

# Appendix C

## Biological Assessment

*UMRR Feasibility Report with Integrated Environmental Assessment  
Yorkinut Slough HREP  
Two Rivers National Wildlife Refuge (Calhoun County, Illinois)*

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## **1 Introduction**

### **1.1 Purpose**

The U.S. Army Corps of Engineers, St. Louis District (USACE) is preparing a Feasibility Report with Integrated Environmental Assessment for implementation of the Yorkinut Slough Habitat Rehabilitation and Enhancement Project (HREP), referred to as the Study. The primary goal of this ecosystem study is to restore and improve the quality and diversity of floodplain forest and wetland ecosystem resources. The purpose of this Draft Feasibility Report with Integrated Environmental Assessment (EA), including the draft unsigned Finding of No Significant Impact (FONSI), is to evaluate the proposal for the UMRR-HREP at Yorkinut Slough. The Draft Feasibility Report and Integrated EA meet USACE planning guidance and meet NEPA requirements. The draft feasibility report presents a detailed account of the planning, engineering, construction details, and environmental considerations.

The need for this Project is described fully in the draft feasibility report, and only briefly summarized here. Aquatic habitats along the Illinois River and UMR have been adversely affected by past human-induced actions that have resulted in a loss of resources for resident and migrant wildlife. Restoring aquatic and floodplain vegetation diversity and floodplain topographic diversity have been identified as habitat needs for the Lower Illinois River (McCain et al., 2019). Existing aquatic habitat is currently in a state of decline due to lack of effective water management which limits the disturbance required to maintain plant diversity and seed production for migratory wildlife. Without action, wetland health and resiliency would be impacted as a result of continued decline in wetland quality. In addition, the continued degradation would lead to conversion of wetland cover to swamp scrub/shrub or early successional forest translating to a quantitative loss of habitat (resting, foraging, and breeding) for migratory and resident wildlife. There is an opportunity to restore a diverse suite of habitats that have all been identified as a habitat need for the Illinois River within the Study area. The restoration of ecosystem structure and function at the Project would contribute to restoring ecological health and resiliency of the Upper Mississippi River System. Refer to the main report for more details.

### **1.2 Resource Significance**

Public, institutional, and technical resource significance categories, as described in ER 1105-2-100 were identified for the Lower Illinois River Valley (a subset of the Upper Mississippi River Basin) which includes the study area for the study. Resource significance is one component utilized in ecological restoration studies to help determine if an ecosystem is significant enough to warrant federal investment. A summary of resource significance by category is provided in the draft feasibility report, while the more comprehensive list of resource significance can be found below in Table 1.

Table 1. Resource Significance for Yorkinut Slough. Yorkinut Slough is part of the National Wildlife Refuge System.

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Resource	Institutional Recognition	Public Recognition	Technical Recognition
Threatened and Endangered Species	<p>Fish and Wildlife Coordination Act, as amended (16 U.S.C. § 661)</p> <p>Endangered Species Act (ESA) of 1973, as amended</p> <p>Mark Twain National Wildlife and Fish Refuge Comprehensive Conservation Plan (USFWS 2004).</p> <p>Two Rivers National Wildlife Refuge (NWR) Habitat Management Plan (FWS, 2011)</p> <p>National Wildlife Refuge Systems Biological Integrity, Diversity, and Environmental Health Policy</p>	<p>Congress has recognized the nation's rich natural heritage is of "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people."</p>	<p><i>Scarcity:</i> The USFWS has identified the Indiana Bat; Northern Long-eared Bat; and Decurrent False Aster as federally-endangered or threatened species that have the potential to occur within Calhoun County, IL.</p>
Migratory Birds	<p>Migratory Bird Conservation Act of 1929, and associated treaties</p> <p>Migratory Bird Treaty Act of 1918</p> <p>EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds</p>	<p>Migratory birds provide the public with recreational opportunities, such as bird watching and waterfowl hunting.</p> <p>National Audubon Society has designated the Two Rivers National Wildlife Refuge an important bird area for migratory waterfowl,</p>	<p><i>Representativeness:</i> Numerous migratory birds utilize Yorkinut Slough wetland units including waterfowl, shorebirds, and migratory landbirds (USFWS, unpublished data).</p> <p><i>Representativeness:</i> (Knutson, Hoover, &amp; Klaas, 1996)); found relative abundances of all birds and total numbers of neotropical migratory birds were almost twice as high in the UMR</p>

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Resource	Institutional Recognition	Public Recognition	Technical Recognition
	<p>Bald and Golden Eagle Protection Act of 1940</p> <p>North American Waterfowl Management Plan Upper Mississippi Great Lakes JV (UMRGLJV) Waterfowl and Waterbird Strategies (Soulliere, et al., 2017); (Soulliere, et al., 2018)</p> <p>UMRGLJV 2021 Landbird Conservation Strategy (Soulliere, et al., 2020)</p>	<p>shorebirds, and breeding Prothonotary Warbler.</p> <p>The Upper Mississippi River Waterfowl Conservation Region (Region 19) is a level III Ducks Unlimited conservation priority area, providing a migration corridor for waterfowl.</p>	<p>floodplain as in the adjacent uplands.</p> <p>Upper Mississippi River Great Lakes Joint Venture (UMRGLJV) (Soulliere, et al., 2018) identified the Mississippi River and Lower Illinois River aquatic habitat as highly important to nonbreeding waterbirds.</p> <p><i>Limiting Habitat:</i> National Audubon Society designated the area an Important Bird Area for concentrations of wetland birds and breeding populations of Prothonotary Warbler (NAS, 2008). Both groups are limited by suitable habitat on the landscape.</p> <p><i>Status and Trend:</i> Forest and wetland habitat diversity in the Illinois Mississippi River confluence have declined over time. These trends are likely to continue, and without intervention, Yorkinut Slough will provide limited migration, dispersal, breeding, nesting, and cover habitat for a wide range of migratory birds.</p>
Floodplain Forests	<p>Fish and Wildlife Coordination Act, as amended (16 U.S.C. § 661)</p> <p>ESA of 1973, as amended</p> <p>Mark Twain National Wildlife Refuge</p>	<p>The Upper Mississippi River Conservation Committee (UMRCC) recognized the importance of the floodplain forest to the fish and wildlife</p>	<p><i>Scarcity:</i> Hard-mast forest resources have declined due to hydrologic changes and land use changes along the UMRS and in the study area (Nelson, Redmond, &amp; Sparks, 1994); (Cosgriff, Nelson, &amp; Yin, 1999)</p>

