Lake Onalaska Protection and Rehabilitation District

Wisconsin Department of Natural Resources (WDNR) Agency Report.
September 8, 2020.

Water Quality

- Water quality monitoring in the Mississippi River has continued despite Covid-19. Water quality monitoring funded by the US Army Corps of Engineers under the Upper Mississippi River Restoration Program has been performed by WI DNR since 1993, providing a unique, high-quality record of Mississippi River conditions and trends. Monitoring includes nutrient and dissolved oxygen concentrations, plankton abundance and measures of water clarity, all of which can impact fish, wildlife and recreation.

- Recent projects include long-term sediment trap monitoring, long-term trend metals sampling, long-term trend water quality sampling, zebra mussel trend monitoring, long-term subsurface light environment monitoring, and water quality monitoring at two habitat restoration sites (McGregor Lake near Prairie du Chien, and Reno Bottoms near La Crosse). Additionally, two new projects resumed: La Crosse County chloride monitoring, and a study of connectivity and water residence time in targeted backwaters in Pools 6, 7 and 8. These monitoring projects allow us to track and understand pollutants and invasive species that degrade the Mississippi River ecosystem and that potentially threaten users of the resource.

- This summer we did additional monitoring in Lake Onalaska including Brice Prairie Channel, per the request of the Lake District and in support of the lake planning grant application. Clear opportunities exist to improve water quality and fisheries habitat in this area that was previously identified as showing impairment.

- Shawn (WDNR Miss. R. Water Quality Specialist) previously shared with the lake district that he had made some estimates of sedimentation into Lake Onalaska from both the Black River and Mississippi River (Sommer's Chute predominantly) several years back and concluded that sediment loading from the Mississippi River sources (Sommer's Chute predominantly) far outweighs sediment loading from the Black River sources. Presented the concept of a bedload deflector at the upstream end of the Sommer's Chute opening and likely Proudfoot Slough directly downstream of Sommer's Chute. It could be similar to a design at the Long Lake inlet in Upper Pool 7. The design concept of a rock deflector oriented at 60 degrees to the main flow vector tends to keep sand bedload moving through the system while still allowing water to flow into the backwater area. In essence, one gets the high oxygen channel benefits minus the loss of backwater area via the deposition of sand (bedload). This is a design that the DNR is looking to implement in other projects. Due to the size and alignment of Sommer's Chute, the bedload deflector structure required would have to be many times larger than the structure constructed at Long Lake. The climate change (high discharge) era has arrived and we need to consider some options to adapt to these challenging conditions.

Upper Mississippi River Restoration Projects (i. e. HREP's)

- Agencies submitted conceptual plans (factsheets) for federally funded habitat projects. The process includes: 1) conceptual plans, 2) ranking of these by the agencies, 3) Corps of Engineers (CoE) lead feasibility, engineering and planning with the river partnership (state natural resource agencies, NGO's, citizens, U. S. Fish and Wildlife Service (FWS) and others, 4) public input 5) environmental review 6) contract letting and 7) construction.
- WDNR submitted a conceptual plan for Lake Onalaska after input from the Lake District and others.
- The priorities projects that came out this most recent process in the St. Paul District of the CoE were:
    1. Lower Pool 4 – Big Lake, Robinson Lake, and Tank Pond
    2. Bank Stabilization and Natural Levee
    3. Lower Pool 5 and Weaver Bottoms
    4. Black River Bottoms Forest Restoration.
    5. Pool 8 Poolwide Floodplain Forest.
- Of these, Bank Stabilization and Natural Levee and Black River Bottoms Forest Restoration (both attached) may affect Lake Onalaska.
- These five projects are just for the St. Paul District of the CoE. There are 10 other projects proposed for the other two other CoE districts in the upper Miss. R. This fund serves the Upper Miss and IL Rivers, from St. Paul MN to Cairo IL. So, this fund serves very large reaches of two rivers.
- **The Upper Mississippi River Restoration program (UMRR)**, currently authorized and funded at $32 M annually, could increase by 71% to $55 M/year. The program has a Continuing Authorization and has received the full $32 M every year now for the past 5 years. The House recently passed the increase in annual authorized funding in the 2020 Water Resources Development Act. The Senate EPW Committee also passed their version.

Wildlife

- Normally we capture, band and release about 600 Canada geese on the Mississippi River and inland locations. Due to COVID-19, we were unable to band in 2020.
- Normally we capture, band and release ducks on the Mississippi River. Due to COVID-19, and the transfer of the Mississippi River Wildlife Technician, we were unable to band in 2020.

Fisheries

- Routine fish sampling will start Sept. 8, 2020 on Lake Onalaska. We do this every 4 years, and normally takes 2 weeks.
- Fish regulation changes went into effect April 1, 2020 on the Mississippi River border waters of Wisconsin and Minnesota (see https://dnr.wisconsin.gov/sites/default/files/topic/Fishing/Regs_FishRegsWeb2021.pdf). Walleye and sauger regulations changed for Wisconsin waters bordering Iowa (Pools 9-12) as well as MN/WI border waters.

Upper Mississippi Partnership Activities (states, Coe, FWS, EPA, US Coast Guard, NGOs)

- UMR Systemic Flood, Sediment & Drought Plan. The UMR States have been pressing for a federal-state partnership to develop an integrated, systemic plan addressing the challenges of flood, drought, and channel maintenance/sediment management. Working through a two-year agreement with the US Army Corps (USACE), the Upper Mississippi River Basin Association (UMRBA) held a series of six public listening sessions in cities along the Miss River during summer 2019. UMBRA is a regional interstate organization formed by the Governors of Illinois, Iowa, Minnesota, Missouri, and Wisconsin to coordinate the states' river-related programs and policies and work with federal agencies that have river responsibilities. Input gathered will be used to develop (1) a list of potential solutions that can be easily implemented, and (2) a list of issues that require more information or coordination. The latter will be used to formulate and refine the scope for larger and longer-term plan to address those issues. General take-away messages from the public Open Space meetings held at several locations previously in 2020: 1) A general recognition that the River has changed, e.g. more frequent and longer duration flooding, 2) Some regional differences in understanding how the river and floodplains function, 3) Recognition that the River is complex and multi-use, Flooding is of greater interest in the lower states (IL/MO), however sedimentation was brought up in all meetings, 5) The status quo is not working, and we need an integrated, systemic plan, and, 6) People appreciated the Open Space meeting approach and shared responsibility for actions. Recently, the two-year Flood, Sediment, and Drought Planning Assistance to States agreement between the five states and the USACE is coming to a close, and the next step would be to start a Section 729 Watershed Study with a 75/25 cost-share (Fed/State). The House version of WRDA identifies this effort for a new start.

- UMRBA is working with Rep. Ron Kind (WI) and others to develop a draft Upper Mississippi River Water Quality Improvement Act. If enacted, it would enhance implementation of land management practices known to reduce delivery of sediment and nutrients to the river and would establish a Mississippi River Program Office to help improve coordination among implementing agencies. Draft legislative framework for Water Quality Improvement Act has been picked up by Angie Craig (MN) and Rodney Davis (IL) for possible inclusion in the 2020 Water Resources Development Act. It proposes among other things, roughly $600 M annually for nutrient and sediment reduction measures in the watershed (at least 70% of the funding to on-the-ground practices), a Mississippi River National Program Office with joint leadership by USEPA and NRCS, and a unified States approach to Clean Water Act monitoring.
- We completed the first interstate Mississippi River water quality Condition Assessment in collaboration with Minnesota and the UMRBA. The assessment was built on data collected during a 2016 Pilot of the UMR States' Interstate Monitoring Strategy, that was itself a culmination of collaborative efforts between the five states and USEPA dating back to 2004 when the Great Rivers Environmental Monitoring and Assessment Program was completed as a demonstration project.
- We developed a systemic (over 1200 River Miles) model for submersed aquatic vegetation (SAV) potential on the Upper Mississippi River System (UMRS). The model, completed in collaboration with the USGS, is based on the combined effects of water level fluctuations and water clarity and will aid in management decisions, including identification of habitat rehabilitation and enhancement projects.
- High water from previous years continues to cause with dredge material disposal. WDNR staff continues to work with the CoE on creative ways to use this material. As the dredging season continues, and approved placement sites approach capacity, the USACE may need temporary placement sites which would require additional support from other DNR programs, e.g., Ch. 30 waterway/wetlands, solid waste, fisheries, and wildlife.

- WDNR is commenting on CoE Master Plan, which is a plan for natural resource management on the Miss. R. The plan is updated every 10-20 years and provides guidance for future actions under the Corps' authorized missions of navigation, natural resource management and recreation. The Plan covers activities spanning several WDNR Programs and disciplines. We will develop a more detailed response with additional cross-program input during the Public Review period, starting in early August.
- Navigation & Ecosystem Sustainability Program (NESP) received $4M in planning funds in FY 20, and the USACE is planning for a $10 M construction start in FY21. If funded in FY 21, they anticipate program funding on the order of $80-100 M annually in FY 22 and beyond. What makes this more likely to happen is that more of the Inland Waterway Trust Fund is available for new navigation projects on the UMR. The NESP has support from the States, NGO's and Navigation industry.
- The Mississippi River Restoration and Resiliency Initiative -- A House Appropriations subcommittee sent an FY 21 Mississippi River Restoration bill encouraging the Department of Agriculture to participate and coordinate with the Environmental Protection Agency on developing a Mississippi River restoration and resiliency strategy focused on improving water quality, restoring habitat and natural systems, improved navigation, eliminating aquatic invasive species, and building local resilience to natural disasters. The Bill was passed to the Full House.

