

# Draft Environmental Assessment

Mud River Enhancement Project

Agassiz National Wildlife Refuge

June 2026

Prepared by Agassiz National Wildlife Refuge

ID 2026-0078489-NEPA-001

U.S. Department of the Interior

U.S. Fish and Wildlife Service

Midwest Region 3

Agassiz National Wildlife Refuge

Middle River, Minnesota



The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.



The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

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## ABBREVIATIONS

CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWS	<i>Clean Water Act</i>
DNR	Department of Natural Resources
EA	Environmental Assessment
FWS	United States Fish and Wildlife Service
JD	Judicial District
MBWSR	Minnesota Board of Water and Soil Resources
NEPA	<i>National Environmental Policy Act</i>
NWR	National Wildlife Refuge
MN DNR	Minnesota Department of Natural Resources
Refuge	Agassiz National Wildlife Refuge
RLWD	Red Lake Watershed District
SD	State Ditch
Service	United States Fish and Wildlife Service
SWCD	Soil and Water Conservation District
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
WMA	Wildlife Management Area

## DEFINITIONS

Biodiversity	Biodiversity, or biological diversity, refers to the variety and variability of all living organisms—including plants, animals, microorganisms, and the genetic differences within them—within a particular habitat or across the entire planet. It covers the complexity of ecosystems and the interactions between different species.
Environmental Assessment	A concise public document that a federal agency prepares, under the <i>National Environmental Policy Act</i> , to provide sufficient evidence and analysis to determine whether a proposed agency action would require preparation of an environmental impact statement or a finding of no significant impact.
Dredging and Excavation	Dredging and excavation are the two most common means of removing sediment from a waterbody (such as rivers, streams, lakes), either while it is submerged (dredging) or after water has been diverted or drained (excavation). Both methods typically necessitate transporting the sediment to a location for disposal. Dredging maintains or deepens water-filled channels, while excavation creates channels or improves dried old channels that, over time, have been filled with sediment.
Flashiness	Stream flashiness refers to how quickly a stream's water levels and flow rates rise and fall in response to precipitation. A "flashy" stream is highly responsive to storms, showing a rapid, sharp increase in flow during rain events, followed by a swift decrease, rather than a slow, gradual release.
Floodplain	Floodplains are areas adjacent to rivers, ponds, and lakes that are periodically flooded at different points in time. Floodplains are hydrologically important, environmentally sensitive, and ecologically productive areas that perform many natural functions. Floodplains frequently have high soil fertility since nutrients carried in floodwaters are deposited there during flood events. This encourages plant growth and creates wildlife habitat areas.
Fluvial Geomorphic Principles / Conditions	Fluvial geomorphic principles and conditions refer to the scientific study of how flowing water (fluvial) shapes the earth's surface (geomorphology) through the processes of erosion, sediment transport, and deposition. It focuses on the interactions between water, sediment, and the physical shape of river channels and their surrounding landscapes (floodplains and valleys).
Hydrology	Hydrology is the study of the properties of the earth's water and, especially, its movement in relation to land.

Monotypic	Refers to an area containing only one type of plant or animal species.
Outcompete	Outcompete means to displace another species in the competition for space, food, sunlight, or other resources, such as when a nonnative (exotic) plant species outcompetes native plants to form a monotypic plant community.
Riffle	A riffle is a shallow, fast-moving, and turbulent section of a river or stream where water flows over rocks, gravel, or cobble.
Riparian / Riparian Habitat	Riparian areas, or zones, are lands that occur along the edges of waterbodies, such as rivers, streams, and lakes. Riparian habitat includes streambanks, riverbanks, and floodplains occupied by plants and wildlife that prefer these particular areas.
Riverine / Riverine Wetland	Riverine describes areas along the banks of a river or stream. Riverine wetlands are found along the edges of rivers, streams, and creeks and include rivers, floodplains, marshes, and lakes.
Sediment	Sediment in water is a collection of suspended or dissolved solid materials—such as silt, sand, clay, and organic matter—that make water cloudy or gritty. Sediment can enter water supplies through storm runoff or natural erosion.
Sediment Flushing Events	Sediment flushing events are planned, high-flow water releases designed to scour and move accumulated sand, silt, and clay downstream. These events typically cause sudden, but temporary, intense increases in sediment concentration and altered flow conditions downstream. While this can temporarily reduce visibility for aquatic wildlife and disrupt habitats, it is often done to improve the natural flow of sediment required for ecosystem health in the long run.
Sinuosity	Sinuosity is a measure of how much a stream meanders or bends.
Turbidity	Turbidity is the measure of relative clarity or cloudiness of water, caused by suspended particles like silt, clay, organic matter, algae, and microbes.
Wetland	Wetlands are low-lying, transitional areas between land and water, defined by saturated soils, water-loving plants (hydrophytes), and high biodiversity. Wetlands are either permanent or seasonal. They play a vital role in improving water quality, controlling floods, providing habitat, and supporting the overall health and function of the ecosystem.

## EXECUTIVE SUMMARY

This Environmental Assessment (EA) for the Mud River Enhancement Project at Agassiz National Wildlife Refuge (NWR) analyzes a no-action alternative and one action alternative.

Alternative A. No Action. Currently, there are no management activities occurring in the Project Area, and there would continue to be no management actions now or in the future.

Alternative B. Proposed Action: Mud River Floodplain Enhancement and Channel Improvement (Preferred Alternative). The proposed action would use excavation and dredging as the primary activities to alter the existing flow of the Mud River; reconnect an historic Mud River channel; modify existing ditches with set-back levees or convert them to two-stage channels; excavate a floodplain along a new channel, which would expand the floodplain area; reduce current, and prevent future, infestations of reed canary grass and similar invasive plants; create physical features (such as bends or meanders) that would help streams manage high flows; create berms or mounds, from the repurposed dredged and excavated materials, to enhance existing habitat areas and create new upland and forested habitat communities.

The purpose of the proposed action is to improve the flow and discharge of water into and out of the Refuge, which would improve natural processes and habitat for aquatic, waterfowl, and migratory bird species and reduce sedimentation in Agassiz Pool to improve habitat quality.

This EA examines the potential environmental effects associated with the proposed action and complies with the *National Environmental Policy Act* (NEPA)<sup>1</sup> in accordance with the Department of the Interior NEPA regulations (43 Code of Federal Regulations [CFR] 46; 516 Department Manual [DM] 8), U.S. Fish and Wildlife Service policy (550 Service Manual 3), and other relevant regulations and requirements. NEPA requires examining the proposed action's effects on the natural and human environment.

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<sup>1</sup> Executive Order 14154, *Unleashing American Energy* (Jan. 20, 2025), and a Presidential Memorandum, *Ending Illegal Discrimination and Restoring Merit-Based Opportunity* (Jan. 21, 2025), require the Department to strictly adhere to the *National Environmental Policy Act* (NEPA), 42 U.S.C. §§ 4321 et seq. Further, such Order and Memorandum repeal Executive Orders 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023). Because Executive Orders 12898 and 14096 have been repealed, complying with such Orders is a legal impossibility. The FWS verifies that it has complied with the requirements of NEPA, including the Department's regulations and procedures implementing NEPA at 43 C.F.R. Part 46 and Part 516 of the Departmental Manual, consistent with the President's January 2025 Order and Memorandum. The FWS has also voluntarily considered the Council on Environmental Quality's rescinded regulations implementing NEPA, previously found at 40 C.F.R. Parts 1500–1508, as guidance to the extent appropriate and consistent with the requirements of NEPA and Executive Order 14154.

The following resources were analyzed in this EA: floodplains, wetlands, water quantity and quality, invasive plants, soils/sedimentation, aquatic wildlife, and streamside and upland habitat and wildlife.

The U.S. Fish and Wildlife Service initially considered several other resources, but they were ultimately dismissed from further analysis because neither the no-action alternative nor proposed action would impact those resources.

Based on the analysis presented in this EA and coordination and consultation with all appropriate federal, state, and local agencies, as well as federally recognized Native American Tribes, the U.S. Fish and Wildlife Service has determined that the impacts associated with the proposed action and its alternative would not individually or cumulatively have a significant impact on the quality of the natural and human environment.

This draft EA is available for public comment from June 1 to June 30, 2026. Public comments and agency responses will be available in Appendix B of the final EA.

Intraservice *Endangered Species Act* Section 7 consultation was initiated on April 23, 2026, and was completed on May 23, 2026.

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## CHAPTER 1. INTRODUCTION

### 1.1 BACKGROUND

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System, the purposes of an individual refuge, federal laws and executive orders, U.S. Fish and Wildlife Service policy, and international treaties. Relevant guidance includes but is not limited to the *National Wildlife Refuge Administration Act of 1966*, as amended by the *National Wildlife Refuge System Improvement Act of 1997* (16 United States Code [U.S.C.] 668dd et seq.); the *Refuge Recreation Act of 1962*; and selected portions of the Code of Federal Regulations (CFR) and the U.S. Fish and Wildlife Service manual. See Appendix A for a list of relevant statutes and executive orders.

The mission of the National Wildlife Refuge System, as outlined by the *National Wildlife Refuge System Administration Act of 1966*, as amended by the *National Wildlife Refuge System Improvement Act of 1997* (16 U.S.C. 668dd), is to

*administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.*

The *National Wildlife Refuge System Improvement Act of 1997* directs the Secretary of the Department of the Interior to ensure that refuges are fulfilling the intended mission of the refuge system and the purposes of individual refuges (16 U.S.C. 668dd(5)(a)(3)(A-M)).

Agassiz National Wildlife Refuge (“NWR” or “Refuge”) was originally established by President Franklin D. Roosevelt in 1937 and is managed by the U.S. Fish and Wildlife Service (FWS) as part of the National Wildlife Refuge System. Specifically, the primary purpose of Agassiz NWR is to be “a refuge and breeding ground for migratory birds and other wildlife.” Currently, the Refuge consists of 61,500 acres of wetland and upland habitats in northwestern Minnesota. The Refuge lies in the aspen parkland transition zone between the boreal forest to the north and east and the tallgrass prairie to the south and west. The Refuge contains 26 wetland impoundments that range in size from 30 to 9,000 acres. The Refuge provides a variety of habitats and breeding grounds for nesting and migrating birds and numerous waterfowl species, with 298 bird species recorded, and is also home to 49 species of mammals, 12 species of amphibians, and 9 species of reptiles. Two natural lakes lie within 4,000 acres of black spruce-tamarack bog, which has been designated by Congress as the Agassiz Wilderness under the *Wilderness Act of 1964* (16 U.S.C. 1131 et seq.). The Refuge is also noted for two resident packs of gray wolves, nesting bald eagles, occasional moose, and colonial nesting birds, specifically Franklin’s gulls. Figure 1 and Figure 2 show the location of the Refuge.

