Mon 10/6/2014 8:36 AM

Dan, in my opinion it is highly unlikely that any mussel populations will be adversely affected by the backwater dredging proposed. The habitat is too swampy to support a diverse or abundant mussel population.

Mike

Mike Davis – Program Consultant
MN DNR, Ecological and Water Resources
Stream Habitat Program -Aquatic Ecology/Malacology
1801 South Oak St
Lake City, MN 55041

Office: 651 345-3332 x 227

Use of that information in the EAW:

Survey work conducted by DNR malacologists within the past seven years found no listed freshwater mussels within the dredge area boundary, and very few mussels exist due to poor habitat conditions caused by shallow water and unconsolidated fine sediments (Personal e-mail communication from DNR malacologist).

NHIS letter requirement:

Federally Protected Species

- Several mussel species including Higgins eye (*Lampsilis higginsii*), a federally and state-listed endangered species, have been documented downstream of the proposed project. Mussels are particularly vulnerable to deterioration in water quality, especially increased siltation. As such, effective erosion prevention and sediment control practices must be implemented and maintained throughout the duration of the proposed project. In order to determine the potential for a take of state-protected mussels, a **qualified surveyor (see enclosed list) will need to conduct a mussel survey and/or relocation in any potential mussel habitat prior to construction**.

  The surveyor will need to obtain a permit from the DNR Endangered Species Coordinator,) before conducting any mussel surveys and will need to follow established survey protocol. The extent of the mussel survey should include all areas of the riverbed that will be directly impacted by excavation, placing of fill or riprap, driving of equipment, or dewatering; as well as any areas downstream that will receive sediment from project activities. Please send the results of all survey work to the DNR Endangered Species Environmental Review Coordinator, Lisa Joyal (Lisa.Joyal@state.mn.us or 651-259-5109). **No work in the riverbed shall occur until potential impacts to mussels have been resolved** to the satisfaction of the DNR's Endangered Species Coordinator, Bridget Henning-Randa.

Thanks
NPR

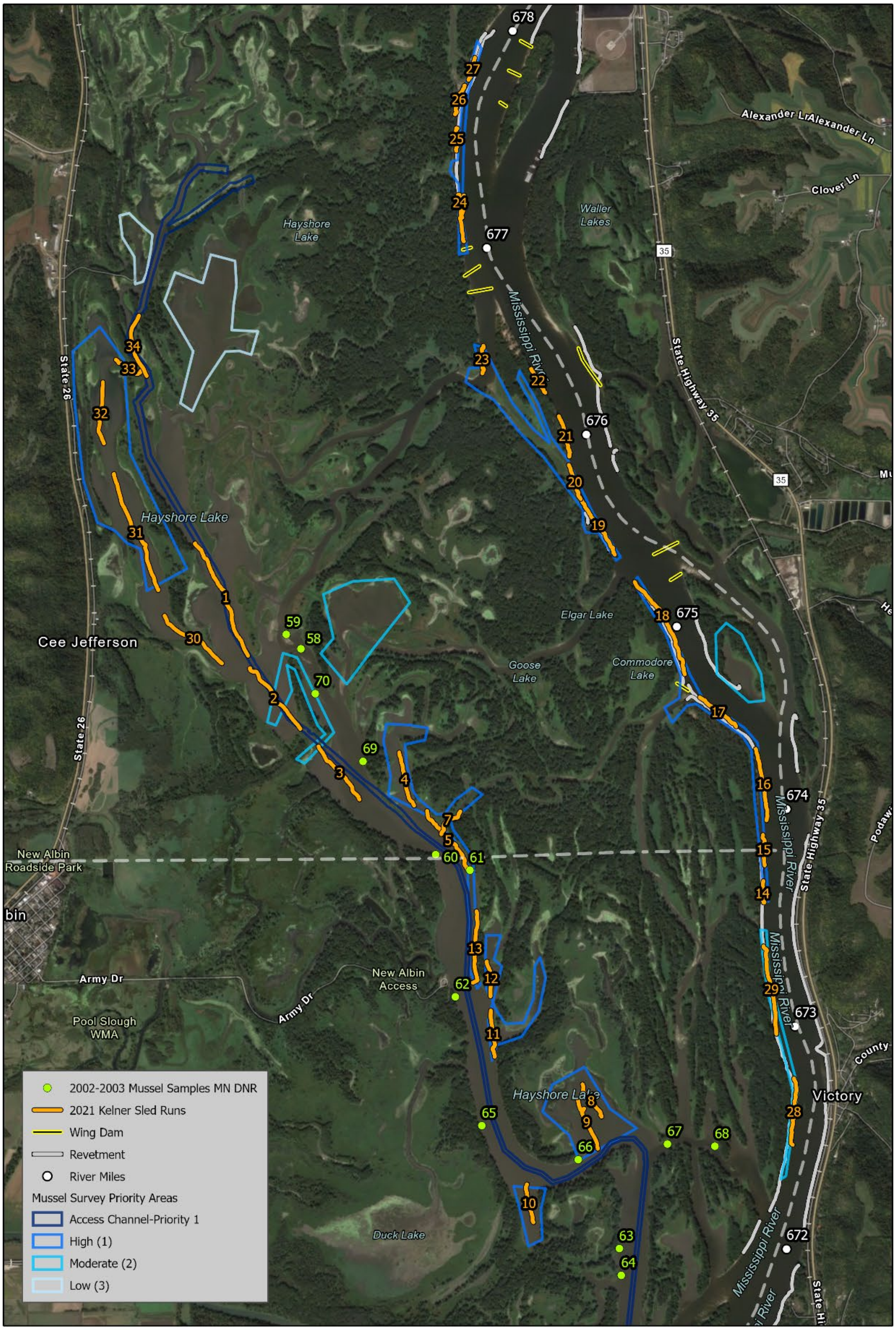
Neil Rude
Mississippi River Habitat Specialist
Minnesota Department of Natural Resources
1801 S. Oak Street
Lake City, MN 55041
Phone: 651-299-4025
Email: neil.rude@state.mn.us

