

**Department of the Interior
U.S. Fish and Wildlife Service**

DRAFT ENVIRONMENTAL ASSESSMENT

For

**Habitat Enhancement, Restoration, and Management, and Wildlife-
Dependent Recreational Use on the Root River Tract,
Houston County, MN**

**Upper Mississippi River National Wildlife and Fish Refuge
La Crosse District**

**Regional Director
Region 3, U.S. Fish and Wildlife Service
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Chapter 1. Purpose and Need for Action

1.1 Purpose

The purpose of this environmental assessment is to evaluate four alternatives identified for enhancing, restoring, and managing habitat on an 825-acre tract of land located along the Root River in Houston County, Minnesota (Figure 1). The Root River Tract is located in T. 104N., R. 4W., Sections 26, 27, 34, and 35, Hokah Township, Houston County, Minnesota. Also being evaluated in this environmental assessment are proposals to construct a parking lot at one of two locations along the main entrance road, develop a trail system on the existing road/dike complex, and expand the existing Root River Slow, No-Wake Area to include most of the Root River Tract.

This environmental assessment will also convey information to the public and provide a basis for public review and comment.

1.2 Need

The Root River Tract is located entirely on land acquired by the federal government, either by the U.S. Fish and Wildlife Service (751 acres) or the U.S. Corps of Engineers (74 acres). Through the terms of a cooperative agreement, the U.S. Fish and Wildlife Service (Service) manages the tract as part of the Upper Mississippi River National Wildlife and Fish Refuge (Refuge). Existing habitat types consist of former agriculture land, bottomland forest along the Root River and Mink Slough, scattered stands of shrubs, marshes, and extensive areas of wet meadow (Figure 2). Most of the project area is low-lying and subject to annual, or near annual, flooding from the Mississippi River. Floodwaters can also enter from the Root River during higher stage events.

A significant portion of the 825-acre project area consists of a 664-acre property acquired by the Service in 2009 from National Decorated Products, Inc. with funding from the Land and Water Conservation Fund (Figure 3). In response to water-logged soil conditions in the late 1950s to early 1960s which prevented farming, internal dikes, water control structures, discharge pipes, and ditches were constructed (Heitmeyer and Larson, 2010). Eventually, several of the fields were managed jointly for agricultural production and waterfowl food crops/hunting. While the property was managed as a shooting preserve until acquired by the Service, declines in waterfowl use and changed ownership gradually diminished management effort and maintenance of dikes and other infrastructure. Much of the infrastructure currently is in deteriorated/failing condition.

The arrangement of existing habitat types on the Root River Tract produces quality habitat for a lengthy list of birds, mammals, reptiles, amphibians, and fish. Refuge visitors also enjoy using the tract year-round for wildlife-dependent recreational activities, including hunting, fishing, wildlife observation, photography, and interpretation. However, given the extensive amount of infrastructure currently present in the floodplain and its overall deteriorated/deteriorating condition, the cost associated with operating and maintaining this infrastructure, and the fact the dikes/ditches may be promoting invasive species such as reed canary grass over native wet

meadow species, led the Service to develop four alternatives for future habitat enhancement, restoration, and management on the tract.

A list of the key features on the tract that are mentioned throughout this document, along with a description of each, appears in Appendix A.

1.3 Decisions that Need to be Made

The Refuge Manager will review the analysis of the four alternatives described in this assessment and the comments received during the 30 day public-comment period. Based on the review, the Refuge Manager will select an alternative to be implemented. The Regional Director, U.S. Fish and Wildlife Service, Region 3, will review the Refuge Manager's selection of one of four alternatives analyzed in detail and will determine, based on the facts and recommendations contained herein, whether this Environmental Assessment (EA) is adequate to support a Finding of No Significant Impact (FONSI) decision, or whether an Environmental Impact Statement (EIS) will need to be prepared.

1.4 Background

The Refuge:

Congress passed the Upper Mississippi River Wild Life and Fish Refuge Act on June 7, 1924. The act authorized the acquisition of land for a Refuge between Rock Island, Illinois and Wabasha, Minnesota. The 1924 act set forth the purposes of the Refuge as follows:

- "...as a refuge and breeding place for migratory birds included in the terms of the convention between the United States and Great Britain for the protection of migratory birds, concluded August 16, 1916, and
- to such extent as the Secretary of Agriculture¹ may by regulations prescribe, as a refuge and breeding place for other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and aquatic plants, and
- to such extent as the Secretary of Commerce¹ may by regulations prescribe as a refuge and breeding place for fish and other aquatic animal life."

¹Changed to Secretary of the Interior pursuant to reorganization and transfer of functions in 1939 (16 USC 721-723).

National Wildlife Refuge System Improvement Act of 1997:

This act amended the National Wildlife Refuge System Administration Act of 1966 and became a true organic act for the System by providing a mission, policy direction, and management standards. Among other provisions, the Act directed the Secretary of Interior to plan and direct the continued growth of the National Wildlife Refuge System (System) and recognized compatible wildlife-dependent recreational uses as the priority general public uses of the System, ensured that opportunities for compatible wildlife-dependent recreation are provided, and

ensured that wildlife-dependent recreation received enhanced consideration over other uses. The Act also provided compatibility of uses standards and procedures and required that each unit of the National Wildlife Refuge System complete a Comprehensive Conservation Plan (CCP) by 2012.

Planning:

Habitat enhancement/restoration planning began in 2010 with the completion of a hydrogeomorphic (HGM) evaluation of ecosystem restoration and management options, including recommendations for future management on the National Decorated Products, Inc. property (Heitmeyer and Larson, 2010). This evaluation determined the historical condition and ecological processes of the site and surrounding area, identified contemporary changes to the physical condition, ecological processes, and biota in the region from historical condition, and identified options and approaches to restore and manage specific communities on the site.

Following completion of the HGM, a management plan for the National Decorated Products, Inc. property was prepared by HDR Engineering, Inc. in October 2011 (HDR Engineering, Inc., 2011). This plan served as an initial planning tool to address the enhancement, restoration, and management approaches described in the HGM. Two restoration strategies were identified using passive and active means. The passive approach is Alternative B in this environmental assessment; the active strategy is Alternative C. Alternative A is the “no action” alternative that contains no strategy for habitat enhancement or restoration or infrastructure alterations or repairs. The plan also stressed the need to monitor and evaluate whatever approach is implemented as part of the long-term management of the tract.

Beginning in 2014, Josh Eash and Vince Capeder, Service Hydrologist and Geospatial Specialist, became involved in the project. Based on their review of recommendations included in the HGM report and the HDR management plan, several site visits, a detailed survey of key features, and inundation modeling using LiDAR data (Light Detection and Ranging), a recommendations report was prepared (Eash and Capeder, 2015). The package of recommendations contained in the report became Alternative D, the proposed action.

Their work was also important in developing a better understanding of how water currently moves across the tract. Key findings are summarized here:

1. Because the Root River Tract is located within the greater Mississippi River floodplain, the water surface slope follows the general downstream flow direction of the area. For the area of the tract the water surface gradient will be from north to south during periods of Mississippi River flooding. This is contrary to the land surface gradient across the tract which appears to have a distinct west to east slope from the Canadian Pacific Railway embankment to the Mississippi River. Further, the southern portions of the tract have been raised by sediment deposition and levees along the Root River. Therefore, although water surface gradients during a Mississippi River flood event will have a slight north to south slope, inundation on the tract will occur in an east to west manner and thus limited by any infrastructure that runs perpendicular (north to south). This is important when considering connectivity of the tract with the surrounding floodplain.
2. The tract does not capture water in the sense there is streamflow from a higher gradient filling up an impoundment until the impoundment reaches maximum capacity. Rather, water will back-flood onto the tract from the north and inundate the tract until water

levels are equal to that of the river. Therefore, the tract only impounds water on the rising and falling limb of a flood peak. During the rising limb, water will fill the tract from the north and due to the direction of the slope of the Mississippi River (north to south) there will be a slight difference in water surface elevation from the north to the south end of the tract which will vary based on the height of the flood event.

3. The spillway elevation in the low area of the South Dike located in the southeastern corner near the tie-in with the East Dike will make little-to-no difference in the height of water across the tract as water levels are driven by the height of the Mississippi or Root Rivers. The lower the spillway elevation, the greater the connectivity. Lower spillway elevations will restrict the frequency of access.
4. According to U.S. Army Corps of Engineers (USACE) flood frequency models, the water surface slope of a 2-year flood (stage of 635.6-ft. Mean Sea Level or MSL, NAVD, 1988) in this area would be approximately 0.5-ft. per mile, a 5-year flood (stage of 637.7-ft.) would be 0.6-ft. per mile, and a 10-year stage (stage of 639.0-ft.) would be 0.7-ft. per mile (U.S. Army Corps of Engineers, 2004). The Root River Tract from the Old Railroad Grade in the north to the outlet structure on the South Dike measures about 0.7-mile.
5. On the falling limb of flood peaks, water will take longer to flow to the north and back through Target Lake than it will to recede from the areas outside the dike system around the tract. Therefore, some water will be impounded as water levels drop. In short, the Mississippi River dictates water levels on the tract and the influence of the infrastructure on wetland depth is fairly insignificant.
6. Existing infrastructure prevents the tract from filling as quickly as it would in its absence, but also delays the tract from draining as quickly post-flood.
7. LiDAR-derived digital elevation models and aerial photos show numerous meander scars, or former channels, running west to east that appear to have been truncated by the existing East Dike, limiting inundation and drainage pre- and post-flood event. Not only does the East Dike obstruct east to west connectivity, but it is also at such a high elevation (639.0-640.0-ft. with some low spots around 638.5-ft.) that it maintains the obstruction until flood events are quite high (10-25-year flood frequency event). Almost the entire Root River Tract will be inundated below a stage of 639.0-ft. through connections to the north and south.

Project Goals:

Three goals have been defined for this project:

- Goal 1 - Return of Natural Floodplain to Enable More Habitat Diversity (River Resources Forum, 2004).
- Goal 2 - Wildlife and Habitat: Habitat management will support diverse and abundant native fish, wildlife, and plants (U.S. Fish and Wildlife Service, 2006).
- Goal 3 - Wildlife-Dependent Recreation: Programs and facilities will be managed to ensure abundant and sustainable hunting, fishing, wildlife observation, wildlife photography, interpretation, and environmental education opportunities for a broad cross-section of the public (U.S. Fish and Wildlife Service, 2006).

Chapter 2. Alternatives, Including the Proposed Action

2.1 Alternatives Not Considered for Detailed Analysis

Reestablish a Hydraulic Connection Through Existing Highway 26 and CP Railway Embankments:

A management option to improve natural water flow flooding regimes on the Root River Tract identified in the HGM report was to evaluate options to improve water flow between the east and west sides of Highway 26. The objective would be to allow water from large flood events on the Root River to pass more freely to the east and reconnect floodplains of the Mississippi and Root Rivers. This would be accomplished by selecting a low-lying area that may allow for bi-directional flow outside of the existing three highway/railroad bridges located between Miller's Corner and the Highway 26 and County Road 7 intersection (Eash and Capeder, 2015).

In their review, Eash and Capeder determined that culverts would need to be sufficiently large (4 to 6-ft. diameters) to accomplish the objective. Moreover, such a project would allow for the inundation of the western portions of the Root River Tract during high flood events on the Root River, while water levels on the Mississippi River are at low to moderate stages. Very large events on the Mississippi River may also inundate lands west of the highway and railroad embankments through this connection. In addition to a hydrologic reconnection, the culvert(s) may also provide a route of safe passage under the railroad and highway for terrestrial wildlife.

While promising, this alternative needs to be explored in greater detail. Additional inundation modeling is required to ensure this connection does not increase flooding on adjacent private land, and to determine the best location and the potential benefits to habitat on both sides of the highway. Current information indicates the flood events required to inundate areas west of Highway 26 would be infrequent and the areas affected may be relatively small. Existing inundation modeling indicates that northern sections of the area lying west of Highway 26 begin to get inundated when the Mississippi River is at stage of 637.5-ft. with wide-scale inundation at 638.0-ft. (Eash and Capeder, 2015).

Pursuing this hydraulic reconnection can be initiated at any time and does not need to be synchronized with habitat work currently proposed for the Root River Tract. Therefore, it will not be considered and evaluated as part of this project.

Options to increase water flow through the highway and railroad embankments and restore more natural regional water flow and flooding patterns would be explored in concert with adjacent private landowners and representatives from Minnesota Department of Transportation and Canadian Pacific Railway pending future opportunities.

Root River Agriculture Levees and Floodplain Restoration Located West of Highway 26:

Over the past 20-25 years, attention has been directed at the lower reach of the Root River, from near Houston, MN to the mouth, because frequent flooding has damaged homes and businesses in Hokah, Minnesota, transportation infrastructure, and private and public land. The flooding has also caused breaches to develop in the agriculture levees located along the Root River in the lower reach. These levees were constructed after the lower reach of the levee was channelized in 1917-1919. Today, breaches that occur on private land are repaired soon after they develop and

the land brought back into agriculture production. Numerous meetings have taken place through the years to discuss the issues and formulate recommendations to address flooding, sedimentation, condition of the levees, recreation, and other topics. To-date, implementation of the recommendations has been piecemeal and opportunistic.

The project being evaluated in this environmental assessment will not address agriculture levees, flooding, or opportunities for floodplain restoration on land located west of Highway 26. Those discussions need to continue and require a private/public partnership for action. Rather, this project is being implemented on land managed by the Service as part of the Refuge. None of the proposed alternatives being evaluated in this environmental assessment will affect flood levels or inundation frequencies on lands located west of Highway 26.

The 0.70-mile section of levee located on the Refuge on the left descending bank of the Root River east of Highway 26 is discussed throughout the document under each of the four alternatives.

2.2 Alternatives Carried Forward and Analyzed

2.2.1 Alternative A (No Action – Limited Maintenance of Existing Infrastructure, Enhance/Restore/Manage Habitat, and Maintain Current Wildlife-Dependent Recreational Uses)

Infrastructure: Existing infrastructure, such as dikes, ditches, and culverts/water control structures, would only be maintained on an “as needed basis” to provide equipment access for management purposes. Sections of dikes would continue to collapse or erode resulting in loss of access. Currently the loop around the Southeast Impoundment is not passable because a section of dike at the culvert/water control structure has collapsed, and a lengthy section of the East Dike is fenced and signed due to the number of animal burrows present in the top and along the sideslopes of the dike (Figure 4).

Root River Levee: A section of levee on the left descending bank of the Root River separates a former channel from the current channel. The former channel was cut-off when the Root River was channelized in 1917-19. Overbank flooding in recent years reached levels where flows topped this section of levee. This flooding has caused downcutting to occur in the levee at several locations, and general undercutting along much of the levee repaired after a breach developed during 2001 flooding.

No repair work would be done on this section of levee, nor would a diversion be constructed for greater connectivity. Attempts to riprap or raise this section of levee would only be temporary and would become an ongoing maintenance concern if funds are spent to repair it now. Rather, future floods on the Root River would dictate the degree and location of any connection with the floodplain located behind the levee. Other than localized sedimentation, there does not appear to be any serious concerns related to the Root River reconnecting with the floodplain in this area.

An example of what a breach could look like along with resulting sediment deposition is located west of Highway 26 on the Refuge’s Fogel Tract (Figure 1). Breaches developed in the early 2000s during several high stage events on the Root River.

Habitat Enhancement/Restoration/Management: Future management practices would restore or mimic natural ecosystem processes or functions to promote habitat diversity and minimize future operation and management costs. Mimicking natural processes in the altered environment found on/surrounding the Root River Tract requires enhancement, restoration, and active management.

Under this alternative, long-term farming operations would be terminated and the nearly 90 acres of former agriculture fields would be converted to about 30 acres of forest and nearly 60 acres of wet meadow (Figure 5). Trees would be planted on higher sites along the Root River in the southeastern corner of the tract. Depending on the location, tree species would be a mix of several species, including American basswood (*Tilia americana*), black oak (*Quercus velutina*), black walnut (*Juglans nigra*), bur oak (*Quercus macrocarpa*), hackberry (*Celtis occidentalis*), Kentucky coffeetree (*Gymnocladus dioica*), northern red oak (*Quercus rubra*), river birch (*Betula nigra*), silver maple (*Acer saccharinum*), and swamp white oak (*Quercus bicolor*). Fields converted to wet meadow may be planted or restored utilizing native plant seed already present in the seedbank.

Active habitat management would continue on the Root River Tract using a variety of tools. Depending on the need or the situation, the tools may include the following: Haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, and best management practices for timber stand improvement.

Low water vehicle/equipment access would be maintained from the main entrance to the East Meadow for future habitat management needs. The route traveled would be across the Crossroad and North Dike to a driveway on the East Dike that provides access to the East Meadow.

Wildlife-Dependent Recreation: The Root River Tract is open to all current public uses authorized on the Refuge, and that would continue. Wildlife observation/wildlands appreciation (walking, cross country skiing, snowshoeing, or biking), hunting (deer, upland game, migratory bird, and furbearer), photography, limited fishing, and furbearer trapping have been the most popular activities. The popular “walking loops” around the Main and Southeast Impoundments would remain, but access would continue to be dependent on water levels and the condition of the dikes that form the loop. These “walking loops” would continue to be mowed after nesting season ends; but no grooming would be done for cross country skiing.

Access: Visitors currently access the Root River Tract in several locations. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general locations. These include the north, main, and south entrances, and near Mink Slough. The majority of tract visitors use these locations. When the limited parking space at each entrance is at capacity, visitors will also park along the shoulder of the highway or in the parking lot at the Minnesota Department of Natural Resources’ Root River landing located just above the highway bridge on the west side of Highway 26 (Figure 4).

Because of the significant increase in rail traffic the past few years, increased attention is now being directed at railroad trespass laws, not only in Minnesota but many other states as well. In

Minnesota, Statue 609.85 addresses trespass on a railroad track, yard, or bridge. Under this statute, trespassing on railroad property is considered a misdemeanor. Each of the three entrances has a stop sign and private railroad crossing sign posted. However, the railroad trespass statute calls into question the future of accessing the tract from Highway 26. A similar concern applies to Alternatives B-D as well.

Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough.

Authorized vehicle and equipment access is provided at each of the three driveways with the main entrance receiving the most use.

Notice Boards: Refuge notice boards and leaflet dispensers are located at each of the three driveways and would remain.

2.2.2 Alternative B (Implement Passive Drainage Improvements, Enhance/Restore/Manage Habitat, Maintain Current Wildlife-Dependent Recreational Uses, Explore Constructing a Parking Lot, and Expand the Root River Slow, No-Wake Area)

Infrastructure: As described by HDR Engineering, Inc., the theme of this alternative is to remove flow impediments across the Root River Tract and maximize saturated areas to create new, or maintain existing, saturated areas (HDR Engineering, Inc., 2011). For that reason, this is referred to as the “passive drainage improvements alternative.” With implementation, water would move across the tract in a northwest/north-to-south/southeast direction and exit through water control structures in the southeast corner of the South Dike, then flow out of the tract to the southeast. The Mississippi River would provide source water through Target Lake.

The following major tasks require completion to set the stage for the conversion to a more natural hydrologic regime (Figure 6):

- Construct ditch plugs or completely fill sections of existing ditches.
- Depending on the location, existing dike breaches may be repaired or a larger opening constructed.
- The South Dike would be raised from the existing elevation of 637.0-ft.± Mean Sea Level (MSL), North American Vertical Datum of 1988 (NAVD, 1988) to the approximate 5-year flood frequency elevation of 637.5-ft. for this location as determined by the U.S. Army Corps of Engineers (USACE) (U.S. Army Corps of Engineers, 2004).
- The two existing water control structures in the South Dike would be replaced. The stoplog water control structure/culvert located on the west “arm” of the former meander would be replaced with a 50-ft. long spillway/low water crossing. The screwgate water control structure/culvert located on the east “arm” would be replaced with a stoplog water control structure/box culvert. These structures would be set to move water into sections of the former meander cut-off when the Root River was channelized.

Root River Levee: In the management plan prepared by HDR Engineering Inc. for the project, the recommendation was made to repair sections of the levee where overbank flooding in the recent past has caused downcutting to occur. This course of action was recommended for this

alternative and Alternative C. Keeping floodwaters, which are heavily laden with sediment, from entering the tract is the rationale behind this recommendation. According to the HDR plan, levee maintenance would continue until such time as the sediment issue is addressed in the upper Root River watershed. After that occurs, breaching this section of levee could be considered.

Upon further review, Service staff opted to deviate from the HDR plan and recommended the same approach proposed in Alternative A. No repairs would be made to the eroding section of levee, nor would a diversion be constructed for greater connectivity. Rather, future floods on the Root River would dictate the degree and location of any connection with the floodplain located behind the levee. Other than localized sedimentation, there does not appear to be any serious concerns related to the Root River reconnecting with the floodplain at this site. Surveys will help track the degradation of the levee over time. The Service is proposing the same course of action in Alternative C.

An example of what a breach could look like along with resulting sediment deposition is located west of Highway 26 on the Refuge's Fogel Tract (Figure 1). Breaches developed in the early 2000s during several high stage events on the Root River.

Habitat Enhancement/Restoration/Management: As described in Alternative A, future management practices would restore or mimic natural ecosystem processes or functions to promote a diversity of habitat and minimize future operation and maintenance costs. Mimicking natural processes in the altered environment found on/surrounding the Root River Tract requires enhancement, restoration, and active management.

Long-term farming operations would be terminated. Other changes expected with conversion to a more passive drainage system include:

- About 30 acres of former agriculture fields would be converted to forest using the same mix of species described in Alternative A (Figure 7).
- Wet meadow habitat would likely increase by nearly 85 acres from the existing condition. The increase is expected from several sources (Table 1). The most visible, and already occurring, is the conversion of former agriculture land. More subtle would be the conversion from existing marsh habitat to wet meadow as the tract begins to mimic natural hydrologic regimes typified by spring/early summer flooding and summer/fall drying. One likely site for this transformation would be in the Main Impoundment as existing marsh habitat found on the west side may convert to wet meadow habitat. The conversion may accelerate with active management and more predictable access. More frequent drying would also allow management activities to occur, including prescribed burning, mowing, rotational grazing, or haying, resulting in higher quality habitat for wet meadow and marsh acres.

Active habitat management would continue on the Root River Tract using a variety of tools. Depending on the need or the situation, the tools may include the following: Haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through plowing or disking, sediment removal, and best management practices for timber stand improvement.

Wildlife-Dependent Recreation: The Root River Tract is currently open to all current public uses authorized on the Refuge, and that would continue unchanged. Wildlife observation/wildlands appreciation (walking, cross country skiing, snowshoeing, or biking), hunting (deer, upland game, migratory bird, and furbearer), photography, limited fishing, and furbearer trapping have been the most popular activities. The popular “walking loops” around the Main and Southeast Impoundments would remain, but access would continue to be dependent on water levels. In addition, sections of the dike complex would be lowered and low water crossings constructed, which would also affect access.

Access: As described in Alternative A, visitors currently access the Root River Tract by several means. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general locations. These include the north, main, and south entrances, and near Mink Slough. The majority of tract visitors use these locations. When the limited parking space on the driveways at each entrance is at capacity, visitors will also park along the shoulder of the highway, or in the lot at the boat landing located just above the highway bridge on the west side of Highway 26 across from the main entrance (Figure 6). Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough.

Because of the significant increase in rail traffic the past few years, increased attention is now being directed at railroad trespass laws, not only in Minnesota but many other states as well. In Minnesota, Statue 609.85 addresses trespass on a railroad track, yard, or bridge. Under this statute, trespassing on railroad property is considered a misdemeanor. Each of the three driveways has a stop sign and private railroad crossing sign posted. However, the railroad trespass statute calls into question the future of accessing the tract from Highway 26. A similar concern applies to each of the other alternatives as well.

Authorized vehicle and equipment access is provided at each of the three driveways with the main entrance receiving the most use.

Notice Boards: Refuge notice boards and leaflet dispensers are located at each of the three driveways and would remain.