Upper Mississippi River Restoration Program
Black River Bottoms Forest Restoration
Habitat Rehabilitation and Enhancement Project
Upper Mississippi River, Pool 7
Trempealeau and La Crosse Counties, Wisconsin
US Army Corps of Engineers - Saint Paul District

Location

The Black River Bottoms is located in Pool 7 of the Upper Impounded reach of the Upper Mississippi River, between river miles 712-708, in Trempealeau and La Crosse Counties in western Wisconsin and within the St. Paul District of the US Army Corps of Engineers (USACE). The Black River flows through the center of the Bottoms and meets the Mississippi River in upper Pool 7, emptying via multiple distributary channels both into the Mississippi River main channel and into backwater Lake Onalaska. (Figure 1). A significant portion of the Black River Bottoms is within the boundaries of the U.S. Fish and Wildlife Service (USFWS) Upper Mississippi River National Wildlife and Fish Refuge (Refuge). The Wisconsin DNR (WI DNR) Van Loon Wildlife Management Area and Van Loon Floodplain Forest State Natural Area (Van Loon) also occur within the Black River Bottoms. Scattered private acreage is also present.

The Black River Bottoms HREP occurs south of Highway 35 and is predominantly USFWS-owned land (Table 1), with some USACE- and WI DNR-owned land also included. All federal land is incorporated into the Refuge, while the Van Loon State Natural Area is within the Van Loon Wildlife Management Area and also overlaps a small portion of Refuge land.

Table 1. Land Use Designation, ownership and acreages in the Black River Bottoms HREP area, in Trempealeau and La Crosse Counties, Wisconsin.

	Ownership				
Land Use Designation	*USFWS*	*USACE*	*WI DNR*	***Other***	**Total**
Wildlife Management	3,712.8	756.7			**4,469.5**
Recreation/Low Density	10.0	5.5			**15.5**
State Wildlife Management Area			515.4		**515.4**
State Natural Area			194.6		**194.6**
*None**				2,152.6	**2,152.6**
Total	**3,722.8**	**762.2**			**7,347.6**

**No land use designation includes aquatic areas and areas included in the project area that are currently being acquired by USFWS and have not yet been designated for a specific land use*

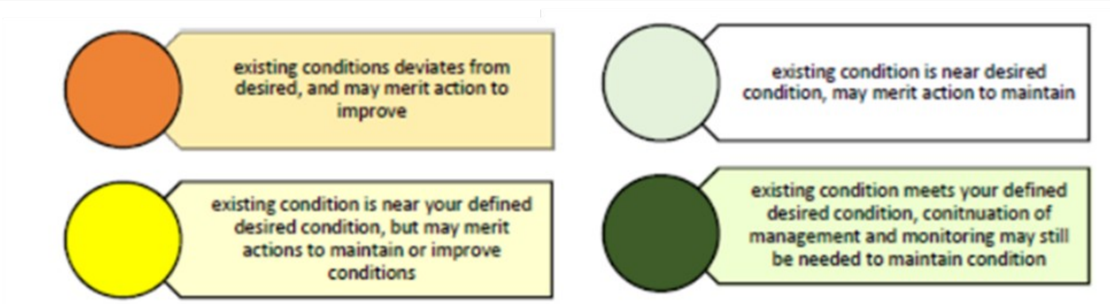
The Black River Bottoms HREP’s northern boundary follows the Refuge and Van Loon boundaries south of WI Highway 35 and continues south along state and federal boundaries to the edge of Browns Marsh and Brice Prairie (Figure 1). From the edge of Brice Prairie, the project area heads southwest along the delta of the Black River in Lake Onalaska. The southwestern boundary follows the Mississippi River channel northward to Tank Creek, turning north along Tank Creek and the Refuge (Figure 1). Areas of the Black River Bottoms west of the Refuge and Van Loon are privately owned. Communities that surround the Black River Bottoms include Trempealeau, Holmen, Holland, New Amsterdam, Brice Prairie and Onalaska.

Existing resources

The majority of the HNA II indicators for both the pool and the Upper Impounded Cluster are outside of the desired conditions (Table 2). The aquatic and floodplain diversity and functional classes were identified by resource agencies as two of the highest importance resource categories in need of management actions in the Upper Impounded Cluster. In Pool 7, four of the five indicators in this group are rated as meriting action.

Table 2. Pool 7 HNA II indicators relative to the Upper Impounded Cluster (UIC) mean.

Indicator			River Team Importance	Pool 7	UIC Mean
Diversity & Redundancy	Aquatic Functional Class 1 (unitless)		High		
	Aquatic Functional Class 2 (unitless)				
	Aquatic Vegetation Diversity (unitless)		High		
	Floodplain Vegetation Diversity (unitless)		High		
	Floodplain Functional Class Diversity (unitless)				
Connectivity	Longitudinal Aquatic Connectivity	% Time Gates Open	Low		
	Longitudinal Floodplain Connectivity	Natural Area (ha/RM)	Medium		
	Lateral River-Floodplain Connectivity	Leveed Area	Low		
	Open Water		Medium		
Controlling Variables	Water Surface Elevation Fluctuation	Tailwater Flux Difference (m)	Low		
	Pool Flux Difference (m)		Medium		
	Total Suspended Solids (mg/L)		Medium		



Physical Features

Elevation in the project area generally increases from the southeast corner in Lake Onalaska to the northeast along the Black River at Hwy 35 (Figure 2). The average elevation in the project area is 640.2 (range: 597-703) feet above sea level (NAVD 88), with more than 99% of the area between about 623 and 652 feet.

Average annual inundation is an important driver of floodplain vegetation dynamics and is a function of land elevation, water surface elevation, and floodplain connectivity. Diverse lowland forest types are positively associated with areas subjected to less than 20 days of annual inundation, while less diverse floodplain forest types have the highest positive correlations with inundation of 10 to 50 days per year (De Jager et al. 2018, 2019).

Only about 60% of the proposed project area is covered by the most recent floodplain inundation model available (Van Appledorn et al. in prep, DeJager et al. 2018, DeJager et al. 2019). The average annual days of inundation for the terrestrial areas covered in the Black River Bottoms is 32.7 days per year, with nearly 50% inundated for 20 days a year or less (Figure 3). These low inundation areas are concentrated most heavily in the southeast corner of the project area in the general vicinity of the Black River and Gibbs and Goose Chute deltas in Lake Onalaska. Higher flows over the last few decades, however, must be taken into consideration in floodplain forest areas and modeled days of inundation should be considered conservative estimates when designing forest features.

The Black River is a substantial sediment source to downstream backwaters, including the northwest corner of Lake Onalaska. Some quantitative data is available defining the magnitude of sediment deposition (S. Giblin, personal communication, Jan 3, 2020). Models used in the UMR indicators report for sediment transport and deposition are not reliable when considering the dynamism of delta formation (DeJager et al. 2018). Management actions are unlikely to have a major impact on this process and continued sedimentation should be expected. However, there may be opportunities to utilize sediments deposited in the Black River delta to improve elevations supporting forest habitat and to temporarily slow the infilling of Lake Onalaska.

Biological Features

<u>Vegetation</u>

The Black River Bottoms project area is more than 60% terrestrial, 13% is open water, and the remaining area consists of various types of emergent and aquatic vegetation in permanently inundated areas (Appendix, Table A1). Terrestrial areas within the project boundaries are currently dominated by floodplain forest. Of the extant forest just over 1,500 acres can be classified as interior forest, including parts of two of the largest contiguous patches of interior forest in Pools 1-10 (961 and 486 ac., data from De Jager and Rohweder 2011, Appendix, Figure A2). Forest inventory has been completed on about 30% of the project area by various means, including a large sampling effort sponsored by the Upper Mississippi River Conservation Committee in the summer of 2019. Findings from these survey efforts show that silver maple (*Acer saccharinum*) is the dominant species on just over 50% of the plots. Swamp white oak (*Quercus bicolor*) and river birch (*Betula nigra*) are each dominant on about 5% of plots (Appendix, Figure A3). Based on desired forest conditions defined in the Upper Mississippi River Systemic Forest Stewardship Plan (SFSP, Guyon et al. 2012), the average per plot basal area in the Black River Bottoms (94.0 ft^2/ac) is just above the minimum acceptable threshold for UMR floodplain forests and average percent stocking (occupancy of growing space) is well below targets.

In addition to the terrestrial forest habitats, the area is known for its wetlands, wet meadows and marshes. These habitats transition the Black River Bottoms to the delta, which empties into Lake

Onalaska and the Mississippi River. Lake Onalaska is one of the most important areas of submersed aquatic vegetation for migratory waterfowl on the Refuge (USFWS 2006) and the upper Mississippi River overall.

The primary invasive species influencing the long-term resilience of floodplain forests and marshes in Pools 1-10 of the UMR is reed canarygrass (*Phalaris arundinacea)*. Based on polygons from Hoy et al. 2017, there were a total of 842.2 acres of reed canarygrass in the project area in the 2010/11 UMRR Landuse/Landcover layer. Of these, 441.0 acres occurred in the optimal inundation ranges for forest restoration (Appendix, Figure A4). Forest inventory data provides finer scale information; out of the 359 plots surveyed since 2017, reed canarygrass was the most dominant non-woody species on 131 of the plots. It was the second most dominant species on an additional 23 plots and was present on almost half of the forest inventory plots.

<u>Fish and Wildlife Resources</u>

The Refuge supports at least 119 species of fish including a few state-listed threatened species. Common sportfish in the Refuge include walleye (*Sander vitreus*), sauger (*S. canadensis*), white bass *(Morone chrysops),* channel catfish *(Ictalurus punctatus),* northern pike *(Esox lucius),* and Centrarchidae like largemouth (*Micropterus salmoides*) and smallmouth bass (*Micropterus dolomieu*), bluegill (*Lepomis macrochirus*), and crappie (*Pomoxis* spp.). All of these sportfish species are found in the Black River Bottoms project areas (Heath 2015, 2019).