Figure 1. Location of Agassiz NWR

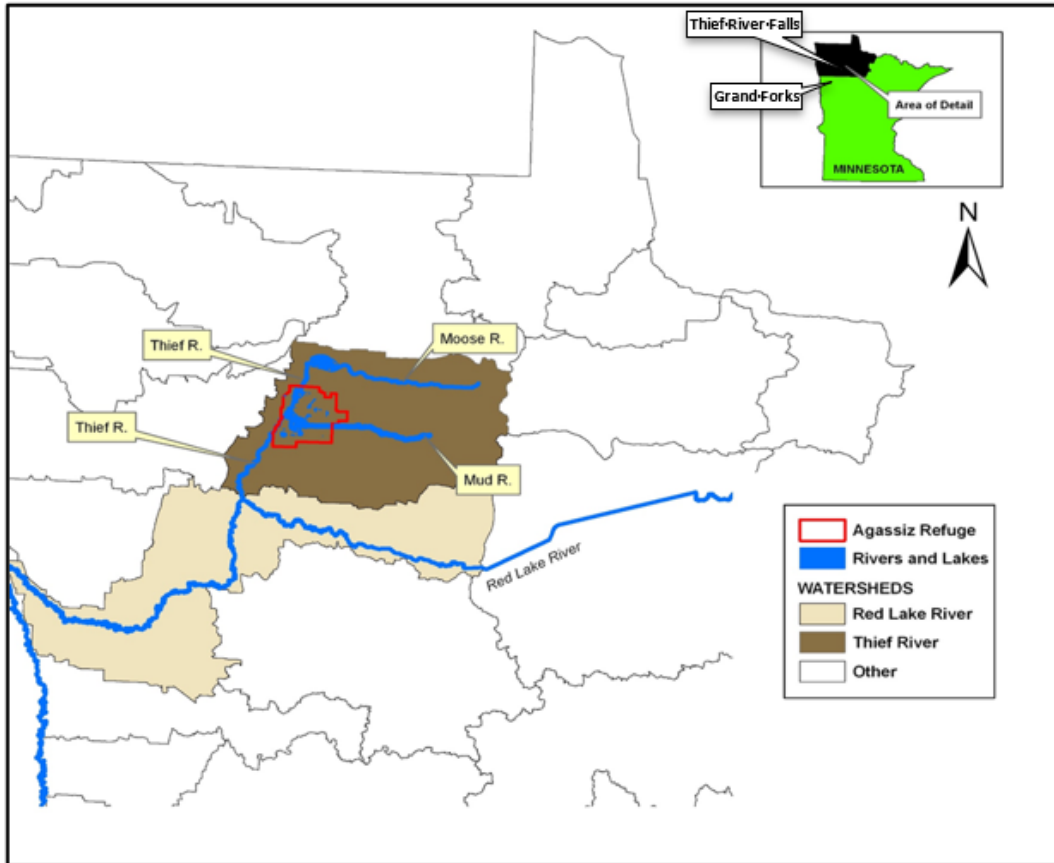
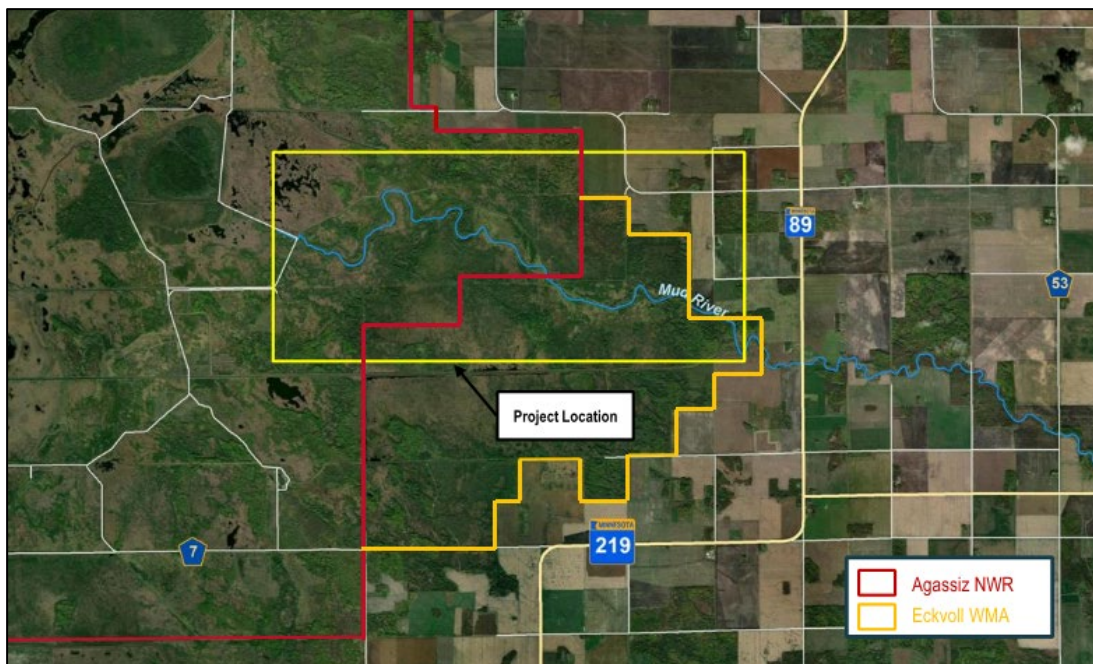


Figure 2. Agassiz NWR and Project Location



Since its establishment, the Refuge has been intensively managed for the benefit of migratory birds and other wildlife through the construction of dikes and water control structures. As noted in Agassiz NWR Comprehensive Conservation Plan (CCP) (USFWS 2005), the Refuge Vision states that

*Agassiz National Wildlife Refuge and the surrounding area will be the premier natural resource of Marshall County and northwestern Minnesota. The Refuge and its seven-county management district, working with partners, will take a landscape approach to promote functional watersheds and connect natural areas. Refuge management programs and activities will emulate natural functions and processes of the different native habitats for optimal wildlife use. The resulting benefits will be showcased to demonstrate the compatibility of biological diversity, integrity, natural ecological processes and sustainable agriculture.*

The Minnesota Department of Natural Resources (MN DNR) has acquired and manages over 77,000 acres across several Wildlife Management Areas near and adjacent to the Refuge. These lands provide additional habitat connectivity, particularly for waterfowl and other migrating birds. Consistent with the Refuge Vision in the CCP, Agassiz NWR works closely with the State of Minnesota and other partners on cooperative conservation across this broader landscape.

## **1.2 PURPOSE AND NEED**

It is important to understand current conditions, issues, and problems in a potential project area in order to develop and articulate a project's purpose and need. A Work Team, comprised of the U.S. Fish and Wildlife Service ("Service"), Red Lake Watershed District, and Minnesota Department of Natural Resources (MN DNR), and others (see Chapter 5) gathered data about current conditions and defined an area for a potential enhancement project of an old channel of the Mud River, Marshall County, Minnesota.

### **PROJECT PURPOSE**

The purpose of the project is to improve the flow and discharge of water into and out of the Refuge, which would improve natural processes and habitat for aquatic, waterfowl, and migratory bird species and to reduce sedimentation in Agassiz Pool to improve habitat quality.

The primary objectives of the Agassiz NWR, as outlined in its CCP and Habitat Management Plan (HMP, USFWS 2007), include restoring wetlands, improving habitat, and moving towards more nature-based solutions for water control and management. Enhancing the Mud River flows would be an important step towards achieving those objectives.

## **PROJECT NEED**

Flooding, in particular, is one of the key issues affecting the Refuge—both its habitat and its facilities—as well as the neighboring region. Not only does flooding affect the Refuge and surrounding private lands, roads, and infrastructure directly, but it also has a big impact on relations between the Refuge and property owners and officials in the surrounding community. Floods occur most often during March, April, and May when spring rains may combine with snowmelt to exceed channel capacity (USFWS 2005). The Mud River drains thousands of acres of agricultural lands before flowing into the Refuge just above the confluence with the Thief River. Altered hydrology, flashiness, and incoming sediment from the Mud River watershed has resulted in the following harmful effects on the Refuge:

1. Habitat quality has deteriorated as a result of sediment accumulation in wetlands.
2. The wetlands, particularly Agassiz Pool, then become infested with invasive, nonnative cattail.
3. There are increased flood impacts as sediment displaces storage volume within Refuge pools.
4. There are periodic spikes in turbidity levels in the Thief River when releases of water transfer sediment out of the Refuge.

The Mud River Enhancement Project was designed to reduce these harmful effects within and around the Refuge, while maintaining or improving the Mud River's outlet capacity from upstream agricultural areas through the Refuge and into the Thief River. This project is not expected to substantially eliminate sediment that has been deposited in Refuge pools in prior decades, but would reduce future sediment deposition. Flood storage is not a formal purpose of the federal project, so is considered "ancillary." The local and regional organizations contributing funding and expertise for this project have flood damage reduction as a primary purpose of their actions and operations.

The need to improve water management, and therefore water quality and habitat quality, on the Refuge has been identified and discussed with partners for several years. Recently, these problems have been exacerbated by extreme weather events that produce heavy precipitation or rapid snowmelt and flash flooding, which are further worsened by the cumulative deposition of sediment in wetlands.

The Work Team undertook a pre-planning process and feasibility study to identify various modifications that would improve the natural processes and accomplish shared goals and objectives for the Refuge and several partners in the area. At the time, however, funding to implement the modifications was not available. There may be imminent opportunity for funding

a project to enhance water flows from the Mud River into and out of the Refuge. This EA provides an analysis of potential effects of a Mud River enhancement project, which would help decide whether or not to move forward with the proposed project, or a project with modifications, should funding become available.

### **1.3 PROPOSED ACTION**

The U.S. Fish and Wildlife Service proposal is to implement actions on Agassiz NWR that would address issues and correct problems in the Project Area. Excavation and dredging are the primary activities that would be used to alter the existing flow; reconnect an historic Mud River channel; modify existing ditches with set-back levees or convert them to two-stage channels; excavate a floodplain along a new channel, which would expand the floodplain area; reduce current, and prevent future, infestations of reed canary grass and similar invasive plants; create physical features (such as bends or meanders) that would help streams manage high flows; create berms or mounds, from the repurposed dredged and excavated materials, to enhance existing habitat areas and create new upland and forested habitat communities.

A proposed action is an initial proposal and may evolve during the development of alternatives, the impact analysis, and public involvement. The lead federal agency may determine that there are other, better, or less impactful ways to address the purpose and need, resulting in a different preferred alternative. The proposed action and alternatives may change during the environmental analysis process as the agency refines its proposal and gathers feedback from the public, federally recognized Tribes and Tribal entities, and other agencies or organizations. Therefore, the final preferred alternative may differ from the initial proposed action and will be finalized at the conclusion of the public comment period after the incorporation of substantive comments. A decision to implement an alternative will not be made until the environmental review process is complete.

## **CHAPTER 2. ALTERNATIVES**

### **2.1 DECISION FRAMEWORK**

The Regional Chief of the National Wildlife Refuge System in the Midwest Region of the U.S Fish and Wildlife Service will determine, following completion of the final EA, if the selected alternative is a major federal action that would (1) significantly affect the quality of the human environment and require preparation of an environmental impact statement; or (2) alternatively, determine there would be no significant impacts on the human environment and complete a “Finding of No Significant Impact.”

### **2.2 EARLY PROJECT PLANNING**

The U.S. Fish and Wildlife Service, Red Lake Watershed District, and Minnesota Department of Natural Resources initiated the pre-planning process for the proposed “Mud River Enhancement Project” in summer of 2021. The three entities defined an area and conducted a preliminary engineer’s report for an enhancement project of an old channel of the Mud River in Marshall County, Minnesota. The Red Lake Watershed District identified entities and individuals to serve on the Mud River Enhancement Project Work Team (“Work Team”)—see Chapter 5 for more information on Work Team members. The Work Team used guidance from the *Thief River Comprehensive Watershed Management Plan / One Watershed, One Plan* (TRPP 2020; RLWD 2000) to develop interagency objectives, goals, and alternate methods for enhancing the Mud River watershed.

### **2.3 ISSUES IDENTIFIED BY THE WORK TEAM**

The Work Team came to a consensus on a project proposal that would direct water into a meandering 8.7-mile stretch of the old Mud River channel. The improved old channel would roughly follow the path of an ancient channel (currently buried under 5 feet of peat) that Service staff discovered using aerial photography and soil borings. The Work Team envisioned a project that would result in a meandering channel and floodplain expansion, which would improve natural processes and habitat for aquatic, waterfowl, and migratory bird species. The proposed project would reduce the impacts of runoff events upon over-water nesting birds in Agassiz Pool by moderating inflows.