Parking Lot: Based on the current parking situation, constructing a visitor parking lot would be explored at one of two locations:

- At the intersection of Highway 26 and the main entrance on property owned by Minnesota Department of Transportation and Canadian Pacific Railway (Figure 6). This location has a history of disturbance dating back to construction of the highway and railway and subsequent improvements. The parking lot would be sized to accommodate 8 vehicles, including 2 vehicles towing trailers. Depending on ingress/egress, the area required for the parking lot would range in size from about 4,500 to 5,200 square feet, or about 0.10 to 0.12-acre.
- At the former building site on the former National Decorated Products, Inc. property. Fill was placed at this site to raise the area above the surrounding floodplain and tie-in with existing levee. The size of a parking lot at this site would be comparable to that described above. Crossing the single set of railroad tracks on the main entrance

driveway, which is posted a private railroad crossing, would require consultation with representatives from Canadian Pacific Railway.

Vehicle count records were reviewed to determine the capacity of the proposed parking lot. The heaviest annual use typically occurs on opening days of the firearms deer seasons, with 2-4 vehicles recorded at the main entrance, 1-2 vehicles each at the north and south entrances, and additional vehicles parked along the shoulder of Highway 26 near Mink Slough and in the parking lot at the Minnesota Department of Natural Resources' boat landing. The highest vehicle count recorded at the main entrance driveway/highway shoulder was 9 in the early morning on October 2, 2010, the opening day of the duck hunting season the year much of the tract was flooded and attracted large numbers of ducks.

Expand Root River Slow, No-Wake Area (SNWA) to include most of the Root River Tract: Established in spring 2007, the 695-acre Root River SNWA is located in a section of bottomland forest bisected by numerous channels. The area provides excellent wetland habitat for waterfowl, wading birds, shorebirds, furbearers, and other wildlife. The slow, no-wake designation reduces disturbance to wildlife during the sensitive spring and summer seasons by slowing the speed of watercraft and reducing noise levels. Reducing disturbance is in keeping with the wildlife mission of the Refuge. Further, the designation also provided those who value relatively secluded and quiet conditions for hunting, fishing, and wildlife observation with an opportunity to use the Refuge through much of the year.

Under this alternative, the Root River SNWA would be expanded to 1,634 acres and include most of the Root River Tract along with a strip of bottomland forest along the Root River (Figure 6). The rationale behind moving the boundary to the Root River is to be able to place and maintain signage along a natural boundary. Along the west boundary, signs would be placed along the common boundary with Canadian Pacific Railway, and on the north, along the Old Railroad Grade.

The current Refuge SNWA regulation would apply to the expanded area: From March 16 through October 31, watercraft must travel at slow, no-wake speed in this area. No airboats or hovercraft are allowed during the same time period. The State of Minnesota's definition for what constitutes "slow, no-wake" speed or operation would apply.

2.2.3 Alternative C (Implement Active Drainage Improvements, Enhance/Restore/Manage Habitat, Maintain Current Wildlife-Dependent Recreational Uses and Explore Constructing a Parking Lot)

Infrastructure: This alternative was also developed by HDR Engineering, Inc. and outlines an approach to move water through the Root River Tract in a controlled manner to enhance existing wetland impoundments and construct new moist-soil impoundments (HDR Engineering, Inc., 2011). Water would be distributed through the impoundment complex using pumps, pipelines, and water control structures. This active drainage system is not dependent on the timing, duration, or stage of Mississippi River high water events to provide source water. Water would be pumped from the Root River. This alternative requires constructing additional dikes and rebuilding sections of existing dikes, constructing a portable pumping station, and installing a pipeline to move water from the Root River to the impoundments. Other required actions

include replacing existing water control structures, and partially filling and regrading sections of existing ditches (Figure 8).

Root River Levee: As described in Alternative B, the Service proposal deviates from the HDR plan. As such, no repairs would be made to the eroding section of levee, nor would a diversion be constructed for greater connectivity. Rather, future floods on the Root River would dictate the degree and location of any connection with the floodplain located behind the levee. Other than localized sedimentation, there does not appear to be any serious concerns related to the Root River reconnecting with the floodplain at this site. Surveys will help track the degradation of the levee over time.

An example of what a breach could look like along with resulting sediment deposition is located west of Highway 26 on the Refuge's Fogel Tract (Figure 1). Breaches occurred in the early 2000s during several high stage events on the Root River.

Habitat Enhancement/Restoration/Management: Managed moist-soil and wetland impoundments would be two of the primary habitat types on the tract under this alternative (Figure 9). Moist-soil impoundments would be constructed in Fields 1 and 2, while existing wetland impoundments would be repaired and new water control structures installed. The impoundments would be managed to provide high quality food and cover for migrating waterfowl, shorebirds, wading birds, and other wetland-dependent wildlife species. Foods would be in the form of seeds, roots, and tubers produced by a variety of native moist soil, emergent, and submersed aquatic plants, and aquatic invertebrates. Management would be directed at keeping these impoundments in a highly productive state by simulating the natural cycle of water level changes, which in turn stimulates good aquatic vegetation growth and a variety of plant and animal species. Habitat diversity would be encouraged through rotational management of the impoundments. Manipulating water levels, periodic plowing/disking to create soil disturbance required to setback plant succession, haying, mowing, prescribed burning, and integrated pest management are among the tools that would be used to manage the impoundments. Another tool that may be needed during wet cycles is the aerial seeding of moist-soil impoundments in years with a late drawdown.

Additional information on moist-soil plants and management is available in Appendix B.

Similar to Alternatives A and B, long-term farming operations would be terminated. About 30 acres of former agriculture fields would be converted to forest using the same mix of species described in Alternative A.

Active management would continue on the Root River Tract using a variety of tools. Depending on the need or situation, the tools may include the following: Haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through plowing or diskings, sediment removal, and best management practices for timber stand improvement.

Wildlife-Dependent Recreation: The Root River Tract would remain open to all current public uses authorized on the Refuge. Wildlife observation/wildlands appreciation (walking, cross country skiing, snowshoeing, or biking), hunting (deer, upland game, migratory bird, and

furbearer), photography, limited fishing, and furbearer trapping have been the most popular activities. With the repair of existing dikes and construction of several new dikes, the opportunities for walking would increase, with access limited during periods of high water.

Access: As described in Alternative A, visitors currently access the Root River Tract by several means. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general locations. These include the north, main, and south entrances, and near Mink Slough. The majority of tract visitors use these locations. When the limited parking space on the driveways at each entrance is at capacity, visitors will also park along the shoulder of the highway or in the lot at the boat landing located just above the highway bridge on the west side of Highway 26 across from the main entrance (Figure 8). Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough.

Because of the significant increase in rail traffic the past few years, increased attention is now being directed at railroad trespass laws, not only in Minnesota but many other states as well. In Minnesota, Statue 609.85 addresses trespass on a railroad track, yard, or bridge. Under this statute, trespassing on railroad property is considered a misdemeanor. Each of the three driveways has a stop sign and private railroad crossing sign posted. However, the railroad trespass statute calls into question the future of accessing the tract from Highway 26. A similar concern applies to each of the other alternatives as well.

Authorized vehicle and equipment access is provided at each of the three driveways with the main entrance receiving the most use.

Notice Boards: Refuge notice boards and leaflet dispensers are located at each of the three driveways and would remain.

Parking Lot: Based on the current parking situation, constructing a visitor parking lot would be explored at one of two locations:

- At the intersection of Highway 26 and the main entrance on property owned by Minnesota Department of Transportation and Canadian Pacific Railway (Figure 8). This location has a history of disturbance during construction of the highway and railway. The parking lot would be sized to accommodate eight vehicles, including two vehicles towing trailers. Depending on ingress/egress, the area required for the parking lot would range from about 4,500 to 5,200 square feet, or about 0.10 to 0.12-acre.
- At the former building site on the former National Decorated Products, Inc. property. Fill was placed at this site to raise the area above the surrounding floodplain and tie-in with existing levee. The size of a parking lot at this site would be comparable to that described above. Crossing the single set of railroad tracks on the main entrance driveway, which is posted as a private crossing, would require consultation with representatives from Canadian Pacific Railway.

As described under Alternative B, vehicle count records were reviewed to determine the capacity of the proposed parking lot.

2.2.4 Alternative D (Proposed Action - Restore Natural Topography and Drainage Patterns, Enhance/Restore/Manage Habitat, Maintain Current Wildlife-Dependent Recreational Uses and Explore Constructing a Parking Lot and Trail System, and Expand the Root River Slow, No-Wake Area)

Infrastructure: Josh Eash, Service Hydrologist, and Vince Capeder, Geospatial Specialist, reviewed recommendations made in the HGM report and the HDR management plan, conducted several site visits and a detailed survey of key features, and developed inundation modeling using LiDAR data, and then prepared a recommendations report (Eash and Capeder, 2015). The recommendations became Alternative D, the proposed action.

Restoring natural topography and drainage patterns requires completion of numerous actions distributed across many areas of the tract. Items were prioritized based on their contribution to meeting the overall goal. The larger action items on the list include (Figure 10):

- **East Dike:** In its current form, no individual feature affects hydrology on the tract more than this dike. Therefore, several 200-600-ft. sections of the dike would be removed down to an elevation equal to existing ground surfaces of approximately 633.0-ft. in areas where the dike crosses former channels. With implementation, inundation modeling results show that areas west of the East Dike will become inundated at lower Mississippi River stages with the dike removed than they would with water sourced purely from the north. Water will flow to the west as the Mississippi River rises, filling-in former channels and connecting water levels outside the former impoundment with those areas within the former impoundment. The tract will have more connectivity with the Mississippi River and would therefore respond more rapidly to the rise and fall of the river. With increased connectivity, water retention times are expected to be less, i.e., inundating sooner but also draining quicker. This is a high priority action item.
- **Northeast Impoundment:** This 36.0-acre impoundment is formed by an extensive system of dikes. The proposed action consists of breaching, or enhancing three existing breaches, in the upper east-west section of dike and constructing two additional breaches in the north-south crossdike. Breaches in the upper dike will facilitate inundation sourced from existing breaches in the Old Railroad Grade, while breaches in the crossdike would allow east-west inundation and drainage. Dike removal in the northeast corner would reconnect former east-west channels in the area allowing inundation and post-flood drainage from east-west. This is a high priority action item.
- **North Dike:** Two sections of this dike would be removed, totaling about 300-500-ft., to an elevation of approximately 634.0-ft. This action would allow for extensive inundation of the nearly 110-acre Main Impoundment at elevations above the low level of 634.0-ft. This is a high priority action item.
- **South Dike:** A 250-350-ft. section of dike located between two existing culverts/water control structures in the southeastern corner near the tie-in with the East Dike would be lowered to elevation of approximately 634.8-ft.±. Lowering this section of dike provides the opportunity to take advantage of “early” floodwaters from the Root River when overbank flooding occurs. This is a high priority action item.
- **Southeast Impoundment:** Sections of the dike surrounding this 20.4-acre impoundment would be removed to facilitate inundation and increase connectivity, inundation frequency, extent, and drying capacity. Up to three individual breaches in the dike are

recommended, totaling 350-850-ft., and lowered to an elevation of 633.0-ft. ±. With implementation, equipment access would no longer be available around this impoundment. This is a high priority action item.

- **Ditch Plugs:** Would be constructed at several locations in each of the existing ditches. The purpose in constructing ditch plugs is to prevent unnatural drainage and drying of surrounding land or wetlands. The absence of ditch flow will also promote sheetflow, natural ponding of water, and soil saturation in areas that would have previously been drained by the ditch. Constructing ditch plugs is a high priority item.
- **Culverts/Water Control Structures:** All six existing structures would be removed and not replaced. Removing these structures is a high priority item.
- **Crossroad:** Would be lowered and adjacent ditches filled to existing ground surface elevations, or at least to an elevation of 636.0-636.5-ft., to facilitate east-west connectivity. This is considered a moderate priority action item. While this action removes a primary barrier to east-west flows at elevations that correspond to frequent Mississippi River flooding (2-5-year flood frequency events), areas west of the Crossroad affected by this action may be small.
- **Fish Pond:** At a minimum, the berms on the north and south ends of the pond would be removed and the depression at least partially filled. This action would facilitate north-south inundation while minimizing the artificial drainage of surrounding areas created by this depression. This is considered a low priority task because it only affects the 1.0 acre Fish Pond and immediate surrounding area.

Root River Levee: As described in Alternative A, no repair work would be done on the eroding section of levee, nor would a diversion be constructed for greater connectivity. Attempts to riprap or raise this section of levee are only temporary and would become an ongoing maintenance concern if funds are spent to repair it now. Rather, future floods on the Root River would dictate the degree and location of any connection with the floodplain located behind the levee. Other than localized sedimentation, there does not appear to be any serious concerns related to the Root River reconnecting with the floodplain in this area. Surveys will help track the degradation of the levee over time.

An example of what a breach could look like along with resulting sediment deposition is located west of Highway 26 on the Refuge's Fogel Tract (Figure 1). Breaches developed in the early 2000s during several high stage events on the Root River.

Habitat Enhancement/Restoration/Management: Similar to the other three alternatives, long-term farming operations would also be terminated. About 35 acres of former agriculture land would be converted to forest using the same methods and mix of species described in Alternative A (Table 1). Trees may also be planted on top of the remaining sections of dike surrounding the Southeast Impoundment.

Another 52 acres of the former agriculture acres would be managed for moist-soil plant production (Figure 11). Moist-soil plants, when flooded, provide plant and animal foods that are a critical part of the diet of migrating waterfowl and shorebirds. Preferred moist-soil plants on the Root River Tract include barnyardgrass (*Echinochloa crusgalli*), smartweeds (*Polygonum lapathifolium* and *amphibium*), chufa (*Cyperus esculentus*), beggarticks (*Bidens* spp.), rice cutgrass (*Leersia oryzoides*), and redroot pigweed (*Amaranthus retroflexus*) among others.

Generally, the most prolific seed producers, and therefore, the most desirable plants for waterfowl are annuals that dominate in early successional stages. Without disturbance, plant succession proceeds within a few years to perennial plants that are generally less desirable for waterfowl food production. Impoundments or fields must be disturbed regularly by practices such as disking/plowing, burning, or carefully timed flooding (Fredrickson and Taylor, 1982 and Strader and Stinson, 2005). Typically, management options increase with the ability to flood and drain when necessary, especially if sites or impoundments can be flooded and drained independent of all other units.

Complete water control is not available within the existing impoundment system located on the Root River Tract, and is not proposed in this alternative. Rather, sites were selected for moist-soil management that are located between elevations 635.0-ft.-636.0-ft. The 2-year flood stage in this area is approximately 635.6-ft., meaning there is a 50% chance or greater, that in any given year all or parts of these fields would be flooded.

Moist-soil management requires monitoring to determine when site treatment, such as disking/plowing are needed, or to determine if/when undesirable plant control is needed (Strader and Stinson, 2005). Management actions would be scheduled on a rotating basis among fields.

Additional information on moist-soil plants and management is available in Appendix B.

For the other habitat types found on the tract, active management would continue using a variety of tools. Depending on the need or situation, the tools may include the following: Haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement.

Wildlife-Dependent Recreation: The Root River Tract would remain open to all current public uses authorized on the Refuge. Wildlife observation/wildlands appreciation (walking, cross country skiing, snowshoeing, or biking), hunting (deer, upland game, migratory bird, and furbearer), photography, limited fishing, and furbearer trapping have been the most popular activities.

The walking loops around the Main and Southeast Impoundments that are popular with visitors would remain, but with lengthy sections of the dikes being breached or lowered, access would become more limited.

Access: As described in Alternative A, visitors currently access the Root River Tract by several means. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general locations. These include the north, main, and south entrances, and near Mink Slough. The majority of tract visitors use these locations. When the limited parking space on the driveways at each entrance is at capacity, visitors will also park along the shoulder of the highway, or in the lot at the boat landing located just above the highway bridge on the west side of Highway 26 across from the main entrance (Figure 10). Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough.

Because of the significant increase in rail traffic the past few years, increased attention is now being directed at railroad trespass laws, not only in Minnesota but many other states as well. In Minnesota, Statute 609.85 addresses trespass on a railroad track, yard, or bridge. Under this statute, trespassing on railroad property is considered a misdemeanor. Each of the three driveways has a stop sign and private railroad crossing sign posted. However, the railroad trespass statute calls into question the future of accessing the tract from Highway 26. A similar concern applies to each of the other alternatives as well.

Authorized vehicle and equipment access is provided at each of the three driveways with the main entrance receiving the most use.

Notice Boards and Single-Panel Kiosk: Refuge notice boards and leaflet dispensers are located at each of the three entrances and would remain at the north and south entrances. The notice board at the main entrance would be replaced with a larger single-panel kiosk, either at the current location or near the parking lot should a facility be constructed near Highway 26. A panel displaying a map of the Root River Tract would be installed on the kiosk.

Parking Lot: Similar to Alternatives B and C, constructing a visitor parking lot would be explored at one of two locations:

- At the intersection of Highway 26 and the main entrance on property owned by Minnesota Department of Transportation and Canadian Pacific Railway (Figure 10). This location has a history of disturbance dating back to construction of the highway and railway and subsequent improvements. The parking lot would be sized to accommodate 8 vehicles, including 2 vehicles towing trailers. Depending on ingress/egress, the area required for the parking lot would range in size from about 4,500 to 5,200 square feet, or about 0.10 to 0.12-acre.
- At the former building site on the former National Decorated Products, Inc. property. Fill was placed at this site to raise the area above the surrounding floodplain and tie-in with existing levee. The size of a parking lot at this site would be comparable to that described above. Crossing the single set of railroad tracks on the main entrance driveway, which is posted a private railroad crossing, would require consultation with representatives from Canadian Pacific Railway.

As described in Alternative B, vehicle count records were reviewed to determine the capacity of the proposed parking lot.

Designated Trail System: During project scoping, several comments were received recommending a trail system be developed on the tract, complete with signs, a hard surface, sections of boardwalk, and other amenities.

Expand Root River Slow, No-Wake Area (SNWA): Established in spring 2007, the 695-acre Root River SNWA is located in a section of bottomland forest bisected by numerous channels. The area provides excellent wetland habitat for waterfowl, wading birds, shorebirds, furbearers, and other wildlife. The slow, no wake designation reduced disturbance to wildlife during the sensitive spring and summer seasons by slowing the speed of watercraft and reducing noise levels. Reducing disturbance is in keeping with the wildlife mission of the Refuge. Further, the

designation also provided those who value relatively secluded and quiet conditions for hunting, fishing, and wildlife observation with an opportunity to use the Refuge through much of the year.

Similar to Alternative B, the Root River SNWA would be expanded to 1,634 acres under the proposed action and include most of the Root River Tract along with a strip of bottomland forest along the Root River (Figure 10). The rationale behind moving the boundary to the Root River is to be able to place and maintain signage along a natural boundary. Along the west boundary, signs would be placed along the common boundary with Canadian Pacific Railway, and on the north, along the Old Railroad Grade.

The current Refuge SNWA regulation would apply to the expanded area: From March 16 through October 31, watercraft must travel at slow, no-wake speed. No airboats or hovercraft are allowed during the same time period. The State of Minnesota's definition for what constitutes "slow, no-wake" speed or operation would apply.

Chapter 3. Affected Environment

3.1 Physical Characteristics

The Refuge encompasses one of the largest blocks of floodplain habitat in the lower 48 states. Bordered by steep wooded bluffs that rise 100 to 600 feet above the river valley, the Upper Mississippi River corridor and Refuge offer scenic beauty, a wild character, and productive fish and wildlife habitat unmatched in mid-America (U.S. Fish and Wildlife Service, 2006). The Refuge covers approximately 240,000 acres and extends 261 river miles from the confluence of the Chippewa River in Wisconsin to near Rock Island, Illinois.

The Root River, which forms the southern boundary of the Root River Tract, is the largest tributary of the Mississippi River in southeastern Minnesota. Flowing east for nearly 82 miles, the river drains parts of five counties before joining the Mississippi River in Navigation Pool 8 just south of La Crosse, Wisconsin. The eastern portion of the watershed is located within the Driftless Area, an area lacking the glacially deposited sediment that covers the surrounding area (The Nature Conservancy, no date). Approximately 97% of the 1,064,970 acres (1,664 square miles) within the watershed are privately-owned (U.S. Department of Agriculture, no date).

The tract is located on the large Root River tributary fan/delta that was created when sediment within the Root River watershed was deposited over time on the edge of the larger Mississippi River floodplain. This tributary fan/delta is one of seven found in the Chippewa River Ecoregion of the Upper Mississippi River System. The deposition of sediments in these fans/deltas is a function of stream velocity and the base level of the Mississippi River. Data suggest these tributary fans/deltas may be expanding due to upstream erosion and the mobilization of stored sediment in tributary streams (Heitmeyer, 2010). The tract contains mostly tributary fans/delta deposits and former and current channels of the Root River.

Narrow natural levees were present along the edges of the historic, pre-channelized, Root River channel. From 1917-19, the Root River channel was straightened from about three miles west of Houston, Minnesota to about one mile east of Highway 26 and cut-off two major meanders on the tract. Material dredged during this operation was sidecast on both sides of the river and used

to construct levees (Heitmeyer and Larson, 2010). A section of levee on the left descending bank of the river separates the meander from flood flows on the Root River. Recent floods reached levels where overbank flooding occurred near this former meander. The overbank flooding caused downcutting to occur in the levee at several sites, and general undercutting along a section of levee repaired after a flood in 2001 opened a large breach.

Most of the tract is low-lying and subject to annual flooding from the Mississippi River. Floodwaters can also enter from the Root River during higher stage events.

3.2 Biological Environment

3.2.1 Habitat/Vegetation

Approximately 47,953 acres of the Refuge total are located in the La Crosse District (Navigation Pools 7 and 8). This total includes about 28,245 acres of open water, 19,057 acres of wetlands, and 565 acres of upland; the remaining acres are in developed sites (boat landings, parking lots, roads, etc.).

Vegetation is a sensitive indicator of environmental change because changes can occur quickly (Zonneveld, 1988). Therefore, vegetation mapping is important because it creates an inventory of existing types, along with their location and geographical distribution at a point in time. The Long Term Resource Monitoring Program, a multi-state and federal partnership created under the Water Resources Development Act of 1986, developed the General Wetland Vegetation Classification System for the Upper Mississippi River System. This classification system consists of 31 general classes of vegetation. Maps are produced for a given tract of land, such as the Root River Tract, following a process that involves color infrared photography, photo-interpretation, field reconnaissance, and digital formatting/geo-referencing polygons of the vegetation types into the 31 general classes (Dieck and Robinson, 2004).

Refuge biologists then lump the 31 general classes into broader categories, or habitat types. The 2010 Land Cover/Land Use data was used to make this conversion. Because vegetation changes, field reconnaissance on the tract in spring 2015 resulted in updates to the 2010 Land Cover/Land Use data. Existing habitat types on the tract, including revisions made in 2015, are summarized in Table 1. The table also lists potential vegetation changes by habitat type for each alternative if the actions proposed for that alternative would be implemented. These are projections. Monitoring would be needed to document the actual vegetation changes.

Descriptions of the larger habitat types, moist-soil plants, and non-native invasive plant species follow:

Emergent marshes on the tract occur on permanently or periodically inundated sites. Cattails (*Typha* spp.) river bulrush (*Scirpus fluviatilis*), common arrowhead (*Sagittaria latifolia*), and broad-fruit burreed (*Sparganium eurycarpum*) are the most common perennial emergent plants present. These plants provide important habitat for a variety of wetland bird species, and mammals such as muskrats (*Ondatra zibethicus*) and beavers (*Castor canadensis*).

Wet meadows are composed of forbs, grasses, and sedge mixtures growing on saturated soils and are annually subjected to inundation following spring thaw and heavy rains and to drying during

summer and fall. They are often considered the transition zone between aquatic communities and upland sites (Dieck and Robinson, 2004). Common forbs occurring in wet meadows on the tract include blue vervain (*Verbena hastata*), ironweed (*Vernonia fasciculata*), sneezeweed (*Helenium autumnale*), northern bedstraw (*Galium boreale*), mountain mint (*Pycnanthemum virginianum*), water smartweed (*Polygonum amphibium*), and swamp milkweed (*Asclepias incarnata*). Grasses are represented by reed canary grass (*Phalaris arundinacea*), a non-native invasive plant that occurs in nearly monotypic stands in sections of meadows. Prairie cordgrass (*Spartina pectinata*) stands are scattered throughout sections of most meadows.