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Resource	Institutional Recognition	Public Recognition	Technical Recognition
	<p>Comprehensive Conservation Plan (FWS, Two Rivers National Wildlife Refuge Comprehensive Conservation Plan Summary. 118 pgs., 2004)</p> <p>Two Rivers NWR Habitat Management Plan (FWS, 2011)</p> <p>Rivers Project Office Master Plan (USACE, 2015)</p> <p>Upper Mississippi River Systemic Forest Stewardship Plan (USACE, 2012)</p> <p>National Wildlife Refuge Systems Biological Integrity, Diversity, and Environmental Health Policy</p> <p>UMRGLJV 2020 Landbird Conservation Strategy (Soulliere, et al., 2020)</p>	<p>of the UMR (Urich &amp; Nelson, 2002).</p> <p>National Audubon Society has identified floodplain forest of the Upper Mississippi River as a focal area due to its importance for breeding and migratory landbirds.</p>	<p><i>Biodiversity:</i> The study area is likely to continue to experience continued loss of forest resources and limited species and structural diversity. Neotropical and other migratory landbirds, Indiana bats, and the other floodplain species that rely on the forest resources will be severely impacted.</p> <p><i>Representativeness:</i> (Knutson, Hoover, &amp; Klaas, 1996) described the importance of floodplain forest in the conservation and management of neotropical migratory birds. (Kirsch &amp; Wellik, 2017) describe the importance oak and other declining species in UMR floodplain forests for neotropical migrant landbirds.</p>

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Resource	Institutional Recognition	Public Recognition	Technical Recognition
Wetlands	<p>The 2018 <i>Waterbird Habitat Conservation Strategy Revision</i> – area of greatest biological importance for breeding and non-breeding waterbird habitats (Soulliere, et al., 2018)</p> <p>Executive Order No. 11990 of May 1977 (Protection of Wetlands)</p> <p>Water Resources Development Act of 1990, Section 307(a)</p> <p>Mark Twain National Wildlife and Fish Refuge Comprehensive Conservation Plan (FWS, Two Rivers National Wildlife Refuge Comprehensive Conservation Plan Summary. 118 pgs., 2004).</p> <p>Two Rivers NWR Habitat Management Plan (FWS, 2011)</p> <p>National Wildlife Refuge Systems Biological Integrity, Diversity, and Environmental Health Policy</p>	<p>Ducks Unlimited has partnered with the Refuge on wetland habitat conservation projects within Two Rivers NWR in recent years due to the importance of the area for migratory waterfowl.</p>	<p><i>Connectivity:</i> The Illinois Mississippi River Confluence area contains a high concentration public and private wetland resources (Soulliere, et al., 2017) for migrating waterfowl. The UMR and Illinois River Valley provide valuable resources for migratory waterfowl in spring and fall (Stafford et al., 2007).</p> <p><i>Scarcity:</i> Through land use changes, approximately 90% of presettlement wetlands were lost by the 1980’s in Illinois.</p> <p><i>Status and Trend:</i> Without Yorkinut Slough HREP, the emergent wetland habitat extent and ability to provide quality habitat for wetland-dependent species is expected to decline.</p>

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The purpose of this Biological Assessment (BA) is to review the proposed Yorkinut Slough HREP in sufficient detail to evaluate whether the proposed actions may affect any federally threatened, endangered, proposed, or candidate species identified by the U.S. Fish and Wildlife Service (USFWS). This BA is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (15 U.S.C. 1536 (c)) and applicable guidance documents. The BA includes the description of the study area, proposed actions, species accounts and status, effects of the proposed actions, and effects determinations.

### **1.3 Proposed Action**

This Biological Assessment evaluates the impacts of the tentatively selected plan for the construction, operation, and maintenance of proposed project features based on the feasibility level of design. For more details on the quantities for the feasibility level of design, see *Appendix I – Civil Engineering*.

### **1.4 Project Description**

USACE is preparing to implement a habitat rehabilitation and enhancement project at Yorkinut Slough, located in Calhoun County, Illinois (Figure 1). The project is in the lower Illinois River between river miles 4.5 and 11. The study area is approximately 2,350 acres of bottomland forest and emergent wetland (2). The Tentatively Selected Plan (TSP), Alternative 3 Intermediate B, is shown in Figure 3 and Figure 4.

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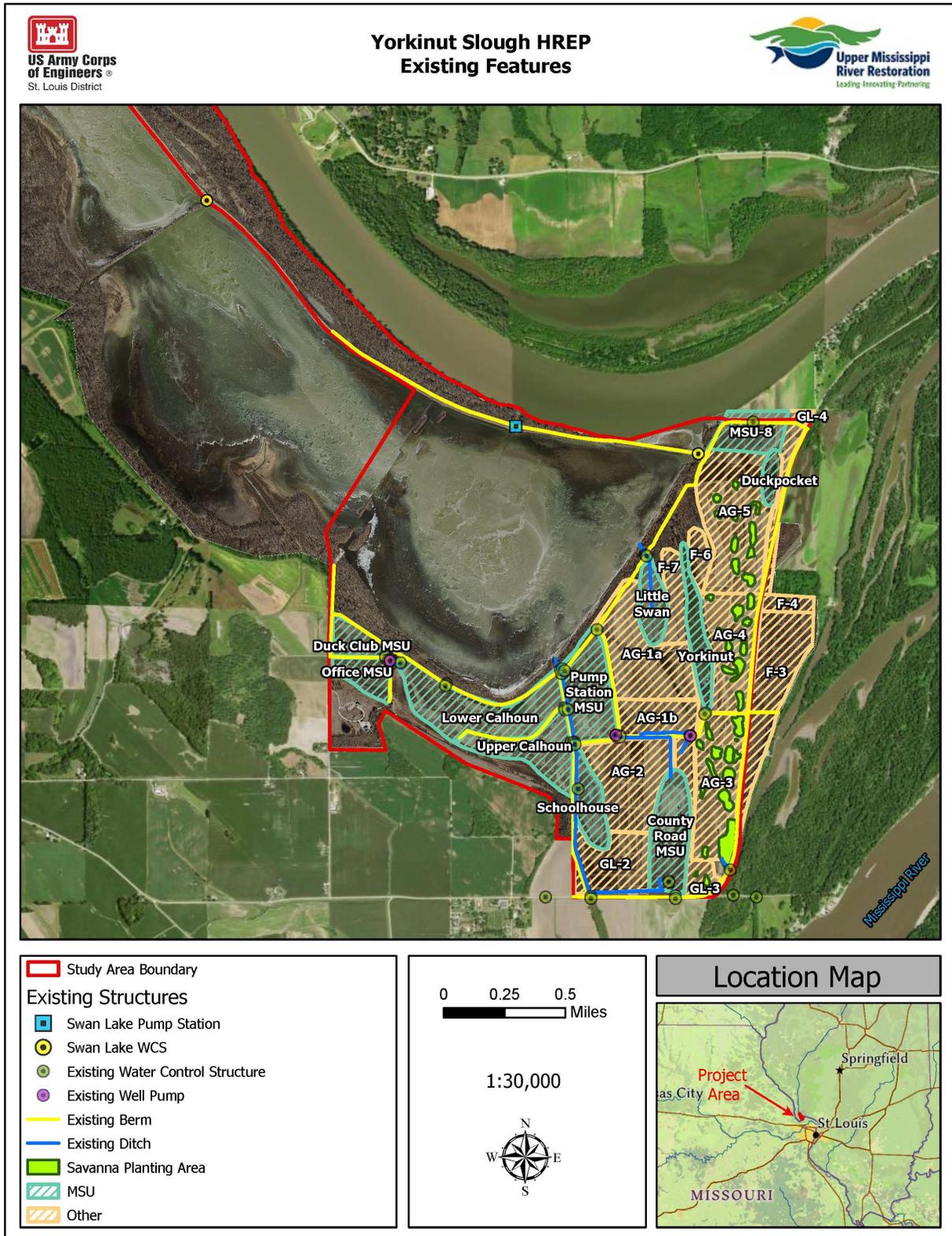