The Work Team’s proposed project design would result in a nature-based channel to convey incoming flow from the Mud River. Instead of being directly deposited in the remnants of Judicial Ditch (JD) 11 channel within Agassiz Pool (from which much sediment can be flushed downstream), sediment could potentially be deposited onto an enhanced floodplain that is currently inaccessible due to the excavation of JD 11, which occurred in the early 1900s. Currently, upstream sediment runoff, from thousands of acres of agricultural lands and ditches, is

being reduced through implementation (separate from the Mud River Enhancement Project) of best management practices that are being largely funded by Thief River Watershed under the Minnesota Board of Water and Soil Resources “One Watershed, One Plan” Program (MBWSR 2018; RLWD 2020).

## **2.4 PROJECT OBJECTIVES**

### **PRIMARY OBJECTIVES**

The primary objectives served as guides for developing alternate project actions that would need to be implemented in order for the project to be considered a success; that is, to meet future desired conditions. The Work Team developed the following approaches:

- Enhance natural riverine, riparian, and floodplain functions along portions of the Mud River/JD 11 channels within the Refuge to improve migratory bird habitat and improve ecological functions that were lost due to past drainage practices, such as wetland drainage, redirecting natural flow paths into ditches, and straightening streams and rivers.
- Reduce deposition of sediment from the Mud River into Refuge pools, which promotes nonnative cattail infestation and degrades the quality of habitat for migratory waterfowl.
- Maintain flood storage capacity as an ancillary benefit to downstream landowners and communities.
- Ensure Refuge operations are not adversely affected.
- Ensure that upstream and downstream agriculture lands are not adversely affected.

### **SECONDARY OBJECTIVES**

The project Work Team determined that, if primary objectives were met, secondary objectives could also be met to help achieve desired future conditions. The following are the secondary objectives:

- Maintain or incrementally improve the function of the Service’s water management system by reducing sediment deposition in primary flow paths through Refuge pools, which would ensure continuous passage of water from upstream agricultural areas to the Thief River during high flow events.
- Reduce or eliminate the need for occasional sediment flushing, which can produce temporary high levels of suspended sediment in the Thief River downstream of the Refuge.
- Use the actions associated with this project to improve riparian habitat, where feasible.

## **2.5 DESIRED FUTURE CONDITIONS**

Desired future conditions, or project goals, are specific descriptions of what the Project Area looks like or how it is functioning after actions have been taken. In general, the timeline for achieving desired future conditions varies by project.

The desired future conditions in the proposed Project Area can be described as an improvement over current conditions or a reduction or elimination of current issues and problems. The effects analysis in Chapter 3 states whether the following desired future conditions would be achieved under each alternative. The following are statements of how the Project Area looks and functions at some future point:

- Habitat quality is no longer being degraded or is only minimally affected as a result of sediment accumulation.
- The reduction of sediment deposition is promoting healthy wetlands with more and better habitat quality, especially for migratory birds and other wildlife.
- Sediments are no longer accumulating to detrimental levels that once decreased storage capacity in Refuge pools.
- Invasive plant infestations are no longer at levels that degrade wildlife habitat.
- Flood impacts are being kept to a minimum because steps have been taken to expand floodplain acres and, thus, storage volumes within Refuge pools.
- There are no longer spikes or are only minimal spikes in turbidity levels in the Thief River after water is released out of the Refuge.

## **2.6 ALTERNATIVES ANALYZED IN THIS EA**

### **ALTERNATIVE A. NO ACTION**

Currently, there are no management activities occurring in the Project Area, and there would continue to be no management actions now or in the future.

### **ALTERNATIVE B. PROPOSED ACTION. MUD RIVER FLOODPLAIN ENHANCEMENT AND CHANNEL IMPROVEMENT (PREFERRED ALTERNATIVE)**

The proposed Mud River Floodplain Enhancement and Channel Improvement alternative (“Mud River Enhancement Project”) was designed to address various problematic conditions along the 8.7-mile stretch of the Mud River (see Figure 3 and Figure 4). Understanding those current problematic conditions, presented above in Section 2.3 and Section 2.4, was instrumental to the development of Alternative B.

Figure 3. Mud River Enhancement Project Location in Agassiz NWR

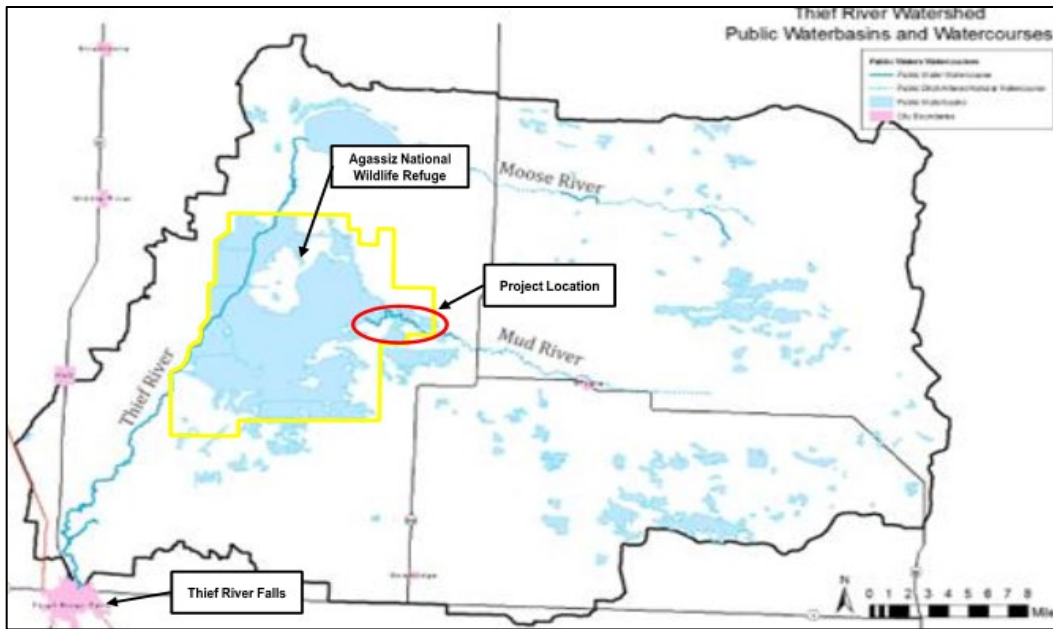
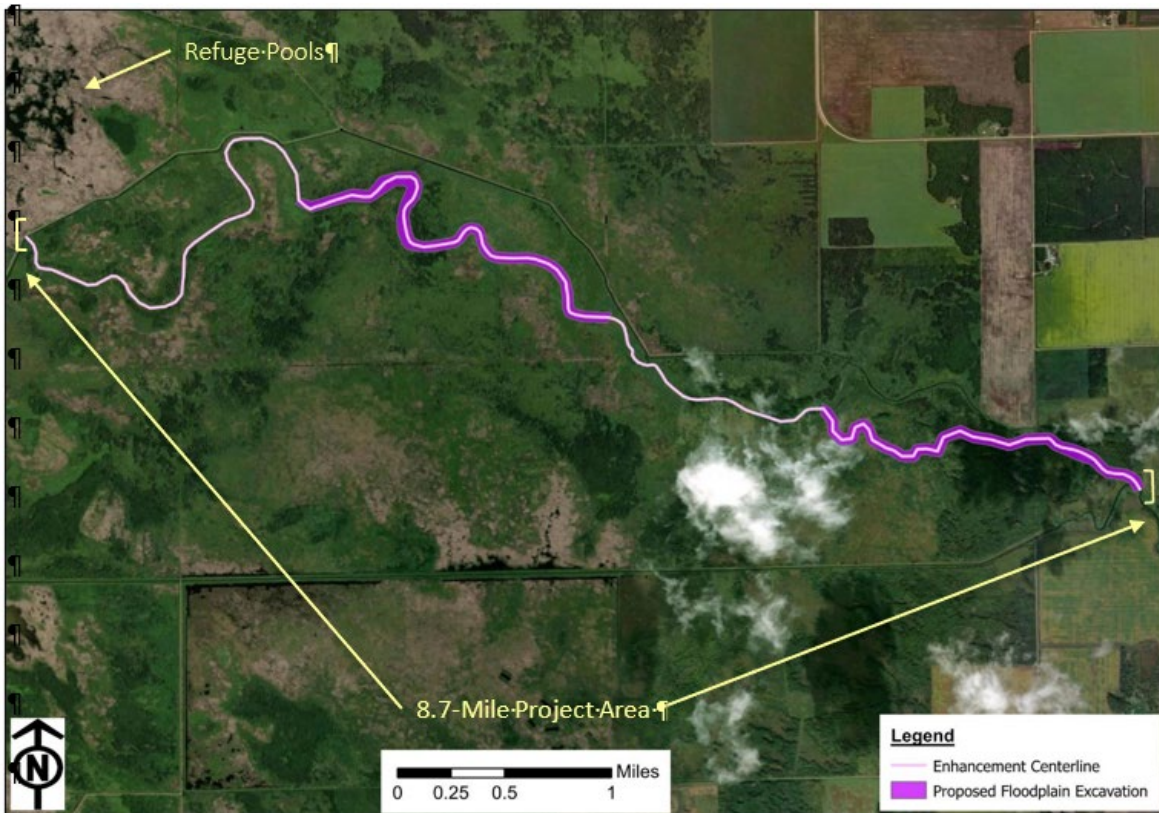


Figure 4. Proposed Floodplain Excavation



The Work Team’s development of Alternative B was guided by design principles (MBWSR 2015; MBWSR 2018; TRPP 2020); the following are based on those principles:

- There should be a cost-effective, functioning channel design that is based on fluvial geomorphic principles.
- Some minor stage increases were identified upstream in Mud River flow should be directed to channel enhancement.
- The channel should be self-sustaining, which means the majority of the channel would not require regular mowing or sediment cleanout.
- There should be diverse vegetative communities that connect existing desirable species through irregular floodplain grading and planting to disrupt the existing monoculture.

Alternative B is best understood by listing the five types of actions (Table 1) that comprise this alternative. These actions are described in more detail in Chapter 3 so it is easier for readers to see how those actions would beneficially or adversely affect current conditions (issues and problems expressed in the purpose and need (Chapter 1).

**Table 1. Alternative B Actions and Descriptions**

**Action 1**

- Modify the existing flow, which is currently split at the junction of JD 11 Main Ditch and the Diversion Channel. Currently, about 78% of the flow goes through JD 11, and 22% goes through the Diversion Channel.
- Under low-flow conditions, up to the two-year run-off event, route all flow into the Diversion Channel, which would be relocated by excavating a new channel in the historic Mud River bed that goes through MN DNR’s Eckvoll Wildlife Management Area (WMA) and Refuge and into the main Refuge pool.
- Reduce current peak flow into Agassiz pool from 675 cubic feet per second (cfs) to 575 cfs.
- Increase the floodplain from the current bankful channel width of 220 feet to 440 feet wide.

**Action 2**

- Excavate a floodplain along a new channel (Figure 4), which would expand the floodplain area from the existing 300 acres to approximately 1,000 acres – an addition of 700 acres.

**Action 3**

- Improve habitat conditions by reducing current, and preventing future, infestations of reed canary grass and similar invasive plants.

**Action 4**

- Create physical features that would help streams manage high flows.
- Place intermittent stream characteristics, such as pools and riffles, to create a mixture of flows and depths.
- Use excavation or dredging to form bends or meanders (referred to as “sinuosity”) in the riverbed.

#### Action 5

- Create berms or mounds of waste material (such as soil, sediments, or debris) from the repurposed dredged and excavated materials (referred to as “spoils”).
- Enhance existing habitat areas from the berms or mounds and create new upland and forested habitat communities within the project footprint, particularly if those areas are planted with native trees, shrubs, grasses, and forms and cover 70% to 100% of the ground.

## 2.7 ALTERNATIVES CONSIDERED BUT DISMISSED FROM ANALYSIS

### PASS-THROUGH CONCEPT

This alternative would have been bigger and more complex than the floodplain enhancement approach in Alternative B. This would have been the Service’s long-term, larger-scale solution to the harmful effects of in-channel storage. This strategy was the focus of a Refuge climate adaptation workshop that took place on August 29 to 31, 2023.