Attachment M

USACE Mussel Survey (2021) and UMRR-HREP Exclusion Zones for Access/ Construction

Reno Bottoms HREP Mussel Survey Results

Dan Kelner – August 2021



St. Paul District GIS CENTER

US Army Corps of Engineers

Reno Bottoms HREP Mussel Sampling - August 23-26 2021

Base Image: Google 6" Imagery 9/28/2013

0 2,250 4,500 Feet

N

Created by: b6pdkjh8 9/7/2021 4:04 PM

P:\UMRR(EMP)\Pool_9-MVP_Reno_Bottoms_MN-472235\Mussels\Reno_HREP_Mussels\GIS_Map\august2021MusselSurvey_RenoBottoms.aprx

Table 1. Mussel species abundance and richnes for skimmer dredge surveys at UMR Pool 9 Reno Bottoms HREP proposed reatures, August 2021.

	Skimmer Dredge Transect																																	
Species	1	2	3	4	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total
Amblema plicata	111	96	2	23	62	24	3		23	15	1	71	1			2		3	31	1			3		2		1	1	113	22	36	96	12	755
Arcidens confragosus*									**1**																									**1**
Ellipsaria lineolata*	**1**																																	**1**
Fusconaia flava	48	28	2	7	17	10			6	5	1	14						1	20				1	2					35	2	12	62	6	279
Lampsilis cardium	2	1				2			1								1	12	1						1	1		1				1		24
Lampsilis higginsii[#]	**1**									**D**								**1**																**2**
Lasmigona complanata				3																														3
Leptodea fragilis	6				1	1			1	1					18		4	3				2			1	1	1		1	1				42
Ligumia recta																1	1																	2
Megalonaias nervosa*									**1**																									**1**
Obliquaria reflexa	71	51	11	7	33	7			26	31		48						8	34				4	3	1			1	31	2	11	16	12	408
Obovaria olivaria	1	11	2		1	5						3	1					1	1	1		2		2		1	4							36
Pleurobema sintoxia*		**1**			**1**				**2**																							**1**		**5**
Potamilus alatus	2	1		1	1				1						1										1		2							10
Potamilus ohiensis																													D					D
Pyganodon grandis	1	1		1	1		1	D				2																		4	2	2		15
Quadrula metanevra*		**1**																																**1**
Quadrula nodulata*		**1**	**1**																													**1**		**3**
Quadrula pustulosa	5	5			2			1		1		1						2	5					4								2		28
Quadrula quadrula	3	3			3	3													2										4			8		26
Toxolasma parvus										1					2															1				4
Truncilla donaciformis*	**1**	**1**			**1**	**1**			**1**										**1**													**1**		**7**
Truncilla truncata															4			2							2							2		10
Utterbackia imbecillis					1																													1
Total live	253	201	18	42	124	53	4	1	63	54	2	139	2	0	25	3	6	33	95	2	0	4	8	11	8	3	8	3	184	32	61	192	30	1,664
Live species	13	13	5	6	12	8	2	1	10	6	2	6	2	0	4	2	3	9	8	2	0	2	3	4	6	3	4	3	5	6	4	11	3	23
Total Species	13	13	5	6	12	8	2	2	10	7	2	6	2	1	4	2	3	9	8	2	1	2	3	4	6	3	4	3	6	6	4	11	3	24
Transect length (m)	946	609	509	419	567	279	293	432	292	359	264	555	198	237	537	363	812	524	274	316	210	224	605	182	242	187	515	669	569	952	464	255	485	14,344
Density (no./m^2)	0.86	1.06	0.11	0.32	0.70	0.61	0.04	0.01	0.69	0.48	0.02	0.81	0.03	0.00	0.15	0.03	0.02	0.20	1.12	0.02	0.00	0.06	0.04	0.19	0.11	0.05	0.05	0.01	1.04	0.11	0.42	2.42	0.20	0.37
Depth (ft. min - max)	2.5-5.5	2.5-7.0	2.5-6.0	2.5-6.0	2.5-7.5	1.5-4.0	1.5-3.0	2.5-6.0	2.0-4.5	2.5-7.0	2.0-3.0	1.5-9.0	3.0-14.0	3.0-3.0	1.5-6.0	5.5-11.0	5.5-15.0	5.5-13.0	1.5-7.0	3.5-8.5	5.5-6.5	3.5-8.5	3.0-8.5	11.0-15.0	5.5-9.0	2.5-8.5	5.5-20.5	8.5-18.0	2.0-4.0	3.0-5.0	1.5-3.5	2.0-5.5	4.5-8.5	

Bold[#] = federally endangered; **Bold* = listed for protection in Iowa and/or Minnesota**

Grey = Areas of concern for impacts to mussels based on abundance, species richness, and T&EPresence

Table 2. Mussel abundance and richness from timed dives in UMR Pool 9 Minnesota Slough (MNDNR), 2002-03.