Plants occurring in meadows include species found in other communities, such as common arrowhead and river bulrush plants in former channels, and scattered trees and shrubs (Minnesota Department of Natural Resources, 2006).

Species composition in meadows can change with site disturbance or if protracted inundation occurs during the growing season. For example, two native forbs, fringed loosestrife (*Lysimachia ciliate*) and winged loosestrife (*Lythrum alatum*) were among the plants that appeared in Field 1 after the field was plowed in November 2012 (Ruth Nissen, pers. obs.). In lower elevation sites in the East Meadow, water smartweed plants replaced large areas formerly dominated by reed canary grass after lengthy periods of inundation during the 2013 and 2014 growing seasons (Ruth Nissen, pers. obs.).

Meadows provide important ecosystem services, including improving water quality by trapping sediments and nutrients, and storing floodwaters (Minnesota Department of Natural Resources, 2006). A lengthy list of wildlife species use meadows throughout the annual cycle, including sandhill cranes (*Grus canadensis*), sedge wrens (*Cistothorus platensis*), common snipe (*Gallinago gallinago*), waterfowl, northern harriers (*Circus cyaneus*), white-tailed deer (*Odocoileus virginianus*), reptiles, amphibians, numerous species of dragonflies, and pollinators.

Haying has been the primary tool used to manage wet meadows on the tract. “Marsh hay” is harvested in meadows in late summer/early fall when conditions permit. The hay is used by local cooperators to feed and bed livestock, and as mulch.

Scattered stands of **shrub-scrub**, comprised primarily of willows (*Salix* spp.), provide important habitat on the tract for a lengthy list of songbirds, American woodcock (*Scolopax minor*), green herons (*Butorides striatus*), and mammals, such as white-tailed deer. When flooded, these stands are used by many species of puddle ducks, but especially wood ducks (*Aix sponsa*). Flooded stands are an important component of quality wood duck habitat throughout the annual cycle (Bellrose and Holm, 1994). On the Root River Tract, they provide wood ducks with migration, breeding, brood-rearing, and molting habitat, and are also used as nocturnal roost sites (Jim Nissen, pers. obs.).

Bottomland forest comprises the largest habitat type on the Root River Tract at approximately 305 acres and provides rich habitat for wildlife (and fish during high water events), reduces soil erosion, improves water quality, and provides a scenic and recreational landscape (U.S. Fish and Wildlife Service, 2006). Working with foresters from the USACE, forest resources on the tract have been inventoried.

Table 1. Acres of existing habitat types on the Root River Tract with potential acreage changes under Alternatives A-D.

Habitat Type	Existing	Alternative A	Alternative B	Alternative C	Alternative D
Open Water	28	28	28	28	28
Submersed Aquatic Veg.	16	16	11	15	16
Marsh	88	88	70	93	82
Wet Meadow	221	282	305	224	234
Grassland/Levee/Bldg. Site	8	6	6	6	6
Agriculture	90	Terminated	Terminated	Terminated	Terminated
Moist-Soil	0	0	0	56	52
Shrub/Scrub	69	69	69	69	66
Bottomland Forest	305	336	336	334	341
Total:	825	825	825	825	825

Although not currently an existing habitat type delineated on the tract, Alternatives C and D describe plans to begin managing for *moist-soil plant* production. A flooded impoundment or field managed for moist-soil plants provides plant and animal foods that are a critical part of the diet of migrating waterfowl and shorebirds (Strader and Stinson, 2005). Preferred moist-soil plants on the Root River Tract include barnyardgrass, smartweeds, chufa, beggarticks, rice cutgrass, and redroot pigweed, among others. These plants provide seeds and other parts (leaves, roots, and tubers) that generally have low deterioration rates after flooding and provide substantial energy and essential nutrients less available to waterfowl in common agricultural grains, such as corn and soybeans. Moist-soil plants also support diverse populations of invertebrates, an important protein source for waterfowl and shorebirds (Strader and Stinson, 2005).

Invasive non-native plant species are present in many areas on, or adjacent to, the Root River Tract. Abundance among these species varies from large, nearly monotypic stands (reed canary grass) to a few scattered plants (Japanese barberry, *Berberis thunbergii*). These plants pose a challenge to the future management of native plant communities if they are not addressed through an integrated approach. The list includes Japanese knotweed or bamboo (*Fallopia japonica*) and pampas grass (*Cortaderia selloana*) at former building sites. In wet meadows and former agriculture fields, reed canary grass can be found in nearly monotypic stands in a number of locations. Purple loosestrife (*Lythrum salicaria*) plants have also invaded former agriculture fields and wet meadows on the tract, and the Highway 26 and Canadian Pacific Railway right-of-ways (r-o-ws). Common reed (*Phragmites australis*, likely the nonnative haplotype) is present in marshes and wet meadows, particularly the East Meadow. Canada thistle (*Cirsium arvense*), Japanese barberry, and wild parsnip (*Pastinaca sativa*) plants are growing on dikes, along the main entrance road and in the Highway 26 and Canadian Pacific Railway r-o-ws. Common buckthorn (*Rhamnus cathartica*) plants occur on higher sites, including along the “Old Railroad Grade.” Japanese hops (*Humulus japonicus*) vines grow along the Root River and scattered sites along the Canadian Pacific Railway r-o-w.

3.2.2 Listed, Proposed, and Candidate Species

Federally Threatened/Endangered Species: The Root River Tract potentially provides habitat for two species on the federal proposed, candidate, threatened, and endangered species list. A

mammal, the northern long-eared bat (*Myotis septentrionalis*), was a recent addition to the threatened list, and the eastern massasauga rattlesnake (*Sistrurus catenatus*) is a candidate species.

Minnesota is included in the range of northern long-eared bats, but to-date the species has not been documented on the Root River Tract. With extensive acreage of bottomland forest on and surrounding the tract, summer habitat requirements could be met because northern long-eared bats are often associated with forested habitats, especially around wetlands. During summer, the bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags. Tree selection may be based on the suitability to retain bark or provide cavities or crevices. Forest management activities can benefit bats by keeping areas forested. However, the type and timing of forest management activities is important to avoid causing mortality or degrading roosting and foraging habitat (U.S. Fish and Wildlife Service, 2015).

Massasauga rattlesnakes prefer wet areas including marshes and wet meadows along rivers and lakes, but they frequent adjacent higher, drier sites during part of the year. Two necessary habitat components are areas of mixed sun and shade for thermoregulation, and mammal/crayfish burrows or tree stumps for overwintering (U.S. Fish and Wildlife Service, 2015). While the mixture of habitat types found on the Root River Tract, combined with higher sites, including the Old Railroad Grade, dikes, and the Root River Levee, should meet the habitat needs of the species, there have been no recent observations. Further, the Minnesota Biological Survey conducted surveys for massasaugas in Houston, Wabasha, and Winona counties in 1993. No massasaugas were found in any of the 23 search areas. Additional surveys in 2002 and 2003 also failed to find any massasaugas (Minnesota Department of Natural Resources, no date).

Monarch Butterfly: The Service is currently conducting a status review of an additional species, the monarch butterfly (*Danaus plexippus plexippus*), under the Endangered Species Act. Monarch butterflies are found throughout the U.S. and some populations migrate vast distances across multiple generations each year. Many monarchs fly between the U.S., Canada, and Mexico. This journey has become more perilous because of threats along their migratory routes and their breeding and wintering areas. Threats include habitat loss, particularly the loss of milkweed plants, the monarch caterpillar's sole food source, and mortality from pesticide use.

Monarch butterflies are commonly observed on the Root River Tract. Two species of milkweed plants have been documented: Common (*Asclepias syriaca*) and swamp. Scattered common milkweed plants can be found around the former building site and in former agricultural fields, while swamp milkweed is locally abundant in several wet meadows.

Minnesota's List of Endangered, Threatened, and Special Concern Species: At least seven species that appear on Minnesota's list of endangered, threatened, and special concern species (Minnesota Department of Natural Resources, 2013) have been observed on the tract, or are likely to use the tract. The seven species, including six birds and one plant, are identified along with the habitat types where they have been observed in the past, or are likely to use:

Birds:

Loggerhead shrike (*Lanius ludovicianus*) – endangered: Along dikes, ditches, and former fencerows.

Louisiana waterthrush (*Parkesia motacilla*) – special concern: Shrub-scrub and bottomland forest bordering water during migration.

Peregrine falcon (*Falco peregrinus*) – threatened: Entire tract during open water portion of year.

Red-shouldered hawk (*Buteo lineatus*) – special concern: Bottomland forest.

Short-eared owl (*Asio flammeus*) – special concern: Wet meadow and moist soil fields during migration.

Trumpeter swan (*Cygnus buccinator*) – special concern: Flooded wet meadows during migration and summer, particularly the East Meadow.

Plants:

Swamp white oak (*Quercus bicolor*) – special concern: Scattered locations; 800 swamp white oaks were planted in Field 9 in 2010.

The Root River Tract also provides breeding and migration habitat for 23 species (22 birds and 1 reptile) included on Minnesota Department of Natural Resources' list of "Species in Greatest Conservation Need" (Minnesota Department of Natural Resources, 2006). See Appendix C for the list of species that have been observed on the tract or on adjacent sites and the habitat types where they can be found.

3.2.3 Other Wildlife Species

More than 300 species of birds, 51 species of mammals, 42 species of freshwater mussels, 119 species of fish, 31 species of reptiles, and 14 species of amphibians have been recorded on the Refuge. The arrangement of existing habitat types on the Root River Tract provides habitat for a many species found on the Refuge.

3.3 Land Use

Land use on the 664-acre National Decorated Products, Inc. property was summarized in the HGM report and applies to the entire Root River Tract (Heitmeyer and Larson, 2010). Parts of the tract were farmed in the early 1900s and small levees and ditches were constructed in an attempt to reduce flooding. From 1917-1919, the Root River was channelized beginning about three miles west of Houston, MN and ending nearly one mile east of Highway 26. Two large river bends were cut-off on the Root River Tract through this project. Levees were constructed on both sides of the new channel using dredged material, in part to reduce flooding on adjacent land.

In addition to the levees and embankments constructed around the Root River Tract, a series of east-west ditches (North and South Ditches) were excavated across the tract and connected to a north-south ditch (East Dike) that drained through a relict slough system and ultimately into the Root River (Figure 1). This system, including dikes, ditches, and water control structures, was constructed in the 1950s through early 1960s.

After most of the project area was acquired in the 1950s by Northern Engraving/National Decorated Products, Inc., the drainage system was used effectively to manage jointly for agricultural and waterfowl food crops/habitat. This operation continued through the 1980s.

While sites on the property continued to be farmed and hayed and managed as a shooting preserve until Service acquisition in 2009, less emphasis was placed on using the infrastructure to manage for waterfowl.

After Service acquisition, farming continued on the National Decorated Products, Inc. property under annual agreements as a means to maintain suitable conditions for future habitat enhancement/restoration activities while project planning was underway. Haying operations in late summer/early fall continued on the larger Root River Tract, involved multiple cooperators, and was used to manage wet meadow habitat benefitting native plant species, waterfowl, shorebirds, sandhill cranes, and other wildlife. Haying and farming are challenging most years due to wet site conditions (Table 2).

Table 2. Acres hayed and farmed on the Root River Tract, 2009-2014.

Year	Acres Hayed	Acres Farmed (Crops Planted)
2009	216	85 (52 corn and 33 soybeans)
2010	0	27 (corn only)
2011	49	0 fields too wet
2012 ¹	96	56 (soybeans only)
2013	73	0 fields too wet
2014	22	0 fields too wet

¹An additional 41 acres were plowed in Fields 1 and 2.

After Service acquisition, most of the buildings and structures located on the National Decorated Products, Inc. property were determined to be surplus, sold, and either moved or salvaged for timbers, lumber, or metal. Today, one building remains. Site clean-up also occurred along with the removal of barbed wire fencing.

About 800 swamp white oak seedlings were planted on nearly 20 acres in Field 9 in spring 2010 to diversify a nearly monotypic stand of cottonwood (*Populus deltoides*) seedlings that germinated after the agriculture field was flooded by the Root River in June 2008 (Figure 1). Fields 8 and 10 were also retired because of their small size (0.3-acre Field 8) or difficult access (Field 10).

3.4 Cultural Resources

The Root River watershed has an extensive history of human occupation. Diagnostic materials recovered from sites examined in the eastern one-third of the Root River watershed in 1984 suggest prehistoric occupation of the region for as long as 8,000 or 9,000 years (Withrow and Rodell, 1984). This archaeological reconnaissance survey, focused on river and stream terraces in the Driftless Area portion of the watershed, discovered 87 new prehistoric sites, representing Late Paleo-Indian, Archaic, Woodland, and Oneota cultures.

Archaeological investigations continued in 1989 when Phase II and Phase III excavations were conducted at Farley Village, an Oneota site, located along Riceford Creek in the Root River watershed in western Houston County, Minnesota (Gallagher, 1990). Investigators estimate this

village was in existence at this location for a short period of time in the seventeenth century, and excavations revealed the occupants were directly or indirectly obtaining European trade goods. The floral and faunal remains were analyzed and provide insights into the inhabitants' diet. Many of the food items were local suggesting occupants were not highly mobile. Moreover, no species typical of large rivers was included in the faunal remains. Dietary emphasis appeared to favor meat over fish. Birds and mammals typical of woodland to open woodland were consumed, including larger mammals such as beaver, white-tailed deer, muskrat, elk, bear, and raccoon. Among the small mammal remains uncovered were those of moles and a shrew. Red-winged blackbirds, a wood duck, and a passenger pigeon were among the bird remains identified. Floral remains were represented by maize (corn), barley, cherry, and "knotweeds" of the genus *Polygonum* among others. Today plants in the genus *Polygonum* have a number of common names, including smartweeds, and occur throughout the Root River Tract on wet sites.

Most widespread European settlement of the lower Root River Valley occurred in the mid-1800s. Much of the history from post-European settlement to the present time was described in the HGM report for the 664-acre National Decorated Products, Inc. property (Heitmeyer and Larson, 2010).

Agriculture was the primary economic use and traffic on the Mississippi River transported goods and people. Efforts were made to improve navigation on the Mississippi River beginning as early as 1871 when Congress approved funding for the USACE to improve the river for navigation, mainly through the removal of snags and occasional dredging. Additional authorizations were approved by Congress over the years for progressively deepening the main channel, culminating in 1930 when Congress authorized funding for a 9-foot navigation channel. This project ultimately led to the construction of 29 locks and dams between St. Louis, Missouri and Minneapolis, Minnesota. The 9-foot navigation channel project resulted in modifications to the main channel and the adjacent floodplain, including the Root River Tract (U.S. Fish and Wildlife Service, 2006).

Other historical developments that affected the tract included construction of the St. Paul Railroad in the late 1800s along the west boundary (now Canadian Pacific Railway) and a parallel road that is now Minnesota State Highway 26 (now part of the Great River Road National Scenic Byway). Both the rail line and road were constructed on top of earthen embankments that effectively created a dam across the Root River floodplain along the west boundary of the tract. Another earthen embankment was constructed along the north boundary of the tract to support a railroad spur line. This line was abandoned in the mid-1900s. The embankment remains and is referred to as the Old Railroad Grade in this environmental assessment.

Parts of the Root River Tract were farmed in the early 1900s and small levees and ditches were constructed in an attempt to reduce flooding. From 1917-1919, the Root River was channelized beginning about three miles west of Houston, MN and ending on the tract about one mile east of Highway 26. Two large river bends were cut-off on the Root River Tract through this project. Levees were constructed on both sides of the new channel using dredged material, in part to reduce flooding on adjacent land. This levee system remains and is referred to as the Root River Levee in this environmental assessment.

In addition to the levees and embankments constructed around the Root River Tract, a series of east-west ditches (North and South Ditches) were excavated across the tract and connected to a north-south ditch (East Dike) that drained through a relict slough system and ultimately into the Root River. This system, including dikes, ditches, and water control structures, was constructed in the 1950s through early 1960s.

After most of the project area was acquired by Northern Engraving/National Decorated Products, Inc. in the 1950s, the drainage system was used effectively to manage jointly for agricultural and waterfowl food crops/habitat. The Main Impoundment (Fields 3, 4, and a portion of 6) served as the primary area for this dual purpose role. Another impoundment, referred to in this environmental assessment as the Southeast Impoundment, was constructed in the early 1970's in support of the waterfowl management/hunting program. Water was pumped from the Root River using a portable pump to flood low areas in the Main Impoundment. The twin goals of agricultural production and waterfowl management/hunting continued through the 1980s.

Ultimately, declines in waterfowl use and changed ownership gradually diminished management effort and maintenance of dikes, levees, and water control structures. Reduced maintenance also impacted the farming program. Because of low field elevations in some fields, farming was challenging even in dry years. In wet years, only the higher elevation fields could be farmed, and in the wettest of years, farming was not possible.

3.5 Local Socioeconomic Conditions

The Refuge is the most visited in the National Wildlife Refuge System with an estimated 3.7 million annual visits (U.S. Fish and Wildlife Service, 2006). The La Crosse District (Navigation Pools 7 and 8) received an estimated 860,130 visits for the following activities in Fiscal Year (FY) 2015 (October 1, 2014 through September 30, 2015):

- 29,700 visits for hunting
- 210,000 visits for fishing
- 238,575 visits for wildlife observation
- 22,125 visits for photography
- 43,220 visits for interpretation
- 1,410 visits for environmental education
- 325,000 visits for other recreational activities

The Root River Tract is a popular destination for visitors from the local area who enjoy walking the road/dike network year-round, bird watchers during spring migration, and hunters, particularly deer hunters, each fall. Visitation estimates for wildlife-dependent recreational activities on the tract from acquisition in 2009 through FY2015 appear in Table 3.

The overall financial impact of the Mississippi River and Refuge is substantial. The Upper Mississippi River System annually contributes an estimated \$1 billion in recreational benefits to the region (U.S. Fish and Wildlife Service, 2006). Further, the Refuge was one of 92 refuges examined as part of a recent peer-reviewed study, *Banking on Nature*, released in November 2013 (U.S. Fish and Wildlife Service, 2013). The study found that recreational visitors to the Refuge generated \$226 million in economic effects in FY2011 on a budget of \$4.9 million –

about \$46 for every \$1 in budget expenditure. The Refuge also supported the greatest number of jobs of all sampled refuges at 1,394.

In addition to the stimulus provided by Refuge and Root River Tract visitors, farming and haying operations on the tract also generated economic activity in the local area.

Table 3. Visitation Estimates for Wildlife-Dependent Recreational Activities on the Root River Tract, FY2009-FY2015¹.

Activity	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015
Hunting	35	685	520	370	360	370	400
Fishing	250	250	250	250	250	250	250
Wildlife Observation	500	1,825	2,190	2,255	3,650	1,825	1,300
Photography	50	185	220	225	365	185	130
Interpretation	50	185	220	225	365	185	130
Environmental Ed.	0	0	0	0	0	0	0
Total Visits	885	3,130	3,400	3,325	4,990	2,815	2,210

¹Fiscal year is October 1 through September 30.

Chapter 4. Environmental Consequences

This chapter describes the foreseeable environmental consequences of implementing the four alternatives identified in Chapter 2.

4.1 Effects Common to All Alternatives

4.1.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote non-discrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment.

Overall, none of the alternatives are expected to disproportionately place an adverse environmental, economic, social, nor health impacts on minority or low-income persons.

4.1.2 Listed, Proposed, and Candidate Species

The Root River Tract potentially provides habitat for two species on the federal proposed, candidate, threatened, and endangered species list. A mammal, the northern long-eared bat, was

a recent addition to the threatened list, and the eastern massasauga rattlesnake is a candidate species.

Minnesota is included in the range of northern long-eared bats, but to-date the species has not been documented on the Root River Tract or in Houston County. With extensive acreage of bottomland forest on and surrounding the tract, summer habitat requirements could be met because northern long-eared bats are often associated with forested habitats, especially around wetlands. During summer, the bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags. Tree selection may be based on the suitability to retain bark or provide cavities or crevices (U.S. Fish and Wildlife Service, 2015).

Massasauga rattlesnakes prefer wet areas including marshes and wet meadows along rivers and lakes, but they frequent adjacent higher, drier sites during part of the year. Two necessary habitat components are areas of mixed sun and shade for thermoregulation, and mammal/crayfish burrows or tree stumps for overwintering (U.S. Fish and Wildlife Service, 2015). While the mixture of habitat types found on the Root River Tract, combined with higher sites, including the Old Railroad Grade, dikes, and the Root River Levee, should meet the habitat needs of the species, there have been no recent observations. Further, the Minnesota Biological Survey conducted surveys for massasaugas in Houston, Wabasha, and Winona counties in 1993. No massasaugas were found in any of the 23 search areas. Additional surveys in 2002 and 2003 also failed to find any massasaugas (Minnesota Department of Natural Resources, no date).

Regardless of which alternative is implemented, construction activity should not directly or indirectly affect either individuals or critical habitat for either species. For the northern long-eared bat, tree clearing would be limited to generally isolated trees and shrubs found on dikes, spoilbanks, or ditches where construction activity is proposed, or where access to work sites is needed. Trees at these sites are young, and therefore, small. With reforestation efforts targeted on 30-35 acres, and a nearly 20-acre site already abandoned and reforested (Field 9), additional habitat should be available in future years.

Massasauga habitat also should not be affected by the project. Depending on the alternative implemented, only sections of the 2.5-mile dike system would be breached or lowered, leaving abundant higher and drier sites in proximity to wet meadows and wetlands available. Further, only sections of spoilbanks located along the North Ditch would be breached. Other than Alternative B, where widening an existing breach on the Old Railroad Grade is proposed, no other construction activity is slated for that embankment. Moreover, with the proposed enhancement/restoration actions identified in each alternative, additional acres of wet meadow habitat are anticipated regardless of which alternative is implemented (Table 1).

As noted, the Service is currently conducting a status review of an additional species, the monarch butterfly, under the Endangered Species Act. Monarch butterflies are commonly observed on the Root River Tract. Both common and swamp milkweed plants are also present. With more wet meadow habitat expected after enhancement/restoration work is completed, additional milkweed plants, particularly swamp milkweed, should be available. Flowering forbs found in wet meadows and other sites would also provide additional feeding opportunities for monarchs.

4.1.3 Irretrievable and Irreversible Commitment of Resources

For Alternatives B through D, habitat enhancement/restoration activities represent a sizeable investment estimated at \$400-500,000 for Alternative B, nearly \$1 million for Alternative C, and \$400-500,000 for Alternative D. The cost to implement Alternative A would be substantially less. For Alternative D, it is improbable that the proposed actions could or would be reversed once they are completed. For Alternatives B and C, actions could be reversed if it is determined the results are ineffective or if operating/maintaining the infrastructure proves to be unsustainable.

Across all four alternatives, reforesting 30-35 acres of former agriculture land is planned, along enhancing, restoring, and managing habitat on other areas of the tract. These actions are considered a long-term investment requiring staff time to plan or administer, implement, and monitor the results. Along with the habitat program, addressing both routine and non-routine maintenance needs is another long-term investment.

Current wildlife-dependent recreational uses would continue on the tract under all four alternatives. Alternatives B-D call for exploring construction of a small parking lot, with a 0.10-0.12-acre footprint, at one of two locations, including a site on the tract. Funding to construct this facility, along with a single-panel kiosk identified in Alternative D, would be irretrievable once spent. However, the habitat displacement is not considered an irreversible or irretrievable use of resources because removal and site restoration is feasible.

Funding for implementing enhancement/restoration activities is being provided by Minnesota's Outdoor Heritage Fund created under the Clean Water, Land and Legacy Amendment. The reforestation effort and activities directed at restoring natural topography and drainage patterns would be eligible for funding under this program. Station funding, donations, and the contribution of volunteers is also critical to the long-term success of the project. Actions identified in Alternatives A-C that rebuild, maintain, or construct new infrastructure, or similar tasks would not be eligible for this funding. Therefore other funding sources would have to be found. Moreover, funding would also have to be found to construct a parking lot if that option is pursued at a future date.