Figure 1: Yorkinut Slough HREP Study Area with existing infrastructure

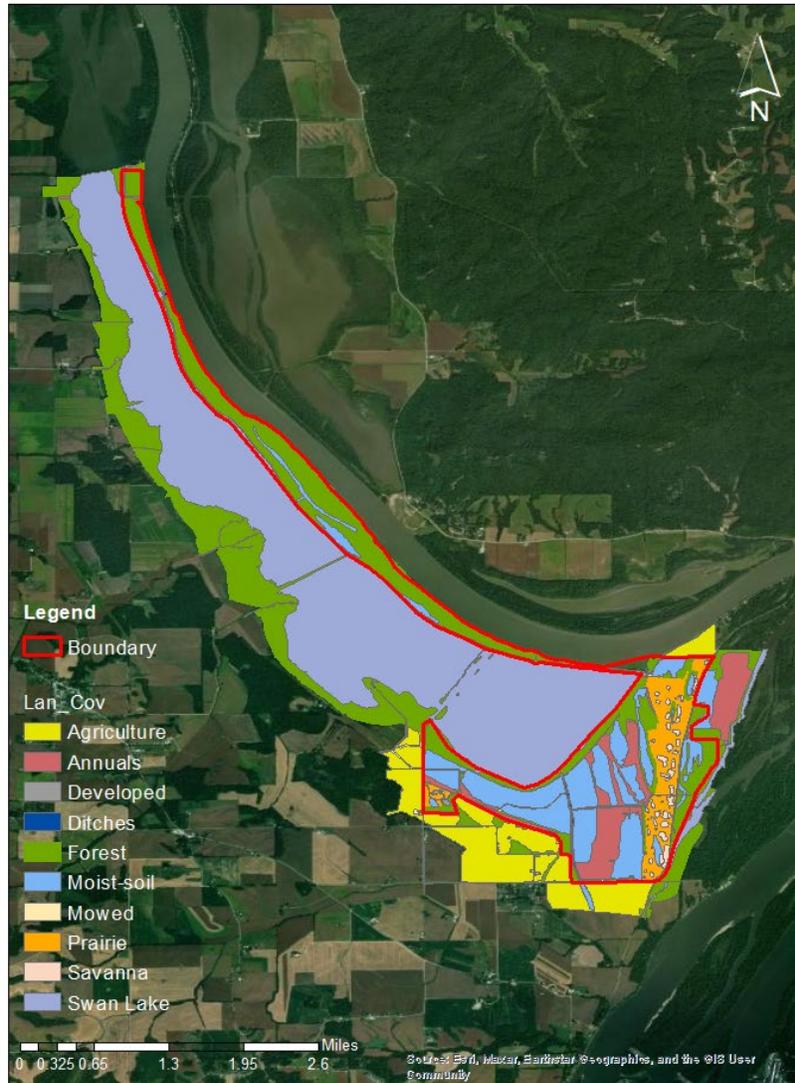


Figure 2: Study Area Landcover

The TSP, Alternative 3 Intermediate B, involves degrading and realigning berms to follow study area contours. Berm realignment would allow for more efficient and effective water transport throughout the study area. Water transport would be improved by realignment of drainage ditches, the construction of 2 well pumps; 11 water control structures; an additional pump station, and a gravity drain on Six Mile Island. Together these measures would allow the study area to be drained and filled more quickly during the spring and fall. Approximately 532 acres of

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emergent wetlands, 632 acres of timber stand improvement (TSI), and 215 acres of hard-mast tree planting would result from measures in the TSP from realigning berms and drainage ditches, and the construction of wells and water control structures.

The TSP was developed following the CE/ICA and was refined with more design details. The TSP includes the following components:

- Berm construction and associated earthwork (approximately 12 acres)
- Berm enhancement and associated earthwork (approximately 8 acres)
- Berm deconstruction and associated earthwork (approximately 21 acres)
- Remove 7 water control structures
- Install 10 water control structures
- Install 2 well pumps
- Well pump pipe installation (approximately 5400 ft.)
- Install 1 large gravity structure (~16' wide)
- Install 1 pump station
- Excavate 27 acres of channel
- Remove 13 acres of channel
- Excavate/re-grade acres of emergent wetlands (included in channel excavation acreage)
- Tree planting (approximately 215 acres)
- Clearing and grubbing (approximately 5 acres)
- TSI (approximately 632 acres)

#### 1.4.1 Berm Deconstruction, Construction, and Enhancement

Approximately 21 acres of existing berm would be deconstructed and material would be utilized to construct approximately 12 acres and enhance approximately 8 acres of berms. Berm deconstruction would increase connectivity of wetland habitats along similar elevation contours.

Berm creation would consist of placement of embankment around emergent wetland boundaries to enhance water management capabilities in realigned emergent wetlands. Locations of constructed berms would be such that natural sheet flow would be promoted within and between units. Berms would be constructed to have a minimum top width of 12 ft. Berms side slopes would have a minimum of 1 vertical to 3 horizontal to allow for maintenance equipment to traverse side slopes. Trees and other large diameter vegetation within the berm footprints would be removed and grubbed to foundation soils. At this time, no trees are expected to require removal for construction of berms. The berm footprints would be stripped prior to construction and stockpiled. This material would then be used as a final dressing on the new berms. Once the new berms are constructed, the berm itself along with any associated disturbed areas would be seeded. The newly constructed emergent wetland unit berms would serve as access to the interior of the emergent wetland area for maintenance equipment. Collectively these changes would be considered wetland restoration and would have a major effect on wetlands.

