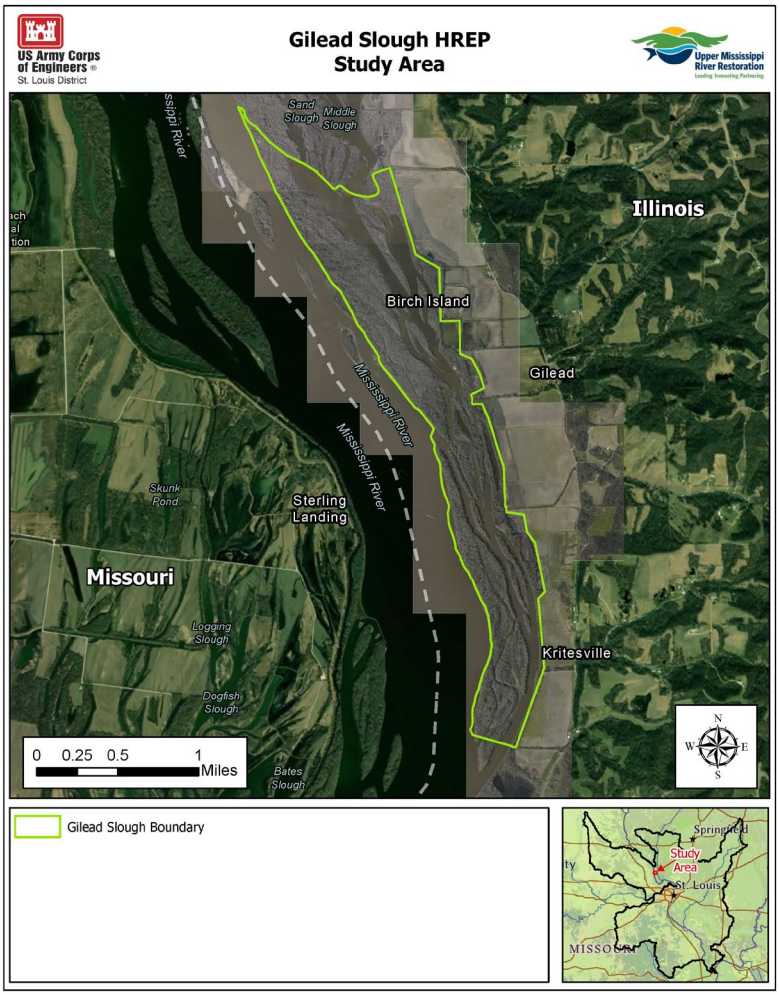
# UPPER MISSISSIPPI RIVER RESTORATION
# FEASIBILITY REPORT
# WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

## GILEAD SLOUGH
## HABITAT REHABILITATION AND ENHANCEMENT PROJECT
## NEPA ID#: EAXX-202-00-B3P-1759826212

## POOL 25, UPPER MISSISSIPPI RIVER MILES 253-248
## CALHOUN COUNTY, IL




**January 2026**
Draft Version

US Army Corps of Engineers
St. Louis District

Upper Mississippi River Restoration
Leading·Innovating·Partnering

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## EXECUTIVE SUMMARY

**Purpose of Report.** The purpose of this feasibility report with integrated environmental assessment (EA), including the Finding of No Significant Impact (FONSI), is to document the decision-making process for the proposed U.S. Army Corps of Engineers (USACE) ecosystem restoration project in the Gilead Slough study area. The Gilead Slough Habitat Rehabilitation and Enhancement Project (HREP) focuses on side channel and backwater habitats and terrestrial floodplain resources in Pool 25.

This report was developed by the USACE with the U.S. Fish and Wildlife Service (USFWS) acting as the study sponsor and coordinating agency. This report provides planning (including National Environmental Policy Act [NEPA] compliance), engineering, and sufficient construction details of the recommended plan to help inform the final recommendation.

**Study Area Location.** The Gilead Slough HREP consists of approximately 1,200 acres of backwater, wetland, side channel, sandbar, island, and floodplain forest areas. The study area is located in the Mississippi River floodplain on the left descending bank of the Mississippi River between River Miles (RM) 253 and 248 in Calhoun County, IL.

**Problem Identification.** Human alterations to the Upper Mississippi River (UMR) channel, along with land use changes in the floodplain and UMR basin over the past two centuries, have altered the hydrology in the study area. These alterations have decreased side channel, backwater, sandbar, island, and wetland habitat diversity and quality in the study area. Existing stressors are expected to remain, resulting in a continued decline in habitat quality. This report outlines an opportunity to improve habitat quality and diversity in the study area. The specific problems as they relate to the study area include:

- Loss of topographic diversity reduces desired forest and herbaceous vegetative community composition and wildlife resources (e.g., forage, invertebrate production, nesting habitat, and resting sites).
- Sedimentation causes poor water quality, shallow depths, loss of bathymetric diversity and reduced connectivity of aquatic habitat throughout the study area.

**Study Goal and Objectives.** The goal of this potential ecosystem restoration project is to restore and improve the quality and diversity of backwater, side channel, sandbar, island, wetland, and floodplain forest resources within the study area. The objectives identified to meet this goal are to:

- Enhance depth, flow and substrate diversity and connectivity of aquatic habitat throughout study area;
- Manage the sediment inputs in the side channel and slough area;
- Restore topographic and bathymetric diversity and improve desired vegetative community composition throughout the project area.

**Plan Formulation, Evaluation and Comparison.** The interagency project delivery team (PDT), which included biologists, engineers, and planners from the USACE and the USFWS, developed a series of measures for consideration to address the identified objectives. Measures were then assessed for their ability to address project problems, goals, and objectives. The final list of measures included:

- Shoreline Protection with Gradual Slope Revetment (GSR)
- Excavation At Varying Depths
- Moist Soil Unit Creation with Pump (Active Management)
- Moist Soil Unit Creation with Overflow (Passive Management)
- Scour Structures
- Hard Points
- Backwater Excavation (Environmental Pool Management; EPM)
- River Connection Starting at Gilead
- Island Creation
- Barbs
- Sediment Deflection Dike
- Bank Protection

**Plan Selection**. The Tentatively Selected Plan (TSP; Plan) for the Gilead Slough HREP (Intermediate Habitat Benefit Alternative) is shown in Executive Summary (ES) 1. It consists of multiple measures to restore and improve the aquatic ecosystem structure and function by implementation of the following:

- Shoreline Protection with GSR
- Excavation At Varying Depths
- Moist Soil Unit Creation with Overflow (Passive Management)
- Scour Structures
- Hard Points
- Backwater Excavation (EPM)
- Island Creation
- Barbs
- Bank Protection

The Plan was identified as the National Environmental Restoration (NER) Plan. For

ecosystem restoration projects, the plan that maximizes ecosystem benefits compared to costs is selected as the NER Plan. The Plan is a best buy alternative that yields 197 net average annual habitat units (AAHUs) at an average cost of $4,663 per AAHU (FY2026 price level; FY2026 federal discount rate of 3%, 50-year period of analysis). It best meets the study objectives and has sponsor support from the USFWS. Implementation of the Plan would increase the quality and quantity of ecosystem resources and meet the needs for a large variety of native aquatic species. The project outputs are also consistent with the goals and objectives of the Upper Mississippi River Restoration (UMRR) Program.

All project measures would be located within the lands and waters of the United States, are federally owned, and are managed by the USFWS. As such, project first cost funding for restoration measures would be 100 percent federal; responsibility for the operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) of the project would be the responsibility the USFWS depending on the specific location of project features.

The St. Louis District Engineer has reviewed the project outputs, a gain of 197 net AAHUs, and determined that the implementation of the Plan is in the federal interest. Therefore, the District Engineer recommends construction approval for the Gilead Slough HREP. The current estimated project first cost (FY2026 price level) of the project (including contingencies) is estimated at $23,329,000. The average annual cost based on the project first cost is $919,000 The fully funded project cost estimate is $XX,XXX,000. USFWS would be responsible for project OMRR&R at an estimated average annual cost of $675 (including contingencies).

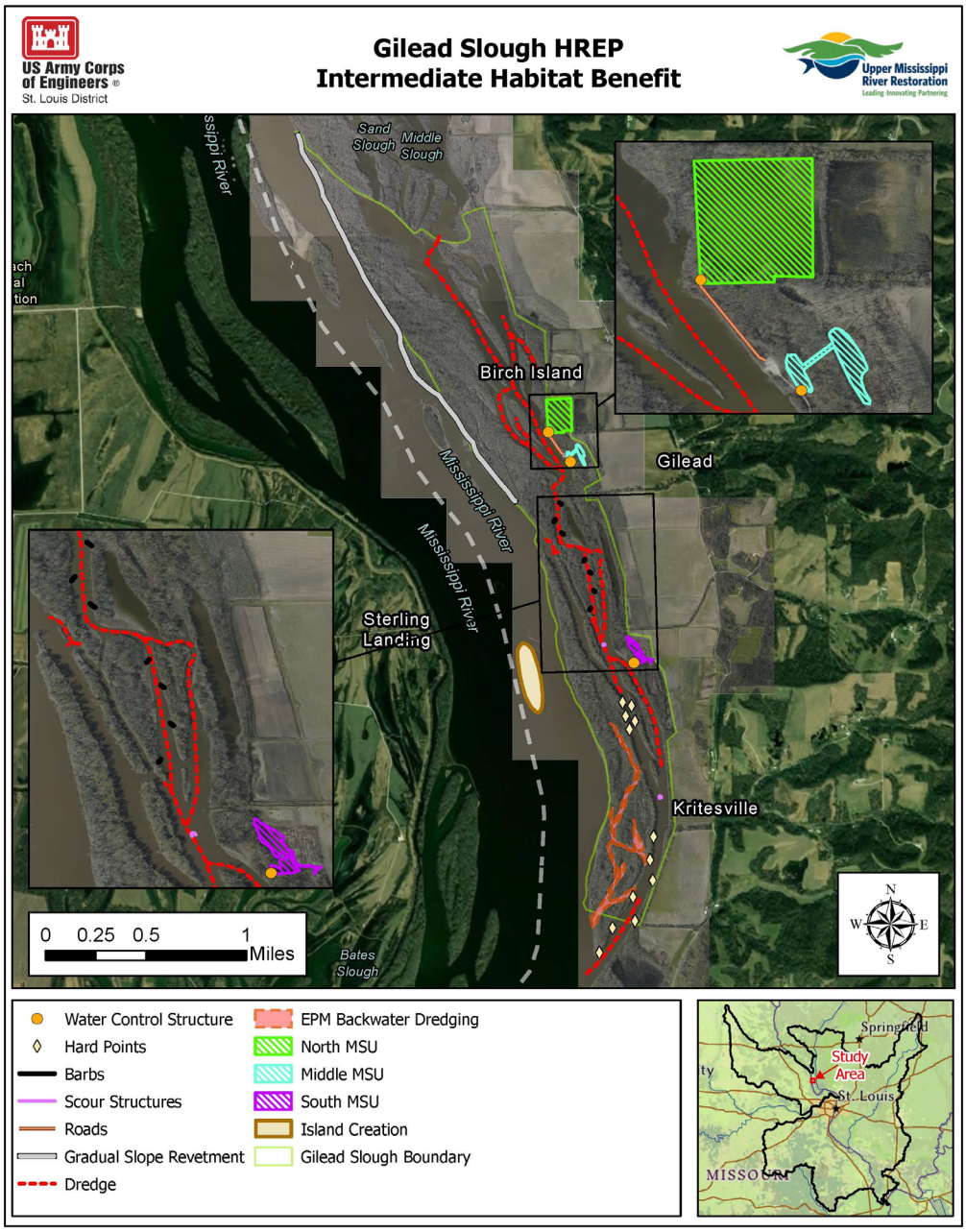


Figure ES- 1 Tentatively Selected Plan

## ACRONYMS

| Term | Acronym | Term | Acronym |
|---|---|---|---|
| Average Annual Habitat Unit | **AAHU** | Migratory Bird Treaty Act | **MBTA** |
| Cost Effectiveness & Incremental Cost Analyses | **CE/ICA** | National Environmental Policy Act | **NEPA** |
| St. Louis District | **District** | Moist Soil Unit | **MSU** |
| Dissolved Oxygen | **DO** | Operation and Maintenance | **O&M** |
| Engineering Circular | **EC** | Plans & Specifications | **P&S** |
| Endangered Species Act | **ESA** | Project Delivery Team | **PDT** |
| Environmental Protection Agency | **EPA** | River Mile | **RM** |
| Engineer Regulation | **ER** | River Resources Action Team | **RRAT** |
| Engineering Research and Development | **ERDC** | River Resources Action Team – Technical Section | **RRAT-Tech** |
| Feasibility Report with Integrated Environmental Assessment | **FR/EA** | Principles and Guidelines | **P&G** |
| Fish and Wildlife Coordination Act | **FWCA** | State Historic Preservation Office | **SHPO** |
| Habitat Evaluation Procedures | **HEP** | Tentatively Selected Plan | **TSP** |
| Habitat Needs Assessment-II | **HNA-II** | Cubic feet per second | **CFS** |
| Habitat Rehabilitation and Enhancement Project | **HREP** | Upper Mississippi River | **UMR** |
| Habitat Suitability Index | **HSI** | Upper Mississippi River Restoration | **UMRR** |
| Hazardous, Toxic, and Radioactive Waste | **HTRW** | Upper Mississippi River System | **UMRS** |
| Lock(s) and Dam | **L&D** | U.S. Fish and Wildlife Service | **USFWS** |
| Northern Long Eared Bat | **NLEB** | Water Resources Development Act | **WRDA** |
| Long-Term Resource Monitoring | **LTRM** | Water Surface Elevation | **WSE** |
| USACE, Mississippi Valley Division | **MVD** | Acoustic Doppler Current Profiler | **ADCP** |
| United States Department of Agriculture | **USDA** | Light Detection and Ranging | **LiDAR** |
| Geographic Information System | **GIS** | Computer-aided Design | **CAD** |
| Operation, Maintenance, Repair, Replacement, and Rehabilitation | **OMRR&R** | | |

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# 1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), St. Louis District (District), has prepared this Feasibility Report with Integrated Environmental Assessment (FR/EA) to present a detailed account of the planning, engineering, construction considerations, and environmental considerations that resulted in the Tentatively Selected Plan (TSP) for the Gilead Slough Habitat Rehabilitation and Enhancement Project (HREP) (Project). The FR/EA (Report) meets USACE planning guidance and National Environmental Protection Act (NEPA) requirements. The planning and decision process includes:

- Scoping (identifying problems, opportunities, objectives, and constraints)
- Identifying existing conditions and future without project conditions
- Plan formulation (identifying measures, formulating plans, evaluating and comparing plans)
- Plan selection

Evidence gathering, risk management, and stakeholder involvement occurs throughout the planning process. This report summarizes the multidisciplinary efforts of the Project Delivery Team (PDT), which includes the District, the Sponsor, and Project partners.

## 1.1 Authority and Project Selection

The Upper Mississippi River Restoration (UMRR) program was originally authorized by the Water Resources Development Act (WRDA) of 1986 under Section 1103 (33 U.S.C. 2201 et seq.; P.L. 99-662, 1986). The UMRR program is composed of two elements: (1) plan, construct, and evaluate measures for fish and wildlife habitat improvement through HREPs, and (2) monitor the natural resources of the river system through the Long-Term Resource Monitoring (LTRM) element. It is a regional program that includes the USACE St. Paul, Rock Island, and St. Louis Districts. Additional information on the program authority can be found at: https://www.mvr.usace.army.mil/Missions/Environmental-Stewardship/Upper-Mississippi-River-Restoration/Key-Documents/.

Interagency groups in each District identify, prioritize, and select the HREPs. Field managers from the aforementioned interagency groups determine the areas that have degraded aquatic, wetland, and bottomland forest habitats and which UMRR authorized objectives are priority for the area. After considering resource needs and deficiencies pool by pool, the River Resources Action Team – Technical Section (RRAT-Tech) and the River Resources Action Team – Executive Team (RRAT) supported and recommended the Project as providing substantial aquatic, wetland, and floodplain benefits with opportunities for habitat enhancement. The Mississippi Valley Division (MVD) approved the Fact Sheet on 01 October 2020.

Participants in the planning of the Project included St. Louis District and Regional Planning and Environment Division North (RPEDN) staff, and the Project Sponsor. Under Federal regulations governing the implementation of NEPA, the U.S. Fish and Wildlife Service (USFWS) is a cooperating agency. Development of this FR/EA was

actively coordinated with the participants during PDT meetings, phone conversations, and on-site visits to the study area.

**U.S. Army Corps of Engineers, St. Louis District.** The District is responsible for Project management and coordination with the Sponsor, Project partners, and other affected agencies. The District will submit the FR/EA, program funds, finalize Plans & Specifications (P&S), complete all NEPA requirements, advertise and award a construction contract, and perform construction contract supervision and administration. Section 906(e) of WRDA 1986 states that first cost funding for enhancement measures will be 100% Federal cost because the Project measures will be located on Federally-owned land.

**Sponsor.** USFWS is the Sponsor. Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R), as described in Section VI.F, is the responsibility of Sponsor in accordance with Section 107(b) of WRDA 1992, Pub. L. 102-580, 33 U.S.C. § 652(e)(7)(A). The OMRR&R responsibilities of the Sponsor will be addressed in the proposed Memorandum of Agreement (MOA) for the Project.

## 1.2 Purpose and Need for Federal Action

The purpose of this Draft FR/EA, including the draft unsigned FONSI, is to evaluate a range of alternatives or actions and their environmental effects and to determine if there is a federal interest in constructing a project. Developed alternatives, including the no action plan, comply with current applicable laws, regulations, and policies.

The District proposes to rehabilitate and enhance the study area through construction of measures that will maintain, enhance, and restore backwaters, side channels, emergent wetlands, sandbars, and island habitats. The need for rehabilitation and enhancement of the site is based on the following reports:

- The *Upper Mississippi Conservation Area Ten-Year Management Plan FY 2016-2025* (Calvert, et al., 2016) identifies a need to protect forest, wetland, and aquatic habitats in the study area for wildlife. The management plan identifies the need to address water level management issues, sedimentation, and tree recruitment/regeneration issues in the study area.
- The *Upper Mississippi River System Habitat Needs Assessment (HNA) II* (McCain, Schmueker, & De Jager, 2018) summarized the desired future conditions in relation to high importance indicators for the Lower Impounded Mississippi River as: 1) improve gate management for native fish passage, 2) restore floodplain habitat and connectivity, 3) restore islands, 4) restore diversity of aquatic habitat types with desire for more lentic and backwater habitats, preferably shallow lotic areas and deep lentic areas, 5) restore aquatic vegetation in backwater areas, 6) restore floodplain forest diversity, including hard-mast, 7) enhance floodplain topographic diversity, 8) restore floodplain vegetation diversity in hand with diversifying floodplain inundation periods, 8) restore water level fluctuation to mimic pre-dam conditions, and 9) improve water clarity.

i. *Two Rivers National Wildlife Refuge Habitat Management Plan* (USFWS, 2011) identifies a desire to protect a natural diversity of habitat types able to support healthy, native wildlife populations. An emphasis was placed on wetland resources and their associated migratory and resident wildlife species, patch size and structural diversity of floodplain forest resources, and to reduce impacts of sedimentation on fish and wildlife resources.

The Project is consistent with USFWS management goals and was planned for the benefit of resident and migratory birds, fish, mussels, and other wildlife.

### 1.3 Study Area

The UMRR Gilead Slough HREP project area is located on the left descending bank of the Mississippi River Pool 25 between river miles (RM) 253 - 248, approximately five miles north-northwest of Batchtown, Illinois. The study area is located within Calhoun County, Illinois on federally owned lands, managed by the USFWS under a cooperative agreement with USACE as part of the General Plan (GP) lands agreement. The study area is located in Pool 25 within the Lower Impounded Cluster as identified by the HNA-II. Figure 1 provides a project vicinity map for the Gilead Slough HREP. The UMRR Reds Landing HREP study area is located immediately north of the Gilead Slough study area

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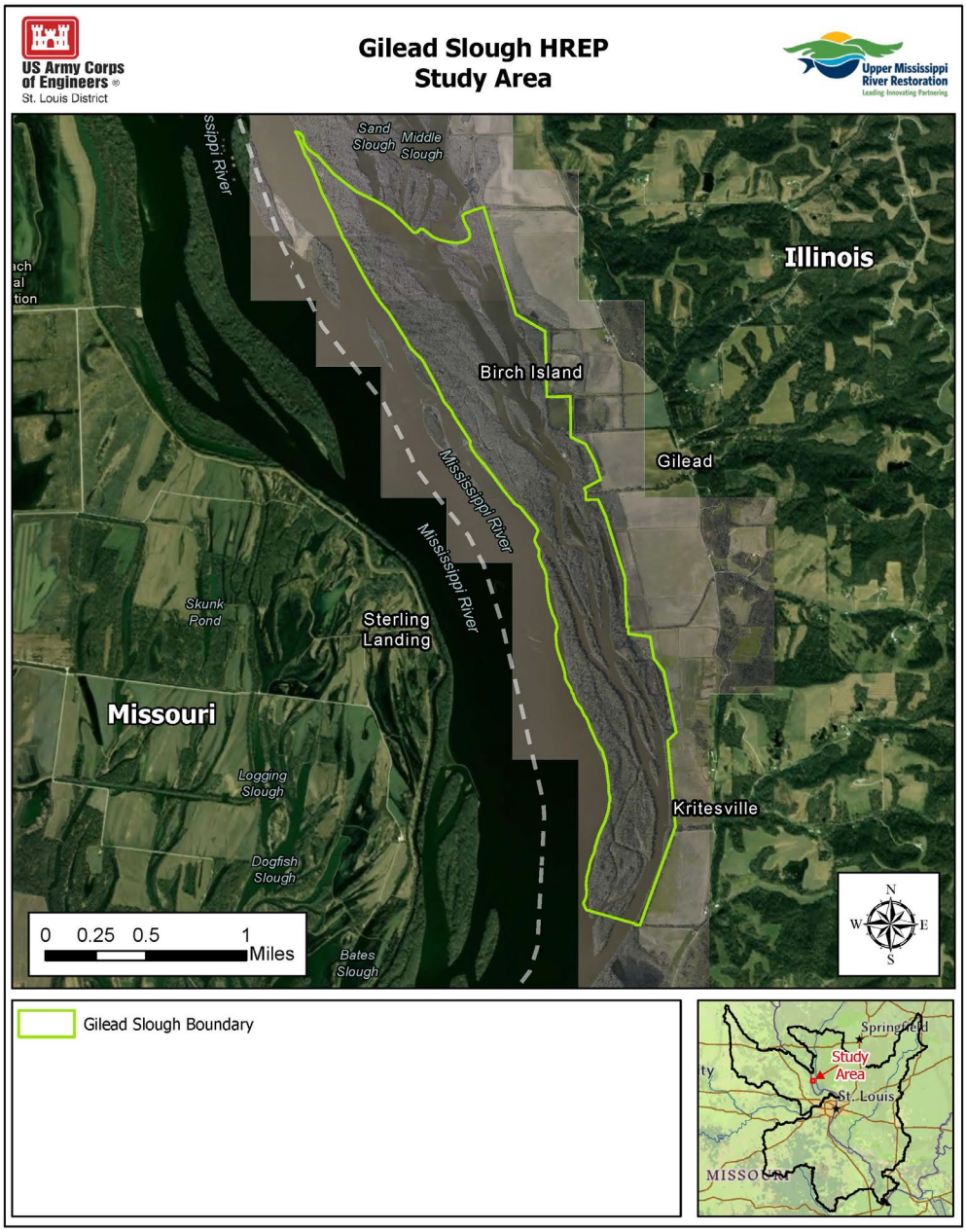


Figure **1**. Project Vicinity Map

## 1.4 Prior Reports, Existing Water Projects, and Ongoing Programs

The following summarizes prior reports, existing water projects, and ongoing programs which provided valuable information, experience, or guidance in the planning of the Project (Table 1). Additional literature cited can be found in Section 9: References, and at the end of each Appendix.