4.1.4 Short-term Uses and Long-term Productivity

Habitat enhancement and restoration actions outlined in all four alternatives often entail short-term negative impacts to ensure long-term productivity of the Root River Tract. Whether it is reforesting former agriculture fields, breaching or lowering sections of dikes, or raising them, these actions will cause disturbance to wildlife, fish, and plants, and disruption of public uses. Similar disturbance would also result during the construction of ditch plugs, filling-in complete sections of ditches, or constructing completely new dikes and rebuilding others. These impacts would be site-specific and of short duration and should be more than offset by increasing the long-term productivity of the tract and surrounding area.

The cyclic management actions identified in the alternatives, including haying, prescribed burning, mowing dikes, disking/plowing to create soil disturbance required for moist-soil plant production or to prepare a site for a seeddown, manipulating water levels, invasive plant and

animal control, sediment removal, and forest management, all can have short-term impacts. These impacts may take a number of forms, including direct mortality of animals and plants, temporary displacement of wildlife, or the temporary closure of sites to public access. However, these actions, many of them mimic natural processes, generally are short-term and offset by the long-term benefits to habitat resulting from them.

With the proposed expansion of the Root River Slow, No-Wake Area under Alternatives B and D, the short-term interruption in current means, locations, and timing of public uses should in the long-term help sustain the greatest diversity of opportunity for the greatest number of participants. In turn, diversity of opportunity for wildlife-dependent activities would provide positive economic impact to local communities.

4.1.5 Unavoidable Adverse Effects

The task lists identified in each of the alternatives have a certain level of unavoidable adverse effects, especially during the actual construction. These effects are mitigated to some degree by the use of practices and precautions that safeguard water quality, avoid sensitive sites, or are timed to avoid or minimize impacts to fish and wildlife. Adverse effects are generally short-term and offset by long-term gains in habitat quality and resulting fish, wildlife, and plant productivity.

Some existing habitat types on the tract will be adversely affected as identified in each alternative. Any adverse effects should be more than offset by the long-term diversity and ecological health of the overall tract and surrounding habitat.

All four alternatives, to varying degrees, will have adverse impacts to a certain segment of the public that may have differing views on the course of action to be taken. Some visitors will see a loss of opportunity in terms of access for walking; others may feel the same concerning the expansion of the slow, no-wake area with its seasonal limits on types of watercraft. These impacts to individuals or groups are unavoidable given the diversity of public desires, project goals, and finite land base on the tract and Refuge to accommodate all forms of public recreation.

Alternative D, the proposed action, strikes a balance between meeting project goals and accommodating wildlife-dependent recreation on the tract.

4.2 Alternative A (No Action – Limited Maintenance of Existing Infrastructure, Enhance/Restore/Manage Habitat, and Maintain Current Wildlife-Dependent Recreational Uses)

4.2.1 Habitat and Biological Impacts

The aging infrastructure on the tract would remain intact with maintenance limited to providing access for management purposes. Hence, the project's top goal of returning to a natural floodplain to enable more habitat diversity may ultimately be met, but would likely require many decades before a complete breakdown of existing infrastructure occurs. Currently, the collapsed dike at the Southeast Impoundment, erosion along a section of the Root River Levee, and

numerous active animal burrows in a section of the East Dike are signs that the tract is gradually reconnecting to the floodplain.

Meanwhile, the existing infrastructure is limiting habitat potential on the tract. The HGM report identified several reasons why this is happening and recommended a course of action to address this situation (Heitmeyer and Larson, 2010):

- Natural summer-fall drying periods are important to maintain the grass-herbaceous vegetation composition in marshes and wet meadows, allow periodic disturbance to recycle nutrients, provide seed germination substrates, and provide critical food and cover resources for fish and wildlife that use these areas seasonally. Infrastructure in poor repair should be removed if it causes water to be impounded for extended periods in summer.
- Improving natural water flow patterns and reducing seasonal impoundment of floodplain forest areas behind dikes, water control structures, and embankments by removing this infrastructure should help the tract dry more quickly and efficiently during drier periods.
- Marshes and wet meadows are heavily invaded by reed canary grass. This invasion seems to have been exacerbated by generally wetter water regimes in these formally seasonally flooded sites, and by heavy siltation caused by soil erosion from upstream watershed areas. Removal of infrastructure should begin to address this situation and also should reduce or eliminate sediment trapping in floodplain depressions where reed canary grass seems to thrive.

The proposed action on the deteriorated section of Root River Levee is to “leave as is” and monitor the situation. Surveys would help track the degradation of the levee over time. The Root River would breach and widen the opening(s) in the levee during future flood events. Other than localized sedimentation, there does not appear to be any serious concerns related to the Root River reconnecting with the floodplain in this area.

Habitat enhancement/restoration/management would occur with this alternative as reforestation efforts are planned on about 30 acres of former agriculture fields (Field 1). The remaining acres of former agriculture lands would revert to wet meadow habitat, or be restored through a restoration program.

Active habitat management would continue using a variety of tools. Depending on the need or situation, the tools may include haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement.

4.2.2 Cultural Resources

Fields and other sites on the Root River Tract have had an extensive history of soil disturbance. Activities that involved soil disturbance included tree clearing in several areas to create cropland, plowing and disking as part of the farming program, dozing willows from sites within the Main Impoundment and other locations, the excavation and maintenance of ditches, and the construction/maintenance of dikes, levees, or the Old Railroad Grade embankment.

Limited maintenance of infrastructure such as repairing dikes for equipment access is part of this alternative.

Habitat enhancement/restoration/management would occur as part of this alternative, including reforesting an estimated 30 acres of former agriculture fields. Several planting methods have been proposed, including:

- Higher sites would be planted using conventional methods, including direct seeding, with minimal ground disturbance.
- On a lower elevation site in Field 2, the recommended planting method is to construct “planting mounds” for establishment of more flood sensitive species using an excavator or similar equipment. Site impacts would include about 400 mounds per acre over a 6.1 acre site. Each mound would have a height of about 1-ft. and a surface area of about 3 square feet. Soil to construct each mound would be obtained from an area around each mound to a depth of 12-14 inches, or within the plowzone.
- Alternatively, “planting mounds” could also be constructed as a continuous terrace, with the length of sections sized so not to affect sheetwater flow across the field. Similar to the “planting mounds,” the height of the terrace would be about 1’ft. and material would be “borrowed” from an area adjacent to the terrace with a depth limited to 12-14 inches, or within the plowzone, using an excavator or similar equipment.

For the other habitat types found on the tract, active management would continue using a variety of tools. Depending on the need or situation, the tools may include haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement. These activities would occur in sites that have a history of disturbance and be restricted to the plowzone.

Because of the extensive history of site disturbance in areas where habitat work would occur, or where dike maintenance would be performed, the Service believes there is a low probability of disturbing significant intact cultural deposits while conducting any of these activities. Prior to project initiation, a professional archaeologist would be consulted to review, and approve, the recommended course of action.

4.2.3 Visitor Use

The Root River Tract is open to all current public uses authorized on the Refuge, and that would continue. The popular “walking loops” around the Main and Southeast Impoundments would remain, but access to the loops would continue to be dependent on water levels and the condition of the dikes and Crossroad.

Access: Visitors currently access the Root River Tract in several locations. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general locations. These include the north, main, and south entrances to the former National Decorated Products, Inc. property, and near Mink Slough. The majority of tract visitors use these locations. The driveways at each of the three entrances have a stop sign and private railroad crossing sign posted. Minnesota Statute 609.85 addresses trespass on a railroad track, yard, or bridge. With

increased rail traffic the past few years, enforcement of this statute is now being discussed in states bordering the Mississippi River, including Minnesota. As a result, questions need to be addressed with representatives from Canadian Pacific Railway concerning visitors crossing at the three entrances, or crossing the railroad tracks near Mink Slough to fish the slough or access the Old Railroad Grade.

Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough. Access by these means and locations would not be affected by the railroad trespass statute.

Notice Boards: Refuge notice boards and leaflet dispensers are located at each of the three entrances and would remain.

4.2.4 Refuge Operations

A temporary expansion of Refuge operations would be expected to manage the reforestation effort on 30 acres of the tract, potentially involving staff, volunteers, cooperators, and contractors. The habitat management program, targeted primarily at wet meadows would continue, with an increased effort directed at using prescribed burning to manage marshes and wet meadows. The farming program would end. Ongoing and future maintenance needs are both routine and non-routine. Routine activities include mowing dikes and roads, spot treatment of invasive non-native plants, and maintaining boundary signing. Repairing collapsed or damaged sections of dikes to maintain access for management purposes are examples of non-routine maintenance actions. Maintenance would be an annual and long-term need.

Until otherwise noted, authorized vehicle and equipment access would continue at each of the three entrances with the main entrance receiving the most use.

4.2.5 Public Health and Safety

The damaged section of Root River levee would not be repaired. Instead, the river would breach and widen any weak spots in the levee in the coming years. Other than localized sedimentation on Refuge lands, there does not appear to be any other serious concerns related to the Root River reconnecting with the floodplains in this area.

The tract, much like the rest of the Refuge, is available to the public for a variety of wildlife-dependent recreational activities on a first-come, first-served basis.

Visitors enjoy walking several loops on the tract that takes them around the Main and Southeast Impoundments and through several of the former agriculture fields that are converting to wet meadow. Two damaged sections of dike on the loops are currently fenced and signed to alert the public about safety concerns. With maintenance limited to repairing those sections of dike required for access for management purposes, combined with the overall deteriorating condition of the dike complex, more sections would likely be closed in the future.

Increased enforcement of the Minnesota Statute 609.85, or the railroad trespass regulation, calls into question continued the future of accessing the tract from Highway 26. This is a concern

common to all four alternatives. Visitors who access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough would not be affected by the railroad trespass statute.

4.2.6 Viewscape

The viewscape would not be impacted if this alternative were implemented because no new development is planned. Improvements to the viewscape may result with the addition of nearly 30 acres of forest generally on higher sites along the Root River, and by allowing sections of dikes and the Root River Levee to be reclaimed by the rivers.

4.2.7 Socioeconomic Impacts

The tract would continue to provide opportunities for wildlife-dependent recreation, primarily to local residents. Given that this alternative generally represents the status quo, visitation is expected to remain at current levels. River stages and condition of the dikes that form the walking loops would continue to influence the amount of use the tract receives for wildlife observation/wildlands appreciation. Deer hunting would remain the most consistent hunting activity, with waterfowl hunting popular in years when large areas of the tract are inundated.

Local cooperators would continue to be involved in the habitat management program, thereby contributing to the local economy.

4.2.8 Cumulative Impacts

This alternative would eventually meet the first goal identified for the tract, the return to a more natural floodplain. However, the time required for a “complete breakdown” of the existing infrastructure would likely be measured in decades. Even with this piecemeal approach to reconnecting the tract to the floodplains, the current arrangement of habitat types provides quality habitat to a long list of species, including rare and declining species. Reforesting 30 acres of former agriculture land would add additional habitat. Active management using haying, prescribed burning, and other tools ensures the tract would continue to be productive. Invasive non-native plant control would continue using an integrated approach. As infrastructure fails over time and areas undergo more natural water flow patterns and reduced seasonal impoundment, wet meadow sites dominated by reed canary grass may slowly diversify with a return of native grasses and forbs.

The public would continue to use the tract for wildlife-dependent recreation. Visitation would continue to fluctuate according to river stages, the condition of the dike complex, and other variables.

4.3 Alternative B (Passive Drainage Improvements - Enhance/Restore/Manage Habitat, Maintain Current Wildlife-Dependent Recreational Uses and Construct a Parking Area, and Expand the Root River Slow, No-Wake Area)

4.3.1 Habitat and Biological Impacts

Implementing passive drainage improvements identified in this alternative begins to more quickly address the project's first goal of returning to a natural floodplain to enable more habitat diversity. The approach is to facilitate flow/inundation from north-to-south where it would be impounded, while obstructing flow/inundation from east-to-west. This increases connectivity, while at the same time, maintains an impoundment-type design (Eash and Capeder, 2015).

The connectivity portion of this approach would be obtained by constructing larger openings, lowering sections of dikes, constructing ditch plugs, or completely filling entire ditches. Maintaining the impoundment-type design requires repairing an existing breach in the upper East Dike, raising the South Dike, and replacing existing culverts/water control structures in the South Dike with a 50-ft. long spillway/low water crossing and a stoplog water control structure/box culvert.

With implementation, portions of the tract would begin to emulate natural hydrologic regimes typified by spring flooding, summer drying, and potential late fall flooding envisioned in the HGM report. However, by raising the South Ditch, impounding water would continue in the Main Impoundment.

Similar to Alternatives A and B, no repairs would be made to the eroding section of Root River Levee, nor would a diversion be constructed for greater connectivity.

Habitat enhancement/restoration/management would occur with this alternative as reforestation efforts are planned on about 30 acres of former agriculture fields (Table 1). The remaining acres of former agriculture lands would either revert to wet meadow habitat, or be restored through a restoration program. With less impounded water, acres may convert from marsh to wet meadow habitat.

Active management would continue on the tract using a variety of tools. Depending on the need or situation, the tools may include haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement.

4.3.2 Cultural Resources

Fields and other sites on the Root River Tract have had an extensive history of soil disturbance. Activities that involved soil disturbance included tree clearing in several areas to create cropland, plowing and disking as part of the farming program, dozing willows from sites within the Main Impoundment and other locations, the excavation and maintenance of ditches, and the construction/maintenance of dikes, levees, or the Old Railroad Grade embankment.

Portions of the existing infrastructure would be affected by this alternative, such as breaching or lowering dikes, filling ditches and the Fish Pond, and removing and/or replacing culverts/water control structures. Breaching a 100-ft. section of the Old Railroad Grade is also proposed. This alternative also calls for raising the South Dike and replacing an existing culvert/water control

structure with a box culvert/stoplog water control structure. Constructing several low water crossings is also proposed, along with exploring the construction of a parking area.

Habitat enhancement/restoration/management would occur as part of this alternative, including reforesting an estimated 30 acres of former agriculture fields. Several planting methods have been proposed, including:

- Higher sites would be planted using conventional methods, including direct seeding, with minimal ground disturbance.
- On a lower elevation site in Field 2, the recommended planting method is to construct “planting mounds” for establishment of more flood sensitive species using an excavator or similar equipment. Site impacts would include about 400 mounds per acre over the 6.1 acre site. Each mound would have a height of about 1-ft. and a surface area of about 3 square feet. Soil to construct each mound would be obtained from an area around each mound to a depth of 12-14 inches, or within the plowzone.
- Alternatively, “planting mounds” could also be constructed as a continuous terrace, with the length of sections sized so not to affect sheetwater flow across the field. Similar to the “planting mounds,” the height of the terrace would be about 1-ft. and material would be “borrowed” from an area adjacent to the terrace with a depth limited to 12-14 inches, or within the plowzone, using an excavator or similar equipment.

For the other habitat types found on the tract, active management would continue using a variety of tools. Depending on the need or situation, the tools may include haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement. These activities would occur in sites that have a history of disturbance and be restricted to the plowzone.

Under Alternatives B-D, construction of a parking lot would be explored at one of two locations: At the intersection of Highway 26 and the main entrance on property owned by Minnesota Department of Transportation and Canadian Pacific Railway, or at the former building site on the National Decorated Products, Inc. property (Figure 10). Both sites have a history of disturbance during construction (main entrance) or when fill was placed (former building site). The parking lot would be sized to accommodate 8 vehicles, including 2 vehicles towing trailers. Depending on ingress/egress, the area required for the parking lot would range from about 4,500 to 5,200 square feet, or about 0.10 to 0.12-acre.

Because of the extensive history of site disturbance in areas where habitat work would occur, where dike maintenance would be performed, or where a parking lot may be constructed, the Service believes there is a low probability of disturbing significant intact cultural deposits while conducting any of these activities. Prior to project initiation, a professional archaeologist would be consulted to review, and approve, the recommended course of action.

4.3.3 Visitor Use

The Root River Tract would remain available to all current public uses authorized on the Refuge. Several changes would occur to the popular walking loops. Walking around the Main

Impoundment would continue to be available, with access to the loop still dependent on river stages and the condition of the dikes and Crossroad. However, the combined actions of maintaining the East Dike and raising the South Dike, while lowering sections of the North Dike, would likely mean more overall access to at least part of the dike complex during higher river stages. The dike around the Southeast Impoundment would be breached in several locations, limiting access to drier periods.

Access: Visitors currently access the Root River Tract in several locations. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general locations. These include the north, main, and south entrances to the former National Decorated Products, Inc. property, and near Mink Slough. The majority of tract visitors use these locations. The driveways at each of the three entrances have a stop sign and private railroad crossing sign posted. Minnesota Statute 609.85 addresses trespass on a railroad track, yard, or bridge. With increased rail traffic the past few years, enforcement of this statute is now being discussed in states bordering the Mississippi River, including Minnesota. As a result, questions need to be addressed with representatives from Canadian Pacific Railway concerning visitors crossing at the three entrances, or crossing the railroad tracks near Mink Slough to fish the slough or access the “Old Railroad Grade.”

Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough. Access by these means and locations would not be affected by the railroad trespass statute.

Notice Boards: Refuge notice boards and leaflet dispensers are located at each of the three entrances and would remain.

Parking Lot: A strategy identified in this alternative and Alternatives C and D is to explore the construction of a parking lot at either the main entrance along Highway 26 or on the tract at the elevated former building site. Initiating talks with representatives from Minnesota Department of Transportation and CP Railway would be the first step in exploring this subject. No funds are currently available to construct a parking lot.

Root River Slow-No Wake Area (SNWA): Would be expanded from the current 695 acres to 1,634 and include most of the Root River Tract. The same goals set for establishment of the SNWA in 2007 apply to this proposal: Reducing disturbance to wildlife and providing an additional area for Refuge visitors to engage in high quality and sustainable wildlife-dependent recreation and opportunities for other recreation.

Sections of the North Dike and the Crossroad would be lowered under this alternative which opens-up the tract interior to increased disturbance from airboats or other watercraft during spring migration or other times of the year when conditions allow. Secondly, during those rare autumns when the tract is inundated, waterfowl hunters seeking solitude or walk-in hunting opportunities would have an additional area. This situation occurred in 2010 when the Mississippi River crested at 639.69-ft. on the La Crosse gauge in late September and gradually receded over the next two weeks. On the opening morning of the Minnesota duck hunting season on October 2, airboats and boats powered by surface drive motors accessed the impoundments by motoring over, or through, flooded sections of dikes. Walk-in hunters from Highway 26 were also present. The thousands of puddle ducks that were using the tract prior to

the hunting season were quickly “burned-out” by all the activity and hunting pressure (Jim Nissen, pers. obs.). That fall was the only time in the past 10 years this scenario occurred.

The expansion only affects the means of navigation in this area, and all current uses would be allowed (fishing, hunting, wildlife observation, etc.) in accordance with current regulations. SNWAs are in effect annually from March 16 through October 31, watercraft must travel at slow, no-wake speed, and no airboats or hovercraft are allowed.

4.3.4 Refuge Operations

A temporary expansion of Refuge operations would be needed to manage the reforestation effort on 30 acres of the tract, potentially involving staff, volunteers, cooperators, and contractors. Staff time would also be expended planning and administering the raising of the South Dike, breaching sections of the North Dike, regrading/lowering the Crossroad, and exploring the construction of a parking lot. Monitoring the developing breach in the Root River Levee would also be another commitment.

While the farming program would end, monitoring, planning, and administering the habitat management would require staff time on a long-term basis. Treating invasive non-native plants is also an annual demand on resources.

Ongoing and future maintenance needs are both routine and non-routine. Routine activities include mowing dikes and roads, spot treatment of invasive non-native plants, and maintaining boundary signing, including signing the expanded Root River SNWA. Repairing dikes is an example of a non-routine maintenance item, which depending on the year and situation can demand large commitments of resources. Maintenance would be an annual and long-term need.

Until otherwise noted, authorized vehicle and equipment access would continue at each of the three entrances with the main entrance receiving the most use.

4.3.5 Public Health and Safety

The tract, much like the rest of the Refuge, is available to the public for a variety of wildlife-dependent recreational activities on a first-come, first-served basis.

Visitors enjoy walking several loops on the tract around the Main and Southeast Impoundments and through several of the former agriculture fields that are converting to wet meadow habitat. Raising and maintaining sections of dikes would ensure there are continued opportunities for walking on the dikes through at least part of the year. Conversely, breaching sections of the dikes surrounding the Southeast Impoundment, lowering sections of the North Dike, and regrading and lowering the Crossroad means sections of the loop would be available only during drier periods.

Increased enforcement of the Minnesota Statute 609.85, or the railroad trespass regulation, calls into question continued the future of accessing the tract from Highway 26. This is a concern common to all four alternatives. Visitors who access the tract by boat from the small Root River

landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough would not be affected by the railroad trespass statute.

This alternative calls for exploring the construction of a parking lot at either the main entrance along Highway 26 or at the former house site on Refuge land. Representatives from Minnesota Department of Transportation and Canadian Pacific Railway would be involved.

4.3.6 Viewscape

Minimal impacts to the viewscape are expected with implementation of this alternative. Maintaining the East Dike and raising the South Dike are proposed. However, structures already exist at each site. Breaching sections of the North Dike, regrading and lowering the Crossroad, completely filling sections of ditches while constructing ditch plugs in others, and allowing sections of the Root River Levee to be reclaimed would likely result in a less engineered appearance and more natural appearing viewscape at the affected locations.

4.3.7 Socioeconomic Impacts

Refuge visitation would be expected to increase slightly if this alternative is implemented. With raising and maintaining some sections of dike, more access would be possible during higher river stages. Opportunities for deer hunting would continue and be available for both locals and non-locals alike. Construction activity will also generate interest and increased visitation, with some visitors returning to monitor changes to the landscape.

Contributions to the local economy would continue from cooperators involved in the habitat management program and contractors engaged in habitat restoration work.

4.3.8 Cumulative Impacts

This alternative begins to meet the first goal identified for the tract, the return of a more natural floodplain, on an accelerated schedule. Areas at the upper end of the tract would be the first reconnected to the floodplains as existing breaches in dikes are widened or new breaches constructed. Filling entire sections of ditches and constructing ditch plugs in others, also contributes to this goal. Reconnecting the Root River to the floodplain would also be expected because no repairs would be made to the eroding section of Root River Levee, nor would a diversion be constructed for greater connectivity. Impounded water would still remain in the lower end of the Main Impoundment because the South Dike would be raised and a spillway and box culvert/stoplog structure would replace existing structures.

Additional acres of forest and wet meadows are expected with implementation of Alternative B (Table 1). Active management using haying, prescribed burning, and other tools ensures the tract would continue to be productive. Invasive non-native plant control would continue using an integrated approach. With a return to more natural flow patterns and reduced seasonal impoundment in some areas of the tract, wet meadow sites currently dominated by reed canary grass may slowly diversify with a return to native grasses and forbs.

With the projected filling of nearly five acres of open water/submersed plants in ditches, these areas would likely convert to marsh, shrub-scrub, or wet meadow habitat. As with all management actions, there is a trade-off with this conversion, both in habitat types and the list of wildlife species that respond

The public would continue to visit the tract for wildlife-dependent recreation. Use of the tract for these activities, consistent with the purposes for which the land was acquired, adds another opportunity for the public to experience the outdoors. This also contributes to the goal of increasing awareness of natural resource conservation, Upper Mississippi River management, the Refuge and National Wildlife Refuge System, and public lands management.

4.4 Alternative C (Active Drainage Improvements - Enhance/Restore/Manage Habitat, Maintain Current Wildlife-Dependent Recreational Uses and Construct a Parking Area)

4.4.1 Habitat and Biological Impacts

Rather than work toward meeting the first goal of the project - returning to a natural floodplain to enable more habitat diversity, this alternative proposes to move water through the Root River Tract in a controlled manner using pumps, pipelines, and the manipulation of water levels through the use of water control structures (HDR Engineering, Inc., 2011). This system would not be dependent on the timing, duration, or Mississippi River flood stages because water would be pumped from the Root River and distributed to individual impoundments through a pipeline. Ideally, Refuge personnel would have complete water control during periods of low-to-moderate Mississippi River stages and be able to manage water levels within the impoundment complex independent of one another. Two new moist-soil impoundments would be constructed requiring new diking. Other new infrastructure or improvements include existing dikes would be maintained or raised, a portable pumping station would be constructed, water control structures would be replaced, and existing ditches would be partially filled or regraded.