	Site													
Species	58	59	60	61	62	63	64	65	66	67	68	69	70	Total
Amblema plicata	35	300	167	27	312	209	26	52	10	169	58	117	81	1,563
Arcidens confragosus*		**D**					**D**			**1**		**D**		**1**
Ellipsaria lineolata*										**2**				**2**
Elliptio dilatata			D		D									D
Fusconaia ebena			D		D									D
Fusconaia flava	15	75	8	2	6	8	1	2		51	10	20	4	202
Lampsilis cardium	10	4	1		1	6	2		2	8	2			36
Lampsilis higginsii[#]		**1**				**1**				**2**				**4**
Lampsilis siliquoidea	D													D
Lampsilis teres	D													D
Lasmigona complanata		3	D	1			2	1		5	1	3		16
Leptodea fragilis		1			D	2		1		1	1			6
Ligumia recta						2				2		1		5
Megalonaias nervosa*					**D**		**D**			**3**				**3**
Obliquaria reflexa	22	46	104	12	169	47	5	29		18	4	59	15	530
Obovaria olivaria	D	11	1			4	1			37		1		55
Pleurobema sintoxia*		**3**	**1**			**15**	**1**			**49**	**1**	**3**		**73**
Potamilus alatus	D				1					D				1
Potamilus ohiensis		1					D			1				2