Table 1. Prior Reports, Projects, and Programs

| Project | Study/Report/Environmental | Project Relevance |
|---|---|---|
| 2012 | Upper Mississippi River Restoration Environmental Design Handbook | The handbook evaluates project features and incorporates lessons learned throughout the lifetime of the program. |
| 2018 | Habitat Needs Assessment-II: Linking Science to Management Perspectives | Describes and compares historical, existing, forecasted, and desired future conditions to identify habitat needs within the Upper Mississippi River System (UMRS). |
| 2022 | Ecological Status and Trends of the Upper Mississippi and Illinois Rivers. | Summarizes ecological health of UMR based on trends identified in LTRM data. |

DRAFT

# 2 NEED FOR AND OBJECTIVES OF ACTION

This section describes the development of Project objectives, including the identification of problems and opportunities, assessment of resource significance of the study area, consideration of the goals and recommendations of overarching programs, and identification of constraints and considerations. For planning purposes, the period of analysis was established as 50 years starting in 2030. The period of analysis is the period of time an alternative would have substantial beneficial effects.

## 2.1 Specific Problems and Opportunities

Since European settlement, the UMRS ecosystem has been substantially degraded by floodplain development, channel alterations, and the construction of a navigation system. While USACE efforts to maintain a 9-foot navigation channel for navigation, including building locks and dams, successfully eliminated low-flow conditions, these actions fundamentally altered the river. The impoundment transformed the UMRS into a series of slow-moving pools, leading to increased water levels and the inundation of terrestrial habitats. The resulting loss of habitat, degraded water quality, and a compromised ecosystem necessitate targeted restoration projects to counteract the environmental consequences of navigation-related modifications and ensure the long-term ecological health and resilience of the UMRS. Without these interventions, the river faces continued decline.

### 2.1.1 Problems

The specific problems as they relate to the study area include:

**i.** Loss of topographic diversity reduces desired forest and herbaceous vegetative community composition and wildlife resources (e.g., forage, invertebrate production, nesting habitat, and resting sites).

ii. Sedimentation causes poor water quality, shallow depths, loss of bathymetric diversity and reduced connectivity of aquatic habitat throughout the study area.

### 2.1.2 Opportunities

Opportunities exist to restore side channel, backwater, wetland and floodplain forest habitat, function, and process. Within the study area, there are opportunities for additional beneficial outcomes beyond solving the stated problems related to wetland and floodplain forest habitats.

Opportunities for the study include:

i. Improve the resiliency of the habitats within the study area;
ii. Support local community by improving nature-based tourism and recreation;
iii. Enhance partnerships with organizations for monitoring and education;
iv. Use dredged material more effectively to benefit or create habitats;
v. Improve water clarity;
vi. Use innovative solutions to create sustainable habitat conditions;

vii. Reduce the quantity of invasive species;
viii. Improve sediment or substrate quality;
ix. Improve habitat for Threatened and Endangered (T&E) species;
x. Improve substrate consolidation;
xi. Improve opportunities for nearby communities.

## 2.2 Resource Significance

Resource significance is considered from a public, institutional, and technical standpoint, as described in ER 1105-2-103. These three categories are used to determine if the ecosystem within the study area warrants Federal investment.

### 2.2.1 Institutional Recognition

Institutional recognition means the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Congress designated the UMRS as both a "…nationally significant ecosystem and a nationally significant navigation system…" in Section 1103 of the WRDA 1986.

Institutional significance of the Upper Mississippi River (UMR) is formally demonstrated in a number of region-specific laws and policies including the UMR National Wildlife and Fish Refuge Comprehensive Conservation Plan of 2006, the UMR Wildlife and Fish Refuge Act of 1924, and the Migratory Bird Conservation Act of 1929. The following laws and policies also demonstrate institutional significance at a broader level:

- Fish and Wildlife Coordination Act, as amended (16 U.S.C.§ 661)
- Endangered Species Act (ESA) of 1973, as amended
- Migratory Bird Treaty Act (MBTA) of 1918
- EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds
- Bald and Golden Eagle Protection Act of 1940
- North American Waterfowl Management Plan

### 2.2.2 Technical Recognition

Technical recognition means the resource qualifies as significant based on scientific knowledge or judgment of critical resource characteristics. Scarcity, representativeness, status and trends, connectivity, limiting habitat, and biodiversity describe technical significance. Differences across geographical areas and spatial scales may determine whether a resource is significant.

The UMRR Gilead Slough study area encompasses a globally significant flyway used by more than 326 species of birds and is a home for at least 260 species of fish, 37 species of mussels, 47 species of reptiles and amphibians, and 50 species of mammals, including a number of rare and endangered species. The UMR ecosystem includes 318,750 acres designated as Ramsar Wetlands of International Importance.

Numerous scientific analyses and long-term evaluations of the UMRS have documented its significant ecological resources. Since the early 20th century, researchers, government agencies, and private groups have studied the larger river floodplain system and proposed ecosystem restoration in the UMRS. Numerous scientific analyses and long-term studies through USACE's UMRR-LTRM have documented the significance of the resources in the UMR basin.

In a 1995 report, the U.S. Department of Interior (DOI) listed large streams and rivers as endangered ecosystems in the United States. The DOI documented an 85 to 98 percent decline in this ecosystem type since European settlement. Large riverine and floodplain ecosystems have become increasingly rare worldwide. Two of the large riverine and floodplain ecosystems lay within the UMRS, namely the Upper Mississippi and Illinois Rivers. These two ecosystems still retain some seasonal flood pulses, and half of their original floodplains remains un-leveed and open to the rivers (Sparks R. N., 1998). The UMRS is one of the few areas in the developed world where ecosystem restoration can be implemented on large floodplain-river ecosystems (Sparks R. , 1995).

Additionally, technical resource agencies (federal, state, and non-profit) view the resources in the UMR as significant, as reflected in the ongoing habitat restoration efforts in the region including completed HREPs at Stag Island, Cuivre Island, Batchtown; and current construction of an HREP at Clarence Cannon NWR. The HNA II (McCain, Schmueker, & De Jager, 2018) has also technically recognized the need to restore floodplain habitat and connectivity to the main river channel, restore islands, restore diversity of aquatic habitat types (deep lentic backwaters and shallow lotic channel areas), restore aquatic vegetation in backwaters, restore floodplain forest diversity, restore floodplain vegetation diversity, enhance topographic diversity, restore water level fluctuation to mimic pre-dam conditions, and improve water clarity which are relevant to the project area. The various aquatic habitats serve as important stopover habitat for migratory waterfowl and forested areas provide stopover habitat for dozens of species of other migratory birds.

### 2.2.3 Public Significance

Public recognition means some segment of the general public recognizes the importance of an environmental resource, as evidenced by people engaged in activities that reflect an interest or concern for the resource. The public recognizes the UMR as a nationally, regionally, and locally significant resource. American Rivers, a non-governmental organization (NGO) dedicated to protecting and restoring healthy, natural rivers, listed the Mississippi River in America's Top Ten Endangered Rivers for 2004 and added the Mississippi River as a "special mention" on the 2011 list. Non-profit and private organizations recognize the significance of the resources in UMRR study areas through active engagement in UMRR implementation or serving as nonfederal cost-share sponsors of habitat projects.

The National Audubon Society designated much of the study area as a State Important Bird Area (IBA), which is a location identified for its importance to particular bird species

or groups of bird species. The site is identified as IBA Site 2369, the Two Rivers NWR (Calhoun Division) / Mississippi River State Fish and Wildlife Area (SFWA). Resources within the study area provide critically important habitat for waterfowl, wading birds, shorebirds, other wetland bird species, and migratory landbirds. As a result, the area is a popular destination for local, national, and international bird enthusiasts for wildlife viewing. The Gilead Slough area serves as an important public recreation site for fishing, hunting, and other recreational activities such as wildlife viewing. Habitats within the study area provide critically important habitat for migratory birds including waterfowl, wading birds, shorebirds, and neotropical migrant songbirds. Many year-round residents occupy these habitats as well. Additionally, numerous organizations, including boat clubs, duck clubs, and environmental NGOs consisting of local members engage in a range of recreational activities that depend on resources in the study area.

## 2.3 Goals and Recommendations of Overarching Programs

### 2.3.1 Upper Mississippi River System Ecosystem Restoration Objectives

Formal planning for UMRS ecosystem management and restoration has been an ongoing process that was institutionalized in the 1970s with a Comprehensive Master Plan completed by the Upper Mississippi River Basin Commission in 1982. The UMRR program was authorized in 1986 and has since gone through several project planning cycles to develop regional ecosystem restoration needs and priorities. Reach Planning processes led to the identification of high priority areas for restoration of natural river processes (as required by Section 8004 of WRDA 2007) and provided context for formulating project measures, defining performance measures, and designing monitoring plans. Goals and objectives for the condition of the river ecosystem are central to river management and are linked to other elements of the framework. The overarching UMRS Ecosystem Goal is to conserve, restore, and maintain the ecological structure and function of the UMRS.

### 2.3.2 Habitat Needs Assessment-II

To address the UMRR program's vision statement of a healthier and more resilient UMR ecosystem that sustains the river's multiple uses, the program developed a suite of 12 indicators in the HNA-II that quantify aspects of ecosystem health and resilience, reflect the ability of large floodplain river ecosystems to adapt and respond to disturbances, and represent ecosystem-based management objectives developed for the UMRS (McCain, Schmueker, & De Jager, 2018). To identify habitat needs for the UMRS, the HNA-II effort compared individual indicators to the conditions desired by the management agencies of the UMRR program. An assessment of current conditions using both quantitative data analysis and qualitative management perspectives was performed at two spatial scales: navigation pool and clusters of navigation pools that shared similar ecological attributes. The UMRR program can use the information provided in the HNA-II to achieve the program's goals and individual HREPs more effectively.

Pool 25 is part of the Lower Impounded Cluster, as identified by the RRAT, and has the following desired future conditions:

- Improve open water connectivity conditions, including island restoration
- Restore function and diversity of aquatic habitat types by improving quality, depth and distribution of lotic and lentic habitats
- Restore, maintain, and enhance floodplain vegetation diversity, including hard-mast (nut-producing) trees

### 2.3.3 Sponsor Management Goals

Management goals for the study area are described by the sponsor, USFWS, in the *Two Rivers National Wildlife Refuge Habitat Management Plan* (USFWS, 2011). Habitat goals are identified as follows:

#### 2.3.3.1 Wetlands And Aquatic Habitat

Restore, enhance, and manage refuge wetland and aquatic areas to provide quality diverse habitat for waterfowl, shorebirds, big river fish, and other wetland-dependent species.

#### 2.3.3.2 Forest Habitat

Conserve and enhance floodplain forest to meet the needs of migrating and nesting neotropical birds and other forest-dependent wildlife.

#### 2.3.3.3 Other Terrestrial Habitats

Protect, enhance, and restore other terrestrial habitats to benefit grassland birds, waterfowl, and neotropical migrants.

#### 2.3.3.4 Sedimentation And Water Quality

Identify and reduce the impacts of sedimentation and other water quality factors, such as contaminants, on fish and wildlife resources.

#### 2.3.3.5 Floodplain Management

Enhance floodplain functions and where practicable mimic historical water level fluctuations in the river corridor.

#### 2.3.3.6 Public Use and Education

Provide wildlife dependent recreation and education opportunities where appropriate and improve the quality and safety of the visitor experience.

#### 2.3.3.7 Monitoring

Develop and implement a wildlife, habitat, and public use monitoring program, integrated with interagency efforts along the river corridor, to evaluate the effectiveness of refuge management programs and to provide information for adaptive management strategies.

## 2.4 Project Objectives

Based on the identified problems and opportunities affecting the Project's natural resources and considering the management goals of the cooperating agencies, the

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Project goals are to maintain, enhance and restore quality habitat for native and desirable plant, animal, and fish species and maintain, enhance, restore, and emulate natural river processes, structures, and functions for a resilient and sustainable ecosystem. The objectives identified to meet these goals over the 50-year period of analysis are to:

- Objective 1: Enhance depth, flow and substrate diversity and connectivity of aquatic habitat throughout study area;
- Objective 2: Manage the sediment inputs in the side channel and slough areas;
- Objective 3: Restore topographic and bathymetric diversity and improve desired vegetative community composition throughout the project area.

## 2.5 Planning Constraints and Considerations

The following constraints and considerations were included in plan formulation:

### 2.5.1 Constraints

- Navigation. Ensure measures do not negatively impact the 9-foot navigation channel.
- Flood Heights. Restoration measures should not increase flood heights or adversely affect private property or infrastructure.

### 2.5.2 Planning Considerations

- Environmental Laws and Regulations. Construct measures consistent with Federal, state, and local laws. Therefore, the following elements were considered when analyzing alternatives:
  - Avoid or minimize negative impacts to floodplain forest
  - Avoid or minimize negative impacts to threatened and endangered species
  - Avoid or minimize negative impacts to migratory birds
  - Maintain hydraulic connectivity to allow for improved water quality for fish
  - Avoid or minimize negative impacts to cultural resources
  - Avoid adverse social impacts
- Project-specific applicable laws and regulations. The following elements were considered when analyzing alternatives:
  - Avoid negative impacts to current water level management activities in the pool
  - Avoid negative impacts to existing HREP projects
  - Avoid and minimize negative impacts to civil works projects (levees and river training structures)
  - Avoid negatively impacting adjoining landowners and private levees
  - Avoid impacts to public utilities
  - Avoid and minimize negative impacts to recreation users
- Sponsor Considerations. The following was considered when analyzing alternatives:
  - Sponsor OMRR&R budgets and capability

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# 3 EXISTING CONDITIONS AND FUTURE WITHOUT PROJECT CONDITIONS

Section 3 assesses both the existing and forecasted conditions with regard to relevant resources, organized by resource topic.

Forecasting the future is an essential part of the USACE planning process with the most important recurring forecasts being the future without project (FWOP) and future with project (FWP) conditions. The FWOP is the basis from which alternative plans are formulated and impacts are assessed and can be defined as "the most likely condition to exist in the future in the absence of a proposed water resources project" (ER 1105-2-103 p. 2-8). The FWOP, considered the No Action Alternative, would not include any USACE project measures associated with this project, and no additional costs to USACE would be generated.

A 50-year period of analysis was used to forecast the FWOP and FWP conditions. The period of analysis was limited to 50 years in accordance with USACE regulations (ER 1105-2-103), even though project measures are anticipated to continue having beneficial effects beyond 50 years. The base year (the year when a proposed project is expected to be operational or, in this case, when construction is complete and benefits begin accruing) considered for this study is 2030, and period of analysis continues until 2080.

Assumptions are one of the most common ways to address uncertainty in a planning study. Several assumptions have been made in forecasting the FWOP scenario:

1. Water management plan levels for Pool 25 would continue as it is now.
2. Aquatic habitat at Gilead Slough would continue to degrade with sedimentation and reduced flow.
3. Backwaters in the study area would continue to lose depth, lose surface water area, and have reduced connectivity due to sedimentation. Current estimates based on representative backwater sites within lower impounded reaches forecast a sedimentation rate of approximately 0.5 inches per year.
4. No substantial change to current operation and maintenance budgets for the sponsor would occur. USFWS would continue to manage fish and wildlife in and on the waters of the study area as they do now.
5. The navigation channel would be maintained in its current location and depth.
6. The GP agreement will remain in place.

This is not a comprehensive discussion of every resource within the study area. Rather, this section focuses on aspects of the environment that were identified as relevant issues during scoping or may be affected by the considered alternatives. The environmental effects on these resources are described in Section 6.7.

## 3.1 Resource History and Current Management of the Study Area

The 1,200-acre study area consists of a side channel, tertiary channels, floodplain forest, and large backwater complex. Previously, the area supported a more diverse mosaic of plant community types, including bottomland forest, submersed aquatics,

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deep marsh, emergent herbaceous, shrub-scrub, wet meadow, and mudflats. Today, floodplain forest and emergent herbaceous types are the dominant plant communities; however, these communities are declining in composition and structure. Wildlife using the area include migratory waterbirds (e.g., waterfowl, wading birds, and shorebirds), terrestrial wildlife, fish, and mussels. The amount and diversity of migratory bird, wildlife, mussel, and fish habitat in the study area has been reduced due to continued river-borne sedimentation from the Mississippi River leading to reduced depth and flow through the backwater channels. The existing status of the HNA-II Indicators depicts a degraded state of floodplain vegetation diversity, floodplain function, and substantially degraded lateral river - floodplain connectivity.

### 3.2 Resources Not Resources Not Evaluated in Detail

The PDT considered relevant environmental resources that would potentially be impacted by the proposed alternatives and eliminated resources that were not in the area of potential effect or would not be impacted with more than negligible effects by any of the alternatives from further evaluation. These resources include:

- Geology and Topography
- Wild and Scenic Rivers (there are no designated wild and scenic rivers in or near the study area)
- Mineral and Energy Resources
- Noise
- Aesthetics and Visual Resources

The PDT focused on information gathered from the study area and the area of potential effect.

### 3.3 Relevant Resources

The PDT evaluated relevant resources in the study area and assessed existing and FWOP conditions. Under the NEPA, the FWOP (considered to be the No Action alternative) is necessary to provide a reference point, enabling a comparison of environmental effects of the action alternatives. The PDT focused its evaluation on resources potentially affected by the alternatives. This section briefly describes the following resources' current condition and compares it to the anticipated future without project condition.

In general terms, the HNA-II report summarized the desired future conditions in relation to high importance indicators for the Lower Impounded Mississippi River, where the project area is located. The most pertinent desired future conditions for Gilead Slough would be:

1) Improve open water connectivity conditions, including island restoration;
2) Restore function and diversity of aquatic habitat types by improving quality, depth and distribution of lotic and lentic habitats.

Without the project, this study area is anticipated to further degrade, with habitat quality deteriorating further away the desired condition. The importance of the desired condition includes:

1) Floodplain Connectivity: Backwater and side channel areas provide habitat and a migratory corridor for many floodplain species, such as fish, migrant birds, bats and insects, along with mobile mammals, reptile, and amphibian species. Excessive fragmentation of natural vegetation by anthropogenic land cover alterations such as agriculture and development may inhibit the movement of migratory species across the UMRS.
2) Function and Diversity of Aquatic Habitat: The ratio of lotic (flowing) and lentic (slackwater) areas is extremely biased to lotic areas in the lower impounded reaches. This amplifies the importance of lentic backwaters where fish and other aquatic organisms can find refuge, forage for food, spawn, and rear offspring. Within that ratio, another consideration is diversity of habitat. Certain species are more generalist, some are more specialized, which is why diversity in habitat type and function is vital. With current trends, the lower impounded reaches are moving away from lentic backwaters and toward flowing lotic habitat types, excluding a large portion of aquatic organisms that rely on lentic backwaters for success.

### 3.3.1 Aquatic & Wetland Resources

#### 3.3.1.1 Existing

Historically, the fishery in the lower impounded Mississippi River was exceptional, with a 200-mile reach beginning near the confluence with the Illinois River producing ten percent of the total U.S. catch of freshwater fish in 1908, more than any other river in North America (Sparks R. E., 1992). The river is home to 115 fish species, 95 percent of which are native species. A group of aquatic organisms that is particularly representative of the Mississippi River include paddlefish (*Polydon spathula*) and sturgeons (*Scaphirhyncus platorynchus, Acipenser fulvescens*). The majority of these fishes are migratory by nature and use a diversity of river habitats, such as flowing channel habitats, side channels, and backwater areas. Many native fish populations are considered limited in the Mississippi River due to the loss of backwater areas that provide sufficient depth for spawning, nursery and overwintering habitat and competition with non-native species (U.S. Army Corps of Engineers, 2007). The Gilead Slough study area is largely a side channel and riverine backwaters complex along the left descending bank of lower Pool 25 of the UMRS. It is comprised of approximately 215 acres of lacustrine backwaters and 160 acres of lotic side channel. Currently, this complex is experiencing heavy riverine sedimentation, resulting in shallower depths and decreased aquatic connectivity between the backwaters and the river. The shallower depths are subsequently causing elevated summer temperatures and depletion of dissolved oxygen (DO), creating poor quality habitat for aquatic organisms.

There are mussel populations known to occur in the Gilead Slough side channels, as described by the site manager, although no quantitative surveys have been conducted

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at the time of this writing.