Approximately 9.2 acres of existing wetlands would be removed through the construction of berms, but proposed measures are anticipated to create an additional 93 acres of emergent wetland habitat in the study area.

Berm enhancements would consist of adding additional embankment material to the Yorkinut Slough Moist Soil Units (MSUs) berm in areas currently below 426.6 ft (NGVD 88). This would

reduce the frequency of flood events caused by frequent, minor flood events. As a result, emergent wetland vegetation development and production would be more consistent over the period of analysis. The berm enhancement would have a minimum top width of 12 ft. Berm side slopes would be a minimum of 1 vertical to 8 horizontal on the land side and 1 vertical to 8 horizontal on the riverside berm to increase resiliency and allow for maintenance equipment to traverse the slopes. No tree removal is anticipated as a result of this change, but if individual trees require removal they would be removed and grubbed to foundation soils. New berm footprints would be stripped and the stripped material would be stockpiled for use as final dressing on the new berms. The new berms and other associated disturbed areas would be seeded. In addition, the Six Mile Island/Illinois River Berm spillway would be restored to original design elevations and slopes to reduce frequent minor flood events that impact the study area.

#### 1.4.2 Straight Berm

A continuous berm constructed across the lake would consist of adding repurposed berm material from berm deconstruction areas to connect existing rip rapped islands across the lake. This berm would be constructed to an approximately 12-foot crown width and a minimum of 1 vertical to 4 horizontal side slopes. This measure would create two separate management units. Each unit would have its own gravity drain and pump station to independently manage water levels. The berm would have the additional benefit to the Yorkinut Slough emergent wetlands by reducing the influence of upland runoff.

#### 1.4.3 Structure Replacement

A total of 7 structures in the study area would be removed with a total of 11 structures installed at locations to improve drainage within and between units.

#### 1.4.4 Well Pump Installation

A total of two well pumps would be constructed near the eastern boundary of the study area along Highway 1. Water distribution lines would be placed from these two well pumps and two additional well pumps that are being installed by Ducks Unlimited in 2023 to the management units. Distribution line routes and material would be refined during planning to factor in soil geochemistry, longevity, and maintenance requirements. Well pumps and associated distribution lines would enhance Two Rivers National Wildlife Refuge's ability to reach seasonal water elevation targets within units as well as support the proposed expansion of emergent wetland area within the study area.

#### 1.4.5 Pump Station Installation

A pump station would be installed on Six Mile Island along with a new gravity drain to the Illinois River. This change would improve water management capabilities in Yorkinut Slough by reducing the influence of riverine flooding and upland runoff induced flooding. Dewatering of Yorkinut Slough emergent wetland units require water levels in the lake to be lower than the Yorkinut Slough units. Current infrastructure limits the ability of the Refuge to achieve suitable water elevations in the lake to allow draining of units after flood events. Additionally, backflooding effects occur from the lake into Yorkinut Slough emergent wetland units. The proposed changes would enhance water management capabilities in Yorkinut Slough emergent wetland units, and also improve management flexibility to achieve Refuge management goals.

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#### 1.4.6 Channel Removal, Modification, and Creation

Reconfiguration of channels would be required to promote sheet flow draining and filling within emergent wetland units. Drainage within units would be improved by grading of new shallow swales graded to drain toward water control structures and removing and grading existing berms to allow sheet flow across the old footprint of the berm. Existing channels that do not support sheet flow draining within the study area would be restored to ground level. Constructed swales to support unit draining will be trapezoidal in shape and consist of a wide 35' bottom width and 1V:4H side slopes. These swales are utilized to both connect existing units and improve drainage within large units. Designers base the dimensions of the swales on a nearby UMRR project where historic meander restoration was utilized in a similar manner to improve drainage within moist soil units. Additionally, new ditch excavation will take place in the southeast corner off the project area to convey water along the highway and through a nearby culvert. This ditch will match the existing ditch with a bottom width of 15' and 1V:3H side slopes. Contractors would remove trees and other large diameter vegetation within the ditch footprints along with grubbing of the foundation soils. Stripped and stockpiled material is the final dressing on the ditches to ensure natural re-vegetation. Frequent flood events also deposit native seed and organic materials to the subunits.

At this time no trees are anticipated to require clearing for construction or modification of channels.

#### 1.4.7 Emergent Wetland Enhancement

Emergent wetland enhancement will consist of berm reconfigurations to realign units with existing topographic relief, expansion of existing units, construction of a tiered wetland unit, and replacement of water management infrastructure (discussed in sections below). Approximately 9.2 acres of wetlands would be removed to enhance the berm for Yorkinut Slough wetlands. However, this would be offset by the removal of 21 acres of berms which would be converted to wetlands and would work towards enhancing or constructing 531 acres of wetlands in the study area as well as improve resiliency and reduce flood impacts to wetlands. A new drainage structure would be installed in the lake to reduce flood impacts to the Yorkinut Slough wetlands. Construction of the new drainage structure and pump station at the Illinois River berm would require an additional five acres of trees to be removed. The tree removal will be limited to areas with no impacts to cultural resources or historic properties.

#### 1.4.8 Tree Planting

Approximately 215 acres would be planted with trees in the area of the Refuge managed as open woodland. Species selection would be refined in the design phase, informed by previous HREP plantings and flood duration tolerances. Overall, species would primarily consist of Oak (*Quercus* spp.) such as Swamp White Oak, Overcup Oak, Pin Oak, and Pecan (*Carya illinoensis*).

#### 1.4.9 Timber Stand Improvement (TSI)

TSI would consist of approximately 632 acres of forest improvement activities such as woody vine removal, midstory removal, crop tree release, and gap formation with the use of cutting and herbicide.

#### 1.4.10 Impacts of TSP on Habitat Management

Construction of the TSP offers an opportunity to more closely mimic the historic, hydrological periods (i.e. summer low-water period followed by winter/spring high-water period) that many floodplain species adapted to by improving water management capacity and flexibility. As a result, the quality and quantity of emergent wetland, floodplain forest, and floodplain woodland would increase through Project measures. Study area habitat restoration through the Intermediate B alternative is preferred compared to other plans due to the degree of improvements to significant resources (institutional, public, and technical) in comparison to cost.

The Intermediate B alternative will help the Refuge better simulate natural flood and drainage regimes through modifications to existing water control structures, drainage channels, unit berms, and construction of well pumps and one pump station. Together, these measures help to ensure that water can be managed at optimal depths, and removed before the growing season or quickly after floods to support high quality habitat for migratory birds (waterbirds and landbirds). This supports the significant institutional resource set forth in the MBTA; EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds; The Bald and Golden Eagle Protection Act of 1940 and the Fish and Wildlife Coordination Act, as amended (16 U.S.C. § 661).