Pyganodon grandis	D		4	2	11	2		5				2	6	32
Quadrula nodulata*												**3**	**1**	**4**
Quadrula pustulosa	7	17	2			2			1	21	1		4	55
Quadrula quadrula	2	7	17	1	9	18	2	3		27	4	4	19	113
Strophitus undulatus*		**1**								**1**				**2**
Toxolasma parvus	2		2		2	2		4					1	13
Tritogonia verrucosa*			**D**											**D**
Truncilla donaciformis*	**4**	**4**	**6**		**12**	**7**				**2**	**1**	**4**		**40**
Truncilla truncata	1	22	14		11	18				7		9	1	83
Utterbackia imbecillis					1		D							1
Total Live	98	496	327	45	535	343	40	97	13	407	83	226	132	2,842
Live species	9	15	12	6	11	15	8	8	3	19	10	12	9	24
Total Species	14	16	16	6	15	15	12	8	3	20	10	13	9	29
Timed search	40	60	40	30	40	50	30	40	30	40	30	40	8	478
CPUE (No. Live/min)	2.5	8.3	8.2	1.5	13.4	6.9	1.3	2.4	0.4	10.2	2.8	5.7	16.5	5.9

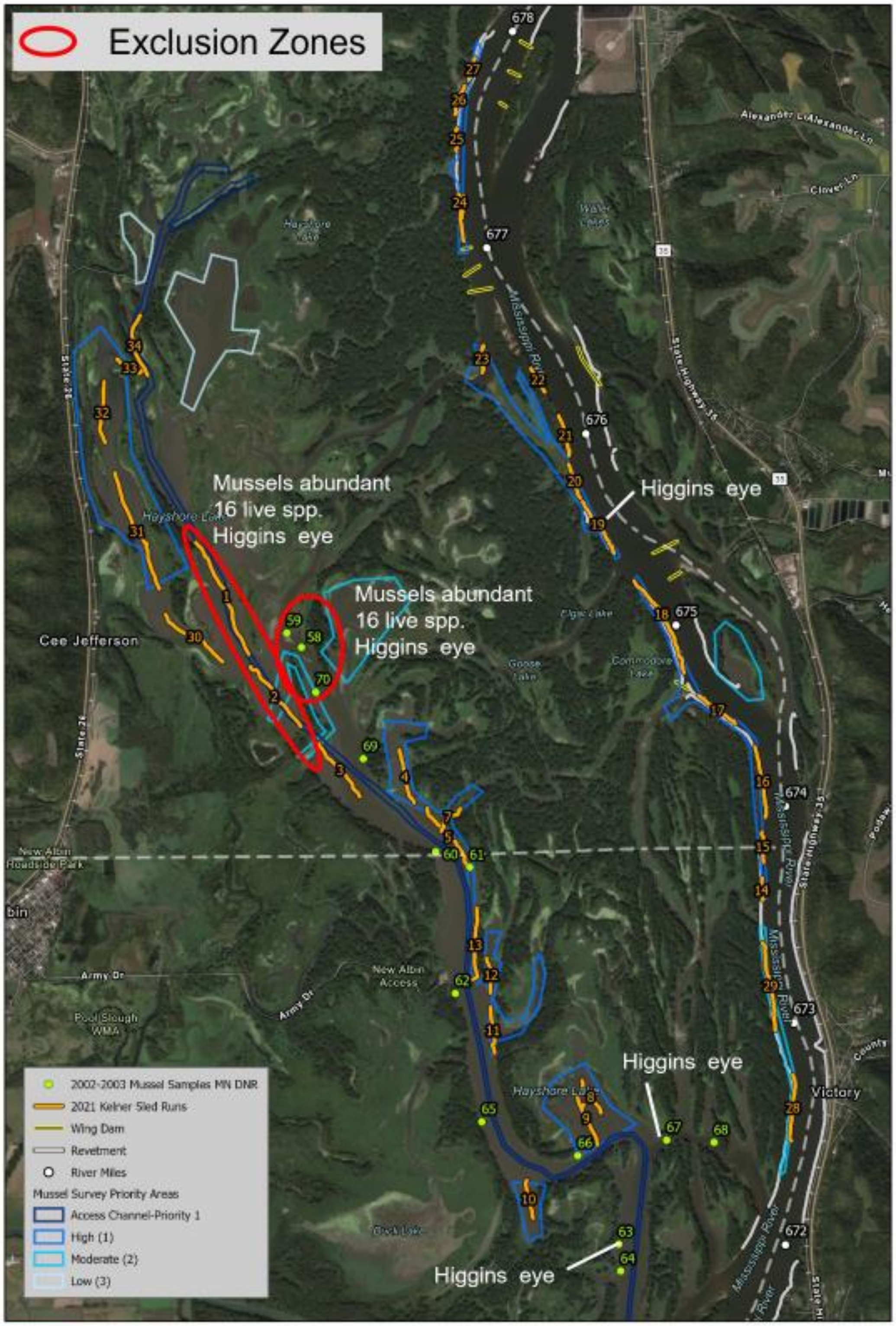
Bold[#] = federally endangered; **Bold* = listed for protection in Iowa and/or Minnesota**