Past actions within the Mississippi River Basin have adversely impacted the fisheries resources by disconnecting the river from the floodplain, altering hydrology and sedimentation. These actions have led to loss of access to important habitat for spawning, rearing, and foraging. Operation and maintenance of the 9-foot navigation channel would continue to contribute to degradation. In general, these impacts could be offset by an adaptive environmental restoration approach that focuses on the recreation or enhancement of key processes (i.e., periodic drawdown, connectivity) and habitat features (i.e., island/side channel creation or restoration). Several restoration programs have been initiated to achieve this goal. However, consistent and effective management and restoration efforts are needed to meet habitat needs in the future. Increased efforts to reverse effects from impoundment on aquatic habitats, vegetation succession, and forest health will be required to sustain ecosystem values such as the restoration of island habitat and side channels in the Mississippi River.

The Gilead Slough study area contains permanent to semi-permanently flooded open water areas and emergent wetlands that are disconnected from the Mississippi River under normal conditions. Water is added to these areas by upland drainage features bringing water from the agricultural fields to the east and from the Mississippi River during high-water events. Existing issues with these aquatic habitats include a lack of substrate diversity, lack of bathymetric diversity (especially in areas of deep water), continued sedimentation reducing depths across the area, and a loss of connectivity between these aquatic habitats. The aquatic habitats support the life-histories of a variety of aquatic insects, crustaceans, amphibians, and reptiles. Snakes, turtles, salamanders, frogs, and toads can all be expected to occur throughout the area. Turtle species could include snapping turtles (*Chelydra serpentina*), river cooter (*Pseudemys concinna*) and red-eared slider (*Trachemys scripta*). The northern water snake (*Nerodia sipedon sipedon*) can be expected to occur as well. Amphibians like the American toad (*Anaxyrus americanus*), spring peeper (*Pseudacris crucifer*), green frog (*Lithobates clamitans*), bullfrog (*Lithobates catesbeianus*), and northern leopard frog (*Lithobates pipiens*) could occur. Aquatic insects would be abundant where and when conditions allow.

Gilead Slough is largely a side channel and riverine backwaters complex along the left descending bank of lower Pool 25 of the UMRS. It is comprised of approximately 215 acres of lacustrine backwaters and 160 acres of lotic side channel.

Currently, this complex is experiencing heavy riverine sedimentation, resulting in shallower depths and decreased aquatic connectivity between the backwaters and the river. The shallower depths are subsequently causing elevated summer temperatures and depletion of DO, creating poor quality habitat for aquatic organisms.

#### 3.3.1.2 No Action (Future Without Project Conditions)

Under the No Action Alternative, it is anticipated that the habitat in the side channel and

backwater areas will continue to decline, due to deposition across the projected 50-year timespan, causing shallower depths, higher temperatures, and decreased DO levels as it further disconnects from the main channel and slowly transitions to terrestrial habitat at the detriment of aquatic organisms that rely on these areas for spawning, rearing, and foraging, and thermal refuge for overwintering.

### 3.3.2 Water Quality

#### 3.3.2.1 Existing

Water Quality Standards (WQS) are the foundation of the Clean Water Act. An objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Two Sections of Illinois Administrative Code (IAC) 35 - Section 302, Water Quality Standards and Section 303, Water Use Designations and Site-Specific Water Quality Standards - contain standards applicable to lakes and streams. The objectives of WQS are to protect uses by applying criteria. Water quality criteria are expressed as concentrations, loads, or narrative statements. The level of protection given to a stream, river, or lake depends on the expected, or "designated use(s)," of that water. Once a designated use is assigned to a water body, it is considered "classified" and listed in the Illinois WQS as such. Illinois waters are designated for various uses including aquatic life, wildlife, agricultural use, primary contact (e.g., swimming, water skiing), secondary contact (e.g., boating, fishing), industrial use, public and food-processing water supply, and aesthetic quality. Antidegradation policy requires actions to maintain and protect high quality waters and existing water quality. The Mississippi River within the vicinity of the study area (Assessment Unit ID: IL_K-21) is listed in the draft 2024 Illinois 303(d) list for impairment from fecal coliform bacteria, aldrin, dieldrin, endrin, heptachlor, mercury, mirex, polychlorinated biphenyls, and toxaphene (Illinois EPA, 2024). The streams draining into Gilead Slough from outside the area are not classified.

#### 3.3.2.2 No Action (Future Without Project Conditions)

Water quality in the aquatic habitats of the southern portion of the study area is expected to remain the same as existing conditions. The water quality in the Mississippi River may improve over time if protection efforts continue over the coming decades.

### 3.3.3 Invasive Species

#### 3.3.3.1 Existing

Invasive Species Executive Order (EO) 13112 aims "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause". To abide by this EO, construction best management practices (BMP), such as cleaning equipment, would be in place and enforced to prevent the introduction of additional species to, and transfer from, the project.

Invasive carp, including bighead carp (*Hypophthalmichthys nobilis*), silver carp (*Hypophthalmichthys molitrix*), common carp (*Cyprinus carpio*) and grass carp (*Ctenopharyngodon idella*), are found throughout the region and utilize habitats with low water velocity such as those found in the backwaters and side channels. Bighead and

silver carp, species of particular management concern, were first documented in the UMRS in 1982 (Koel, Irons, & Ratcliff, 2000). Since then, populations have increased dramatically in the UMR (Koel, Irons, & Ratcliff, 2000) and Illinois River reaches (Irons, Sass, McClelland, & O'Hara, 2011).

Zebra mussels (*Dreissena polymorpha*) have been identified in much of the UMRS. The zebra mussel is a small shellfish native to eastern Europe and Western Russia, named for the striped pattern of its shell. In their introduced range they are known to clog irrigation intakes; attach in clusters to various types of watercrafts reducing performance and efficiency; attach to submerged rocks, ladders, and swim rafts causing a cut hazard to swimmers; and attach to and smother native mussels, while competing for the same food resources as those native bivalves. According to the U.S. Geological Survey Nonindigenous Aquatic Species (NAS) database, Zebra Mussels have been collected just upstream of Lock and Dam (L&D) 24 at RM 273.4, as well as multiple locations both up and downstream of the project area.

Common invasive plant species likely to be present within the study area include reed canarygrass (*Phalaris arundinacea*) and Japanese hops (*Humulus japonicus*). Reed canarygrass is a variable species with circumpolar distribution (Steyermark, 1999). The Eurasian ecotype, originally planted for forage and erosion control, has spread throughout much of the United States and invades wetland communities and wet prairies (MDC, 2010). This cool-season grass forms dense clumps once established, and spreads aggressively through creeping rhizomes and an abundance of seed. Stems lodge by mid- to late-summer to form a dense mat that prevents other species from establishing. Seeds are primarily dispersed within and between sites by waterways, animals, and on machinery.

Japanese hops is an herbaceous annual native to east Asia. The species is well adapted to disturbed, open floodplain habitats (MDC, 2012). The seed is dispersed primarily by water, wind, and machinery. Seeds germinate in early spring but can occur later in the season when suitable moisture and light are available. Frequent floods in floodplain habitats create ideal conditions for spread and establishment. Once established, this twining vine can quickly overtop, blanket, and outcompete surrounding herbaceous vegetation, woody shrubs, and trees up to about 10 feet in height.

Several additional species have increased in the study area over the past decade at some locations. Wintercreeper (*Euonymus fortunei*) is a perennial woody vine that tolerates a range of light and soil conditions. In the floodplain, it is occasionally found along edges of islands and in canopy gaps but could increase in extent rapidly through vegetative spread or by bird-dispersed seed.

Purple loosestrife (*Lythrum salicaria*) is a perennial wetland plant native to Europe and Asia (Munger, 2002). The species occupies a range of wetland habitats, including meadows, emergent marsh, and river and stream banks. The plant spreads rapidly due to its high seed production rate (up to three million seeds per plant) and ability to spread

vegetatively through rapidly growing rhizomes (USDA, 2005). Additionally, seed viability of up to twenty years results in a prolonged risk of establishment in natural communities. Increasingly, established patches of purple loosestrife have been identified in UMRS Pools 24, 25, and 26.

#### 3.3.3.2 No Action (Future Without Project Conditions)

Under the No Action alternative, it is anticipated that the invasive species previously identified would have ample opportunity to establish and proliferate in the project area unchecked. This would be a detriment to the native species within the area.

### 3.3.4 Terrestrial Habitat

#### 3.3.4.1 Existing

The terrestrial habitats in the Gilead Slough study area are a mix of floodplain and riparian bottomland forest. Common tree species occurring in the forested habitats include silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), cottonwood (*Populous deltoides*), American sycamore (*Plantanus occidentalis*), and other common floodplain tree species. At the highest elevations, overstory trees include mature pecan (*Carya illinoinensis*) and pin oak (*Quercus palustris*). Full-sun openings in the forest canopy are often covered in spreading vines like bur cucumber (*Sicyos angulatus*) and Japanese hops. As a result, the understory includes very little regeneration of desirable floodplain tree species. USACE and USFWS conducts limited forestry management on Gilead Slough as part of the GP land agreement.

Many mammal species occur on Gilead Slough, including white-tailed deer (*Odocoileus virginianus*), cottontail rabbit (*Sylvilagus floridus*), fox squirrel (*Sciurus niger*), gray squirrel (*Sciurus carolinensis*), river otter (*Lontra canadensis*), American mink (*Neovison vison*), muskrat (*Ondatra zibethicus*), American beaver (*Castor canadensis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), and long-tailed weasel (*Mustela frenata*). A variety of nocturnal species are also present, including marsh rice rat (*Oryzomys palustris*), deer mouse (*Peromyscus maniculatus*), prairie vole (Microtus ochrogaster), short-tailed shrew (*Blarina brevicauda*), and many bat species. Eastern box turtle (*Terrapene carolina*), rat snake (*Pantherophis obsoletus*), eastern racer (*Coluber constrictor*), and northern water snake (*Nerodia sipedon*) also occur in the area.

The National Audubon Society designated much of the study area as a State IBA, which is a location identified for its importance to particular bird species or groups of bird species. The site is identified as IBA Site 2369, the Two Rivers NWR (Calhoun Division) / Mississippi River SFWA. This site was chosen as an IBA as it met the criteria for breeding Prothonotary Warbler and also congregations of Waterfowl and Shorebirds. Resources within the study area provide critically important habitat for numerous species of waterfowl such as Green-winged Teal (*Anas crecca*), Northern Shoveler (*Spatula clypeata*), and Northern Pintail (*Anas acuta*); shorebirds such as Greater Yellowlegs (*Tringa melanoleuca*), Least Sandpiper (*Calidris minutilla*), and Pectoral Sandpiper (*Calidris melantos*); wading birds such as Great Egret (*Ardea alba*), Great Blue Heron (*Ardea herodias*), and Little Blue Heron (*Egretta caerulea*); as well as

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numerous other wetland bird species, and migratory landbirds.

#### 3.3.4.2 No Action (Future Without Project Conditions)

The area would continue to support floodplain and riparian bottomland forest. USACE and USFWS would continue to conduct limited forestry management and invasive species control at Gilead Slough independent of this project. Future threats to floodplain riparian forest would include the lack of desirable tree regeneration and the spread of existing and the potential for establishment of new invasive species. The existing forest resources would continue succession into mature forest as time goes on. Invasive species would continue to pose a threat to the establishment of this forest area, however. Some aquatic areas may also transition to a more terrestrial status as sedimentation gradually fills-in shallow aquatic habitats.

### 3.3.5 Threatened & Endangered Species

#### 3.3.5.1 Existing

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the USFWS provided a list of six federally threatened, endangered, or candidate species that could potentially be found in the area (Calhoun County, IL) via a letter dated May 30, 2024, and updated on September 4, 2025 (IPAC report); see Appendix C - Biological Assessment, for more details. The listed species, federal protection status, and habitat descriptions can be found below in Table 2. No critical habitats are identified within the project area.

Table 2. Federally listed species that may occur within the project area.

| Species | Status | Habitat |
|---|---|---|
| Indiana Bat (*Myotis sodalis*) | Endangered | Hibernates in caves and mines. Maternity & foraging habitat includes small stream corridors with well-developed riparian woods, upland & bottomland forests. |
| Tricolored Bat (*Perimyotis subflavus*) | Proposed Endangered | Roosts among live and dead leaf clusters of live or recently dead deciduous hardwood trees in summer and fall. Hibernates in caves and mines in winter. |
| Spectaclecase (mussel) (*Cumberlandia monodonta*) | Endangered | Found in large rivers where they live in areas sheltered from the main force of the river current. Often clusters in firm mud and in sheltered areas, like beneath rock slabs, between boulders and even under tree roots. |
| Monarch (*Danaus plexippus)* | Candidate | Grassland and other herbaceous dominated habitats with Milkweed resources during the breeding life stage and similar habitats with abundant nectar resources during breeding and migration life stages. Overwintering occurs outside our region and must provide specific roosting microclimate conditions. |
| Western Regal Fritillary (*Speyeria idalia*) | Proposed Threatened | Restricted to remnant prairies, slightly degraded prairies, pastures, and old fields with abundant violets. |

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| Species | Status | Habitat |
|---|---|---|
| Decurrent False Aster (*Boltonia decurrens*) | Threatened | Disturbed alluvial soils. Moist, sandy floodplains and prairie wetlands along the Illinois River and a small portion of the Mississippi River primarily above the Missouri-Mississippi River confluence. |

#### 3.3.5.2 No Action (Future Without Project Conditions)

Under the No Action alternative, sedimentation is anticipated to result in further degradation and conversion of vital backwater habitats and side channels into more terrestrial habitat. The anticipated effects to the aforementioned listed species are detailed below:

- The bat species may be beneficially affected should the floodplain forest communities at Gilead Slough continue to degrade into the future. However, these impacts would not necessarily be a result of the No Action, as limited forestry management would continue regardless of whether an alternative is selected. Timber in the north area of Gilead Slough may continue to experience higher stress and mortality because of the high sedimentation rates that will begin to impact drainage, resulting in some extended periods of inundation in forest stands; and the encroachment of invasives species such as Japanese hops. This would temporarily provide more standing dead timber for bats to utilize, providing that beneficial uplift.
- Spectaclecase mussel status in the study area would likely remain similar to existing conditions. The river channel habitat adjacent to the study area is currently considered suitable and is unlikely to change over time.
- Monarch butterfly may be adversely affected if the continuing spread of invasive species reduces the availability of nectar sources, but invasive species control would continue, even in the FWOP condition. Western regal fritillary status is likely to remain similar to existing conditions as suitable habitat is not present currently and will not develop on the study area. In both the FWOP and the FWP condition, the existing open areas would gradually reforest over time, reducing the area of open fields for foraging butterflies.
- Decurrent false aster does not occur on Gilead Slough, but could become established sporadically after future disturbance events, but this would not be related to the FWOP. Decurrent false aster status is likely to remain similar to existing conditions.

### 3.3.6 State Listed Species

#### 3.3.6.1 Existing

The Illinois Ecological Compliance Assessment Tool (EcoCAT) was used to generate a list of state-listed species that may occur in the study area (September 09, 2025, Project # 2605049). The report included a list of resources that may be in the vicinity of the Gilead Slough study area: the Batchtown Mussel Bed INAI Site, the Maple Island Bed INAI Site, the Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and butterfly mussel (*Ellipsaria lineolata*).

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#### 3.3.6.2 No Action (Future Without Project Conditions)

The two listed INAI sites do not actually occur within the study area. The status of these sites is likely to remain similar to existing conditions. Any change to the status of these sites is unlikely to be correlated with the No Action alternative. The existing status and status of the Indiana bat in the No Action alternative is discussed in Appendix C - Biological Assessment.

The northern long-eared bat may be beneficially affected should the floodplain forest communities at Gilead Slough continue to degrade into the future. However, these impacts would not necessarily be a result of the No Action, as limited forestry management would continue regardless of whether an alternative is selected. Timber in the north area of Gilead Slough may continue to experience higher stress and mortality because of the high sedimentation rates that will begin to impact drainage, resulting in some extended periods of inundation in forest stands; and the encroachment of invasives species such as Japanese hops. This would temporarily provide more standing dead timber for bats to utilize, providing that beneficial uplift.

Butterfly mussel status in the study area would likely remain similar to existing conditions. The river channel habitat adjacent to the study area is currently considered suitable and is unlikely to change over time.

### 3.3.7 Historic Properties & Cultural Resources

#### 3.3.7.1 Existing

A District archaeologist performed a records review of the study area to determine if archaeological sites have been previously recorded within the study area and if any cultural resource studies have been conducted in the study area. There are no recorded archaeological sites in the study area. Approximately one third of the Gilead Slough study area has previously been included in an archaeological reconnaissance survey **Invalid source specified.**; However, limited field reconnaissance occurred at that time. No artifacts or evidence of an archaeological site are known within the study area.

Illinois State Historic Preservation Office (SHPO) coordination sent on 2 August 2024 requesting initial consultation with the District on this project. The District plans to utilize the June 25, 2024, implemented, Programmatic Agreement (PA) regarding the UMRR Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program for any additional compliance with Section 106. The USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction of the Program undertaking. SHPO received the coordination letter on 6 August 2024 and logged the project into their Correspondence Tracking System, giving it a project ID number 005080624.

#### 3.3.7.2 No Action (Future Without Project Conditions)

FWOP conditions are not expected to have adverse effect on historic properties.

### 3.3.8 Tribal Resources and Coordination

#### 3.3.8.1 Existing

Initial tribal coordination was sent on 8 August 2024 inviting initial tribal consultation with the District on this project and inquiring about potential concerns they may have about traditional cultural properties, sacred sites, or other resources that may be located within the study area. The District informed the consulting tribes of our plans to utilize the June 25, 2024, implemented, PA regarding the UMRR Program Habitat Rehabilitation and Enhancement Projects and the Navigation and Ecosystem Sustainability Program for any additional compliance with Section 106. The USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction of the Program undertaking. The District received responses to the 8 August 2024 tribal coordination letter from six federally recognized tribes: Caddo Nation, The Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians, Miami Tribe of Oklahoma, Iowa Tribe of Kansas and Nebraska, the Peoria Tribe of Indians of Oklahoma, and the Prairie Band Potawatomi Nation. None had objections to the project but wish to be kept informed. However, the Prairie Band Potawatomi Nation brought up concerns of looting occurring at cultural sites withing Calhoun County.

#### 3.3.8.2 No Action (Future Without Project Conditions)

The status of Tribal Resources is expected to remain similar to existing conditions.

### 3.3.9 Hazardous, Toxic, and Radioactive Waste

The USACE regulations (ER-1165-2-132) and District policy requires procedures be established to facilitate early identification and appropriate consideration of potential hazardous, toxic, and radioactive waste (HTRW) in feasibility, preconstruction engineering and design, land acquisition, construction, operations and maintenance, repairs, replacement, and rehabilitation phases of water resources studies or projects.

#### 3.3.9.1 Existing

A Phase I Environmental Site Assessment (ESA) has been completed for the project area following methods outlined in ASTM E2247-23. There were no HTRW sites discovered within the project area that would impact project cost, schedule, or design. Additionally, migration of off-site HTRW onto the project area is unlikely. The Phase I ESA report is included as Appendix F.

#### 3.3.9.2 No Action (Future Without Project Conditions)

Existing HTRW concerns would remain unaltered and undisturbed. Given the area's use as public land, it is unlikely that substantial new sources of HTRW concerns would arise in the area in the future.

### 3.3.10 Soils, and Prime or Unique Farmland

#### 3.3.10.1 Existing

The soils in the project area primarily consist of silty clay loams, silt loams, and clay loams (NRCS, 2024).

The soil type found most abundantly within the project area is characterized by the Natural Resource Conservation Service as Beaucoup silty clay loam (1070L). The

geomorphic position is described as floodplains, typically found on zero to two percent slopes and frequently flooded under long duration. It is described as a fluvaquentic endoaquoll, found in ponded floodplain marshes, poorly drained and hydric. Beaucoup silty clay loam is not classified as prime farmland.

The second most common soil type found in the project area is characterized as Tice silt loam (3284L). The geomorphic position is also described as floodplains, typically found on zero to two percent slopes and frequently flooded under long duration. It is described as a fluvaquentic hapludoll, found in loamy floodplain forests, classified as somewhat poorly drained, but not hydric. Tice silt loam is classified as prime farmland.

The third most common soil type found within the project area is characterized as Sarpy sand (3092L). The geomorphic position is described as floodplains, typically found on zero to two percent slopes and frequently flooded under long duration. It is described as a typic udipsamment, found in sandy floodplain forests, excessively drained and hydric. Sarpy sand is classified as a farmland of statewide importance.

#### 3.3.10.2 No Action (Future Without Project Conditions)

Under the No Action Alternative, the Gilead Slough area would continue to be managed by USFWS as a NWR. No major changes in management strategies are anticipated, and therefore no effects to soils, and prime or unique farmland are anticipated to occur in the FWOP condition.

### 3.3.11 Hydraulics & Hydrology

#### 3.3.11.1 Existing

Hydrologic conditions within the UMRS area were modified substantially by human alterations over approximately 200 years. Forest clearing was noted to occur as early as the mid-1830s to fuel increasing numbers of steamboats and growing populations of European settlers. Large patches of grassland and woodland were converted to agricultural production by the late 1800s. Land use change to agricultural production led to increasing rates and quantities of runoff and sediment being routed from upland sources to backwater lakes, wetlands, and the river.

L&D 24 at Clarksville, MO and L&D 25 at Winfield, MO both began operating in March of 1940. Due to the USACE-mandated 9-foot navigation channel and 300-foot channel width, ongoing maintenance efforts are needed to maintain the authorized minimum channel depth and width requirements within the river for navigation operations.

The study area lies within Pool 25 of the UMR between L&D 25 and L&D 24. Flows and water levels are dependent on water release from tainter gates based on L&D 24 and L&D 25 operations. Sediment deposition rates were calculated by comparing bathymetric surveys from 2023 and 2012. The sediment deposition rate for this section of the river and adjacent study area was estimated to be between 1.8 inches to 2.9 inches per year. However, this rate may be less within the upper backwaters of Gilead Slough since there is no upper hydrological connection to the river within this area.