The north-south orientation of the river and adjacent habitat make it a globally important migratory flyway for 40 percent of all North American waterfowl and 60% of all the bird species in North America (USFWS 2006). Sampling on the Refuge, including the Black River Bottoms, has shown that the American redstart (*Setophaga ruticilla*), red-winged blackbird (*Agelaius phoeniceus*), great crested flycatcher (*Myiarchus crinitus),* Baltimore oriole (*Icterus galbula*), and at least 6 other species have an affinity for floodplain forest (Kirsch et al. 2013, Kirsch and Wellick 2017). The Refuge's wildlife priority resource of concern (ROC) list includes the red-shouldered hawk (*Buteo lineatus*) and prothonotary warbler (*Protonotaria citrea*) which are both known to nest in the Black River Bottoms.

A number of terrestrial and semi aquatic species that are federally-listed endangered or threatened, state-listed endangered or threatened, or Refuge resources of special concern have been found or are likely to occur in the Black River Bottoms project area.

Problem Identification

The project area has seen significant changes in the last 150 years. Clearing of forest for agriculture and fuel following European settlement undoubtedly altered the composition and distribution of the forest in the 1800s and early 1900s. Impoundment of Pool 7 in the 1930s further degraded forest habitats by permanently inundating low-lying forested areas, thereby killing the forest, and increasing duration of inundation events on higher-elevation areas.

UMRR 1890 landcover areas do not cover the entire project area, but of the 6,233 acres covered in 1890, more than 2/3 (4,333 ac.) was forested. By 2010, the total forested acreage had declined from 4,420 acres to 2,420 acres. More than 1,000 acres of that area was lost to wet meadow and open water. Wet meadow area remained relatively constant, with increased acreage where wet meadow replaced forest offset by losses of wet meadow to aquatic area. Overall, the greatest increase in landcover was in aquatic habitats, which quadrupled from about 720 acres in 1890 to 2,628 acres in 2010. This was primarily in response to inundation of the floodplain due to operation of Lock and Dam 7. Table A1 (Appendix) provides more detail on landcover changes since 1890.

Other modern stressors continue to degrade forest habitats. Two of the most common tree species in the Mississippi River floodplain, American elm (*Ulmus americana*) and green ash (*Fraxinus pennsylvanica*) have been decimated by non-native pests, virtually eliminating a key late-successional, flood tolerant component from the forest and shifting forests to greater dominance by silver maple. Changes in annual flows (Figure A1), patterns of inundation and terrestrial sedimentation have further exacerbated shifts in species composition. Based on data from 1840s General Land Office survey notes and modern forest inventory datasets across the St. Paul District, all tree species except for silver maple and eastern cottonwood (*Populus deltoides*) have declined in relative abundance over the last 200 years.

Dominance of forest understories by native and non-native herbaceous vegetation, primarily reed canarygrass but including wood nettle (*Laportea canadensis*), stinging nettle (*Urtica dioica*) and other species, appears to be causing massive failures of regeneration of remaining tree species, with forest slowly converting to non-forest cover types as canopy trees die. Additional problems of herbivory from deer, beaver, voles and other rodents have also made it more difficult for trees to establish.

Without habitat protection or restoration, terrestrial habitats in this critical area are likely to continue to decline, with areas currently dominated by silver maple slowly converting to reed canarygrass-dominated wet meadow. In the context of the Lock and Dam system, the extent of historic floodplain forest dominance cannot be recovered, however, active management provides the opportunity to protect and enhance the remaining pockets of forest.

The building of Lock and Dam 7 in the 1930s caused significant degradation of the terrestrial habitats in Pool 7 and the Black River Bottoms, but also led to the development of an extensive backwater area in Lake Onalaska. This lake has provided high quality fish habitat and has been an important stopover point for migrating waterfowl due to the extensive beds of wild celery and other aquatic vegetation. However, sedimentation from both the Black River and the main stem of the Mississippi River are quickly decreasing depth diversity in parts of Lake Onalaska, reducing the extent of viable habitats for fish and potentially threatening the important aquatic vegetation resources.

Aquatic habitats in the project area will continue to degrade due to continued expansion of the Black River Delta into the northwest corner of Lake Onalaska. This is a complex problem and a solution is not within the scope of the Black River Bottoms HREP. Instead, this project will provide temporary improvements in conditions in small areas and may help to maintain some important species in the landscape. Because the primary objectives of this HREP are improvements in terrestrial habitats, any aquatic benefits will be considered to be supplemental to the project's main objectives.

The resource problems in the Black River Bottoms HREP area are consistent with those documented for Pool 7 and the Upper Impounded Cluster within the HNA II report.

Project Goals

The primary goals of this project will be the maintenance and enhancement of existing forest habitats in the main interior forest areas in the northern portion of the project area and the reestablishment of forest (afforestation) in areas that were historically forested. The focus of afforestation efforts will be to increase forest patch size in the more fragmented southern portion of the project area. Areas with a higher probability of success will be targeted based on recommendations in the SFSP and Refuge's Habitat Management Plan (USFWS 2019), the HNA II Indicators Report (De Jager et al 2018) and other reports (e.g. De Jager et al. 2019, Romano 2010, Urich et al. 2002). In general, higher elevation sites with declining forest canopy and low species diversity will be targeted first for restoration. Sites with high species diversity but experiencing significant stress will also be targeted, as will lower elevation sites with currently high densities of small diameter trees. These areas will receive either regeneration treatments to stimulate the establishment of a new cohort of trees within existing forest or tending treatments to improve the health and vigor of existing trees. Where forest was present in 1890 but is currently absent, and where elevations are sufficient to allow for afforestation, treatments will also be implemented to control competing vegetation and establish trees.

Another goal will be to raise the elevation of areas currently dominated by reed canarygrass and establish forest. These efforts will have the potential to also benefit aquatic resources through dredging. Borrow material will likely be obtained in the vicinity of the Black River delta near Lake Onalaska, but sites for dredging and placement would be selected using existing and newly acquired data to ensure the greatest longevity of beneficial impacts to terrestrial and, secondarily, aquatic resources.

A final goal will be to improve wet meadow and sedge meadow habitats (Refuge ROC classification: Midwestern Wet Prairie and Meadow) for wildlife species of concern that depend on these more open habitats. Forested areas adjacent to targeted meadow habitats will also be managed to increase canopy openness, creating a complex mosaic of open, partially open, and closed habitat. Treatments including management of reed canarygrass in wet meadows, increasing elevation diversity, and thinning of forest with retention of downed wood will be implemented.

The largest positive impact from the project will be on floodplain vegetation diversity, both in terms of species and age class diversity. This project will increase species diversity by promoting the establishment of species other than silver maple in low inundation areas with broken canopies through the control of reed canarygrass and seeding and planting of diverse tree species. Seeding and planting will also introduce young trees in areas where forest regeneration is absent, greatly increasing the age class diversity of the sites.

Floodplain functional class diversity will be positively impacted in a small area through dredging activities and placement of material in lower elevation locations, creating a greater level of local elevation diversity in those areas. Increased elevation diversity in meadow habitats will also positively impact floodplain functional class diversity. Aquatic functional class and vegetation diversity may also be increased in the areas to be dredged by creating greater depth diversity and increasing the area available for establishment of aquatic vegetation. It is unlikely that any of the other indicators will be impacted.

HNA II Desired Future Conditions

The project will provide a significant improvement in terrestrial habitat, specifically the forest community. This project will increase floodplain vegetation diversity throughout a large portion of the project area (1,000-1,500 ac.) and will increase topographic and inundation diversity in smaller areas (10-50 acres). It may also increase depths in small areas (10-50 acres) where borrow is obtained from.

Two HNA-II indicators related to forest resources are expected to be directly influenced as a result of this project. In support of the desired future conditions of the indicators, as described by the FWWG, this project would help to:

- **Floodplain Functional Class: Restore floodplain topographic diversity and diversify inundation periods**
    - Extend the viable area for forest establishment back into 30 acres of historically forested areas that are currently too wet for forest
    - Increase elevation diversity on up to 30 acres of wet meadow and sedge meadow habitat

- **Floodplain Vegetation Diversity: Restore, maintain and enhance floodplain vegetation diversity, including hard-mast trees**
    - Enhance and maintain conditions on up to 1,500 acres of existing forests (polygons classified as forest in UMRR 2010/11 landcover layers)
    - Re-establish forest on up to 300 acres of historically forested areas (polygons classified as forest in UMRR 1890 landcover layers)
    - Increase species diversity on up to 247 acres of meadow habitat

Two HNA-II aquatic resource indicators may also be influenced dependent on management actions used to achieve forest objectives:

- **Aquatic Vegetation Diversity: Maintain and enhance aquatic vegetation diversity**
- **Aquatic Functional Classes (AFC) 1 and 2: Improve and restore function and diversity of aquatic habitat types by improving quality, depth and distribution of lotic and lentic habitats**

Additionally, the proposed project will address the following objective for a species of concern within the study area:

- **Improve up to 100 acres of habitat for federally-listed threatened and endangered species**

Relationship to System, Reach and Pool Needs

The Black River Bottoms is of importance to multiple groups and agencies on the Mississippi River and is referenced in multiple agency plans; Environmental Pool Plans (Fish and Wildlife Working Group 2004) pp. 83-90, USFWS: Comprehensive Conservation Plan (USFWS 2006) and HMP (USFWS 2019), and the WI DNR: Van Loon Wildlife Area Master Plan (WI DNR 1981), Wildlife Action Plan Conservation Opportunity Area (WI DNR 2015). All of the HNA II indicators addressed by the project are high priority indicators for the upper impounded pool cluster.