The concept involved improvements to the existing on-Refuge infrastructure to allow flows and sediment to pass through the Refuge to State Ditch 83 (SD 83), thus bypassing Refuge impoundments. This concept would have required substantial modifications to current Refuge infrastructure but would have allowed the Refuge to conduct off-channel impoundment management by taking flows off the pass-through ditches selectively, as needed, to manage pool levels. The 15 ditches that transport water from the upper watershed (624 square miles) into the Refuge would have required analysis, as well as an update to the Refuge’s operational plan. Alternative B would have complemented this strategy by allowing for natural sediment deposition upstream of the Refuge pools, thereby, reducing sediment loads in SD 83 downstream of the Refuge during high flow events. This larger proposal was well into the conceptual stage, but it was determined it would not be financially feasible to implement at this time.

### SEDIMENT CAPTURE CONCEPT

This alternative would have constructed a sediment-capture basin upstream and off Refuge lands. It would have required the acquisition of a sizable piece of land due to the large extent of the contributing watershed. The highest sediment yields are occurring between the Refuge and the upper watershed. This area is predominately in agricultural production, and the lands do not have the desirable topography and hydrological characteristics to offer practical implementation of a sediment basin project. Application of on-farm best management practices have proven to reduce sediment loads and are more cost-effective than large-scale sediment basins.

#### Potential Challenges with this Concept

- Lack of suitable topography and hydrological characteristics.
- Land acquisition costs.

- The “One Watershed, One Plan” already considers best management practices that attempt to accomplish what this concept is considering.
- Land use and sediment yield in the watershed is most concerning immediately upstream of the Refuge, where land use is predominately agricultural.

### **Reasons for Dismissal**

- Moose River Impoundment is already in place upstream.
- A large-scale sediment reduction facility is not cost-effective when compared to best management practices.
- The agricultural region upstream of the Refuge does not have the topography to effectively store and detain sediment in a cost-effective manner.
- Social acceptance for a dedicated sediment retention facility upstream of the Refuge is unlikely.
- Effective sediment reduction would require diversion of substantial volumes of water, which would require difficult wetland permitting and on-channel adverse impacts.

This alternative was deemed technically unfeasible because the upstream drainage area is 200 or more square miles, and the residence time required to effectively remove sediment from floodwaters from a 1-square-mile site would only treat a negligible volume of water generated from a runoff event.

## CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

### 3.1 ENVIRONMENTAL ANALYSIS PROCESS

The environmental analysis process, to prepare this EA for the proposed “Mud River Enhancement Project,” began in spring 2026. Project planning and the environmental analysis process were conducted in accordance with the numerous laws, regulations, and policies listed in Appendix A.

Two alternatives were analyzed for beneficial and adverse effects. The affected environment (best described in terms of current conditions) is identified in the context of how Refuge resources in the Project Area are currently affected as a result of no management actions (Alternative A).

The purpose and need discussions (Chapter 1) and project objectives (Sections 2.3 and 2.4 in Chapter 2) describe the current conditions in the Project Area that drove development of Alternative B. The current conditions discussed under Alternative A are carried forward to Alternative B in order to show how those conditions would be changed or improved.

### 3.2 IMPACT TOPICS NOT ANALYZED IN THIS EA

Impact topics cover resources that could be affected, either beneficially or adversely, by the two alternatives presented in this EA. Neither Alternative A nor Alternative B would beneficially or adversely affect the following impact topics; therefore, they were not addressed in this chapter:

**Cultural Resources.** One potential threat would be to currently unknown cultural resources, but there is only a slight possibility that unrecorded archeological sites remain undiscovered in the Project Area. If cultural resources are observed or uncovered during excavation, Refuge managers would consult with the Service’s Midwest Regional Historic Preservation Officer who would determine the Area of Potential Effect, the type of cultural resource, assess potential effects, and coordinate with applicable external entities, such as the State Historic Preservation Officer. Appendix A lists the statutes and executive orders that protect and guide management of cultural resources; most notably, Section 106 of the *National Historic Preservation Act*.

**Geologic Resources.** There are no geological resources in the Project Area. These resources are naturally occurring materials found within the Earth's crust (both on and below the surface) that are extracted, including minerals, metals, fossil fuels, and groundwater.

**Indian Trust Resources.** The Department of the Interior requires its bureaus to explicitly consider the effects of its actions on Indian Trust resources in environmental documents (USDI 1997). The federal Indian Trust responsibility is a legally enforceable obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to

carry out the mandates of federal laws with respect to Native American Tribes. There are no known Indian Trust resources on the Refuge, and lands comprising the Refuge are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians.

**Public Health and Safety and Visitor Experience.** The proposed project would not result in public health concerns for visitors. Excavation could stir dry materials on a windy day, but any adverse effects on air quality would be negligible or non-existent because visitors would not be present in the Project Area. There would also be no visitor safety concerns.

**Socioeconomic Setting.** This topic was not analyzed because the actions proposed in this EA would have a negligible, if any, impact on the economy and demographics (characteristics and statistics of human population, especially its size, growth, density, and distribution) of the areas surrounding the Refuge. The Refuge likely provides nonmarket values, such as maintaining endangered species, preserving wetlands, education and preservation for future generations, and adding stability to the ecosystem. The proposed project would not have an appreciable impact on these types of nonmarket values, however.

**Transportation.** The project would not affect roads or highways in or near the Project Area.

**Threatened and Endangered Species and Critical Habitat.** There is no critical habitat in the immediate Project Area. There are three listed species present on the Refuge: grey wolf (listed as threatened in Minnesota); monarch butterfly (threatened); and Suckley's cuckoo bumble bee (endangered). There is suitable nesting and foraging habitat to support the presence of these species, but if they may be present in the Project Area, project activities would be temporary and effects negligible due to the mobility of these species. The Service determination is that the project is "Not Likely to Adversely Affect" critical habitat.

### **3.3 IMPACT TOPICS ANALYZED FOR EACH ALTERNATIVE**

This chapter describes the beneficial and adverse effects that would result from Alternative A and Alternative B. The following impact topics are discussed in terms of current conditions (issues and problems) and how those conditions would be affected; that is, not changed, changed, or improved by each alternative.

- Floodplains
- Wetlands
- Water quantity and quality
- Soils / Sedimentation
- Invasive plants
- Aquatic wildlife
- Streamside and upland habitat and wildlife

### **3.4 ALTERNATIVE A. NO ACTION**

Currently, there are no management activities occurring in the Project Area, and there would continue to be no management actions now or in the future.

#### **BENEFICIAL EFFECTS**

Alternative A would not result in any beneficial effects.

#### **ADVERSE EFFECTS**

Under Alternative A, current issues and problems, expressed in Chapters 1 and 2, would not be resolved, the purpose and need would not be met, and desired future conditions would not be realized. There would continue to be moderate to major, long-term adverse effects on habitat in the Project Area from lack of management actions.

Current habitat conditions would continue to deteriorate as a result of sediment accumulation in wetlands, and the wetlands would continue to be infested with invasive plants. The areas with only monotypic plant communities, such as reed canary grass, cattails, and willows, would continue to be devoid of a variety of quality wildlife habitat and thus, biodiversity. Monotypic plant communities would continue to create the following problems in the Project Area and other parts of the Refuge:

- Reed canary grass is a tall, aggressive grass that forms impenetrable mats and outcompetes native plants for sunlight and nutrients and decreases biodiversity and, thus, wildlife diversity.
- Cattails create thick, monotypic stands that reduce water flow, lower oxygen levels, dominate shorelines, reduce biodiversity, and choke waterways.
- Willows destroy habitats by clogging waterways, altering hydrology, and outcompeting native vegetation, leading to reduced biodiversity and increased flooding. Their aggressive, widespread root systems destroy infrastructure, while dense thickets ruin aquatic systems.

There would continue to be potential for increased flood impacts as sediment displaces storage volume in the current floodplain and Refuge pools. There would also continue to be periodic spikes in turbidity levels in the Thief River when releases of water transfer sediment out of the Refuge.

### 3.5 ALTERNATIVE B. PROPOSED ACTION. MUD RIVER FLOODPLAIN ENHANCEMENT AND CHANNEL IMPROVEMENT (PREFERRED ALTERNATIVE)

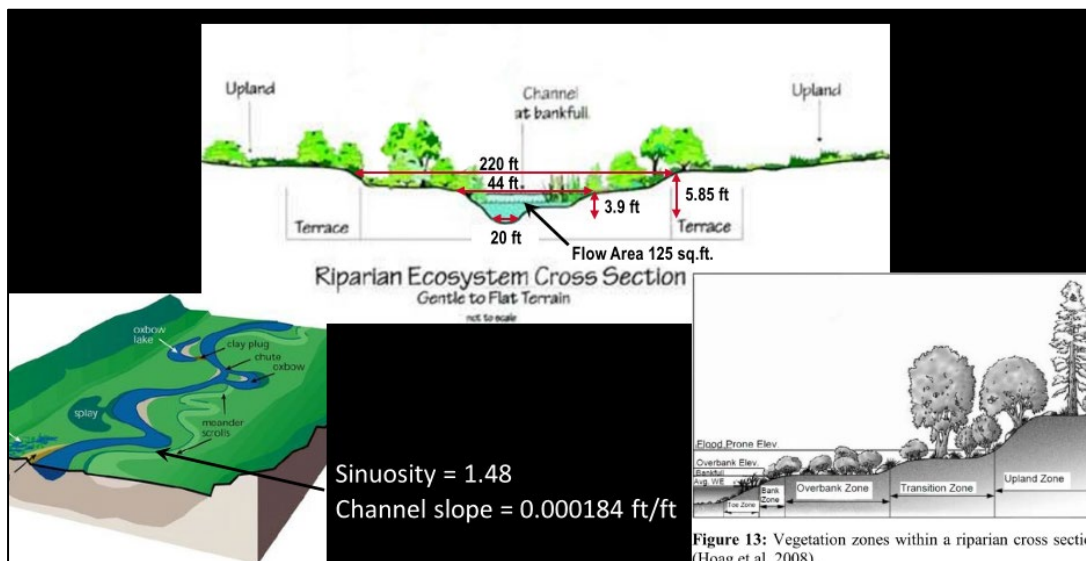
This section provides more detail about the five actions that were presented in Table 1 (in Chapter 2) for Alternative B so it is easier for readers to associate current conditions with the effects that could result from each of the five actions.

#### ACTION 1

Alternative B proposes to modify the existing flow, which is currently split at the junction of JD 11 Main Ditch and the Diversion Channel. The channel enhancement would convey all the base flows from upstream Mud River. (Without diversion structures, for example, it only would receive about 20% of the Mud River flows, which would not meet channel enhancement objectives.) The intent of this alternative is to reconnect an historic Mud River channel, which has been identified from aerial imagery and ground-truthing surveys. Under low-flow conditions, up to the two-year run-off event, Alternative B would route all flow into the Diversion Channel, which would be relocated by excavating a new channel in the historic Mud River bed that goes through MN DNR’s Eckvoll WMA and Refuge and into the main Refuge pool. Modifying existing ditches with set-back levees or converting them to two-stage channels could also achieve desired floodplain characteristics.

The current peak flow into Agassiz pool is 675 cubic feet per second (cfs), and the proposed flow would be reduced to 575 cfs. Alternative B proposes a bottom channel width of 20 feet to an upper channel width of 44 feet (Figure 5) This alternative also proposes to increase the floodplain from the current bankfull channel width of 220 feet to 440 feet wide.

Figure 5. Proposed Channel and Floodplain Dimensions



**Effects of Action 1.** As stated above, the current peak flow into Agassiz pool is 675 cfs; the proposed flow would be 575 cfs. Alternative B would route base flows into the new, enhanced channel, thus prohibiting water from backing up into local ditches upstream. Alternative B would result in beneficial effects in that it would help minimize sediment impacts in the watershed and reduce sediment transported downstream to the Thief River. Alternative B would enhance wildlife habitat and hydrology, reduce potential for upstream and downstream flooding, and reduce sediment infilling in Refuge impoundments. Action 1 would result in major long-term beneficial effects.