Gilead Slough was established by means of river processes, while the boundary berms at Gilead Slough were constructed by the Gilead Club in the mid-1900's for water level management for waterfowl and fishing within the backwater reaches of the study area. The backwaters of Gilead Slough are connected to the main channel of the river through secondary and tertiary side channel connections which maintains water levels for passive management for fish and mussel habitats based on L&D 25 Pool tainter gate operational water releases. The upper backwater reaches of Gilead Slough has consistent depths and sees less flow conditions, unless there is excessive water coming from the Reds Landing overflow spillways or due to fluctuations in L&D 25 Pool gate operations. The lower portion of Gilead's backwaters sees more flow diversity with the secondary side channel river connection at approximately RM 250.3. There are remnants of historic river training structures within the side channel, which create depth diversity with scattered deep-water pockets for fish habitats and shallow areas for other aquatic habitats. In summary, the upper backwaters consist of shallower depths and lower velocities, while the lower backwaters and side channels consist of variable depths and velocities within Gilead Slough.

#### 3.3.11.2 No Action (Future Without Project Conditions)

Without project implementation, sedimentation is expected to continue within the Gilead Slough area and cause backwater regions to close off from the main channel due to natural erosion received from farmland cultivation, upland drainage ditches, backwater shorelines, and large flood events depositing out material as velocities and water levels fall and normalize. Secondary and tertiary side channels may become cut off from the main channel due to debris blockage and sedimentation over time. Degraded conditions of these backwater habitats would prevent proper water level depths ideal for fish habitat and accessibility, waterfowl habitat, wetland quality, and diversified forest acreage. Without action, future conditions in the area would be similar to existing conditions with backwater (low flow area) aquatic habitats within the study area continuing to degrade due to loss of flow, depth diversity, and possible loss of side channel connection.

### 3.3.12 Resiliency

#### 3.3.12.1 Existing

Recent U.S. Hydrology Literature Applicable to USACE Missions are summarized in this section. The river ecosystem within Pool 25 has been substantially affected by the impoundment of the pool along with permanently higher water tables maintained by L&D 25. Geomorphic features such as sandbar accretion and backwater deposition are forming near the study area. Restoring side channels and backwater areas are crucial to freshwater mussel habitats and riverine fish. The study area is located in 2-digit hydrologic unit code (HUC) 07, the Upper Mississippi Region and in the Fifth National Climate Assessment (NAC5) Midwest region. The site lies within the Sny watershed (HUC 07110004) stream segment 07000604. Several literature reviews were conducted utilizing National Oceanic and Atmospheric Administration (NOAA) summaries, the USACE Timeseries Toolbox, the USACE Comprehensive Hydrology Analysis Tool (CHAT), and the USACE Vulnerability Assessment (VA) Tool.

Upper Mississippi Region 07 projections show an annual increase in precipitation and the frequency of large storm events in the future of the Upper Mississippi Region (USACE, 2015). Studies of trends in streamflow collected over the past century have been performed and there appears to be a consensus among these studies that show a general increase in river flow for the Upper Mississippi Region (USACE, 2015). However past trends may no longer be a good predictor of the future. To predict future streamflow some studies used Coupled Model Intercomparison Project Phase 5 (CMIP5) meteorological models, which are widely recognized as the best available source. Clear consensus in the data is lacking, with some studies predicting an increase in future streamflow in the study region, while others project a decrease in flows (USACE, 2015). Additional information can be found in Appendix H – Resiliency Assessment.

#### 3.3.12.2 No Action (Future Without Project Conditions)

The effects of long-term weather variability would continue to have an impact on the region, regardless of whether the project is implemented. Long-term weather variability is expected to result in adverse impacts to habitats and organisms within the study area, but these impacts would not be the result of the No Action. Some areas may experience more frequent drying, wetlands that are frequently dry may never experience wet conditions again, and other wetlands may experience more frequent flooding (Halabisky, 2017). The effects of the anticipated variability can adversely impact communities when changes occur faster than natural adaptation can respond.

### 3.3.13 Air Quality

#### 3.3.13.1 Existing

The Clean Air Act of 1963 requires the U.S. Environmental Protection Agency (USEPA) to designate National Ambient Air Quality Standards (NAAQS). The USEPA has identified standards for six pollutants: lead, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and particulate matter (at less than 10 microns and at less than 2.5 microns in diameter), along with some heavy metals, nitrates, sulfates, volatile organic and toxic compounds. The USEPA regulates these pollutants by developing human health-based or environmentally-based permissible pollutant concentrations. The USEPA then publishes the results of air quality monitoring, designating areas as meeting (attainment) or not meeting (nonattainment) the standards or as being maintenance areas. Maintenance areas are those areas that have been re-designated as in attainment from a previous nonattainment status. A maintenance plan establishes measures to control emissions to ensure the air quality standard is maintained in these areas.

The Project area with a 5-mile buffer was assessed for Air Quality using the NEPA Assist Tool. The area currently meets all USEPA air quality standards and is not a designated maintenance area (USEPA, 2024).

#### 3.3.13.2 No Action (Future Without Project Conditions)

Under the No Action Alternative, there are no changes from current conditions anticipated in regard to air quality. The project area and 5-mile buffer are in a relatively rural area and not anticipated to experience much development in the future.

## 3.3.14 Socioeconomics

### 3.3.14.1 Existing

Existing socioeconomic data was gathered for Calhoun County, Illinois from www.census.gov.

Economic Base. The median household income is $88,059. Approximately 10.4% of the population is below the poverty line.

Education. An estimated 92% of the population have a high school degree or higher, while 19.5% have a bachelor's degree or higher.

Employment/Unemployment. Approximately 49.8% of the county population is in the labor force (between the ages of 16 and 64). The unemployment rate has decreased by 5.4% since the last census.

Population Demographics. The county has a total population of 4,360. Of the total county population, 4.8% is under five years old, and 24.8% of the population is over the age of 65. The population within the county is approximately 97.7% white, 0.7% black, 1.8% Hispanic or Latino, 0.3% American Indian and Alaska Native, and 0.4% Asian.

Visual Resources. Visual resources of the study area consist primarily of natural habitats including forests, fields, wetlands, and a view of the Mississippi River.

Recreational Resources. Currently, the area is used for hiking, bird-watching, hunting, and fishing. Waterfowl hunting and pan fishing drive the recreational use of the area. There is a gravel access road that leads to a boat landing on the Mississippi River for recreational boating.

### 3.3.14.2 No Action (Future Without Project Conditions)

Socioeconomic conditions in the study area are likely to remain similar to existing conditions.

## 3.3.15 Noise

### 3.3.15.1 Existing

Inadequately controlled noise presents a risk for adverse impact to humans. Noise can also impact wildlife in the vicinity. Sounds at or below 70 dBA are usually considered safe, even if they last a long time. Noises are more likely to damage your hearing if they are: 85 dBA and last a few hours; 100 dBA and last at least 14 minutes; or 110 dBA and last at least 2 minutes (Bayot, 2024). Noise levels surrounding the project area are varied depending on the time of day and season. The current human activities causing elevated noise levels in the vicinity of the project area includes recreational boat traffic and commercial navigation. A pleasure boat or barge traffic noise can typically range

between 65-115 decibels (dB) (USEPA, 1974). Infrequent horn blasts may be in excess of 120 dB at one foot. Noise during the hunting season may occur with typical 12 gauge shot gun at 130 dB. All of these may contribute to noise levels within the project area. There are no noise sensitive areas in the project vicinity.

#### 3.3.15.2 No Action (Future Without Project Conditions)

Noise levels in the study area are likely to remain similar to existing conditions.

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# 4 PLAN FORMULATION

The USACE planning process, as well as NEPA, requires the USACE to evaluate a range of reasonable alternatives.

A management measure is a feature (such as a structural element that requires construction or assembly on-site) or an activity (a non-structural action) that can be combined with other management measures to form alternative plans.

Management measures were developed to address project problems, meet study goals and objectives, and to capitalize on study area opportunities outlined in Section 2. Management measures were derived from a variety of sources including prior studies, existing projects, and the PDT. These measures have been implemented successfully throughout the UMR and are based on the UMRR Program – Environmental Design Handbook (December 2012) and lessons learned from other large river ecosystem restoration projects including those designed and constructed in the UMRR program.

A number of meetings were held with the Sponsor, including an initial technical workshop held on the 4th and 5th of October 2023 and a scoping charrette on 30$^{th}$ and 31$^{st}$ of January 2024. As a result of these meetings, 17 potential project measures were developed for consideration.

## 4.1 Management Measures

Of the 17 measures identified in the early planning stages, four were partially developed before being determined not feasible and thus did not undergo further evaluation. Measures that were further evaluated to a point appropriate for planning purposes and meet the goals and objectives outlined in Section 2.4 - Project Objectives, are described below (Table **3**).

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Table 3. Initial List of Measures

| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| Shoreline Protection with GSR | Source: UMRR Handbook | Beneficial use of excavated material to protect the shoreline from erosion due to wind and wave action – adding Gradual Slope Revetement (GSR) to contain the material and provide flow diversity and structure for aquatic species. | X | | X |
| Excavation at Varying Depths | Beaver Island HREP. Source: USACE, 2021 | Dredge Cut: Creation of bathymetric diversity and deeper seasonal habitat conditions for aquatic species. Material excavated could be used for beneficial purposes such as shoreline protection, island construction and sandbar creation. | X | X | X |

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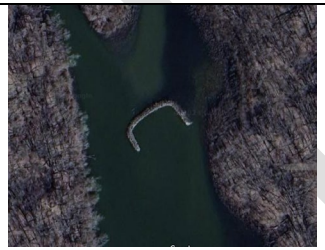
| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| Moist Soil Unit Creation with Pump (Active Management) | Source: USACE Reds Landing | Action of managing water levels with an actively managed pump to create managed moist soil units suitable for emergent vegetative growth. | X | X | X |
| Moist Soil Unit Creation with Overflow (Passive Management) | Source: The Wetlands Initiative | Action of managing water levels with a passively managed water control structure to create managed moist soil units suitable for emergent vegetative growth. | X | X | X |
| Scour Structures |  Google Earth Image of scour structure at Batchtown project - 2024 | Utilizing stone to create deep water aquatic habitat during high flow events. | X | | |

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| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| Hard Points | USACE- UMRR Environmental Design Handbook, 2012 | Placement of structure perpendicular to bankline creating diverse aquatic habitat and bathymetric and flow diversity | X | | |
| Backwater Excavation (Environmental Pool Management; EPM) | Beaver Island HREP. Source: USACE, 2021 | Removal of a thin layer of sediment to create conditions suitable for native emergent wetland vegetation to establish using the fluctuation of the river levels through EPM | X | | X |

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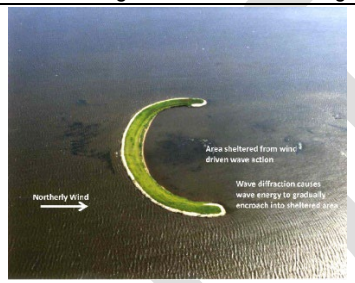
| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| River Connection Starting at Gilead | Source: Google Earth – Gilead Slough | Creating a connection to the river through a historic connection point to create more of a side channel habitat. | X | | |
| Island Creation |   Source: UMRR-EMP Environmental Design Handbook, 2012 | Rock berm and land created in the river from dredged material. Rock berm reduces flow and creates a barrier to wind driven waves, holding material in place. | X | | X |

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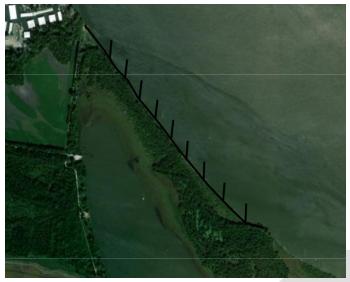
| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| Barbs |  Source: USACE Rendering 2023 | Placement of stone angled upstream to catch sediment, creates diverse aquatic habitat and bathymetric and flow diversity. | X | | X |
| Sediment Deflection Dike | USACE- 2023 | Sediment deflection dikes move sediment downstream and prevent deposition at the opening of backwater areas. | X | X | |

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| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| Bank Protection | Huron Island HREP. Source: USACE, 2020 | Shields interior shoreline from eroding and to provide habitat for aquatic species. | X | X | |
| Vegetative Management Activities | USACE- NESP Engineering Pamphlet, 2023 | Activities to promote native and desired vegetative species. May include reseeding MSU's after excavation, tree plantings along the shoreline protection areas that get disturbed | | X | X |

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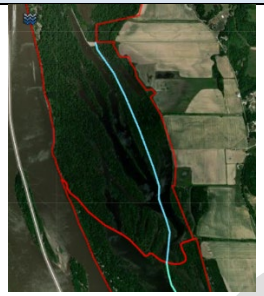
| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| River Connections (starting at Reds Landing) |  Google Earth represntation of aproximate channel location - 2024 | Creating a connection to the river through historic connection points to create a side channel habitat. | X | | |
| Channel to Control Secondary Inputs/Upland Flow | Google Earth representation of aproximate channel location - 2024 | Excavation of a channel that would control the sedimentation? inputs from secondary sources and channel through the area to reduce sedimentation in the backwater. | | X | |

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| Type of Measure | Representative Photograph | Description | Obj.1 Enhance depth, flow & substrate diversity & connectivity of aquatic habitat throughout study area | Obj. 2 Manage sediment inputs in side channel & slough areas | Obj. 3 Restore topographic & bathymetric diversity & improve desired vegetative community composition throughout project area |
|---|---|---|---|---|---|
| Water Control Structure with Berm | Source: The Wetlands Initative | Use of a water control structure and berm to create more of a disconnected backwater area and help control secondary inputs. | X | X | |

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### 4.1.1 Evaluation and Screening of Measures

Measures were screened and eliminated throughout the plan formulation process based on the Principles and Guidelines criteria (Table 4).

- **Completeness**: Extent to which the measure provides and accounts for all necessary investments or actions to ensure realization of the planning objectives. Must consider the sustainability and long-term aspects of plans and whether all resource requirements are included.
- **Effectiveness**: Extent to which the measure contributes to achieving the planning objectives. Does not mean all planning objectives need to be addressed or fully realized. Degree of effectiveness will be used to illustrate trade-offs between plans when compared.
- **Efficiency**: Extent to which the measure is the most cost-effective means of addressing the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment. Determined through a comparison of the costs and benefits of each alternative.
- **Acceptability**: Workability and viability of the measure with respect to acceptance by federal and non-federal entities and the public, and compatibility with existing laws, regulations and public policies.
    - Implementability: Extent to which the alternative is feasible from a technical, financial, and legal perspective
    - Satisfaction: Extent to which the plan is welcome from a political or preferential perspective
- **Plan Identification**
    - NER: Reasonably maximizes ecosystem restoration benefits compared to costs, while also meeting all planning objectives. The NER also considers information that cannot be quantified, such as environmental significance, scarcity, socioeconomic impacts, and historic properties.
    - Total Net Benefits: Reasonably maximizes total net benefits across all benefit categories including monetized and non-monetized benefits (net benefits plan), consistent with only the study purpose.
    - Least Environmentally Damaging Practicable Alternative (LEDPA): Identified by the Clean Water Act (CWA) under Section 404 (40 CFR Part 230). This plan is not environmentally damaging and meets the requirements to identify the Least Environmentally Damaging Practicable Alternative as specified in ER 1105-2-103.

The following measures were considered but not selected for alternative formulation because they were found to be ineffective:

- After additional evaluation, it was determined that there was not substantial upland flow coming into the project area. As a result, "Channel to Control Upland Flow" was screened as a measure.
    - "Water Control Structure with Berm" was tied to upland flow and thus screened as a measure.
- "Vegetative Management Activities" was considered no longer feasible since it is

assumed that natural regeneration of vegetation would occur once water level management is improved

The following measure was selected for alternative formulation but later screened with the associated alternative:

- “River Connection Starting at Reds”

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Table **4**. Measure Screening Criteria and Design Considerations

| Considered Management Measure | Effectiveness: Obj.1 Enhance depth, flow and substrate diversity and connectivity of aquatic habitat throughout study area | Effectiveness: Obj 2 Manage the sediment inputs in the side channel and slough areas | Effectiveness: Obj 3 Restore topographic and bathymetric diversity and improve desired vegetative community composition throughout the project area | Complete | Efficient | Acceptable | Measure Retained? |
|---|---|---|---|---|---|---|---|
| Shoreline Protection with GSR | X | | X | X | X | X | YES |
| Excavation At Varying Depths | X | X | X | X | X | X | YES |
| Moist Soil Unit Creation with Pump (Active Management) | X | X | X | X | X | X | YES |
| Moist Soil Unit Creation with Overflow (Passive Management) | X | X | X | X | X | X | YES |
| Scour Structures | X | | | X | X | X | YES |
| Hard Points | X | | | X | X | X | YES |
| Backwater Excavation (EPM) | X | | X | X | X | X | YES |
| River Connection Starting at Gilead | | | | X | X | X | YES |
| Island Creation | X | | X | X | X | X | YES |
| Barbs | X | | X | X | X | X | YES |
| Sediment Deflection Dike | X | X | | X | X | X | YES |
| Bank Protection | X | X | | X | X | X | YES |
| Vegetative Management Activities | | X | X | X | X | X | NO |
| Channel to Control Secondary Inputs/Upland Flow | | X | | X | | X | NO |
| River Connection (Starting at Reds) | X | | | X | X | X | YES* |
| WCS with Berm | X | X | | X | | X | NO |

*Screened later in the process as it was only associated with a single alternative which was ultimately screened.

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#### 4.1.1.1 Summary of Retained Measures

Initial Measure Moist Soil Unit Creation with Overflow (Passive Management) was change to Moist Soil Unit Creation with Stoplog WCS (Passive Management) to provide more controlled water management.

The final array of measures includes:

- Shoreline Protection with GSR
- Excavation At Varying Depths
- Moist Soil Unit Creation with Pump (Active Management)
- Moist Soil Unit Creation with Stoplog WCS (Passive Management)
- Scour Structures
- Hard Points
- Backwater Excavation (EPM)
- River Connection Starting at Gilead
- Island Creation
- Barbs
- Sediment Deflection Dike
- Bank Protection

## 4.2 Development of Initial Array of Alternatives

Measures deemed feasible were carried forward for consideration in the development of alternatives. Alternatives are combinations of measures that contribute to attaining the planning objectives. This section describes considerations that led to the development of an initial array of alternatives for this project and the evaluation of alternative plans' ability to meet project objectives.

Formulation strategies, defined by Planning Manual Part II: Risk-Informed Planning 2017, are a set of conditional decisions that shape and guide the development of alternatives.

The plan formulation strategies combine measure(s) together into alternatives based on the study goal, objectives, planning criteria, and opportunities, while avoiding constraints. Measures were combined based on appropriate dependencies and exclusivities. Gilead Slough HREP formulation strategies included the following:

- **No Action Alternative:** This alternative is defined as the alternative in which no federal action takes place. The FWOP conditions as described in Section 3 would be anticipated for each resource as a result of no federal action.

- **Minimum Habitat Benefits Alternative:** This alternative strategy identifies the least cost plan resulting in minimal improvements towards each project objective while making a measurable and cost-effective improvement to existing conditions.

- **Intermediate Habitat Benefits Alternative:** This alternative strategy focuses on

measures that improve the structure and function of the existing conditions while prioritizing measure configurations that have the most efficient use of unit size to realize benefits.

- **Maximum Habitat Benefits Alternative:** This is the alternative that maximizes habitat improvements and gets the habitat closest to optimal functionality in both aquatic and terrestrial areas. Measures included in this strategy address project problems statements to the greatest extent.

- **Maximum Aquatic Benefits Alternative:** This alternative focuses on measures that maximizes habitat improvements in the aquatic areas only to achieve optimal functionality.

- **Interconnected Alternative:** This alternative focused on using historic river connections in the adjoining Reds Landing area to create a side channel habitat that connects both Reds Landing and Gilead Slough, instead of the existing separate backwater and managed moist soil areas.

Table 5 shows the initial array of measures and the alternative formulated.

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Table **5**. Summary of Measures included in the Alternatives

| Measure # | Gilead Slough | No Action | Maximum Habitat Benefit | Intermediate Habitat Benefit | Minimum Habitat Benefit | Maximum Aquatic Benefits | Interconnected Management |
|---|---|---|---|---|---|---|---|
| 1 | Shoreline Protection with GSR | | X | X | X | | |
| 2 | Excavation At Varying Depths | | X | X | X | X | X |
| 3 | Moist Soil Unit Creation with Pump (Active Management) | | X | | | | |
| 4 | Moist Soil Unit Creation with Stoplog WCS(Passive Management) | | | X | | | X |
| 5 | Scour Structures | | X | X | X | X | |
| 6 | Hard Points | | X | X | | X | X |
| 7 | Backwater Excavation (EPM) | | X | X | X | | X |
| 8 | River Connection Starting at Gilead | | X | | | X | |
| 9 | Island Creation | | X | X | | | |
| 10 | Barbs | | X | X | X | X | |
| 11 | Sediment Deflection Dike | | X | | | X | |
| 12 | Bank Protection | | X | X | | X | |
| 13 | Vegetative Management Activities | | | X | X | | |
| 14 | River Connection Starting at Reds | | X | | | | X |
| 15 | Channel to Control Secondary Inputs/Upland Flow | | | X | | | |
| 16 | WCS with Berm | | X | X | | | |

Note: The gray boxes identify screened measures and alternatives. Descriptions of the screened process are provided below

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### 4.3 Evaluation and Screening of Alternatives

Upon further evaluation, the PDT screened two alternatives:

- The Maximum Aquatic Benefits Alternative did not adequately meet the study objectives and was screened for effectiveness.
- The Interconnected Alternative was screened for acceptability since the adjoining lands are managed by two separate agencies and backwater habitat is limited in the area and considered a limited habitat within the pool.
    - When the Interconnected Alternative was screened, it also screened the "River Connection starting at Reds Landing" measure. This was the only alternative that particular measure was associated with.

After screening, thirteen measures and four alternatives (including the No Action) were retained for further evaluation.