Constructing and managing this complex would likely provide high quality waterfowl habitat and replicate the manner in which the Northern Engraving/National Decorated Products Inc. property was managed from the 1960s through the 1980s, but only on a much larger scale. However, constructing an impoundment complex on a floodplain as active as the Mississippi River's, and then trying to isolate it by attempting complete water control, presents numerous challenges. For example, to attain water control to meet management objectives, dikes would have to be constructed or raised high enough to withstand high river stages. Raising dikes would also require a wider base for added stability, resulting in the placement of fill into existing habitat. Natural summer-fall drawdowns would be replaced by draining impoundments, assuming river stages are low enough for that to happen at the designated time. Sections of marsh, wet meadows, and moist-soil habitat types within the impoundments may benefit, but the same results may not be achieved on the remainder of the tract.

Similar to Alternatives A and B, no repairs would be made to the eroding section of Root River Levee, nor would a diversion be constructed for greater connectivity.

Habitat enhancement/restoration/management would occur with this alternative as reforestation efforts are planned on about 30 acres of former agriculture fields (Table 1). The remaining acres of former agriculture lands would either revert to wet meadow habitat, or be restored through a restoration program. With less impounded water, acres may convert from marsh to wet meadow habitat.

Active management would continue on the tract using a variety of tools. Depending on the need or situation, the tools may include haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement.

4.4.2 Cultural Resources

Fields and other sites on the Root River Tract have had an extensive history of soil disturbance. Activities that involved soil disturbance included tree clearing in several areas to create cropland, plowing and disking as part of the farming program, dozing willows from sites within the Main Impoundment and other locations, the excavation and maintenance of ditches, and the construction/maintenance of dikes, levees, or the “Old Railroad Grade” embankment.

To fulfill the objectives identified for this alternative, significant upgrades to existing infrastructure are proposed, including partially filling and regrading a section of the South Ditch east of the Crossroad, the construction of several new sections of dikes and the raising of others, and the replacement of culverts/water control structures and the installation of others in new locations. Burying a pipeline to move water from a portable pump stationed on the Root River to moist-soil or marsh impoundments is also proposed.

Habitat enhancement/restoration/management would occur as part of this alternative, including reforesting an estimated 30 acres of former agriculture fields. Several planting methods have been proposed, including:

- Higher sites would be planted using conventional methods, including direct seeding, with minimal ground disturbance.
- On a lower elevation site in Field 2, the recommended planting method is to construct “planting mounds” for establishment of more flood sensitive species using an excavator or similar equipment. Site impacts would include about 400 mounds per acre over the 6.1 acre site. Each mound would have a height of about 1-ft. and a surface area of about 3 square feet. Soil to construct each mound would be obtained from an area around each mound to a depth of 12-14 inches, or within the plowzone.
- Alternatively, “planting mounds” could also be constructed as a continuous terrace, with the length of sections sized so not to affect sheetwater flow across the field. Similar to the “planting mounds,” the height of the terrace would be about 1-ft. and material would be “borrowed” from an area adjacent to the terrace with a depth limited to 12-14 inches, or within the plowzone, using an excavator or similar equipment.

Moist-soil management is proposed under this alternative on about 56 acres of former agriculture land (Table 1). Generally, the most prolific seed producers, and therefore, the most desirable plants for waterfowl are annuals that dominate early successional stages. Without soil

disturbance, plant succession proceeds within a few years to perennial plants that are generally less desirable for waterfowl food production. It is necessary to setback plant succession by periodically disking/plowing, burning, or year-round flooding to stimulate the growth of annuals (Strader and Stinson, 2005). Disking/plowing would be limited in depth to the existing plowzone.

For the other habitat types found on the tract, active management would continue using a variety of tools. Depending on the need or situation, the tools may include haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement. These activities would occur in sites that have a history of disturbance and be restricted to the plowzone.

As described in Alternative B, construction of a parking lot would be explored at one of two locations: At the intersection of Highway 26 and the main entrance on property owned by Minnesota Department of Transportation and Canadian Pacific Railway, or at the former building site on the National Decorated Products, Inc. property (Figure 8). Both sites have a history of disturbance during construction (main entrance) or when fill was placed (former building site). The parking lot would be sized to accommodate 8 vehicles, including 2 vehicles towing trailers. Depending on ingress/egress, the area required for the parking lot would range from about 4,500 to 5,200 square feet, or about 0.10 to 0.12-acre.

Because of the extensive history of site disturbance on this tract, the Service believes there is a low probability of disturbing significant intact cultural deposits while implementing many of the tasks proposed in this alternative, including constructing “planting mounds” or the construction of a parking lot. The proposed construction of several new sections of dike, installation of new culverts/water control structures, and burying a pipeline, with the potential to disturb soil below the plowzone, requires more scrutiny. Therefore, if this alternative is implemented, a professional archaeologist would be consulted during project design to outline a course of action.

4.4.3 Visitor Use

The Root River Tract would remain available to all current public uses authorized on the Refuge. By raising/widening existing dikes and repairing/maintaining others, current walking loops would likely be accessed more days through an average year.

The combination of rehabilitating existing or constructing new infrastructure, pumping water, and actively managing habitat in multiple impoundments by manipulating water levels requires a considerable commitment in resources. Habitat quantity and quality in the impoundments may attract large concentrations of waterfowl or other species, or uncommon species, such as shorebirds. To minimize human-caused disturbance, space and time restrictions may be required to manage visitation. Depending on the situation, hunting opportunities, particularly for waterfowl, may have to be managed.

Access: Visitors currently access the Root River Tract in several locations. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general

locations. These include the north, main, and south entrances to the former National Decorated Products, Inc. property, and near Mink Slough. The majority of tract visitors use these locations. The driveways at each of the three entrances have a stop sign and private railroad crossing sign posted. Minnesota Statute 609.85 addresses trespass on a railroad track, yard, or bridge. With increased rail traffic the past few years, enforcement of this statute is now being discussed in states bordering the Mississippi River, including Minnesota. As a result, questions need to be addressed with representatives from Canadian Pacific Railway concerning visitors crossing at the three entrances, or crossing the railroad tracks near Mink Slough to fish the slough or access the Old Railroad Grade.

Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough. Access by these means and locations would not be affected by the railroad trespass statute.

Notice Boards: Refuge notice boards and leaflet dispensers are located at each of the three entrances and would remain.

Parking Lot: A strategy identified in this alternative and Alternatives B and D is to explore the construction of a parking lot at either the main entrance along Highway 26 or on the tract at the elevated former building site. Initiating talks with representatives from Minnesota Department of Transportation and CP Railway would be the first step in exploring this subject. No funds are currently available to construct a parking lot.

4.4.4 Refuge Operations

A significant and long-term commitment of resources would be required with implementation, a daunting task with more than 47,000 acres and numerous programs and facilities on the La Crosse District to manage. Considerable staff time would be required by managers and biologists to plan and implement management actions in each impoundment, conduct inventorying and monitoring surveys, and manipulate water levels. Maintenance staff would be engaged in operating and maintaining the pump and other equipment. With increased visitation, visitor services and law enforcement staff would also be engaged in tract management. Volunteers would assist in the overall operation.

A temporary expansion of Refuge operations would be needed to manage the reforestation effort on 30 acres of the tract, potentially involving staff, volunteers, cooperators, and contractors. Staff time would also be expended planning, administering, and inspecting construction activities, and exploring the construction of a parking lot.

While the farming program would end, monitoring, planning, and administering that portion of the habitat management program outside the impoundment complex would also require staff time on a long-term basis. Treating invasive non-native plants is also an annual responsibility.

Ongoing and future maintenance needs are both routine and non-routine. Routine activities include mowing dikes and roads, spot treatment of invasive non-native plants, and maintaining boundary signing. Repairing dikes and removing flood-deposited sediment are examples of non-routine maintenance tasks. Given the large inventory of infrastructure present in the floodplains

of the Mississippi and Root Rivers, non-routine maintenance needs could be significant, especially after floods. Maintenance would be an annual and long-term need.

Until otherwise noted, authorized vehicle and equipment access would continue at each of the three entrances with the main entrance receiving the most use.

4.4.5 Public Health and Safety

The tract, much like the rest of the Refuge, is available to the public for a variety of wildlife-dependent recreational activities on a first-come, first-served basis. However, that may not be the situation with implementation as seasonal time and space restrictions may be needed at some sites. Moreover, with increased visitation there is the chance for conflicts between and among user groups.

Visitors currently enjoy walking several loops around the Main and Southeast Impoundments and through several of the former agriculture fields. Raising, widening, and maintaining these dikes would likely result in more opportunity in an average year because sections of dike would not be inundated.

Increased enforcement of the Minnesota Statute 609.85, or the railroad trespass regulation, calls into question the future of accessing the tract from Highway 26. This is a concern common to all four alternatives. Visitors who access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough would not be affected by the railroad trespass statute.

This alternative calls for exploring the construction of a parking lot at either the main entrance along Highway 26 or at the former house site on Refuge land. Representatives from Minnesota Department of Transportation and Canadian Pacific Railway would be involved.

4.4.6 Viewscape

Actions proposed under this alternative would likely result in a more engineered look on the tract. The construction of new dikes, raising/widening existing dikes, and installation or replacement of culverts/water control structures would not be fully mitigated by the addition of nearly 30 acres of forest along the Root River, by partially filling and regrading sections of ditches, or by allowing sections of the Root River levee to be reclaimed by the river.

4.4.7 Socioeconomic Impacts

Refuge visitation would be expected to increase significantly with implementation of this alternative, from both locals and nonlocals alike. Elevated sections of diking would continue to attract visitors interested in walking the dike complex, while managed impoundments would offer more opportunities to view and photograph wildlife, especially in late summer or fall. Hunting visits, particularly for waterfowl and other migratory birds, would increase because some impoundments would be flooded in fall and attract waterfowl. Opportunities for deer hunting would also continue. Construction activity would also generate interest and increased visitation, with some visitors returning to monitor changes.

Contributions to the local economy would continue from cooperators involved in the habitat management program and contractors engaged in habitat restoration work or maintenance operations.

4.4.8 Cumulative Impacts

This alternative proposes to rebuild and manage existing infrastructure, along with constructing two new moist-soil impoundments. At low-to-moderate Mississippi River stages, this system would not be dependent on the timing, duration, or level of the river because water would be pumped from the Root River and distributed to individual impoundments through a pipeline. Water would be moved through the tract in a controlled manner using pumps, pipelines, and the manipulation of water levels. While high quality marsh, moist-soil, and wet meadow habitat may result on the 275-300 acres that potentially benefit from managing with complete water control, the remainder of tract may not experience the same results. Implementation could also detract from the habitat management and restoration programs on the remainder of the La Crosse District because of the significant commitment of resources that would be required to manage, operate, and maintain the impoundment complex.

The public would continue to visit the tract for wildlife-dependent recreation. Use of the tract for these activities, consistent with the purposes for which the land was acquired, adds another opportunity for the public to experience the outdoors. This also contributes to the goal of increasing awareness of natural resource conservation, Upper Mississippi River management, the Refuge and National Wildlife Refuge System, and public lands management.

4.4 Alternative D (Proposed Action - Restore Natural Topography and Drainage Patterns, Enhance/Restore/Manage Habitat, Maintain Current Wildlife-Dependent Recreational Uses and Construct a Parking Area, and Expand the Root River Slow, No-Wake Area)

4.4.1 Habitat and Biological Impacts

Implementing this alternative would restore natural topography and drainage patterns on the tract, thereby meeting the first goal of the project. Implementation accelerates the eventual deterioration of existing infrastructure by targeting specific sites for dike breaches or ditch plugs. Unlike Alternative B, this alternative addresses both north-south and east-west inundation during Mississippi River flood events. This is important when considering connectivity of the tract with the surrounding floodplain.

Reconnecting the tract with the surrounding floodplain addresses recommendations contained in the HGM report and eliminates the concern that existing infrastructure is limiting habitat potential on the tract (Heitmeyer and Larson, 2010). Specifically, implementation of Alternative D would:

- Restore natural summer-fall drying periods which are important to maintain the grass-herbaceous vegetation composition in marshes and wet meadows, allow periodic disturbance to recycle nutrients, provide seed germination substrates, and provide critical food and cover resources for fish and wildlife that use these areas seasonally.

- Improve natural water flow patterns and reduce seasonal impoundment of floodplain forest areas behind dikes, water control structures, and embankments, and should help the tract dry more quickly and efficiently during drier periods.
- Marshes and wet meadows are heavily invaded by reed canary grass. This invasion seems to have been exacerbated by generally wetter water regimes in these formally seasonally flooded sites, and by heavy siltation caused by soil erosion from upstream watershed areas. Removing key parts of this infrastructure should begin to address this situation and also should reduce or eliminate sediment trapping in floodplain depressions where reed canary grass seems to thrive.

The proposed action on the deteriorated section of Root River Levee is to “leave as is” and monitor the situation. Surveys would help track the degradation of the levee over time. The Root River would breach and widen the opening(s) in the levee during future flood events. Other than localized sedimentation, there does not appear to be any serious concerns related to the Root River reconnecting with the floodplain in this area.

Habitat enhancement/restoration/management would occur with this alternative as reforestation efforts are planned on about 35 acres of former agriculture fields (Table 1). The remaining acres of former agriculture lands would be managed for moist-soil plant production, revert to wet meadow habitat, or be restored through a restoration program. With less impounded water, some sites may convert from marsh to wet meadow habitat.

Active management would continue on the tract using a variety of tools. Depending on the need or situation, the tools may include haying, mowing, rotational grazing, prescribed burning, integrated pest management using biological, mechanical, or herbicide treatments, short-term farming to prepare a site for restoration, soil disturbance through disking/plowing, sediment removal, or best management practices for timber stand improvement.

4.4.2 Cultural Resources

Fields and other sites on the Root River Tract have had an extensive history of soil disturbance. Activities that involved soil disturbance included tree clearing in several areas to create cropland, plowing and disking as part of the farming program, dozing willows from sites within the Main Impoundment and other locations, the excavation and maintenance of ditches, and the construction/maintenance of dikes, the Root River Levee, and the Old Railroad Grade embankment.

To fulfill the goal of restoring natural topography and drainage patterns, breaching, lowering, or removing sections of existing dikes is proposed, along with constructing ditch plugs at key locations. Depending on the location, dikes would be lowered or breached to existing ground surface levels. In other locations, a sill may be left and a low water crossing constructed for access. Fill for the ditch plugs would be obtained from material excavated from the dike(s) and hauled to the respective sites, or obtained from existing spoilbanks located adjacent to the proposed ditch plug. All existing culverts/stoplog structures would be removed or plugged. No construction, or future maintenance activity, is planned for the Root River Levee or along the Old Railroad Grade.

Habitat enhancement/restoration/management would occur as part of this alternative, including reforesting about 35 acres of former agriculture fields. Several planting methods have been proposed, including:

- Higher sites would be planted using conventional methods, including direct seeding, with minimal ground disturbance.
- On a lower elevation site in Field 2, the recommended planting method is to construct “planting mounds” for establishment of more flood sensitive species using an excavator or similar equipment. Site impacts would include about 400 mounds per acre over the 6.1 acre site. Each mound would have a height of about 1-ft. and a surface area of about 3 square feet. Soil to construct each mound would be obtained from an area around each mound to a depth of 12-14 inches, or within the plowzone.
- Alternatively, “planting mounds” could also be constructed as a continuous terrace, with the length of sections sized so not to affect sheetwater flow across the field. Similar to the “planting mounds,” the height of the terrace would be about 1-ft. and material would be “borrowed” from an area adjacent to the terrace with a depth limited to 12-14 inches, or within the plowzone, using an excavator or similar equipment.

Moist-soil plant management is proposed under this alternative on about 52 acres of former agriculture land (Table 1). Generally, the most prolific seed producers, and therefore, the most desirable plants for waterfowl are annuals that dominate the early successional seral stage. Without soil disturbance, plant succession proceeds within a few years to perennial plants that are generally less desirable for waterfowl food production. It would be necessary to setback plant succession in fields on a regular basis using disking/plowing, prescribed burning, or through other means. Disking/plowing would be limited in depth to the existing plowzone.

Similar to Alternatives B and C, construction of a parking lot would be explored at one of two locations: At the intersection of Highway 26 and the main entrance on property owned by Minnesota Department of Transportation and Canadian Pacific Railway, or at the former building site on the National Decorated Products, Inc. property (Figure 10). Both sites have a history of disturbance during construction (main entrance) or when fill was placed (former building site). The parking lot would be sized to accommodate 8 vehicles, including 2 vehicles towing trailers. Depending on ingress/egress, the area required for the parking lot would range from about 4,500 to 5,200 square feet, or about 0.10 to 0.12-acre.

Because of the extensive history of site disturbance on this tract, the Service believes there is a low probability of disturbing significant intact cultural deposits while conducting any of the activities that would be implemented as part of this alternative, including construction of a parking lot. Prior to project initiation, a professional archaeologist would be consulted to review, and approve, the recommended course of action.

4.4.3 Visitor Use

The Root River Tract would remain available to all current public uses authorized on the Refuge. Dikes surrounding the Main and Southeast Impoundments would remain, but with the number and location of dike breaches proposed in this alternative, completing a loop would be more limiting during higher river stages. Specific recommendations for two sites follow:

- Several 200-600-ft. sections of the *East Dike* would be removed down to an elevation equal to existing ground surfaces of approximately 633.0-ft. in areas where the dike crosses former channels. The elevation at the top of the dike now is in the range of 639.0-640.0-ft., with the lowest section at 636.5-ft.
- Three breaches are proposed in the dike surrounding the *Southeast Impoundment*. Each breach would be constructed at an approximate elevation 633.2-ft. Similar to the East Dike, the top of the dike now ranges from 638.0-639.0-ft.
- Other sections of dike or the Crossroad that are part of the loops would also be lowered, with the aforementioned locations the lowest.

Based on Mississippi River stage readings recorded at the La Crosse gauge from 2004-2014, levels exceeded elevations of 633.0-ft. an average of 83 days each year (Table 4). Using the 2004-2014 average, the seasonal distribution above stage 633.0-ft is: 25 days in March and April, 49 days from May to August, and 8 days from September to November. Wintertime visitors may walk the loops while others explore more of the tract on cross country skis or snowshoes.

In contrast, the current “low spot” in the walking loops is located on the North Dike. The elevation of this site is approximately 635.5-ft. Using stage 636.0-ft, this “low spot” was inundated an average of 14 days each year (or slightly more to account for the 0.5-ft difference) from 2004-2014.

Table 4. Days per range of stage on the Mississippi River at La Crosse, Wisconsin, 2004–2014¹

Stage	Average # of days per Year
Between 633 – 634 ft.	27
Between 634 – 636 ft.	42
Between 636 – 638 ft.	11
Between 638 – 640 ft.	3
Above 633 ft.	83
Above 634 ft.	56
Above 636 ft.	14

¹From *Eash and Capeder, 2015*.

While walking the loops may be limited in the future depending on river stages, opportunities for walking would continue. Authorized vehicle and equipment access, and therefore, access for walkers, would continue from the main entrance to a driveway on the East Dike that provides access to the East Meadow. Low water crossings are proposed for sections of the North Dike that would be lowered as part of this alternative. The construction of ditch plugs in several areas may also create opportunities for visitors to discover new walking loops. Mowing the top of dikes for vehicle and equipment access would continue.

Access: Visitors currently access the Root River Tract in several locations. From Highway 26, by parking off-site and crossing the single set of Canadian Pacific Railway tracks at four general locations. These include the north, main, and south entrances to the former National Decorated Products, Inc. property, and near Mink Slough. The majority of tract visitors use these locations.

The driveways at each of the three entrances have a stop sign and private railroad crossing sign posted. Minnesota Statute 609.85 addresses trespass on a railroad track, yard, or bridge. With increased rail traffic the past few years, enforcement of this statute is now being discussed in states bordering the Mississippi River, including Minnesota. As a result, questions need to be addressed with representatives from Canadian Pacific Railway concerning visitors crossing at the three entrances, or crossing the railroad tracks near Mink Slough to fish the slough or access the “Old Railroad Grade.”

Visitors also access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough. Access by these means and locations would not be affected by the railroad trespass statute.

Notice Boards and Single-Panel Kiosk: Refuge notice boards and leaflet dispensers are currently located at each of the three driveways. The notice board located at the main entrance would be replaced with a larger single-panel kiosk that includes a map of the tract and other information. Designating a location for this kiosk awaits a decision on the parking lot. No funds are currently available to construct the kiosk or design/fabricate new kiosk signs.

Parking Lot: A strategy identified in this alternative and Alternatives B and C is to explore the construction of a parking lot at either the main entrance along Highway 26 or on the tract at the elevated former building site. Initiating talks with representatives from Minnesota Department of Transportation and CP Railway would be the first step in exploring this subject. No funds are currently available to construct a parking lot.

Designated Trail System: During project scoping, several comments were received recommending a trail system be developed on the tract, complete with signs, a hard surface, sections of boardwalk, and other amenities. However, given the low-lying land and efforts to breach, lower, or remove existing infrastructure, constructing and maintaining a trail with all the amenities would be cost prohibitive.

Root River Slow-No Wake Area (SNWA): Would be expanded from the current 695 acres to 1,634 and would include most of the Root River Tract. The same goals set for establishment of the SNWA in 2007 apply to this proposal: Reducing disturbance to wildlife and providing an additional area for Refuge visitors to engage in high quality and sustainable wildlife-dependent recreation and opportunities for other recreation.

Sections of the North Dike and the Crossroad would be lowered under this alternative which opens-up the tract interior to increased disturbance from airboats or other watercraft during spring migration or other times of the year when conditions allow. Secondly, during those rare autumns when the tract is inundated, waterfowl hunters seeking solitude or walk-in hunting opportunities would have an additional area. This situation occurred in 2010 when the Mississippi River crested at 639.69-ft. on the nearby La Crosse gauge in late September and gradually receded over the next two weeks. On the opening morning of the Minnesota duck hunting season on October 2, airboats and boats powered by surface drive motors accessed the tract interior and impoundments by motoring over, or through, flooded sections of dikes. Walk-in hunters from Highway 26 were also present. The thousands of puddle ducks that were using the tract prior to the hunting season were quickly “burned-out” by all the activity and hunting

pressure (Jim Nissen, pers. obs.). That fall was the only time in the past 10 years this scenario occurred.

The expansion only affects the means of navigation in this area, and all current uses would be allowed (fishing, hunting, wildlife observation, etc.) in accordance with current regulations. SNWAs are in effect annually from March 16 through October 31, watercraft must travel at slow, no-wake speed, and no airboats or hovercraft are allowed.

4.4.4 Refuge Operations

A temporary expansion of Refuge operations is expected to manage the reforestation effort on 35 acres of the tract, potentially involving staff, volunteers, cooperators, and contractors. Staff time would also be expended planning, administering, and inspecting construction activities, and exploring the construction of a parking lot. Placing signs along the proposed new boundary of the Root River SNWA is an additional task.

While the farming program would end, the habitat management program would continue to require resources on a long-term basis to plan, monitor, and carry-out the program. Managing nearly 52 acres of fields targeted at producing moist-soil plants would require monitoring and periodic soil disturbance. The latter may involve working with contractors or cooperators.

Ongoing and future maintenance needs are both routine and non-routine. Routine activities include mowing dikes and roads, spot treatment of invasive non-native plants, and maintaining boundary signing, including the Root River SNWA. By breaching or lowering sections of existing dikes, non-routine maintenance responsibilities should be reduced. Maintenance would continue to be an annual and long-term need.

Until otherwise noted, authorized vehicle and equipment access would continue at each of the three entrances with the main entrance receiving the most use.