Emergent wetlands will be restored by realigning unit berms along elevational contours, updating water controls structures to better manage water after flood events, and improving well pump capacity to reach desired water levels to promote high quality emergent wetland habitat that supports the critical life stages of wildlife. This complements the significance of area wetland resources identified in the USFWS *Two Rivers NWR Habitat Management Plan (2011)*, *Waterbird Habitat Conservation Strategy (2018)*, *North American Waterfowl Management Plan (2017)*, and partnership work between Ducks Unlimited and the Refuge to conserve, restore, and manage wetland habitats for migratory waterfowl and waterbirds.

TSI, including selective tree, shrub, and vine removal, would improve horizontal and vertical structural diversity of the floodplain forest. Forestry measures would improve conditions for natural recruitment and increase age and species diversity. Tree Planting would improve underrepresented forest communities that have declined as a result of unsuitable light conditions (hard-mast, cottonwood, sycamore, and some soft-mast species), competition from shade-tolerant species, or low propagule number (seeds from suitable seed sources under natural conditions). Enhanced water level management capabilities would reduce growing season stress on planted trees which would result in healthier forest conditions long-term. Collectively, the changes in forest and woodland conditions are expected to increase habitat suitability and resiliency for a wide diversity of migratory landbirds in an area that was identified for its importance to migratory landbirds in the state (NAS, 2009).

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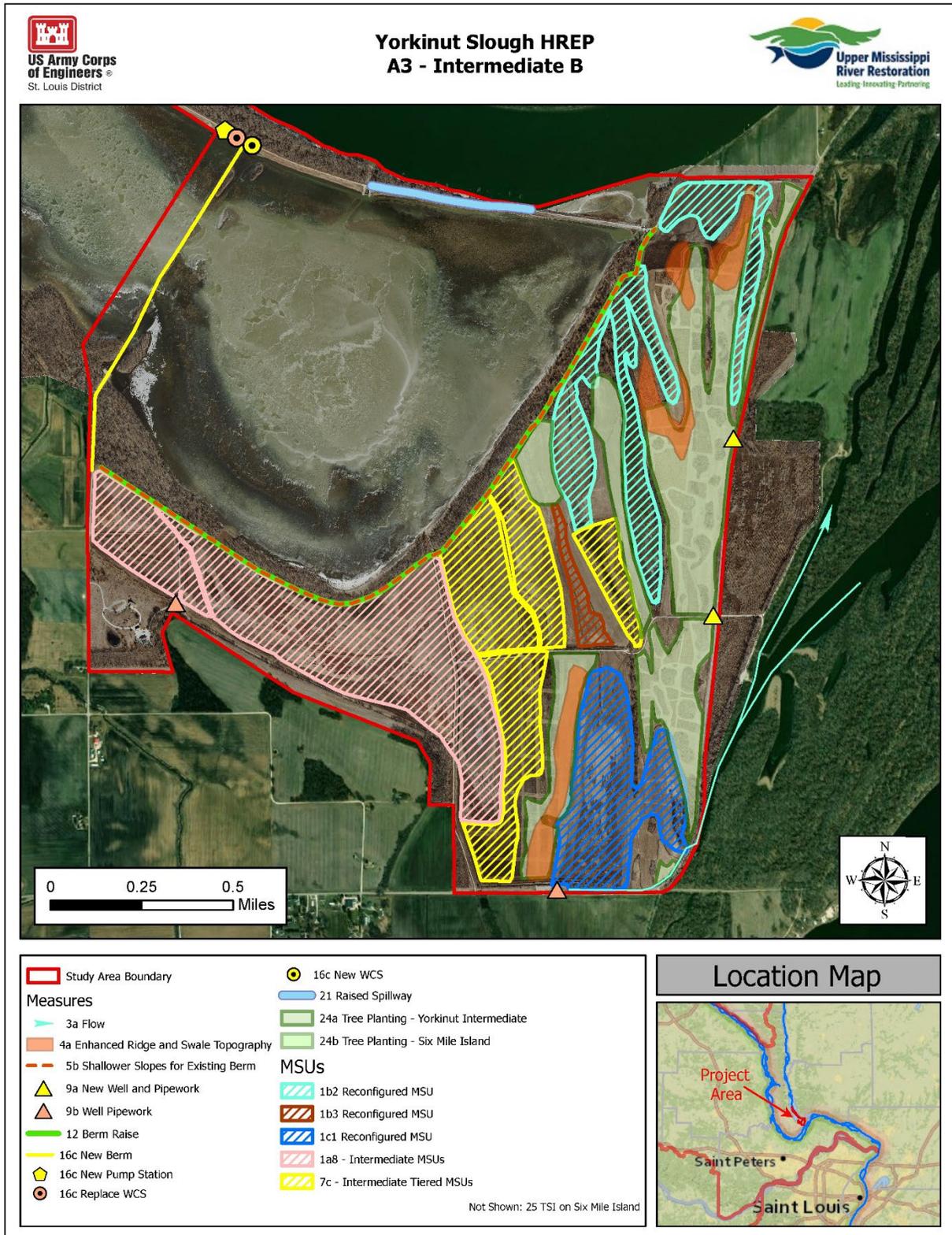