The additional storage capacity in the floodplain and pools could prevent an overrun in the spillways upstream of the Refuge during 3- to 4-inch rain events. It is important to note that when a rain event moves into and through the Refuge from upstream, it is possible that a few spillways, in the upstream side, may be used, but as water continues to flow, the water control structures would be opened to reduce the rise in the water level and manage excess water. These actions would help prevent temporary adverse effects in the Project Area.

## **ACTION 2**

Excess sediment deposition degrades waterfowl habitat, reduces water storage, and affects downstream water quality (USEPA 2026). Alternative B proposes to excavate a floodplain along a new channel, which would expand the floodplain area from the existing 300 acres to approximately 1,000 acres – an addition of 700 acres. The larger floodplain would naturally capture sediment during flood events. However, sediment would continue to accumulate at the downstream end of the enhanced channel, which is an unavoidable situation because the stream gradient (slope) flattens out in that area.

**Effects of Action 2.** Floodplains are critical ecological and hydrological areas that provide vital benefits, including natural flood risk reduction, groundwater recharge, and enhanced water quality. They act as sponges that slow, store, and absorb floodwaters. These areas support immense biodiversity by providing important habitat for wildlife (MDNR 2026; FEMA 2026). Some of the key long-term beneficial effects that would be realized from expansion of the floodplain, include the following (FEMA 2026):

- There would be a reduction in downstream flood severity by storing, slowing, and conveying floodwaters.
- Floodplains are biologically rich, so an expanded floodplain would provide better food and shelter for birds and other wildlife.
- Floodplains help reduce water velocity, thereby preventing erosion and stabilizing riverbanks.

Flood reduction efforts would result in minor to major, long-term beneficial effects because the expanded floodplain (Figure 6) would reduce peak flows downstream and, as a result, sediment would drop down more efficiently in the floodplain along the new channel. The proposed new channel design would route a much larger portion of the Mud River flow into the new channel and less into the JD 11 Main Ditch. This proposed design would target up to the 10-year run-off event. Drainage on upstream areas, including private property and Eckvoll WMA, would be improved and would not be subject to flooding. This design would not change conditions if larger flow events occur, however.

Figure 6. Proposed Floodplain Access



### ACTION 3

Alternative B proposes to improve conditions in the Project Area by reducing current, and preventing future, infestations of reed canary grass and similar invasive plants, which have degraded or reduced habitat diversity and, therefore, wildlife presence in the Project Area.



Canary reed grass (photo credit: MN-DNR)



Dense stand of cattails (photo credit: USFWS)

**Effects of Action 3.** Alternative B would improve current and future undesirable conditions that reed canary grass, cattails, and other invasive plants have created in the Project Area and Refuge. Implementation of Alternative B would result in long-term, moderate to major, beneficial effects by helping correct the following problems and issues:

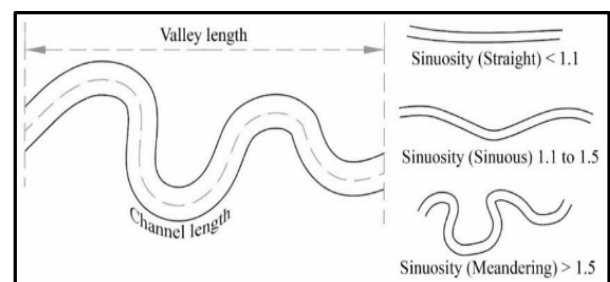
- Invasive plants outcompete native vegetation for sunlight, water, and nutrients. Dense mats of invasive plants can reduce water circulation and significantly lower dissolved oxygen levels, leading to hypoxic (inadequate oxygen) conditions unsuitable for many aquatic species.
- The greatest issue in the Project Area is canary reed grass, which is a highly invasive, rhizomatous perennial that forms dense, single-species monocultures in wetlands and riparian areas. It suppresses native biodiversity, impairs wetland ecological functions, and obstructs water management infrastructure. It outcompetes native plants by creating thick, impenetrable sod mats (up to 1.5 feet thick) that prevent the regeneration of native species. Dense stands offer poor habitat for wildlife, reduce native biodiversity, and restrict access for birds and small mammals (SDSUE 2021).

Cattails replace diverse native riparian plants and reduce plant diversity and habitat complexity. Invasive cattails grow thick, dense root systems (rhizomes) and produce high amounts of organic litter. This debris builds up, trapping sediment and increasing sedimentation, which reduces water depth and can increase flood risks. While some wildlife may use cattails, their aggressive growth suppresses plant species that support a diversity of native birds, butterflies, and other wildlife (USGS 2020). The immediate Project Area is not infested with cattails, but other areas in the Refuge could indirectly benefit from conditions that prohibit the growth of cattails.

Even though cattail is considered an invasive plant in many ecosystems, it does provide beneficial ecosystem services, such as forage and shelter for certain animals (like muskrat). Cattails help reduce pollution through bioremediation, where it breaks down and removes waterborne contaminants (USGS 2020).

#### **ACTION 4**

Excavating or dredging would be used to form bends or meanders (referred to as “sinuosity”) in the riverbed. The intent of Action 4 is to create physical features that would help streams manage high flows. Placement of intermittent stream characteristics, such as pools and riffles (Figure 7 and Figure 8), would result in a mixture of flows and depths (PSUE 2025).



The above illustration shows various levels of sinuosity, starting with sinuosity of less than 1.1 degrees, which is quite straight. The middle example shows sinuosity of 1.1 to 1.5 degrees, which has a mild bend in the channel. The example of a meandering stream would have a sinuosity of greater than 1.5 degrees.

Figure 7. Proposed Flow Concept Under Alternative B

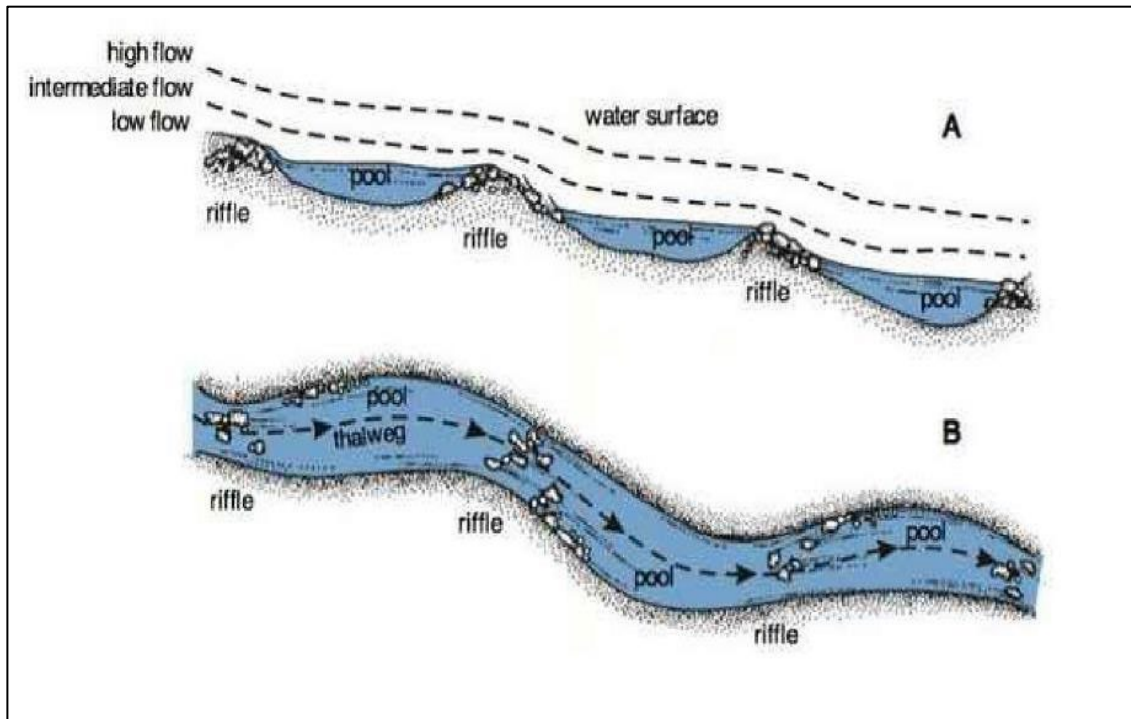
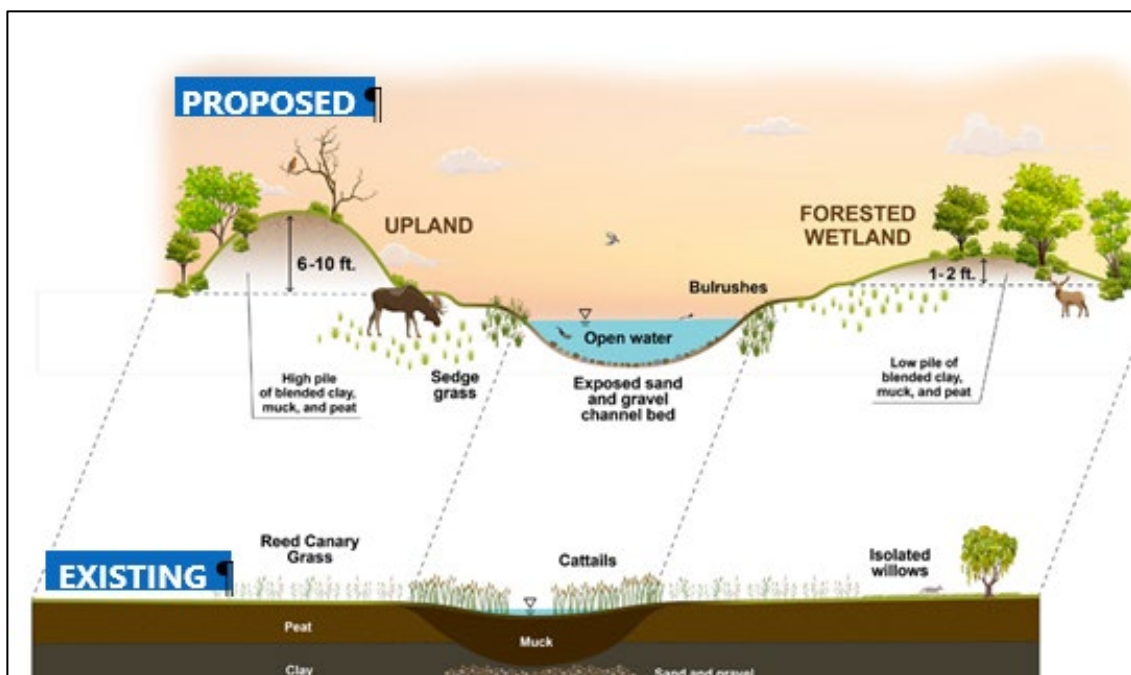


Figure 8. Existing and Desired Conditions of the Mud River



Riffles are shallow, fast-flowing sections of a stream or river that are characterized by turbulent water bubbling over gravel, cobble, or boulders. Pools are deep with slow water (LSS 2026). Further improvements could potentially include such features as root wads and rock vanes. A root wad is a mass of roots, soil, and sometimes stumps left at the base of a tree after it has fallen or been uprooted. There are also artificial root wads (Sylte and Fischenich 2000). Rock vanes are in-stream structures formed by large boulders and used, primarily, to reduce streambank erosion and enhance aquatic habitat (Sylte and Fischenich 2000).