4.4.5 Public Health and Safety

The damaged section of Root River Levee would not be repaired. Instead, the river would breach and widen at any weak spots in the levee in the coming years. Other than localized sedimentation on Refuge lands, there does not appear to be any other serious concerns related to the Root River reconnecting with the floodplains in this area.

The tract, much like the rest of the Refuge, is available to the public for a variety of wildlife-dependent recreational activities on a first-come, first-served basis.

Visitors enjoy walking several loops on the tract which takes them around the Main and Southeast Impoundments and down the Crossroad. After dikes are breached or lowered, there would be less opportunity to complete these loops at river stages above 633.0-ft. Outreach tools, in the form of map panels, leaflets, or web-based tools would be prepared and available to the visiting public that show the location of the breaches and a description of what visitors may encounter during their visit.

Another outreach tool would be the development of a project sign that explains details of the restoration project and construction activity. These signs would be installed at each of the three entrances and remain in-place through the duration of construction.

Increased enforcement of the Minnesota Statute 609.85, or the railroad trespass regulation, calls into question continued the future of accessing the tract from Highway 26. This is a concern common to all four alternatives. Visitors who access the tract by boat from the small Root River landing, by boating up the Root River from Wisconsin, or boating through Target Lake or Mink Slough would not be affected by the railroad trespass statute.

This alternative calls for exploring the construction of a parking lot at either the main entrance along Highway 26 or at the former house site on Refuge land. Representatives from Minnesota Department of Transportation and CP Railway would be involved.

4.4.6 Viewscape

Improvements to the viewscape are likely with implementation. Breaching or lowering sections of dike and spoilbank, constructing ditch plugs, and removing water controls structures would result in a less-engineered feel to the tract. Improvements to the viewscape may also result with the addition of nearly 35 acres of forest generally on higher sites along the Root River, and by allowing sections of the Root River levee to be reclaimed by the river.

4.4.7 Socioeconomic Impacts

Refuge visitation is expected to increase if this alternative is implemented. While walking the loops may be more limited, visitors would still find the tract inviting. High river stages for several weeks in fall 2010 and again through all of April and May in 2011 inundated much of the tract and prevented walking the complete loop, but many visitors still parked and walked the main entrance road to observe the concentrations of migrating waterfowl and other wildlife. For some visitors, the construction activity would generate interest and a return visit to monitor changes. Others would read or hear about the project and visit to see for themselves what was done and the results. Opportunities for hunting would continue and attract both locals and nonlocals alike.

Contributions to the local economy would continue from cooperators involved in the habitat management program and contractors engaged in habitat restoration work or maintenance operations.

4.4.8 Cumulative Impacts

Implementing this alternative fully meets the first goal of the project which is restoring natural topography and drainage patterns on the tract. Unlike Alternative B, this alternative addresses both north-south and east-west inundation during Mississippi River flood events, which is important when considering connectivity of the tract with the surrounding floodplain (See Appendix D for a side-by-side comparison of proposed actions for each feature in Alternatives B and D).

Habitat enhancement/restoration/management would occur with this alternative as reforestation efforts are planned on about 35 acres of former agriculture fields. The remaining acres of former agriculture lands would be managed for moist-soil plant production, revert to wet meadow habitat, or be restored to wet meadow through a restoration program. Moreover, with less impounded water, some sites may convert from marsh to wet meadow habitat.

Ditch plugs are preferred rather than filling entire ditches. However, a variable dictating the potential size of an individual ditch plug is the amount of material available. If more material is available, than ditch plugs would be sized to accommodate that material. Constructing ditch plugs still contributes to the objective of improving natural flow patterns and reduces seasonal impoundment, saving resources in the process for use elsewhere, and maintaining some ditch habitat used in the summer by many species of wildlife, including furbearers.

The recommendation for the deteriorating section of Root River Levee is to “leave as is” and monitor the situation. Surveys would help track the degradation of the levee over time. The Root River would be expected to breach and widen the opening(s) in the levee during future flood events. Other than localized sedimentation, there does not appear to be any serious concerns related to the Root River reconnecting with the floodplain in this area.

Use of the tract for wildlife-dependent recreation, consistent with the purposes for which the land was acquired, would add another opportunity for the public to experience the outdoors. This would also contribute to the goal of increasing awareness of natural resource conservation, Upper Mississippi River management, the Refuge and National Wildlife Refuge System, and public lands management.

4.5 Summary of Consequences by Alternative

A summary table providing the consequences of each of the four alternatives is provided. The proposed action offers the best opportunity to meet the first goal of the project, the restoration of natural topography and drainage patterns on this 825-acre tract. Moreover, accelerating the reconnection of existing infrastructure with the surrounding floodplain begins to eliminate the concern that this infrastructure is limiting habitat potential. Reforestation efforts would also be directed at 35 acres of former agriculture fields with another 52 acres of agriculture fields targeted for moist-soil plant management. Lastly, opportunities for quality wildlife-dependent recreation would be provided with implementation of the proposed action.

Consequences	Alternative A - No Action	Alternative B – Passive Drainage Improvements	Alternative C – Active Drainage Improvements	Alternative D - Proposed Action
Habitat & Biological Impacts	Active habitat mgt., 30 acres reforested, incremental changes when aging infrastructure fails	Active habitat mgt., 30 acres reforested, surface flow from north facilitated	Active habitat mgt., 30 acres reforested, managed impoundments	Active habitat mgt. – incl. moist-soil, 35 acres reforested, surface flow across tract
Floodplain Connectivity	Yes – from eventual deterioration of all infrastructure	Partial - only impediments to flows from Target Lake removed	No – dikes are rebuilt & new dikes constructed	Yes - full restoration from breaching of major impediments
Cultural Resources	Minimal impact	Minimal impact	Review plans; site monitoring required	Minimal impact
Visitor Use	Current levels maintained	Increase if parking lot constructed; slow, no-wake area is expanded	Significant increase due to tract becoming a destination for travelers	Increase if kiosk & parking lot are constructed; slow, no-wake area is expanded
Refuge Operations	Increase in short-term commitment with reforestation project	Increase in both short- and long-term resource commitments	Significant increase in short- and long-term resource commitments	Increase in short-term & slight increase in long-term commitments
Public Health & Safety	Damaged sections of dikes repaired for equipment access	Promoted through outreach efforts during & after construction	Promoted through outreach efforts during & after construction	Promoted through outreach efforts during & after construction
Viewscape	Minimal impact	Minimal impact	Minimal impact	Minimal impact
Socioeconomic Impacts	Limited - local economy benefits	Local economy benefits from visitation, management and construction	Local & regional economies benefit from visitation, management and construction	Local economy benefits from visitation, management and construction
Cumulative Impacts	Minimal maint. of infrastructure, habitat quality the goal of mgt. program, public use continues	Partial reconnection to floodplain and habitat cover types change as a result; public use continues	Emphasis placed on managing habitat in impoundments and isolating them on the floodplain; public use continues	Emphasis placed on restoring natural topography and drainage patterns; public use continues
Funding	Available for reforestation	Available for reforestation and dike breaching only	Available for reforestation only	Funding available for project except parking lot and kiosk

Biological Integrity, Diversity, and Environmental Health Policy: The Service is directed in the National Wildlife Refuge System Improvement Act of 1997 to “ensure that the biological integrity, diversity, and environmental health of the National Wildlife Refuge System are maintained for the benefit of present and future generations of Americans...” This policy helps define and clarify this directive by providing guidance on what conditions constitute biological integrity, diversity, and environmental health; guidelines for maintaining existing levels; guidelines for determining how and when it is appropriate to restore lost elements; and guidelines in dealing with external threats to biological integrity, diversity, and health (U.S. Fish and Wildlife Service, 2006). All four alternatives to one degree or another would meet the elements of the biological integrity policy. However, implementing Alternative D, with the list

of action items directed at enhancing, restoring, and managing infrastructure and habitat on the tract, moves from maintaining current conditions and begins the return to the historic condition. Alternatives A and B would also move in that direction, but at a slower pace or on a more limited scale.

Chapter 5. List of Preparers

This draft environmental assessment was written by Jim Nissen, contractor, and reviewed by Tim Yager, Deputy Refuge Manager, Tim Miller, La Crosse District Manager, Kendra Niemec, Deputy La Crosse District Manager, and Josh Eash, Region 3 Hydrologist. Brian Stemper, Refuge Wildlife Biologist, prepared each of the figures. Andrew McDermott, Supervisory General Engineer/Landscape Architect, provided information on the proposed parking lot. James Myster, Region 3 Historic Preservation Officer, provided guidance for the various sections involving cultural resources.

Chapter 6. Consultation and Coordination with the Public and Others

Scoping and public involvement are important components of planning for this habitat enhancement and restoration project.

Scoping began on May 21, 2015 with a meeting attended by representatives from the U.S. Army Corps of Engineers, Minnesota Department of Natural Resources, Root River Soil and Water Conservation District, The Nature Conservancy, and Audubon Minnesota. Later, meetings were also held with representatives from the American Bird Conservancy and Ducks Unlimited, Inc.

A public scoping meeting was held in the meeting room at the Hokah (MN) Fire Station on June 30, 2015. A news release announcing the meeting was issued June 11, 2015. In addition to issuing the news release, nearly 50 interested citizens, neighbors, farming and haying cooperators, businesses, elected officials, and agency staff were notified. About 15 citizens attended and provided comments. Following the meeting, copies of the presentations and posters were posted on the Refuge website on July 1, 2015.

Follow-up meetings were also held with another six citizens who could not attend the public scoping meeting but expressed an interest in learning more about the proposed project.

Tim Miller, La Crosse District Manager, and USACE foresters met on-site with 10 members of Wisconsin Department of Natural Resources' Silviculture Guidance Team on July 28, 2015 to discuss reforestation recommendations.

Refuge staff also discussed the proposed project while participating in other meetings. Tim Miller attended the following meetings and provided information on the project:

- The La Crosse County Conservation Alliance's Waterfowl Hunter Meeting on July 9, 2015.
- Quarterly meeting of the Lake Onalaska Protection and Rehabilitation District on July 9 and at their annual meeting on September 1, 2015.
- Monthly meeting of the Brice Prairie Conservation Association on July 22, 2015.

- The Wisconsin Conservation Congress' Mississippi River Committee meeting in Alma, Wisconsin on July 31, 2015.

Public Involvement to Review Draft Environmental Assessment: This draft environmental assessment will be available for public review and comments through Friday, October 30, 2015.

The public will be aware of the draft environmental assessment through a news release, posting on the Refuge website, personal contacts, and through presentations at meetings. In addition, a follow-up public meeting is scheduled for Wednesday, October 21, 2015 in the Hokah (MN) Fire Station to discuss the draft environmental assessment, answer questions, and take comments.

Chapter 7. Public Comment on the Draft Environmental Assessment and Service Response

Correspondence received during the public review and comment period will be addressed and summarized in the final environmental assessment.

All comments received from individuals become part of the official public record. All requests for such comments will be handled in accordance with the Freedom of Information Act and the Council on Environmental Quality's National Environmental Policy Act regulations in 40 CFR 1506.6(f). Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individuals can request that we withhold their home address from the record, which we will honor to the extent allowable by law.

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Appendix A. Names and Descriptions of Key Features Found on, or Adjacent to, the Root River Tract (See Figure 1 for Locations)

Mink Slough & Target Lake: Provides water to the Root River Tract during the rising limb of a flood event due to the direction of slope on the Mississippi River (north-to-south).

Old Railroad Grade: This embankment was constructed prior to 1890 and served as a railroad spur line, and abandoned in the mid-1900s (Heitmeyer and Larson, 2010). Existing breaches in the embankment allow the Mississippi River to enter/exit the northern portions of the tract. The embankment, while not continuous, appears to be about 1-mile in length.

Miller Oxbow Slough: This meander scar or oxbow slough was altered by construction of berms across the upper and lower ends to provide access across the slough. These berms were constructed prior to 1962 and used to manage the farming/grazing operation conducted on the property while in private ownership.

Culverts/Water Control Structures: Six are located on the tract, including three screwgate and three stoplog structures (Figure 1). See descriptions for Main Impoundment, North and South Dikes, and Southeast Impoundment for additional information, including the condition of each structure.

Northeast (NE) Impoundment Complex: This complex encompasses about 36 acres of marsh, wet meadow, shrub-scrub, and forest habitat types. Aerial photographs indicate the upper east-west dike was constructed before 1962. A crossdike, splitting the impoundment nearly in half (17 acres on the east and 19 acres on the west) was constructed after 1968, likely about 1972 or 1973. In the extreme northeast corner of the unit, several former channels were cut-off when the dike was constructed. The overall condition of the dike complex is poor due to the existence of full and partial breaches, the presence of numerous animal burrows in other sections, and erosion on the sideslopes.

Fish Pond: Information presented in this description was summarized in a report generated by staff from the Service's La Crosse National Fish and Wildlife Conservation Office based in Onalaska, Wisconsin after they surveyed the pond (U.S. Fish and Wildlife Service, 2010). This 0.69-acre pond, reportedly 8-ft. in depth, was constructed in the early 1970s for the purpose of recreational fishing. From construction through 2001, a low elevation dike separated the pond from the surrounding floodplain, and the pond flooding during higher Mississippi River stages. Dikes were constructed around the pond in 2001, and since construction, no flooding has occurred. After dike construction, carp and buffalo were removed through a seining operation, and the pond was restocked in 2001, and again in 2005, with sunfish, bass, and crappies. No fish kills were ever observed by the property's caretaker, who lived on-site from 1976 through 2008.

A team from the La Crosse National Fish and Wildlife Conservation Office surveyed the pond in summer 2010 to document the fish population, dissolved oxygen levels and other parameters, and develop a list of recommendations. Key results were:

- Fyke nets were used to sample fish in the pond. Two species of fish were captured: Brown bullheads and bluegills with the average length of each at 11.27 and 11.50 centimeters, (4.4 inches and 4.5 inches), respectively. More than 99% of the fish caught

were brown bullheads. The few bluegill caught suggested they were not competing well with the large brown bullhead population. Further, the lack of any large fish indicated a young, but also a stunted fish population.

- The temperature and dissolved readings recorded at the time of the survey indicated the pond was thermally stratified, with the thermocline limited to the top 1.0-1.5 meters (3-4.5 ft.). Fish in the pond were limited to the upper 1 meter (about 3 ft.) of the water column.
- With no flooding since 2001, the absence of any bass and crappie in the fyke nets may have been the result of recreational fishing, predation, or, given the stratification present in the pond, the fish may have succumbed to a winter- or summer-kill due to lack of oxygen.

Recommendations for future management included in the report revolved around the need to address the stratification problem and large population of stunted brown bullheads. Installing an aerator was suggested. The report's conclusion was that due to the pond's small size and the fact there is no flow into or out of it, winter and summer fish kills would be threats to maintaining any desired fish populations.

Former Agriculture Fields 1-10: About 132.6 acres as measured by the Farm Services Agency. Individual field information follows:

- Field 1 = 13.9 acres – hayed and plowed in 2012.
- Field 2 = 33.3 acres – 11 acres adjacent to South Ditch farmed in 2012 and hayed in 2014; remaining acres plowed in 2012.
- Field 3 = 5.3 acres – last farmed in 2010; hayed in 2014.
- Field 4 = 8.3 acres – last farmed in 2010; portion hayed in 2014.
- Field 5 = 10.0 acres – last farmed in 2012.
- Field 6 = 28.8 acres – last farmed in 2012.
- Field 7 = 6.5 acres – last farmed in 2012.
- Field 8 = .3 acre - retired from farming in 2009 and converting to forest.
- Field 9 = 19.7 acres - retired from farming in 2009 and converting to cottonwood forest; diversified with 800 swamp white oaks planted in spring 2010.
- Field 10 = 6.5 acres – retired from farming in 2009; wetland dominated by reed canary grass.

North Dike: From aerial photographs, this dike was constructed sometime in the 1960s. The dike extends nearly 1,895-ft. (.36-mile) from the Crossroad east to the tie-in with the East Dike (Figure 1). A low spot in the dike, aligned with a former channel cut-off when the dike was constructed, serves as a spillway for flows entering the Main Impoundment during higher Mississippi river stages, or leaving the impoundment after the flood peak recedes. The overall condition of the dike is fair. There are no culverts/water control structures located in this dike.

West of the Crossroad, no dike is present, but a series of spoilbanks where material excavated during construction of the North Ditch was placed. These spoilbanks are located on the south side of the ditch and vegetated with cottonwoods and other trees, shrubs, and reed canary grass.

North Ditch: From aerial photography, the section of this ditch located east of the Crossroad, and a section of the ditch located west of the Crossroad, were constructed at the same time as the

North Dike (Figure 1). The western-most section of this ditch appears to have been excavated sometime between 1968 and 1973. The total length of the ditch is nearly 4,035-ft. (.76-mile) and extends from near the Canadian Pacific Railway right-of-way in the west to the tie-in with the East Dike and borrow area in the east. Flow is from west to east. West of the Crossroad, material excavated during construction was placed on the south side of the ditch in a series of spoilbanks. East of the Crossroad, the material was used to construct the North Dike. Willows and other shrubs have colonized both sides of the ditch located east of the Crossroad. The width of the North Ditch varies from about 15 to 40-ft. and encompasses about 2.2 acres. A culvert/screwgate water control structure is located in the Crossroad and is in poor condition.

Main Impoundment: Nearly 110 acres are encompassed by dikes (North, East, and South) and the Crossroad. This unit also includes Fields 3, 4, and 6 (Figure 1). About 58 acres are located north of the South Ditch and 51 acres below this ditch. Existing habitat types are marsh, agriculture field, shrub-scrub, wet meadow, and forest. In the years when the property was managed for both agriculture production and waterfowl/hunting, water was pumped into this impoundment to flood crops and provide hunting opportunity.

East Dike & Borrow Area: Aerial photographs indicate this dike, which is nearly 2,755-ft. in length (.52-mile), was constructed before 1962 (Figure 1). The East Dike is in “failing” condition due to numerous active animal burrows, severe sideslope erosion in many sections, and woody vegetation growing onto the top of the dike from the sideslopes. A lengthy section of the dike is currently fenced. A culvert/stoplog water control structure is located in the dike and allowed water to be released into the adjoining East Meadow when operational. This structure is no operable.

Material needed to construct the full length of the dike was “borrowed” from the adjoining area, thereby resulting in this borrow area or ditch. The borrow area is wide, varying in width from about 40-ft. in a section near the south end to 75-ft. at the widest spot. Approximately 3.3 acres, most classified as submersed aquatic habitat, are contained in this feature.

Crossroad: This raised access road, with ditches on both sides, appears to have been constructed prior to 1962. Total length is estimated at 1,850-ft. (.35-mile).

East Meadow: This meadow begins east of the East Dike and extends to the Mississippi River (Figure 1). Depending on the elevation, vegetation includes water smartweed (*Polygonum amphibium*), swamp milkweed (*Asclepias incarnata*), and reed canary grass (*Phalaris arundinacea*) on the “higher” sites, while river bulrush (*Scirpus fluviatilis*), broad-fruit burred (*Sparganium eurycarpum*), common arrowhead (*Sagittaria latifolia*), and common reed (*Phragmites australis*) are among the plant species inhabiting former channels and other low areas. When conditions are dry enough, late summer/fall haying has been the tool used to manage this meadow.

Root River Slow No-Wake Area (SNWA): Established in spring 2007, the 695-acre Root River SNWA is located in a section of bottomland forest bisected by numerous channels. The area provides excellent wetland habitat for waterfowl, wading birds, shorebirds, furbearers, and other wildlife. The slow, no-wake designation reduces disturbance to wildlife during the sensitive spring and summer seasons by slowing the speed of watercraft and reducing noise levels. Reducing disturbance is in keeping with the wildlife mission of the Refuge. Further, the

designation also provides those who value relatively secluded and quiet conditions for hunting, fishing, and wildlife observation with an opportunity to use the Refuge through much of the year.

Southeast (SE) Impoundment: This impoundment, at one time known as the “Big Loop,” was constructed in the early 1970s (Figure 1). The 20 acres contained within the unit consists predominately of marsh and shrub-scrub habitat types, with smaller areas of forest and wet meadow (Figure 2). A former channel was cut-off when dikes were constructed. The overall condition of the dike is fair-good. However, a section of dike has collapsed around the culvert/stoplog water control structure, and is currently fenced and signed.

South Ditch: This ditch was constructed in the 1960s and extends about 3,470-ft. (.66-mile) from near the Canadian Pacific Railway right-of-way in the west to the terminus at the East Dike in the east. Flow is from west to east. The ditch is narrow (10-ft. or less) west of the Crossroad, wider at the lower end (25-ft.), and encompasses about 1.5 acres. Material excavated during construction was placed along both sides of the ditch. Willows and trees have colonized these higher sites for nearly the full length of the ditch. Larger silver maple (*Acer saccharinum*) trees are growing on spoilbanks found on the north side of the ditch at the lower end. A culvert/screwgate water control structure is located in the Crossroad and is in poor condition.

South Dike: Similar to the North Dike, this dike, in its current location, was constructed in the 1960s. The dike extends about 2,000-ft. (.38-mile) from near the Root River to confluence with the East Dike and the Southeast Impoundment (Figure 1). A low spot in the dike is located in the extreme southeast corner near the confluence with the other dikes. This spot serves as a spillway for flows to enter the Main Impoundment when overbank flooding is occurring in the Root River, and for water to leave the impoundment on the falling limb after a flood peak on the Mississippi River.

Except for the low section of dike in the southeast corner, the South Dike is in good condition. Two culverts/water control structures are located in the low section of dike. They include a stoplog structure and the other is a screwgate structure. Neither structure is operational.

A ditch is located on the north side of the dike. This ditch begins near the Root River and extends nearly 1,150-ft. (.22-mile) before emptying into a pond in the southeast corner. This ditch served a twofold purpose: Provided fill material for dike construction and served as a conveyance channel when water was pumped from the Root River to flood the Main Impoundment in the fall for the waterfowl hunting program. The ditch empties into a pond that is about 1.5 acres in size and is classified as submersed aquatic vegetation (Figure 2). In reviewing aerial photography and LiDAR data, it appears this pond was at one time the very upper end of the former meander of the Root River cutoff during the channelization project.

Former Building Site: When the Service acquired the tract in 2009, a house, large barn, pole shed, grain bin, dog kennel, and a pheasant flight pen were located in this complex. Today, only the pole shed remains.

Former Root River Channel: This section of channel, or meander, was isolated when the Root River was channelized in 1917-1919, and was the last meander on the Root River affected by the channelization project. Material excavated during the project was placed on both sides of the new channel and shaped into levees. Prior to 1962, a ditch was constructed from the levee to the

upper end of the former meander, or at the intersection of the East and South Dikes. Material from the excavation was placed on the lower side of the ditch. The ditch is about 1,850-ft. (.35-mile) in length.

Root River Levee: As noted in the “Former Root River Channel” summary, levees are located on both sides of the Root River, beginning at the Canadian Pacific Railway right-of-way and ending where the channelization project ended. On the right descending bank, the levee extends approximately 5,575-ft. (1.06 miles) before ending abruptly on private property. The length of the levee on the left descending bank is estimated at 3,650-ft. (.69-mile). The actual end of the levee is difficult to find. Repairs were made to the lower section of this levee in 2001 and again in 2009. Depending on the location, the condition of the levees varies from “near failing” to fair. On the right descending bank, large trees are growing on top of the levee.

North, Main, and South Entrances: These driveways provide parking and access to the former Northern Engraving/National Decorated Products, Inc., property. To reach the property requires crossing a single railroad tract. Each driveway is designated and signed a private railroad crossing.

Highway 26: Maintained by Minnesota Department of Transportation.

Canadian Pacific Railway: A single set of railroad tracks owned by Canadian Pacific Railway.

Minnesota Department of Natural Resources Boat Landing: This small landing and parking lot are located on the Root River just above the bridge on Highway 26 and managed by the Minnesota Department of Natural Resources. The landing provides access to the Root River for smaller boats, canoes, and kayaks. Visitors to the Root River Tract will also park their vehicles and walk across the highway to access the tract.

Fogel Tract: This 34.0-acre tract is located south of the Root River at the junctions of Highway 26 and County Highway 7 and was acquired by the Service in 2012 and added to the Refuge. Several breaches developed in the levee on this tract in the early 2000s. As a result, flows during higher stage flood events on the Root River enter the tract through these breaches and move downstream through the bridge opening on Highway 26.