Proposed Project Features

This project will include features intended to:

1. Enhance and maintain conditions on up to 1,500 acres of existing forests (polygons classified as Forest in UMRR 2010/11 Landcover layers, see figure A2) using:
    a. Planting and seeding of native tree species underrepresented in or absent from the project area
    b. Site preparation to facilitate natural regeneration of currently present tree species
    c. Chemical control of competing herbaceous vegetation
    d. Thinning of canopies to release established trees of underrepresented native species
    e. Thinning of canopies to allow enough sunlight on the forest floor for seedling establishment
    f. Potential use of prescribed fire as a tool controlling competing vegetation and improving probability of establishment of hard mast tree species
2. Re-establish forest on 300 acres of historically forested areas (polygons classified as Forest in UMRR 1890 landcover layers) using:
    a. Chemical control of competing herbaceous vegetation
    b. Site preparation to facilitate natural regeneration of tree species present in adjacent forests

    c. Planting and seeding of native tree species underrepresented in or absent from the project area
3. Extend the viable area for forest establishment back into 30 acres of historically forested areas that are currently too wet for forest while temporarily enhancing depth diversity using:
    a. Elevation modification utilizing locally available dredged material
    b. Techniques for forest establishment from 2a, 2b and 2c above
4. Increase species and structural diversity on 247 acres of wet meadow, sedge meadow and open forest mosaic habitats by:
    a. Chemical control of reed canarygrass to promote greater diversity of wet meadow plant communities
    b. Active felling of less desirable trees into open areas adjacent to forests
    c. Thinning and understory vegetation control in forests adjacent to potential restored meadow habitats to create open canopy conditions, potentially using prescribed fire as a tool
    d. Maintaining larger open areas near forests
    e. Increasing elevation diversity.
5. Increase elevation diversity on up to 30 acres of wet meadow and sedge meadow habitat by:
    a. Creation of mounds and artificial ridge and swale topography using local soil
    b. Placement of new material on low elevation, low diversity wet meadow sites to raise elevation
6. Improve access to the project area for future O&M by:
    a. Rehabilitating and protecting existing roadways
    b. Adding additional low maintenance road beds

Implementation Considerations

If other funding sources became available, this project's actions could be expanded into the Van Loon north of Highway 35. Other adjacent properties could be acquired from willing sellers and the USFWS Private Lands program could work with private landowners to improve forest conditions adjacent to the project. Access easements could be acquired from willing sellers.

Constraints would include flood timing, duration, and depth, and its impact on access and moving equipment. Access to many of the project areas will be a challenge. Road access is limited in terrestrial areas, and water is generally shallow in the Black River delta so specialized equipment and potentially access dredging will be needed to implement the project.

Uncertainty regarding site hydrology and inundation will also be a constraint, especially related to the limited reach of the Van Appledorn floodplain inundation model in the project area. Modeling flooding in the northern half of the project area necessitates significant extrapolation from upriver Black River gauges and is unlikely to be accurate.

Access restrictions and sequencing considerations will be necessary based on the presence of sensitive or listed wildlife in some of the project area. Considerations for specific species known to be present or potentially present will be addressed during the feasibility phase of the project and will include the need to use low-impact/light-weight track mounted equipment or hand tools to minimize impacts. Time of year activity restrictions near active bald eagle nests (January 15 – June 15) and related to migratory bird nesting (April 15 – August 15) and the northern long-eared bat maternity period (June 1 – July 31) will also need to be accounted for.

There may also be limitations on the amount of work that can be done on State land. Parts of the Van Loon are currently classified as deferral areas in which no major management actions may occur. In addition, the long-term O&M commitment for HREP projects may be a barriers for non-federal entities, including for WI DNR-owned lands.

Optimally, due to logistical constraints and variable weather conditions, implementation of forest restoration activities will be sequenced over a 5 to 10 year period. It may also be determined that this project would be more feasible as a phased project, with components split between individual, distinct phases over a longer period of time.

Survey needs

There are habitat and wildlife surveys that need to be completed in the Black River Bottoms that would not just inform the Refuge and WI DNR of the current status of rare or imperiled species using this block of forest but would also guide habitat management decisions in the project area.

Wildlife survey needs

Records of wildlife species of concern using the area are largely historic or incidental. New, comprehensive surveys using established USFWS protocols for monitoring would assist in generating population estimates for these species in the project area, and best inform restoration areas that would provide the greatest benefit.

Some initial bat acoustic work and radio-tracking has been initiated by the Refuge and by WI DNR. Continuing initial pilot surveys and transitioning into a more systematic survey for bat use in the floodplain would inform areas that currently support bat species during the maternity season and suggest areas to improve roost networks and identify open or early-successional foraging areas for bats and birds. The Black River Bottoms is a priority area for the Refuge to implement the USFWS landbird survey protocol, which is currently in use in the Refuge's McGregor District for surveying birds, further enhancing the scope of landbird use on Pool 7 of the Refuge and the Mississippi River.

Habitat survey needs

With approximately 70% of the forest inventory plots remaining in the Black River bottoms, surveys should be conducted to strategically inform project area decisions related to reed canarygrass control, canopy opening or release, and areas appropriate for modifying the forest successional stages with high chances of success. Additionally, in conjunction with surveys for wildlife species of concern, habitat conditions in wet meadows and marshes should be surveyed and recorded to document the non-forested use areas for those species.

A hydrodynamic assessment or expanded inundation modeling will be critical prior to any planned dredging or elevation increases. This is due to the shift in flow from the Black River to Tank Creek in recent years and the inherent variability of flows and sediment deposition in a delta system. With specific real-time gauges, it may be possible to relate real-time flows at the Galesville gauge to conditions on the Black, Tank, and possibly the Eastern-most channel of the Black River. An initial step in this process would be to review current hydrologic assessments of the area, in particular the Hydrodynamic Conditions Assessment (Hendrickson and Haase 1994) and to determine the magnitude and formulation of updates needed to those assessments. With this information collected or modeled, it will improve the project sequencing and decision-making for access and dredge placement.

Financial Data

1. Project planning and pre-project data acquisition:

    a. Estimated total cost: $1,000,000

2. Enhance and maintain conditions on 1,500 acres of existing forests across all ownerships:
    a. Estimated cost per acre: $2,000
    b. Total estimated cost: $2,250,000
3. Re-establish forest on 300 acres of historically forested areas on federal ownership:
    a. Estimated cost per acre: $3,000
    b. Total estimated cost: $900,000
4. Extend the viable area for forest establishment by raising 30 acres an average of 2 feet from backwater dredging cuts:
    a. Estimated cost per ac (~3200 CY/ac @$25/CY, 12” fines, 12” granular): $80,000
    b. Total estimated cost: $2,400,000
5. Increase species and structural diversity on 247 acres of wet meadow, sedge meadow and open forest mosaic habitat:
    a. Estimated cost per acre: $2,000
    b. Total estimated cost: $494,000
6. Increase elevation diversity on up to 30 acres of wet meadow and sedge meadow habitat:
    a. Estimated cost per acre: $20,000
    b. Total estimated cost: $600,000
7. Improve access to the project area for current project and future O&M:
    a. Estimated cost: $500,000

Total estimated cost: **$8,144,000**

Status of Project

This project is a high priority for the Refuge and USACE with partnership from WI DNR. It is currently being considered for endorsement by the River Resources Forum, St. Paul District, via the Fish and Wildlife Work Group.

Sponsorship

The Refuge will be the project sponsor for all features on Refuge Lands and, if any project components are implemented in the Van Loon Wildlife Area, the State of Wisconsin would be the sponsor on those lands. These projects would be implemented in active partnership between the USFWS, State agencies and the USACE.