### 4.4 Final Array of Alternatives

Figure **2** through Figure **4** show the proposed arrangement of the measures within the study areas within the final array of action alternatives. The following alternatives are included in the final array:

- No Action
- Maximum Alternative
- Intermediate Alternative
- Minimum Alternative

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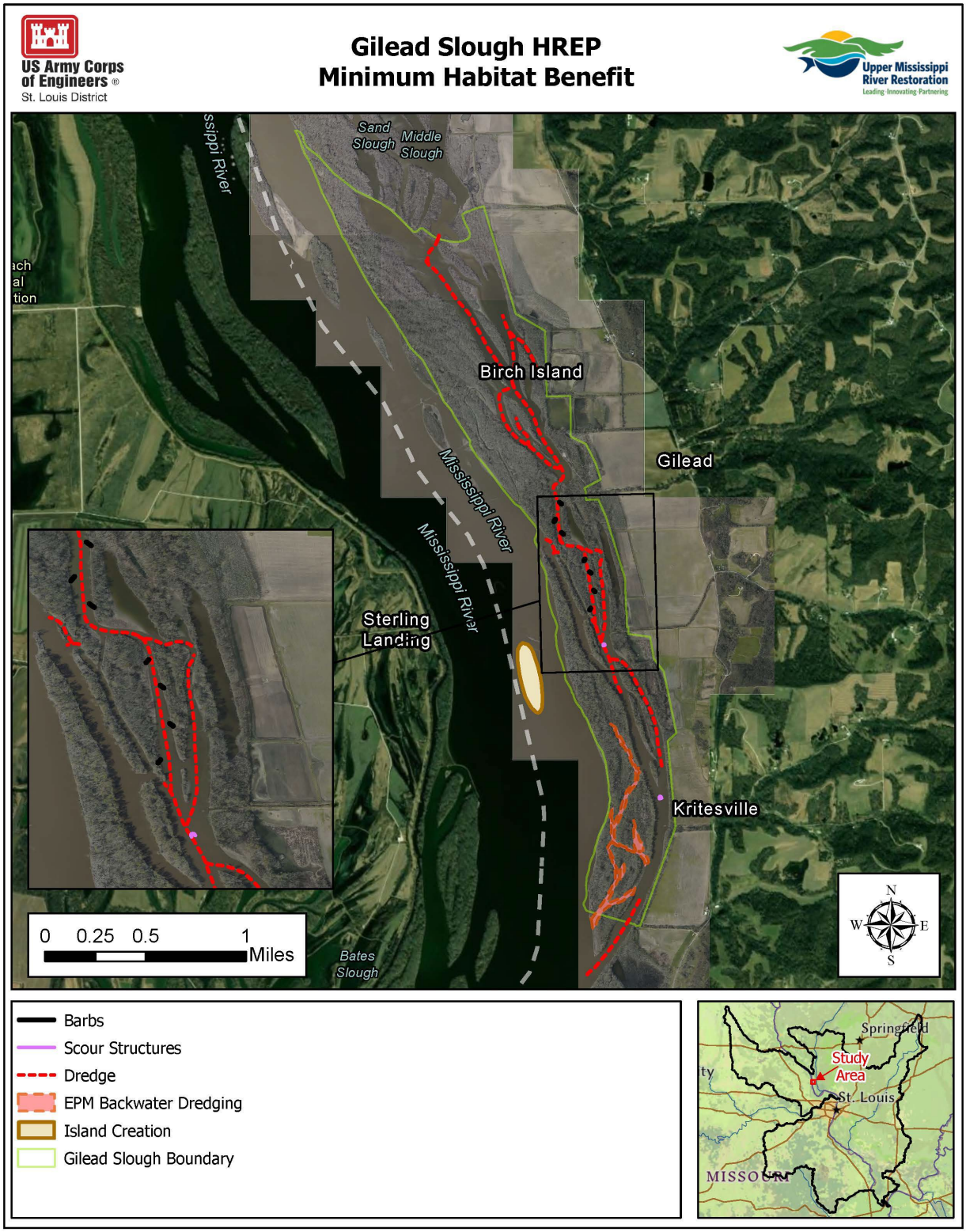


Figure **2**. Minimum Habitat Benefits Alternative

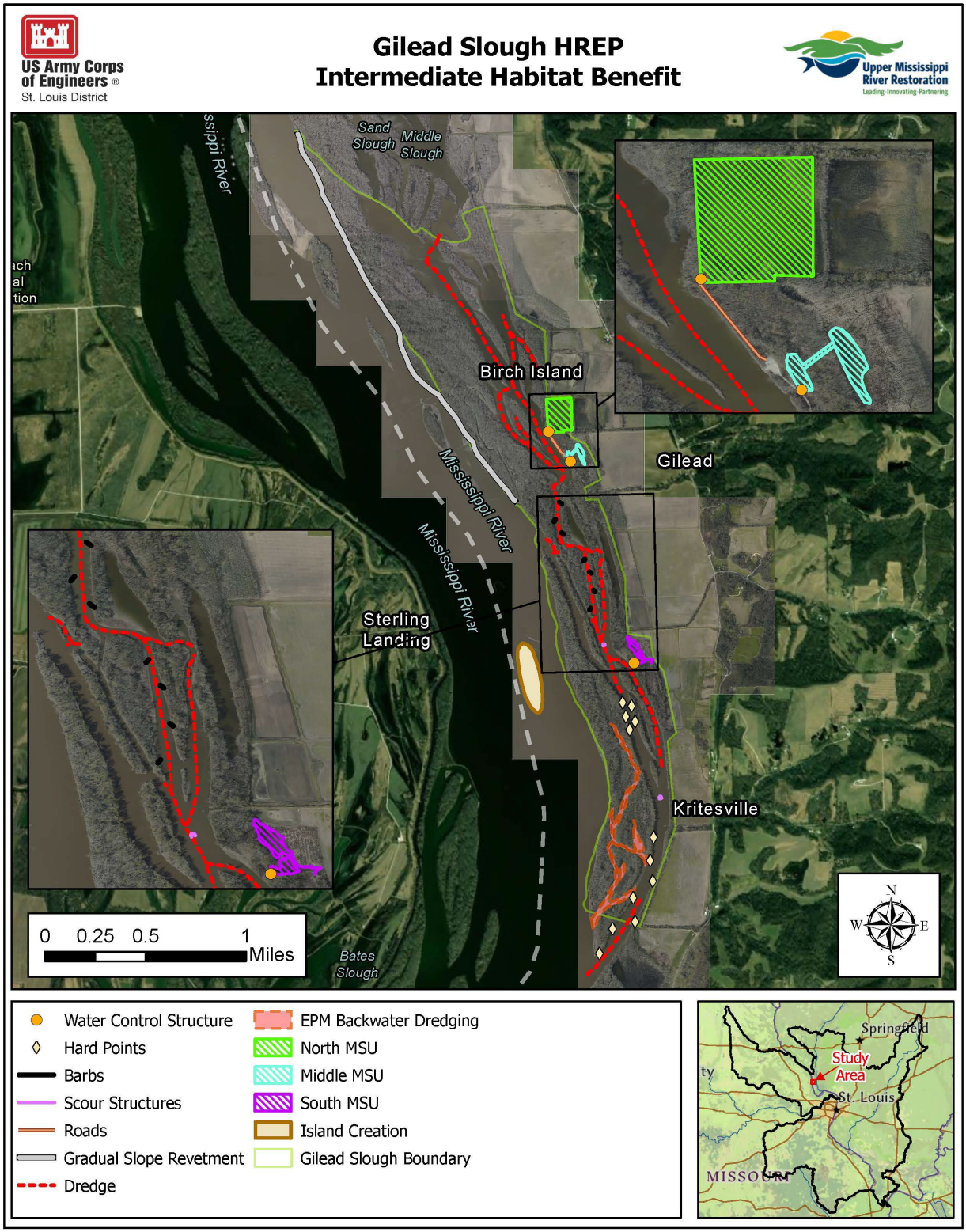


Figure 3. Intermediate Habitat Benefits Alternative

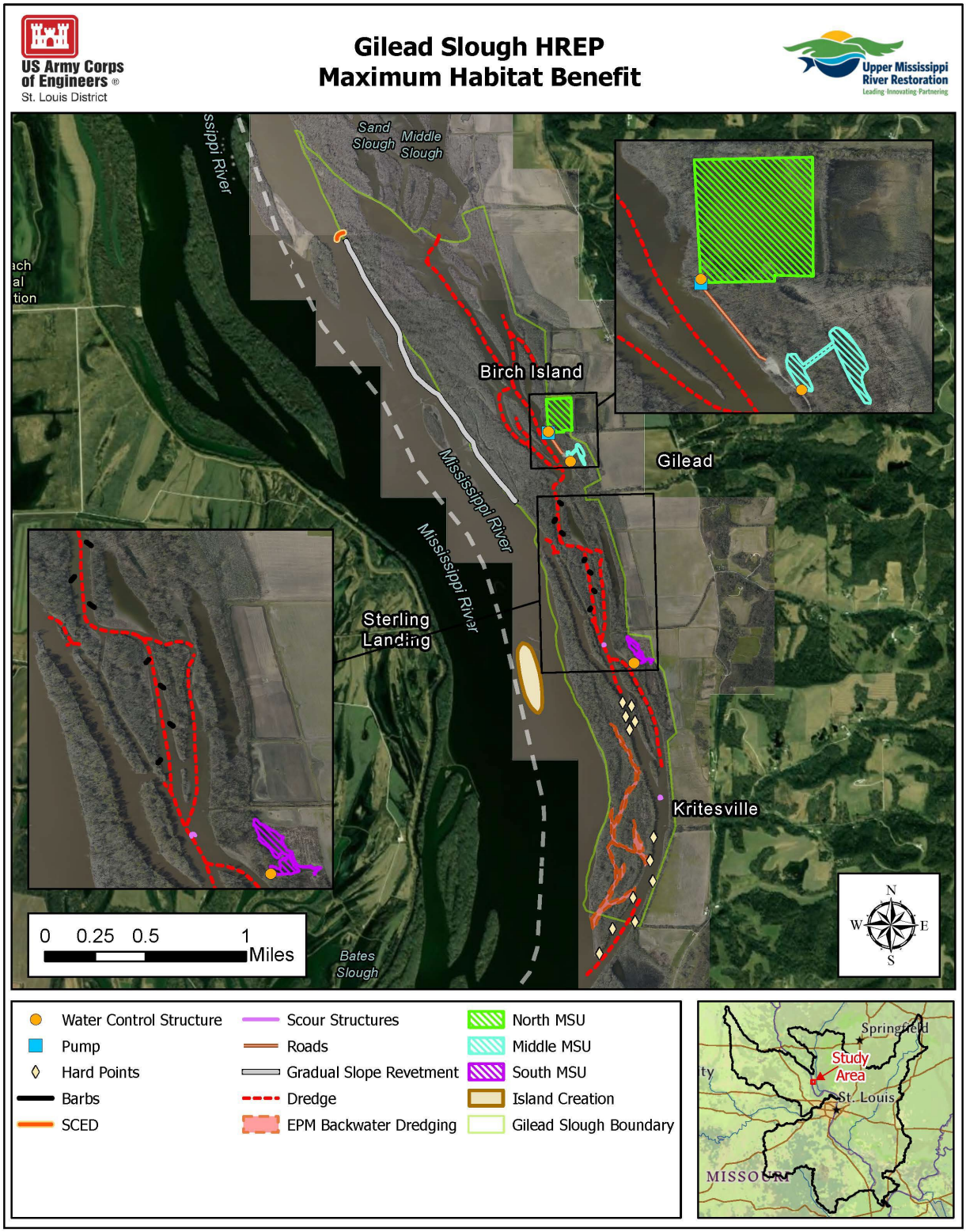


Figure 4. Maximum Habitat Benefits Alternative

# 5 EVALUATION AND COMPARISON OF FINAL ARRAY OF ALTERNATIVES

## 5.1 Evaluation of Final Array of Alternatives

This chapter describes the process and methods utilized to evaluate the final array of alternatives for the Gilead Slough HREP. The evaluation included use of Habitat Evaluation Procedures (HEP), the Principles & Guidelines (P&G) criteria, the Guiding Principles (CEQ 2014 Principles, Requirements, and Interagency Guidelines), and development of parametric cost estimates. HEP outputs and costs were entered into Institute for Water Resources (IWR) Planning Suite Cost Effective/Incremental Cost Assessment (CE/ICA).

### 5.1.1 Habitat Benefits

This assessment includes a summary of the existing biological conditions used in the evaluation, as well as a forecast for future conditions under the No Action Alternative and each potential Project alternative. The evaluation was conducted by a multi-agency team that included representatives from the District, USFWS, and IDNR. Aquatic and floodplain benefits were quantified using the HEP (USFWS 1980a), a habitat-based evaluation methodology used in project planning. The procedure documents the quality and quantity of available habitat for selected wildlife species. The HEP assume that habitat for selected wildlife species can be described by a Habitat Suitability Index (HSI). This index value (from 0.0 to 1.0) is multiplied by the area of applicable habitat to obtain Habitat Units (HUs).

Changes in HUs will occur as a habitat matures naturally or is influenced by development. These changes influence the cumulative HUs derived over the period of analysis (50 years). HUs are calculated for select target years and annualized using the IWR Planning Suite II tool annualizer over the period of analysis to derive a net Average Annual Habitat Unit (AAHU) quantity. By using target years, AAHUs were annualized using a linear interpolation approach, essentially drawing a straight line between target years, and then calculating the area under the curve for the resulting planning horizon benefit curve. Resulting net AAHUs are used as the output measurement to compare alternatives for the proposed Project.

The PDT used four USACE-approved (per EC 1105-2-412) habitat evaluation methodologies in their analyses:

- Dabbling Duck HSI model
- Yellow Warbler HSI model
- Smallmouth Buffalo HSI model
- White Bass HSI model

Table 6 shows which habitat model corresponds with each habitat type. A summary of the habitat analysis is provided in Table 7; additional details are provided in Appendix B - Habitat Evaluation and Quantification.

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Table 6. Habitat Type and Model Application for This Assessment

| Habitat Type | Habitat Suitability Index Model |
|---|---|
| Wetlands | Dabbling Duck Migration Model |
| Lacustrine Backwaters | Smallmouth Buffalo HSI Model |
| Lotic Side Channels | White Bass HSI Model |
| Riverine Island | Yellow Warbler HSI Model |

Table 7 and 8 summarize the benefits for each alternative to be carried forward for CE/ICA using IWR Planning Suite II software. Complete documentation of the habitat benefits analysis is provided in Appendix B - Habitat Evaluation and Quantification.

Table 7. Results of the habitat benefit evaluations for each habitat model used to evaluate alternatives.

| Alternative | Dabbling Duck Migration Model Net AAHU | Yellow Warbler HSI Model Net AAHU | Smallmouth Buffalo HSI Model Net AAHU | White Bass HSI Model Net AAHU | Total Net AAHU |
|---|---|---|---|---|---|
| **No Action** | 0 | 0 | 0 | 0 | 0 |
| **Minimum** | 2 | 18 | 108 | 21 | 149 |
| **Intermediate** | 13 | 20 | 123 | 41 | 197 |
| **Maximum** | 17 | 22 | 17 | 120 | 175 |

Table 8. Environmental Outputs

| Alternative Name | Area (acres) | Total AAHU | Total Net AAHU |
|---|---|---|---|
| No Action | 344 | 81 | 0 |
| Minimum Habitat Benefit | 369 | 230 | 149 |
| Intermediate Habitat Benefit | 397 | 278 | 197 |
| Maximum Habitat Benefit | 402 | 256 | 175 |

### 5.1.2 Cost Estimates

Cost estimates for alternative comparison were prepared using October 2025 price levels; annualized costs include construction costs, contingency costs, adaptive management costs and OMRR&R costs. Total Project costs were annualized based on the Fiscal Year (FY) 2025 discount rate of 3% and a 50-year period of analysis. Interest During Construction (IDC) was calculated using end of year compounding based on a two-year period of construction, using the FY2025 discount rate of 3%. Table 9 shows the estimated cost of the action alternatives as of completion of the habitat analysis and for use in the comparison of alternatives, prior to selection, refinement, and developing a full cost estimate of a TSP.

Table 9. Cost Estimates for Action Alternatives

| Item | Minimum Alt ($) | Intermediate Alt ($) | Maximum Alt ($) |
|---|---|---|---|
| Construction | $12,451,000 | $15,875,000 | $20,535,000 |

| Item | Minimum Alt ($) | Intermediate Alt ($) | Maximum Alt ($) |
|---|---|---|---|
| PED | $2,241,000 | $2,858,000 | $3,696,000 |
| Real Estate | $31,000 | $31,000 | $31,000 |
| MAM | $2,835,000 | $3,500,000 | $5,256,000 |
| OMRR&R | $0 | $33,750 | $49,750 |
| S&A | $1,245,000 | $1,588,000 | $2,054,000 |
| Total Cost[1] | $18,803,000 | $23,852,000 | $31,572,000 |
| Annualized Cost ($) | $722,000 | $918,000 | $1,212,000 |

1. Total cost includes a 36% contingency added to the total of construction, a 18% contingency added to E&D and a 14% contingency added to S&A
2. FY 2025 Price Level, 3% Discount Rate

## 5.2 Comparison of Final Array of Alternatives

IWR Planning Suite II software was used to complete CE/ICA for the four alternatives (including the No Action Alternative), using the AAHUs and annualized costs described in this section. The CE/ICA is used when project benefits are not measured in dollars and is used to ensure the least cost alternative is identified for each possible level of environmental output, and the maximum level of output is identified for any level of investment. Cost Effectiveness evaluation is used to identify the least costly solution to achieve a range of project benefits; the Incremental Cost Analysis identifies the subset of cost-effective plans that are superior financial investments, called “Best Buys,” through analysis of the preliminary incremental costs. Best Buys are the plans that are the most efficient at producing the output variable or provide the greatest increase in AAHUs for the least increase in preliminary cost. The first Best Buy is the most efficient plan, producing output at the lowest incremental cost per unit. If a higher level of output is desired than that provided by the first Best Buy, the second Best Buy is the most efficient plan for producing additional output, and so on.

The CE/ICA analysis evaluated four retained plans. Table **10** and Figure **5** show the resulting alternatives differentiated by cost effectiveness. From this list of four alternatives, one Cost-Eeffective plan and two Best Buy Plans were identified (Table **11** and Figure **6**). One non-Cost-Effective plan was also identified.

Table 10. Array of Alternatives Differentiated by Cost Effectiveness

| Alternative | Annualized Cost ($) | Annualized Output (AAHU) | Average Cost/Output ($/AAHU) | Cost Effectiveness |
|---|---|---|---|---|
| No Action | $0 | 0 | $0 | Best Buy |
| Minimum | $722,000 | 149 | $4,845 | Cost-Effective |
| Intermediate | $918,000 | 197 | $4,663 | Best Buy |
| Maximum | $1,212,000 | 175 | $6,923 | Non Cost-Effective |

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1. FY 2025 Price Level, 3% Discount Rate

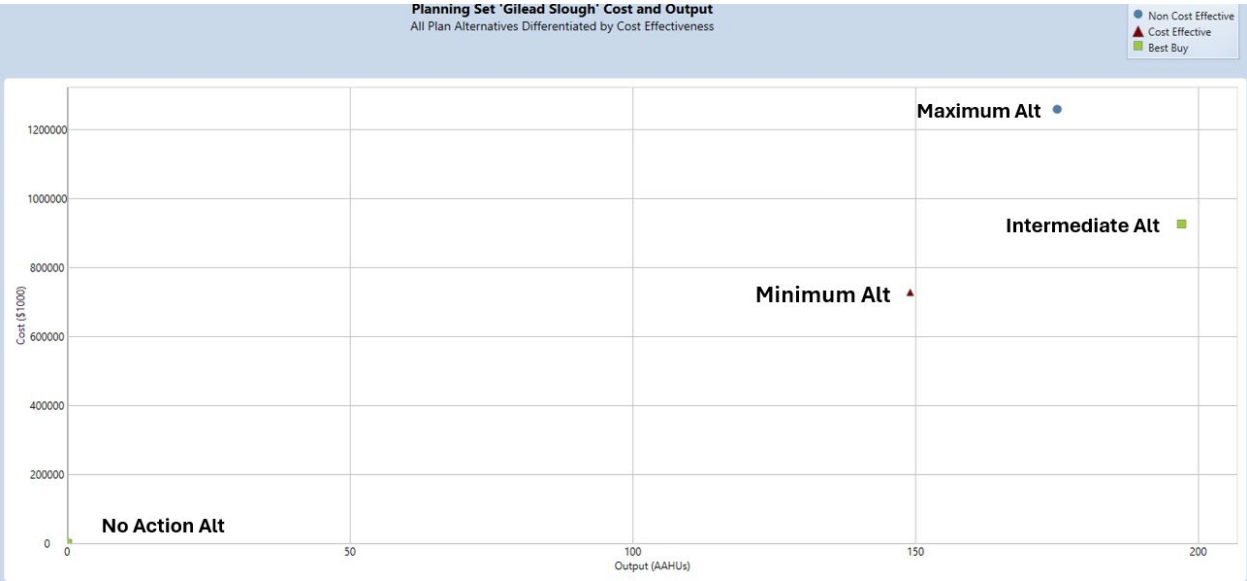


Figure 5. Array of Alternatives Differentiated by Cost Effectiveness

After reviewing the results of the CE/ICA analysis, the Maximum Alternative was excluded from further evaluation because it was not cost effective. The Cost-Effective Alternative (Minimum Alternative) and the Best Buy Alternatives (No Action and Intermediate Alternative) were further evaluated and compared and are discussed in the following sections. (**Error! Reference source not found.** and **Error! Reference source not found.**).