Appendix B. Moist-Soil Plant Management

Although not currently an existing habitat type delineated on the tract, Alternatives C and D describe plans to begin managing for moist-soil plant production. An impoundment or field managed for moist-soil plants provides plant and animal foods that are a critical part of the diet of migrating waterfowl and shorebirds (Strader and Stinson, 2005). Moist-soil plant production would be managed in all or parts of four impoundments under Alternative C, collectively totaling 56 acres. In Alternative D, 52 acres of former agriculture fields would be managed for moist-soil plant production.

Moist-soil plants refer to species that grow on exposed mudflats. Generally, the most prolific seed producers, and therefore, the most desirable plants for waterfowl are annuals that dominate early successional stages (Strader and Stinson, 2005). Annual plants are those that perform their entire life cycle from seed to flower to seed within a single growing season. All parts of the plant die each year. The dormant seed is the connection to the next generation of plants. Perennials are plants that persist for many growing seasons. Annual plants are desirable where high seed production is the management goal (Fredrickson and Taylor, 1982). Without management, perennials become increasingly common on sites where moist-soil management is being practiced. Some perennials are excellent seed producers and provide cover for spring migrants. However, over time they may become undesirable because they can form dense stands and shade-out food-producing species.

Preferred moist-soil plants on the Root River Tract include barnyardgrass (*Echinochloa crusgalli*), smartweeds (*Polygonum lapathifolium* and *amphibium*), chufa (*Cyperus esculentus*), beggarticks (*Bidens* spp.), rice cutgrass (*Leersia oryzoides*), and redroot pigweed (*Amaranthus retroflexus*), among others. These plants provide seeds and other parts (leaves, roots, and tubers) that generally have low deterioration rates after flooding and provide substantial energy and essential nutrients less available to waterfowl in common agricultural grains, such as corn and soybeans. Moist-soil plants also support diverse populations of invertebrates, an important protein source for waterfowl and shorebirds (Strader and Stinson, 2005).

Without disturbance, plant succession proceeds within a few years to perennial plants that are generally less desirable for waterfowl food production. Impoundments or fields must be disturbed regularly by practices such as disking/plowing, burning, or carefully timed flooding (Fredrickson and Taylor, 1982 and Strader and Stinson, 2005).

Typically, management options increase with the ability to flood and drain when necessary, especially if sites or impoundments can be flooded and drained independent of all other units. The ability to have complete water control requires considerable infrastructure (dikes and water control structures), equipment such as pumps, and the expertise and funds to manage and operate a system of impoundments dedicated to moist-soil management (Strader and Stinson, 2005).

Complete water control is not currently available within the existing impoundment system on the tract. However, Alternative C proposes to move water through the tract in a controlled manner using pumps, pipelines, and the manipulation of water levels through the use of water control structures (HDR Engineering, Inc., 2011). This system would not be dependent on the timing, duration, or Mississippi River flood stages because water would be pumped from the Root River and distributed to individual impoundments through a pipeline. Ideally, Refuge personnel would

have complete water control during periods of low-to-moderate Mississippi River stages and be able to manage water levels within the impoundment complex independent of one another. Other new infrastructure or improvements include existing dikes would be maintained or raised, a portable pumping station would be constructed, water control structures would be replaced, and existing ditches would be partially filled or regraded.

Conversely, under Alternative D, gaining complete water control is not proposed. Rather, sites were selected for moist-soil management that are located between elevations 635.0-ft-636.0-ft. The 2-year flood stage in this area is approximately 635.6-ft, meaning there is a 50% chance or greater, that in any given year all or parts of these fields would be flooded. Moreover, in the past 11 years (2004-2014), river stages between 634.0-ft.-636.0-ft. were recorded an average of 42 days each year (Eash and Capeder, 2015). The annual breakdown includes an average of 13 days in March-April (spring waterfowl migration), 26 days in May-August (late spring waterfowl migration and shorebird migration), and just 3 days from September-November (shorebird and waterfowl migration).

Since Service acquisition of the National Decorated Products, Inc. property in 2009, moist-soil management has occurred as a result of the farming program. For example, in 2009, about 85 acres were farmed, producing corn and soybeans. The following year, farming continued, but only about 27 acres of corn were planted and harvested because of persistent wet fields. The acres farmed in 2009 and idled in 2010 produced a robust crop of annual moist soil plants. The fields flooded in late September 2010 and attracted thousands of puddle ducks, including mallards (*Anas platyrhynchos*), pintails (*Anas acuta*), American wigeon (*Anas americana*), green-winged teal (*Anas carolinensis*), and blue-winged teal (*Anas discors*). Waterfowl hunters enjoyed good early success (Jim Nissen, pers. obs.). The following spring, flood-up of the Root River Tract in late March coincided with the onset of spring waterfowl migration to create optimal feeding conditions in most of the fields. The result: An estimated 10,000 puddle ducks were observed feeding in flooded areas of moist soil plants in Field 2 in late March. Waterfowl, sandhill cranes, and shorebirds continued to concentrate in fields throughout spring and early summer (Jim Nissen, pers. obs.).

No farming occurred in 2011 because fields were wet well into summer. By 2012, plant succession in most agricultural fields was trending toward perennial plants with fewer annuals present. Fields were again tilled in June producing excellent stands of preferred annual plants.

Moist-soil management requires monitoring to determine when site treatment, such as disking/plowing are needed, or to determine if/when undesirable plant control is needed (Strader and Stinson, 2005). Management actions would be scheduled on a rotating basis among impoundments or fields.

Appendix C. Minnesota's List of Species in Greatest Conservation Need

The Root River Tract also provides breeding and migration habitat for a lengthy list of species included on Minnesota Department of Natural Resources' list of "Species in Greatest Conservation Need" (Minnesota Department of Natural Resources 2006). Species that have been observed on the tract or on adjacent sites, and the habitat types where they can be found, include the following:

Birds:

American bittern (*Botaurus lentiginosus*): Flooded marsh and edge of shrub-scrub during migration; observed at the edges of the Main and Southeast Impoundments.

American black duck (*Anas rubripes*): Flooded marsh, wet meadow, agricultural land, and areas with flooded moist-soil plants during migration.

American woodcock (*Scolopax minor*): Most habitat types found on the tract; migration and nesting.

Bald eagle (*Haliaeetus leucocephalus*): Entire tract during open water portion of year; 1 active nest located near the Southeast Impoundment.

Black-billed cuckoo (*Coccyzus erythrophthalmus*): Shrub-scrub and bottomland forest; migration and possible nesting.

Black-crowned night heron (*Nycticorax nycticorax*): Marshes during migration.

Bobolink (*Dolichonyx oryzivorus*): Wet meadows in northwest corner of tract; migration and possible nesting.

Brown thrasher (*Toxostoma rufum*): Shrub-scrub and bottomland forest during migration and probable nesting.

Dunlin (*Calidris alpina*): Hayed wet meadows lightly flooded during migration.

Eastern meadowlark (*Sturnella magna*): Wet meadows in northwest corner of tract; migration and possible nesting.

Greater yellowlegs (*Tringa melanoleuca*): Hayed areas in lightly flooded wet meadows, agriculture land, and areas with lightly flooded moist-soil plants during migration.

Least bittern (*Ixobrychus exilis*): Marshes during migration, particularly cattails in the Main Impoundment; likely nesting.

Lesser scaup (*Aythya affinis*): Flooded wet meadow, agricultural land, and flooded sites with moist-soil plants during migration.

Marsh wren (*Cistothorus palustris*): Nests in marshes, particularly in northeast corner of Southeast Impoundment.

Northern harrier (*Circus cyaneus*): Wet meadows – hayed and non-hayed during migration, and marshes.

Northern pintail (*Anas acuta*): Flooded marsh, wet meadow, agricultural land, and flooded areas with moist-soil plants during migration.

Ovenbird (*Seiurus aurocapillus*): Shrub-scrub and bottomland forest during migration.

Prothonotary warbler (*Protonotaria citrea*): Shrub-scrub and bottomland forest; migration and nesting.

Sedge wren (*Cistothorus platensis*): Nests in wet meadows.

Swamp sparrow (*Melospiza georgiana*): Nests in wet meadows and marshes in association with standing water.

Virginia rail (*Railus limicola*): Marshes and lightly flooded wet meadows and moist soil fields during migration.

White-throated sparrow (*Zonotrichia albicollis*): Shrub-scrub and bottomland forest during migration.

Reptiles:

Common snapping turtle (*Chelydra serpentina*): Entire tract, but most visible in spring and summer on levee, dikes, and the main entrance road.

Appendix D. Summary of Proposed Actions to Key Features in Alternatives B and D (See Figures 6 and 10 for Locations)

Features	Alternative B	Alternative D
Old RR Grade @ Mink Slough	Construct 100' long breach	No action (#2 in Figure 10)
Old RR Grade north of NE Impoundment	No action	No action – existing breaches are sufficient
Short, lateral north-south dikes/levees extending from Old RR Grade to interior dikes	No action	Remove or lower each dike/levee (#3)
2 access berms crossing Miller Tract Oxbow Slough	No action	Remove or lower both berms (#s 4A & 4 B)
Former fenceline @ north edge of Field 1	Remove fill from a 100-ft. long section in existing low spot	No action
Northeast Impoundment	Breach @ 3 locations in upper east-west dike with each 100-ft. long; repair the existing breach on upper-most section of East Dike to direct flow southward	Remove a 50-75-ft. long section of dike to 633.0-ft. (#5A); construct a breach or series of breaches each totaling 150-250-ft. in length to 633.0-ft. (#s 5B-5D); to 634.2-ft. (#5E); remove complete sections of dike to 633.0-ft., including area with existing breach (#5F)
Fish Pond	Drain and remove perimeter berms; reshape and leave as open water pool	Remove berms on north and south ends and fill-in pond, at least partially
North Ditch - west of Crossroad	Construct 2 ditch plugs in North Ditch and 1 in drainage ditch in northwest corner of Field 2	Construct 2 ditch plugs (#s 10 & 11A)
North Ditch – east of Crossroad	Fill-in full length of ditch using material excavated from Fish Pond restoration	Construct 2 ditch plugs (#s 11C & 11D)
Culvert/screwgate water control structure on North Ditch @ Crossroad	Remove and replace with spillway/low water crossing for access	Remove water control structure and construct ditch plug (#11B)
Spoilbanks along North Ditch - west of Crossroad	No action	Breach or lower 2 sections of spoilbank each 150-250-ft. in length to 635.5-ft. (#s 9A & 9B)
North Dike – east of Crossroad	Maintain and construct a 100-ft. long spillway/low water crossing in existing low area for access	Breach or lower 2 sections of dike each 150-250-ft. in length to 634.0-ft. (#s 9C & 9D)
Crossroad & Ditches	Regrade to no more than 6-inches higher than adjacent low spots in adjacent fields; install low water crossings @ resulting low spots.	Lower/remove Crossroad and adjacent ditches to adjacent land surface elevations to facilitate east-west connectivity
Culvert/screwgate water control structure on South Ditch @ Crossroad	Remove water control structure but keep the culvert for access	Remove water control structure and construct ditch plug (#18A on map)

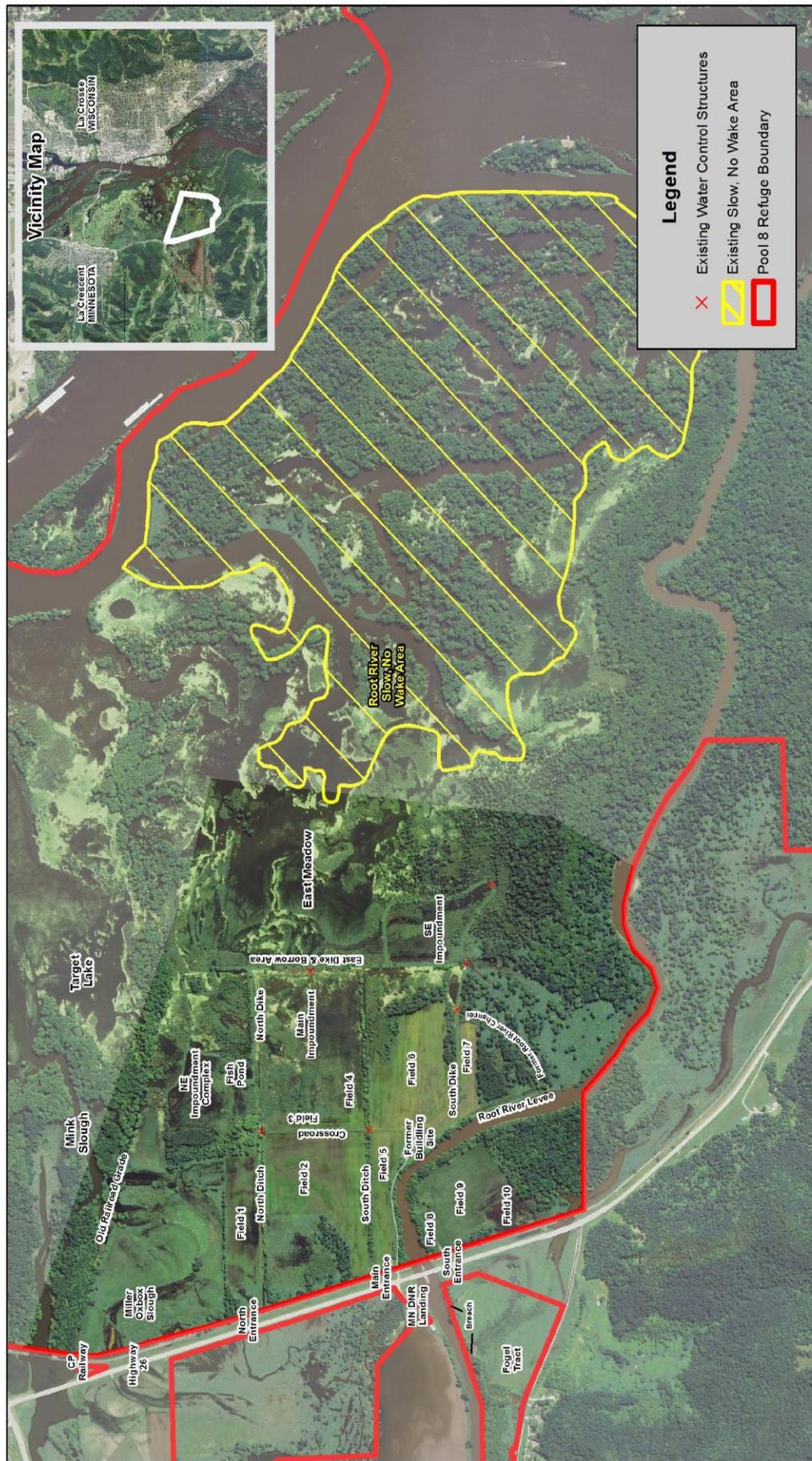
Features cont'd.	Alternative B cont'd.	Alternative D cont'd.
South Ditch - west of Crossroad	Maintain the ditch but remove material sidecast on both sides of ditch to improve drainage	No action
South Ditch – east of Crossroad	Construct a ditch plug 100-200-ft. below the Crossroad and fill-in the remaining section of ditch to force water out of ditch	Construct 2 ditch plugs each 50-ft. in length (#s 18B & 18C)
East Dike & Borrow Area	Maintain for access but remove culvert and water control structure from upper dike; fill-in entire length of borrow area to keep more surface water on fields	Remove several 200-600-ft. long sections of dike down to approx. 633.0-ft.± where dike crosses former channels, but continue to provide access to East Meadow for management purposes; construct 2 ditch plugs as noted (#s 15, 11D, & 18C)
South Dike & Ditches	Raise existing dike from 637.0-ft.± to 637.5-ft.±, or 5-year flood frequency elevation; fill-in ditch on north side of dike	Remove or lower a 250-300-ft. long section of dike in the southeast corner to 635.0-ft.± (#19)
Culverts/water control structures (2) in South Dike	Replace culvert/stoplog water control structure on west “arm” of former meander with a 50-ft. spillway/long low water crossing; replace culvert/screwgate water control structure on east “arm” with box culvert/stoplog water control structure and excavate pilot channel	Remove both culverts/water control structures (#19)
Southeast Impoundment	Construct breaches or lower sections of dike in 3 locations each 30-ft. in length and construct low water crossings at each site for access; remove the culvert/stoplog water control structure	Remove sections of dike in 3 locations: 100-150-ft. long section in upper end (#16A), a single breach of 200-600-ft. in length, or several 150-200-ft. long breaches on the east side (#16B), and a 50-100-ft. long breach in the lower end (#16C); remove the culvert/water control structure; no low water crossings are proposed
Root River Levee	No action – leave as is and monitor with expectation degradation will continue to occur	No action – leave as is and monitor with expectation degradation will continue to occur

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Figure 1. Root River Tract with Location and Names of Key Features



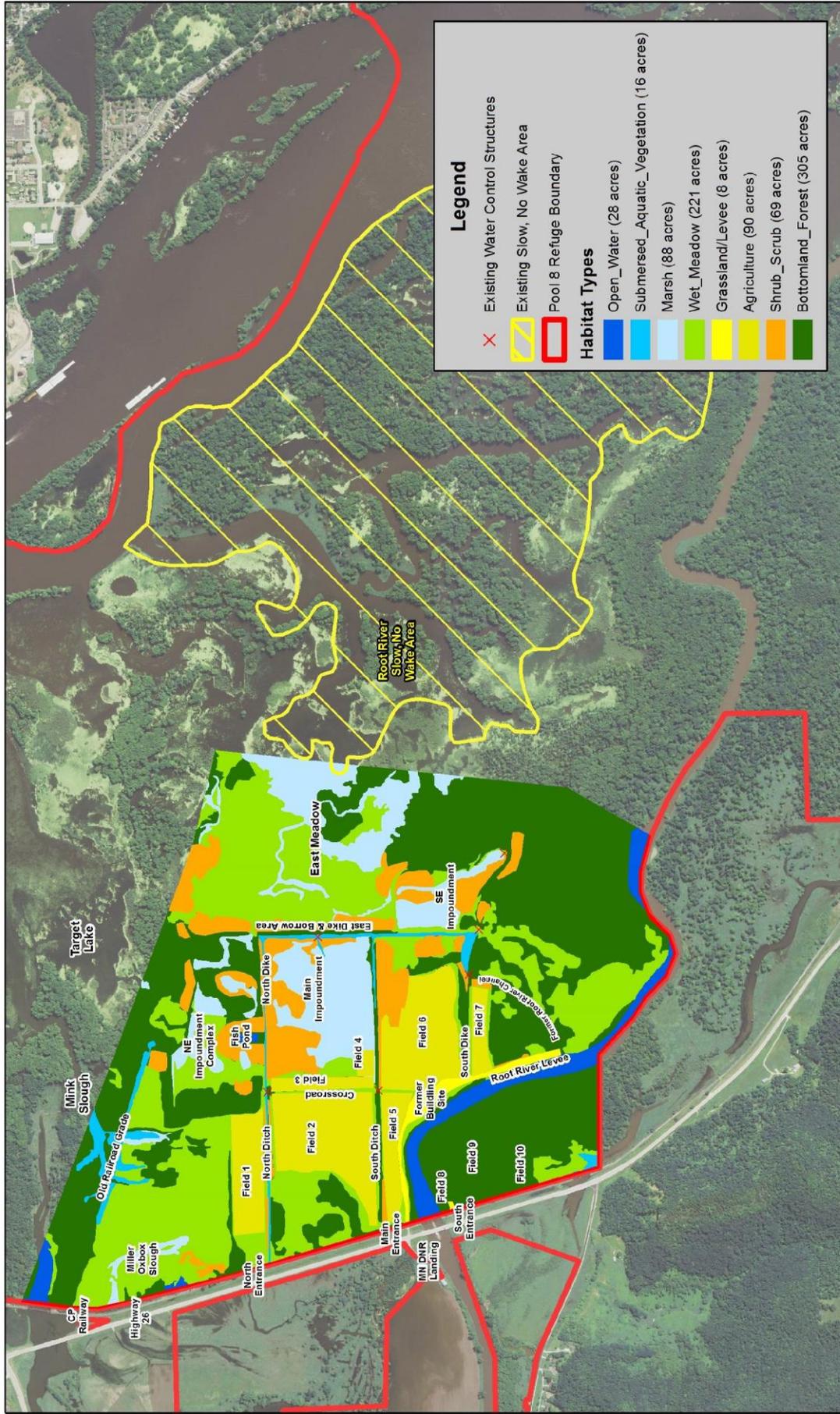
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Figure 2. Existing Habitat Types Found on Root River Tract

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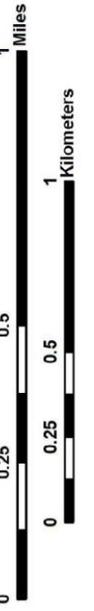
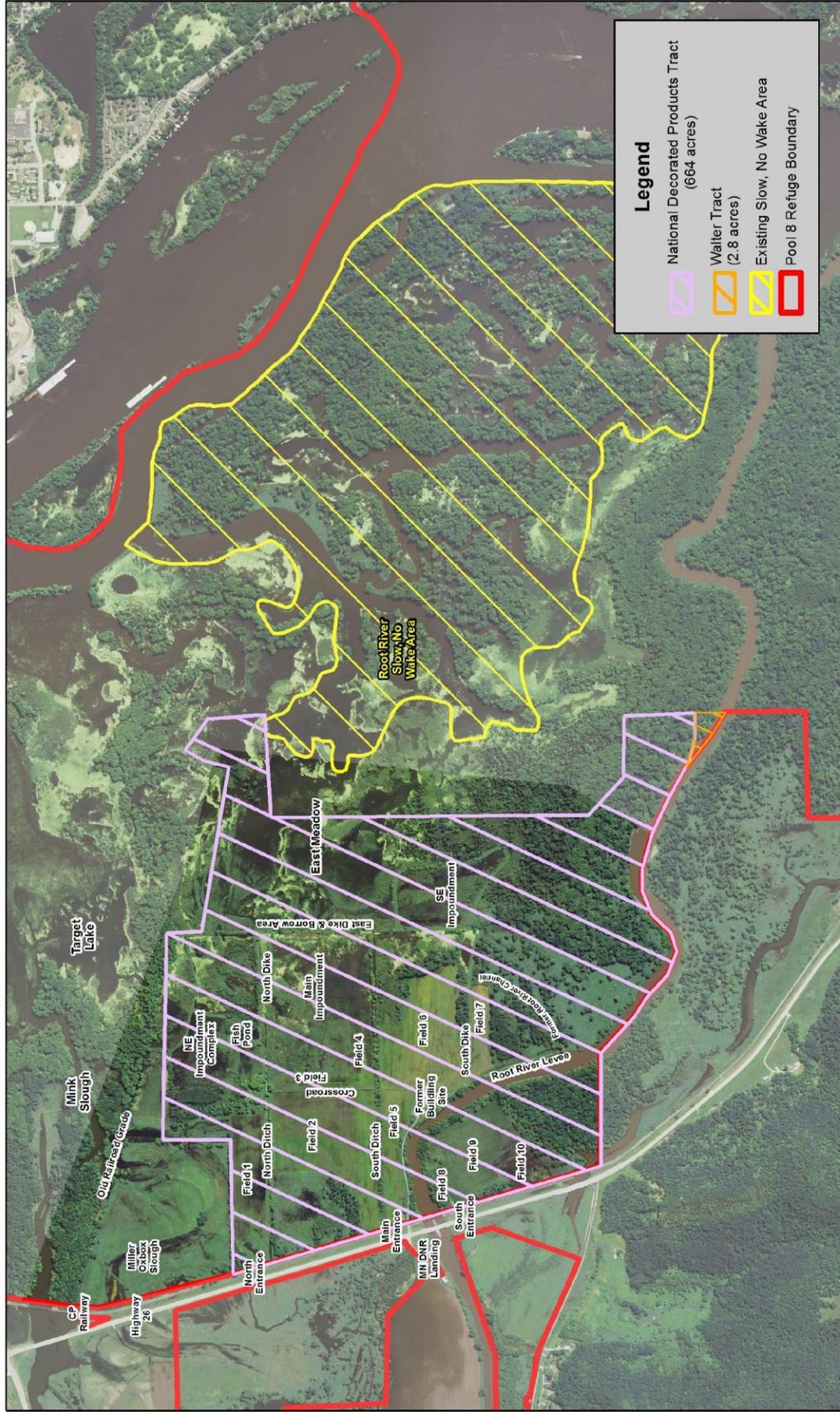