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Attachments

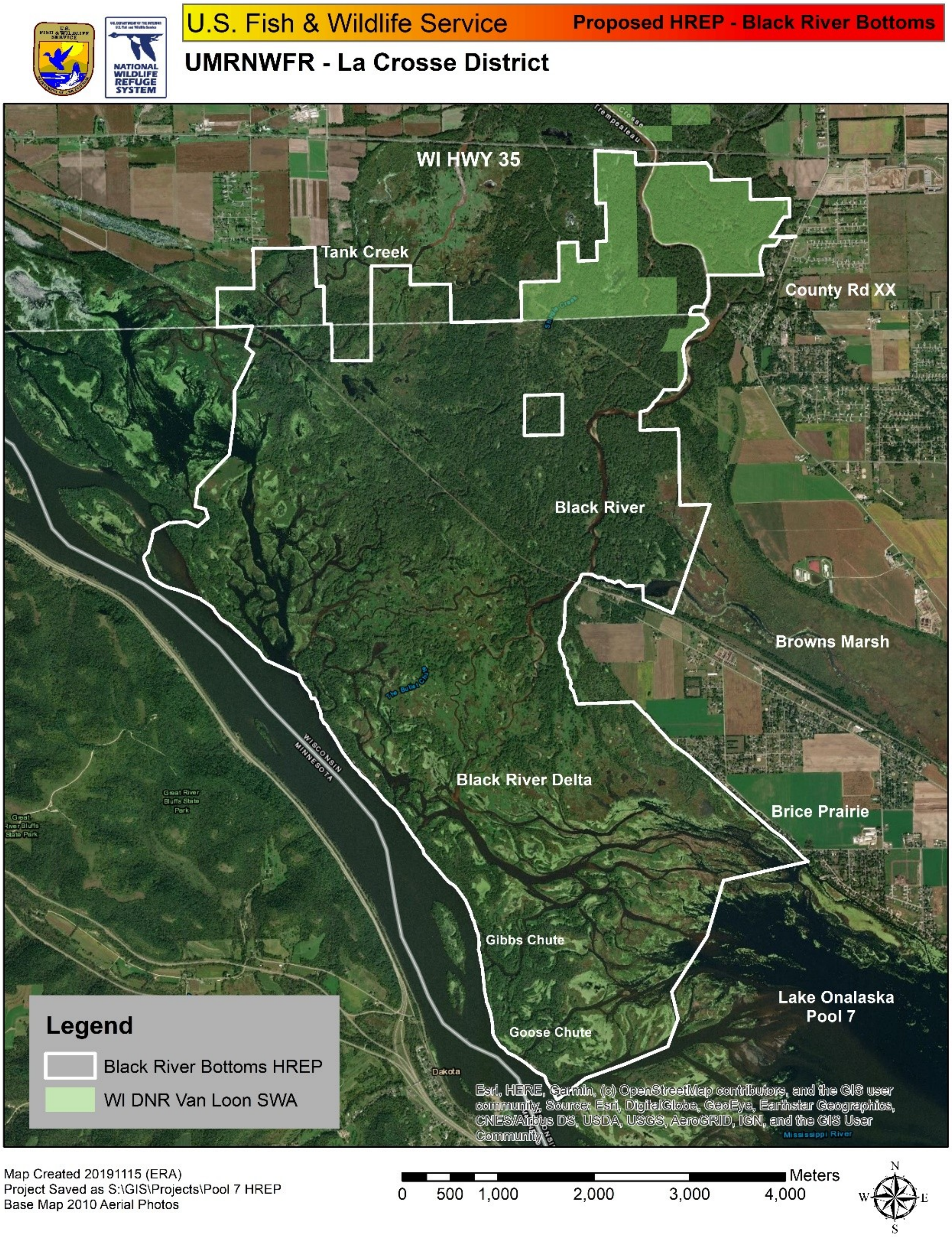
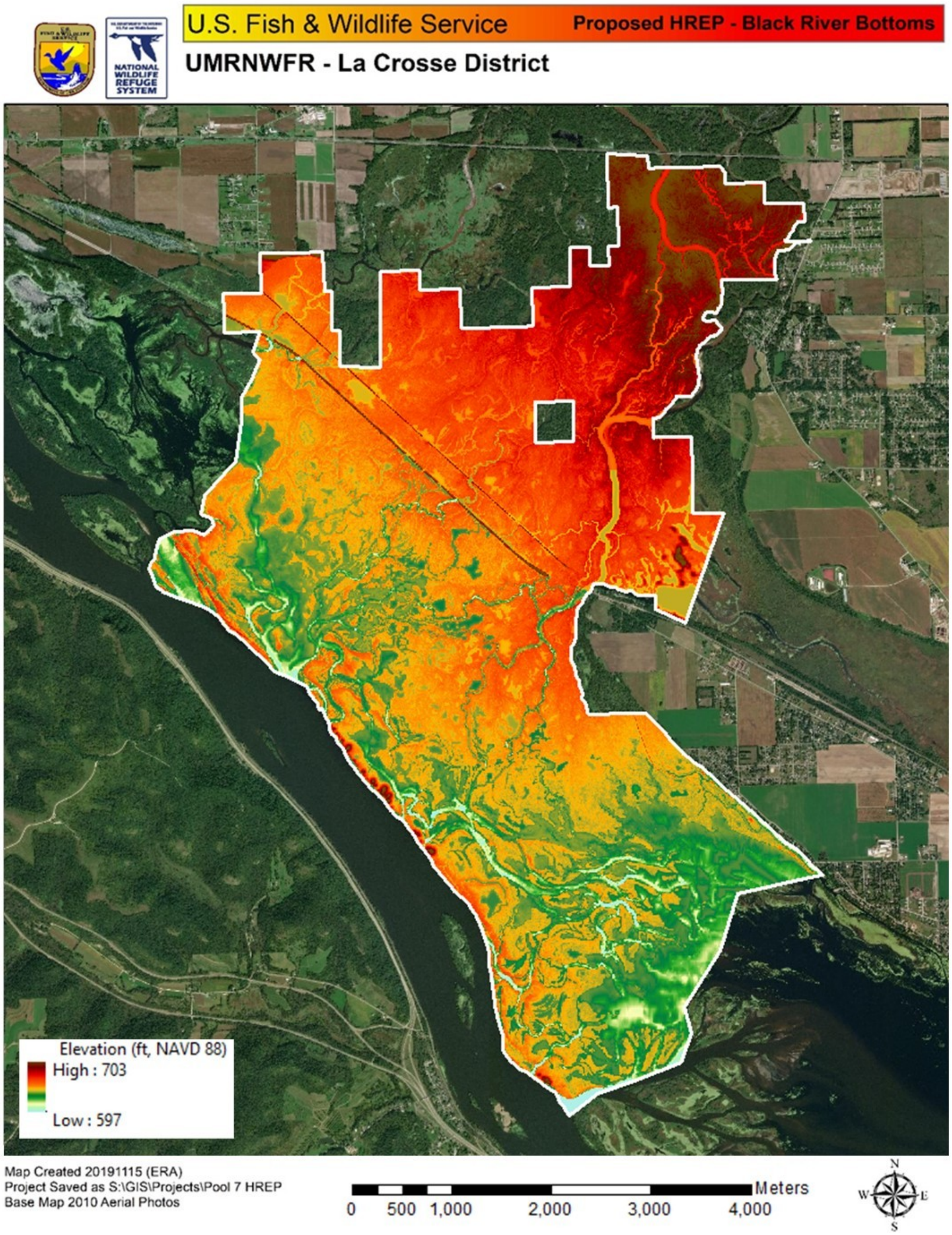
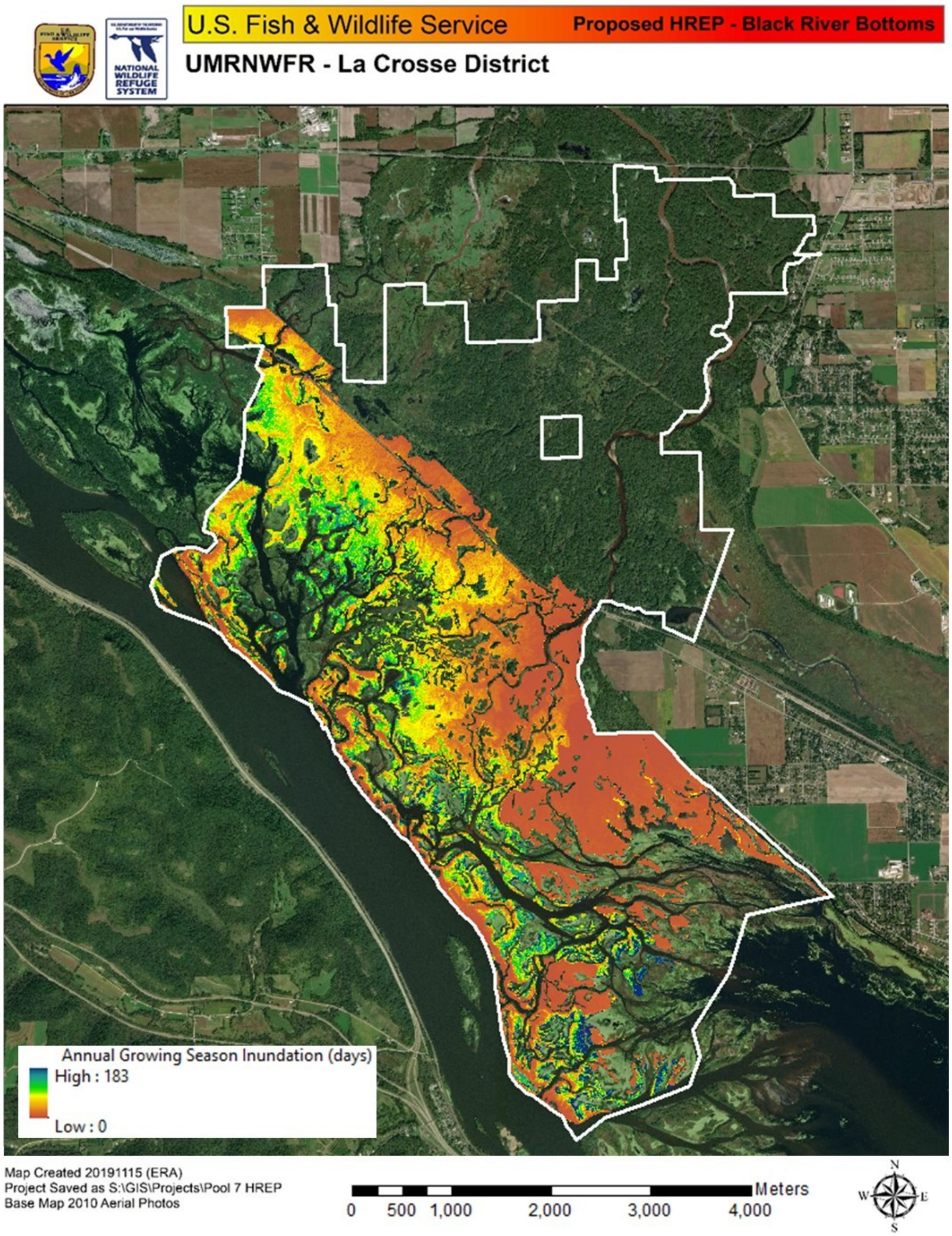


Figure 1. Black River Bottoms proposed project boundaries.

593



594 *Figure 2. Elevation for the Black River Bottoms project area*



595*Figure 2. Average annual growing season inundation for the Black River Bottoms project area.*

APPENDIX

Elevation and inundation

Flows

The project area is influenced by flows from both the Upper Mississippi and from the Black River. Growing season flows on both rivers follow typical patterns of rivers in temperate regions, with flows, on average, being highest in the spring, lowest in July in August, with increased flows possible again in the fall (Figure A1). However, recent decades have tended to be wetter, especially during the summer and fall months. The two wettest decades for July and August are the 1990s and 2010s (Figure A1a,b) and no decade prior to the 1980s had higher monthly average daily flows during the middle of the growing season than the current 30 year average (Figure A1c,d). The 1980s were wetter on the Black River in the middle and late growing season relative to other years than Pool 7, while the 2010s had the highest average growing season flows of any period since the 1960s in Pool 7.