Figure 3: Tentatively Selected Plan (TSP) at Yorkinut Slough HREP

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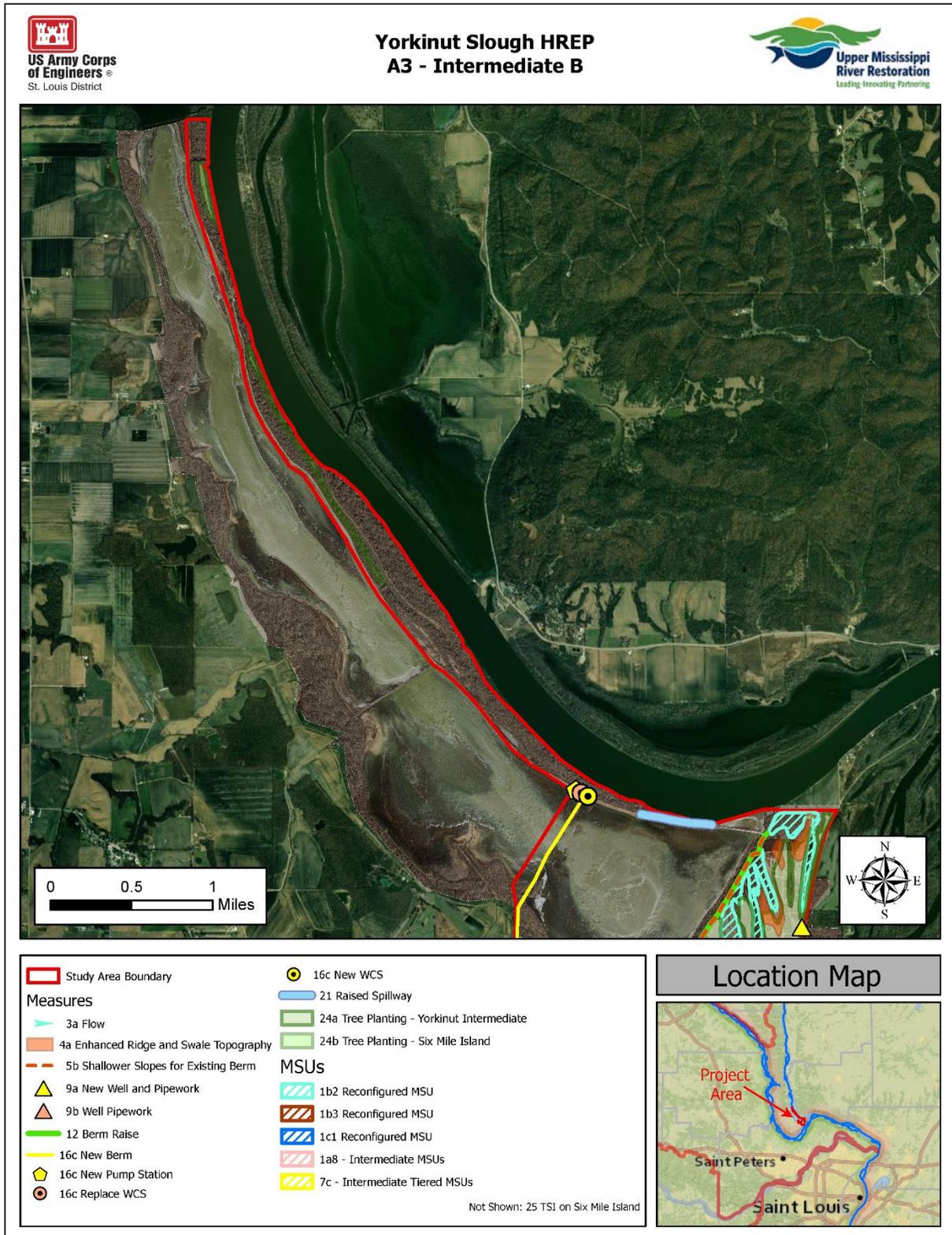


Figure 4: Tentatively Selected Plan (TSP) at Yorkinut Slough HREP – Six Mile Island

## 2 Species/Habitat Considered in the Consultation

USACE requested the official species via the ECOS-IPaC website (<http://ecos.fws.gov/ipac/>) on 30 October 2019, and updated on 02 February 2023. U.S. Fish and Wildlife Service provided a list of threatened and endangered species that may occur within or near the study area. The USFWS Ecological Services office in Marion, Illinois serves as the point of contact for this project and subsequent Biological Assessment. The five species, federal protection status, and habitat can be found in Table 2. No critical habitat is located in the study area.

Table 2. Federally Listed Threatened and Endangered Species Potentially Occurring the study area.

Species	Status	Habitat
Indiana Bat ( <i>Myotis sodalis</i> )	Endangered	Hibernates in caves and mines; maternity & foraging habitat: small stream corridors with well-developed riparian woods; upland & bottomland forests
Northern Long-eared Bat ( <i>Myotis septentrionalis</i> )	Endangered	Hibernates in caves and mines; swarming in surrounding wooded areas in autumn. Roosts and forages in upland forests during spring and summer.
Tricolored Bat ( <i>Perimyotis subflavus</i> )	Proposed Endangered	Hibernates in caves and mines in our region; found in forested habitats in spring, summer, and fall; generally roosts in canopy among leaf clumps/clusters.
Decurrent False Aster ( <i>Boltonia decurrens</i> )	Threatened	Disturbed alluvial soils
Monarch Butterfly ( <i>Danaus plexippus</i> )	Candidate	Overwinter in central Mexico; Migrate north in the spring occupying a range of grass/herbaceous flower dominated habitats. Dependent on milkweed as host plant for caterpillars

		and nectar producing flowers for adults throughout breeding, migration, and overwintering seasons.
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### 3.0 Measures Taken to Avoid Impact to Listed Species

During the planning process for the Yorkinut Slough HREP, the study team considered how project measures could impact listed species. Efforts have been made to reduce direct and indirect impacts to listed species.

#### 3.1 Conservation Measures

Conservation measures are actions to benefit or promote the recovery of a listed species that a federal agency includes as an integral part of the proposed action and that are intended to avoid, minimize, or compensate for potential adverse effects of the action on the listed species. As such, mandatory measures below will be incorporated into every USACE action that falls within this consultation framework.

The following bat conservation measures are proposed for the proposed action alternative to help minimize effects to currently listed species within the Project.

1. All tree clearing resulting from the USACE action will occur during the inactive season from November 16 to March 31 unless negative presence/probable absence survey results were obtained for the action area through appropriate surveys approved by the U.S. Fish and Wildlife Service (USFWS).
2. During clearing, dead trees, split trees, trees that have cavities, and trees with exfoliating bark would be favored for retention where possible.
3. All tree that are girdled in TSI process will be left standing for wildlife habitat and allowed to fall down naturally unless they pose a hazard to public safety or property.
4. Tree removal designed to create open foraging corridors in forests and uncluttered understory with plenty of cover and access to foraging corridors.
5. Indiana bat habitat assessments and presence/absence surveys would be conducted as needed per USFWS requests.
6. Best management practices would be utilized according to NWP 27 and 33 conditions to reduce impacts to wetlands, sediment movement, and water movement patterns. Additionally, disturbed areas would be restored by applying seed and mulch utilizing species that are native and would establish cover quickly to stabilize soils.
7. Herbicides used to control invasive species would follow EPA product label instructions.
8. Appropriate buffer distances around potential eagle nests would be coordinated with the USFWS prior to or during construction to account for any changes in conditions from existing resources.
9. No forestry measures would be utilized within a buffer of at least 100 ft of a known Bald Eagle nest. A buffer of at least 330 ft would be utilized during the nesting season for TSI measures in which the eagle nest is surrounded by forest. A buffer of 660 feet would be utilized under instances of direct line of site during the active nesting period.

## 4.0 Impact Assessment

The following section includes a status description of each species and how it will be affected by proposed Project elements as well as the determination of effects for each species. The effects determination took into account implementation of the conservation measures listed above.