Figure 3. Root River Tract with National Decorated Products Acquisition



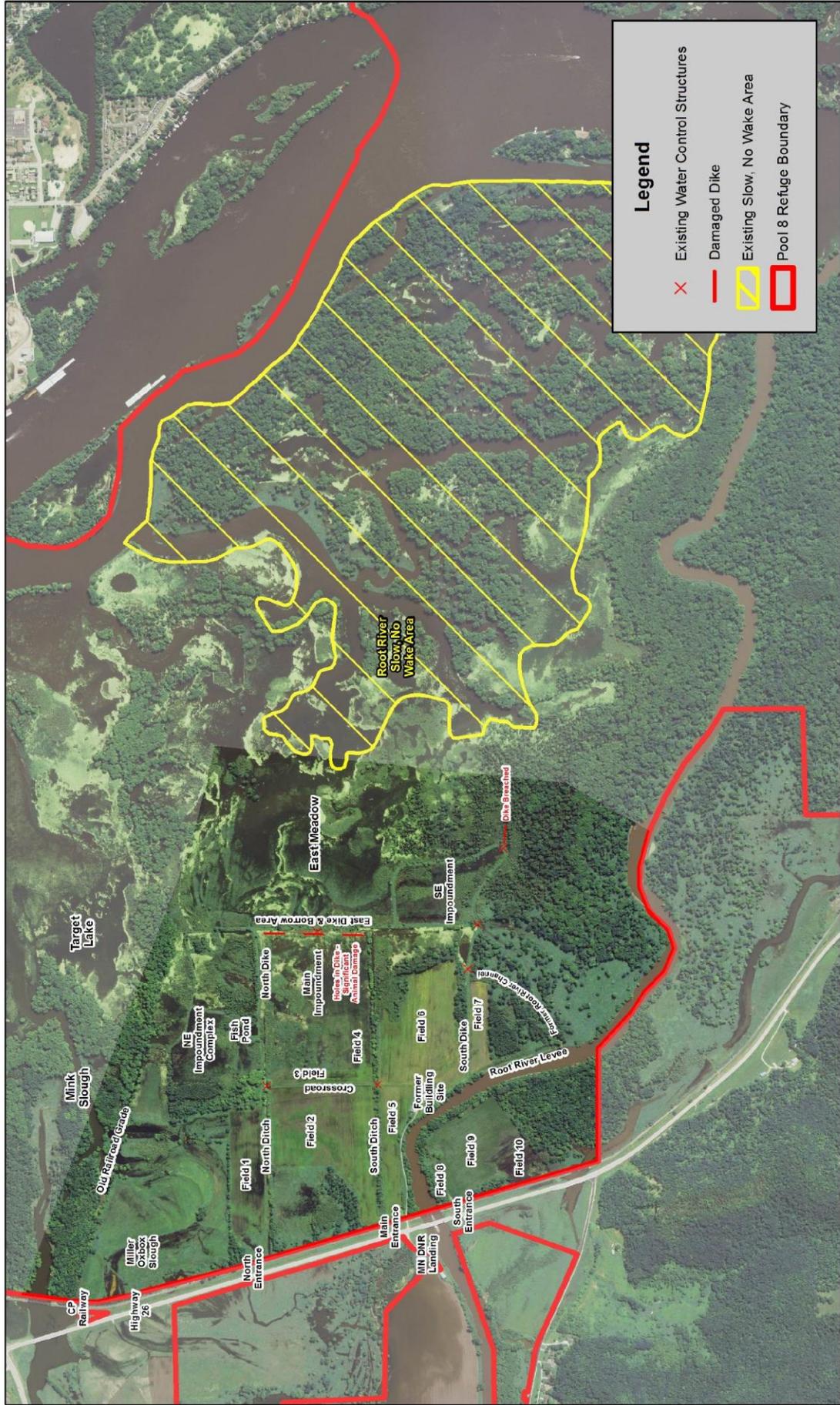
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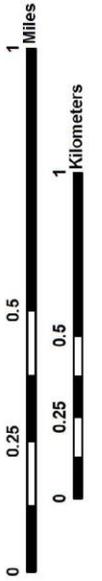
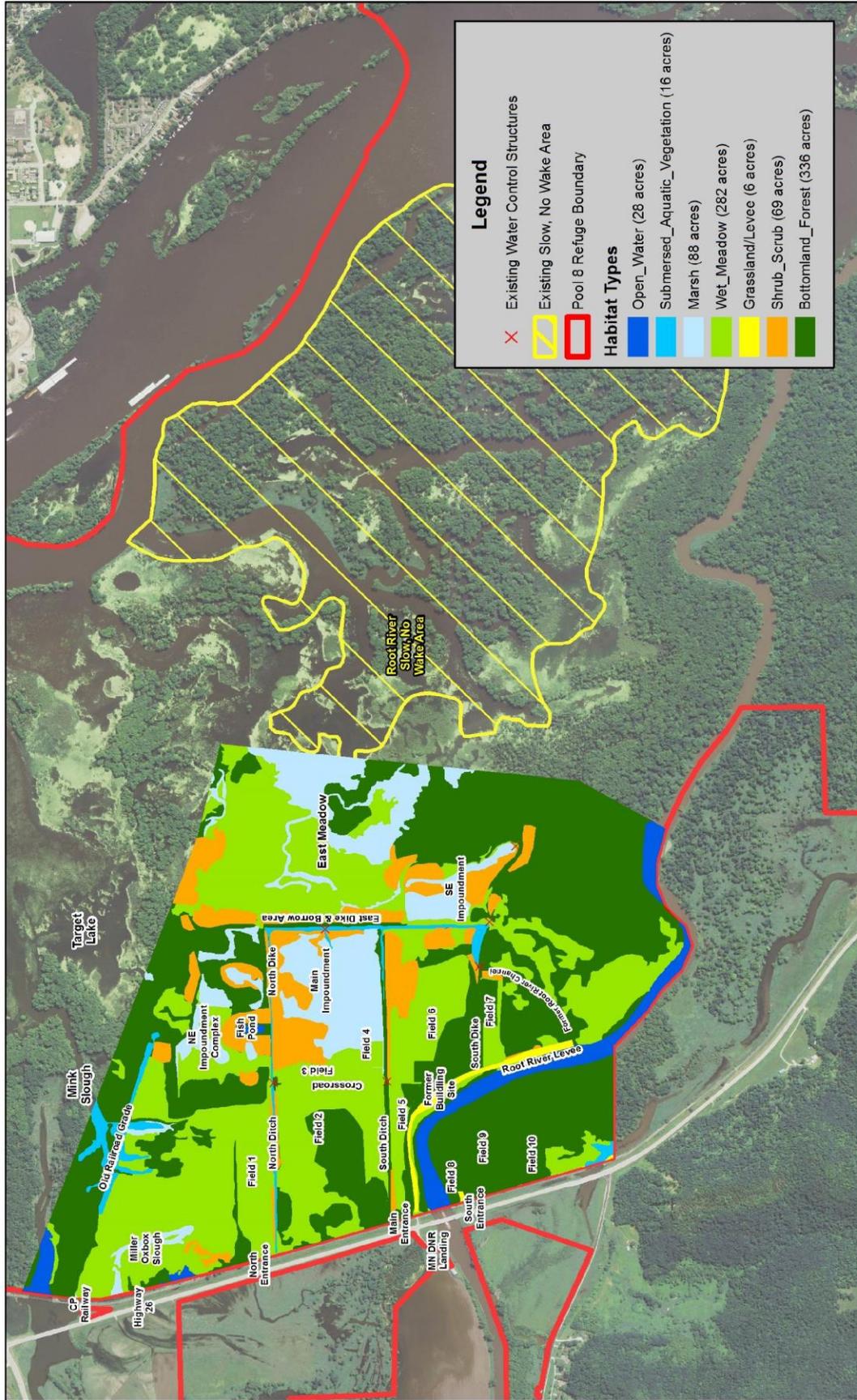
Figure 4. No Action - Alternative A



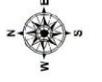
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Figure 5. No Action - Potential Habitat Types if Alternative A is Implemented



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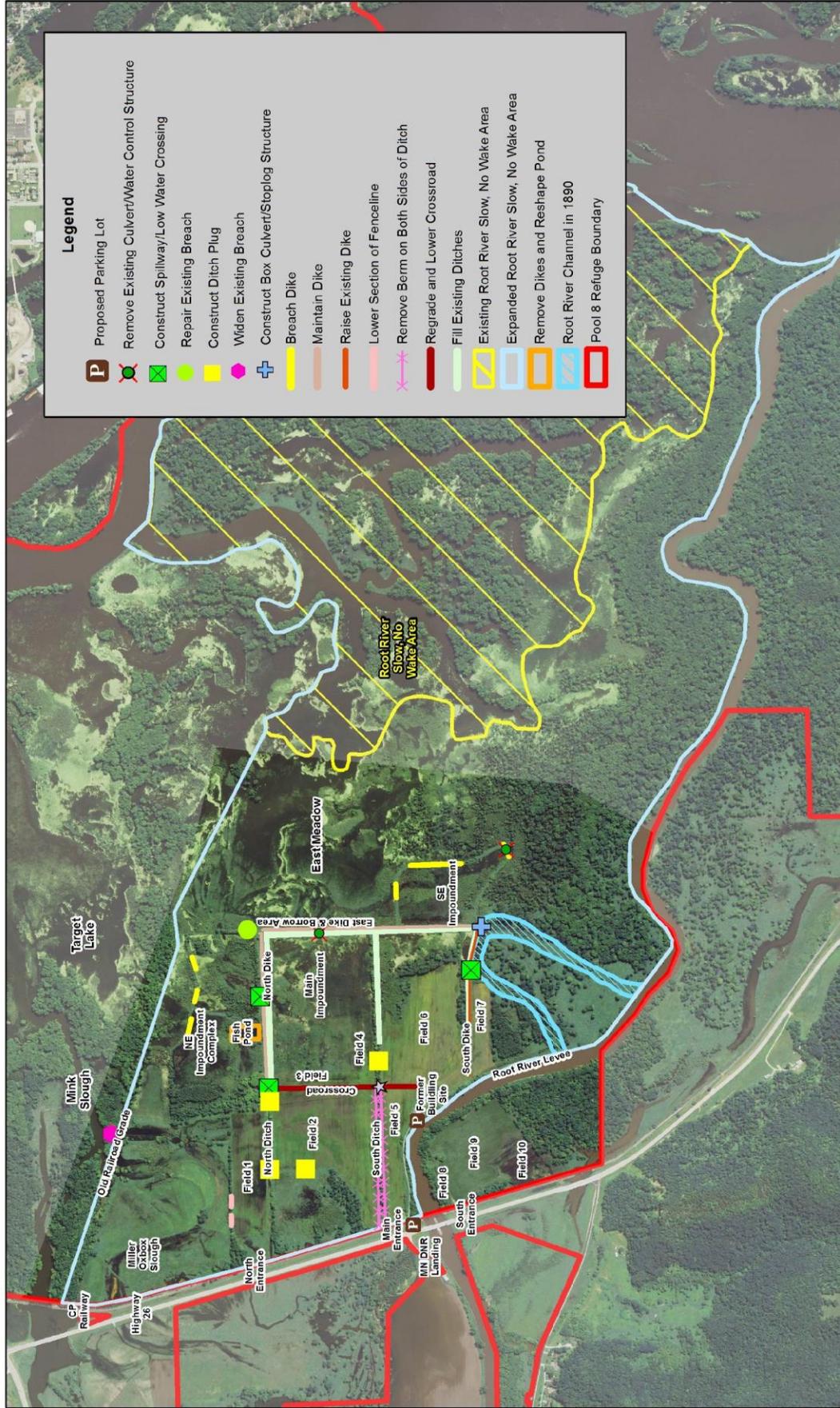


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Figure 6. Alternative B - Passive Drainage Improvements



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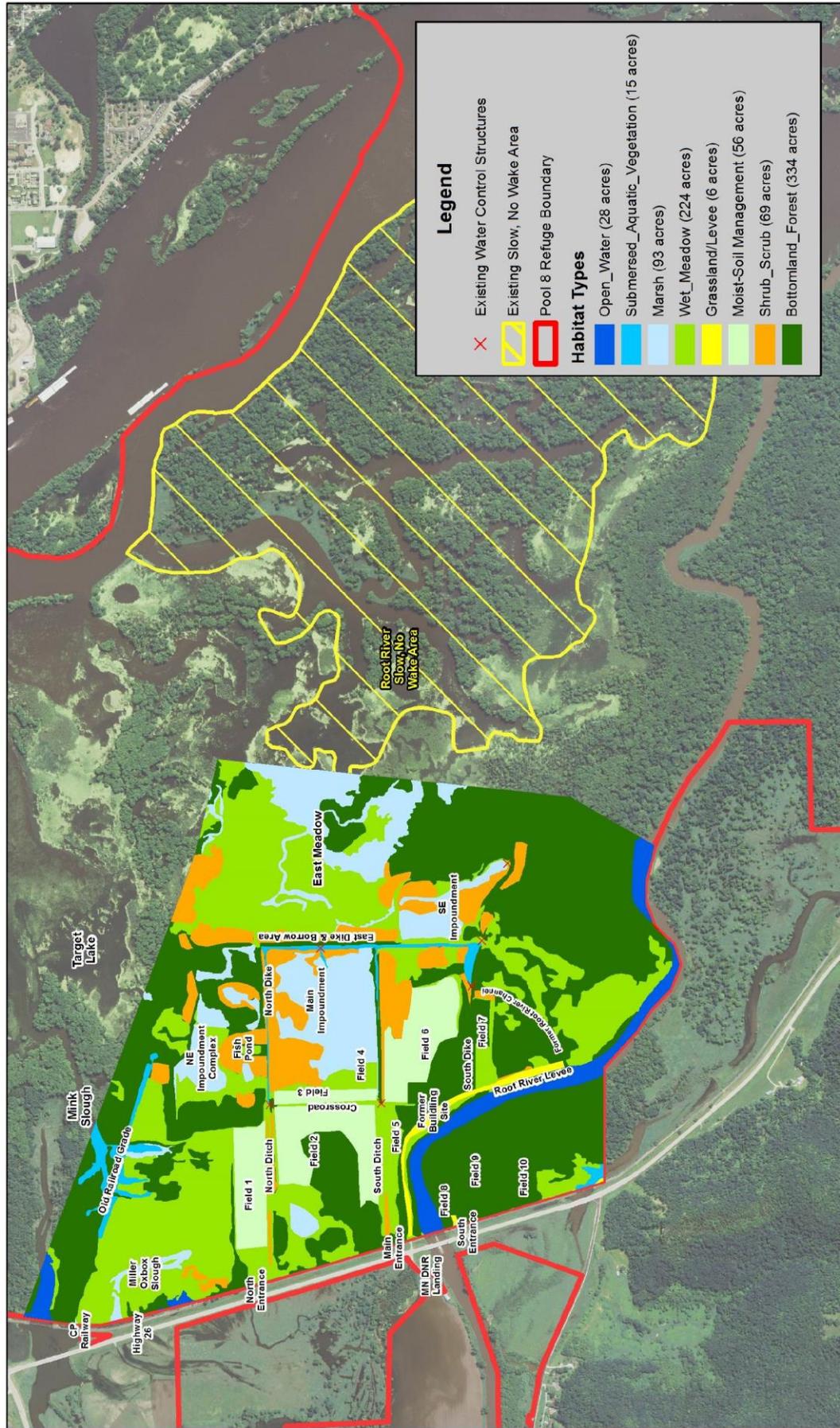


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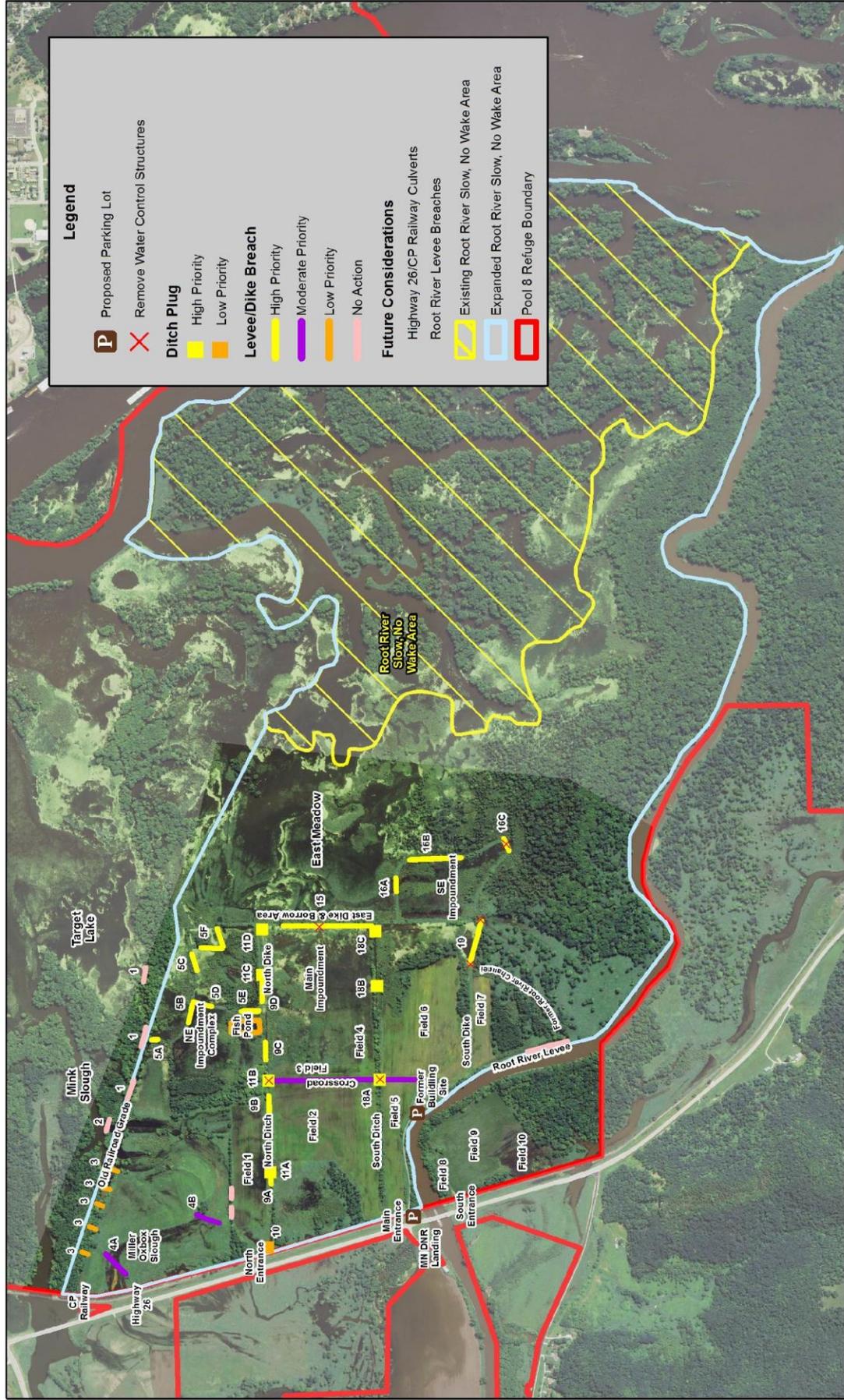
Figure 9. Potential Habitat Types if Alternative C is Implemented



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Base Map is 2013 Aerial Photography



Figure 10. Alternative D - Proposed Action - Restore Natural Topography and Drainage Patterns



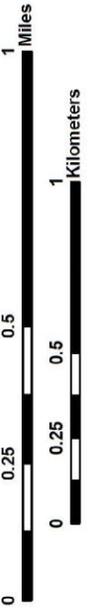
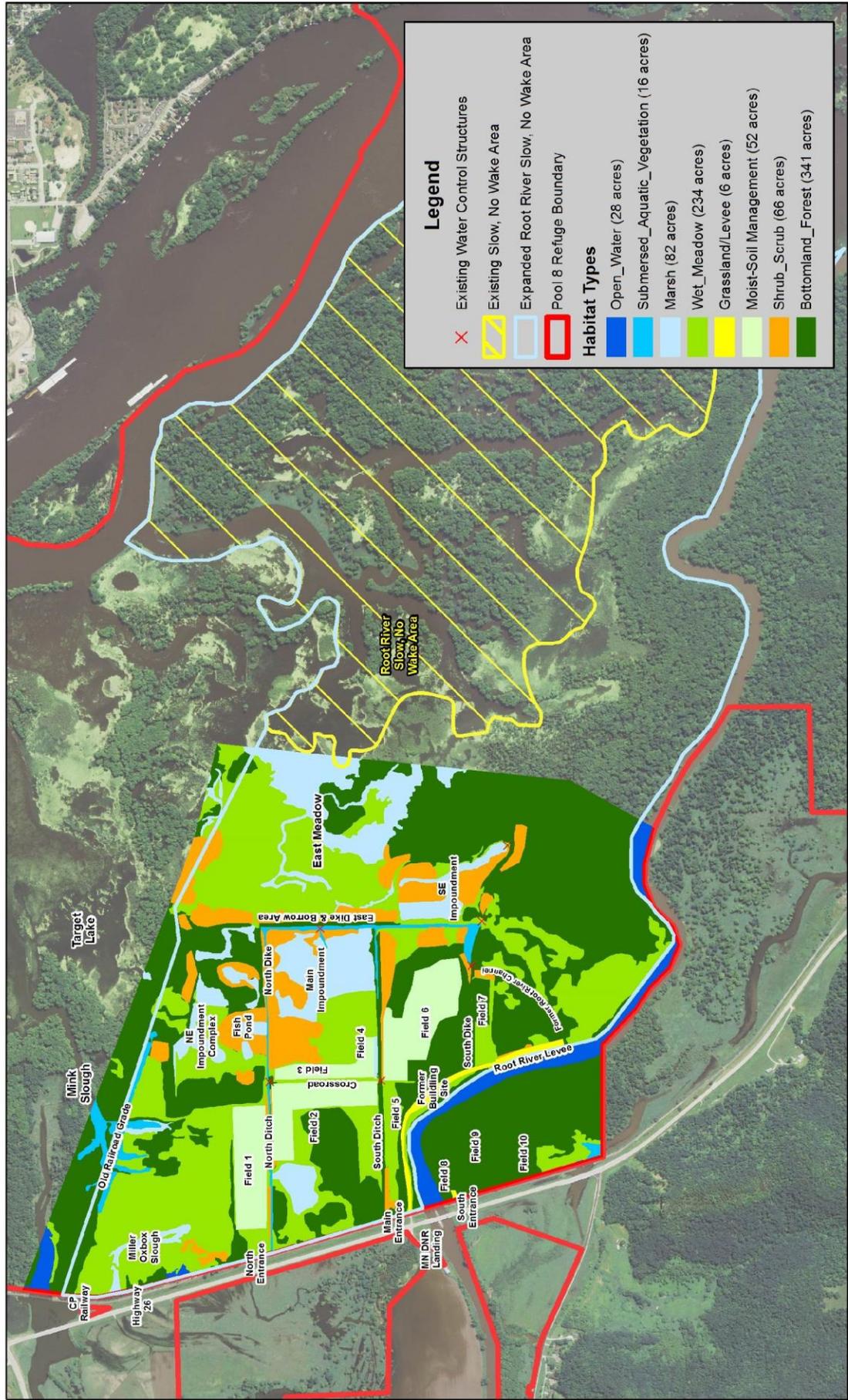


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Figure 11. Proposed Action - Potential Habitat Types if Alternative D is Implemented



Map Created 7/16/15
Project Saved as D:\gledina\loc08\root_river_es_alternative_d_habitat_7_16_15
Base Map is 2013 Aerial Photography