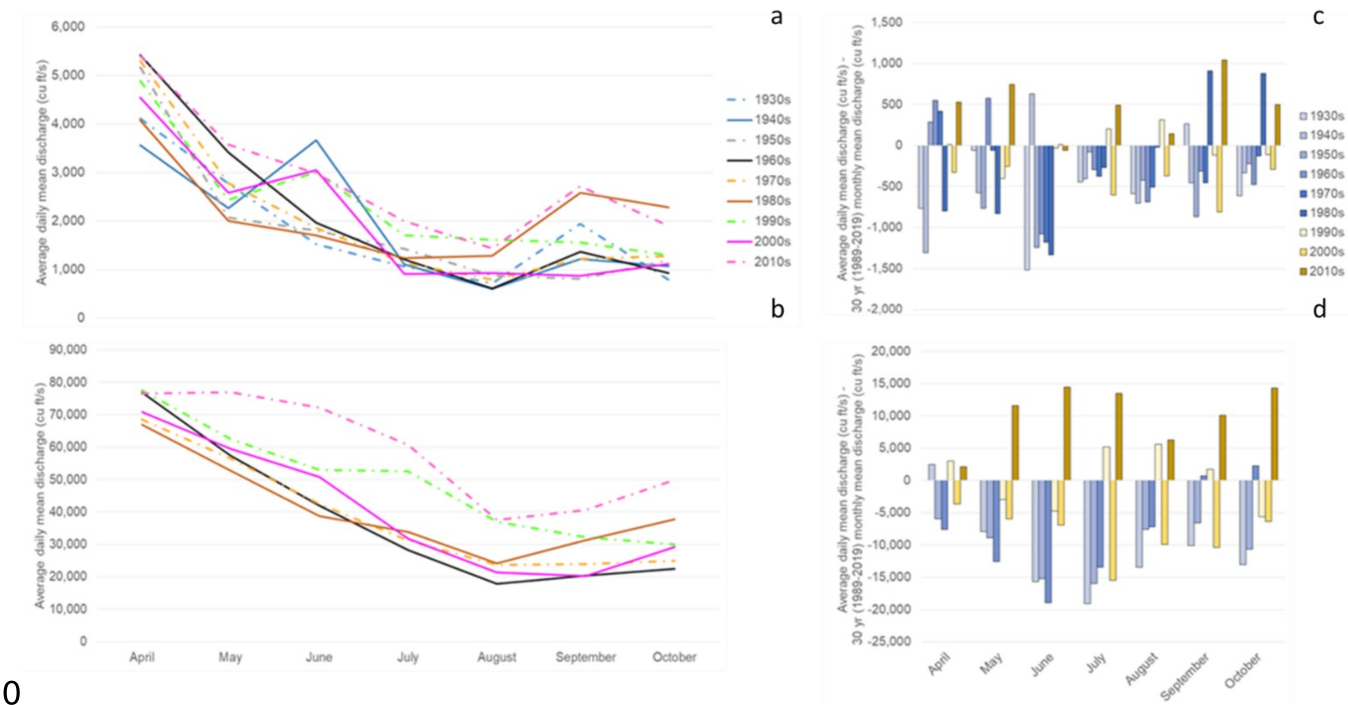


Figure A1. Black River at Galesville (a,c) and Mississippi River Pool 7 at LD7 (b,d) monthly average daily flows by decade (a,b) and relative to the 1989-2019 monthly average daily flow (c,d) by decade. For relative flow, positive values indicate flows higher than the 30 year average and negative values indicate flows lower than the 30 year average. Flow data is only available for LD7 starting in 1959, so only the 1960s and onward are shown in b and d.

Land cover

Table A1. Acreage of landcover types in 2010 relative to 1890 landcover. Data from UMRR 2010/11 Landcover/Landuse datasets.

	2010 Landcover (acres)													
1890 Landcover	**Agriculture**	**Wet forest**	**Wet meadow**	**Deep marsh**	**Developed**	**Open water**	**Road/levee**	**Rooted floating aquatics**	**Sand/mud**	**Shallow marsh**	**Submersed aquatic vegetation**	**Upland forest**	**Wet shrub**	***Grand Total***
Wet forest		*1944.7*	*661.1*	*621.9*		*463.0*	*38.2*	*92.7*	*0.1*	*200.4*	*101.7*	*2.3*	*207.1*	***4333.1***
Wet meadow	*5.2*	*195.2*	*137.8*	*257.1*	*1.2*	*153.6*	*1.5*	*37.2*	*1.0*	*122.5*	*48.0*	*5.0*	*18.2*	***983.6***
Agriculture		*42.9*	*0.7*	*7.0*		*12.2*		*0.8*		*0.6*	*0.9*	*0.0*	*0.1*	***65.2***
Deep marsh		*32.6*	*48.5*	*69.6*		*67.0*		*7.8*		*24.6*	*11.1*		*0.0*	***261.3***
Open water		*156.1*	*33.7*	*53.4*		*177.6*	*0.6*	*5.7*	*0.1*	*12.3*	*18.4*		*1.9*	***459.8***
Sand/mud		*11.4*	*5.7*	*4.1*		*3.9*					*1.1*			***26.1***
Wet shrub		*36.9*	*14.1*	*31.7*		*9.6*		*1.2*		*8.3*	*1.8*		*0.8*	***104.4***
No coverage		*767.3*	*136.0*	*39.9*		*59.2*				*25.5*	*9.3*		*115.3*	***1152.4***
Grand Total	***5.2***	***3187.1***	***1037.6***	***1084.6***	***1.2***	***946.1***	***40.2***	***145.4***	***1.2***	***394.1***	***192.3***	***7.3***	***343.5***	***7385.8***

Forest

Historically, the area was even more heavily dominated by wet forest, with nearly 60% of the project area being forested in the 1890s (Table A1). More than 1,000 acres of floodplain forest have been lost in the last century. The total acreage of wet meadows has stayed relatively stable but have shifted location. Many acres of wet meadow in the 1890s have largely converted to other, wetter cover types, and most of the current wet meadow is in areas that were forested in the 1890s. The primary increases in cover types have been in marsh and open water habitats; marsh has increased from just under 4% of the area in 1890 to nearly 20% in 2010, while open water doubled from about 6% to 10%. These are conservative estimates of forest loss, as the no coverage areas from the 1890 landcover data are currently predominantly forested since almost one-fourth of the 3,000 forested acres in 2010 are in the 1890s no coverage area. If only acreage with 1890 coverage is included, wet forest has dropped from 70% to just under 40% of the total area, a loss of nearly 2,000 acres of wet forest.

Most of the extant forest is in the northeastern 1/3 of the project area along the main stem of the Black River and northeast of the Great River State Trail. South and west of the state trail, the forest becomes substantially more broken, with forest along the main Mississippi River Channel and in adjacent to Lake Onalaska consisting primarily of broken forest fragments in linear patches (Figure A2).

Plots are heavily dominated by silver maple (*Acer saccharinum*), with more than ¾ of plots having greater total tree basal area represented by silver maple trees (Figure A3a). However, other species are present, with silver maple making up just over 50% of the basal area when averaged across all plots (Figure A3b). White oaks, primarily swamp white oak (*Quercus bicolor*) are the second most dominant species followed by river birch (*Betula nigra*).

Reed canarygrass

This grass tends to invade floodplain forest stands either following catastrophic disturbance which removes the forest canopy, or by slowly establishing forest understories as canopy trees die naturally. By annually producing tall, thick growth from perennial rhizomes, reed canarygrass is able to completely prevent native vegetation from establishing, including woody plants, and, in floodplain forests, eventually facilitates a conversion from forest cover to a single species graminoid monoculture. Loss of forest habitat has potentially significant implications for a number of wildlife species of regional and national conservation concern that depend on floodplain forest structure for survival. Many areas currently dominated by reed canarygrass are areas that were historically forested and have the potential for afforestation (Figure A4).