Grey = Areas of concern for impacts to mussels based on abundance, species richness, and T&EPresence

Table 3. Mussel species collected in dive (2002-03) and skimmer dredge (2021) survyes, within Minnesota Slough and main channel border sites at proposed Reno Bottoms HREP features, UMR Pool 9.

Species	Common name	2002-03	2021	Total
Amblema plicata	threeridge	1,563	755	2,318
Arcidens confragosus*	**rock pocketbook**	**1**	**1**	**2**
Ellipsaria lineolata*	**butterfly**	**2**	**1**	**3**
Elliptio dilatata	spike	D		D
Fusconaia ebena*	**ebonyshell**	**D**		**D**
Fusconaia flava	**Wabash pigtoe**	202	279	481
Lampsilis cardium	plain pocketbook	36	24	60
Lampsilis higginsii[#]	**Higgins eye**	**4**	**2**	**6**
Lampsilis siliquoidea	fatmucket	D		D
Lampsilis teres*	**yellow sandshell**	**D**		**D**
Lasmigona complanata	white heelsplitter	16	3	19
Leptodea fragilis	fragile papershell	6	42	48
Ligumia recta	black sandshell	5	2	7
Megalonaias nervosa*	**washboard**	**3**	**1**	**4**
Obliquaria reflexa	threehorn wartyback	530	408	938
Obovaria olivaria	hickorynut	55	36	91
Pleurobema sintoxia*	**round pigtoe**	**73**	**5**	**78**
Potamilus alatus	pink heelsplitter	1	10	11
Potamilus ohiensis	pint papershell	2	D	2
Pyganodon grandis	giant floater	32	15	47
Quadrula metanevra*	**monkeyface**		**1**	**1**
Quadrula nodulata*	**wartyback**	**4**	**3**	**7**
Quadrula pustulosa	plain pimpleback	55	28	83
Quadrula quadrula	mapleleaf	113	26	139
Strophitus undulatus*	**strange floater**	**2**		**2**
Toxolasma parvus	lilliput	13	4	17
Tritogonia verrucosa*	**pistolgrip**	**D**		**D**
Truncilla donaciformis*	**fawnsfoot**	**40**	**7**	**47**
Truncilla truncata	deertoe	83	10	93
Utterbackia imbecillis	paper pondshell	1	1	2
Total live		2,842	1,664	4,506
Live species		24	23	25
Total Species		29	24	30

Bold[#] = federally endangered; **Bold* = listed for protection in Iowa and/or Minnesota**



St. Paul District

US Army Corps of Engineers

Reno Bottoms HREP Mussel Sampling 2002-03 and 2021

Base Image: Google 6" Imagery 9/28/2013

0 2,250 4,500 Feet

N

Attachment N

Rare Fish Species Coordination with MNDNR Fisheries Staff for NHIS

DEPARTMENT OF NATURAL RESOURCES

Minnesota Department of Natural Resources
Division of Fish & Wildlife
Lake City Area Fisheries Office
1801 S Oak St.
Lake City, MN 55041

July 23, 2025

Dear Neil (Mississippi River Habitat Specialist),

You recently requested that fisheries provide our position on a number of fish issues related to the ongoing project planning in Reno Bottoms.