Table 11. Incremental Cost Analysis of Cost Effective and Best Buy Alternatives

| Alternative | AAHUs | Annualized Cost ($) | Annualized Cost ($) Per AAHU | Incremental Cost ($) | Incremental Output (AAHUs) | Incremental Cost ($) (per AAHU) |
|---|---|---|---|---|---|---|
| No Action | - | - | - | - | - | - |
| Minimum | 149 | $722,000 | $4,845 | $722,000 | 149 | $4,845 |
| Intermediate | 197 | $918,000 | $4,663 | $197,000 | 48 | $4,099 |

1. FY 2025 Price Levels, 3% Discount Rate

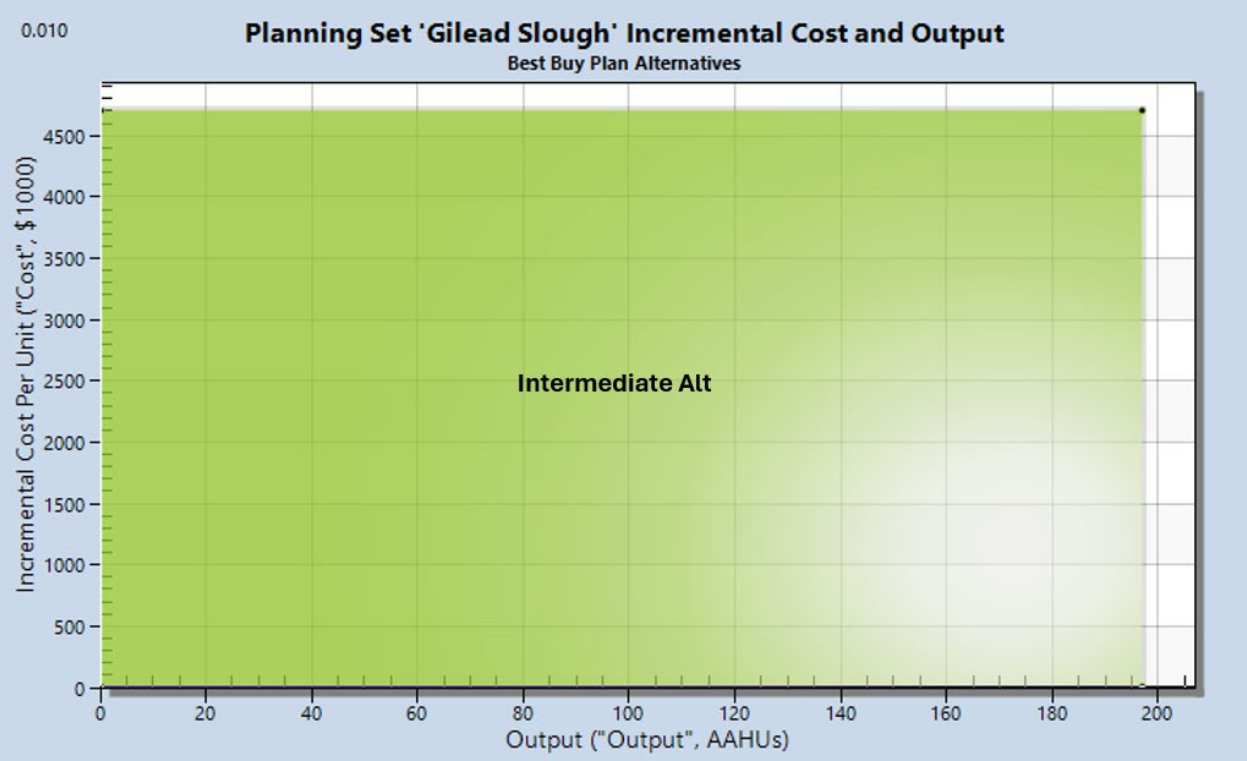


Figure 6. Incremental Cost Analysis of Best Buy Plans

The Cost Effective and Best Buy alternatives provide critical information to support well-informed decisions regarding the appropriate scale of restoration features. Evaluating alternatives through increasing levels of output allows decision-makers to assess whether additional ecological benefits justify the incremental costs. When decision-makers determine that an increase in outputs is "not worth it," subsequent alternatives will also likely be considered "not worth it." Identifying these breakpoints can be subjective, but for this project, the distinctions between Cost-Effective and Best Buy alternatives have been clearly identified. The following documents the accomplishments of the Cost-Effective and Best Buy alternatives for Gilead's Slough. All prices are in FY2025 Price Levels.

**No Action Alternative**

- Best Buy
- 0 AAHUs
- Annualized Cost: $0

**Minimum Alternative**

- Cost-Effective
- 149 AAHUs
- Annualized Cost: $722,000
- Incremental Cost per AAHU: $4,845

**Intermediate Alternative**

- Best Buy
- 197 AAHUs
- Annualized Cost: $918,000
- Incremental Cost per AAHU: $4,099

### 5.2.2 Comprehensive Benefits

Per the 5 January 2021 SACW POLICY DIRECTIVE – Comprehensive Documentation of Benefits in Decision Document, all USACE planning study project delivery teams (PDTs) must evaluate and provide a complete accounting, consideration, and documentation of the total benefits of alternative plans across all benefit categories. Total benefits involve a summation of monetized and/or quantified benefits, along with a complete accounting of qualitative benefits, for project alternatives across national and regional economic, environmental, and social benefit categories.

In computing total benefits of a project alternative, it is imperative that any benefits reflected in more than one category are only counted once. The level of detail will vary based on study type and the decision-context for the specific problems identified, recognizing that not all benefits can be monetized, and some cannot be cost-effectively quantified. Even if non-monetary measures are used, these benefits and impacts must be accounted for in the most substantive way possible.

Each study must include, at a minimum, the following plans in the final array of alternatives for evaluation:

1. The “No Action” alternative.
2. A plan that maximizes net total benefits across all benefit categories.
3. A plan that maximizes net benefits consistent with the study purpose.
4. For flood-risk management studies, a nonstructural plan, which includes modified floodplain management practices, elevation, relocation, buyout/acquisition, dry flood proofing, and wet flood proofing.
5. A locally preferred plan, if requested by a non-federal partner, if not one of the aforementioned plans.

For this comprehensive benefit analysis, the No Action, Minimum, Intermediate, and Maximum alternatives were evaluated. Table 12 provides that summary.

Table 12. Summary of Comprehensive Benefits across P&G accounts

| Alternatives | National Economic Development | Regional Economic Development | Environmental Quality | Other Social Effects |
|---|---|---|---|---|
| No Action | $0 | 0 Jobs | 0 | No Benefits |
| Minimum Habitat Benefit | $4,845 | 59 Jobs | 149 | As AAHUs increase, |

| Alternatives | National Economic Development | Regional Economic Development | Environmental Quality | Other Social Effects |
|---|---|---|---|---|
| Intermediate Habitat Benefit | $4,663 | 72 Jobs | 197 | improved recreation opportunities increase |
| Maximum Habitat Benefit | $6,923 | 97 Jobs | 175 | |

1. FY 2025 Price Levels, 3% Discount Rate
NED – Avg Annual Cost per AAHU
RED - Jobs, etc.
EQ – Total Net HUs gained
OSE - Recreation, Hunting, Fishing, etc.

#### 5.2.2.2 National Economic Development

The National Economic Development (NED) account evaluates changes in the economic value of the national output of goods and services. The quantified effects within this account are represented as the Average Annual Cost per AAHU for each alternative:

- **No Action Alternative:** $0 (No cost; no impact on NED).
- **Minimum Alternative:** $4,845
- **Intermediate Alternative:** $4,663
- **Maximum Alternative:** $6,923

#### 5.2.2.3 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 the final array of action alternatives. As the costs of action alternatives varied, regional benefits would also vary.

The no-action alternative would result in no project expenditures and would have no positive or negative regional impact. The results of the RECONS analysis were relatively similar across all alternatives and did not substantially impact plan selection. Table **13** summarizes the RECONS analysis. See Appendix K - Economics for details of the economic analysis of the alternatives

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Table 13. RECONS Summary

| Alternative | Gross Regional Product | Full Time Equivalent Jobs |
|---|---|---|
| No Action | $0 | 0 |
| Minimum | $5,359,489 | 59 |
| Intermediate | $6,833,338 | 75 |
| Maximum | $8,839,220 | 97 |

1. FY 2025 Price Levels, 3% Discount Rate

#### 5.2.2.4 Environmental Quality Account

The Environmental Quality (EQ) account measures effects on ecological, cultural, and aesthetic resources. For ecosystem restoration projects such as this one, contributions to the EQ account are detailed both through NEPA compliance and through calculation of net ecosystem benefits. Here, NEPA compliance is achieved by integrating an EA into this feasibility report, with a qualitative summary of environmental effects detailed in Chapter 5 of this report. A calculation of net ecosystem benefits was completed through the use of HEP and HSI models. The quantitative results of the evaluation are contained in Appendix B – Habitat Evaluation and Quantification. The credit for the EQ account is the quantified benefits resulting from the Project (AAHUs). Intangible and or non-quantifiable environmental benefits associated with the alternatives are assumed to increase proportionally relative to the AAHU outputs associated with each alternative. In Table 14, the Minimum Habitat Benefit alternative contributes 149 net AAHUs, the Intermediate Habitat Benefit alternative contributes 197 net AAHUs, and the Maximum Habitat Benefit alternative contributes 175 net AAHUs.

Table **14**. Total and Net AAHUs of Each Alternative

| Alternative | Total AAHUs | Net AAHUs | Acres Included in Alternative |
|---|---|---|---|
| No Action | 81 | 0 | 344 |
| Minimum | 230 | 149 | 369 |
| Intermediate | 278 | 197 | 397 |
| Maximum | 256 | 175 | 402 |

#### 5.2.2.5 Other Social Effects Account

The Other Social Effects (OSE) account evaluates plan impacts from perspectives not fully captured by the other three accounts. The account is intended to illustrate the effects the alternatives will have on lives of residents and the social fabric of communities in the study area. In accordance with the Policy Directive “Comprehensive Documentation of Benefits in Decision Document” (5 January 2021), the PDT used input from interagency experts and local stakeholders to assess OSE factors for the Gilead Slough study area. While the OSE benefits may be slight or difficult to measure for individual HREP projects, taken as a whole, the completed restoration projects over 35 years of the UMRR program have greatly enhanced social factors in the UMRS. All action alternatives considered are expected to contribute positively and similarly to social benefits. Recreational benefits are expected to increase under all action alternatives due to the improvements in habitat diversity and access though restoration

activities within the Gilead Slough area. These changes align with USFWS goals to enhance habitat for local and migratory species. The restored habitats provide opportunities for overwintering fish and additional foraging areas for birds, contributing to a richer, more biodiverse ecosystem.

Table 15 provides the results of the evaluation completed on the four accounts for each cost effective alternative.

Table **15**. Comprehensive Benefit Analysis Comparison

| Alternative | Total Project Cost (NED) | Gross Regional Product / FTE Jobs (RED) | AAHUs (EQ) | Acres Restored (EQ) | Incidental Recreation Benefits (OSE) |
|---|---|---|---|---|---|
| **No Action** | $0 | $0 / 0 FTE Jobs | 0.0 | 0 | Remain as is |
| **Minimum** | $18,803,000 | $5M / 59 FTE Jobs | 149 | 369 | Positive Impact |
| **Intermediate** | $23,852,000 | $7M / 75 FTE Jobs | 197 | 397 | Positive Impact |

1. FY 2025 Price Levels, 3% Discount Rate

### 5.3 Selection of the Tentatively Selected Plan

Federal planning for water resources development was conducted in accordance with the U.S. Water Resources Council's P&G and the Assistant Secretary of the Army (Civil Works) policy directive for comprehensive documentation of benefits.

> "For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, shall be selected. The selected plan must be shown to be cost effective and justified to achieve the desired level of output."
>
> "All USACE planning study PDTs must evaluate and provide a complete accounting, consideration, and documentation of the total benefits of alternative plans across all benefit categories. Total benefits involve a summation of monetized and/or quantified benefits, along with a complete accounting of qualitative benefits, for project alternatives across nation and regional economic, environmental and social benefit categories."

Review of the four formulation criteria suggested by the P&G (completeness, effectiveness, efficiency, and acceptability, Table 16) and resource significance (institutional, public, and technical) were used to aide in the selection of the TSP.

The Intermediate Habitat Benefit alternative was chosen as the TSP because it was the plan that reasonably maximized the cost to habitat benefit ratio, provided the highest output of AAHUs, received support from the sponsor, and had a reduced level of risk when compared the Maximum Habitat Benefit Alternative. The Minimum Habitat Benefits alternative did not capitalize on existing low-lying areas to develop quality moist soil habitat and did not have additional GSR, which provides habitat resiliency and

protection from flood and sedimentation events. The Minimum also minimally meets all objectives and is cost effective.

The Intermediate Habitat Benefits alternative is expected to produce the highest AAHUs (197) than the Minimum or Maximum. The cost per AAHU was lower for the Intermediate ($4,663) than the Minimum ($4,845), meaning more benefits could be realized at a lower cost. The Intermediate also fully meets all objectives and is cost effective.

The Maximum Habitat Benefit alternative would have resulted in the conversion of backwater habitat within Gilead Slough into free flowing, side-channel habitat. Backwater habitat is a more limited resource compared to side channel habitat within the UMRS due to substantial loss of this habitat type in recent decades throughout the system. Thus, the Maximum alternative produced fewer AAHUs and presented substantial risk revolving around that conversion. The Maximum is also not cost effective and does not fully meet Objective 3.

The Intermediate Habitat Benefit alternative was chosen as the TSP because it was the plan that reasonably maximized the cost to habitat benefit ratio, provided the highest output of AAHUs, received support from the sponsor, and had a reduced level of risk when compared to the Maximum Habitat Benefit Alternative.

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Table 16. Table of Effects

| **GUIDING PRINCIPLES** | **Sustainable Economic Development** | | **Floodplains** | **Healthy & Resilient Ecosystems** | **Healthy & Resilient Ecosystems** | **Healthy & Resilient Ecosystems** | **Equity** | | |
|---|---|---|---|---|---|---|---|---|---|
| **P&G ACCOUNTS** | **NED** | **RED** | **EQ** | | | | **OSE** | | |
| **PLANNING OBJECTIVES** | | | **All objectives** | | | | | | |
| **EVALUATION CRITERIA** | Effectiveness | Effectiveness | Effectiveness | Efficiency | Effectiveness | Effectiveness | Effectiveness | Acceptability: Implementation & Satisfaction | Completeness |
| **METRICS QAUN & QAUL** | Annualized Cost (($)AAHU) / Cost Effective | RECONS - Total "Value Added" to Local Economy & Total "Jobs" for Local Economy | Habitat Types Improved within the Floodplain | Annualized Cost ($) per AAHU | Net AAHUs | Study Objectives Met | OSE & Local Community Benefits | Yes, No, Partial | Complete, Incomplete, Partially Complete |
| **No Action** | $0 / Yes | $0.00 / 0 FTEs | None | $0 | 0 | 0 | None | Partial, Existing conditions of environment, Provides no solution to problem | Complete |
| **Minimum Habitat Benefit** | $4,845 / Yes | $5,359,489 / 59 FTEs | Streams, side channels, backwaters, wetlands | $4,845 | 149 | Minimally meets Obj 1, 2, 3 | As AAHUs increase, improved recreation opportunities increase | Partial, Not preferred | Complete |
| **Intermediate Habitat Benefit (R, T, L)** | $4,663 / Yes | $6,833,338 / 75 FTEs | Streams, side channels, backwaters, wetlands | $4,663 | 197 | Fully meets Obj 1, 2, 3 | | Yes, Highest preferred | Complete |
| **Maximum Habitat Benefit** | $6,923/ No | $8,839,218 / 97 FTEs | Streams, side channels, backwaters, wetlands | $6,923 | 175 | Fully meets Obj 1, 2, 3* | | No; Partner – High cost, OMRR&R, MAM; High risk measure resulting in reduced benefits | Complete |

**T = Total Net Benefits Plan, R = NER Plan, L = LEDPA**
***The river connection measure turns the backwater habitat into more of a flowing side channel, which resulted in fewer modeled habitat benefits.**

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# 6 TENTATIVELY SELECTED PLAN

## 6.1 Description of Plan

The TSP was developed following an analysis of project alternatives, including a CE/ICA. The TSP is the Intermediate Alternative (Figure 7), which includes the:

- Shoreline Protection with GSR (6,000 ft)
- Excavation At Varying Depths (252,500 CY)
- Moist Soil Unit Creation (16 acres) with Stoplog Water Control Structures (three, 20” CMP)
- Scour Structures (two)
- Hard Points (twelve)
- Backwater Excavation (EPM) (28,000 CY)
- Island Creation (18 acres)
- Barbs (seven)

Quantities provided in parathesis are estimates for planning purposes and are subject to change during PED refinement.

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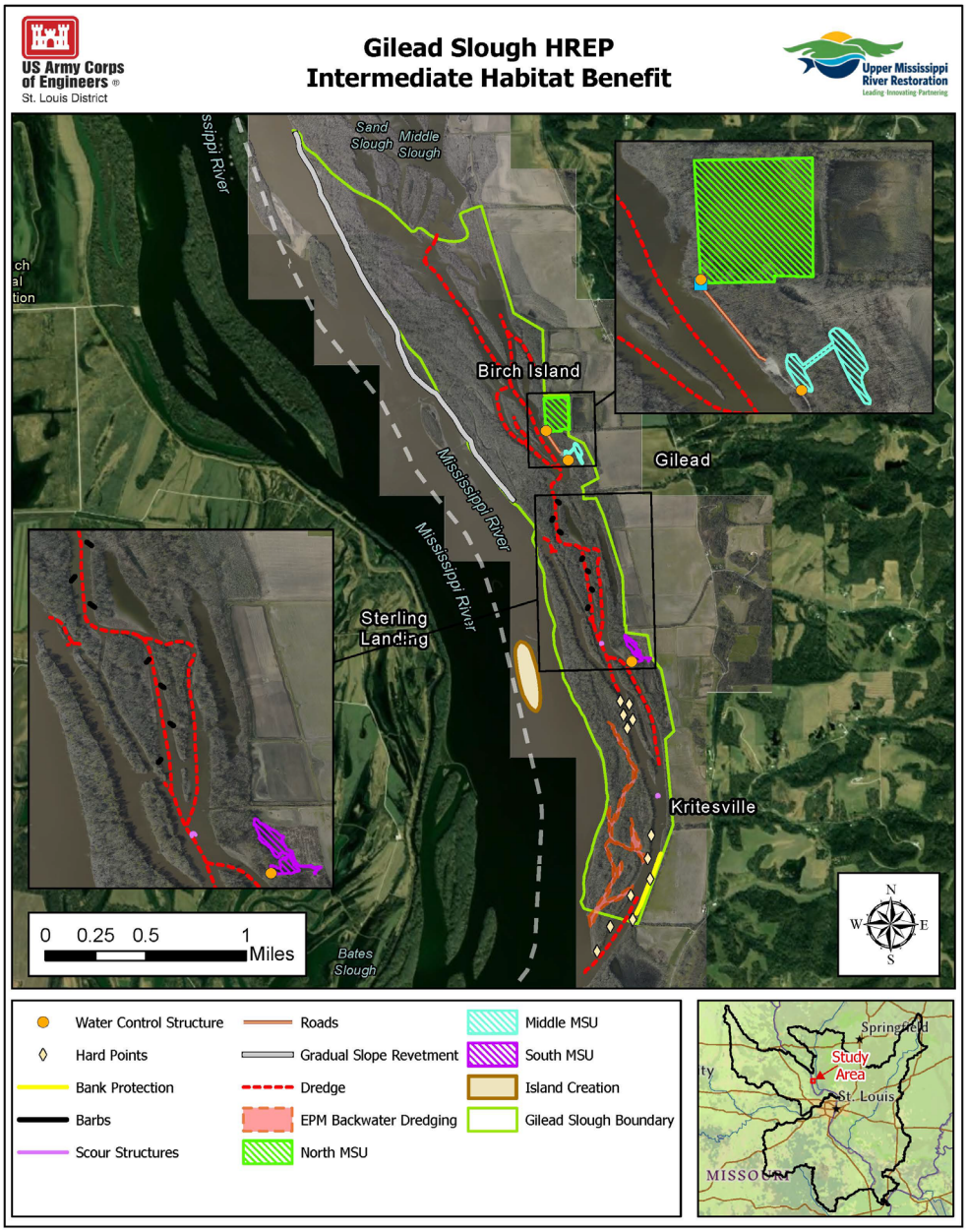


Figure 7. Tentatively Selected Plan

Table **17** presents the Project Implementation Schedule. The dates provided in the table are accurate as of the writing of this report, but are subject to change

Table 17. Project Implementation Schedule

| Event | Scheduled Date |
|---|---|
| Public Review of Draft Report | 1/13/2026 |
| Submit Final FR/EA to MVD | 07/10/2026 |
| Approved Final FR/EA from MVD | 11/20/2026 |
| Execute the Memorandum of Agreement with the Sponsor | |
| Initiate Design | |
| Complete Design | |
| Initiate Construction | |
| Complete All Construction Stages | |

The details of the estimated quantities developed for the design of the TSP can be found in Appendix L - Civil Engineering. A summary of estimated quantities is located in Table **18**.

Table 18. Estimated Quantities for the TSP Measures

| Measure | Cut (CY) | Fill (CY) | Concrete (CY) | Stone (TN) |
|---|---|---|---|---|
| Shoreline Protection | 12,730 | 640 | 0 | 17,180 |
| Channel Excavation | 252,420 | 0 | 0 | 0 |
| Moist Soil Unit | 4,410 | 18,290 | 0 | 2,260 |
| Water Control Structures | 0 | 0 | 10 | 50 |
| Scour Structures | 0 | 0 | 0 | 1,960 |
| Hard Points | 170 | 0 | 0 | 15,660 |
| Backwater Excavation | 27,960 | 0 | 0 | 0 |
| Island Creation | 0 | 216,110 | 0 | 38,030 |
| Barbs | 20 | 0 | 0 | 340 |
| Bank Protection | 0 | 0 | 0 | 2,230 |
| **Total** | **297,710** | **235,040** | **10** | **77,710** |

Note: Quantities are rounded to the nearest tenth. See Appendix L for detailed quantities.

## 6.2 Cost Estimates

Table **19** presents the Project first cost. Quantities and costs will be refined during final design. A full description of the cost estimate, including all related elements, can be found in Appendix J - Cost.

Table 19. Project Design and Construction Cost Estimates (October 2025 Price Level)

| Account | Measure | Project First Cost |
|---|---|---|
| 01 | Lands and Damages | $84,000 |
| 06 | Fish and Wildlife Facilities | $15,425,000 |

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| Account | Measure | Project First Cost |
|---|---|---|
| 30 | Planning, Engineering and Design | $6,277,000 |
| 31 | Construction Management | $1,543,000 |
| | Project Cost Estimates | $23,329,000 |

The annualized costs and AAHUs were used to calculate a total annual cost per average annual habitat unit (Table **20**). The total cost per habitat unit is $4,663. The costs used for analysis purposes include total Project costs, IDC, and annualized OMRR&R, adaptive management, and monitoring costs.