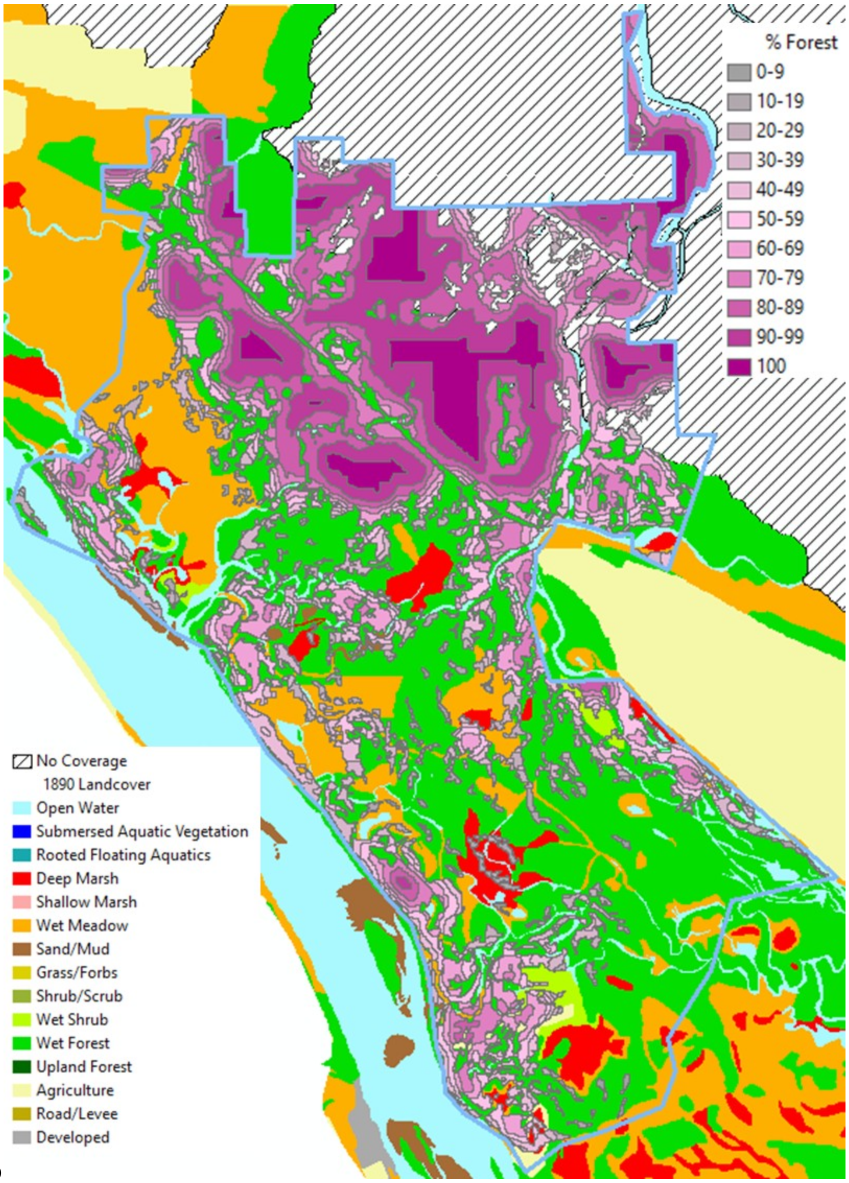


Figure A2. Distribution of forest patches in the Black River Bottoms in relation to 1890 forest cover. % Forest is calculated by tallying the number of forested pixels in the area adjacent to any given pixel relative to the total number of adjacent pixels. Data from De Jager and Rohweder 2011.

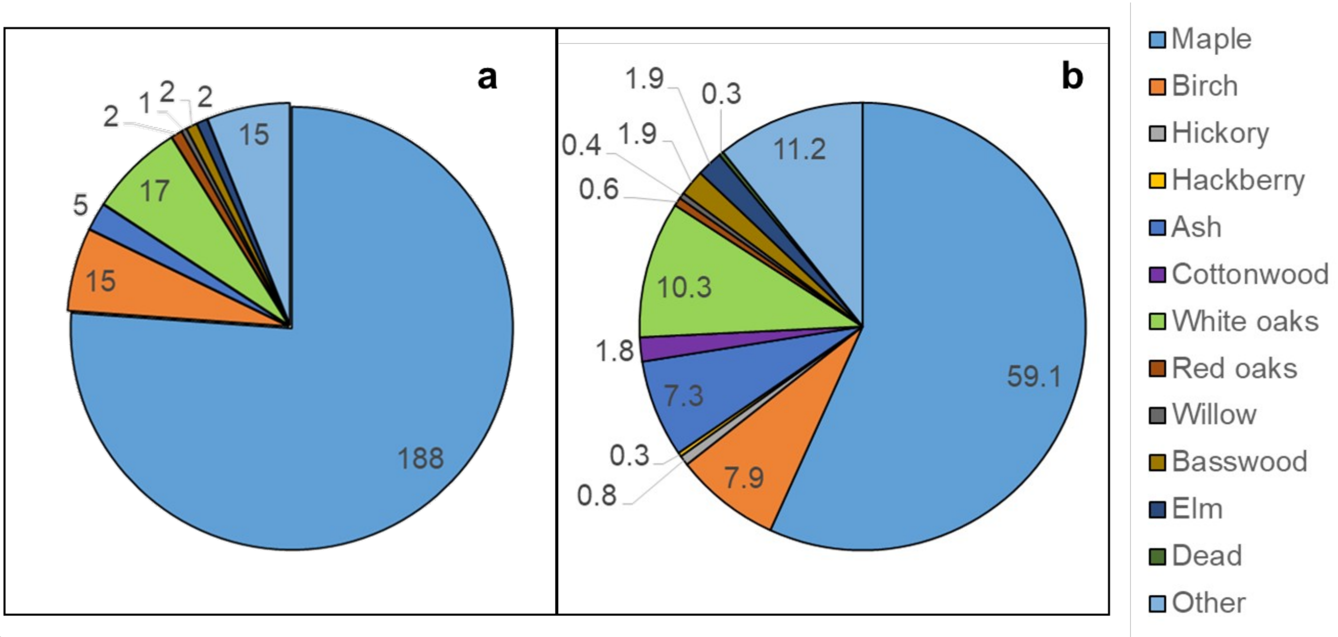


Figure A3. Summary of 359 forest inventory plots in the Black River Bottoms project area, showing average number of plots dominated (>50% of total basal area) by a single species group (a) and average basal area (ft^2/ac) per plot by species (b).

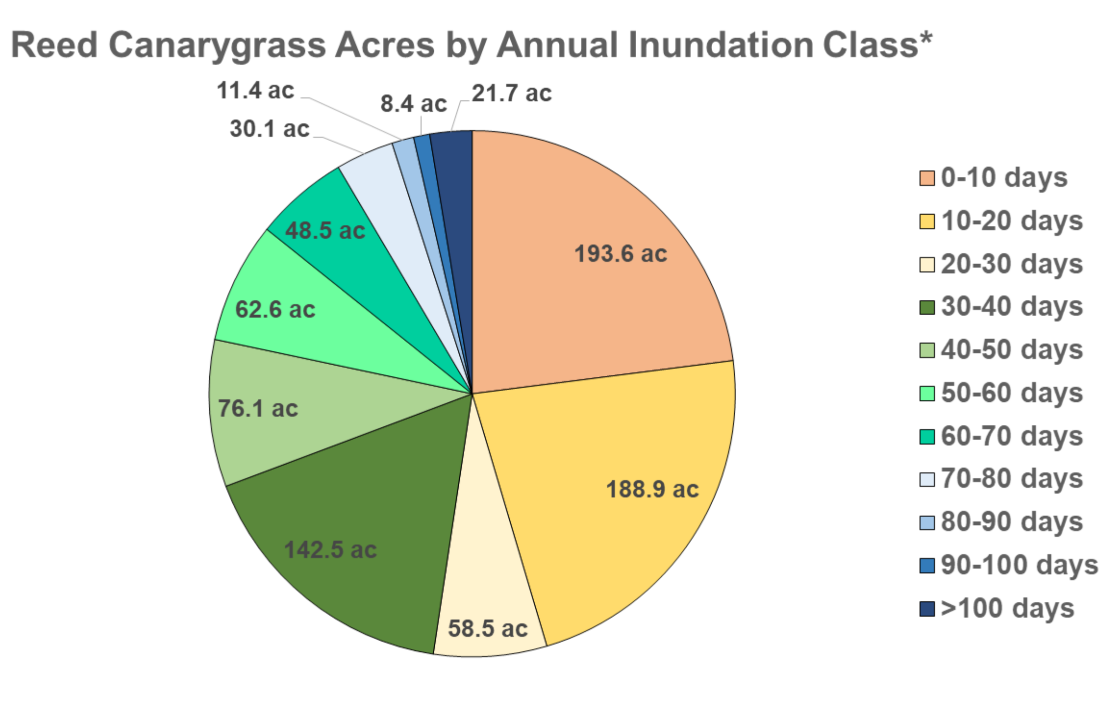


Figure A4. Reed canarygrass acreage by annual inundation class, based on an analysis of existing 2010 landcover polygons (Hoy et al. 2017).

Upper Mississippi River Restoration (UMRR) Program
Bank Stabilization and Natural Levee
Habitat Rehabilitation and Enhancement Project
Upper Mississippi River Pools 4 – Upper Pool 11
Minnesota, Wisconsin,
and Iowa St. Paul District

Location

Potential project locations include various islands throughout Pools 4 to 11 (river miles 613.5 – 763.4) of the Upper Mississippi River (UMR), bordering the states of Minnesota, Wisconsin, and Iowa within the St Paul District of the U.S. Army Corps of Engineers. Specific habitat protection locations will be determined during the feasibility study following field reconnaissance as well as a re-assessment of previously identified habitat protection needs. Locations proposed for restoration are on lands managed by the U.S. Fish and Wildlife Service's (USFWS) Upper Mississippi River National Wildlife and Fish Refuge – Winona, La Crosse, and McGregor Districts or state managed lands within the floodplain.

Existing resources

The islands throughout Pools 4-11 of the UMR are comprised of bottomland and upland forest communities, unique lotic and lentic aquatic areas, transitional aquatic zones, protected wetlands, side channels and other habitat types. However, following lock and dam construction, water levels throughout the UMR are generally higher over the entire year, flood pulses are higher, and in the lower portion of pools, periods of lower surface water elevations have been eliminated. Altered water surface elevations, combined with channel and flow velocities, have led to the erosion and loss of islands and the dissection of natural levees, increasing connectivity throughout Upper Mississippi River pools. Island loss results in increased wind fetch, further eroding and exposing previously protected habitats, such as mussel beds, overwintering areas for fish, and floodplain forest acreage. These stressors are likely to continue system wide, as will the decline of the quality of aquatic, wetland, and floodplain habitats. Though degraded, the habitats within the proposed study area are important for migratory and breeding waterfowl and other waterbirds, migratory and breeding songbirds and other landbirds, bald eagles, tree-roosting bats, and fish and mussels adapted to both lotic and lentic conditions. Some of the fish and wildlife species in the study area are listed as threatened, endangered, or in need of conservation by state and federal agencies. This project provides an opportunity to protect and prevent further degradation and loss of critical habitats throughout the system.