### 4.1 Indiana Bat (*Myotis sodalis*)

#### 4.1.1 Status

The Indiana bat is a federally listed, endangered mammal species (USFWS, 2007). The range of the Indiana bat includes much of the eastern half of the United States, including Illinois. Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females emerge from hibernation in late March or early April to migrate to summer roosts. During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods, as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forest, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds in pastures. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to single young in June or July. A maternity colony may vary widely in size due to time of year, roost switching behavior, and thermal conditions. Maternity roosts with a few to more than 350 individuals have been reported (USFWS, 2007) but typically contain fewer than 100 individuals. A single colony may utilize several roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females.

Disturbance and vandalism, improper cave gates and structures, natural hazards, such as flooding or freezing, microclimate changes, land use changes in maternity range, and chemical contamination are the leading causes of population decline in the Indiana Bat (USFWS, 2007). To avoid impacting this species, tree clearing activities should not occur during the period of 1 April to 31 October.

Suitable summer foraging and roosting habitat exists within the study area. Potential roost trees in already forested areas such as Six Mile Island are continuously changing as potential roost trees are created and existing roost trees become unsuitable. Tree mortality is anticipated to increase significantly in mature Cottonwood and Green Ash over the near-term. Mist net surveys conducted at Calhoun Point in 2014 resulted in the capture of two Indiana bats. Those individuals were radiotagged and tracked to roost trees on subsequent nights. Two roost trees were located on Six Mile Island and one roost tree on a nearby island.

No suitable hibernation habitat exists within the study area. However, a known hibernaculum is located approximately 2.5 miles away.

#### 4.1.2 Effects Determination

**Impact of No Action Alternative** - Under the No Action Alternative, the forest community in the study area would persist but Cottonwood, hard-mast (Oaks and Pecan), and mature Green Ash would decrease in abundance as a result of age, hydrological, or insect-related mortality. As a result, habitat suitable for roosting would be expected to decrease over time in the study area.

Given the proximity to adjacent bottomland and upland forest habitat, Indiana bats that could be present in the study area would likely relocate to suitable habitat.

### **Impacts of Proposed Federal Action –**

The forest tree planting and TSI portion of the Project would improve habitat for the Indiana Bat. Approximately 5 acres of forest would be cleared to enhance water level management capabilities for the Yorkinut Slough study area through the construction of an additional pump station, gravity drain, and drainage channel between Swan Lake and the Illinois River. This linear connection that will include open water could serve as potential foraging habitat for the Indiana Bat. Additionally, proposed forestry measures would enhance foraging habitat through TSI activities that would improve age, species, and structural diversity, open up the understory and midstory on 632 acres, would increase floodplain woodland habitat by 215 acres, and promote development of suitable roost tree habitat through enhanced tree recruitment on 901 acres. Although known roost trees exist within the study area, none are known to occur within the footprint of potential Project measures. Tree clearing and felling associated with the project would occur during the non-roost season, November 15 through March 31. Areas that have known roosts would be delineated and avoided. During detailed engineering and design and prior to construction, a more detailed Indiana bat habitat assessment would be performed and coordinated with the USFWS to identify and mark each potential roost tree if trees are to be removed during the roost season. If necessary, presence/absence surveys and/or emergence surveys would be conducted as needed per USFWS guidelines. Tree clearing within the study area account for 0.5 % of the total available habitat within the study area, and additional potential habitat occurs across thousands of public land acres in the project vicinity. Several components of the proposed Project could have site specific impacts on Indiana Bats and Indiana Bat habitat, but are not anticipated to individually or cumulatively have an adverse impact on the population as a whole. Therefore, we conclude that the Project **may affect but is not likely to adversely affect the Indiana Bat.**

## **4.2 Northern Long-eared Bat (*Myotis septentrionalis*)**

### **4.2.1 Status**

The northern long-eared bat is a federally listed, endangered mammal species (Federal Register 29 Nov 2022). The northern long-eared bat is sparsely found across much of the eastern and north central United States and spends winter hibernating in caves and mines. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Within hibernacula, they are found in small crevices or cracks (USFWS, 2022). Northern long-eared bats typically occupy their summer habitat from mid-May through mid-August each year and the species may arrive or leave some time before or after this period. Summer habitat for the northern long-eared bat includes a wide variety of forested/wooded habitats and some adjacent habitats where they roost, forage, and travel for resources. During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees  $\geq 3$  inches diameter at breast height. Suitable roost habitat may occur in blocks of forest, linear corridors (i.e. fencerows or riparian forests), and dense or loose clusters of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit

characteristics of suitable roost trees and are within 1,000 feet (ft) of other forested/wooded habitat. Males and non-reproductive females may also roost in cooler places, like caves and mines. They have also been found, rarely, roosting in structures like barns and sheds (USFWS, 2022). Foraging occurs in floodplain and upland forests. Forest fragmentation, logging and forest conversion are major threats to the species. One of the primary threats to the northern long-eared bat is the fungal disease, white-nose syndrome, which has spread to over 39 states and 7 provinces in North America, and results in extensive mortality (USFWS, 2002). Cheng et al. (2021) estimated populations declines of 97-100% across over 75% of the northern long-eared bat's range.

The study area does not have suitable hibernation habitat, but suitable summer foraging habitat is present. A previous survey that captured Indiana bats nearby did not capture northern long-eared bats, but the species still may occur in adjacent areas as well as the study area.

#### 4.2.2 Effects Determination

**Impact of No Action Alternative** - Under the No Action Alternative, the forest community in the study area would persist but Cottonwood, hard-mast (Oaks and Pecan), and mature Green Ash would decrease in abundance as a result of age, hydrological, or insect-related mortality. As a result, habitat suitable for roosting would be expected to decrease over time in the study area. Given the proximity to adjacent bottomland and upland forest habitat, Northern Long-eared Bats that could be present in the study area would likely relocate to suitable habitat.

**Impacts of Proposed Federal Action** – Implementation of this project as discussed in Section 4.1.2 would be expected to improve the foraging and roosting habitat for the northern long-eared bat also. No known roost trees occur within the footprint of the potential Project measures, but potential roost trees occur within forested areas of the study area. The proposed action could have site specific impacts on northern long-eared bats and habitat, but are not anticipated to individually or cumulatively to have an adverse impact on the population as a whole. Some potential, future roost trees may be removed as a result of forestry measures, but foraging habitat would be expected to improve as a result of the treatments and snag densities are anticipated to remain at levels that would support roosting bat species. No tree clearing would occur between April 1 and October 31. Therefore, the Proposed Federal Action **may affect but is not likely to adversely affect the northern long-eared bat.**

#### 4.3 Tricolored Bat (*Perimyotis subflavus*)

##### 4.3.1 Status

Tricolored bats were formerly called eastern pipistrelle. Tricolored bats are usually found roosting singly. Maternity colonies averaged approximately 4 (range 1-8) females and pups in Indiana (USFWS, 2021). In winter, tricolored bats hibernate in caves with a preference for caves that are humid and warm. In summer, they generally leave their hibernation caves and roost in trees, clumps of leaves in the canopy, cliffside crevices, and human-made structures. They forage for insects high in the air along forest edge and the boundaries streams or open bodies of water. Tricolored bats mate during spring, fall, and sometimes in the winter. Maternity colonies begin forming in mid-April and females bear 1 to 2 pups by late May to mid-July.