Table 20. Total Annual Cost per Average Annual Habitat Unit

| Analysis Element | Total |
|---|---|
| Project First Cost ($) | $23,329,000 |
| IDC ($) | $615,000 |
| Total Economic First Costs ($) | $24,467,000 |
| Annualized Economic First Cost ($) | $919,000 |
| Annual O&M ($) | $675 |
| Annual Adaptive Management ($) | $103,000 |
| Total Annual Costs ($) | $919,000 |
| AAHUs | 197 |
| Total Annual Cost/AAHU ($) | $4,663 |

Costs for post-construction evaluation are provided in Appendix E – Monitoring and Adaptive Management. Performance monitoring and adaptive management are funded by the Project. Monitoring to support Long-Term Performance Reporting starts following the completion of performance monitoring and adaptive management (approximately 10 years), if implemented, except for water quality monitoring. Long-term performance reporting is a UMRR Program cost and not included in the Gilead Slough HREP cost estimate.

## 6.3 Design Considerations

The study has been developed to a feasibility level of design. Design details are included in the engineering appendices and all proposed measures were modeled to increase the likelihood of project success. As with all feasibility level studies, these details will be refined further in the Pre-Construction Engineering and Design (PED) stage.

During PED, the USACE and USFWS will complete the detailed engineering and technical analysis needed to begin construction of the project as recommended in this decision document. This includes engineering design documentation and the plans and specifications. Further refinement and any necessary changes to the TSP will occur during PED.

### 6.3.1 Surveys

Coordination for collection of any additional survey data will be initiated during the PED

phase and will be conducted as need is determined and water levels allow. Determination of the survey needs are ongoing.

### 6.3.2 Geotechnical Explorations

Existing subsurface information at the Project location is limited. Drilling, sampling, and testing of the soils is expected in support of the MSU berm construction that is part of the TSP. Subsurface information will be used to determine the subsurface stratigraphy and develop design soil profiles and engineering properties for geotechnical design of TSP features. Sampling of dredge material will also be needed to determine soil classification and suitability as borrow material. Dredged soils will be saturated and will need to be dried out prior to using as borrow material. Dry time will significantly impact the project schedule.

### 6.3.3 Hydraulics & Hydrology

Design of the Project features will continue to require input from hydraulic engineers. Additional hydraulic modeling may also be utilized to inform design concerns that may come up during PED.

### 6.3.4 Civil

#### 6.3.4.1 Planning Level of Design

The Planning process did not include Civil engineering design of features beyond a conceptual level. Features were quantified using OpenRoads Designer. Quantities were extrapolated from this minimal information to provide a feasibility level of design. After discussion of risks associated with the current conceptual design, it was determined that additional design refinement should be completed early in PED, and no further refinements would be needed to complete the report during the feasibility phase while managing the associated risks. The remaining measures will also be designed and adjusted as needed to reduce impacts, manage construction costs, and maximize potential habitat benefits.

All existing access roads may remain in place to facilitate OMRR&R of the project features, as well as Monitoring and Adaptive Management (MAM). Any staging areas will be placed to limit disturbance to existing habitats, provide appropriate access to transfer materials and equipment to and from the construction site, and/or utilize existing operational areas.

#### 6.3.4.2 Scope of Design Phase

An Existing Conditions Terrain model will be created for use by Civil Design and Hydraulics PDT members. This data will be used to model the proposed conditions, to develop detailed quantity estimates, and for generating plans.

All features from the TSP will be designed based on this terrain, aerial imagery, and site visits to the feature locations to identify potential design conflicts and opportunities. All features will be designed in detail and adjusted as needed to reduce impacts, manage construction costs, and maximize potential habitat benefits during Design.

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## 6.4 Construction Considerations

This section provides a summary of critical construction considerations, with more detail (construction sequence, etc.) provided in Appendix L – Civil Engineering.

### 6.4.1 Protected Species

#### 6.4.1.1 Bald Eagles

Consideration would be given during design preparation to sequence construction activities in a manner that minimizes impacts to Bald Eagles. A 660 feet buffer would be utilized under instances of direct line of site during the active nesting season according to the National Bald Eagle Management Guidelines. Staging of equipment would not be allowed within a 660 feet buffer of a known nest. Additional coordination with the USFWS would be conducted during the design phase to account for changes in conditions in the study area relative to proposed project measures prior to or during construction.

#### 6.4.1.2 Tree Clearing Restrictions

Removal of trees with a diameter at breast height of at least three inches will be restricted to a period between November 1st to March 31st of any given year. Should any tree removal require removal of the root ball as opposed to cutting off the tree at the stump, then the MVS Cultural resources specialist will be contacted prior to removal.

#### 6.4.1.3 Migratory Wildlife

In accordance with EO 13186, take of migratory birds protected under the MBTA should be avoided or minimized, to the extent practicable, to avoid adverse impact on migratory bird resources. Only minimal tree clearing necessary to achieve project measures will be allowed. Areas of soil disturbance will be graded and seeded with a native seed mix to restore them to a pre-project condition.

### 6.4.2 Air Quality

Diesel emissions and fugitive dust during project construction may pose environmental and human health risks and should be minimized. Applicable protective measures as outlined in USEPA's "Construction Emissions Control Checklist" would be followed.

### 6.4.3 Permits

Laws of the United States and State of Illinois have assigned the USACE and Illinois with specific and different regulatory roles designed to protect the waters within and on the State's boundaries. Protecting Illinois' waters is a cooperative effort between the applicant and regulatory agencies.

#### 6.4.3.1 Section 404/401 Compliance

The District is compliant with Section 404 and 401 of the Clean Water Act. See Appendix D – Clean Water Act for more details. Based on this evaluation, the project qualifies for a Nationwide 27 permit for Ecosystem Restoration. The Nationwide 27 permit includes general conditions that meet IDNR Section 401 water quality

certification requirements. Therefore, the necessary Section 401 water quality certification would be achieved through the associated Nationwide 27 permit conditions.

### 6.4.4 Schedule Constraints

Scheduling of construction contracts would depend on availability of funds. The following documents constraints related to construction:

- During hunting seasons, construction activities may be limited to certain areas.
- Construction staging and access points to project measures would be defined during Plans and Specifications to avoid and minimize potential impacts to wetland resources.
- Coordination with USFWS personnel is required prior to working during hunting seasons.
- Construction activities and other sources of disturbance would be avoided within a 660-foot buffer area from any eagle nests, when active.
- In accordance with EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, take of migratory birds protected under the MBTA should be avoided or minimized, to the extent practicable, to avoid adverse impact on migratory bird resources.

### 6.4.5 Access & Staging

Construction will be mostly river-based using barges to transport equipment and material. In the case that land access is needed, the site can be accessed by using W Gilead Ln from N Mississippi River Rd. Existing roads are anticipated to be adequate for construction. Access will be further investigated during PED.

The location of the staging area will be determined during PED. Staging location will be determined based on distance, accessibility, right of way, and environmental considerations. No permanent staging areas are anticipated.

All areas of soil disturbance would be evaluated for historic and cultural impacts prior to construction.

Any tree clearing that would be required for access and staging would follow the bat restriction dates – all clearing must occur between November 1st and March 31st of any given year.

Should any construction activities for access and staging be situated within 660ft of any bald eagle nests, coordination would be conducted with USFWS as stated in Section 6.4.1.1.

All areas of soil disturbance would be reseeded with a native seed mix appropriate to the area and regraded to their pre-construction contours and condition.

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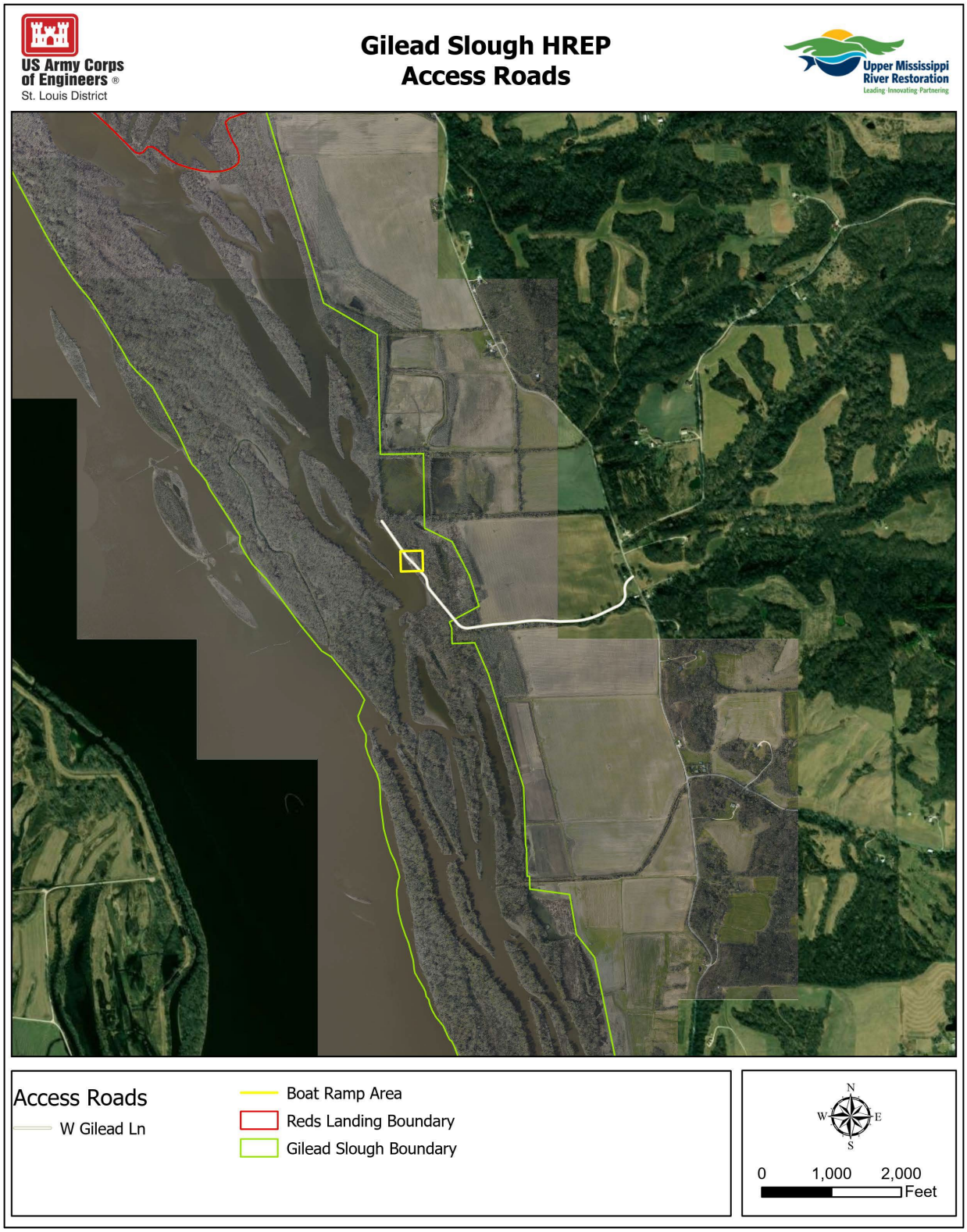


**Figure 8 Gilead** Slough Access and Staging Layout

### 6.5 Real Estate Considerations

All project lands are owned by the United States of America and managed by USFWS, who is serving as the sponsor. USACE reserves all land rights that are not specifically granted per the terms of the applicable Cooperative Agreement. All Project measures are located on lands in which the US government holds Fee and Easement rights on. These rights are managed by the USACE and USFWS, as part of the General Plan Lands Agreement.

This project may require a temporary work area easement for staging area(s). All dredge materials will be excavated from within project waters and from existing soil within the project area. A Real Estate Plan is included as Appendix I – Real Estate.

### 6.6 OMRR&R Considerations

OMRR&R of UMRR HREPs is similar to that undertaken by the partner agencies in day-to-day management of parks, boat ramps, wildlife management areas, and other public use areas. OMRR&R is the responsibility of the Sponsor in accordance with Section 107(b) of WRDA 1992, Public Law 102-580. Upon completion of the construction as determined by the District Engineer, the Sponsor shall operate and maintain the Project as defined in this FR/EA and in the Project's OMRR&R Manual; 100 percent of all costs associated with the OMRR&R of the Project will be borne by the Sponsor.

This Project was designed to reduce overall operation costs and ensure low annual maintenance requirements. In general, operation is limited to periodic water surface elevation management by operation of the stoplog structure to ensure that the measures are performing as designed. Maintenance will include annual site inspections and general upkeep to the stoplog structure. In general, operations and maintenance, to include annual site inspections of the constructed features is an obligation of the sponsor. Maintenance requirements would be further detailed in the Project's OMRR&R Manual published after construction completion and preparation of as-built drawings, and prior to transferring the Project to the Sponsor.

The Sponsor is expected to maintain the HREP as outlined in the Memorandum of Agreement (MOA). Rehabilitation cannot be accurately measured during PED or construction phases. Rehabilitation is the reconstructive work that significantly exceeds the annual OMRR&R requirements and is needed as a result of major storms or flood events.

Table 21 lists the major OMRR&R components, their associated frequencies, and estimated costs.

Table 21. OMRR&R Considerations

| OMRR&R Component | Frequency of Action | Total Cost Over 50 Years |
|---|---|---|
| Site inspections / Stoplog Structure Operation | Annually | $33,750 |
| Total Cost | | $33,750 |

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| OMRR&R Component | Frequency of Action | Total Cost Over 50 Years |
|---|---|---|
| Average Annual Cost | | $675 |

## 6.7 Environmental Effects

The following sections describe the potential environmental effects (both adverse and beneficial) that the TSP may have on the resources addressed in Section 3, *Existing Conditions and Future Without Project Conditions*. The effects described in the following sections may be temporary or long-term in duration. Minor effects are typically considered negligible, while moderate adverse effects may be either avoided or counteracted by other actions that further enhance or benefit the resource. According to NEPA guidance, the meaning of significant effects varies with the context (where the action occurs) and intensity (how much damage or improvement the action causes). Non-significant effects means there is no substantial change to the resource, while significant effects may be beneficial or adverse. The effects of the TSP may furthermore occur immediately because of the action, occur later in time or removed in distance in response to the action, or may be reasonably expected to occur, given similar restoration actions within the UMRR Program.

No substantial negative effects are expected as a result of implementation of the TSP.

### 6.7.1 Short-Term Construction Effects

Short-term construction effects would include noise, vibration, dust, and emissions from the use of vehicles and equipment. Soil disturbance from temporary access roads, staging areas, and other construction activities would also occur. Aquatic habitats would experience temporary increases in turbidity as materials are either placed or removed.

### 6.7.2 Aquatic & Wetland Resources

#### 6.7.2.1 Collective discussion of effects (direct, indirect, and cumulative)

Construction disturbances would take the form of vehicles and heavy equipment used within the aquatic habitats. Excavators would be used to remove material in the MSU area, and these vehicles would move through terrestrial wetlands. A barge would be used to dredge material from the lake area and to place GSR stones along the Mississippi River bank. Any aquatic organisms in the vicinity of the GSR placement or dredging/excavation would be temporarily displaced. The GSR would bury any aquatic organisms that cannot move out of the path of the stones. The TSP would result in temporary minor adverse impact to aquatic habitat but permanent benefits in the years following construction. The lotic riverine habitat will be benefitted by the placement of GSR by stabilizing the riverbed material and providing structure and cover that can be used by a wider variety of aquatic organisms than what is available under existing conditions. The riverine backwater habitat would be benefitted through increased water depths and bathymetric diversity. Increased depths will reduce average water temperatures, increase dissolved oxygen, and provide thermal refugia for overwintering fishes. The increased bathymetric diversity would also create additional microhabitats within the backwaters for a greater diversity of aquatic organisms to exploit

#### 6.7.2.2 Environmental Commitments

Measures to minimize impact to aquatic habitat will be similar to those that minimize impact to water quality. All relevant BMPs to reduce runoff sediments will be implemented, including, but not limited to erosion control blankets, filter fences, and seeding disturbed areas with a fast-growing native seed mix. The dredging in the lake area would take place in the fall and winter to minimize impact to spawning bluegill.

### 6.7.3 Water Quality

#### 6.7.3.1 Collective discussion of effects (direct, indirect, and cumulative)

During the placement of GSR, the excavation, and dredging activities, the affected waterbodies would experience increased turbidity as material is placed and removed. The work on the access roads and berm would also create conditions that may cause soil runoff sediments to enter adjacent waterbodies. The TSP would cause temporary minor adverse impacts during construction but would also cause permanent benefits following construction.

#### 6.7.3.2 Environmental Commitments

Several BMPs to reduce runoff sediments are relevant to the proposed work including erosion control blankets, filter fences, and seeding disturbed areas with a fast-growing native seed mix.

### 6.7.4 Invasive Species

#### 6.7.4.1 Collective discussion of effects (direct, indirect, and cumulative)

The main factors driving the spread of invasive species would be the use of vehicles and equipment, soil disturbance, and tree removal. Vehicles and equipment can carry seeds of invasive species from one location to another if not properly cleaned before transport. Barges can likewise transport aquatic “hitchhikers” from one aquatic habitat to another. As vehicles move through the various terrestrial habitats, the disturbance to the topsoil layer can create conditions suitable for germination of invasive species. The tree removal need for access and staging could also create openings in the canopy, allowing more sunlight to reach the forest floor, which invasive species can easily take advantage of. Seed mixes used to restore areas of soil disturbance can also contain invasive or undesirable grass and forb species unless a proper native seed mix is used. The TSP would have minor adverse impacts to invasive species concerns.

#### 6.7.4.2 Environmental Commitments

Areas of soil disturbance would be revegetated with fast-growing grasses and forbs to hinder the spread of invasive species that would respond to the disturbance event. Contractors will be required to use an appropriate native seed mix that does not contain invasive species. Construction specifications would include BMP’s and measures to

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greatly reduce or eliminate the introduction of aquatic hitchhikers on construction equipment and barge

### 6.7.5 Terrestrial Habitat

#### 6.7.5.1 Collective discussion of effects (direct, indirect, and cumulative)

A small portion of the terrestrial floodplain habitat would be disturbed by the excavation of the MSU areas in Gilead Slough. Access and staging would require some amount of tree clearing. The TSP would have temporary minor adverse impacts to terrestrial habitat. Terrestrial species such as birds, mammals, and amphibians would benefit from higher quality wetland habitat and food resources generated by the MSU's moist soil vegetation. Forest birds and bat species would experience a temporary decline in habitat availability from the tree clearing, but it would be limited in quantity, as it would only be required for access and staging. Forest resources would otherwise be untouched by the TSP, so this adverse impact would be considered minor and temporary.

#### 6.7.5.2 Environmental Commitments

Adverse impacts to forest bat species would be minimized by adhering to the winter tree clearing restriction. Tree clearing would only be allowed between 01 November to 31 March to avoid the time of year when bats are roosting in trees. Selection of staging areas and temporary access roads would be such that the fewest trees feasible would be removed. Areas of disturbed soil would be revegetated with an appropriate native seed mix that includes fast-growing forbs and grasses.

### 6.7.6 Threatened & Endangered Species

#### 6.7.6.1 Collective discussion of effects (direct, indirect, and cumulative)

The District has made a NLAA determination for the Indiana bat, tricolored bat, Spectaclecase mussel, western regal fritillary, and decurrent false aster. A determination of "not likely to jeopardize the continued existence of" was made for the monarch butterfly. The construction disturbance will cause temporary, minor adverse impacts in the form of vibration and noise. The vibration and noise could disturb bats roosting and foraging nearby. The movement of construction equipment may temporarily interfere with monarch or western regal fritillary foraging behavior, but foraging habitat would not be disturbed by any action alternative. The action alternatives will cause soil disturbance, which may provide an opportunity for decurrent false aster to become established in wet roadside areas. See Appendix C – Biological Assessment for more details.

#### 6.7.6.2 Environmental Commitments

Targeted mussel surveys would be needed to inform placement of GSR in order to avoid impacts to Spectaclecase mussel. Tree clearing restrictions for staging areas and access would follow the guidelines listed in Sections 6.4.1.2. and 6.7.5.2. See Appendix C – Biological Assessment for additional BMPs for terrestrial species.

### 6.7.7 State Listed Species

#### 6.7.7.1 Collective discussion of effects

The Illinois DNR's Ecological Compliance Assessment Tool was used to determine the presence of natural resources within the affected habitats in the study area. On 9 September 2025, the EcoCAT tool was used to generate report #2604814. The report provided a list of resources within the project area – the Batchtown Mussel Bed INAI Site, the Maple Island Bed INAI Site, the butterfly mussel, Indiana bat and northern long-eared bat. Impacts to the Indiana bat was discussed in the Biological Assessment

The northern long-eared bat may be beneficially affected should the floodplain forest communities at Gilead Slough continue to degrade into the future and provide more dead snag habitat. However, these impacts would not necessarily be a result of the TSP, as no forestry management is included in the measure of the TSP.

Butterfly mussel status in the study area would likely benefit from flow improvements by the channel excavation measures, and reduced sediment load by the GSR placed along the main channel border. The river channel habitat adjacent to the study area is currently considered suitable and is unlikely to change over time.

The two INAI sites are not within the study area and would not be affected. The TSP would have no effect on the state INAI sites. The IDNR responded with a letter dated September 15, 2025, with recommendations of mussel survey and tree clearing avoidance dates (letter is included in Appendix A – Coordination). Given that their recommendations are adopted, the IDNR determined that impacts to the protected resources identified in their letter are unlikely. The IDNR determined impacts to other protected resources in the vicinity of the project location were also unlikely.

#### 6.7.7.2 Environmental Commitments

Tree clearing restrictions will be followed to avoid adverse impacts to listed bat species. Mussel survey would be conducted prior to any placement of features into the riverbed to determine location and impact avoidance of any mussel resources.

### 6.7.8 Historic Properties & Cultural Resources

#### 6.7.8.1 Collective discussion of effects (direct, indirect, and cumulative)

No known historic properties will be affected by the TSP; However, with the potential for impact to unknown historic properties by temporary construction disturbance, the implementation of the UMRR/NESP PA will occur prior to construction. All attempts will be made to avoid historic properties identified at this time per Section 3D 1 of the PA.