Problem identification

The HNA-II identified bankline erosion and island dissection as major factors contributing to the decline in habitat quality throughout the UMR floodplain (McCain et al, 2018). Wind and boat generated waves in large open water habitats created by the dams contribute to island erosion and sediment resuspension, with banklines within the Upper Mississippi River observed to be eroding at rates ranging from 0.3 to 3.7 feet per year (Bhowmik et al. 1991; Johnson 1994, MN DNR 1997, MN DNR 2003). Higher annual flows resulting from a changing climate are further exacerbating island erosion and dissection (Schottler et al. 2014). Collectively, these factors reduce the number and acreage of islands throughout many UMR pools.

Bankline erosion and island or natural levee dissection allow flow to enter isolated habitats, such as wetlands, and areas of the backwaters which were formally free of current. These new channels and increased connectivity carry sediment into the backwater lakes reducing their depth and quality due to sedimentation (Bhowmik and Adams 1989; Rogala et al. 2003). This introduction of current and sediment can wipe out aquatic vegetation beds and diminish the value of a backwater lake as an overwintering site for a variety of fish species. Further, as banklines erode, trees roots are exposed and destabilized. When these trees fall, they further disturb the bankline as the roots pull free. Prolonged periods of inundation leads to a conversion of historically diverse floodplain forest to a low-diversity forest characterized by a limited number of flood tolerant tree species, and regeneration

of trees is hindered by highly flood-tolerant herbaceous species such as reed canary grass. The loss of floodplain forest acreage and diversity also results in the loss of valuable habitat for breeding and migratory landbirds and tree-roosting bats, among other species. These stressors are likely to continue system wide, as will the decline of the quality of aquatic, wetland, and floodplain habitat. This project provides an opportunity to protect further degradation and loss of critical habitats throughout the system.

Project Goals

The intention of this project is to identify multiple locations where relatively small, similar efforts can be strung together in a cost effective and flexible manner to accomplish habitat protection and maintenance goals at a larger scale than typically addressed by other project-specific fact sheets. The desired outcome of this project is to protect, maintain, and enhance existing habitat quality at various locations throughout the UMR floodplain within the St Paul District. Goals for this project were derived from multiple planning efforts and align with several document guidelines including; the Habitat Needs Assessment II (HNA-II), the Upper Mississippi River National Wildlife and Fish Refuge’s Habitat Management Plan (U.S. Fish and Wildlife Service 2019), and the Environmental Pool Plans (River Resources Form 2004). Specifically, project work will focus on protecting, maintaining, and restoring historic island acreage and floodplain habitat diversity and areas of quality habitat within the Upper Mississippi River. Targeted habitats include contiguous and isolated backwater complexes, lotic and lentic habitat diversity, secondary and tertiary channels, aquatic vegetation beds, floodplain forests, and wetlands.

Seven HNA-II indicators are expected to be directly influenced as a result of this project. In support of the desired future conditions of the indicators, as described by the FWWG, this project would help to:

- **Lateral Connectivity (Open Water): Improve open water connective conditions, including island restoration**
    - Reduce the effects of bankline erosion due to wind and wave action and restore island habitat by armoring banklines, restoring historic island acreage, and diversifying flow velocities across the floodplain to protect terrestrial species and backwater fish communities and aid in the production of aquatic vegetation.
- **Floodplain Functional Class: Restore floodplain topographic diversity and diversify inundation periods**
    - Protect and enhance existing island acreage to maintain and increase floodplain vegetation acreage and utilized dredged material to promote topographic diversity within the project site.
- **Floodplain Vegetation Diversity: Restore, maintain and enhance floodplain vegetation diversity, including hard-mast trees**
    - Protect and enhance existing island acreage to maintain and increase floodplain vegetation acreage and establish a diverse mix of mast producing trees to provide habitat for a variety of birds and mammals, including tree roosting bats and migrant passerines.
- **Aquatic Vegetation Diversity: Maintain and enhance aquatic vegetation diversity**
    - Protect existing islands and utilize dredged material to restore historic island areas to preserve and promote aquatic vegetation growth and diversity within "shadow effect" zones.
- **Total Suspended Solids Concentrations (TSS): Reduce sedimentation and total suspended solids concentrations**
    - Reduce island erosion and restore a more natural sediment transport pattern throughout the study area by decreasing the amount of total suspended solids entering and being deposited within backwater lakes and side channels.
- **Aquatic Functional Classes (AFC) 1: Improve and restore function and diversity of aquatic habitat types by improving quality, depth and distribution of lotic and lentic habitats**
    - Decrease loss of channel border habitat and enhance/ maintain velocities, depths, sediment types and sediment transport within targeted channels of the upper and middle portions of pools.
- **Aquatic Functional Classes (AFC) 2: Improve and restore function and diversity of aquatic habitat types by improving quality, depth and distribution of lotic and lentic habitats**
    - Decrease island and natural levee dissection in the upper and middle portions of the pools, to preserve and improve ideal flow conditions to backwater lentic and shallow lotic areas and protect floodplain terrestrial wet meadow, isolated wetlands and smaller, less-connected lentic habitat areas.

All of these indicators were identified as indicators of highest importance amongst the Upper, Middle, and Lower Impounded clusters, with the exception of total suspended solids (McCain et al. 2018). The proposed project is not expected to result in a negative influence to any HNA-II indicators.

Proposed Project Features

Specific habitat protection locations would be determined following field reconnaissance as well as a reassessment of previously identified habitat protection needs within these pools. A list of island protection sites within these pools was previously prepared under the Navigation and Ecosystem Sustainability Program (NESP) in 2005. Figures 1-3 show examples of habitat project locations and features being considered. A wide range of small scale projects could be accomplished under this project.

Proposed project features to address the habitat goals for the project include the following:

- Shoreline stabilization features such as rock wedges, off-shore rock mounds, rock-log breakwaters, vanes, groins, biological bank stabilizations, and bank reshaping to protect and enhance existing quality habitat.
- Closure structures constructed of rock and/or earth would be considered in areas where connectivity should be reduced.
- Historic island acreage restoration, including partnering with the St Paul District Operations and Maintenance Program to utilize areas behind rock protection as dredged material placement sites.
- Forest creation, diversification, and enhancement activities, including increased topographic diversification through use of dredged material and tree plantings to enhance or restore natural levies.

This is not an exhaustive list but serves to illustrate the wide range of small scale projects that could be accomplished under this project. Many of these potential features are described in the Upper Mississippi River Restoration Environmental Management Program Environmental Design Handbook (USACE 2012).

Collectively, these features will provide protection to existing quality habitats, including bottomland and upland forest communities, unique lotic and lentic aquatic areas, transitional zone aquatic areas, protected wetlands, side channels, and other habitat types. This project provides the opportunity to protect, enhance, and restore habitats for all native and desirable plant, wildlife, and fish species. Target resources include many of the Refuge priority resources of concern (ROC) as identified by the respective Refuge Habitat Management Plans (USFWS, 2019) and State fish and wildlife plans. Priority wildlife ROCs potentially benefiting from the proposed actions include Cerulean Warbler, Prothonotary Warbler, Red-shouldered Hawk, transient neotropical migrant passerines, and tree-roosting bats, limnophilic native fish, migratory fluvial-dependent native fish, and limnophilic and fluvialdependent freshwater mussel species.

Implementation Considerations

Opportunities: There exist many discrete locations within the UMR where a relatively modest expenditure of effort to protect and maintain existing habitat would be ecologically beneficial and very cost effective. Additional economies of scale can be realized when a number of similar habitat protection and maintenance projects, that require similar equipment and construction techniques, can be coordinated and sequenced over large geographical reaches and multiple pools. Additionally, there are chronic dredging needs throughout the UMR pools, providing for a regular supply of sand dredged material that may be utilized for habitat protection, where feasible and appropriate. Further, this project has the potential to complement and help maintain existing HREP effects and will provide a large ecological footprint throughout the St Paul District. A design opportunity is to implement stabilization techniques that continue to allow wildlife access to aquatic/floodplain terrestrial habitat.

Constraints: Work in off-channel areas may present access constraints, and there is the potential for seasonal work constraints, in accordance with Refuge Closed areas and state permits. Additionally, resources that are currently found near the project sites, including freshwater mussels, may constrain implementation of some features throughout the project.

Sequencing Requirements: The intent of this project is to identify multiple locations where relatively small, similar efforts can be strung together in a cost-effective manner to accomplish habitat protection and maintenance goals that are not addressed by other programmatic or project-specific fact sheets. Since there are several project locations throughout the proposed study area, it may be beneficial to plan construction in multiple phases. For example, dividing the project into phases based on location (Minnesota, Wisconsin, and Iowa) or by pool may facilitate moving the project through the respective flood impact compliance processes.

Financial Data

Project lands federally-owned and managed by the USFWS as part of the Upper Mississippi River National Wildlife and Fish Refuge would be 100% federal with operation and maintenance on these lands the responsibility of the USFWS. Project features implemented on non-refuge lands will require a cost share partner that will contribute 35% of the project costs and all maintenance costs. The estimated cost for the general planning, design, and construction of the items discussed under the Proposed Project Features Section, depending on sequencing and the number of sites and features selected, could range from $ 5 to $20 million. The estimated annual O&M is $5,000.

Status of Project

The project was submitted to the Fish and Wildlife Work Group (FWWG) on <DATE> and accepted by the River Resources Forum on <DATE>.

Sponsorship

In many instances the USFWS Upper Mississippi River National Wildlife and Fish Refuge would be the project sponsor. In other instances the project sponsor might be a state agency, tribe, local municipality, or a nongovernmental organization. In all instances, projects would be developed and executed with participatory contributions by all interested federal, state, and non-governmental entities.

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Figure 1: Examples of banklines exhibiting erosion and acreage/habitat loss that could benefit from bankline protection.

Figure 2. Example of bankline erosion and forested island loss between the main channel and Swift Slough in upper Pool 11, 1994-2013. Yellow line depicts extent of tree canopy in 1994.

Figure 3. Examples of stabilized banklines at Polander Lake, Pool 5 (top) and in Pool 6 (bottom).