**Effects of Action 4.** Dredging and excavation would result in long-term, moderate to major beneficial effects because sinuosity, or many curves, would lead to a more stable stream that is better able to moderate high flows after storms and would create more diverse habitat for aquatic and other wildlife (PSUE 2025; MDNR 2006). Having a high level of sinuosity would increase the distance that water travels, slow the flow of water, and increase the volume of water that the Mud River could hold (PSUE 2025). Since winding streams are generally more stable, they are often able to access their floodplain better than straightened streams. When water is able to flow into the enhanced floodplain, there may be temporary flooding in some areas, but it also means there would be much less destructive flooding downstream. As streams rise and leave the channel, flows would be spread out over a wider area and slow down. Water would be absorbed by the adjacent riparian area, meaning less water overall would be transported downstream compared to a waterway that is straighter and confined within its banks (PSUE 2025).

The creation of riffles and pools would provide natural habitat functions during low flows. Riffles are known as the "lungs of the river" because they increase dissolved oxygen levels and provide vital habitat for aquatic invertebrates. Riffles typically alternate with deeper, calmer pools. The vertical force of the water falling down on the other side of a riffle would carve out a pool in the stream. One of the benefits of slow-moving water is that organic debris settles out into it. (LSS 2026). Action 4 would result in long-term, major beneficial effects from the mixture of flows and depths (riffles and pools), which would provide a variety of aquatic habitats (LSS 2026).

Root wads would be beneficial for streambank stabilization and to create riparian habitats for cavity-nesting species such as wood ducks, wrens, chickadees, tree swallows, and hooded mergansers. Root wads are often a cost-effective bank stabilization and habitat enhancement treatment (Sylte and Fischenich 2000). Rock vanes would help (1) reduce erosion by redirecting high-velocity flow away from the outer banks of bends, thus reducing shear stress on the bank; (2) prevent the channel from cutting deeper (downcutting) by anchoring the channel elevation; (3) create deep, calm scour pools on their downstream side; (4) encourage natural sediment transport by creating gravel bars (sediment sorting), which are beneficial for aquatic life; and (5) maintain a stable width-to-depth ratio in the channel (Hickman and Thompson 2026).

## **ACTION 5**

Channel improvement work would occur in specific areas along the channel. Alternative B proposes to dredge portions of the current watered Mud River channel and excavate dry portions. Action 5 would create berms or mounds (Figure 9) of waste material (such as soil, sediments, or debris) from the repurposed dredged and excavated materials (referred to as “spoils”).

The entire Project Area is classified as a wetland. Figure 10 shows proposed wetland types along the project corridor that could result under Alternative B. Wetlands are primarily regulated by the U.S. Army Corps of Engineers and Environmental Protection Agency (USEPA 2026b) under Section 404 of the *Clean Water Act* (CWA). The CWA is the primary piece of national legislation that regulates activities in and around wetlands and protects our nation's waters. The CWA prohibits discharging dredged or fill material into "waters of the United States," including wetlands, without a permit. The CWA requires that the deposition of dredged material be placed on currently disturbed areas, such as ditch corridors or outside wetland areas. The U.S. Fish and Wildlife Service manages wetlands on its refuges in compliance with the CWA, and will ensure compliance with Section 404 of the CWA before and during project implementation.

**Effects of Action 5.** The creation of berms or mounds, from the repurposed dredged and excavated materials, would enhance existing habitat areas and create new upland and forested habitat communities within the project footprint, particularly if those areas are planted with native trees, shrubs, grasses, and forbs and cover 70% to 100% of the ground (USFWS 2016). The wooded spoil areas would promote desired forested habitat communities and expand existing forested/shrub communities, thereby increasing diversity of cover and additional edge habitat for local wildlife—this would result in long-term, moderate to major beneficial effects.

Dredging activities could result in temporary adverse effects on aquatic resources in the areas scheduled for channel improvements, but the enhanced flows and function of floodplain wetlands would exceed the current limited function and values that might temporarily be lost during dredging. There may be temporary, minor adverse effects on invertebrate species that may inhabit portions of the channel currently containing water. The areas along the channel contain monotypic plant communities, which not only lack plant diversity but wildlife presence. Therefore, there would be no or only minimal chance of adversely affecting terrestrial wildlife.

Figure 9. Proposed Areas for Placement of Excavated Materials

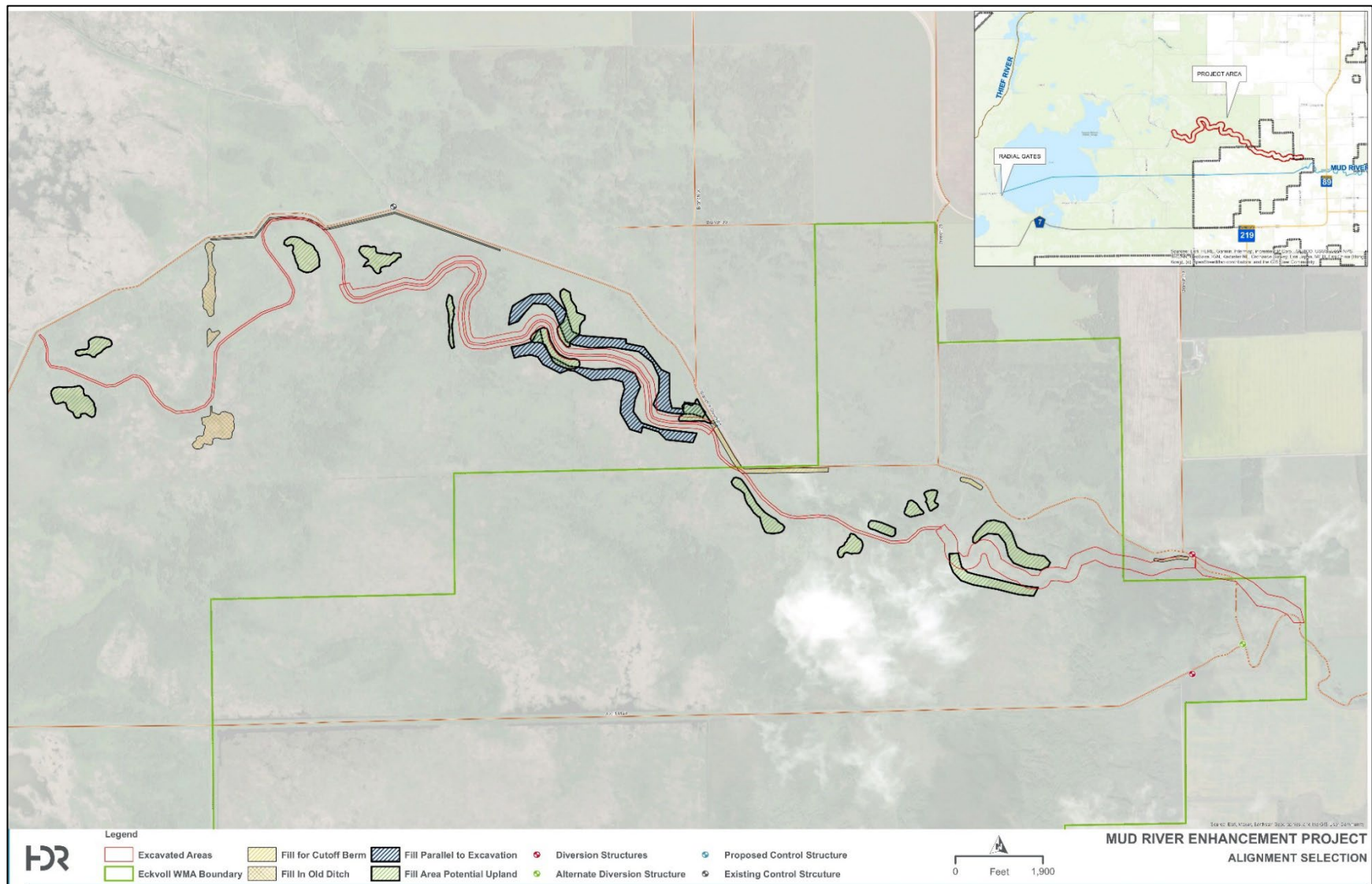
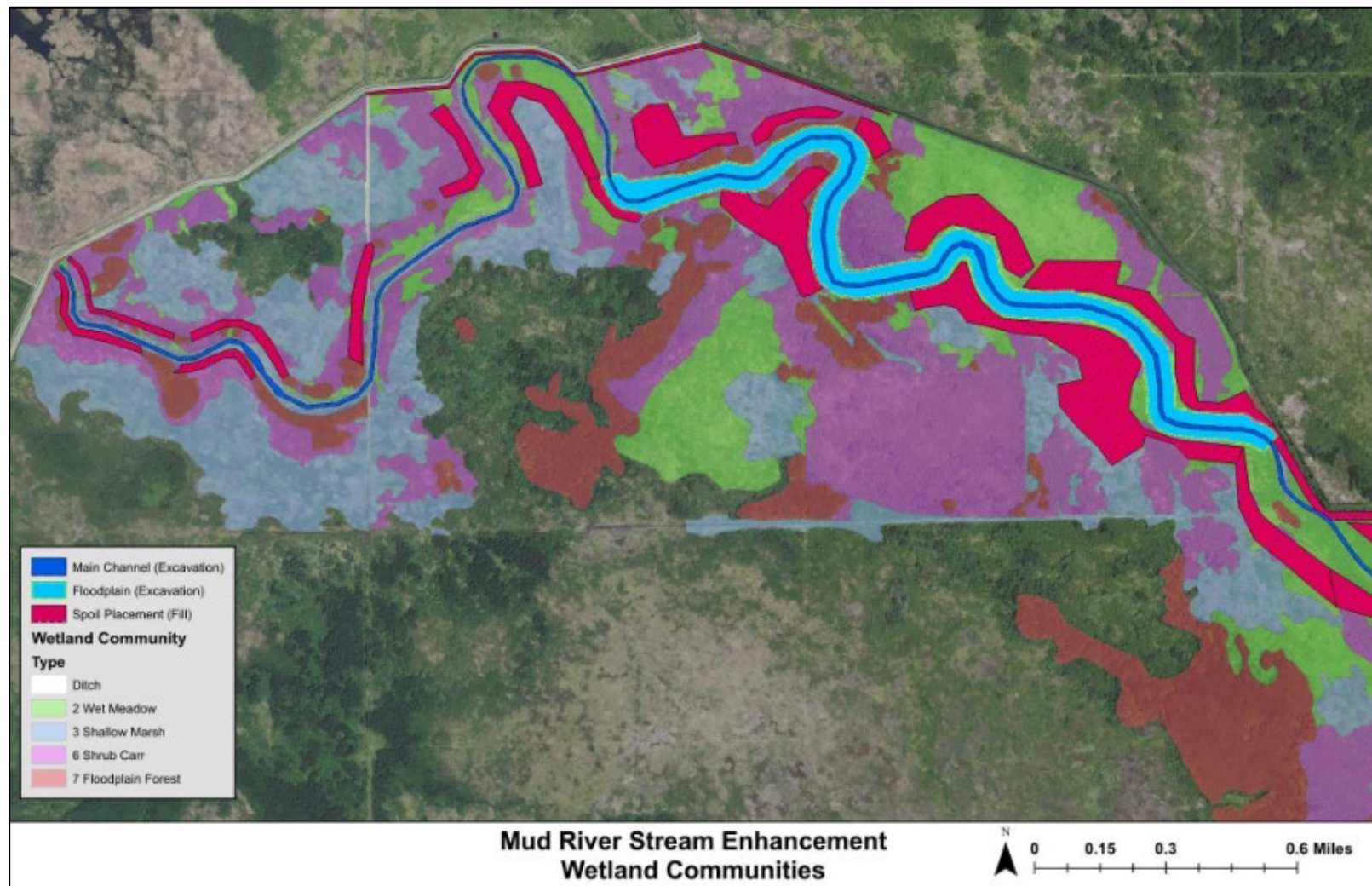


Figure 10. Proposed Wetland Types Along Project Corridor



The below photos show the current condition of many parts of the Project Area and how an area might look after the repurposed materials are planted with native plant species.