Suitable tricolored bat summer habitat likely occurs in the forested areas adjacent to and within the study area.

#### 4.3.2 Effects Determination

**Impact of No Action Alternative** - Under the No Action Alternative, the forest community in the study area would persist but Cottonwood, hard-mast (Oaks and Pecan), and mature Green Ash would decrease in abundance as a result of age, hydrological, or insect-related mortality. As a result, habitat suitable for roosting would be expected to decrease over time in the study area. Given the proximity to adjacent bottomland and upland forest habitat, tricolored bats that could be present in the study area would likely relocate to suitable habitat.

**Impacts of Proposed Federal Action** – Implementation of this project as discussed in Section 4.1.2 would be anticipated to improve the foraging and roosting habitat for the tricolored bat. Direct impacts from tree removal would be avoided by implementing the winter clearing restriction, which requires all tree clearing to be conducted between November 15 and March 31. No structures that could provide roosts would be impacted. No known roost trees occur within the footprint of the potential Project measures, but potential roost trees occur within forested areas of the study area. The temporary direct and indirect adverse impacts would be outweighed by the substantial direct and indirect benefits of the proposed TSI treatments. Therefore, the Proposed Federal Action **may affect but is not likely to adversely affect the tricolored bat.**

### 4.3 Decurrent False Aster (*Boltonia decurrens*)

#### 4.3.1 Status

Decurrent false aster is a federally listed, threatened floodplain perennial plant species that may be found on moist, sandy floodplains and prairie wetlands along the Illinois River and portions of the Mississippi River. It is dependent on flood pulses or other disturbances that eliminate competing vegetation and provide the high light and moist soil conditions needed for seed germination and establishment (Smith and Keevin, 1998). Without disturbance, other plant species can out-compete decurrent false aster and eliminate it in 3 to 5 years from any given area. Species decline is due to several factors including excessive silting of habitat due to topsoil run-off, conversion of natural habitat to agriculture, drainage/development of wetlands, altered flooding patterns, and herbicide use. No critical habitat rules have been published for the decurrent false aster. This species has been found within the study area.

#### 4.3.2 Effects Determination

**Impact of No Action Alternative** - Under the No Action Alternative, the emergent and herbaceous, early successional communities in the study area would persist into the near future. Decurrent false aster populations would likely appear periodically after flood disturbance and/or after mechanical disturbance utilized by USFWS to manage emergent wetlands created suitable habitat. Suitable habitat would likely decline as water level management capabilities in the emergent wetlands decreased and some units converted to other land cover types (i.e. open

water, shrub, or early successional forest). However, some suitable habitat is expected to occur in the study area over the period of analysis.

**Impacts of Proposed Federal Action** – The emergent wetland portion of the project as discussed would improve habitat for decurrent false aster. 92 acres would be added to existing emergent wetlands. In addition, improved water level management capabilities (described in Section 1.4) would support conditions that allow more reliable habitat management activities, including periodic disturbance and more natural hydrologic conditions. *Boltonia decurrens* often responds positively to periodic disturbance in emergent wetland communities. As a result, proposed Project measures would be expected to increase the amount of suitable habitat available per year. Periodic riverine flooding that would still occur would also help support conditions for the continuation of this species on site. Therefore, the Proposed Federal Action **may affect but is not likely to adversely affect the decurrent false aster.**

#### 4.4 Monarch (*Danaus plexippus*)

##### 4.4.1 Status

The monarch butterfly is a large orange butterfly that is a candidate for listing on the Endangered Species List. Monarch populations of eastern North America have declined 90%. Much of the Monarch butterfly's life is spent migrating between Canada, Mexico, and the U.S. Monarchs do not overwinter in Illinois (U.S. Fish & Wildlife Service, 2020). The monarch occurs in a variety of habitats where it searches for its host plant, milkweed. Of the over 100 species of milkweed that exist in North America, only about one fourth of them are known to be important host plants for monarch butterflies. The main monarch host plant is Common Milkweed (*Asclepias syriaca*) (Kaul & Wilsey, 2019). Other common hosts include Swamp Milkweed (*Asclepias incarnata*), Butterfly Milkweed (*Asclepias tuberosa*), Whorled Milkweed (*Asclepias verticillata*), and Poke Milkweed (*Asclepias exaltata*) (U.S. Fish & Wildlife Service, 2021). Both Common and Swamp Milkweed are likely to occur in wetland and woodland areas in the study area. Three factors appear most important to explain the decline of Monarchs: loss of milkweed habitat, logging at overwintering sites, and climate change and extreme weather. In addition, natural enemies such as diseases, predators, and parasites, as well as chemicals used in agricultural areas may also contribute to the decline.

##### 4.4.2 Effect Determination

**Impact of No Action Alternative** – Under the No Action Alternative, the emergent and herbaceous, early successional communities in the study area would persist into the near future as a result of periodic flooding and annual mowing activities. The quality of habitat would be anticipated to decline over time as water level management capabilities in the emergent wetlands decreased and some units converted to other land cover types (i.e. shrub or early successional forest). However, some suitable habitat is expected to occur in the study area over the period of analysis.

**Impacts of Proposed Federal Action** - The emergent wetland portion of the project as discussed would improve habitat for the monarch butterfly. The improvements to water level management and habitat management activities would help to support a more diverse emergent wetland community. In addition, the woodland restoration on site would be expected to enhance floral resources over the long-term in the study area. The floodplain woodland area currently undergoes annual mowing to reduce dominance of aggressive species that establish after flood

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events. The enhanced water level management capabilities that would result from the project would help to create conditions that better support habitat management in the floodplain woodland areas. The target is to develop and open woodland setting that would support a diverse, herbaceous understory. Maintenance activities that would be utilized to support tree establishment over the first 7-10 years would likely decrease floral resources in this area over the short-term, but would enhance floral resources once the more intensive maintenance activities can be reduced in frequency around year 7. The short-term decrease in floral resources in the floodplain woodland restoration area would be offset by the expansion of emergent wetland by approximately 92 acres and through proposed Project measures that will help the Refuge achieve more diverse emergent wetland units. ***Therefore, the Proposed Federal Action may affect but is not likely to adversely affect the monarch butterfly.***

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**6. List of Preparers**

Lane Richter

Wildlife Biologist

U.S. Army Corps of Engineers

Regional Planning and Environmental Division North

St. Louis, MO 63101