Your first question related to the implementation of work exclusion periods for this project. The standard non-trout stream construction exclusion period of March 1st – June 1st applicable in the project region would be sufficient for this project. As you noted in your initial inquiry there are several listed species in the area (Black Buffalo and Pallid Shiner) that have later exclusion dates recommended. However, the proposed project area is unlikely to contain suitable spawning habitat (flow, substrate, etc.) for these species, and their presence is unlikely.

Second, you sought input on the potential impacts to a number of state and/or federally listed species identified in the projects vicinity. I will lay out MN DNR Fisheries position on each of these as it relates to the project area below.

1) Black Buffalo – The project site is near the northern edge of their range. Black Buffalo can occupy mainstem or backwater habitats, but tend to use deeper water habitats than what is present in the proposed work area, and are highly mobile and would likely avoid direct impact from construction work. As mentioned above the work area is unlikely to represent quality spawning habitat for Black Buffalo and the standard exclusion period should be sufficient for the project.
2) Pallid Shiner – Pallid Shiner are found in backwater habitats, but are described, by the MN DNR Rare Species Guide, as “avoiding heavily silted habitats” that would be a common habitat type in the project area. As mentioned above the work area is unlikely to represent quality spawning habitat for Pallid Shiner and the standard exclusion period should be sufficient for the project.
3) Paddlefish – Paddlefish are a highly mobile species present in the Mississippi River most often associated with main and side channel habitats. Thought they can be present in backwater habitats their long rostrum, potentially large size, and ram filter feeding method (swimming with their large mouth open to filter water as it passes through) make them poorly adapted to maneuvering or feeding in highly vegetates shallow backwaters. Similar to several of the other species listed their mobility would also allow them to avoid construction activities if they happened to enter into the area.
4) Blue Sucker – Are highly current associated. Typically found in deep or swiftly flowing water, primarily associated with main channel and side channel habitats and structures (wing and closing dams), that would not be present in the project area. The few times we sample them near backwater habitats are generally during flood periods when water is spilling over main channel border features in localized areas of swift current suitable for feeding.

5) Pirate Perch – Area a species that might be found in the project area, but the project would likely be a net benefit to the species with the proposed slope on the edges of the dredged areas allowing for a habitat gradient in which the Pirate Perch can establish while providing critical overwintering habitat with suitable oxygen in the vicinity.
6) Warmouth – Warmouth are at the northern edge of their range in the Mississippi basin in Minnesota. Similar to the Pirate Perch, Warmouth are a species that may be present in the area and prefer backwater habitats. In recent years we have seen an expansion in the number of Warmouth we have encountered out of the Lake City office though most of those have come from Pools 5A and 6. Suitable overwintering habitat developed as part of this project would be a net benefit to this species allowing greater overwinter survival to both current occupants of the area and any populations that might encounter the area in the future as they disperse from other areas in the river.
7) Yellow Bass – Yellow Bass are also at the northern limits of their range in the Mississippi River in the project area, though it should be noted that illicit stocking of Yellow Bass in the upper reaches of the Minnesota River may lead to immigration to the project area from upstream at a future date. Yellow Bass are a mobile species able to avoid disturbance related to construction if they happened to encounter it, and are unlikely to be negatively impacted by the construction activity itself or the resulting habitat changes that may provide seasonal (overwintering) benefit to individuals.

Feel free to reach out if you need input on any additional species or ay other aspects of the proposed project.

If you have any questions, please feel free to call or email me.

Sincerely,

Nicholas Schlesser

Nick Schlesser
Area Fisheries Manager
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Lake City, MN 55041
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Attachment O

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