#### 6.7.8.2 Environmental Commitments

If historic properties are identified within the APE and a finding of adverse effect to historic properties is determined, USACE shall consult with Applicable Consulting Parties to determine appropriate avoidance, minimization, and/or mitigation measures to address the adverse effects. If through consultation with Applicable Consulting Parties, the USACE modifies the Program undertaking to avoid adverse effects to historic properties, the USACE shall document the actions utilized to eliminate the potential

adverse effects in a revised finding of "No Adverse Effect to Historic Properties", which must receive concurrence from the consulting parties pursuant to Stipulation III.D.3 of the PA. Once concurrence is achieved, USACE will have no further obligations for the undertaking

### 6.7.9 Tribal Resources and Coordination

#### 6.7.9.1 Collective discussion of effects (direct, indirect, and cumulative)

No known historic properties will be affected by the TSP; However, with the potential for impact to unknown historic properties by temporary construction disturbance, the implementation of the UMRR/NESP PA will occur prior to construction. All attempts will be made to avoid historic properties identified at this time per Section 3D 1 of the PA.

#### 6.7.9.2 Environmental Commitments

If historic properties are identified within the APE and a finding of adverse effect to historic properties is determined, USACE shall consult with Applicable Consulting Parties to determine appropriate avoidance, minimization, and/or mitigation measures to address the adverse effects. If through consultation with Applicable Consulting Parties, the USACE modifies the Program undertaking to avoid adverse effects to historic properties, the USACE shall document the actions utilized to eliminate the potential adverse effects in a revised finding of "No Adverse Effect to Historic Properties", which must receive concurrence from the consulting parties pursuant to Stipulation III.D.3 of the PA. Once concurrence is achieved, USACE will have no further obligations for the undertaking

### 6.7.10 Hazardous, Toxic, and Radioactive Waste

#### 6.7.10.1 Collective discussion of effects (direct, indirect, and cumulative)

The Phase I Environmental Site Assessment did not identify any HTRW sites of interest. Therefore, the action alternatives would not disturb any known HTRW sites. The TSP would have no effect on HTRW sites.

#### 6.7.10.2 Environmental Commitments

Although the likelihood is low, there is still a potential of encountering hazardous substances during the proposed work. If HTRW material is encountered at any point during the proposed actions, HTRW discovery provisions in the Activity Hazards Analysis (AHA) should be followed and the USACE Environmental Quality Section should be contacted immediately to assess the conditions. USACE does not and cannot represent that the site contains no hazardous waste or material, including petroleum products.

### 6.7.11 Soils, and Prime or Unique Farmland

#### 6.7.11.1 Collective discussion of effects (direct, indirect, and cumulative)

Several of the soil types found within the study area are considered prime farmland,

including the Tice silt loam, Drury silt loam, Stookey silt loam, and Raddle silt loam. There are also several soil types that would be prime farmland if drained and protected from flooding including Haymond silt loam, Wakeland silt loam, and Orion silt loam. The excavation in the MSU area would remove some of these soil types in order to create the unit and berm. However, the study area is public land and would not be available for farming. The TSP would cause temporary minor adverse impacts to soils during construction by the movement of large, tracked vehicles and equipment. The TSP would cause permanent minor adverse impact to prime farmland.

#### 6.7.11.2 Environmental Commitments

The contractor will create a Stormwater Pollution Prevention Plan prior to construction to account for the greater than one acre of soil disturbance. BMPs will be used to arrest erodible soils from washing away from work areas. Staging areas would be restored to their pre-construction grade and soil condition.

### 6.7.12 Hydraulics & Hydrology

#### 6.7.12.1 Collective discussion of effects (direct, indirect, and cumulative)

The proposed measures are expected to cause localized differences to hydraulics and hydrology. Dredging in the project area will likely increase water flow through the area. The river structures (barbs, hardpoints, and scour structures) will have localized effects of increased aggradation and degradation, creating a more varied substrate. The island will likely create a flow split at the upstream end and an area of decreased velocities at the downstream end. The MSU's will be designed to retain water within their footprints. With dredging in the backwater channels and the addition of new river structures in some areas of the project, this may create an increase in flow in some portions of the channels while also seeing a decrease in flow in other areas. With these conditions, it will allow for more habitat diversity within the backwater channels.

Illinois state guidelines dictate that in rural areas such as the project site, proposed features may not cause more than 0.5 ft of rise in water surface elevation under a 1% AEP **Invalid source specified.**. Appendix G describes the "no rise" evaluation. Preliminary results showed that most water surface elevations for the cross sections were less than the maximum allowable rise. Further investigation of 'no rise' will be conducted in the design phase of this project.

#### 6.7.12.2 Environmental Commitments

There are no environmental commitments for hydraulics and hydrology.

### 6.7.13 Resiliency

#### 6.7.13.1 Collective discussion of effects (direct, indirect, and cumulative)

The implementation of the TSP would not have an adverse effect on overall resiliency. The overall patterns of hydrometeorological trends would not be altered by the implementation of the TSP. The substantial permanent improvements made to the

habitats within the study area would also increase the resiliency of those habitats to future flood events. In this way, the TSP would provide benefits to resiliency concerns.

#### 6.7.13.2 Environmental Commitments

The features of the TSP would be designed with resiliency in mind. **Table 22** indicates potential residual risks for this project related to changes in hydrometerological variables, along with a qualitative rating of how likely those residual risks are to materialize and undermine project features resulting in hard to the study area. See Appendix H – Resiliency Assessment for more details.

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Table 22. Residual Risks Related to Resiliency

| Project Feature | Trigger | Hazard | Harm | Qualitative Likelihood | Justification of Likelihood Rating |
|---|---|---|---|---|---|
| Backwater Habitat- Dredging, Excavation, Connection | Decreased discharge and WSE | Future droughts may increase sedimentation rates. | Increased sedimentation may decrease available habitat area in backwaters. | Unlikely | Proposed design will ensure necessary depth for overwintering habitat and provide connections for backwater habitat. It is unlikely that increased droughts will increase the severity of sediment deposition. |
| Shoreline Protection with Gradual Slope Revetment | Increased discharge and WSE | Future flood velocities and elevations may be higher. | Increased discharge and velocity will increase the shear stress on shoreline projection features and may overtop protected features. | Very Unlikely | Riprap is sized and graded to ensure a robust design, reduce project feature damage, and provide habitats. |
| Moist Soil Unit | Decreased discharge and WSE | Water volumes and depth may be lower than at present. | Lower WSE within moist soil unit has the potential to dry out moist soil unit features | Very Unlikely | Water control structures with stoplog will be constructed within moist soil unit to provide water level management. Berms will be above ordinary high water, be compacted, include additional topsoil, and vegetated to slow the rate of erosion. |
| Substrate Diversity - Rock-Gravel Substrate | Increased discharge and WSE | Future flood volumes may be greater than at present. | Higher flows may cause erosion of substrate placed within the backwater channels. | Very Unlikely | Proposed design would ensure quality habitat for mussels and fisheries. |
| River Training Structure – Barbs, Hard Points, Scour Structures | Increased discharge and WSE | Future flood velocities and elevations may be higher. | Flow may overtop rock structures more frequently causing erosion of the backwater channels. | Very Unlikely | Riprap is sized and graded to ensure a robust design and reduce project feature damage. Orientation of rock structures are designed to withstand high flows. |
| Island/Sandbar Creation | Increased discharge and WSE | Future flood volumes may be greater than at present. | This will extend the duration and extent of island inundation resulting in habitat degradation and erosion. | Unlikely | The island design height would be set at an elevation slightly above normal pool that would be conducive to establishment of desired floodplain plant communities |
| Improved Existing Roads & Berms | Increased discharge and WSE | Water volumes and depth may be higher than at present. | Higher WSEL has the potential to overtop and/or erode levee and berm features. | Unlikely | Berms will have continuous riprap around shorelines to minimize high stage impacts and include additional topsoil to slow the rate of erosion. |

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### 6.7.14 Air Quality

#### 6.7.14.1 Collective discussion of effects (direct, indirect, and cumulative)

The proposed measures are not expected to cause Calhoun County, Illinois, to lose attainment status for any air quality criteria. During construction, the use of vehicles and heavy equipment would create localized dust and emissions. The TSP would result in temporary minor adverse impact to air quality.

#### 6.7.14.2 Environmental Commitments

All relevant BMPs to reduce excess dust and equipment emissions would be implemented. Dust control BMPs may include watering down exposed soils, applying dust suppressants, and covering stockpiles of material. BMPs to reduce vehicle/equipment emission may include reducing idling time, proper traffic management to reduce congestion, and the use of particulate matter filters.

### 6.7.15 Socioeconomics

#### 6.7.15.1 Collective discussion of effects (direct, indirect, and cumulative)

Socioeconomic factors in the local area are likely to remain similar to existing conditions. However, the TSP would have some recreational benefits. Recreational benefits are expected to increase under all action alternatives due to improvements in habitat diversity and access though restoration activities within the Gilead Slough area. These changes are likely to lead to increased and improved hiking, bird-watching hunting and fishing opportunities.

#### 6.7.15.2 Environmental Commitments

The TSP would have no effect on local demographics; therefore, no environmental commitments are proposed.

### 6.7.16 Noise

#### 6.7.16.1 Collective discussion of effects (direct, indirect, and cumulative)

Construction of the proposed measures would cause minor and temporary adverse impacts that would cease following construction. Noise would be generated by the operation of heavy machinery, vehicles, and chainsaws. Following construction, there would be no additional sources of noise beyond what already exists on the area (e.g. nearby commercial barge traffic, recreational boating and hunting noise as discussed in Section 3.3.15.).

#### 6.7.16.2 Environmental Considerations

No environmental commitments are proposed because the impacts are temporary and minor and there are no sensitive noise receptors that would be adversely impacted.

## 6.8 Compliance with Environmental Statutes

Status of compliance activities with environmental protection statutes, regulations, and guidelines is listed in Table 23 below. Remaining compliance activities will be completed as construction limits and timelines develop with enough detail to properly coordinate

any potential effects related to the TSP within and/or adjacent to the study area. NEPA compliance will be substantially complete upon the signing of the FONSI.

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the USFWS provided a list of six federally threatened, endangered, or candidate species that could potentially be found in the area (Calhoun County, IL) via a letter dated May 30, 2024, and updated on September 4, 2025 (IPAC report); see Appendix C - Biological Assessment, for more details. The listed species, federal protection status, and habitat descriptions can be found below in Section 3.3.5. No critical habitats are identified within the project area. In response to our Public Review period, the USFWS concurred with our determination of effects in a letter dated XX, 202X.

The USFWS Ecological Services Office provided a Draft Fish and Wildlife Coordination Act Report (FWCAR) on November 05, 2025, for the project that was reviewed and concurred by IDNR and USFWS (Appendix A - Coordination).

The Migratory Bird Treaty Act (MBTA) prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the DOI USFWS. The project lies within the Mississippi Flyway, an important route for migratory birds. The proposed habitat restoration would provide substantial permanent benefit to migratory birds. In order to be compliant with the MBTA, the USFWS will be consulted with during the Public Review period to provide guidance on how to minimize or eliminate adverse impact to migratory birds.

Although the bald eagle (*Haliaeetus leucocephalus*) was removed from the federal list of threatened and endangered species in 2007, it continues to be protected under the MBTA and the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA prohibits unregulated take of bald eagles, including disturbance. There are currently no bald eagle nests known near the proposed work areas. However, should new nests be located in the project area, then the USFWS will be contacted, and the protection guidelines would be implemented to include a permit, if the USFWS deems it necessary.

Table 23. Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements

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| Federal Environmental Protection Statutes and Requirements | Applicability/ Compliance 1/2/3 |
|---|---|
| Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq. | Full Compliance |
| Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq. | Full Compliance |
| Clean Water Act, Sections 404 and 401 | Full Compliance |
| USACE Planning Guidance Handbook (ER 1105-2-103) | Full Compliance |
| Endangered Species Act of 1973, as amended, 16 S.C. 1531, et seq. | Partial Compliance |
| EO 11988 – Floodplain Management | Full Compliance |
| EO 11990 - Protection of Wetlands | Full Compliance |
| EO 13112 - Invasive Species | Full Compliance |
| Farmland Protection Policy Act. 7 U.S.C. 4201, et seq. | Full Compliance |
| Federal Water Protection Recreation Act, 16 U.S.C. 460-(12), et seq. | Full Compliance |
| Fish and Wildlife Coordination Act, 16 U.S.C. 601, et seq. | Partial Compliance |
| Land and Water Conservation Fund Act, 16 U.S.C. 460/-460/-11, et seq. | Full Compliance |
| National Environmental Policy Act, 42 U.S.C. 321, et seq. | Partial Compliance |
| National Historic Preservation Act, 16 U.S.C. 470a, et seq. | Full Compliance |
| Rivers and Harbors Act, 33 U.S.C. 403, et seq. | Full Compliance |
| Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq. | N/A |
| Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq. | N/A |

[1] Full Compliance = having met all requirements of the statute for the current stage of planning
[2] Partial Compliance = having met some requirements of the statute for the current stage of planning or anticipate full compliance at completion of planning (additional information below)
[3]Not Applicable = no requirements for the statute or Project does not contain resources applicable to the law

## 6.9 Post-Construction Evaluation

Per Section 2039 of WRDA 2007, monitoring for ecosystem restoration studies will be conducted to determine Project success. “Monitoring includes the systematic collection and analysis of data that provides information useful for assessment of Project performance, determining whether ecological success has been achieved, or whether adaptive management may be needed to attain Project benefits.” This section summarizes the post-construction evaluation plan, which includes performance monitoring, adaptive management, and long-term performance reporting, described in Table 24. See Appendix E - Monitoring and Adaptive Management, for a full description of post-construction evaluation, including performance monitoring, adaptive management activities, and long-term performance reporting.

Table **24**. Post-Construction Evaluation Description

| Monitoring Stage | Length of Time | Description | Funding Source |
|---|---|---|---|
| Post-Construction Evaluation: Performance Monitoring | 10 years | For entire Project, determine the degree to which the Project is meeting the success criteria and for informing potential adaptive management decisions | Project Cost |

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| Monitoring Stage | Length of Time | Description | Funding Source |
|---|---|---|---|
| Post-Construction Evaluation: Adaptive Management | 10 years | Provides a process for making decisions in the face of uncertainty and learning from outcomes of management actions; may improve the performance of a designed construction measure that is not meeting performance criteria | Project Cost |
| Post-Construction Evaluation: Long-Term Performance Reporting | 50 years | For entire Project, demonstrates the ability to meet Project success criteria through the period of analysis, inform OMRR&R, and provide basic data for planning and UMRR Program purposes | UMRR Program Cost |

Other factors may be considered to evaluate Project performance and success. Appendix E- Monitoring and Adaptive Management (MAM) Plan provides a detailed discussion of post-construction monitoring and adaptive management of the measures proposed in the TSP. The appendix provides the post-construction evaluation plan, which displays several specific parameters and the levels of enhancement that the Project hopes to achieve.

### 6.10 Environmental Operating Principles (EOPs)

The EOPs outline the USACE's role and responsibility to sustainably use and restore our natural resources in a world that is complex and changing. The TSP meets the intent of the EOPs. The PDT proactively considered the environmental consequences of the proposed Project, as well as the benefits of the TSP. The Project would be constructed in compliance with all applicable environmental laws and regulations. The formulation of alternatives considered for implementation met all the EOP principles, including:

- 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;
- employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

### 6.11 Risk and Uncertainty

Areas of risk and uncertainty have been analyzed and were defined so that decisions

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could be made regarding the reliability of estimated benefits and the costs of alternative plans. Risk is defined as the probability or likelihood for an outcome. Uncertainty refers to the likelihood that an outcome results from a lack of knowledge about critical elements or processes that then contributes to risk or natural variability in the same elements or processes.

The PDT worked to manage risk in developing measures by expanding on and referencing successful similar work completed by previous HREPs and the Design Handbook. The PDT used that information, as well as subject matter expertise to identify possible risks and decrease uncertainty in plan formulation. No measures in the TSP are believed to be burdened by substantial risk or uncertainty regarding the eventual success of the proposed measures. Substantial risk would be avoided by proper design, appropriate selection, and correct seasonal timing of applications.

The PDT identified potential risk items and risk management activities associated with staging areas being located within culturally high probability areas with high potential for identification of previously unknown cultural sites. Through the use of the existing UMRR-NESP PA, USACE will fulfill its responsibilities following the program undertaking review process described in Sections III of the PA. This would include identification of historic properties, assessment of potential effect, and, if necessary, resolution of adverse effects. Through the existing PA, appropriate consultation and actions will take place.

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# 7 PUBLIC INVOLVEMENT, COORDINATION, AND CONSULTATION

Scoping is an early and open process for determining the range of issues to be addressed and for identifying the significant issues related to a proposed action. Scoping and coordination were conducted during the planning process using a variety of communication methods with the following state and federal agencies: USFWS, IDNR, and the Illinois Historic Preservation Office.

## 7.1 Coordination Meetings

This draft report reflects a collaboration of key partners and stakeholders. Numerous coordination and stakeholder meetings, as well as site visits, were conducted to discuss problems, opportunities, project goals and objectives, potential restoration measures, and expected outcomes with and without the proposed project. A scoping charrette was held January 30th and 31st, 2024, prior to the development of the study. Representatives from USFWS, IDNR, MDC, and USACE attended and provided input on project objectives, potential management measures, future conditions of the site, and identified resource issues. A full copy of the Planning Charrette report is available upon request. Site visits were conducted on April 12th, 2023, October 4th and 5th 2023, and August 15th, 2024. Additional meetings with key partners and stakeholders were held as needed, including a May 15th, 2024, meeting to provide updates and receive feedback from the sponsor for refinement of the alternatives and a March 13th, 2025, meeting to receive feedback on the TSP from the sponsor for refinement of the alternatives.

## 7.2 Coordination by Correspondence

The US government has a unique legal relationship with federally recognized American Indian tribes based on recognition of inherent powers of tribal sovereignty and self-government per EO 13175 Consultation and Coordination with Indian Tribal Governments (November 6, 2000). Communication with 22 federally recognized tribes that have an interest in this area was initiated with a USACE letter dated 8 August 2025, stating that no known historic properties will be affected but requesting if the nations had any information or indigenous knowledge that they would be able to share.

Copies of all tribal correspondence are provided in Appendix A - Coordination.

### 7.2.1 Public Views and Comments

In accordance with NEPA, the draft report with integrated EA will be available to interested members of the public during a 30-day public review period, yet to be scheduled. The report will be made available on the District's website and a letter will be mailed to interested members of the public identifying where to find the report, how to provide comments, and date of the public meeting/open house to be held. Comments received during public review will be incorporated into the report where appropriate, and copies of written comment received will be provided in Appendix A.

## 7.3 Views of the Sponsor

This section discusses the implementation responsibilities for USFWS (Sponsor) and

USACE. The responsibility for plan implementation and construction falls to USACE. USFWS would be responsible for OMRR&R for lands they manage as part of the project. Performance evaluation is a USACE responsibility and can be found in Appendix E - Monitoring and Adaptive Management.

A MOA is the formal agreement that would be entered into separately by USACE and USFWS before implementation of the project. The MOAs describe obligations for constructing, operation, and maintaining the implemented features of the Gilead Slough HREP. This project is 100% federally funded (per Section 906(e) of WRDA 1986) because it is taking place on federal lands managed by the sponsors. OMRR&R is the responsibility of the sponsors managing the lands per Section 107(b) of WRDA 1992.

### 7.3.1 US Army Corps of Engineers

USACE is responsible for study management and coordination with USFWS and other affected agencies. USACE will submit the feasibility report; program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration. USACE has agreed to support this HREP's monitoring, and data collection needs as outlined earlier in this report.

### 7.3.2 US Fish and Wildlife Service

Because the proposed project will be located on land managed by the USFWS, the Regional Director of the USFWS, Region 3, will determine whether the proposed project is compatible with NWR goals and objectives and the NWR Comprehensive Conservation Plan. The USFWS Regional Director will also determine if the USFWS approves the Plan for implementation and if, based on the facts and recommendations contain herein, whether the draft integrated FR/EA meets the USFWS's obligation under NEPA, the Fish and Wildlife Coordination Act (FWCA) of 1965, the ESA of 1973, the MBTA of 1918, and the Bald Eagle Protection Act of 1940. The USFWS has been a cooperating agency in the preparation of this EA and has been integral in the decision-making process.

The USFWS has actively participated in the planning process. The Sponsor is in support of implementation of the Intermediate Alternative as the TSP. OMRR&R is the responsibility of the USFWS and annual OMRR&R costs are estimated at $675 per year. The USACE will further specify activities in the Project OMRR&R Manual, which will be provided after construction completion of a functional portion of the project or separable element, as determined by the District Engineer to the USFWS.

Repair, rehabilitation and replacement considerations may extend outside of the typical 50-year period of analysis, as the USFWS is expected to maintain the HREP as outlined in the MOA. Rehabilitation cannot be accurately measured during design phase or construction stages. Rehabilitation is the reconstructive work that substantially exceeds the annual OMRR&R requirements and is needed as a result of major storms or flood events.

# 8 RECOMMENDATION

The TSP is the Intermediate Habitat Benefit Alternative, including GSR and shoreline protection, dredging, moist soil unit creation, scour structures, hard points, island creation, and barbs. The estimated Project first cost of the TSP is $23,329,000 (October 2025 price level), which includes monitoring costs of $9,625 and adaptive management costs of $3,489,000. Upon completion, the Sponsor is responsible for OMRR&R at an estimated annual cost of $675.

The expected outputs of the TSP include restoration of 397 acres of habitat. The TSP will contribute 197 net average annual habitat units for riverine, lacustrine, and wetland habitat types over the 50-year period of analysis.

I have weighed the outputs to be obtained from the full implementation of the Gilead Slough HREP against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. I recommend that the Gilead Slough Project be implemented as generally described in this report.

The recommendations herein reflect the information available at the time and current Department of the Army policies governing the formulation of individual projects. They do not reflect programming and budgeting priorities inherent in the formulation of national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are approved for implementing funding. However, prior to approval, the state, Federal agencies and other parties will be advised of any modifications and afforded the opportunity to comment.

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Andy J. Pannier
Colonel, U.S. Army
District Commander

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