The photo on the left shows an area that is completely covered with canary reed grass. The photo on the right shows desired future conditions of what a proposed berm would look like when it is planted with native shrubs and trees to create new habitat areas.

There would be no adverse effects from channel excavation in the dry bed of the historic Mud River channel because those areas are currently not used by most wildlife species due to lack of water and poor habitat conditions. As with dredging activities, there would be no or only minimal chance of adversely affecting wildlife.

## **ALTERNATIVE B SUMMARY OF EFFECTS**

**Beneficial Effects.** Alternative B would result in both short- and long-term beneficial effects that would range from moderate to major as the project's purpose and need are being met and current conditions (issues and problems) are being corrected and improved. The greatest beneficial effects would be realized if, at some point in the future, the Project Area resembles the desired future conditions described in Section 2.5 of Chapter 2.

**Adverse Effects.** Dredging and excavation would be the only activities that could result in temporary, negligible to minor adverse effects on aquatic wildlife (such as invertebrates) during project implementation. The monoculture of canary reed grass in the Project Area provides poor wildlife habitat, thus few wildlife visit the area. Noise from dredging and excavation may cause birds and small mammals to briefly leave the immediate Project Area, but there are many other

areas on the Refuge to which they can move. Project activities would result in temporary, negligible adverse effects on wildlife.

There is one possible future project (“Thief River/State Ditch #83”), currently in the planning stages, that could occur downstream of the Mud River Enhancement Project. That future project would benefit from the proposed Mud River Enhancement Project, which proposes to reduce the quantity of water going down the watershed during high-water events. The Thief River/State Ditch #83 Project would not beneficially or adversely affect the upstream Mud River Enhancement Project, however.

## **CHAPTER 4. CONSULTATION AND COORDINATION**

### **4.1 PUBLIC INVOLVEMENT**

#### **NOTIFICATION AND COMMENT PERIOD FOR THIS DRAFT EA**

**Notification.** The Service sent a press release to the Northern Watch, which is published in City of Thief River Falls, Minnesota. The press release included a link, from which people could download the draft EA, and the physical address to where people can send written comments on the draft EA.

**Draft EA Availability.** The draft EA can be downloaded from the Agassiz NWR website at

<https://www.fws.gov/refuge/agassiz>

The draft EA is a PDF (Portable Document Format) file and is Section 508 compliant, meaning it is accessible to assistive technology. (Note: Section 508 is an amendment to the *Rehabilitation Act of 1973*.) Upon request, paper copies of this draft EA will be sent via U.S. mail. Please call 218.503.2127 to request a paper copy.

Please note: only written comments will be accepted.

#### **Mail written comments to**

Refuge Manager, Agassiz NWR  
22996 290th St. NE  
Middle River, MN 56737

**Comment Period.** The public comment period for this draft EA is from June 1, 2026, to June 30, 2026 (30 days).

**How to Comment on This Document.** Thank you for showing interest in this EA for the Mud River Enhancement Project. The U.S. Fish and Wildlife Service encourages you to submit comments on information contained in this document. Any comments, concerns, suggestions, or other feedback will be incorporated into the final EA if a substantive response is required.

**Will All Comments Be Read?** Yes, every comment will be read, but some comments are more helpful than others. It is important that your comments are properly considered, and that begins with being able to relate your comments to the analysis presented in this EA and to comments received from other readers with regard to the same fact, assumption, or conclusion. Here are some suggestions for making helpful comments:

- Please be as detailed as possible with your comments. If, for example, you are concerned about wildlife, please be more specific than a broad statement such as “this EA did not adequately study wildlife.” If you think impacts on wildlife species would be greater than what is described in this EA, back up that statement with a detailed explanation and facts. This applies to all impact topics covered in this EA.
- If you have a concern about one of the actions proposed in Alternative B, please be specific in describing your concern. Comments that are solution oriented are more effective than those that simply state opposition to the project or action.
- Comments should be clear, concise, and relevant to the analysis of the proposed action and alternatives. Commenting is not a form of voting on an alternative.

## **4.2 STATE, FEDERAL, AND LOCAL AGENCY COORDINATION**

### **CONSULTATION**

#### **Endangered Species Act Consultation**

The *Endangered Species Act of 1973* directs all federal agencies to participate in conserving federally listed species. Specifically, section 7(a)(1) of the Act charges federal agencies to aid in the conservation of listed species. Section 7(a)(2) of the Act requires that agencies, through consultation with the U.S. Fish and Wildlife Service, ensure their activities are not likely to jeopardize the continued existence of listed species or destroy or adversely modify their critical habitat.

The Service submitted a request for consultation with USFWS ecological services staff on April 23, 2026, which is required for consultation under 16 U.S.C. Section 1531 et seq., the *Endangered Species Act* 4D rule of Section 7 of the *Endangered Species Act*. There are three listed species present on the Refuge: grey wolf (listed as threatened in Minnesota); monarch butterfly (threatened); and Suckley’s cuckoo bumble bee (endangered). The Service’s determination is that the project is “Not Likely to Adversely Affect” critical habitat.

#### **Tribal Consultation**

The Refuge recognizes the Service’s federal trust responsibility as described in Executive Orders, Secretarial Orders, Director’s Orders, and USFWS policy; and as such, we offered coordination and participation opportunities with the Red Lake Tribe. As part of the Work Team formation, Red Lake Nation was asked to be a participant on the team. The Service sent letters to the Tribe in August 2021 and November 2021, requesting their review and input on the initial proposed action, which was carried forward as the “Proposed Action” in this EA. The Service will consider any input or requests from the Tribe before making its final decision.

## CHAPTER 5. LIST OF PREPARERS AND SOURCES

### 5.1 LIST OF PREPARERS

#### PLANNING TEAM AND REVIEWERS

##### Agassiz NWR, Refuge-Level Planning

James Graham, Refuge Manager

Refuge lead on the project Work Team  
Coordinate with project engineers  
Develop purpose and need and alternatives  
Coordinate with EA contractor  
Review and comment on this EA  
Review public comments on this EA and provide responses

##### U.S. Fish and Wildlife Service Midwest Region 3

Sarah Quinn, *National Environmental Policy Act*  
Coordinator

Review and Comment on this EA  
Ensure *National Environmental Policy Act*  
compliance

##### Minnesota Department of Natural Resources

Doug Franke, Area Wildlife Manager

Lead for MN DNR  
Develop purpose and need and alternatives  
Subject Matter Expert review of this EA

##### Red Lake Watershed District

Tammy Audette, Administrator

Lead for RLWD  
Develop purpose and need and alternatives  
Subject Matter Expert review of this EA

##### Project Planning Contractors

Nate Dalager, Engineering Project Manager  
HDR Engineering, Inc.

Project development  
Technical analysis  
Subject Matter Expert review of this EA

Glenn T Krogman, Senior Water Resources  
Engineer  
HDR Engineering, Inc.

Project development  
Technical analysis  
Subject Matter Expert review of this EA

Jacob Huwe, Professional Engineer  
HDR Engineering, Inc.

Project development  
Technical analysis  
Subject Matter Expert review of this EA

### **EA Preparation Contractor**

Susan Hale, National Environmental Policy Act  
Specialist  
Project Support Services

National Environmental Policy Act compliance  
Write and edit environmental assessment  
Review public comments on this EA

## **5.2 LIST OF SOURCES CONSULTED**

Extensive and important early consultation and collaboration occurred during the project development phase to conduct feasibility analyses, develop initial designs, identify alternatives, and articulate the purpose and need for a project. This proactive planning helped identify environmental constraints, refine project designs to avoid impacts, and conduct outreach to identify potential public concerns. The environmental impact analysis contained in this EA relied on the outcomes of that significant early planning so completion of this EA could be accomplished within the required one-year timeline.

The U.S. Fish and Wildlife Service, Red Lake Watershed District, and Minnesota Department of Natural Resources initiated the planning process for the proposed “Mud River Enhancement Project” in the summer of 2021. They conducted a preliminary engineer’s report to identify a potential enhancement project in the old channel of the Mud River, Marshall County, Minnesota.

The Red Lake Watershed District identified entities and individuals to serve on the Mud River Enhancement Project Work Team. The Work Team used guidance from the “Thief River Comprehensive Watershed Management Plan / One Watershed, One Plan” (TRPP 2020) to help develop the purpose and need statements, the proposed action, and alternatives presented in Chapter 2. The Work Team’s first meetings were in 2021, and they continued meeting numerous times each year through the end of 2023. The following were members of the Work Team:

- U.S. Fish and Wildlife Service, Agassiz NWR
- Red Lake Watershed District staff and board managers
- Minnesota Department of Natural Resources
- Minnesota Board of Water and Soil Resources
- Soil and Water Conservation Districts
- Minnesota Pollution Control Agency
- Flood Damage Reduction Work Group
- United States Army Corps of Engineers
- Area landowners, sportsmen’s clubs, and county and township representatives

## REFERENCES

- FEMA 2026 Federal Emergency Management Agency. “Benefits of Natural Floodplains” and “Floodplains and Wildlife Conservation.” Accessed March 2026 at [https://www.fema.gov/floodplain-management/wildlife-conservation/benefits-natural#:~:text=Natural%20floodplains%20provide%20flood%20risk,watching%2C%20boating%2C%20etc.\);](https://www.fema.gov/floodplain-management/wildlife-conservation/benefits-natural#:~:text=Natural%20floodplains%20provide%20flood%20risk,watching%2C%20boating%2C%20etc.);) and <https://www.fema.gov/floodplain-management/wildlife-conservation/benefits-natural> and <https://www.fema.gov/floodplain-management/wildlife-conservation>.
- Hickman and Thompson 2026 Hickman, E.L. and T.M. Thompson, Biological Systems Engineering. Virginia Tech. “Fact Sheet Number 1: Stream Restoration Series.” Accessed March 2026 at <https://cbtrust.org/wp-content/uploads/Cross-Vane-Fact-Sheet.pdf>
- LSS 2026 Lake Superior Streams.org “Stream Anatomy — Riffles, Runs, and Pools.” Accessed March 2026 at [https://www.lakesuperiorstreams.org/understanding/riffle\\_run\\_pool.htm](https://www.lakesuperiorstreams.org/understanding/riffle_run_pool.htm). Information on the webpage is adapted from [Stream Biology](#), a web site developed by Cristi Cave, B.S., Fisheries, 1998, School of Fisheries, University of Washington.
- MBWSR 2015 Minnesota Board of Water and Soil Resources. *Minnesota Buffer Law* at 103F.48 “Riparian Protection and Water Quality Practices.” Access at <https://bwsr.state.mn.us/minnesota-buffer-law> and <https://www.revisor.mn.gov/statutes/cite/103F.48>.
- MBWSR 2018 *One Watershed, One Plan Guidebook*. March 28, 2018. Access at <https://bwsr.state.mn.us/sites/default/files/2018-12/One%20Watershed%2C%20One%20Plan%20Guidebook.pdf> and *One Watershed, One Plan*. Fact Sheet. Access at [https://www.hubbardswcd.org/wp-content/uploads/2019/08/1W1P\\_Fact\\_Sheet\\_2018.pdf](https://www.hubbardswcd.org/wp-content/uploads/2019/08/1W1P_Fact_Sheet_2018.pdf)
- MDNR 2006 “The Shape of Healthy Streams: Characteristics of Healthy Watercourses.” April 2006. Access at [https://files.dnr.state.mn.us/publications/ecological\\_services/healthy\\_rivers\\_color\\_background.pdf](https://files.dnr.state.mn.us/publications/ecological_services/healthy_rivers_color_background.pdf)
- MDNR 2026 Minnesota Department of Natural Resources. “River Ecology: The Geomorphic Approach.” Minnesota DNR Ecological and Water Resources Division. Webpage access: <https://www.dnr.state.mn.us/eco/streamhab/geomorphology/index.html#:~:text=Design%20Resources> and Fact Sheet on Channel Design:

<https://files.dnr.state.mn.us/eco/streamhab/geomorphology/channel-design-factsheet.pdf>

PSUE 2025 Pennsylvania State University Extension. "Sinuosity and Stream Health." Updated June 13, 2025. Accessed at <https://extension.psu.edu/sinuosity-and-stream-health#:~:text=flows%20is%20sinuosity,-,Sinuosity%20is%20a%20measure%20of%20how%20much%20a%20stream%20meanders,%2C%20insects%2C%20and%20other%20wildlife>

RLWD 2020 Red Lake Watershed District. Overview of the Mud River Enhancement Project. See RLWD website at [https://cms1files.revize.com/marshall/document\\_center/Emergency%20Management/Thief%20River%201W1P.pdf](https://cms1files.revize.com/marshall/document_center/Emergency%20Management/Thief%20River%201W1P.pdf) and <https://www.redlakewatershed.org/mud-river-enhancement-project>.

SDSUE 2021 South Dakota State University Extension. "Major Problems Caused by Reed Canary Grass." Updated June 28, 2021. Access at [https://www.google.com/search?q=problems+caused+by+canary+reed+grass&og=problems+caused+by+canary+reed+grass+&gs\\_lcrp=EgZjaHJvbWUyBggAEFUYOTIHCAEQIRigATIHCAlQIRigATIHCAMQIRigATIHCACQIRifBTIHCAgQIRifBTIHCAkQIRifBdIBCjEzNDIxajBqMTWoAgiwAgHxBQnOdVJKQAU8&sourceid=chrome&ie=UTF-8](https://www.google.com/search?q=problems+caused+by+canary+reed+grass&og=problems+caused+by+canary+reed+grass+&gs_lcrp=EgZjaHJvbWUyBggAEFUYOTIHCAEQIRigATIHCAlQIRigATIHCAMQIRigATIHCACQIRifBTIHCAgQIRifBTIHCAkQIRifBdIBCjEzNDIxajBqMTWoAgiwAgHxBQnOdVJKQAU8&sourceid=chrome&ie=UTF-8).

Sylte and Fischenich 2000 Traci Sylte (Hydrologist/P.E., Lolo National Forest, Missoula, MT) and Craig Fischenich (Research Civil Engineer, ERDC EL, Vicksburg, MS). "Root Wad Composites for Streambank Erosion Control and Fish Habitat Enhancement." May 2000. [https://www.spa.usace.army.mil/Portals/16/docs/civilworks/regulatory/Stream%20Information%20and%20Management/ERDC%20Rootwad%20Composites.pdf#:~:text=OVERVIEW.%20A%20rootwad%20composite%20is%20a%20combination,streambanks%20and%20provide%20aquatic%20habitat%20\(Figure%201\)](https://www.spa.usace.army.mil/Portals/16/docs/civilworks/regulatory/Stream%20Information%20and%20Management/ERDC%20Rootwad%20Composites.pdf#:~:text=OVERVIEW.%20A%20rootwad%20composite%20is%20a%20combination,streambanks%20and%20provide%20aquatic%20habitat%20(Figure%201))

TRPP 2020 Thief River Planning Partnership. *Thief River Comprehensive Watershed Management Plan / One Watershed, One Plan*, through partnership with the "One Watershed, One Plan Program." Prepared by Houston Engineering, Inc. February 2020. Accessed at <https://www.redlakewatershed.org/files/f194ffb9a/Thief-River-1W1P.pdf>.

USDI 1997 Environmental Compliance Memorandum 97-2: Departmental Responsibilities for Indian Trust Resources and Indian Sacred Sites on Federal Lands, Part 1, May 8. Available online at <https://www.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/ECM97-2.pdf>

USEPA 2026a United States Environmental Protection Agency "Sediments." This EPA website presents a discussion of the adverse effects of sediments in waterbodies. Access at <https://www.epa.gov/caddis/sediments>

- USEPA 2026b “Policy and Guidance Documents under CWA Section 404.”  
<https://www.epa.gov/cwa-404/overview-clean-water-act-section-404>
- USFWS 2005 U.S. Fish and Wildlife Service. Region 3. Agassiz National Wildlife Refuge Comprehensive Conservation Plan. Access at  
<https://www.govinfo.gov/app/details/GOVPUB-I49-PURL-LPS64614>
- USFWS 2007 Agassiz NWR Habitat Management Plan (HMP). G. Huschle and G. Knutsen, authors. The HMP is available online to the public through the U.S. Fish and Wildlife Service Catalog (ServCat) at  
<https://iris.fws.gov/APPS/ServCat/DownloadFile/16001>.
- USFWS 2016 U.S. Fish and Wildlife Service. “Mud River Plan of Study.” Produced by HDR, Inc. for U.S. Fish and Wildlife Service and Red Lake Watershed District. Available from Agassiz NWR headquarters.
- USGS 2020 United States Geological Survey, Northern Prairie Wildlife Research Center. “Cattail (Typha) Invasion in North American Wetlands.” Posted on May 30, 2020; access at <https://www.usgs.gov/news/cattail-typha-invasion-north-american-wetlands#:~:text=Cattail%20invasion%20and%20expansion%20can%20have%20the,%20Associated%20with%20many%20traditional%20cultural%20uses> and March 10, 2020: <https://www.usgs.gov/media/videos/importance-cattails-wetlands>

# Appendix A. Applicable Statutes and Executive Orders

Draft Environmental Assessment  
for the  
Proposed Mud River Enhancement Project  
Agassiz National Wildlife Refuge

June 2026

## **APPENDIX A. APPLICABLE STATUTES AND EXECUTIVE ORDERS**

The National Wildlife Refuge System includes federal lands managed primarily to provide habitat for a diversity of wildlife species. The purpose(s) for which a particular refuge is established are specified in the authorizing document for that refuge. These purposes guide the establishment, design, and management of a refuge. Key authorities, statutes, and orders that guide operations and management are summarized in this appendix. Not all of the information, herein, is pertinent to the Mud River Enhancement Project.

### **PLANNING AND ENVIRONMENTAL ANALYSIS**

The environmental analysis process and project planning efforts were guided by numerous laws, regulations, and policies listed below.

- *National Environmental Policy Act of 1969*
- Department of the Interior *National Environmental Policy Act* Regulations, 43 CFR Part 46, as amended on May 12, 2026. <https://www.ecfr.gov/current/title-43/subtitle-A/part-46>

#### Title 43: Public Lands: Interior

##### Subtitle A (1-199): Office of the Secretary of the Interior

- Part 46 (10-450): Implementation of the *National Environmental Policy Act of 1969*
- Subpart D (300-325): Environmental Assessments

### **U.S. FISH AND WILDLIFE SERVICE POLICY**

- Service Manual Chapters
  - Series 500 – Interagency, intergovernmental, and international activities, environmental quality series
    - Parts 501-509: Interagency activities
    - Part 505: Environmental review
      - FW 1: Policy and responsibilities
      - FW 2: NEPA assistance
      - FW 3: Review of environmental documents
      - FW 4: Other related reviews
    - Parts 550-559: Environmental quality
    - Part 550: *National Environmental Policy Act of 1969*
      - FW 3: Documenting and implementing decisions

## EXECUTIVE ORDERS

- Executive Order 11513 – Protection and Enhancement of Environmental Quality, March 5, 1970
- Executive Order 11593 – Protection and Enhancement of the Cultural Environment, 36 Federal Register 8921 (1971)
- Executive Orders 11988 – Floodplain Management and 11990 (Protection of Wetlands)
- Executive Order 12996 – Management and Public Use of the National Wildlife Refuge System
- Executive Order 13007 – Indian Sacred Sites, 61 Federal Register 26771 (1996)
- Executive Order 13112 – Invasive Species, 64 Federal Register 6183 (1999)
- Executive Order 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds, 66 Federal Register 3853 (2001)

## STATUTES

### Fish and Wildlife

- *Bald and Golden Eagle Protection Act*, as amended, 16 U.S.C. 668-668c, 50 CFR 22
- Conservation of Nature Protection and Wildlife Preservation in the Western Hemisphere Act of 1940 (56 Stat. 1354)
- *Endangered Species Act of 1973*, as amended, 16 U.S.C. 1531-1544; 35 CFR Part 13; 50 CFR Parts 10, 17, 12, 81, 217, 222, 225, 402, and 450
- *Fish and Wildlife Coordination Act* (1934), as amended; 16 U.S.C. 661-666
- *Fish and Wildlife Act of 1956*, 16 U.S.C. 742a-m
- *Fish and Wildlife Improvement Act of 1978* (16 U.S.C. 7421; 92 Stat. 3110) Public Law 95-616, November, 1978
- *Fish and Wildlife Conservation Act of 1979* (Public Law 96-366), dated September 29, 1980; (nongame Act) 16 U.S.C. 2901-2911; 94 Stat. 1322
- *Lacey Act*, as amended, 16 U.S.C. 3371 et seq.; 15 CFR Part 10, 11, 12, 14, 300, and 904
- *Migratory Bird Treaty Act*, as amended, 16 U.S.C. 703-712; 50 CFR Parts 10, 12, 20, and 21

### Natural Resources

- *Administrative Procedures Act*, 5 U.S.C. 551-559, 701-706, 1305, 3344, 4301, 5362, 7521; 60 Stat. 237, as amended (Public Law 79-404)

- *Clean Air Act*, as amended, 42 U.S.C. 7401-7671q; 40 CFR Parts 23, 50, 51, 52, 58, 60, 61, 82, and 93; 48 CFR Part 23
- *Clean Water Act*, Section 404, Nationwide Permit 27.
- *Environmental Education Act of 1975*, 20 U.S.C. 1531-1536
- *Federal Aid in Wildlife Restoration Act*, 16 U.S.C. 669-669i, as amended
- *Federal Noxious Weed Act of 1975* (Public Law 93-629); 7 U.S.C. 2801 et seq.; 88 Stat. 2148
- *Federal Water Pollution Control Act* (Public Law 92-500), commonly known as the *Clean Water Act of 1972*, 33 U.S.C. 1251-1387et seq.
- *Land and Water Conservation Act of 1965*, as amended, 16 U.S.C. 460L-460L-11; as amended through 1987
- *National Wildlife Refuge System Administration Act of 1966* (16 U.S.C. 668dd-668ee)
- *National Wildlife Refuge System Improvement Act of 1997* (Public Law 105-57); 16 U.S.C. 668dd
- *Refuge Trespass Act*, 18 U.S.C. 41; Stat 686
- *Wilderness Act*, 16 U.S.C. 1131 et seq.
- *Wild and Scenic Rivers Act*, 16 U.S.C. 1271 et seq.

### **Cultural Resources**

- *National Historic Preservation Act of 1966*, as amended, Section 106; 614 FW 3; 16 U.S.C. 470 – 470x-6; 36 CFR Parts 60, 63, 78, 79, 800, 801, and 810
- *Archaeological Resources Protection Act of 1979*, 16 U.S.C. 470aa-470mm; 18 CFR Part 1312; 32 CFR Part 229; 36 CFR Part 296; 43 CFR Part 7
- *American Indian Religious Freedom Act*, as amended, 42 U.S.C. 1996–1996a; 43 CFR Part 7
- *Antiquities Act of 1906*, 16 U.S.C. 431-433; 43 CFR Part 3
- *Historic Sites Act of 1935*, 16 U.S.C. 461
- *Paleontological Resources Protection Act*, 16 U.S.C. 470aaa-470aaa-11
- *Native American Graves Protection and Repatriation Act*, 25 U.S.C. 3001-3013; 43 CFR Part 10

Equal opportunity to participate in and benefit from programs and activities of the U.S. Fish and Wildlife Service is available to all individuals regardless of physical or mental ability. Dial 711 for a free connection to the state transfer relay service for the hearing impaired. For more information or to address accessibility needs, please contact the refuge staff or the U.S. Department of the Interior, Office of Equal Opportunity, 1849 C Street NW, Washington, DC 20240.

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June 2026

